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ELECTRIC RADIO

celebrating a bygone era

Number 90 October 1996

Bob Tapper, K1YJK

ELECTRIC RADIO

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Editor - Barry R. Wiseman, N6CSW
Office Manager - Shirley A. Wiseman

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; Steve Thomason, WB4IJN; Don Meadows, N6DM; Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS

Last month I talked about the change that may come about in regulations that will delete the CW requirement for a license to operate on the HF bands. Since then I've heard from a great many ER subscribers. I'm delighted to report that all but two of the people that contacted me were in agreement with my point of view that this change in the regulations would be disastrous to Amateur Radio.

As I mentioned last month, we must become more involved in the ARRL and particularly in the election of officers and directors. One thing we can do, that I believe would be beneficial, would be to contact our directors and find out where they stand on this issue. If they are not inclined to our point of view we should contact whomever is running against them in the upcoming ARRL elections and find out what their position is. I've reprinted the list of ARRL Directors on page 35. This list gives the phone numbers, addresses - including e-mail addresses - of all the present ARRL directors. This list came from the August, 1996 QST.

Recently I received my ballot from ARRL. Along with it came the statements from the two candidates for director in the Rocky Mountain Division. Incumbent, Marshall Quiat, AGØX, does not mention anything about the CW issue in his statement. Gunnar Carlson, AE4W who is running against him, says that he will "fight to retain the CW requirement in the U.S. Amateur licenses, and in the international treaty which requires a CW code test to be passed to operate below 30 MHz." Needless to say Gunnar gets my vote.

I think that most of us have been very apathetic in the past when it came to what ARRL was doing on our behalf. I think this was because most of us have felt a little alienated and out of step with 'modern' Amateur Radio. If we really care about our hobby we've got to become more involved.

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Cover: Bob Tapper, K1YJK, in his Novice station back in 1961. Recently his interest in AM and vintage gear has been revived. He is very active on 20, 75 and 160 meters.

My Dream Receiver

by Horst Geipel, WAØNUH
2231 Hampshire Rd.
Fort Collins, CO 80526

As we get older, many of us tend to become nostalgic about our hobby. We may long for the equipment we were using when we were first licensed, or may wish to buy that dream receiver we could not afford when we were younger.

When I was in my early teens, my dream receiver was the BC-348. That was about fifteen years before I ever became a licensed ham, as I was then living in Germany where the minimum age to be eligible for a license was eighteen. I was, therefore, restricted to listening only. The receivers I used were all homebuilt. Most of the German hams in those days also used homebuilt receivers, but many had World War II German army receivers. Very popular was a TRF receiver with three tuned stages, the Kurzwellenempfaenger Berta (ER #78, page 15, "Torn.E.b."). But there were also superhets such as Kurzwellenempfaenger Anton, Koeln and Schwabenland. A few of the very lucky hams used a U.S. Army surplus receiver called BC-348. Those who owned one raved about it. After all, it had two RF stages, three IF stages and a crystal filter - wow! I never got to see a BC-348, but learned what it looked like from magazine articles describing modifications. I could only wonder what it would be like to use one of these dream receivers. I did not think I would ever be lucky enough to own one.

I was almost right. When I emigrated to the States in 1954, the BC-348 had disappeared from the surplus market. By the time I served with the U.S. Army Special Forces prior to receiving my citizenship, the receivers I was using were SP-600's and R-390's. Those receivers knocked the socks off the BC-348 and its dream receiver status started to fade. But, I too, fell victim to nostalgia eventually and the old equipment started to appeal again.

During the Colorado Morning Net of March 8, 1996, K7DU mentioned that he was using a BC-348 with his ART-13 transmitter. I told him that the BC-348 had once been my dream receiver and that I would still like to own one. Much to my surprise, I received a letter a few days later from a SWL and receiver collector in Santa Fe, New Mexico. Enclosed was a photo of a modified BC-348-N which the owner was willing to sell for a reasonable price. What closed the deal was an offer by the owner to deliver the receiver to a ham friend of his near Denver. His friend in turn would take it to an upcoming hamfest nearby. Forty-five years after it became my dream receiver, I finally owned a BC-348.

As received, the receiver worked in the MVC mode but not in the AVC mode. A toggle switch had been installed next to the CW oscillator switch and a P-239 antenna connector in the upper right hand corner. A four contact socket had been added to the RF cover, apparently to provide power to a converter and AVC to an external S-meter. The power connector in the rear had been removed to make room for a huge DC smoothing choke. The AC power supply installed in the receiver used a power transformer with a 375-volt secondary. Consequently a power resistor had been added to reduce the voltage. Both the resistor and the transformer

The author's restored BC-348-N.

ran very hot. The dial drive had considerable backlash and the front panel had been patched with gloss black spray paint around the RF cover. But the receiver was restorable. K7DU was kind enough to send me copies of the BC-348 schematic, alignment instructions and other important information.

I did not intend to do a full restoration, but knew that I would have to paint the receiver if I wanted to be at all happy with it. Once I removed the front panel and started sanding, the urge to make the receiver look like the original took over. I patched the holes left by the toggle switch and antenna connector with epoxy and sanded them smooth. With all that sanding it was unavoidable not to also sand down the slightly embossed front panel lettering. I bought two cans of black wrinkle paint from a local Harley Davidson dealer. After trying the paint on the dial bezel I was encouraged enough to tackle the front panel. I exposed it to the hot sun prior to several applications of wrinkle paint in five minute intervals. Then the panel was placed back into the sunlight to bake. An aluminum panel I had cut to size earlier to replace the original RF cover was also painted, as were the cabinet, tuning, band switch and mode switch knobs. The remaining knobs were painted with flat black spray paint. I had to engrave arrows into three of the knobs to match the other two. Application of white rub-on lettering in the correct type size completed the restoration of the receiver's exterior. I was now ready to start work on the chassis.

After reading the excellent article describing the BC-348 in the November 1991 issue of *Electric Radio*, I was concerned about those black, flat paper capacitors with a reputation of shorting out. This receiver did not have any. All bypass capacitors were the tubular metal encased type, and the moisture and fungus proofing still covered all the solder joints. The bypass capacitors were, therefore, original. The set was manufactured by Wells Gardner with the serial number 8913.

There was evidence that the tuning capacitor had once been removed by a former owner, probably to make it easier to modify the RF deck. He then neglected to load the split gear when he reinstalled the capacitor. After I removed it again, loaded the gear and

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The Road from QMR to Fair Radios Catalog

by Chuck Teeters, W4MEW
841 Wimbledon Dr.
Augusta, GA 30909

How, why, and where Signal Corps radios came from is somewhat of a mystery to most amateurs and even to some of the companies who built the radios. Credit, if it's a good performing radio, usually goes to the company who built the first production radios. If it was not such a hot radio, the U.S. Army Signal Corps usually gets the blame. Neither case is quite right, as lots of people and companies took part in the design, development, and building of Signal Corps radios.

The start of a military radio was a QMR, form DA-249, a Qualitative Material Request. The QMR came from, in the vacuum tube days, the Office of the Chief Signal Officer. It was written because OSIGO approved a radio needed by a Field Command, Combat Developments Command, Advanced Projects Research Agency, The Marine Corps, or any of several other agencies. The QMR listed the desired characteristics, specifications, objectives, projected use, limitations and as much other information as could be put together.

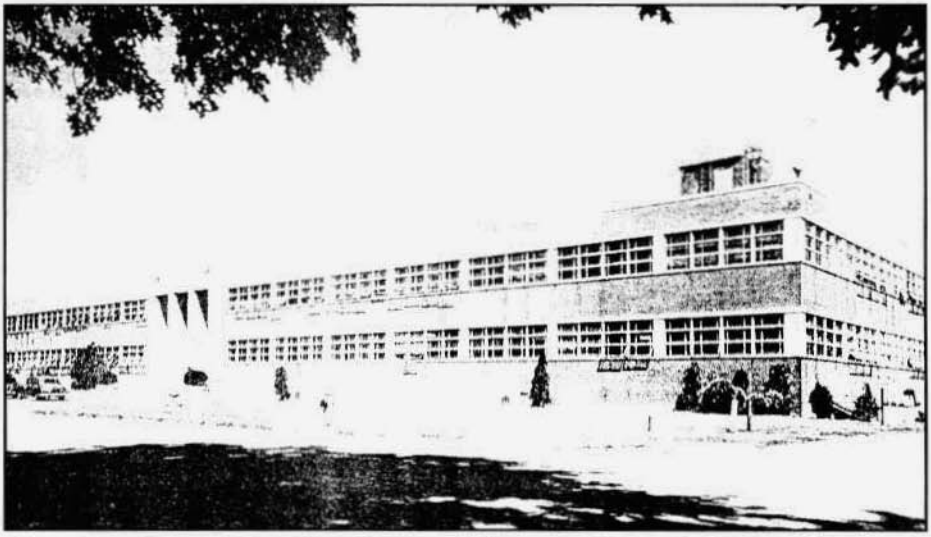
The QMR went to the Signal Corps Labs at Fort Monmouth, New Jersey where it was assigned to one of the radio sections. Short range radio got the QMR if the desired range was under 250 miles, and long range got it if over 250 miles. A project engineer was assigned, who kicked the project off with a feasibility study. If this proved it wasn't a pink cloud dream and was in the realm of possibility, a development project was started, which would lead to a model of the radio, for engineering test. Many Monmouth engineers were hams and the amateur influence could be seen in lots of projects. The T-195/GRC-19 HF transmitter QMR called for a a 20 MHz upper limit, but it covers 15 meters courtesy W2GUM, the project engineer.

Feasibility studies lead to formation of a separate group within the labs, referred to as the "Pink Cloud Group". They looked for solutions to impossible requirements, and were not tied to QMRS. They developed things like overtone crystals (W2PAT), moon radar (W4ERI), spread spectrum (W2IMU), printed circuits (W2KQJ), and the not so popular, toroidal coupling to use trees as antennas (anonymous - for obvious reasons).

Prior to 1940, development models were built in the Signal Labs, but due to the war the first contract for development outside the labs was approved. It went to Bell Telephone/WECo. From 1942 to 1945 over 50% of the development was done by contract or other government agencies. That stopped in 1945 but in 1949 a few outside development contracts were signed. It has grown since, by 1965 outside development contracts represented 80% of Signal projects.

Development contracts started with a request for proposals (RFP), and had to be advertised in the Commerce Business Daily, a Washington paper. The RFP had a statement of work (SOW), which said what was wanted, how it should be done, how long it should take, how progress would be checked, listed requirements, specifications, and any government furnished equipment (GFE).

Signal Corps Lab RFPs were recognizable as they started with SCL. Development contracts were cost plus



The Squire Signal Lab at Fort Monmouth, home of the Radio Division from 1936 to 1956.

profit contracts and required close control by the project engineer to keep the project going in the right direction without spending money wildly. Contractors loved to change engineering direction in midstream, which kept money flowing, and could result in spin off projects.

The response to RFPs were company proposals, stating how they would go about developing the radio, who would work the project, what facilities they would use, and how much money they wanted. Company proposals were written with the assurance their engineers could walk on water if necessary. The Monmouth project engineer would head a group who would look over the proposals, minus the money part. They would be ranked by merit, and turned over to contracting. The contracting office would match price and ranking and negotiate a contract for the best price with the best ranked company. The project engineer could only be in on final negotiations.

Sometimes an existing radio could do the job. This eliminated development cost and put the radio in the field much sooner. Many companies had representatives at Fort Monmouth, with their ear to the ground. If security was not a problem, a lunch time discussion of a proposed RFP at Luggis in Red Bank could produce amazing results. The most notable I remember was Ernie Mattson of TMC. He would walk into the office two hours after a lunch discussion and ask if we had a copy of TMC's latest catalog, which listed a new product that happened to meet our requirements. Since we always seemed to have wet ink on our fingers after reading TMCs catalogs, I often wondered if we saw the TMC product write up before Ray de Pasquale, TMC's boss. But the Army bought a lot of good TMC stuff. The 10 and 40 KW AN/FRT-52 and -54 SSB transmitters were two of the best transmitters Signal had.

Jim Farmer from Motorola took a different approach, he had the factory build up some radios that could do the job the QMR required and he would deliver them directly to the originator of the QMR. We would be grinding along on the RFP when OSIGO would tell us to check out a radio that was being used

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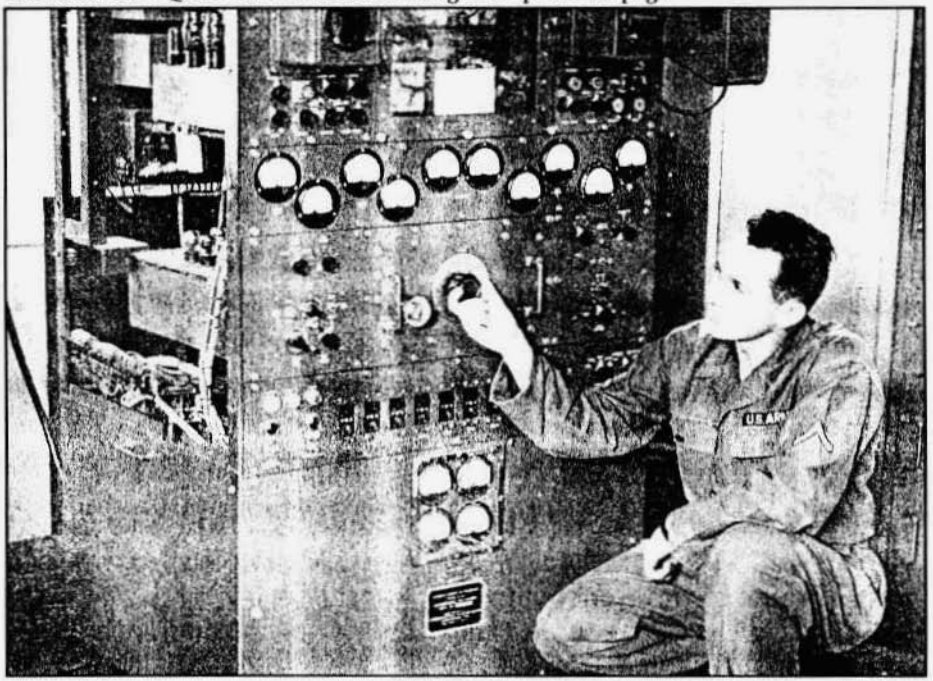

The engineering test of a Link Radio HF transmitter model C-3 (we bought 14 of them).

by some Army Commander. If the Motorola worked even half way decently, you couldn't tell some two star he couldn't keep his new radios, or you would find yourself inspecting microwave sites on snowy hill tops in Korea. Jim sold the USC-3 radio central that way, the Motorola FDM cell phone was 15 years ahead of everything else. The Army bought a lot of Motorola radios because of Jim. Bell Labs/WECo were the only ones who never came to Fort Monmouth unless invited.

Most of the time the RFP got published, which brought lots of proposals, good and bad. When trouble was expected in getting a good proposal there would be a pre-solicitation conference. This gave everyone a chance to sit down and talk over ideas. The Army lost some good engineers at these conferences, when they found out what the contractors took home. Our pay rates didn't quite match up. But the best proposals always came after a pre-solicitation conference. Many companies would get together to share ideas, and would bid together. Lots of proposals for transmitters, but few for receivers. The first proposal suggesting a SSB transceiver, from RCA in 1950 was rejected, but Collins engineers were listening.

After the award of a developmental contract, the project engineer was in for a lot of reading and travel. Every step of a project required review and approvals. Thousands of pages of paper work were generated by a development contract. As opposed to the proposal, company engineering reports were prepared by a cross between a science fiction and soap opera writer. They were full of suspense with statements like"yet to be investigated", "all possible calculations imply", or the perennial favorite "design advancing the state of the art". Anybody that says engineers are not politicians has not read cost plus con-

A diversity test of the AN/FRR-39 receiving set, with R-390s.

tract reports.

When the radio was completed, the engineering tests started. This was normally at Fort Monmouth. Company engineers were allowed to make adjustments. Some developmental models looked like ham radio hay wire. I remember a SSB converter for the R-390 which became the CV-157. Murray Crosby Labs from Long Island brought in the model on a table, less legs. It looked like a hams junk box. There were scrap paper labels here and there, and every thing from 6AG5s to syncros screwed down all over the table, with wire running everywhere. But in engineering tests it worked great. Crosby had come up with a new product detector that really worked. So much for looks.

Collins Radio sent developmental test models which looked like they were ready for a showroom. But looks weren't everything. A Collins contract for a receiver tracking low-power transmitter to work with the R-390 was a disaster. The AN/URA-13 matched the R-390, looked very professional and tracked the receiver tuning, but it was a UU/SG, unpredictable unreliable spectrum generator. If you thought the R-390 had gears and coil racks, you wouldn't believe what they stuffed into a 390 sized cabinet. We dropped the project. It was hard to believe the Collins engineers that turned out the URA-13 produced the R-392 which was the best, most reliable vacuum tube receiver Signal ever had.

Following a successful engineering test, it was time for a pre-production contract, which produced about 10 or 20 radios for field testing. The company that did the development did not always get, or want, the contract for the pre-production radio. This was very competitive bidding because pre-production contracts did not require large engineering departments, just a good model shop, and could lead to a production contract and big bucks. There were always surprises in these contract awards, Lionel Electric Train building a Federal ITT transmitter and Webcor, the tape recorder company, building a Collins designed VHF transceiver.

continued next page

The basement of Squire Signal Lab with all the left overs from WW II developments that didn't make it. Please note how we saved your tax dollars with the locally procured heating system. (I spent 20 years in Squire and that thing never got hot).

All production contracts were fixed price and proved you got what you paid for with the lowest bidder. To avoid this, bidders were required to have experience building the type equipment they were bidding on. Some companies would buy up a failing one to get a name with experience attached. Lloyd Hammarlund would turn over in his grave if he knew some of the shady operators that used his name for bids. The first R-390A production run by one company was junk. They had a name with a great track record building receivers, but they had bought it 12 months before.

Pre-production radios were field tested by Army troops without engineering assistance from contractors. The Army maintained a test board for small radios at Fort Bragg, NC, Jack, W4AAH and Dick W8RM had a ball running a continuous field day. The big stuff was tested by Army Communications Service Division at La Platta, MD, and Woodbridge, VA. I always got the feeling that W4JUY and the Potomac Valley Amateur Radio Club had a lot to do with tests. I would like to compare DX contest dates to test dates for the 500 KW AN/FRT-33 SSB transmitter.

At major points in the process comments were solicited from Army organizations interested in the project, and field tests let the nitpickers into the act. No comments on a double balanced mixer in the TRQ-32, but 39 comments on the microphone connector on the T-368. The little PRR-9 FM receiver generated over 100 comments about the headphone/loudspeaker. Even Health Services Command sent comments about possible ear damage and infection problems. Operational and maintenance problems were corrected, and the others were filed with the engineering reports, marked do not open until Christmas (secret).

At the end of this process the troops had their new radios, five years later. When there was a war we cut time and got some lemons. And when there was no money, we cut corners and got some lemons. In 1960 we changed to the GM approach, develop the new model but don't buy it. When we finished the AN/GRC-19 and put it into the field, we did the GRC-65, but didn't buy any. Then we did the GRC-98, but didn't buy any. Then we did the GRC-106, and since the GRC-19 had high mileage by then we bought and fielded the 106. Keep devel-

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Recompensating Old Oscillators to Minimize Drift

by John Robert Burger, WB6VMI
5104 Newcastle Ave.
Encino, CA 91316

Introduction

Old VFOs and local oscillators can suffer from many problems, including noisy tubes that have AC hum, lack of RF grounding, loose connections and cracked components. A problem that I think is fairly common is a bad temperature compensating capacitor. This problem cropped up in both of my DX-100s and in my Valiant. I suspect also that a local oscillator in my HQ-160 suffers from a lack of compensation on 75 meters.

The compensating capacitors are usually only a few picofarads, but they have negative temperature coefficients that compensate for the positive coefficients of the coils. Hence, they minimize drift during equipment warmup. Unfortunately, bad capacitors can be unstable, giving frequency wavers and small, sudden jumps in frequency. This is not a big problem for AM, but it wrecks the possibility of using CW code, since most operators like to use sharp filters. Even without filters, the sound of a carrier cracking up is extremely annoying.

My DX-100 Experiences

I repaired an old DX-100 obtained free from Sandy,W6BYE. The VFO was unstable, so I replaced the resonate circuit capacitors with off-the-shelf parts that are readily available today. Ideal capacitors are NPO (negative or positive temperature coefficient equal to 0). Although the VFO now sounded clean as a whistle, its drift was excessive. Figure 1 shows the uncompensated drift to a lower frequency starting from 14.0000 MHz.

