$2.50

ELECTRIC RADIO

celebrating a bygone era

Number 115 November 1998

Paul Wang, KU6T

ELECTRIC RADIO

published monthly by Electric Radio Press, Inc.
14643 County Road G, Cortez, CO 81321-9575
Second Class postage paid at Cortez, CO and additional offices

Authorization no. 004611
ISSN 1048-3020

Postmaster send address changes to: **Electric Radio**
14643 County Road G
Cortez, CO 81321-9575

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; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK; Thomas Bonomo, K6AD and others.

Editor's Comments

10-Meter AM DX

October was a good month for DX on 10-meter AM. It seems that everyone has been working foreign stations up in the AM window (29.0-29.2)—maybe there's more DX showing up there this cycle than last. Dave Dalley, Jr. NY4D sent in the following report.

"Here's a DX report from the west coast of Florida. On September 25 I was surprised and excited by sudden band openings into several parts of the world. At about 10:30 AM EDT I had a 5-minute QSO with CT1EHI, Marcos from Portugal, with 5x7 signals. Shortly after that I worked LU2DPW, Juan from Argentina. Later that afternoon at about 6:00 PM I worked VK2BA, Dave from Australia. On Oct. 10 I worked PY5EJ from Brazil. On Oct. 18 I worked Arno, DL6SX fromBavaria. He was a regular on 10 last cycle. He was glad to be hearing the states again. He said that stateside signals have been very good. It looks like we are going to have a fun winter."

On October 23 a lot of us had the thrill to work T32PS on Christmas Island. That was Pete Schumacher, AE7C, (son of Alice Schumacher, the author of the HPM biography) who was part of a DX-expedition/contest station led by Bill Leahy, KØMP (T32MP). Also part of the expedition was Bill's wife Pam, WØNF (T32PL) and Barry Mitchell, NØKV (T32KV). Because everyone in the group has an interest in vintage radio and AM operating they decided to allocate some of their time on Christmas Island to working AM stations in the 10M AM window. This was the first time that I've ever heard a DX-expediton/contest station operate in the AM window on 10. It was a lot of fun. They worked 47 AM stations and I'm hoping that we'll have a full report in next months issue.

A reminder to all AMers not to miss the 5th Annual Colorado AMI Thanksgiving Day Bash. It will get underway very early on 3876. The net control will be KØOJ assisted by other Colorado AM'ers.

continued on page 30

TABLE OF CONTENTS

Cover: Paul Wang, KU6T, with his all-Hammarlund vintage station. Some of the equipment shown includes an HQ-180AC, an HQ-215, an HX-50 and a HXL-ONE. The original WRL map was obtained in 1948.

Looking Back

by Lew McCoy, W1ICP
1500 Idaho St.
Silver City, NM 88061
mccoy@zianet.com

I guess I am finally getting into a groove after the passing of my wife Martha. I had been invited to give a lecture on "Truth In Advertising for Antennas" at the QCWA National Convention in Palm Springs, California. I really didn't want to go but everyone got on me, saying that it might help me.

Usually, I do some preparation for a talk but in this case my heart wasn't in it. Then something kind of strange happened. I got out the latest QST and CQ and looked through them for antenna ads. I know the League now has an excellent antenna program that antenna manufacturers must submit to if they want to show gain figures. So far, the only one of these ads that used this program is Mike Stahl—a manufacturer I rate very highly. But that is not the point here. In going through these magazines the adjectives used to describe antennas performance were really humorous to me. One manufacturer stated his antenna had "Stupendous" performance. I ask our readers: what in hell does "Stupendous" mean in relation to performance? My audience was amused and I think they enjoyed the talk.

But then, Don Doughty, W6EEN, (my buddy?) asked me a big favor. Don was the general chairman of the convention and the second speaker—he was the guy that invented (?) the screwdriver antenna. However, at the last minute he failed to show up so Don asked me to give a second talk on mobile antennas. I tried to decline but wasn't able to. Don is very persuasive—he could sell ice cubes to Eskimos and make a profit. It so happens that this column is called "Looking Back" and on the subject of mobile antennas—that was the case for me.