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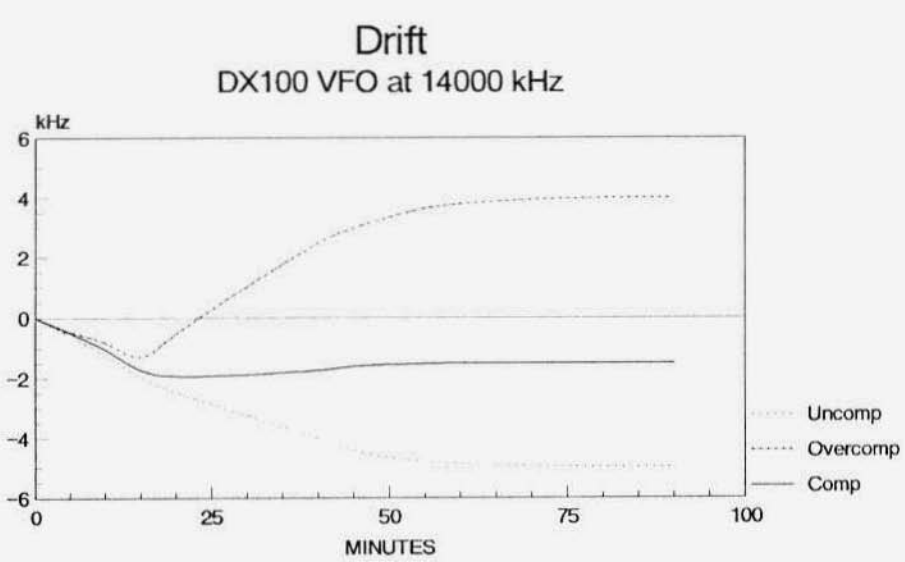


Figure 1

Nostalgia - A Simple Single Tube Transmitter

by Philip Goodman, W5YVT
217 Millbrook Farm Rd.
Marietta, GA 30068-3766

"It was a dark and stormy night....." not that it had anything to do with receiving my first ham ticket in that afternoon's mail! I was on top of the world and thunder crashes were not going to keep me from planning my first ham station.

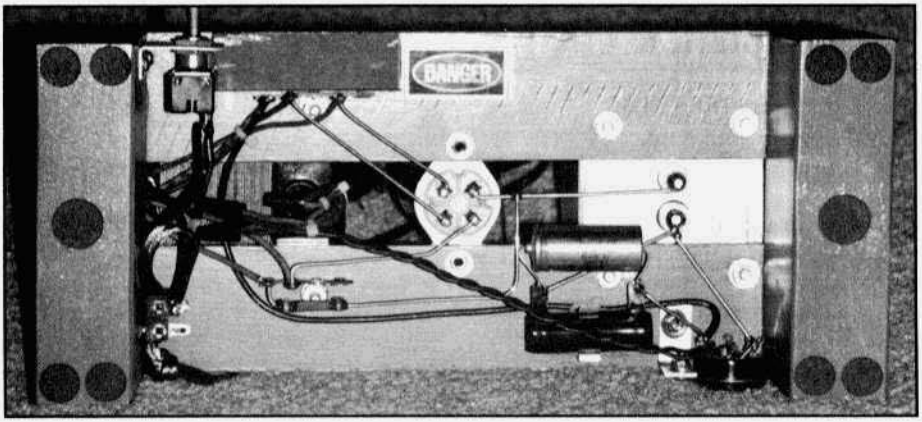
A friend of Dad's had found an old Hallicrafters "Sky Buddy" receiver in the back of a dark closet. It was mine and it even worked! Good thing too ... because if it had not worked, I doubt if I would have ever succeeded in repairing it. As an early teenager, my level of electronic competence was nil.

The wet and noisy evening was spent filtering through Allied Radio catalogs and one old *QST* Magazine. It didn't take long to realize that a transmitter from these sources was way beyond my meager finances.

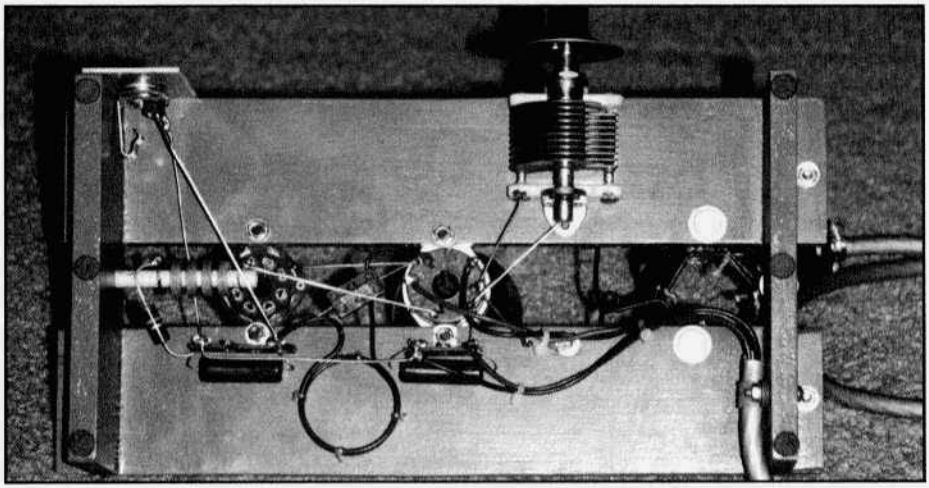
A shoe box full of assorted parts ....capacitors, resistors, transformers, etc. plus a 1949 edition of the ARRL Handbook held out the only remaining possibility. In flipping through the handbook, I landed in a section called "High Frequency Transmitters - A simple Single Tube Transmitter". A tube, a crystal, a variable capacitor, bell wire and even a wood chassis .... one couldn't go wrong here!

My Dad even found some Fahnstock clips to complete the bill of materials. The greatest difficulty encountered for a first-time homebrewer was learning how to wind the coils .... proper number of turns, correct diameter, alternating in and out of the nails and securing the turns once finished. Three days of tedious work (at least tedious for me) and some unsophisticated wood work .... and she was finished.

The author's simple single tube transmitter



Bottom view of power supply.



Bottom view of transmitter.

It actually worked! .... a real CW tone! I could not have been prouder if I had been presented with a Collins transmitter. Now to burn up the Novice bands! And burn it up I did. I remained gung-ho for this little transmitter even after the electrolytic blew up one early morning, filling my bedroom with white smoke and bringing my parents running! I told you I wasn't very good with this black magic called electronics.

There has been a lot of water under the bridge since the early fifties and the original rig was long since abandoned to some unremembered fate.

Nostalgia can be a powerful motivator. It was eons later that another ham friend and I were flipping through an old ARRL Handbook (1949 to be exact) and there it was .... the old single tube, wooden chassis transmitter. I simply could not pass up the urge to rebuild my first Novice rig. This time I might even get it right! I did gather all that was needed and did get it right the first time. This time I even built the coils for 40-meters. Its practical day-to-day use is questionable .... but what fun to relive what was so urgent to me as a teenager.

Now if I can just get the Smithsonian to show some interest! **ER**

Hamfest Station Airs Despite Hurricane

Paul Courson, WA3VJB
1025 Connecticut Ave., NW, #800
Washington, DC 20036

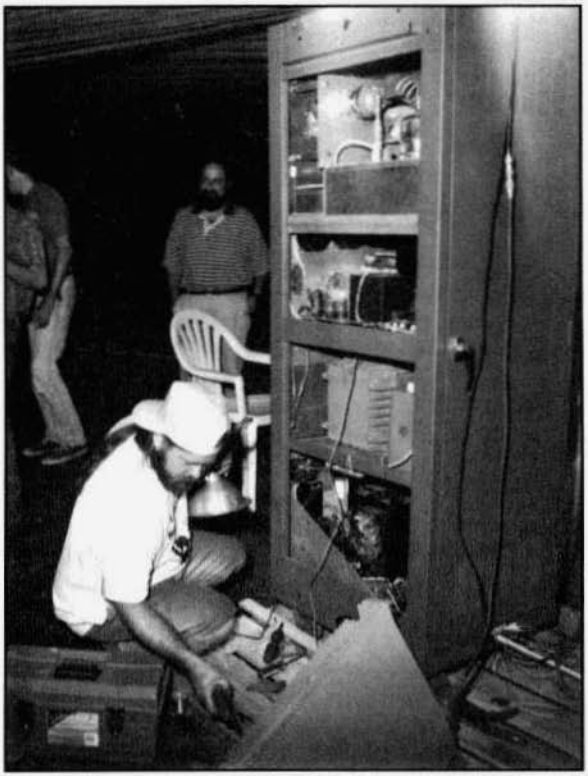
(Gaithersburg, MD, Sept. 9) -- Hurricane Fran was no match for the determination of Classic Radio fans behind the latest AM special event station at a major east coast hamfest. The outdoor station was established in record time and only hours after the last rainfall had dropped on the Montgomery County Fairgrounds about 30 miles from Washington, DC.

Sporting a club call, W3PRL, members of the AM Radio Network were again invited to setup at the hamfest by the Foundation for Amateur Radio. FAR officials have expressed their delight at the homebrew expertise and operating enjoyment that are such an obvious part of similar events the past few years. The hamfest committee, quoting comments from people attending the show, believes the station boosts attendance and enthusiasm for the hobby.

This year, the prospect of a hurricane was an added element of excitement. In the days before the Sunday event, forcasters knew the storm would either be part of the hamfest or would just have passed, depending on the track and schedule of its progress. As it turns out, the storm struck land hundreds of miles away and had already spent much of its fury by Friday, when it passed well to the west of the hamfest site.

Left behind was a lot of wet ground. By Saturday the skies were clear and the winds were calming down. Antennas were put aloft via the usual bow-and-arrow in the grand old oak trees

Gary, N2INR, at the console of W3PRL-AM.



Tim Smith, WA1HLR, repairing the plate transformer on the homebrew transmitter.

which suffered very little damage from the storm. The wet ground dried out as the station came together, and was no problem by the time camping tents went up around the "AM Corral."

It usually takes about four hours to establish a portable, full-sized vintage station at a remote site. Sometimes it can take even longer, such as the six hours it took for the 1993 Dobbins Island AM Expedition, and at the all-day effort it took at 1994's Lake Arial (Pennsylvania) event.

But this time the station was on the air, just two hours after we hit the fairgrounds. Some of this was luck, such as having the antenna arrow going over the "right" branch on the first few tries. Another part of it was the benefit of a process that gets refined each time we try a stunt like this.

Elaborate Station

When we say "full size" portable vintage station, the equipment could be anyone's typical operating position at home, rather than some kind of mobile rig. But, not being content with that definition, the latest effort really tipped the scales and pushed ahead the concept of "full size."

A Heathkit DX-100 transmitter was among the lightest gear. An EAC R-390A receiver ranked somewhere in-between, and the heavy end was held down by a homebrew six-foot rack transmitter called the JS-750. This beast, brought by liftgate truck, outdid even the T-368 military transmitter from last year's event at Gaithersburg.

On Sunday, the station drew quite a crowd. Pete Markavage, WA2CWA noticed that "during the day there was a sizeable amount of people walking by, watching and listening in awe a bit at the sizeable equipment that was being used."

Big Rig, Big Problem

The JS-750 is a pair of 813s modulating one 5-500 built for broadcast audio quality. The modulation transformer and plate supply are from commercial service. But even top-grade components can go bad, and they did -- quite dramatically.

After a few hours service Saturday evening, the plate transformer failed and smoke arose from the back of the rack. Undaunted, Tim Smith, WA1HLR, conducted some extraordinary surgery.

Imagine taking apart a sofa to repair a bad spring. Tim loosened the laminations, peeled back the paper, and probed the layers of windings on the plate trans-

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Hamfest Station Airs Despite Hurricane from previous page
former to reveal the location of a short.

Using a piece of insulated, ladder-type feedline, he bridged the bad segment and positioned the "splice" so it would stand up and away from the transformer. And, just like that, the repair was complete and survived the remaining 15 hours of airtime that weekend!

It was quit a sight in the wee hours late Saturday into Sunday. There was a view from the AM Corral, lit by kerosene lanterns, toward the station -- where the JS-750, rack panels removed, was glowing in full glory as the 813s and 5-500 played into the night. ER

The author installing antennas in the oak trees.

Official Logbook

Operations began at 3 pm Saturday, Sept. 7th and continued through 1:30 pm Sunday, Sept. 8th. The following stations are listed in the official log.

However, with multiple ops and roundtable QSOs, it is possible some calls do not appear. QSL policy offers great flexibility. Send your detailed reports and/or aircheck tapes (including from SWLs) along with an SASE to the station trustee:

Hugh Turnbull, W3ABC
W3PRL Special Event Station
6903 Rhode Island Ave.
College Park, Md. 20740

All of the following are on 75 meters, exclusively 2-way AM, during time frame above:

WA3GPE, K4SKW, WA3WBC, W7FG, K2UX, KD3SK, N3NRI, KN4ME, KB8OMO, KJ4KV, K1GUP, NØSFH, W8SR, AA8XC, N2KFZ, KA3OTT, AA3JU, KB2QQF, K1RBM, WA3JYO, KH3BBH, N1RBM, WA1SOZ, WA3FYZ, WA2IXP, KA1ORG, WB4AIO, AE3O, W3HKL, K9RJ, WB8BEM, K3KN, N2SHG, W1EOX, KØOCC, W8MNC, N4EDE, KC4CMR, K1JYK, N3JEH, N2XYR, WA1GFZ, NØTE, N2IDU, N3NQI, W3DUQ, KB4YST, K3KLC, N2ZAB, NE1S, K4KYVKX3Z, KJ3X, N3LHP, W5NWX.

Editor's Note:

Paul and his group are giving AM and vintage operation good publicity. Maybe this is what we should all be doing to overcome some of the misconceptions about our aspect of ham radio. If others become inspired by this article and go on to do something similar, let us know about it. We'd be happy to give advance publicity and follow-up with an article on the event.

A 6 kHz Mechanical Filter For The Collins 51J-4

By Bob MacDonald, N2NIR
10 Woodward Rd.
Poughkeepsie, NY 12603

I recently purchased a Collins 51J-4 that came with a 3.1 kHz mechanical filter but did not have the 6 kHz mechanical filter that I wanted for AM reception. The cost of a new 6 kHz filter almost equals the cost of the receiver itself. Even a used, direct replacement filter is quite expensive, assuming you can find one.

Fair Radio of Lima, Ohio, lists an 'F500-Y60 (526 9378)' as part of a 500-kHz IF/audio amplifier module from a Collins 618T transceiver. A cross reference lists this filter as having a bandwidth of 6.0 kHz at 3 dB, and 13.2 kHz at 60 dB.

However, the 51J-4 filter is an "M8" package, and the Fair Radio filter is an M6. An adapter must be fabricated to make it plugable. I used a scrap piece of fiberglass board, approximately 3/16" thick and shaped it slightly larger than the footprint of the existing 3.1 kHz filter, 3.0" by 1.0" (see Fig. 1). 4 holes are then drilled, again using the existing footprint, to hold pins that will be used to make contact to the filter socket. I used a 3/64" drift bit but that was too large. Get something smaller if you can, so the pin fits tighter in the board.

The pins are made from 3/4" 18-gauge brass escutcheon pins available at the hardware store. Use a file and sandpaper to smooth the sharp tip of each pin, then using a hammer or pliers mash or crimp the middle of the pin so that it will fit tightly in the hole in the fiberglass (see Fig. 2). Put a drop of epoxy into the pin hole to cement the pin in place. You should now have a board with 4 pins that will plug easily into the filter socket. I didn't add the 2 alignment/support pins as in the existing filter because the unit I made is very light in weight. Lastly, since it is important to plug this board in correctly, mark one of the long sides as 'up'.

Next remove the new filter from the IF/audio unit. Be careful, in my unit everything was coated with a sealing material. I didn't have much luck cleaning it off with any of my home cleaners. Possibly some of you have a good suggestion for removing that mess. Be especially careful removing the wires from the filter since the terminals are small and a bit delicate. Mark the input side of the filter for future reference. (I did this but I'm not sure it matters).

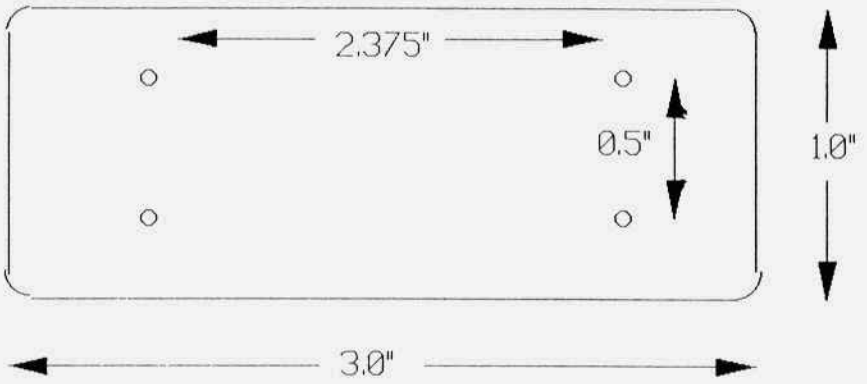
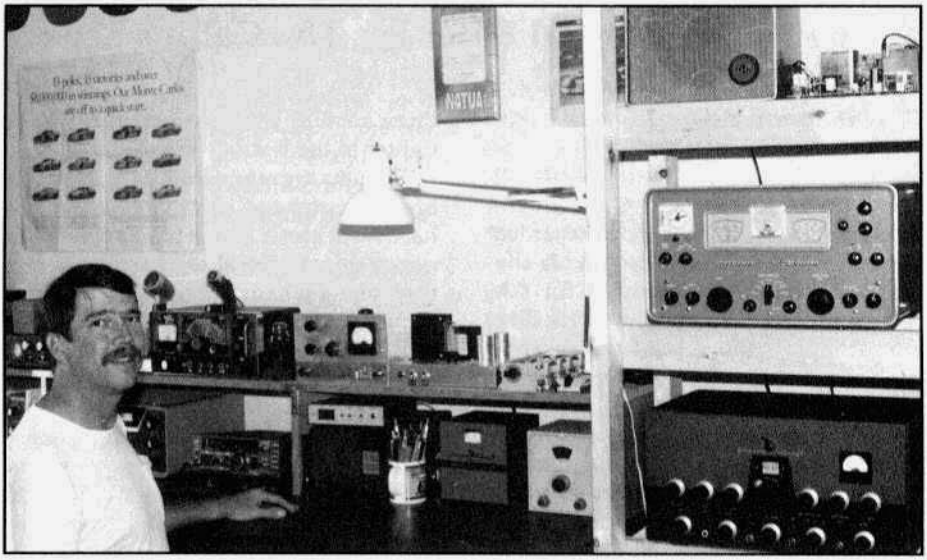
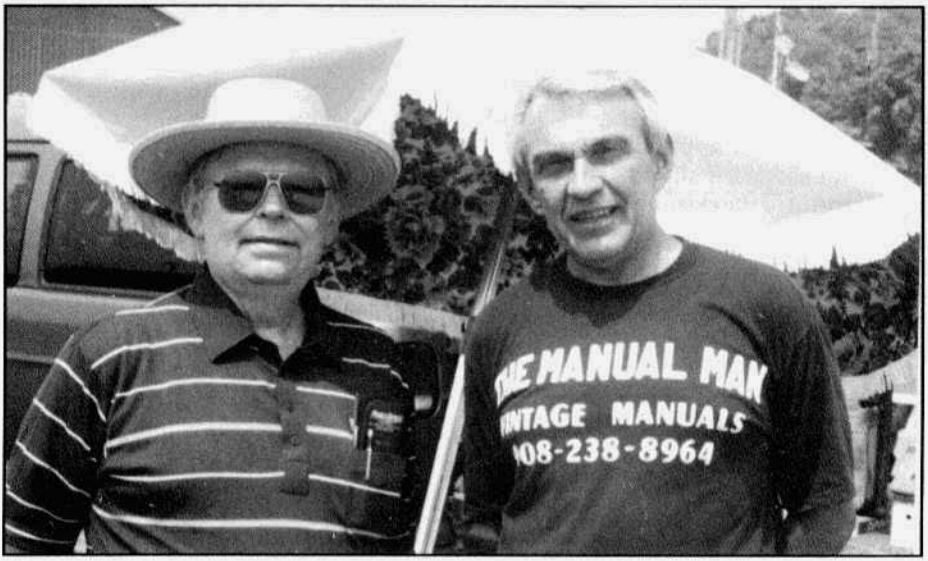


Figure 1 - fiberglass adapter

continued on page 36

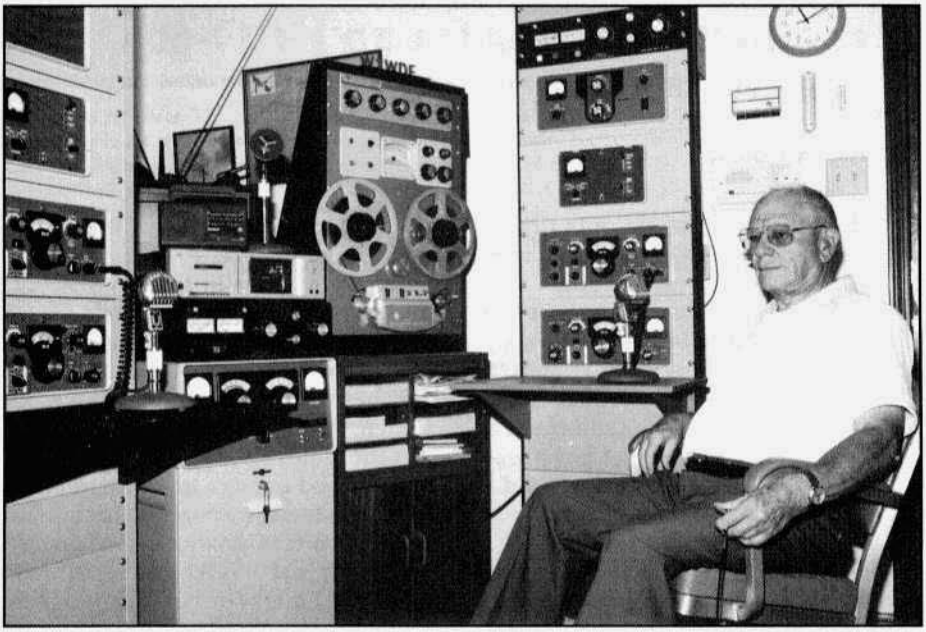


Collin Collier, N4TUA, in his vintage hamshack. The Johnson 122 VFO under the shelf, in front of his operating position, was recently acquired as an unbuilt kit.

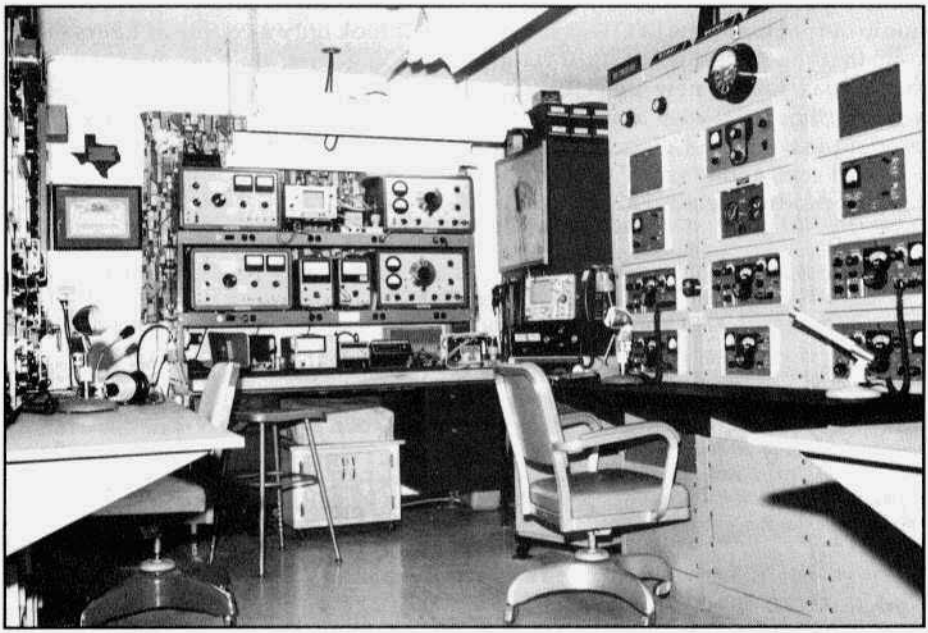


Richard Prester, WA2IFS and Pete Markavage, WA2CWA, "The Manual Man", at a recent hamfest. *Photo by Marty Drift, WB2FOU.*

Correction: Last month we listed Cliff Kurtz's call as N6LZI. His correct call is N6ZU.



Ed Schaad, W3WDF, at one of his operating positions in his mostly Collins hamshack. The photo below shows another view which includes his nicely organized test bench.



A Product Detector for an HRO-60

by George Cummings, K7DU
P.O. Box 657
Hanna, WY 82327

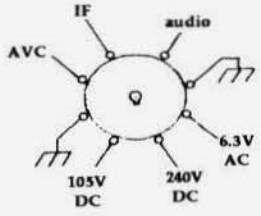
Back in the '50s, I could only dream about owning an HRO-60. We had nine kids to raise, so the radio budget was very small. It took many years, but in 1989 I finally had an HRO-60 sitting on my desk. I work mostly CW so I started to think about adding a product detector to the HRO. There was a commercial unit available on the market but it was a bit beyond my budget. If I wanted a product detector, I'd have to build it myself.

I started to mentally design it (the box, the tubes, etc). when it occurred to me that I could just put a 6SA7 in the accessory socket, since the voltages and signal in-and-out were all there. I built a standard 6SA7 mixer circuit (that's what a product detector is!) with an audio output load. The BFO was pulled from the diode detector and run through small coax to the new detector. The wires on the socket were changed to the proper pins of the 6SA7, the few resistors and caps added (see Fig. 1), and I had my product detector.

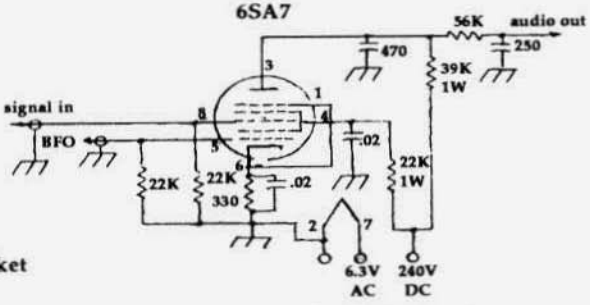
The only hitch to this was the BFO B+ voltage, which was only on when the mode switch was in the CW position. The construction of the mode switch made it impossible to turn on the B+ in the NBFM position. My remedy was to cut the BFO B+ wires from the mode switch, short them together, and let it run continuously. The shielding on the BFO is good enough to be inaudible on the diode detector, therefore I don't need to turn it off.

The original AVC circuit is still complete, but I might do some experimenting with slow and fast AVC. For now, however, it works well. I find this circuit more sensitive than the old detector, and the RF gain control averages one less number setting than previously.

It took only a couple of hours to put this together, and my junk box provided all the parts. I strongly recommend a product detector for better SSB/CW reception. ER



original HRO-60 NBFM socket



rewired NBFM socket

Figure 1

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: Saturday mornings at 8 AM PST on 3835.
California Vintage SSB Net: Sunday mornings at 8 AM PST 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: AM activity daily 3 PM - 5 PM on 3875. 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. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial 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 varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. 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 3808 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. 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.
Westcoast Military Radio Collectors Net: Meets Fri. at 2200 local on 3990 and Sat. at 0800 local on 3990 + or - QRM. Net control is Tom, WA6OPE or Andy, KD6TKX.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:30 PM EST & EDST.
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 14.037, Sundays at 7 PM Eastern. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same frequency. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
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.
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 was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Night 6 Meter AM Net: 8 PM Sundays on 50.4. Net controls are Dan, KV6I and Scott, K6PYP. Informal, supports restoring old gear and using it on the air. Loan gear available for those wanting to join in.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Old Buzzards Net: Meets daily at 10 PM EST on 1945. This is an informal net in the New England area.

Mercury Relay Break-In For The Classic CW Station

by Jim Hanlon, W8KGI
P.O. Box 581
Sandia Park NM 87047

For the CW operator, full break-in or "QSK" is the only way to go. Touch the key and your transmitter is on the air, your receiver is cut back to a comfortable level for monitoring. Release the key and you are right back to receiving again, even between dots and dashes while you are sending. You hear what's happening on your frequency, be it interference or a remark made by the person you're talking to. After you've operated QSK, you'll never want to go back to throwing switches and transmitting blind again.

Traditionally, break-in was first achieved by using a separate antenna for the receiver, sized and oriented to minimize pickup from the transmitting antenna, and by keeping the transmitter power low. The transmitter in more sophisticated setups might be keyed by a relay which had an extra set of contacts for cutting back the receiver. This worked; but the relay was generally noisy, the receiver antenna pattern did not match that of the transmitter, and more space was required for two antennas.

The antenna problem was solved by the development of the "TR Switch," typically a broad band vacuum tube amplifier stage connected between the transmitting antenna and the receiver input that was driven into cutoff during transmit. Handbooks which describe this approach caution that the TR Switch is a harmonic generator that requires filtering to avoid TVI and ham band harmonics. And there was still the problem of how to cut back the receiver.

The circuit presented here offers a distinct improvement over earlier QSK methods for separate receiver-transmitter stations, and I have used it with satisfaction for the past fifteen years. It uses several mercury wetted relays to switch the antenna from receiver to transmitter, cut the receiver gain back to a monitor level, and key the transmitter. It is quiet, generates no harmonics; and it will handle transmitters up to 200 watts output power in a 50-ohm coax system with readily available relays.

The Mercury Wetted Relay

The mercury wetted relay was developed by Bell Laboratories and Western Electric during WW II. It has a hydrogen pressurized, sealed glass switch capsule with a reed armature inside that swings between two fixed contact pole pieces. Capillary grooves on the armature feed liquid mercury up from a pool at its base to the top where it makes contact with one or another of the pole pieces. As the armature engages or pulls away from a pole piece, electrical contact is made or broken by the film of liquid mercury. This film stays together through the minor mechanical "bounces" on closure that often cause dry contact relays to "chatter" open and closed several times. Thus the mercury wetted relay is a bounceless or chatterless contact. Because it contains a pool of liquid mercury, it must be operated with the pole piece end up. Normally there will be an arrow on the case of a pc board mounted relay showing how to orient it.

Moderate contact arcing on closure or opening will evaporate some mercury. Evaporated or splashed away mercury winds up condensing on the capsule's glass wall and running back

down into the pool at the bottom where it recirculates. Thus the contact material in a mercury relay is constantly renewing itself and essentially never wears out. C P Clare used to have a test rack of mercury relays in their Chicago plant that had been switching a lamp load for years. They had run ten billion operations the last time I heard. However - if the contact load is heavy enough to "dry up" the contact beyond the capillary path's ability to supply fresh mercury, then the contact will weld and you have a dead relay.

Most mercury wetted relays of the "transfer contact" or SPDT variety use the interaction between interior permanent magnets and the relay coil field to switch the armature. So expect a polarized coil, one end + and the other -, on these relays. There are both "open transfer" and "shorting transfer" contacts available. Shorting transfer contacts produce a momentary connection between the swinging armature and both fixed contacts during a switching cycle. There are also SPST or make-only contact mercury relays. These have just one pole piece rather than two, and they use an internal magnet only if they are normally closed without power applied to the coil. Normally open varieties do not have a polarized coil. All mercury relays make just a very light "plink" sound when they operate. You will probably never notice it unless you listen carefully. Operate and release times for typical mercury relays range from less than 1 millisecond to several milliseconds, so they are easily fast enough for amateur CW keying duties.

The table below lists several typical mercury wetted relays that you will find in the Newark Electronics Catalog[1] as well as several Western Electric types that could show up in a surplus dealer's bin. If you find another mercury relay that I haven't listed, it's easy to determine its coil and contact connections with an ohm meter and then to determine its operating voltage by applying power to its coil from a variable-power supply.

The QSK Circuit

The mercury wetted relay makes implementing QSK CW easy. In the circuit of Figure 1, SPDT relay Yant switches the antenna from receiver to transmitter while another SPDT relay Yrx shorts the receiver antenna input and opens an auxiliary RF/IF gain control which sets the receiver monitor level during transmit. An SPST relay, or two if differential keying of the oscillator and amplifier is desired, keys the transmitter. The rest of the circuit sequences the relay operations so that they occur in the correct order - antenna switch and receiver cut back first, then transmitter keying, with oscillator first followed by the amplifier as the key is closed. When the key is released, the relays cycle back in reverse order. (Simply omit the oscillator relay portion of the circuit and use only the amplifier relay part if differential keying is not needed.)

The circuit is built out of simple resis-

		Coil		Contact			
Maker	Model	Volts	Ohms	Type	Short	Amps	Cost
C P Clare	HGJM51111K00	5	125	SPDT	no	2	$18.65
C P Clare	MSS21A05	5	140	SPST	-	.75	$8.95
Midtex	160-451M00	5	325	SPDT	no	2	$14.44
WE	337A/B	5	350	SPDT	no	3	-
WE	345A/B	5	300	SPST	-	1	-
WE	276	?	?	SPDT	yes	5	-

continued next page

tors, capacitors, pnp and npn transistors and diodes, all available from Radio Shack. Five volts can be derived from a Radio Shack regulator and any DC supply of your invention, for example a 6.3 volt filament transformer with a bridge rectifier and a capacitor filter.

And here's how the circuit works. With the key open, all transistors are biased off and all relays are not energized. When the key closes, transistor T1 turns on immediately. The 2 uF capacitor at the collector of T1, initially at zero volts, charges up rapidly toward +5 volts. As it passes 0.7 volts, transistor T2 turns on and energizes the Antenna Transfer and Receiver Cutback relays, Yant and Yrx. Continuing with this section of the circuit, when the key opens, T1 turns off immediately. The 2 uF capacitor then discharges toward 0 volts through the 5.2K resistor and the base-emitter junction of T2 and also through the 22K resistor. As T2 turns off, the diode shunting the relay coils in the collector of T2 allows their current to decay without creating a damaging voltage spike. For the values shown and in my circuit, the antenna relay switches on 3.7 milliseconds (ms) after the key closes and turns off 45 ms after the key opens.

T3 and T4 form a "delay on make, rapid release on break" driver for the oscillator and amplifier keying circuits. When the key closes, T3 turns on immediately and begins to charge the 2 uF capacitor at the base of T4 through the 10K resistor. After some delay, this capacitor charges to 0.7 volts and T4 turns on. Later, when the key opens, T3 turns off immediately and the 2 uF capacitor discharges rapidly through the low resistance of T4's base-emitter junction until T4 turns off. The capacitor then completes its discharge to 0 volts through the 10K and 22K resistors.

T5 and T6, because their associated 2 uF capacitor is tapped midway on a potentiometer, provide some delay on "make" and some delay on "break" of the key and driver. In my circuit with the tap set 10.34Kohms from the T5 end and 1.55Kohms from the T6 end of the nominal 10Kohm Radio Shack pot, the Oscillator relay turns on 5 ms after key closure and turns off 23 ms after key opening. It is nicely "nested" within the antenna and receiver relays' operate and release times.

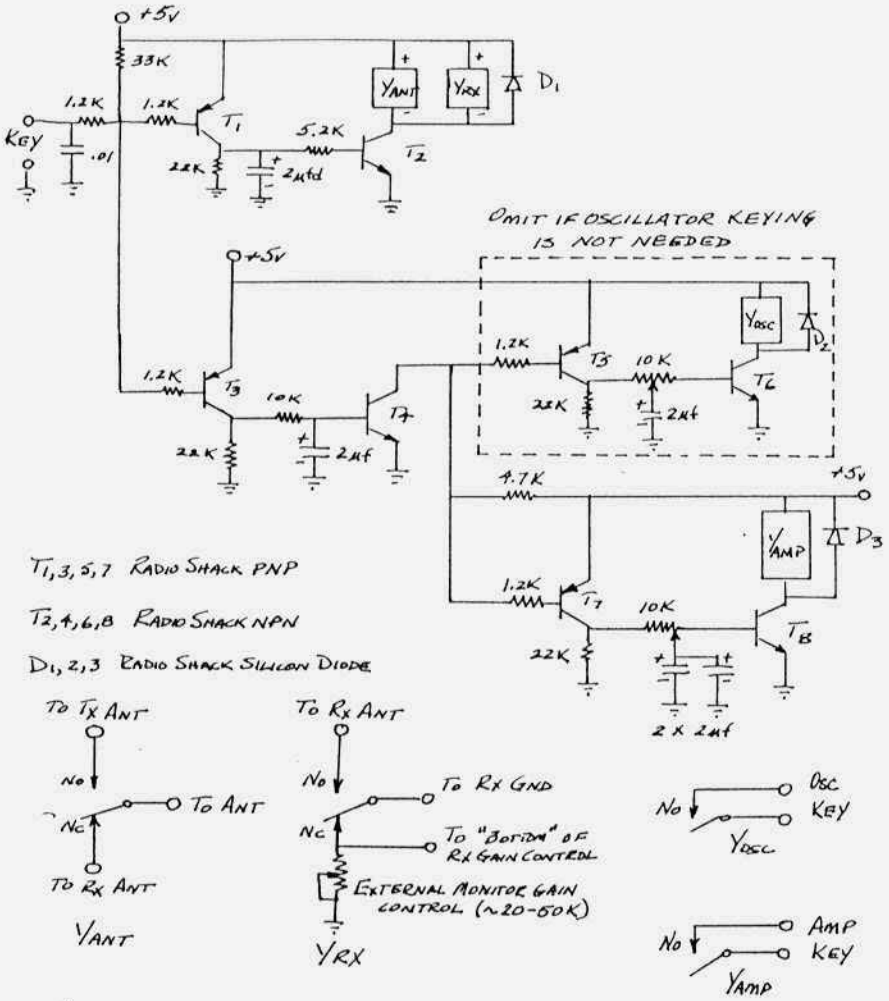
T7 and T8 delay the Amplifier relay turn-on beyond that of the Oscillator relay because their capacitor is larger and all the way at the T8 end of the 10K resistor. The Amplifier relay turns off faster than the Oscillator relay because the capacitor discharges rapidly through the base-emitter junction of T8. In my circuit, the Amplifier relay turns on at 6.4 ms after key closure and turns off at 11.5 ms after key opening. It is "nested" within the Oscillator relay turn-on and turn-off times.

The 0.01 uF capacitor across the key is an RF bypass. My higher powered transmitters can supply enough signal at the input to keep the circuit energized even if I release the key without this bypass. (How do I turn this '@!&$!' thing OFF?)

Verifying the Timing Sequence

Timing is primarily determined by the 2 or 4 uF capacitors and their associated resistors, by the power supply voltage level, and by the relays' inherent operating times. The best way to check, and if necessary to adjust the timing, is to use an oscilloscope with a calibrated time base.

You can provide a "signal" to observe on the scope by switching a convenient voltage to ground through a series resistance with the relay contacts as shown in Figure 2. It helps to have a continuous string of dots as a test signal to apply to the "key" input terminal. An electronic keyer will do the job, or a simple 555 pulser circuit as shown in Figure 3 can be built on the same board with the rest of the QSK circuit and



NO = NORMALLY OPEN CONTACT (WITHOUT POWER)

NC = NORMALLY CLOSED CONTACT (WITHOUT POWER)

YANT, RX CLARE HGJM51111K00; WE337A, B; MIDTEX 160-451M00; OR EQUIVALENT

YOSC, AMP CLARE MSS21A05, WE345A, B OR EQUIVALENT

FIGURE 1 - THE QSK CIRCUIT

continued next page

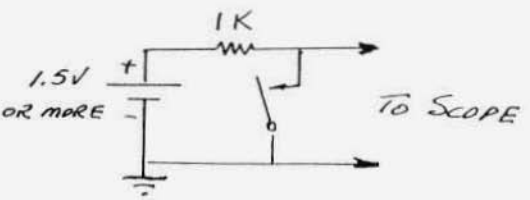


FIGURE 2

switched in when needed to provide a test signal.

If an oscilloscope is not available, the circuits shown in Figure 4 will indicate the relative sequence of two relay contacts opening or closing. You can verify how these circuits work by playing with them using a pair of clip leads. In circuit A, whichever contact opens first will latch on its corresponding LED. In circuit B, whichever contact closes first will latch on its corresponding LED. Use circuit B to set the closure time of the oscillator keying relay slightly after that of the antenna and receiver relays as you depress the key. Use circuit A to verify that the oscillator relay opens before the antenna and receiver relays as you release the key. In a similar manner, use the circuits again to verify that the operation of the amplifier relay is nested inside that of the oscillator relay.

Receiver Monitor

Relay Yrx is used to short the antenna terminals of the receiver and to cut the receiver RF/IF gain back to a comfortable level for monitoring the transmitter's signal.It is normally mounted on the rear or inside of the receiver close to the antenna terminals to minimize lead length.

Most older receivers use an RF/IF gain control potentiometer that is in series with several stages' cathodes to ground. It is a simple matter, as shown in Figure 5, just to disconnect the ground on the receiver control and connect a second pot of about the same resistance in series with the receiver control to ground. Bring the connection point between the two out to the normally closed contact of relay Yrx so that the added gain control will be shorted out on Receive. On Transmit, this gain control becomes active and may be set as desired for a comfortable monitor level.

Some receivers, such as the Hammarlund SP-600, do not have one side of their RF gain controls grounded. In such cases, just use two SPDT Yrx relays to switch out the regular, receiver RF gain control and switch in a monitor gain control. You will have to give up shorting the receiver antenna to ground during transmit, but it works OK anyway.

Keying the Transmitter and Switching the Antenna

The contacts of a mercury wetted relay are fairly robust. As you can see from the table, they are rated to switch currents from 1 to 3 amps, and they can generally carry more current than they can switch. I have successfully used even the smaller SPST relays to key amateur transmitters in almost any circuit imaginable, including in the cathode, in a screen grid switching 300 volts, and in blocked grid keying circuits. There is no problem in operating the switch contacts hundreds of volts off ground. The relays are insulated to withstand at least 1500 volts to ground or contact to coil.