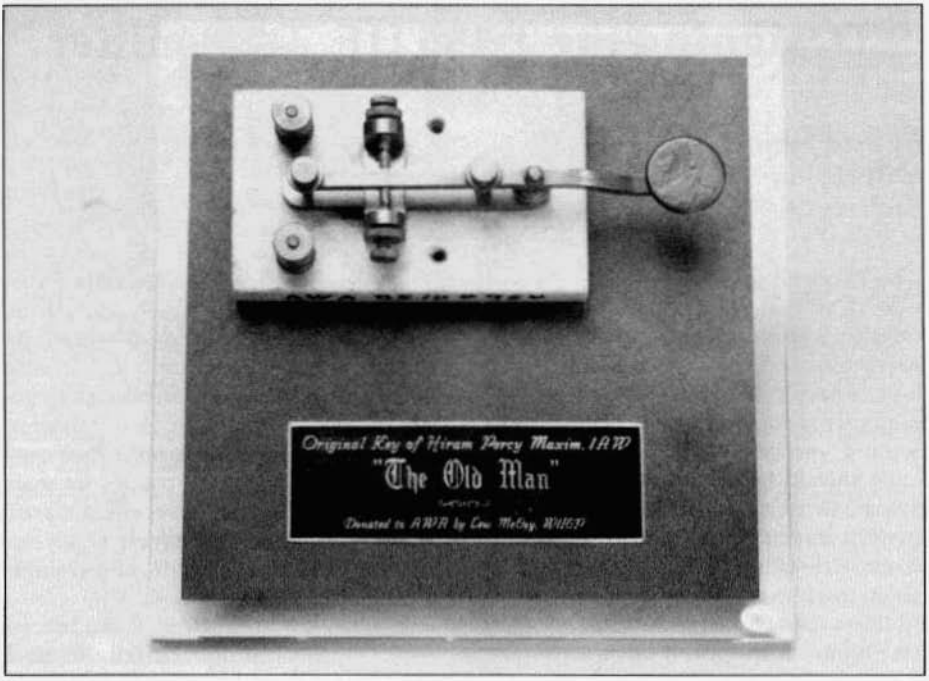
Not long after I entered the Technical Department of ARRL I had started fooling around with 80-meter mobile installations. I quickly learned that if there was ever an inefficient antenna, it was a mobile whip. The radiation resistance is so damn low that it is almost impossible get efficiency.

In any event, one morning George Grammar, our Technical Director, called me into his office and we had a long talk about 80-meter mobile antennas and he suggested (ordered) me to make some tests. The tests were to include a straight 8-foot whip, no loading, an 8-foot whip with a base coil, a center loaded (coil) whip, and another one with a top hat over the coil. I also tested one whip that was wound with wire, bottom to top, with top loading. In those days we didn't have linear field strength meters so my tests were measured on a fairly accurate field strength (tuned circuit) meter. All antennas were mounted on the back of my Ford, power fed to the antenna was accurately measured and the field results checked. (The reader must realize that this was many years before famous antenna shootouts came along—and I might add that these shootouts are very accurate.)