You must avoid breaking the current in an inductive load, for example in a transformer or choke or relay winding, without giving the current another path to travel through while it decays. Inductors will develop whatever voltage it takes across themselves to "turn on" a path so that their current will keep on flowing. That means that they will arc

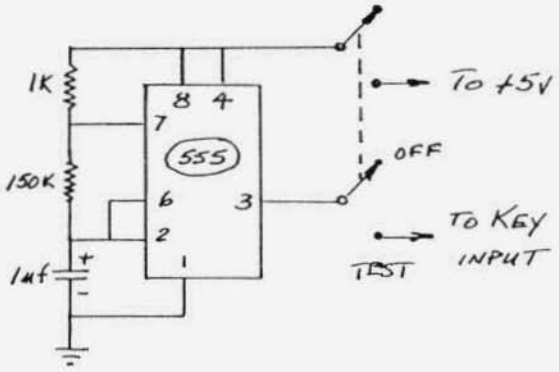


FIGURE 3 - PULSER

something over if necessary, or burn out a drive transistor. This continues until they dissipate all of the energy they have stored up in their magnetic fields. That is why all of the relay coils in the driver circuits have diodes shunted across them. Note in Figure 1 that when T2 for example is on and its relays are operated, the diode shunting the relay coils is reversed biased. When T2 turns off, the coils develop a voltage across themselves that is about 0.7 volts more positive at T2's collector than at the power supply connection. This voltage turns on the shunt diode and allows the coil current to decay through it.

If you switch an inductive load with a relay, be sure to include a shunt path across it, like a diode or a resistor, to avoid arcing and damaging the relay contact on release.

The antenna relay is so timed in this circuit that it does not switch the output of the transmitter "hot," while the transmitter is on. Using a WE 337A relay, I have successfully carried the output of such transmitters as a Valiant, a 32V-3, a DX-100 and a 275-watt Globe King (the best of the bunch with 200 watts out) for several years. When I went to 600 watts out from a Heath SB-200 however, I welded my WE 337A antenna relay.

To carry 600 watts, I had to go to a relay with a larger, higher capacity switching capsule. I am presently using a WE 323A which is a printed circuit mount relay with a Western Electric "218A" capsule inside. You will probably not be able to find a 323A, but the Western Electric "metal tube can" type relays with an octal base that look like a 6AG7 are findable. Several of the more common types that contain the 218A switch are listed in the table. Any Clare relays with "HGM" rather than "HGJM" in their part number also contain this higher capacity switch. One of these should be used as an antenna relay if you are planning on QSK above 200 watts.

Bells, Whistles and Variations

There are obviously more things that you can do with this basic circuit. Several of them are shown in Figure 6. I use multiple Yrx relays to cut back nine receivers at once in my Classic Exchange setup. Transistor T_2, cannot handle the full load by itself. So I use the "extender" circuit shown in the top two rows of Figure 6 to drive a larger number of relays, Y_{ant}, Y_{r1} through Y_{r5}, Y_{r6} and so on.

I need a SPST relay to stay closed when the key is up and to open when the key is closed to provide a "mute" signal for my R4B. A simple, single stage inverter beyond T_2, as shown in the third row of Figure 6 will accomplish this. Of course, the normally closed contacts of an SPDT relay could be used to do the same thing without an inverter.

It is possible to drive a relay whose coil requires more than 5 volts to operate. The bottom row of Figure 6 shows a driver circuit I use for my WE 323A antenna relay which runs from 24 volts. Note that when I "expand beyond" T_2 with several parallel stages, I include a 100-ohm resistor in the base path to

continued next page

each of them. This equalizes the current drive to each, and prevents one stage from "hogging" all the drive from T_2.

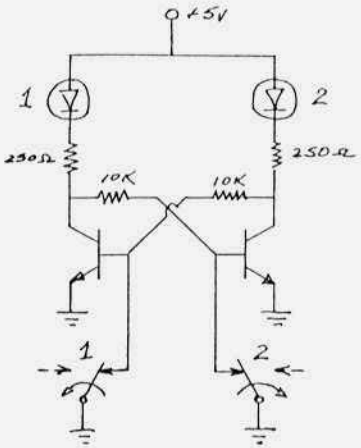
It is possible to switch on even more things in your keying sequence. For example, I use another relay actuated along with the amplifier keying relay to remove cutoff bias from my SB-200 linear. There is really no limit to controlling your station with this circuit once you become inventive.

The QSK Circuit on VOX SSB or AM

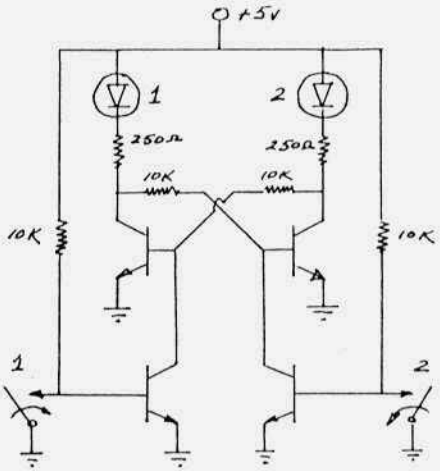
Use of this circuit is not limited to QSK CW. It is also easily adapted to push-to-talk or VOX phone operation.

For push-to-talk phone, I arrange things so that the push-to-talk (PTT) switch closes a contact in series with the key input to the QSK keyer and so that it also opens a contact in parallel with my receivers B+ switch. For phone operation I leave the key closed and turn the receiver B+ switch off. The receiver B+ stays on as long as I am in the Receive mode because of the PTT contact. When I close the PTT switch, the keying sequence operates and the transmitter turns on, and the receiver turns off. (For QSK CW, I turn the receiver B+ switch on and the QSK circuit operates as previously described.) Knowing me, you will have guessed by now that I use a 24-volt, DPDT relay controlled by the PTT switch to accomplish the above switching operations.

For VOX SSB phone, I use a contact on my transmitter's VOX relay in series with my key and I keep the key closed all the time so that the VOX relay controls the transmit sequence. I control receiver volume during transmit by backing off the monitor gain control. I've also been known to mute the receiver with a



IF RELAY 1 OPENS FIRST, LED 1 LATCHES ON.



IF RELAY 1 CLOSES FIRST, LED 1 LATCHES ON.

FIGURE 4 - SEQUENCE CIRCUITS

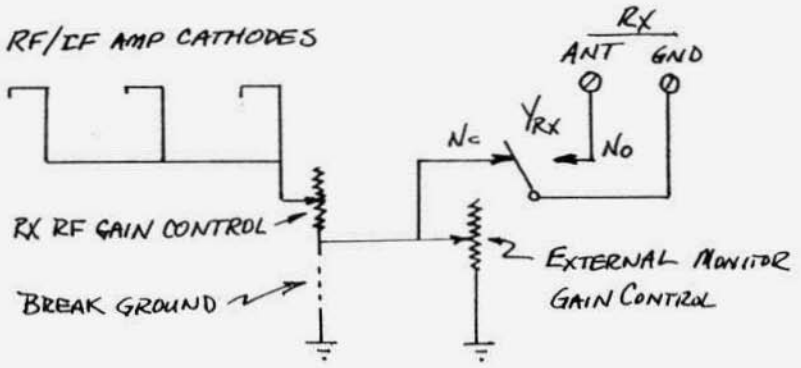


FIGURE 5 - CONNECT EXTERNAL MONITOR GAIN CONTROL

relay across the receiver's B+ switch opened in time with Yant and Yrx.

Like I said, the possibilities are many. Use your imagination.

Using Dry Reed Relays

Mercury wetted relays offer a lot of capability, but they are somewhat expensive and you can't buy them at Radio Shack. If you want to save a few dollars, you could use less expensive dry reed relays for the receiver cut-back function and just perhaps for transmitter keying. The trouble with dry reed relays is that they tend to chatter on make, and they cannot switch as heavy a load.

If you want to use an SPST dry reed relay to cut back your receiver, make one normally closed by using the inverter circuit of Figure 8 and use it to short across the receiver's auxiliary monitor level RF gain control. If the receiver does not cut back to an adequate level on transmit, add a second dry reed relay operated normally open when the key is up to short the receiver antenna terminal to ground when the key closes.

Some electronic keyers do use a dry reed relay to key the transmitter. Since this relay may chatter on make, you are likely to get chatter at the leading edge of each dot and dash - which I do not care for. Still, you could key the oscillator in a differential oscillator/amplifier keying circuit with a dry reed relay and not transmit chatter on the air. I personally would hesitate to key the amplifier with a dry reed relay.

Radio Shack should have an adequate dry reed relay. Beyond that, types I would recommend include the C P Clare PMRA1A05, with a 500-ohm, 5-volt coil and a normally open SPST contact, available from Newark for $3.75, and the PRMA1B05 with a 500-ohm, 5-volt coil and a normally closed SPST contact for $5.90. These relays come in a DIP package and their contacts are rated at 0.5 amp max, 100 volts max, and 10 VA max. The somewhat larger Clare MRB1A05 (5 volts, 225 ohms, normally open, $4.20) is rated at 0.5 amp max, 200 volts max, 10 VA max.

It is possible to buy a dry reed, transfer contact relay (SPDT). But they have a poor reputation for reliability and life, and they are not that much cheaper than the mercury wetted transfer contact relays. As a former relay engineer for AT&T I would strongly advise you to avoid them.

QRT

If you have read this far, you probably have at least some interest in QSK CW. I hope this encourages you to pur-

continued on page 34

Affordable High Power AM - A Flea Market Modulator

by R.W. (Berk) Berkemeyer, WØREP
402 Kingridge Dr.
Ballwin, MO 63011
wørep@inlink.com

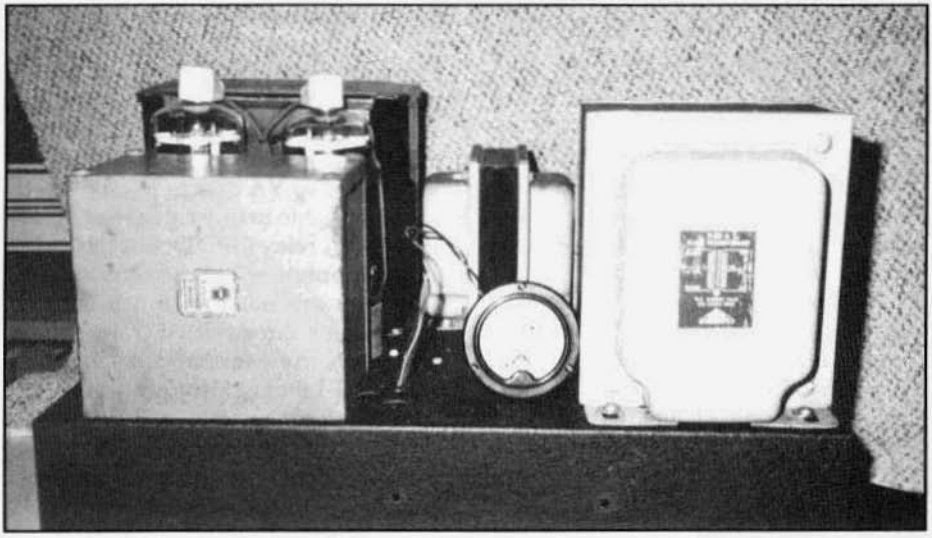
OK, so you tried the 829B clamp tube modulated AM rig (ER#77), and the Simplest Modulator (ER#75) on your CW final and you still want more power!

Time for a (several) trip to the hamfest flea market with great expectations and a few bucks in your pocket. For less than $100 you should be able to build a 300-500 watt AM modulator and power supply. I did and if I can so can you. It just takes time and dirty knees (everyone knows that the best flea market bargains are under the tables).

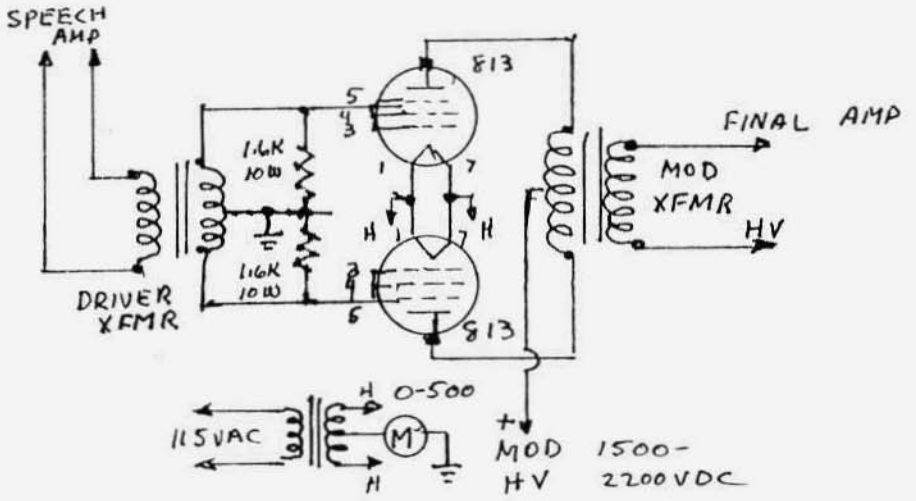
The inspiration for this modulator came from W6BM's article on triode connected 813s for modulators in ER#57. There have been several mentions of this usage for the venerable tube in ER but nothing specific, no diagrams, no pictures, no detailed descriptions. This article should take care of that. REMEMBER, you don't want to copy my unit. You take it as a starting point and adapt what you have to make your own unique creation- that adds to the fun.

Delving in to my older Editors and Engineers Handbooks, I found several schematics using 813s and 803s as triode connected Class B modulators. They sure make a simple unit! Three transformers, two tubes and a meter are the active components. If, as I did, you add a power supply on the same chassis, it adds a little more complexity (and a lot more weight), but actually only six more components. The schematic is shown in Figure 1. The driver transformer was placed on the speech amplifier chassis, but could also go on the modulator chassis, your choice.

A driver transformer couples the 10 watts or so of the speech amplifier to the grids of the 813s. Each tube has the two grids and the beam forming plates tied together to make the triode configuration. The center tap of the driver



The author's flea market modulator.



Flea Market Modulator

Figure 1

secondary is grounded. The 813 plates are connected to the input side of the modulation transformer and the secondary brought out to two high-voltage terminals. HV from the final amplifier power supply comes into the modulator, through the secondary, and thence to the final. These terminals must be well insulated as twice the DC plate voltage appears on them at 100% modulation. A 500-mA meter is connected between the 813 filament transformer center tap and ground. That's it! You may want to connect a 1600-2000 ohm 10 watt resistor from each grid to ground. These are called swamping resistors and tend to reduce modulation peaks. I'm not sure that they are necessary, but they are cheap and may do some good.

Where is the bias supply and how is it connected? There isn't any unless you plan to run the 813s above 2500 volts which I don't recommend. This basic modulator (less power supply) should cost less than $50 if you spend enough time locating the parts. The hardest part to find is a suitable modulation transformer, but even they show up occasionally. Mine cost $20.

As mentioned above, there are two ways to supply high voltage to the unit. If the power supply for your final amplifier is capable of supplying the added power, it is only necessary to tie the primary center tap of the mod transformer to the incoming high-voltage terminal. I chose to put the high-voltage supply on the modulator chassis because: (1) my final power supply couldn't manage the extra load, and (2) it makes a self-contained unit which can be moved intact from transmitter to transmitter as my experimenting and rebuilding progresses. The power supply I used is made up from a $5 flea market transformer, a swinging choke from somewhere and a flea market 8 mfd filter cap. I could have used a microwave transformer (ER#79), but the only one I have left was in use elsewhere.

Well, the modulator is finished, now, how do I make it work? There may be a

continued on page 37

A 1936 Style Breadboard Transmitter

by E.V. Sandy Blaize, W5TVW
417 Ridgewood Dr.
Metairie, LA 70001

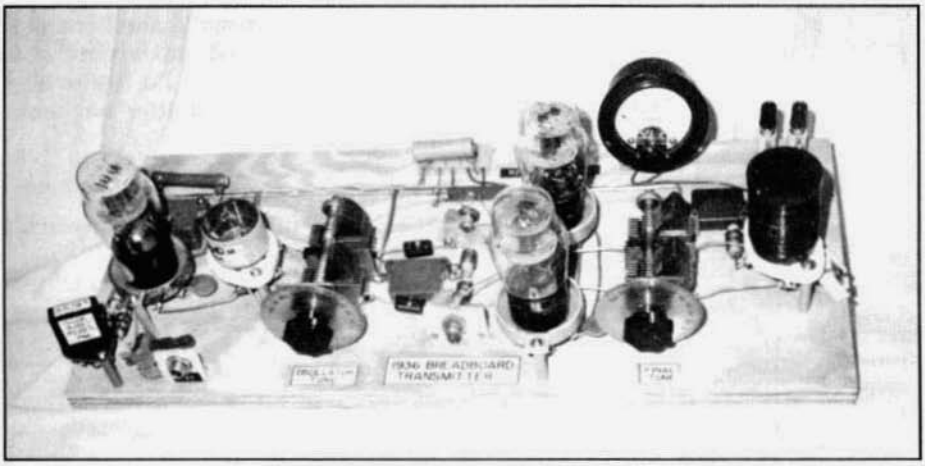
This project started out quite a few years ago, actually in 1951. Like a lot of "budding" wannabe amateurs, I built the old 6V6 Tri-Tet rig that appeared in a lot of the old ARRL Handbooks. The one that was built on a wooden "slat" chassis fashioned from an apple crate, with the tank coils wound from common waxed #18 d.c.c. "bell" wire wound around, 7 nails, was it? Anyway, it never "got me out" of town and had a penchant for popping crystals. (Typical Tri-Tet oscillator trick!)

Enter a Frank C. Jones Radio Handbook for 1936, given to me by a ham a block away one day while I was raiding his junk box! Frank liked to use '53 and 6A6 tubes, so I figured I would give them a try too. There was a single 6A6 (or '53) push-pull crystal oscillator circuit in the transmitters section. I built it. Lo and behold, my first out-of-town QSO was made on it (Baton Rouge, LA) Big DX! Eventually it got shelved and dismantled for its parts, I went on to a string of ARC-5/SCR-274N transmitters I used on 80 and 40. 160 meters being a "no-no" band at the time due to the Loran "A" chain in this area.

I decided a couple of years ago to try and rebuild the 6A6 rig, this time with a little antique flavor. If one 6A6 worked so good, then what would 3 of 'em do! A little work with the old "Lightning Calculator" derived the needed coil inductances and two additional 6A6s were added to the original triode amplifier. The results have been very gratifying.

The circuit is very straightforward, cathode bias being used on the oscillator stage as in the original per Frank C. Jones. The final amplifier just uses a grid leak with no fixed bias. It and the oscillator are keyed together. No big problems were encountered in construction of the prototype, which was built on a masonite chassis. This didn't look right, so I rebuilt it on a chunk of 3/4" plywood. Everything in the transmitter came from the junkbox! Nothing is new. Even the power supply components came from junked equipment.

Sockets for 6A6s may prove difficult to find. Most people that handle 7-pin sockets have the small variety as used on the 6A7 etc. Not too many tubes used the 7-pin medium socket. The 6A6, 53, 1625, 802, 837 to name a few. Mine came from old junk ARC-5 transmitters, the chimneys slotted and cut down with a hacksaw and the tabs remaining bent down to form mounting ears for the sockets. The 77MIP7M Amphenol sockets would be ideal if you can find them! I used a wafer octal socket for the crystal socket and connected it with all the odd numbered pins connected, and all the even numbered pins connected together, now no matter how I plug the crystal in, it will work. 5-pin tube bases from old 'dud' 807 tubes were cleaned out and used as coil forms for the oscillator stage. ICA, Hammarlund, National 1-1/2" reclaimed forms were used for the final stage. Another alternative I've tried that works well, is common plastic pill bottles glued/screwed to old octal tube bases. I plan to find some phenolic plastic tubing at my local plastics store that will slip onto old 807 bases or octal bases to use for coil forms as well. The old ones are getting hard to find and reproduction ones are EXPENSIVE! Coils sets were wound for 160, 80 and 40 meters. I plan to eventually make a set for 30 meters if I ever get any 30 meter crystals!



The 1936 style breadboard transmitter.

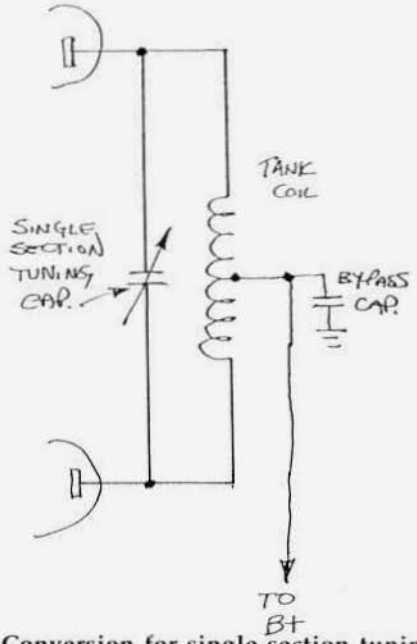
The fixed capacitors (bypasses) are all the old Sangamo molded types with the mounting ears and lug terminals. They were used as they looked good and added to the old flavor of the reconstruction. They are all 0.027 mFd at 1200 volts. Use what ever you have. Anything from 0.005 to around 0.03 mFd mica/ceramics should work just fine. The two coupling capacitors are the small postage stamp type mica, again from some salvaged junk. A word of warning for you! DON'T use ANY molded capacitor made by MICAMOLD unless you definitely know it is a mica! They made a bunch of paper caps that are mica look alikes and they are notorious for failing! A pair of dual 100 pF Hammarlund variables were used, as they were on hand. If you don't have any split-stator variables, you can use single section ones by rearrangement of the circuit as shown in the diagrams. The shafts will be hot with B+ so be careful! The 2.5 MH RF chokes used were scooped up at a hamfest one day. Anything from 1-3 MH should work OK. I even know one fellow who used to take apart old style 455 kHz IF transformers, saw the wooden coil former in half and use those for two RF chokes. Remember to keep the symmetry in the circuit electrically when you substitute parts though! (i.e: don't use a 1 MH and a 2.5 MH in the grid circuit of the oscillator, for instance! Keep both values the same!)

I use 350 volts (under load) as the plate supply. A choke input filter is used for better regulation. The finals will draw from around 90-125 mA when fully loaded. Whatever the rating of the junk transformer I have is, it does not get so hot I can't hold my hand on it, so whatever I'm drawing from it is not excessive! The 6A6's will use about 2.4 amps at 6.3 volts for the heaters. Use a 5U4/5R4/5Z3 rectifier tube or silicon diodes, whatever tickles your fancy. Solid state diodes will give slightly better regulation and a little more voltage. Up to 400 volts under load on the 6A6's is OK.

I won't go into neutralization procedures, as this is covered in the literature elsewhere. I will say there is nothing tricky about neutralizing this rig! A mica padder cap was used to tune reactance out of the output link. Once set, you can pretty much let this alone for all bands. I used a simple 'L' section antenna tuner in conjunction with a 130 foot end-fed wire antenna on all bands.

This rig has been regularly used on 3560 and 3579.5 (the "burst" frequency). Most of my 40 meter operation is be-

continued next page



Conversion for single section tuning capacitor.

tween 7020 and 7040 kHz. The "Boat anchor" group has been worked on 3579.5 very consistently with it. Why not stop by one evening at 0300 and 0500 GMT most nights. Be prepared to ragchew!

Keying is very good with good active crystals and proper oscillator tuning. A sluggish rock may give a little 'yoop' or slight 'chirp', but nothing serious. The transmitter has been also tried as a M.O.P.A. transmitter by plugging in a tuned circuit in the octal crystal socket, configuring the oscillator as a push-pull TPTG oscillator. It delivers a fairly good sounding signal for a TPTG too. Very chirpy if not adjusted properly! Don't expect the same power out of it used this way! Mine runs about 10 watts output in this mode.

The next project will be to build a push-pull 3C24/24G triode amp for it, to boost the power to around 200 watts input or so. But that's another story! Search through that junkbox and heat up the soldering iron. I'd like to hear your "1936 6A6 Transmitter" on the air.
ER

Coil Winding Data

160 Osc - 80 turns #32 p.e. closewound, center-tapped.

160 PA - 2 windings of 45 turns #28 p.e. closewound, 1/2" gap between windings. Link is 16 turns #28 p.e. wound in gap.

80 Osc - 38 turns #26 single cotton/enamelled wire (from AES) closewound, center-tapped.

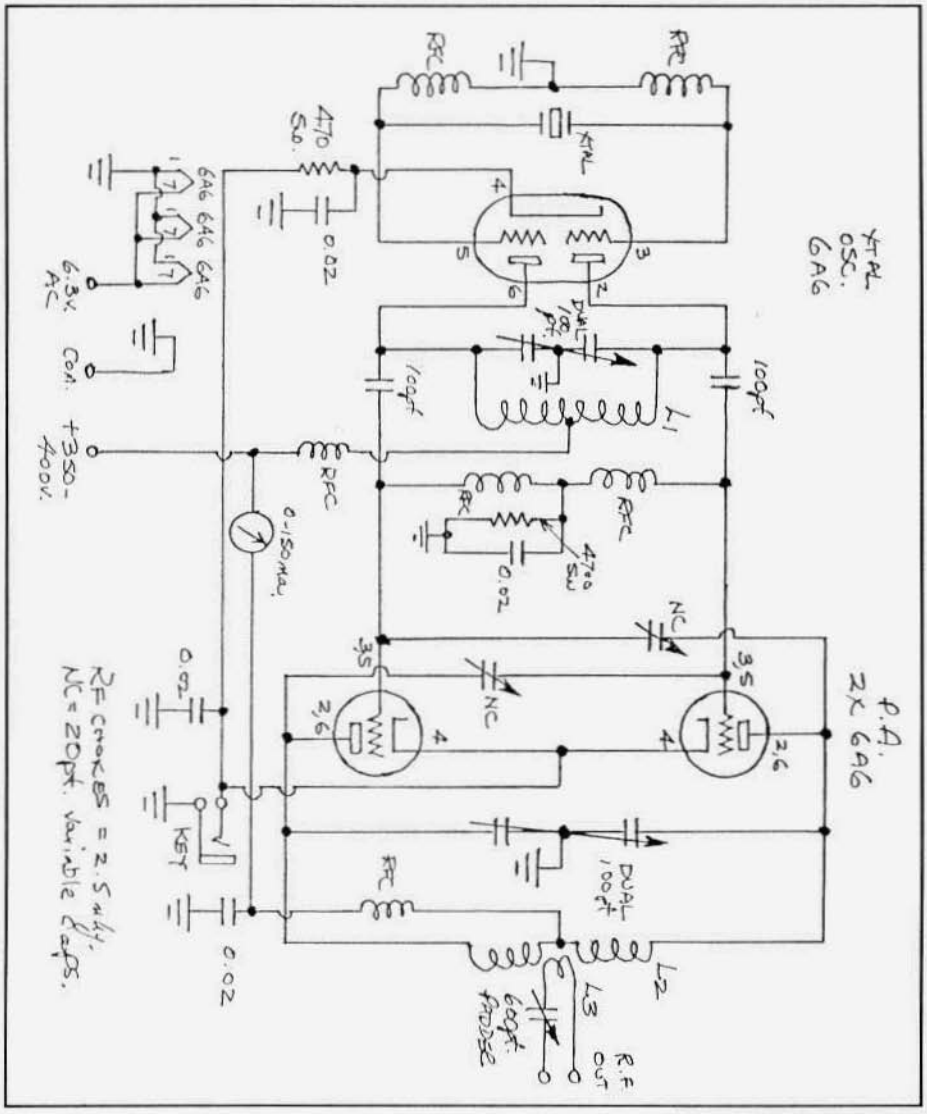
80 PA - 2 windings of 22 turns #20 p.e. closewound, 3/8" gap between windings. Link is 8 turns #20 p.e. wound in gap.

40 Osc - 18 turns #26 cotton/enamelled closewound, center-tapped.

40 PA - 2 windings, 10 turns #20 plastic insulated, solid hookup wire, closewound 3/8" gap between windings. Link is 6 turns #26 cotton enamelled, closewound in gap.

All oscillator coil forms are old 807 tube bases 1-3/8" in diameter.

All PA coil forms are 1-1/2" old style plug-in coil forms. These can be fabricated with old 807 bases slid into 1-1/2" OD plastic bathroom drain (waste) tubing cut to length. Bring an old 807 base to the hardware store and browse the plastic plumbing supplies to find what I'm referring to!


XTAL OSC. 6A6
P.A. 2X 6A6
RFC
XTAL
470 Ω
0.02
6A6 6A6 6A6
6.3V AC
Com.
+350-400V.
100pf
DUAL 100 pf.
L1
RFC
0-150 MA.
4700 Ω
NC
3.5
2.6
KEY
DUAL 100pf
L2
L3
60pf. PADDER
R.F. OUT
RF CHOKES = 2.5 mhy.
NC = 20pf. Variable plates.

sue it further. In most articles there are one or two qood ideas. The best one here is using a keyed, mercury wetted antenna relay. The rest is mostly added tinsel. But I hope you find it at least thought provoking. ER

References:

Newark Electronics, 6321 North Avondale Ave., Chicago, IL, 60631-1924. Phone - 312-792-8233, FAX - 708-820-0803. Also in many cities throughout the USA. Catalog 112: C. P. Clare Mercury Relays page 452, Midtek Mercury Relays page 483.

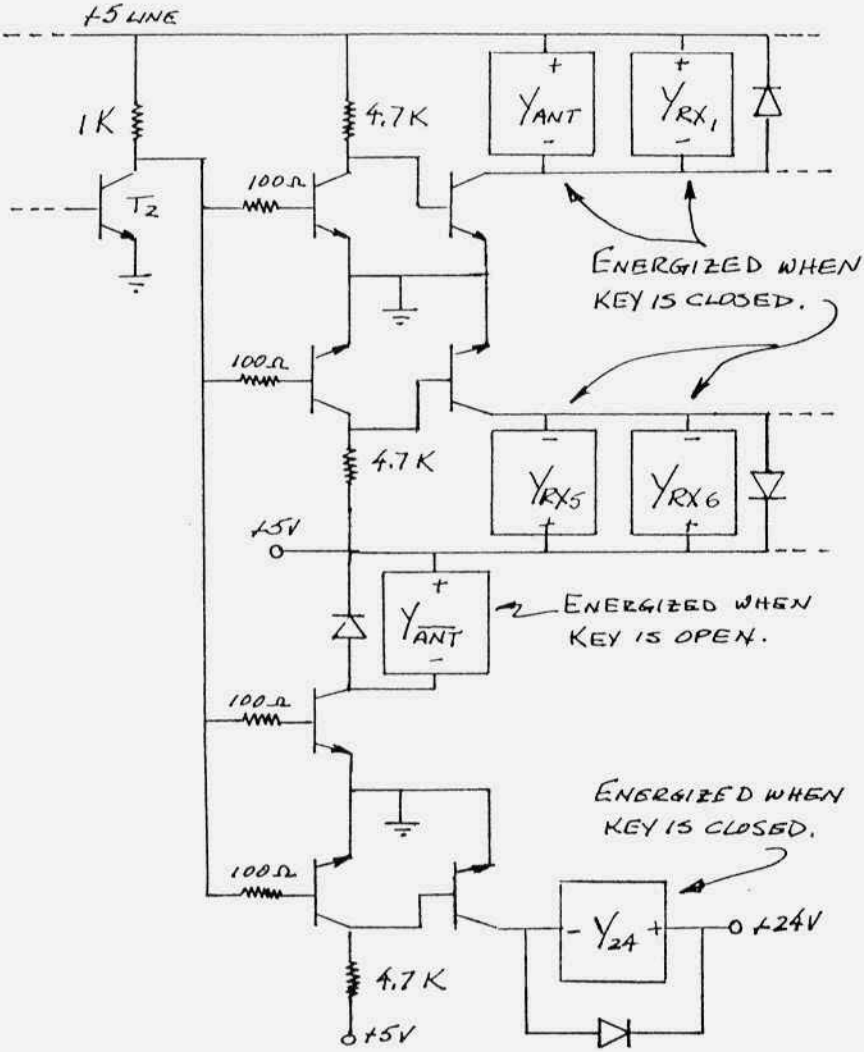


FIGURE 6 - BELLS AND WHISTLES

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e-mail **wa6wzo@arrl.org**
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2901 Palau Pl, Costa Mesa, CA
92626 (714-556-4396);
e-mail **w6xd@arrl.org**

West Gulf Division
TOM COMSTOCK, N5TC
Rt 3 Box 124, Thornton, TX 76687
(817-729-3338); e-mail **n5tc@arrl.org**
Vice Director: Jim Haynie, WB5JBP,
3226 Newcastle Dr, Dallas, TX 75220
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Center the filter on the board and epoxy into place. Put a drop of epoxy over the mounting tabs of the small metal cover that held the filter to the IF unit circuit board. Bend the tabs to lay flat on the board. Pay attention to the orientation of the filter as shown in Fig. 3.

Now wire the filter as shown in Fig. 3. Be careful when soldering to the pins since excessive heat can damage the epoxy. A heat sink between the iron and the fiberglass board is a good idea.

The coils in the new filter are a different inductance than the originals. Collins has installed approximately 220 pF in the circuit to resonate them at 500 kHz. But the new filter needs only 100-110 pF. So to keep from tearing the 51J-4 apart (that's against my rules!), I install a 180 pF cap in series with the coil and the built-in caps. That should resonate the new filter in the 500 kHz range. The series cap also removes plate current from the filter coil. But make sure the cap can handle the 150-170 VDC plate voltage. I used mica units. The 3.3K 1/2W resistor supplies B+ to the first IF, and the 100K 1/2W resistor terminates the filter and the grid of the 2nd IF.

Turn the power off, and plug the new filter unit into the 6 kHz position in the receiver. Be sure 'up' is 'up'! Tune in an AM station. There should be little or no difference in signal strength when switching between the 6 kHz and 3 kHz filters. In my receiver the new filter has slightly less loss then the 3 kHz filter.

When all done the 6.0 kHz filter should cost less than $50. Not bad considering the alternatives. **ER**

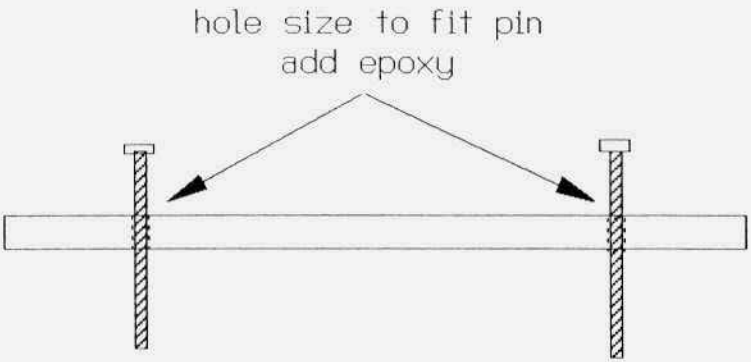

Figure 2

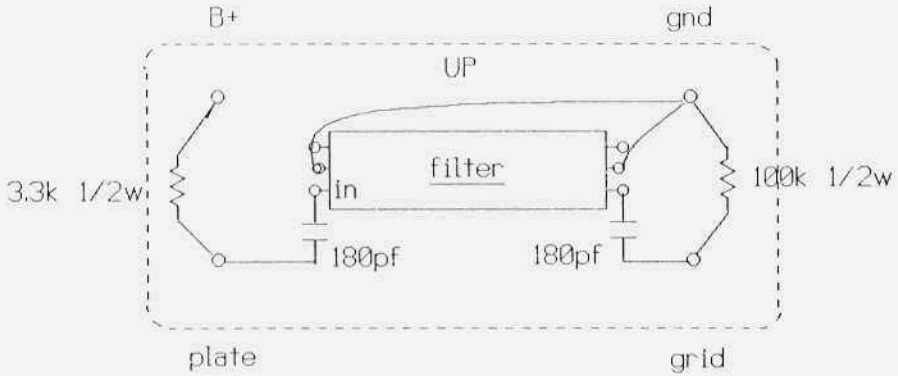

Figure 3 - layout and wiring

A Flea Market Modulator from page 29

bunch of taps on the driver transformer and more on the modulator transformer primary and secondary. It can all be done by guess and trial and error (DON'T MAKE THE ERROR OF GETTING ACROSS THE HIGH VOLTAGE) but a scope sure makes things easier. It doesn't have to be elaborate, a $10 oldie will do OK. Couple it to the transmitter output as loosely as possible so you get the RF wavaform about half scale on the scope tube. Talking into the mic should cause the modulator meter to move upscale and the scope pattern to vary (see an older Radio Amateur's Handbook). Adjust the mic gain until the scope indicates about 100% modulation. If this is not attainable, KILL THE HIGH VOLTAGE on the final and modulator and adjust the modulator transformer taps and repeat the scope test. The 813 plates should be connected to the highest impedance (most turns) terminals on the primary, and all adjustments made on the secondary.

Variations on the Theme

You need a speech amplifier. You can build one or you can use an old mono Hi-Fi or PA amplifier. If you can't find a driver transformer, use an output transformer from a scrapped push-pull audio amplifier, using the original primary as the driver secondary and coupling the low impedance output of the speech amplifier transformer to the voice coil winding of the new driver transformer. The possibilities are almost endless, so start to scrounge and it won't take long before you too can have a rockcrusher on the AM nets.

Note that nothing has been said about frequency compensation, audio filtering, etc. There have been many good articles on those subjects in ER and elsewhere, and since your unit won't be identical to mine, I've left these refinements up to you.

Last words: THERE ARE LETHAL VOLTAGES INVOLVED! ! ! BE CAREFUL! **ER**

Peter J. Malvasi, WB2BYQ
Hudson Division Vice Director Candidate

Ham radio has been under attack on several fronts. We need like-minded hams to be part of the ARRL Board of Directors to put ham radio back on the right course. THE LEAGUE IS OUR ONLY OFFICIAL ADVOCATE - LETS MAKE IT WORK FOR US!

As Vice Director I will work to assure that your valid concerns are heard by the leadership. I WILL WORK FOR THE COMPLETE ABOLITION OF THE NO-CODE HF IDEA! WE WILL REINVIGORATE HAM RADIO FROM WITHIN. I will also work to protect our valid interests as AM and vintage equipment opeators.

I will work hard for your trust in the NYC - LI - NNJ sections to keep this as far more than a hobby - but a way of life and one of America's finest and most noble institutions. THANK YOU!

Pete, WB2BYQ

Call me at (201) 934-0321 or e-mail: wb2byq@aol.com or wb2byq@wa2sna

Editor's Comments from page 1

Above you will see a brief statement from Pete Malvasi, WB2BYQ who is running for Vice Director in the Hudson Division. Pete is a well-known AM'er who will represent our best interests if he is elected. I urge everyone in the Hudson Division to support Pete.

Electric Radio has never been oriented toward the politics of Amateur Radio. I've always been bored with the wrangling and hard feelings that seem to go along with it. Now I realize that I've got a lot at stake in this issue. I want Amateur Radio to stay the way it is. I do not want to see it change into another CB band. I think that if the CW changes come into effect that is exactly what will happen.

I hope all the readers of ER will become more involved. N6CSW

The Road from QMR to Fair Radios Catalog from page 8

opment up to date, but save money. End a project at field testing, and then start the new model. Didn't generate a great amount of surplus, but what there was, certainly was new and different.

My apologies to radar, countermeasures, photo, wire, met, and the others at the labs who produced occasional products. And I would be remiss by not mentioning all the supporting agencies at Fort Monmouth. No radios would have been possible without all the parts from the components milstandards people, or the nomenclature branch that gave us all those terrific numbers and letters. The publication branch, the logistics branch, and the New Equipment Training Teams made the radio a complete package. The SigC Radio Wave Propagation Agency always adjusted the ionosphere so the radios would work, and the Electromagnetic Compatiblilty Agency made sure there never was QRM or QRN. The SigC Patent Agency kept the Army out of trouble even though they must have gone crazy with 2500 disclosure books. The Fort managed to keep at least 7,500 radio nuts busy and off the streets.

So then Signal Corps radio was the result of a lot of people. Soldiers recognizing a communication problem that needed a solution and a Chief Signal Officer with foresight (and money). The Fort Monmouth project engineer who provided the guidance to get what was needed, and the contractors engineers who put that guidance into a real walking, talking radio. The soldiers who tested and straightened out all the problems, and the contracting officers who got us the most for our money. None have their name on the front of any radio.

I hope this gives some idea of why, and where that -368 or -524 came from and why it was a combination radio and automotive jack stand. For me it was fun playing with them, and getting a pay check. One advantage of staying with Signal so long is I don't need a picture album, I just pick up the Fair Radio Catalog to look over my last 50 years. **ER**

Editor's Note:

The author spent 49 years with Signal, in uniform, as a civil servant (ended as Director of Radio), and as a consultant (to Combat Developments for the

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My Dream Receiver from page 3

reinstalled the capacitor, the annoying dial backlash was gone.

I built a new power supply with a smaller transformer, solid state diodes and choke input filter putting out exactly the required 220 volts DC. Lacking the original power connector, I installed an octal socket instead and reconnected the muting switch, DC and audio output wires. As I had removed the toggle switch from the front panel, I utilized one section of the AVC/OFF/MVC switch to turn the AC power on and off. The wire from the switch going to the AVC section of the volume control was missing. This was the reason for the AVC mode being inoperative. Replacing the missing wire concluded work on the chassis. After reinstalling the newly painted front panel and touching up the RF and IF alignment, I became the proud owner of a BC-348-N receiver which looks and performs like new. No, it is not one hundred percent authentic. The lettering is not embossed, and white instead of silver, the earphone jack covers are missing, the nameplate is screwed on instead of riveted and there is no Signal Corps inspection stamp. But then my receiver was never intended to be a museum piece. I am having too much fun using it. **ER**

New Product Announcement

SVETLANA 4CX400A HIGH PERFORMANCE TETRODE

Svetlana announces the new 4CX400A high performance tetrode designed for linear amplifier service. The highly efficient 4CX400A, in the AB2 mode, produces over 600 watts PEP with low intermodulation distortion and exceptionally high conversion efficiency. The high efficiency is accomplished with an innovative electron focusing and trapping configuration which reduces anode secondary electron emission, thus creating increased conversion efficiency and reduced intermodulation distortion.

A single 4CX400A will produce 600 watts PEP power output at only 2500 volts DC. At this low operating voltage, inexpensive components such as low voltage filter and tuning capacitors may be used. A pair of 4CX400As produces 1.2 kW PEP and 1.2 kW CW. Three inexpensive 4CX400A tetrodes in parallel will conservatively produce the legal limit of 1500 watts PEP and key down CW with bullet-proof reliability. The 4CX400A will deliver full performance to 500 MHz.