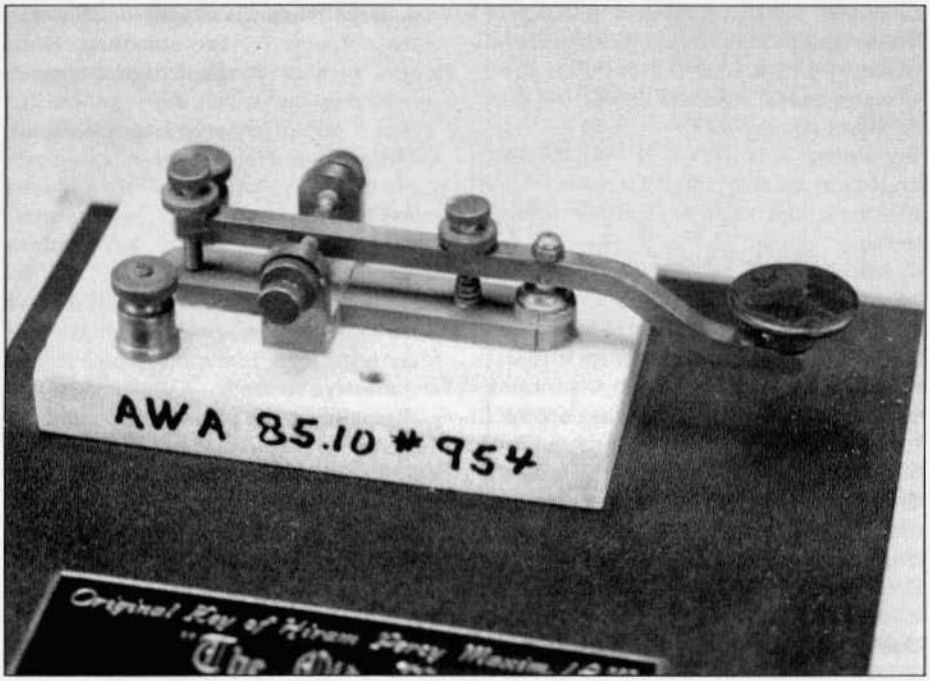
My audience at the QCWA conventions nearly all operate mobile on 80. For example, our famous general, Leland Smith, is a very ardent 80-meter mobile CW operator. To continue, I asked a show of hands from the audience (about 150 hams) what they used. I had made up my mind that I would not tell the audience my results of my tests but they insisted on knowing—I am going to do the same thing here—I am sure that Barry will let this run. Remember when I write, I am 82, very well off, and don't give a damn so the truth comes easy.

The straight whip, 8-foot rod, was by far the worst, 8-foot whip with base load-

continued on page 42



Hiram Percy Maxim's original key that is on display at the AWA Electronic Communication Museum in East Bloomfield, N.Y. ***Photos by AWA Museum staff.***



Designing the T-195 HF Transmitter

Part 3

by Fred Johnson
6202 Hilltop Trail
Sachse, TX 75048

The Exciter

With regard to the exciter, Elmer recalls an important electrical/mechanical decision that had to be made: "We had to decide if the cams that drove the slug rack were to be linear, and the coils wound variable-pitch, or whether the coils should be constant pitch and the cams cut non-linear. The second approach was used. I'm glad I didn't have to variable-pitch all those coils and have them track to each other. An alignment hole was put in each cam so they could be aligned using a rod with the frame structure". This decision was surely right even though it made more work for the cam design. There were no CNC machines then, nor programs to figure out unusual contours. We calculated a point-by-point table of angular positions vs radial dimensions for the cam follower diameter. That made the tuning linear with cam rotation. Collins engineers were good at mechanical solutions to electrical problems and vice-versa.

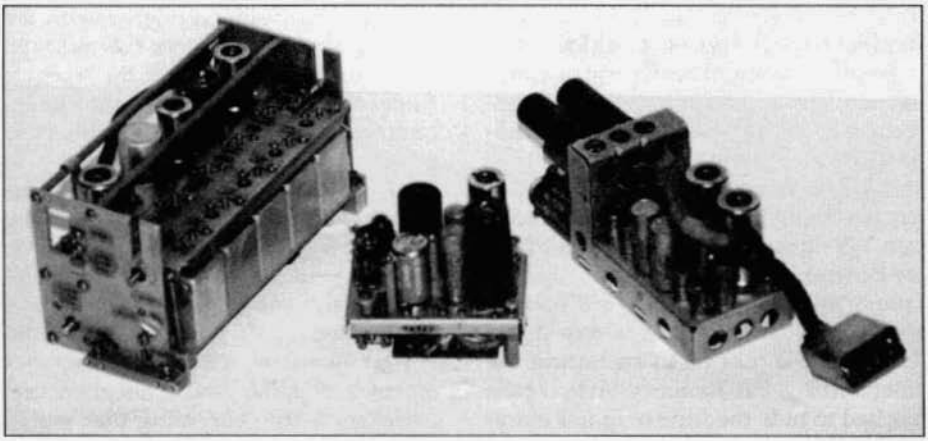
Arlo remembers that Bob Cox came by one day to see Elmer's exciter. Of course, Elmer showed it to him. Cox told him he had too many parts in it and take half of them out. Elmer was shook up. Elmer now says "Cox was correct. I had put in too many bypass capacitors and the circuit worked fine with fewer". Elmer recalls another time when Cox came by the bench where we were doing something with the T-195: "I addressed him as Mr. Cox. He took me aside and told me that his name was Bob". But, back then it was not possible for me to address him as "Bob".