The inexpensive Svetlana SK2A ceramic socket is available for use with the 4CX400A tetrode. The rugged SK2A is exceptionally well designed and, together with the 4CX400A, provides a combined structure capable of severe shock and vibration.

Contact Svetlana for a free technical data sheet describing the 4CX400A and a list of other Svetlana power tubes, with operating characteristics, for amateur applications.

SVETLANA ELECTRON DEVICES, INC.
Headquarters
8200 S. Memorial Parkway
Huntsville, AL 35802
Phone: 800-239-6900/205-882-1344
Fax: 205-880-8077

SVETLANA ELECTRON DEVICES, INC.
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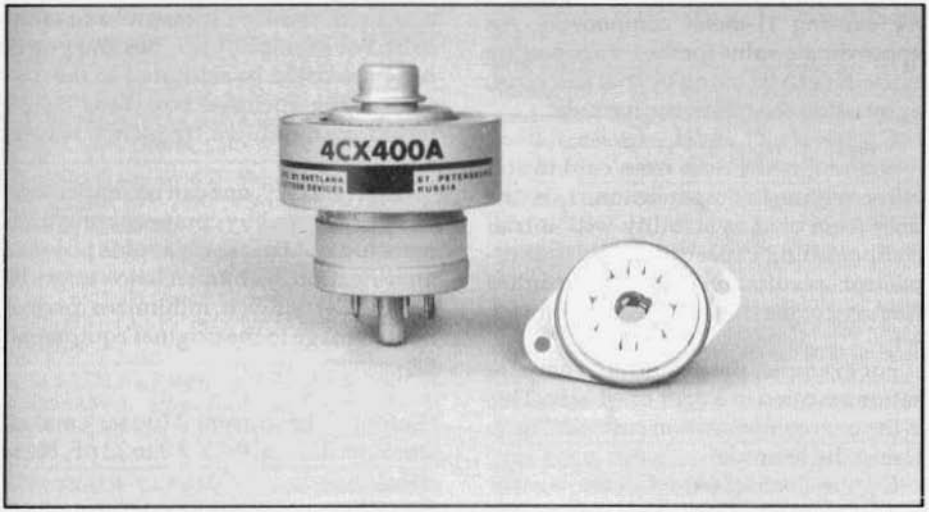
Portola Valley, CA 94028
Phone: 800-578-3852/415-233-0429
Fax: 415-233-0439



Bill, AB6MT kindly gave me a collection of N750 (negative temperature coefficient of 750 parts per million) compensating capacitors. I installed the correct values (5 pF, N750) into the DX-100, but drift was still excessive, this time to a higher frequency. Figure 1 indicates that over an hour of warmup time was necessary.

Next I tried trimming, that is, lowering the value of the compensating capacitance by placing it in series with a 30 pF air variable. After trimming the DX-100 it needed only 15 minutes of warmup (See Fig. 1). The trimming circuit is shown in Fig. 2.

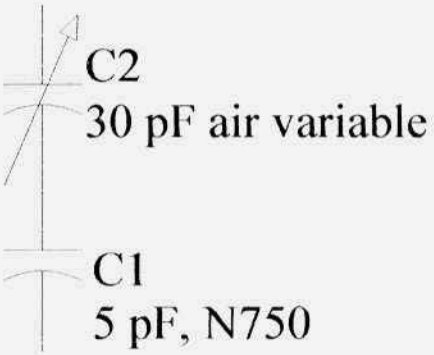


Figure 2 - variable compensation

The extra capacitor C2 fits in place of the existing 11-meter components. An approximate value for the compensating capacitor can be found by trial and error, or by using the following formula:

$C_{comp} = C_{TRIAL}, f_1/(f_1 - f_2)$

where f_1 is the drift from cold to stability without compensation, f_2 is the drift from cold to stability with a trial compensating capacitor. If the trial capacitor results in drift to a higher frequency, the denominator becomes $f_1 + f_2$.

For example, the 5 pF "trial" compensation resulted in a drift of +4 kHz. This is the overcompensation curve in Fig. 1. Using the formula:

$C_{comp} \approx 5 \times 5/(5+4)$

$=2.77$ pF

Trimming began from a value larger than this. I reduced C_2 in Fig. 2 in steps, so that each step increased the VFO frequency by approximately 2 kHz. This procedure is repeated until it becomes evident that overcompensation is occurring.

Adjustment is time-consuming because the small values of capacitance have to be fairly close. One speeds the process by remembering that the enclosed VFO must drift down to a certain frequency and then stay there, that is, not go up in frequency as in overcompensation. From Fig. 1, each step of compensation in my DX-100 required a minimum of 15 minutes.

Conclusions

Why does this VFO take 15 minutes to stabilize while quality Collins equipment, the R-390 receiver for example, stabilizes within a minute or two? Part of the answer lies in the engineering of the heat flows within the VFO. The coils in my DX-100 apparently heat up before the capacitors can compensate.

VFOs whose compensation has gone bad, for example a drifting Viking 122, will suffer because of heat-generating resistors and tubes. In such cases, if one is willing to modify the original construction, a re-arrangement of components will reduce the magnitude of the drift. For example, the tubes and power resistors could be relocated to the outside of the enclosed box. Less heat, I found, also reduces frequency wavers and jumps.

Alternatively, one can recompensate. It is possible to buy compensating trimmers today.* Because it avoids physical modification, recompensation might be better. Certainly it minimizes permanent damage to the original equipment. ER

*Refer to the current Mouser catalog, stock no. 242-3610-23, 2.8 to 23 pF, N450 - $1.24.

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DEADLINE for the NOV. Issue: NOV. 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: "AM FOREVER" quality Haynes T-shirts, grey, blue, green & red. Sizes M, L, XL - $15 shpd. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

FOR SALE: T-368 xmtr w/AFSK generator, tuner, dummy load, documentation & spares - BO over $300, PU in southern Mississippi. Charlie, WD5BJT, (601) 466-9170.

FOR SALE: NC190, exc - $120; very clean HQ110C - $135. **WANTED:** Clean Globe King 500, 500A (West Coast). George, CA, (805) 682-3094.

FOR SALE: Kenwood TS-530S - $375; ART-13 w/28V & 1150V p/s - $250; TCS-13 xmtr w/AC p/s - $100; (2) Astron RM-50 12 VDC 37 amp cont. p/s - $80 ea.; LM-15 freq. meter w/AC p/s - $40; Bird 43 wattmeter w/5W, 25W & 100W 400-1000 MHz slugs - $125; (2) Gonset Comm. IV xcvrs, one w/VFO - $75 for all. PU only. Jim DiMauro, NJ, (201) 764-5203.

FOR SALE: 3' x 5' reprint of factory schematic for Collins KW-1 - $25 ppd US. Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660. (312) 262-5360

FOR TRADE: Globe scout 680-A, good cosmetic condx., untested, for TV/7U tube tester. KA4ETR, GA, (912) 956-1609.

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. (540) 822-5643

FOR SALE/TRADE: Meissner Signal Shifter, exc - $125; Millen NOS 90801 TX; Millen 90881 amp. **WANTED:** Orig. manual for Collins 51S1. Thanks! Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 h, 957-6420 w.

FOR SALE: Knight T-60 in very good condx. w/manual copy - $45 + shpg; Drake MS-4 spkr, exc condx - $35 + shpg. **WANTED:** EF Johnson Ranger or Navigator in exc condx. Chuck, NZ5M, 8705 Toledo Ave., Lubbock, TX 79424. (806) 798-1452.

FOR SALE: CN-514/GRC voltage regulator/case 115 VAC @5KVA, field day portable, exc - $175 +ship. Bob Bakinowski, 1524 St. Tropaz, Tuscon, AZ 85713. (520) 624-8029

FOR SALE: Marconi FM/AM modulation meter type 2300 A, checked by WE eng, OK - $250 + shpg; P&H Electronics VFOmatic model 8020 (to make Collins 75A2, 3, 4 into xcvr, looks extra nice, unchecked - $75 + shpg or BO. Fred, K14YL, NC, (910) 883-0897.

FOR SALE: Hallicrafters SX-28, matching spkr, manual copy, internal modifications w/documentation, no panel holes - $245, U-shp. WA7HDL, ID, (208) 756-4147 after 0030Z.

WANTED:

Collins 51J4, 32V3, 75A1, 75A4, 30S1, 270G1 (2 or 3), 4:1 knob, F455J-05/08, F455J-40/60, 32S3A (RE), 310B3, 30K1, mech filter adapters, 55G1, Johnson Desk KW, SP-600X & cabinet.

Lee, W9VTC, (847) 439-4700 (d), 726-1660 (n)

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

WANTED: Heathkit, Eico, Fisher, Dynaco or similar tube audio amplifier in any condition or manuals for same. Mike Nowlen, WB4UKB, POB 1941, Herndon, VA 22070. (703) 716-1363.

WANTED: Still collecting early WW II radar equip. & manuals, what have you. Allan H. Weiner, 97 High St., Kennebunk, ME 04043. (207) 985-7547.

WANTED: Meter historian searching for instruments, The Instrument Maker & other 1940s meter magazines. Chris Cross, Box 94, McConnell, IL 61050.

WANTED: Collins 302C-3, DL-1, 62S-1, 51S-1, 55G-1, 312B-5, 399C-1, KWM-1, SM-1/2/3, 32V2, any Collins spkrs. Leo, KJ6HI, CA, (310) 670-6969.

WANTED: QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: TX-1 Apache, RX-1 Mowhawk, SB-10 SSB adapter. With manuals. Sandy Gerli, CT, (860) 675-5566 any time or angerli@connix.com

WANTED: R47 spkr to match my SX101 MK3 rcvr. Doug Knoll, KA9IQA, 1400 4th Circle NE, Waseca, MN 56093. (507) 835-8821.

WANTED: Good R-389, R-390A and SP600JX. Mitsugu Shigaki/ 2825-2, Jozan Kamidai Machi.Kumamoto.860, Japan. FAX:JAPAN (0)96-329-4601, fle83163@pcvan.or.jp

WANTED: Hallicrafters SR-75 rcvr; two good 860 tubes for Hartley project; National type "B" dials. Sandy W5TVW, 504-836-2134, ebjr@worldnet.att.net

WANTED: Help: Schematics for Epic Wavesaver and Wavetek 113. Ed Price, WB6WSN,CA, (619) 440-2977, Fax 440-5859.

WANTED: Aluminum knob to fit multiplier tuning on B & W 5100 B, need exact replacement only. Kent Miller, K4IHN, 941 Ridge Rd., Lexington, NC 27295. k4ihn@juno.com

WANTED: Hallicrafters SX-62 radio, good to exc; manual/schematic for Drake SSR-1. Jack Ellis, 7607 Ensley Dr., Huntsville, AL 35802. Voice/FAX (205) 881-6646.

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW 30th, Oklahoma City, OK 73112. (405) 525-3376.

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 13280, Maumelle, AR 72113. (501) 851-8783, FAX 851-8784.

WANTED: I buy ham rcvr's not working but worth saving. Ron, 10701 W. 54th St., Shawnee, KS 66203.

WANTED: Old ham desktop microphones, any condx.; separate mic heads & stands. Rick, KF5NU, 9031 Troulon Dr., Houston, TX 77036. (713) 774-5102.

WANTED: Heath xtal sets; early ham & shortwave equip.; literature, accessories, broken or parts units; any Heath amateur gear. WA5THJ, Rt 9 Box 163, Alvin, TX 77511. (713) 331-2956.

WANTED: Pre 1980 microcomputers for historical museum collection; early magazines & sales literature. Dave, KK4WW, POB 341, Floyd, VA 24091. (540) 231-6478/ 763-2321.

WANTED: Fair to good condx. E.F. Johnson Valiant I or II . Will pay above average price. J. Costello, WA5HSI, LA (504) 889-2424.

WANTED: Vintage AM equipment for personal use, must be collector quality or mint. Prefer Collins, will consider others. Bob Tapper, K1YJK, Box 61538, Denver, CO 80206. (303) 740-2272, FAX 777-6491.

WANTED: BC-611 &/or spare parts. Andy, WA4KCY, 105 Sweet Bay Ln., Carrollton, GA 30116. (770) 832-0202. wa4kcy@usa.net

WANTED: Info on early 1950's Meissner regenerative rcvr kits. Neil Borg, W0MXX, 2219 Ridgewood Dr. NW, Alexandria, MN 56308.

WANTED: P/S for Elmac AF-67, model M1070. Chuck Haut, W9UB, WI, (414) 679-1721 W9UB@worldnet.att.net

WANTED: Mic: Astatic T-3; Shure 705, 707A, 520D/SL, 545, 533VC; Turner BX/CX, VT-73; EV 605, 905, 638, 634. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225, Fax 328-4217. 74053,3164@compuserve.com

WANTED: Sideband adapter for RME rcvr, RME4301? Tom Raymond, W5JM, 2320 S. OSt., Ft. Smith, AR 72901. (501) 783-8848.

FOR SALE: T-Shirts w/Johnson Viking logo - $15, state size. Viking Radio Amateur Radio Society, POB 3, Waseca, MN 56093.

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

FOR SALE: Repair/restoration of vintage Drake EFJ, Collins & others. Please call for info: Dee, W4PNT, (540) 949-8300

FOR SALE: B&W 5100/5100B VFO dial overlays, super quality - $10 postpaid. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803.

FOR TRADE: Two good RCA 833A's for one Taylor 833A. John H. Walker Jr., 16112 W. 125th St. Olathe, KS. 66062. (913) 782-6455

FOR SALE: QST's complete from 1947 thru 1970, including 1975 - $250, PU only; HRO-60, A-D coils, spkr, VGC - $400 PU only; taking bids for all of the following (need the basement cleared & will not seperate): Hallicrafters SX28 & 3 spkrs; Hickock RF generator; Knight RF generator; Accurate Instruments 257 tube tester; T368 VFO assy; 4 Dow key relays; Leader LAB310 scope; Pyramid phase 3PS; Ramsey CT-90 freq. counter; Global Specialties max 100A freq. counter; Palomar Tuner tuner; Heath patch & Q -mult., coax & other adapters; Conel DF RX; box of xtals; various xfmrs; home-brew antenna tuners & parts; short rack cabinet; 100TH'S, 250TH's, 2A3's & many other tubes, some for BC-610; 2 Autek WM-1 & other SWR meters; many boxes of components & more! Pickup in the Providence, RI area. Call for info: Dan, MA, (617) 736-9126.

FOR SALE: Collins manuals, reports: 17L2, 17L8/8A, 51R-2, DF-203, 208U-3, 237A-1A to A-3, 237B-1, 237B-2X, 237, 648Z, 637B1, 789R-1, 789T-1 CER: 1736, 1747. CTR: 117, 120, 123, 140, 154, 167, 208A, 235, 236, 238, 243, 276. Heath courses: 3701 Novice, 3703 Advanced - $10 ea. R4C/T4XC, MS4 /PS - $375; Sherwood mods - $155; TS-520 - $360; SX-110 - $110; SX-111 - $125; S-28 - $125; KT-320 - $40; S-107 - $50; SX-117, HT-44 - $345. Joe, WSØE, MO, (417) 882-3197, eves, joe.7bc@juno.com

FOR SALE: Complete R. L. Drake station, circa 1966, consisting of: Model R-4A rcvr, serial #3672 w/instruction manual; model T-4XB xmtr, serial #165808R w/instruction manual; model MS-4 spkr & pwr sply, serial #34574 (diagram included in Transmitter Instruction Manual) w/all connecting cables & in working cond. - $300 as a unit, + shpg. Willie, W6CKV, CA, (916) 342-1180.

FOR SALE: BC779 w/RA74 ps, EC, no shpg - $175; HQ170, works good - $125; BC779, no ps, works good - $100; Hallicrafters SX71, works - $85; HQ145, parts unit? 1 band dead, needs RF can - $90. All prices firm + shpg. Dave Metz, VA, (540) 885-7914 eves 7-10 PM EDT please.

FOR SALE: Homemade galena xtal radios & parts. Write for details. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: Tube radios and amps. Send LSASE for list. Hoover Noonan, Rt. 1, Box 187, Pineland, SC 29934. (803) 726-5762

FOR SALE/TRADE: Xmtg/rcvg tubes, new and used - $.52 LSASE for list. Many thousands added lately. I collect old and unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 16112 W. 125th, St. Olathe, KS 66062. (913) 782-6455

FOR SALE: 500 kHz Collins mech filters, USB or LSB. See ER #83 & 86 - $40 ea or both for $65. Call or write for more info. Roger Leone K6XQ, 136 Delta Cir, Vallejo, CA 94589. (707) 552-6659

FOR SALE: Collins repair: FCC licensed technician, we repair the Collins gray line i.e. S-Line, KWM-2/2A etc., and other select models. Merle, W1GZS, FL, (352) 568-1676

FOR SALE: Hammarlund HQ-170 rcvr, near mint condx., just refurbished, manual - $225. Michael, WA8LAG, OH (216) 951-3124

FOR SALE/TRADE: SP-600-JX-26 - $450; DX-60B - $150; NC-300 - $225; RAO-5 - $150; S-77 - $100; HW-101 - $250. LSASE list. Sam Timberlake, POB 161, Dadeville, AL 36853. (205) 825-7305

FOR SALE: Hammarlund HQ 110, HQ 180A w/manuals. Hoover, SC, (803) 726-5762.

FOR SALE: Conset G-50, nice - $75; Conset Communicator IV/220 mc, paint chipped at edges - $125; SW-3 63A, 13A & 35 coil sets - $64/set; EV 635 mic - $25; National NC-46, working badly - $80; SRR-13A Navy HF rcvr, needs work - $85; FRR-21 (same as SRR-11) Navy VLF rcvr, working badly - $100; RAS-3 (WWII HRO Jr.), 1 coil, 2 unoriginal front panel holes - $120; RAK WWII Navy VHF rcvr, no pwr sply, nice - $120; RBC-6 WWII HF rcvr, paint chips & pwr sply problems - $130; WWII Navy Collins-made MBF rcvr, good - $80; 2-stamp LSASE for list of parts, accessories, knobs & more. Don, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST weekdays.

FOR SALE: New knobs: small skirted 75A/32V; Superpro fluted (early) - $1.50; STD pointer - 3/$1. Lowell Thomas, AA6ZD, POB 15026, Fresno, CA 93702. (209) 227-1605

FOR SALE: 75A-4 MHz drum decals, 20.5 or 20.8 MHz (you specify), buff color, install instructions - $8.50 ppd. W3HM, Rt 3 Box 712, Harpers ferry, WV 25425

FOR SALE: Negative cycle loading circuit, instructions - $2; Protect modulation transformer, extend positive peaks. WB8IEM, 410 Robinhood Dr., Florence, Al 35630.

FOR SALE: Collins 51J series drum overlay - $10 ea, specify which. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150

FOR SALE: 1946 GE metal portable radio model 250, 5-tubes, 2 volts - $60; 1944 Navy radar scope TS-43AP, w/orig. carrying case, test leads, keys for case - offers. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699

FOR SALE/TRADE: Hallicrafters HT-37 xmtr, good to exc condx. Fred Clinger, OH, (419) 468-6117 after 6 PM EST

FOR SALE: NOS 6V6G Westinghouse & GE - $10 ea.; 869B Amperex, NIB - $120; WX 30884/7052 Westinghouse, NIB - $200; NOS 310A, 311A, NIB & many others. Andrea Moretti, Via Colle Bisenzio 31, 50040 Usella FI, Italy. Fax 574 982123 anytime.

FOR SALE: Low freq. rcvr - $60; Heath VF1 - $40; R-388 Collins rcvr (fixer) - $100; PRC-47 accessories & spare - $200; Knight T-60 xmtr - $40. Ed Hammond, POB 390, Buckfield, ME 04220. (207) 336-2858

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), POB 697, Grayland, WA 98547. (360) 267-4011

FOR SALE: Misc. military equipment & accessories; ham/military manuals. List available. Henry, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

FOR SALE: Heath T-shirts, fine quality - $15 ea + $1.50 shpg. Marty Drift, POB 21, Blawenburg, NJ 08504.

FOR SALE: Numerous pieces of RF test equip; SB-104 station. SASE for list. Scott, KC7BGE, 5111 E. Sharon Dr., Scottsdale, AZ 85254. (602) 953-5779, eves.

FOR SALE: Heath HX-30, exc condx - $150 + shpg. Willis, WØWI, AR, (501) 857-3366.

FOR SALE: BC 221 meter - $15; new National ACN dial - $15; NIB Taylor T55 - $20; antique omnigraph w/tapes - $15; 2-NIB Sylvania VT52 - offer + shpg. Thomas Berbari Sr., 870 Wales NE, Massillon, OH 44646.

FOR SALE: Vintage tubes, (833A, VT4C, etc.); assorted radio/wireless telegraph books & magzines, 1880-1935. SASE list. Jan Perkins, 524 Bonita Canyon Way, Brea, CA 92621.

FOR SALE: Fisher Spacexpander tube reverb - $100; Hewlett-Packard 410B vacuum tube voltmeter w/probes & manual - $125; Collins manuals (copies). N1FRX, ME, (207) 834-6273.

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: Info on the old Allied Radio in Chicago. I'm researching the company for an article in ER. Need anecdotes, stories, history, etc. Kurt H. Miska, N8WGW, 3488 Wagner Woods Ct., Ann Arbor, MI 48103. (810) 641-0044 wk. FAX (810) 641-1718. 76247,1422@compuserve.com

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

WANTED: Old tube amps & xtmr's by Western Electric, UTC, Acro, Peerless, Thordarson; Jensen, JBL, EV, Altec, WE spkr's. Mike Somers, 2432 W. Frago, Chicago, IL 60645. (312) 338-0153

WANTED: HF-380, 451S1, AC-3814. Koji Mitoshi, Japan. TEL/FAX 011-81475-24-9115, e-mail: byj01726@niftyserve.or.jp

WANTED: Mics by Altec, Neumann, AKG, WE, Sony, any vintage; tube compressors/limiters; will trade my rare NOS tubes for mics. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fx

WANTED: ARC51, ARC164, ARC83, ARN118, ARN-127, SST181X, KY28, Wilcox 807, cables, radios, mounts, manuals. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272

WANTED: James Knight H16 xtal holder, 100 kHz preferred, other frequency OK. Paul Monroe, W9MEH, 303 Cornelia St., Janesville, WI 53545. (608) 756-9757.

WANTED: Collins R389, 30K-, 310-, 399C-1, 851S-1, KW-1, HF8000 series, Hallicrafters SX-115. Richard, NE, (402) 464-8682.

WANTED: Yaesu FT-301D & sply FP301D in exc operating condx, state price. Roland Matson, POB 956, Lake Panasoffkee, FL 33538. (352) 568-1629

WANTED: James Millen high frequency RF amplifier, model no. 90811. Mike, K0CRX, MN, callbook, (612) 257-1675. 75143.2737@compuserve.com

WANTED: Military radios. Canadian WS #29 (CDN) A set; eastern European RM-31 set. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Kleinschmidt teleprinter models: 311, 321, (AN/FGC-40, AN/GGC-16, AN/UGC-39...) Tom Kleinschmidt, 506 N. Maple St., Prospect Hts., IL 60070-1321. (847) 255-8128

WANTED: SP400, EH Scott rcvrs, only in very good condx. Jose Congas, EA4JL. Contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: GPR-90, 91, 92; Hallicrafters SX-88; Eddystone rcvr's. James B. Geer, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Navy xmtrs TBK, TBL, TBM, TBW, TCA, TCE, TCX & accessories, any condx. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: S-meter for SX-24 or SX-25. George Flanagan, W2KRM, 42 Cygnet Dr., Smithtown, NY 11787. (516) 360-9011

WANTED: Galaxy RF-550; LA-550; F-3 filter; Harvey Wells TBS-50B; VFO; APS-50 sply; Harvey-Wells TS-90 xmtr; R-9 rcvr; PS-1 & MS-1 spkrs; VPS-R9 & APS-90 splys; National MCS spkr; NC-270 & matching spkr; military LS-1 & LS-2 spkrs; SX-73 cabinet & rear panel. R.D. Kelley, W8GFG, 9010 Marquette, St. John, IN 46373. (219) 365-4730

WANTED: Plastic dial scales for HRO-50/HRO-60. Gary Cain, PO Box 521, Shakopee, MN 55379. (612) 496-3794

WANTED: HA-10 LF tuner, HA-5 VFO. Gary Vandergrift, N3XON, 122 Wynd Ln., Aliquippa, PA 15001. (412) 495-3638

WANTED: Hallicrafters SX-101A cabinet & 100 kc xtal for calibrator. James Shank, W3CNS, 21 Terrace Ln., Elizabethtown, PA 17022. (717) 367-3149

WANTED: Cable set (3) for TCS rcvr & xmtr; looking for a couple of military rcvrs (hobby) please state cond. & type. Chas Filer Jr., 1163 Hawksbill Ln., Sugarloaf Key, FL 33042-3159. (305) 745-1801, leave message

WANTED: Mint National NCL-2000; HRO-500 TS spkr. Sam, W2DNN, 486 Glenwood Trail, Elgin, IL 60120. (847) 695-0218

WANTED: Hallicrafters bandswitch knob used on following rcvr's: SX-23, S-27, SX-28 & SX-32. Karl Daxland, KA1RM, POB 3420, Westport MA 02790. (508) 636-3281

WANTED: Manual or info on KAAR Engineering Corp. Type PTL-254A-1 xmtr. Alan Barlow, WA6FMZ, 8838 West Hill Dr., Pinon Hills, CA 92372. (619) 868-6383

WANTED: Frequency synthesizer module PRC74C; tubes 10Y, 843; GPT 750. John, POB 1773, Pinehurst, NC 28374.

WANTED: Gray front panel for Hallicrafter HT-9 xmtr. John Packer, W3QCL, 318-1/2 School St., Springdale, PA 15144. (412) 274-4734

FOR SALE: 2 new 6159U tubes & ceramic sockets - $65 ea. or $120 both or trade for GUD used 3-400Z's; 1-4CX 250B - $35; HA 201A 2 mtr Heath amp - $25. **WANTED:** GUD VTVM prefer Heath w/Hi-voltage probe. Bill Bogart, KA9CWK, 4146 S. Goff Rd., Hillsboro, IN 47949. (317) 397-3860

FOR SALE: Heath HD-1410 keyer - $25; Heath PM-2, field strength meter - $25; Heath manual SB-610 - $5; Heath AR-14 rcvr - $35; Ham straight key - $35; keyer - $30; Hammarlund S-100 spkr, mint - $85; Heath HD-20 - $25; ORR VHF hand book - $5; ARRL VHF hand book, new - $4; Heath log books - $4 ea; Heath SWR AM-2 - $20; Heath SWR HM-15 - $20; Sixer - $45; Heath manuals, VC-3, GW-10, S-3, TS-4A, 0-11 - $3 ea. Marty, NJ, (609) 466-4519.

TRADE: Collins 30S1 for S-line equip. Lee Fouts, K7MBJ, 4874 Powell Hwy, Cody, WY 82414. (307) 587-9506 or 864-3286

FOR SALE: R-808, 2-32 MHz rcvr, part of GRC-19, w/spkr, like new - $325 U-shp. Ken Kolthoff, K8AXH, 5753 David Pl, Fairfield, OH 45014-3507. (513) 858-2161

FOR SALE: New list -hundreds of manuals, schematics and service information. Send 2-stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805. (401) 934-1845

FOR SALE: 1953 portable lifeboat xmtr 401-A; Collins 32V-2; Globe Chief 90-A; Hallicrafter CB-3A; Heath HW-32A; BC-191F & accessories; BC-604; HRO black tuning knob; Drake 4C; Boy Scout signaler radio blinker telegraph key; four dynamotors; dual 150 mf 200 volt caps - 50¢ ea. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: Late model test gear like HP, TEK, Fluke, Analogic data precision. V. Vogt, 330 SW 43rd St. #247, Renton, WA 98055. (206) 382-5571

FOR SALE: Unfinished triggered o'scope, 3 WPI CRT mounted on chasis, plans - $100; TEK type D plug-in, untested - $40, OBO. Randy Hull, WB3ECC, POB 501, Halifax, PA 17032. (717) 896-2435

FOR SALE: National HRO-500 w/manual, exc condx. - $900. **WANTED:** Navy RBB/RBC rcvrs & accessories, any condx; TCS series xmtr. Paul Busnuk, 2110 E. Lombard St., Baltimore, MD 21231. (410) 522-0481

FOR SALE/TRADE: Collins 30J broadcast xmtr & Yaesu 901 DM station. Need T368; Johnson 500; 75A4 rcvr, etc. Jeff, AA8JG, 2730 McKinley Ave., Kalamazoo, MI 49004. (616) 381-4133

WANTED

Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011. FAX (805) 259-3830

WANTED: Help Vibroplex build its Company collection of Vibroplex bugs, keys and memorabilia. Call Mitch, WA4OSR, at The Vibroplex Co., (800) 478-8873.

WANTED: Collins – Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard, KD6CPE, POB 992, El Toro, CA 92630-0992. (714) 855-4689.

WANTED: TMC GPR-92 HF Rcvr. Hank, W6SKC. (602) 281-1681 FAX: 281-1684.

WANTED: National emblem for HRO-60 spkr; 75A4 rcvr. Matt, WB2VZS, CA, (310) 476-2129 (h).

WANTED: Yaesu (Spectronics) spkr SP-400. John, Alaska, (907) 337-9157.

WANTED: Manuals: Squire-Sanders SS1B1; Allied Knight KG 687. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: Heath balun coil I B-1 & Heath HD-20; xtal calibrator; Heath HG-10 or HG10B, VFO. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677.

WANTED: Johnson HCS20, HCS40, HCS80, HCS160 coils. KA5SRB, NM, (505) 8242155.

WANTED: CV-591/URR SSB converter for R-390A; technical manual for CV-591. Jeffery Hopkins, WA2DPK, 2482 Remington Rd., Elizabeth, CO 80107. (303) 646-0139.

WANTED: Small ant trim knob from Heath HR-10 rcvr. Jack Bertholf, WA4CSM, 8109 NW 58 Ct., Tamarac, FL 33321. (954) 721-2337.

WANTED: Huge Navy equipment: shipboard & shore radio, radar, & sonar, mint thru junkers. William Donzelli, 304 S. Chester Ave., Park Ridge, IL 60068. (847) 825-2630, integrat@ust.com.

WANTED: TMC GPR-92; Hallicrafters SX28, SX42 rcvrs, collector quality, complete. John, NE6G, 7495 Gunter Rd., Pensacola, FL 32526. (904) 944-6563.

WANTED: Military electronics, RDF, radar, communications, test, manuals, literature, etc. What have you got? William Van Lennep, POB 211, Pepperell, MA 01463. (508) 433-6031.

WANTED: Hallicrafters HT-1, HT-9, HT-4; National SW-3, model 1, 6 & 12V versions; other pre-1950 ham gear. Dean Showalter, WA6PJR, 72 Blackboard Rd., Tijeras, NM 87059. (505) 286-1370.

WANTED: Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135.

WANTED: Reward paid for National SW-4, has 4 tubes but only one set of coils. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (617) 934-5043.

WANTED: Globe King 500, A, B or C xmtrs, any condx., reasonably priced. Terry Collins, KB9AUP, 18 N. Tomahawk Ave., Tomahawk, WI 54487. (715) 453-3707 d, 453-4633 eves.

WANTED: CQ Magazines-May 1945 & Sept 1945, 1975 World Radio-TV Handbook; Hammarlund XC-100P xtal calibrator. Brian, IL, (800) 225-0256, ext.14733.

WANTED: Hallicrafters S-14 Sky Chief, must be cosmetically perfect. Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078.

WANTED: Will pay premium prices for unassembled Heathkit rigs; HW-99, HW-5400, HW-9, etc. Gary Debock, N7EKX, WA, (206) 848-4748.

WANTED: Military countermeasures & EC M gear and late military tech manuals to buy or trade. Let me know what you have! Nothing too small! **MESSAGE:** Rick Setliff please call with new phone number, lost track of you! Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457. (757) 721-7129, Fax 426-6454.

WANTED: Miller slug tuned coils #B320A, B320RF for converter project. **FOR SALE:** HP 606A sig. genetator, exc. - $100. Dave, W1DWZ, MA, (508) 378-3619.

Please remember to count the words in your ad. If you are over 20 words, please send 20 cents for each extra word.

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

WANTED: Hammarlund manuals, parts, parts units, from the series Comet, HQ, SP. Also accessories, catalogs, spec sheets, memorabilia. Robert, Amateur Radio Surplus, (517) 789-6721

WANTED: Paying immediate cash for old Fender and VOX guitar amplifiers. Frank Czaja, AI9T, 8968 W. Forest Home #4, Greenfield, WI 53228

WANTED: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: Unassembled Heathkits, Heath gear, Heath catalogs. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI, (616) 375-7978, billrobb@serv01.net-link.net

WANTED: Orig. tube-type CB radio operating/owners manuals; also tube-type CB radios. Walter Ryan, 7114 Geyser Ave., Reseda, CA 91335. (818) 344-8735

WANTED: ARC/5 equipment, R25 1.5-3 Mc rcvr; T17, T18 xmtr. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Johnson Ranger; Johnson Desk KW. Willing to pay top $ for pristine condx. Lee, W9VTC, IL, (847) 439-4700 (d), 726-1660 (n)

WANTED: Plate tuning capacitor for Johnson 6N2 xmtr; studio/broadcast mic; Hallicrafters HA-6. Emil Zelasko, KA8GEF, 9401 Grand Division, Cleveland, OH 44125. (216) 883-5134

WANTED: Junked HT-44 for parts; nice HA-10 for personal use. Robert Struk, 1726 Kinglet Ct., Sunnyvale, CA 94087. (408) 991-3747

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

WANTED: To buy any Lunch Boxes & related items. Arthur Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752. (717) 547-2674

WANTED: WW II Japanese military radio of any kind; pre-war Japanese QSL cards. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, Japan. FAX: 011-8145-301-8069

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug-in coils) for restoration & ER articles. Ken Lakin, KD6B, 63140 Britta St., Ste. C106, Bend, OR 97701. (503) 923-1013. klakin@aol.com

WANTED: Hammarlund Comet Pro, AVC model; Comet Pro coils, parts & parts sets; Hallicrafters SX-11 dial plate; Millen 90801 exciter. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: Clean SP-600-JX-21A & HQ-170ACX VHF w/orig. manuals, C6ANI, POB N410G, Nassau NP, Bahamas.

WANTED: Collins KW-1, 30S-1, KWS-1. WAØAKG, NE, (402) 464-8682

WANTED: Johnson Challenger, Adventurer, Navigator, good cosmetic condx. Doug Knoll, KA9IQA, 1400 4th Circle NE, Waseca, MN 56093. (507) 835-8821

WANTED: EV 420 desk stand; dead TV-2 tester for case; manuals BC-1031B/C, S-38E, Morrow FTR rcvr, KA radio 80 rcvr & pwr sply. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

Please remember to count the words in your ad. If you are over 20 words, please send 20 cents for each extra word.

FOR SALE: Thousands of tested tubes w/ warranty! Both xmit & rec tubes. Buy those spare tubes for your tube radio, audio, ham and electronics. Most tubes are used at about 1/3 of new, many are around $1. I have bunches of octal, 7 & 9-pin tubes. All tubes are tested on TV-7D/U tester and then boxed. I give a 30 day warranty. Send wants or SASE with two stamps for list. Daniel Nelson, 1025 E. Desert Lane, Phoenix, Ariz. 85040. (602) 243-7421 eves. djn@indirect.com

FOR SALE: WACO-5NWX telephone interference filters - 1/$12.95, 2/$24, 3/$33. If these don't work then none will. Just plug in. Cecil Palmer, 4500 Timbercrest Ln., Waco, TX 76705. w5nwx@juno.com

FOR SALE: Just released: Send 2-stamp LSASE for latest Olde Tyme Radio Co. Flyer 196A. Olde Tyme Radio Company, 2445 Lyttonsville Rd., Ste 317, Silver Spring, MD 20910.

FOR SALE: Three Kurz Kash Bakelite dials, 4 inch - $10 ea; four National N vernier - $15 ea. Both in mint, + shpg. John, POB 905, Grover Beach, CA 93483.

FOR SALE: Scott SLR-F - $75; ARC-3 (rcvr, xmtr, dynamotors, cables) - $45; HP-330B distortion analyzer - $45; IP-69C/ALA-2 panoramic adapter - $40; BC-929 A-scope radar indicator - $40; (2) AM-864/U limiting audio amps - $30 ea; BC-375 parts unit w/TU-7B - $25. Heavy units, PU only. Clare Owens, N2RJB, NY, (716) 692-8832.

FOR SALE: National SW5; HRO-M w/8 coil sets; 1-10 w/6 coil sets; Criterion Binaural. Will sell each to the best offer received by October 27. Greg Farmer, 71 Rice Creek Way, Fridley, MN 55432. (612) 571-6062. farme007@tc.umn.edu

FOR SALE: S38, SX71/R-46, R-48, HQ110, S-120. Ray, MO, (314) 428-1963.

FOR SALE: Tube list, new & used, wide variety audio, ham. Recently expanded. SASE 52¢. Bill McCombs, WB9WNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: Valiant, needs work - $150; Johnson Matchbox, exc - $125. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603.

FOR SALE: Neon bulbs, 110 VAC. I have a few small neon bulbs, 1-watt & 2-watts, 100 VAC. Send postcard for info w/needs. C. Graham, 4 Fieldwood Dr., Bradford Hills, NY 10507.

FOR SALE: RT67 & 68 sply, spkrs, mounts, works - $75, PU only; National Select-O-Ject - $35 + shpg; UTC universal mod xfmr, S-22 + S-9 driver - $75 + shpg; DX35 parts your wants; SX71 parts your wants; Hallicrafter HT-46 & SX146 + parts HT46 work - $100 + shpg. Bill Bogart, 4146 S. Goff Rd., Hillsboro, IN 47949. (317) 397-3860.

FOR SALE: Drake 2 NT xmtr - $70; Drake 2B rcvr - $100; Collins 75A series cabinet, good paint. Jerry, N5KYE, OK, (405) 373-2228.

FOR SALE: R-390A/URR orig. 1961 maintenance manual. TM11-5820-358-35, 189 pgs - $28 incl priority mail. Aben, POB 4118, Jersey City, NJ 07304. avidov@juno.com

FOR SALE: Hallicrafters HT-37, manual copy - $90; Drake R4B/MS-4, manual copy - $200. Mark S. Rauber, POB 1077, Minden, NV 89423. (702) 782-3596.

FOR SALE: Hallicrafters HA-5; Johnson Challenger; P&H antenna relay box; Swan 350 w/ AC-DC ps; Thordarson T21M65, 500W mod. xfmr; Thordarson T82M25, 350W mod xfmr; DX60 parts unit; 5 833A/C tubes; Heath HO13 monitor; Morrow MB560A, MB565. R. Berkemeyer, W0REP, 402 Kingridge Dr., Ballwin, MO 63011. (314) 394-0441.

FOR SALE: Vintage equipment manuals starting at - $5; Hallicrafters, Johnson, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: C-Line: R4C serial 22, xxx, T4XC serial 27, xxx; Sherwood solid state third mixer, audio amp & voltage regulator mods, AC-4, NB-4, 1-5, 5, Heil BM-10 (#4), SP-75 speech processor, all hand bands in both units, SWL, excellent performer - $650 - or trade for Drake L4B or will take an SB-220 plus cash. Lane, KM3C, CA, (619) 470-6528.

FOR SALE: Xtals (200) NIB, 80m, 40m - $5 ea. SASE for list; National XCU-50 xtal calibrator - $95. Trade HRO-50 G, H coils for two HRO-50 or HRO-60 A thru F coils; Collins WE 30L-1 - $500; Heathkits: VC-1 voltage calibrator (1954) - $30; HW-101 & PS - $110; SB-200 - $325; HRA-10-1 xtal calibrator - $18; SSB, CW filters - $40 ea. All w/ manual + shpg. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881.

FOR SALE: Hallicrafters S38, S38abc's w/manual - $85; 45 ARRL handbooks. Much more LSASE for list. WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149.

FOR SALE: Very nice Ameco AC1 xmtr, 2 coils no book, mint; HRO 60TS spkr. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373. (513) 339-1546.

FOR SALE: Dow key relay 110 VAC - $30; ARRL Handbook 1947, fair - $10; 1948 exc. - $15; 1958 Allied, good - $7; Hallicrafter Sky Courier, WW II RX - $30; Heath GD-1 coils w/o GDO - $5; Shure # 701D mic - $18; General Radio audio osc - $15; Pr Eimac 4-400 Air Sockets - $50; Johnson 6N2 converter - $38; 1-3/4 amp variac - $15; small roller coil - $18; Baldwin headphones - $35; hand key - $10. Joe Sloss, K7MKS, WA, (206) 747-5349.

FOR SALE: Hallicrafter R-274D / SX-73 w/covers & manuals - $335; BC-939-B - $100; TV 2C/U - $200; TEC 454R, 150 mc scope - $135; TEC 7A19 plug-in - $40. All + UPS. Dan Mason, R RT1 Box 204F, Santa Fe, NM 87501. (505) 455-3416.

FOR SALE: Hallicrafters SX25 - $200; Hammarlund HQ129X - $150; Johnson Viking Challenger - $100; All work, U-ship. Bob, AZ, (602) 816-0660, 5415146@mcimail.com

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

FOR SALE: "Teletype" T-shirts. The Teletype Corporation's "T" symbol in black on a yellow (what else?) Hanes shirt - $15 ppd. Sizes L or XL only. Jack, WA2HWI, NJ (201) 927-7784.

FOR SALE: New orig. PJ-068 mic plugs for Collins S-line/KWM-2A/HF-380 shp'd in USA - $8 ea. Clint Hancock, KM6UJ, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: Collins KWS-1, SN1520, exc conds., orig. doc., + 5BJ4, exc. rare HP grey etched - panel mint, SN 94 - BO. Barry Nadel, POB 29303, San Francisco, CA 94129. (415) 346-3825.

FOR SALE: Heath SB-303, SB-600, manual, filters, exc. - $175; Drake R-4B, nice - $150; Swan 350 - $125. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230.