The Toughest Mechanism Problem

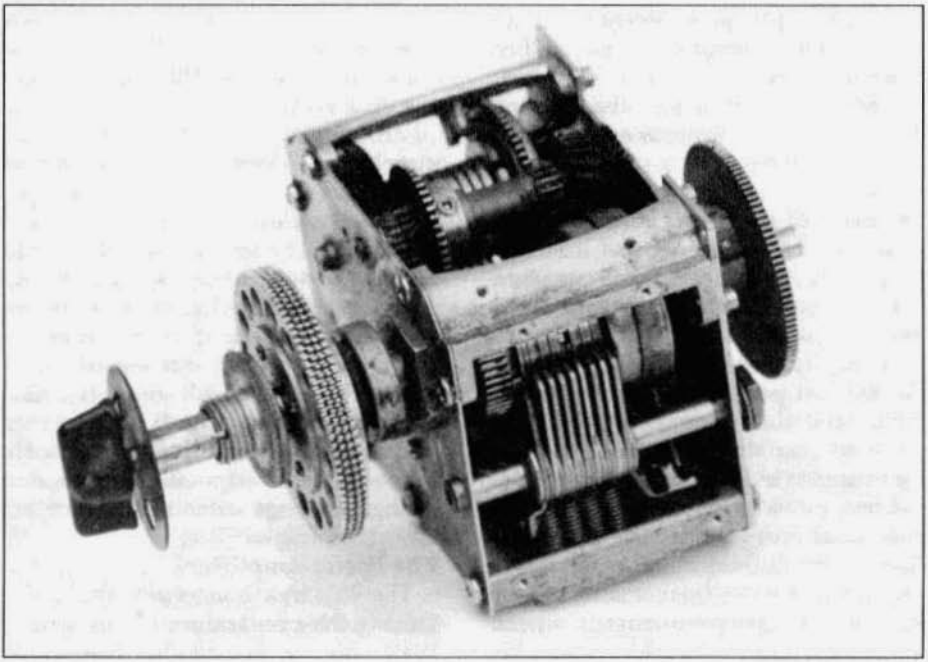
The three gears with lightening holes were part of my toughest design problem. This is the situation: The autotune allows ten arbitrarily preset angular positions to be locked in its mechanical memory within its ten turns. When commanded, the autotune rotates its main shaft to the selected preset angular position. It stops there instantaneously via the drop of a solid pawl in a rigid slot in a disc within the autotune.

The driven master oscillator has essentially zero rotational inertia. Its shaft turns only a 3/16" dia. lead screw moving an iron slug axially. It has essentially no tendency to coast past the stop position. The same is true for other elements driven by the autotune. However, the new fangled digital counter readout is an entirely different matter. When jammed to a stop from rotation at full tuning speed, it will coast a small amount while breaking anything we tried as a drive for the "speedometer" wheels. The wheels are determined not to stop or start instantaneously. All the wheels rotate together each at their own rate. When the wheels are up to speed they are a little like a miniature rolling locomotive to stop.

Remember, the preset rotational positions of the autotune shaft, and the corresponding numbers on the "speedometer" wheels, must remain in exact sync. So, whereever the autotune is set within its ten turns, the speedometer wheel assembly must stay with it while it is driven through the clutch. The clutch is comprised of the three low inertia gears and three circular matching surfaces.



The exciter and servo amps. *Photo by Dennis DuVall, W7QHO.*



The autotune head. *Photo by Dennis DuVall, W7QHO.*

The coup de grace for the inertia problem lies in a special beryllium copper multi-leaf tapered spring mechanism. This is a pre-loaded multi-layer leaf spring having high internal damping. The counter assembly is driven and arrested through this spring assembly. When the autotune jams to a stop, the multi-leaf spring allows the counter assembly to coast a little, then return to its correct static position when the rotational energy is dissipated. This all takes place in a blink of the eye and there is no evidence of this action visible to the user. We used a high speed camera to check spring action for stress analysis.

continued next page

Think how simple an LCD or other modern digital display would be.