FOR SALE: Telrex rotator A2140RISK, sn 80049, chain drive, 9000 lbs torque; Telrex 20M646 20 meter, 6 element beam w/46 ft boom; Telrex 15M317 15 meter, 3 element beam w/ 14 ft boom; Telrex 10M313 10 meter, 3 element beam w/17 ft boom. All three antennas stacked on top of Rohn 25G, on 21 ft heavy wall mast, 5 sets anti sway bars, five sets guy wires, three anchor points, on a hilltop before being taken down. Tower modified to accept Telrex rotator, & except for guy wires is complete & ready to bolt together. Five sections of 25G plus three commercial, $100 dollar each, heavy duty bearings for mast to rotate on. This was a very strong set up & easily carried the Telrexes. A crane with a 90 ft boom would be required to install this system. Telrex 40M329 40 meter, 3 element beam, brand new, never assembled, 29 ft boom. Purchased all new between '74 & '86. Tower taken down in '91, antennas in various stages of disassembly, complete, & indoors. These antennas are not for the faint at heart. Will sell as a complete package - $4000. William P. Stewart, KC5LJ, Box 90, Balverde, TX 78163. (210) 980-2500.

FOR SALE: KWM-2 fan bracket - $15 ppd. Dave Ishmael, WA6VVL, 2222 Sycamore Ave., Tustin, CA 92780. (714) 573-0901.

FOR SALE: Original ART-13 manual, approx. 225 pages, VG cond. - $35 ppd. Hank, K1ZDI, 2 Aglipay Dr. Amherst, NH 03031. (603) 882-8896.

FOR SALE: R-725/URR, Servo Industries. See in ER #84. Excellent original condx, great panel and knobs. Cleaned, aligned, and in perfect working order with meters and covers - $750. Tom, N5OFF, LA, (318) 989-3430.

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: PRC47 LSB/USB kit - $40; new machined coax antenna panel - $9. All restorable. Jay Craswell, WB0VNE, 321 West 4th St., Jordan, MN 55352-1313. (612) 492-3913.

FOR SALE: All electronic repairs welcomed. Specializing in ham gear, qualified. Stocking Collins, Heath, etc. Tiki Electronics, 1564-62 Front St., Cuyahoga Falls, OH 44221. (330) 922-8454.

FOR SALE: Gonset Communicator II-B 2 meter xcvr, matching VFO & liner amp - $325 set. Mark, WI, (414) 494-0787 CDT, eves.

FOR SALE: Allied Radio, set of 5 coils (5 prong) covers 165 kHz to 35 MHz - $25. Joseph R. Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003. (304) 277-3154, schematic1@aol.com

FOR SALE: National Criterion tuner w/Horizon 5 preamp - $100; Horizon 20 amp - $60; HRO-W w/9 coils, ps - $450; HRO-50 w/6 coils, spkr - $350; HRO-7 w/12 coils, ps, spkr, NBFM adapter, Select-o-Ject - $600; HRO-7 (uncommon black wrinkle table model) w/6 coils, matching spkr & ps - $500; RAS-5 w/all coils, coilbox, ps, spkr, rack (matching serial numbers) - $500; NC-109 w/spkr - $110; NC-44 - $55; NC-46 w/spkr - $80; VFO-62 - $45; National rack mount pwr sply - $50; HFS coil set - $25. Send SASE for list of orig. National manuals, catalogs, brochures. Wayne Childress, KC7KUE, Rt.1 Box 200A, Altavista, VA 24517. (804) 369-4072.

FOR SALE: Johnson 500; Viking II; Heath TX-1 Apache; HG10B (2); R-390 in fresh pwdr wrinkle grey cabinet; EV630; Shure 556S D104; JT30; Astatic model A; 4 new J-T30 xtal elements; most ARRL handbooks 40's, 50's & 60's; West coast handbooks #8, 11, 15, 23; tube handbooks (rcvr & xmtr) Radiotron Designer's Handbook; DBX163 compressor/limiter; TV7U tube tester; Drake TR-7 w/500 HZ CW filter; many new rcvr tubes (ABT 500); Globe King mod xfmr (500), 1 new, 1 used; Dahl mod xfmr for Valiant (new); many other xfmr's, air variables, parts, etc. Package only, PU only. G. Cheek, 8621 Hahn, Utica, MI 48317, no phone calls please.

FOR SALE: Heath IM-18 VTVM w/etched circuit RF probe, both like new, shpd UPS - $35.00. Ros Hawks, WB0GKL, CO, (970) 259-0785.

FOR SALE: HT30 Hallicrafters xmtr - $79 + shpg. Henry Mohr, W3NCX, 1005 W. Wyoming St., Allentown, PA 18103.

FOR SALE: Hallicrafters SX-42 cabinet, no holes, dents, or deep scratches, but does need re-painting - $50 + shpg. Jeffrey Hopkins, WA2DPK, 2482 Remington Rd., Elizabeth, CO 80107. (303) 646-0139.

FOR SALE: Fiberglass rods, 5/8" dia., 13' long, UV resistant, good standoff insulators, twinlead spreaders, ten ppd - $10. Ron, K5YNR, NM, (505) 327-5646.

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

FOR SALE: Radio & electronics related books, 160 titles, call or write for list. Paul Washa, WØTOK, 4916 Three Points Blvd., Mound, MN 55364-1245. (612) 472-3389.

FOR SALE: Collins embroidered grey baseball caps, winged or meatball - $15 ea or both for $27. Outside US enquire. Mail check to Ridinger's Enterprise, 3487 Bayberry Dr., Chino Hills, CA 91709-2817.

FOR SALE: Collins repair. I specialize in S-line equipment. Reasonable, & work guaranteed. Steve, N6HK, Box 1136, Goleta, CA 93116. (805) 967-7466.

FOR SALE: AN/USM-3A, some items missing, nice shape - $25. Don Knotts, W7HJS, 3158 NE Azalea, Hillsboro, OR 97124. (503) 648-1738.

FOR SALE: Antique Atwater Kent horn type spkr, marked AK type M, complete w/orig. 9' cloth covered cord w/pin jacks - BO. **WANTED:** For BC-610 xmtr, 1 to 4 100TH modulator tubes; 1 to 4 2A3 mod. driver tubes; B&W T-368 xmtr exciter. Joe, AB5LL, AR, (501) 257-2839.

FOR SALE: EF Johnson Messenger II, antenna, mic & universal dash mtg. kit - $35; Hallicrafters HT-20 xmtr parts unit - $25; Heath GR-84, as is - $15; Sencore CR 125 cathode ray tube tester, no manual, unchecked - $15; Heath IT-12 signal tracer w/probe, no manual, unchecked - $25; IT-12, unchecked, no manual, no probe - $15; RCA VTVM, no model #, no handle, has leads - $15; Precise model 909 VTVM unchecked, no manual - $15; RCA 45 RPM record changer, unchecked, a piece of plastic is broken from end of base - $25; HK V7A, V5, V7 VTVM's, unchecked - $15 ea. All above + shpg. ARL-USA, 5355 S. 275 W, Cutler, IN 46920-9629. (317) 268-2214.

FOR SALE: From K7FF. See July & Sept ER ads, most items still available. Send for the K7FF (formerly KI6O) Mailorder List of parts/equip. (which is sent w/orders), two first-class stamps & mailing label. It's guaranteed, you'll like this list! Lot's of new small parts, (military surplus & otherwise), antenna insulators & stuff, tubes, rack panels, wire, coax, etc. etc. etc. Hundreds of happy buyers (if there is a problem, I make it right, one way or another!) Derek, K7FF, 5191 Rimwood Dr., Fair Oaks, CA 95628. (916) 965-4904.

FOR SALE: Drake TR-4C - $185; MN-2000 - $215; T-4XB - $150; AC-4 - $90; W-4 - $65; Hygain collectable rotor repeater - $65. + UPS. WA1APX/8, MI, (810) 781-9717.

FOR SALE: Audio amps, Bogen & Murantz, unchecked - $35 ea + shpg (heavy). **WANTED:** Knobs for Valiant II. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

FOR SALE: Collins 3251-7563-312B4-516F2-LW filter - $1050; 7553A/w CW filter - $350; 7553B w/ CW - $375; KWM2A-516F2, RF, new conds, SM-3 mic, MP-1, 351D-2 - offer; (2) TEK 2235 scopes - $800. Fred, W6YKM, 17893Sharon Ct., Pine Grove, CA 95665. (209) 296-5990

FOR SALE: Heath SB-300, SP-600, AM & CW filters, mint - $190. Lane, KM3C, CA, (619) 470-6528.

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (810) 391-4660, hires@frust.net

FOR SALE: Collins S-Line, 32S-3, 75S-3, 516F-2, all in exc conds. Will sell xmtr or rcvr seperate. Ron, GA, (770) 664-6931.

FOR SALE: 5C101 lamp hoods, kHz dials for all Collins St. Jame gray equip. Butch, K9BS, 5361 St. Mary Dr., Rochester, MN 55901. (507) 288-0044

FOR SALE: T-368E, many spares & books, good working conds. - $900, no shpg. Mike, WB3CTC, PA, (717) 656-8746.

FOR SALE: Classic gear - SASE for list. **WANTED:** Vintage rigs. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (313) 454-1890

FOR SALE: Collins 325-3 (wing) - $300; PTO & dials for KWM-2/S-line - $65; 148C-1 NBFM adapter - $150; Drake: R-8, mint, - $600; R-4A, T-4X, AC-4 - $250 or will seperate; Harvey-Wells TBS-50D - $100; Heath HR-10B - $40. **WANTED:** S-meter & small panel spkr for Racal RA-17; good panel for SX-88 or parts radio; manuals or info for Wells Gardner 250-GSC xmtr & Browning-Drake National rcvr. Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (630) 852-4704.

FOR SALE: Hallicrafter HT-33A 1 KW linear amplifier, uses PL172 tube, very good condx. - $450; R-390A, mfr Amelco, good condx, rack mount - $300; R-390A, mfr Stewart Warner, Miltronix rework, w/orig. cabinet, exc condx, rare - $600. Jay Spivack, N7JDT, 325 S. Washington Ave. #244, Kent, WA 98032. (206) 859-2680

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. (909) 658-3444

FOR SALE: Tubes, new, 1 or 3000, 40% + off. SASE or e-mail for list. Jim Dillon, WL7CMQ, 201 Seward, Juneau, AK 99801. (907) 586-3223, beadgal@ptialaska.net

FOR SALE: Johnson Viking parts unit, not restoreable - $45; Johnson 275 matchbox, needs a case, works fine - $45; Dentron Super Tuner (1 kw PEP) - $125; Hustler mobile HF whips, call - $100; Henry 1KD5, runs a single 3-500Z, needs work, good tube, as is - $325. Lane, KM3C, CA, (619) 470-6528.

TRADE: Hallicrafters PM-23 spkr for National HRO-5 spkr; trade Millen 43680 (80 meter 900800 coil) for one 43660, 43042, 43062 or 43012 coil. Trade used/good globe 245 tubes for 801 or 801A tubes. Trade British military MK 128, 1967-vintage "spy" radio w/homebrew AC pwr sply for HRO-5 BCB coils, Hallicrafters T-54 TV, BC-610 1.5-2 Mc coil/tuning unit or ??? Don, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST weekdays.

FOR SALE: Heath package - 2- VF-1-VFO's, 1-VC3, 1-AC-1 & Q-multi, all for - $150. Clyde Denton, 2538 Country Club Ln., Columbia, TN 38401. (615) 380-8480. 4-6 PM CST

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FOR SALE: Countermeasures rcvr R1051/URR-6 made by GTE, solidstate, .5-30MHz in 6 bands, miniature nixie six digit display, variable bandwidths, AM/FM/CW/USB/LSB, 115VAC in (modify for 12V), .5 uV sensitivity, size of bread loaf - $375 + shpg. Checked and guaranteed. Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457. (757) 721-7129, Fax 426-6454

FOR SALE: Dentron Super tuner, 160-10-40 1 kw - $50, shpd to 48 states. Don Dillard, WA5NKP, 5106 Red Oak Dr., Amarillo, TX 79110. (806) 352-4776 eves.

FOR SALE: T-368 exciter, nice unmodified condx w/6000 tube & orig. cable plug - $75. Don, OR, (503) 289-2326.

FOR SALE: Collins 30L1 amp, WE, w/manual and cables - $395+UPS. Steve, N6HK, POB 1136, Goleta, CA 93116. (805) 967-7466

FOR SALE: AN/USM 338 o-scopes, solidstate, 75 MHz, gov't rebuilt w/all new accessories, in the crate - $250. Shawn Daniels, MO, (314) 343-5263

FOR SALE: HQ100 - $95; HQ145 - $75; Galaxy 5 VFO/station console - $95; Murch 2000 - $110. George, AA0WP, MN, (507) 288-0242

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WANTED

Vintage AM equipment for personal use. Must be collector quality or mint. Prefer Collins, will consider others. Bob Tapper, K1YJK, Box 61538, Denver, CO 80206. (303) 740-2272, FAX (303) 777-6491

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ELECTRON TUBES: All types - transmitting, receiving, obsolete, military--Large inventory. **Daily Electronics Corp.**, 10914 NE 39th St., B-6, Vancouver, WA 98682. (800) 346-6667, (360) 896-8856, FAX (360) 896-5476

FOR SALE: Hallicrafters FPM-300 xcvr - $350; antennas, AT895 - $12; AT1096 - $12; LS-166 spkr's - $15; HB ps for Swan 120 - $75. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

FOR SALE/TRADE: WW II, restored, SCR-510 (BC-620) w/PE-97 pwr sply & FT-250 bracket - $500; ground operation portable SCR-509 (BC-620) includes unused CS-79 battery case & AN-45 antenna - $300. Accessories available. Ed, IL, (630) 469-3183.

FOR SALE/TRADE: Pwr sply's model PP-114B/VRC-3, for vehicle installation of walkie-talkie SCR-300 (BC-1000), fair to good - $80. Ed, IL, (630) 469-3183.

FOR SALE: Lots of tube ham gear, Collins & National mostly. Write for list. V. Vogt, 2311 Pimmit Dr. #114E, Falls Church, VA 22043.

FOR SALE: Copies: Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip, ham gear. Contact me for prices, availability. Duane Ballew, KB7QZK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

FOR SALE: BC342 w/AC pwr sply, exc condx. - $75. **WANTED:** HQ140/HQ150 for parts-cabinet. Bill, KB8IJC, WV, (304) 842-4635.

FOR SALE: Johnson matchbox, kw/meter - $295; Ranger - $265; Hammarlund HQ105 TRC - $195; Heath HW-8/ps - $125; SB620 - $165; SB303 - $200; SB614 - $125; HD-1250 dip meter - $45; free lists - equipment/manuals. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454

FOR SALE: Collins KWM-2A/516F2, rackmount, RE, all mods/upgrades, exc., $1490. Cory, N2AQS/AFA4TZ, 1000 E. 14th/178, Plano, TX 75074-6249. (972) 751-7535 (24 hrs)

FOR SALE: Hallicrafters S95, S38C, nice - $40 ea.; Lafayette HA-460 6mtr xcvr - $50. Larry Steeno, K9LWI, 1838 Bluespruce Ct., Green Bay, WI 54311. (414) 468-5149, lsteeno@execpc.com

FOR SALE: R-388 (mods, fair) - $200; SP-600 (fair) - $200. **WANTED:** Collins 302C-1 wattmeter. Joe Eide, KB9R, 2623 Clare St., Eau Claire, WI 54703-1002. (715) 834-4582, jeide@eau.net

FOR SALE: SW-3, SW-5, FB-7 and more. SASE for list. Hank, CA, (805) 498-8907 or Quailhill@aol.com

FOR SALE: Gates broadcast xmtr 500T, set up for 160M, lots of spare parts - $1000. Steve, KA9QLF, IL, (217) 243-3920

TRADE: Johnson Challenger for Drake 2NT; Swan 350 w/AC/DC pwr for Ranger or Ranger II. Berkemeyer, MO, (314) 394-0441

FOR SALE/TRADE: HQ110; Heath Conelrad monitor; swap for manual or Q-multi?; BK667 Late tubetester - $18; IDI189 test set for PRT4; antenna & three FT338 vehicle mounts for BC728 rcvr - $50; RD140TNS, very unusual 1950s sound ranging unit, built in CRT & wire recording - $50; Avionics: ARA 1.5-3, dyn - $30; ARC1, rack, front cover - $20; MD7, 12V dyn, rack, BC451, cable between - $55; MD7 only - $25; MD7 modified - $15; T20 T21 ARC5 NIB APX2, control box, NAS Sandpoint logo, APX6; APT3 radar jammer; ART9, rack, WW II communication jammer 38-43 MHz - swap or offer. **WANTED:** WW II equip., especially German, Italian, Japanese; US mobile equip. especially ARC2, ARR16, ARQ1, ARQ8, BC224A-C, BC310, BC348A-C Dag, DZ. Buy or would offer favorable trade; Ship, fishing vessel RDF, non FM radio, older style octal tube based or later SSB types; Forest Service radio before 1950; Regen rcvr's or kit or homebuilt SW rcvrs; manuals for ship electronics, military equip., solid-state CB or digital car radios. Trv! Hue Miller, 2505 900 E, #4C, Salt Lake City, UT 84102. msg only (801) 237-4903

FOR SALE: HF rcvr R1051G made by Stewart Warner, solidstate except for 1st RF amp, 2-30 MHz, decade tuning, synthesized osc, AM/CW/FSK/USB/LSB/ISB, built in preselector, rackmount, military construction, 115VAC, extremely stable. Will include mating URA-17 RTTY converter (checked) - $585 + shpg. Checked and guaranteed, like new. Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457. (757) 721-7129, Fax 426-6454

FOR SALE: 7B5-3 timebase for TEK 7000 series o-scope. Complete unchecked - $20, checked - $35. Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457. (757) 721-7129, Fax 426-6454

FOR SALE: Navy RBM, TCS, LM, Army BC-610, TN-939, BC-348, BC-221, BC-669 w/ps, AN/GRR-5, PRC-25, AM-2060, PRC-74, VRC-19, VRC-24, TRC-34, R-220/URR, R-388/URR, R-390A/URR; HQ-150 exc w/spk & book. Donavan, 1325 Greymont Ave., Jackson, MS 39202-1802. (601) 354-8811

FOR SALE: RCA BC-5 broadcast console - $250; Collins 12Z. **WANTED:** Tube audio amplifiers (Hi-Fi & guitar). Franklin, CA, (510) 845-2625.

FOR SALE: SX-62 - $260. Ed Sauer, KC9SP, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483

FOR SALE: Price reductions on estate sale items still left. See August ER, pg. 53. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (617) 934-5043

FOR SALE: Hardware sockets xfmr's, chokes, caps, NOS, parts, knobs, etc. Joe, W6CAS, 1501 Sherwood Ave., Sacramento, CA 95822.

FOR SALE: Collins 75A4 w/spkr & CW filter - $900; Collins 32V2 - $600. PU only. Steve, K6PFW, CA, (909) 985-1062

FOR SALE: Miller 585-T - $40; many perpetual Rider's manuals & indexes. Evan Haydon, 4308 N. 15, Lincoln, NE 68521. (402) 435-4083

FOR SALE: National NC183D & NC183, both work good, cosmetics fair - $190 & $150. **WANTED:** S200 spkr for HQ170A; Turner 25X & D, 22D, 33X; manual for NC300. Call Sat or Sun only. Sam Champie, KD7XX, 105 W. McKenzie, Hermiston, OR 97838. (541) 567-2879

FOR SALE: Heath HW-12 - $40; HP-23 sply - $50; HW-100, HP-23 - $150 or BO. Trade for Swan gear or Uniden HR-2510; antique VOM Weston model 779 - make offer; Drake AC-4 - $70 + UPS. Dan Langston, KO4RA, GA, (912) 452-1015.

FOR SALE: Partial Test-Tool set AN/USM-3A (see ER#63) - $20 + shpg. Earl, K6GPB, CA, (707) 764-3141.

FOR SALE: National NCX-100 - $500; two dynamotors on chassis - $50; Hewlett-Packard distortion analyzer-330B - $30; Maguire aircraft xmtr, ART-1-3905 kcs, mint - $100; 4-400 A&C - $20 (pulls). Bob, K2LGO, Box 158, Riverhead, NY 11901. (516) 722-5737, 5-8 PM EDST/EST

FOR SALE: HP-8640B/323 signal generator, 0.45 to 520 MHz, in transit case, complete & working, AM FM CW & pulse - $320; HP-428B DC current probe - $125 + UPS. Stan Krumme, KO6YB, CA, (714) 841-5866.

FOR SALE: Collins 312-A1/SC-101 all original, 5 piece kit to restore Luma-line lamp, includes lamp, end caps, sockets - $65. Chuck Rippel, WA4HHG, 2341 Herring Ditch Rd., Chesapeake, VA 23323. (804) 485-9660, crippel@exis.net

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All back issues are available at $34 per year or $3.25 for individual copies. Buy the entire first 7 years (#1- 84) for $195. This price includes delivery in the U.S. Foreign orders please inquire.

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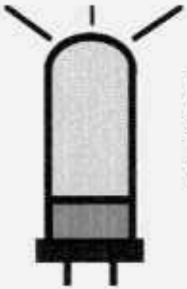

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