A side note might be of passing interest. It relates to the engineering reliability test of the autotune motor. The motor is shunt-wound. In normal application it is reversed at full speed by simply reversing polarity of the drive voltage. We rigged a test mount for reliability cycling on a 3/4" plywood board a couple feet square. When the voltage (from a stiff supply) was reversed, the impact noise was just like hitting the board with a 1-lb hammer. Arlo recalls we had to hide the test setup in a closet and shut the door. The test went on to completion in relative silence. Those who have read earlier accounts of the design environment at Collins will recall that components were extensively tested before being allowed to come together and create unnecessarily complex problems.

Cooling

Design of the T-195 cooling system did not have the benefit of industry-leading thermal design and measurement capabilities that were later developed at Collins for next generation products. My approach in the T-195 was to do the best possible with simple Pitot tubes and data from manufacturers. Colored wax sticks called "Tempilac" were used to indicate temperatures. You rubbed the wax on the surface to be measured and watched for it to melt. There were different colors for different temperatures. This remains today a good way to get approximate temperatures on surfaces with high voltage. We did understand that all the air moved should "scrub" heated surfaces. The result has proven satisfactory over time. There were three "vent" holes in the front panel. One was an air inlet, the other two were for exhaust from the double-ended blower. Each of these openings had to be covered with a drip-shield when in use, and sealed with a reversible cover for river fording.

Regarding field experience with the cooling system, Stu says: "A redesign involved adding a tab on the inlet air filter so the GI's couldn't put the filter in backwards. GI's reversed the filters to put the dirty side in so they could pass inspections with the clean side showing. When the filters were reversed the clean side showed for inspection. But, that allowed the dirt to be sucked inside. Of course a good ME would have anticipated that".

I recall in the early design layout stages I tried to find a location and orientation for everything that would take advantage of the blower velocity head. Unfortunately, that perfect layout was not to be found. So, I left some change on the table so to speak. One noticeable feature of this design is that the exhaust blower dumps directly out of an opening in the front panel. You sure have no doubt whether or not it is running.

The Modulator

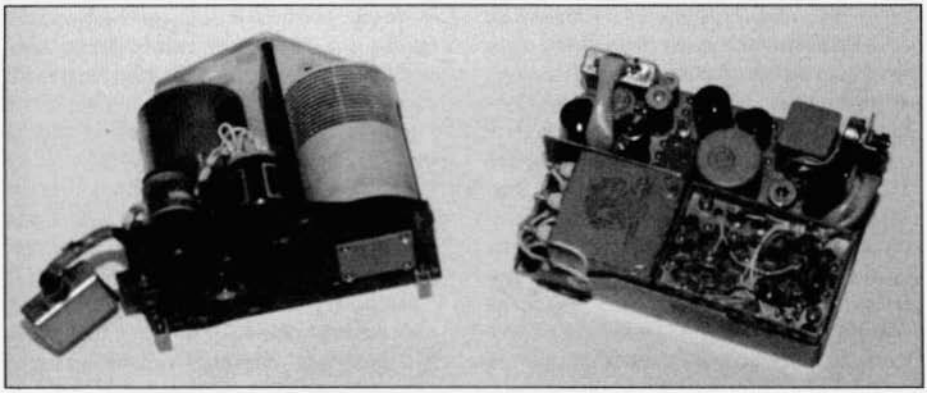
Dale Carlson passed away in the mid 70's so we don't have his slant on construction of the modulator. I joked with him about making it "hi-fi". That has been a continuing interest of mine. Along with other sub units its frame was rigid aluminum sheet. Dale got help and direction from Stu and others. He followed the design into production doing what we affectionately called Collateral Engineering.

The Power Amplifier

The PA was done by Walt Zarris. During the preparation of this article, Walt was the last of the team to be tracked down for his input. Arlo consulted a nationwide computer phone list and there was Walt's number. I'm really pleased that Walt had a chance to contribute. I have included most of his inputs.

Miscellaneous Structures

Grade 5052 H-34 aluminum sheet in various thicknesses was used for most of the T-195 structure. That alloy is a



The antenna inductor and modulator.

compromise between maximum strength and workability. Most of it was chromate coated (Iridite at the time) to minimize corrosion. Chromate is a conductive coating that provides good electrical bonds. 5052 H-34 aluminum can be formed to about one metal thickness bend radius. This allowed parts to fit tighter into the corners more closely than would be possible with the larger bend radii required for higher strength alloys. The panel and case were painted olive drab with baked enamel over zinc chromate primer.

The matching shock mount was designed with rear and front hold downs that wedged the radio down and to the rear. The hold down angles were chosen to proportion the forces between front and rear mounts. Hard steel socket plates were mounted to the front panel for the hold down hooks to engage. The forces there were too high for the cast aluminum panel, and would have dug grooves in the aluminum.

I mentioned earlier that the R-392 companion receiver of the GRC-19 was being designed in a nearby area. Actually, Gene Senti and the receiver team were on the floor above in the third street building. The R-392 followed the T-195 schedule, and many of the T-195 design characteristics were carried forward to the R-392. Thus, when they sit side by side in the shockmount they look like they came from the same place. Both have an interesting array of precision machinery behind the front panel.

Interesting Sidelights

In any group effort of this type there will be happenings that are memorable for the ones involved, and maybe entertaining to others. This group had a good time while meeting the design goals and schedules. Here are a few recollections:

Battery Explodes

The closest the project had to a serious accident was the blowup of batteries used as a primary power source. Elmer Schwittek tells it this way: "I was standing next to Stu when the battery exploded. Here's how it happened. He was simply connecting an alligator clip to the battery terminal of one of the banks of batteries used to power the T-195 in the lab. There must have been an accumulation of hydrogen above the battery and the spark that occurred at the point of contact initiated the explosion. Had we first turned off the T-195 before making the battery connection, nothing would have occurred."

I was standing at my drafting table about 25 ft. from the batteries, and on the other side of a row of tall cabinets. The sharp high frequency crack of hydrogen was unmistakable. Elmer was right there and, fortunately, a restroom was about 20-ft. away. Elmer rushed

continued on next page

Stu to the wash bowls and here's what Stu tells about it: "And then there was the fateful battery explosion. We needed 400-cycle power for the automatic tuning servos. So, we had a dynamotor supplier add an alternator onto the shaft of the dynamotor supplying the low voltage B+. When the first model arrived, Elmer and I wanted to try it out. So, we hooked it up to the 28 volt battery cart and away it went! Almost literally. We forgot that the cart had been charging the batteries all that time and some hydrogen was lurking in that area. Fortunately, neither Elmer or I was seriously injured. I do remember that my tie (we wore ties in those days) was destroyed by the sulfuric acid from the exploded battery. The main humor was Ray Ruggerio (technician) running across the street to a doctor's office and dragging the doctor back to save us. In the meantime, Elmer had my head under water in the men's room washing away any acid."

Flash Bulbs

Elmer had been working on some major accomplishment which was to be tried out one day right after lunch. Nameless persons arranged to get a flash bulb connected inside the engineering model unknown to Elmer. Elmer returned from lunch and people "in the know" gathered for the occasion. The flash went off as planned when Elmer turned it on. Elmer instantly became a blur of motion in turning things off. I don't recall if it was on this program or not but an ME strung a small plastic tubing into a model from the back so when the EE turned the model on the ME blew smoke into the tubing. These are gags that can't be repeated very often.

Meet The Big Boss

Roger has a side note: "When I had been at Collins for only a few months, I was sent to Fort Monmouth and I was walking alone down a hall at the hexagon. Bob Cox was walking toward me with another gentlemen and recognized me. I thought Oh-Oh, this is going to be embarrassing for him. But he knew my name and introduced me. I'm not sure if I had even talked to him before that. I was impressed!!"

While the T-195 project was going on there was another program one floor down. This was a fixed station transmitter -- possibly in the 20-Kw range. It was the size of a giant refrigerator. It was daily routine for a coffee cart to be rolled to each floor of the building in sequence. Mid-morning and mid-afternoon snacks were available. Coffee was served in paper cups. Now, most folks have heard paper cups being turned upside down and "stomped". It makes a loud pop. To this day it isn't known who stomped a coffee cup when Bob Cox was around the corner with his head inside the large transmitter.

Bob Cox was noted for having periodic cleanups in the labs. His memorable instructions were to "Throw out stuff until you miss something the next morning".

Bob is also remembered for "Nothing taped to the walls!". Now that may sound trivial but look around today and see what a place looks like when no one cares.

Dead Issue

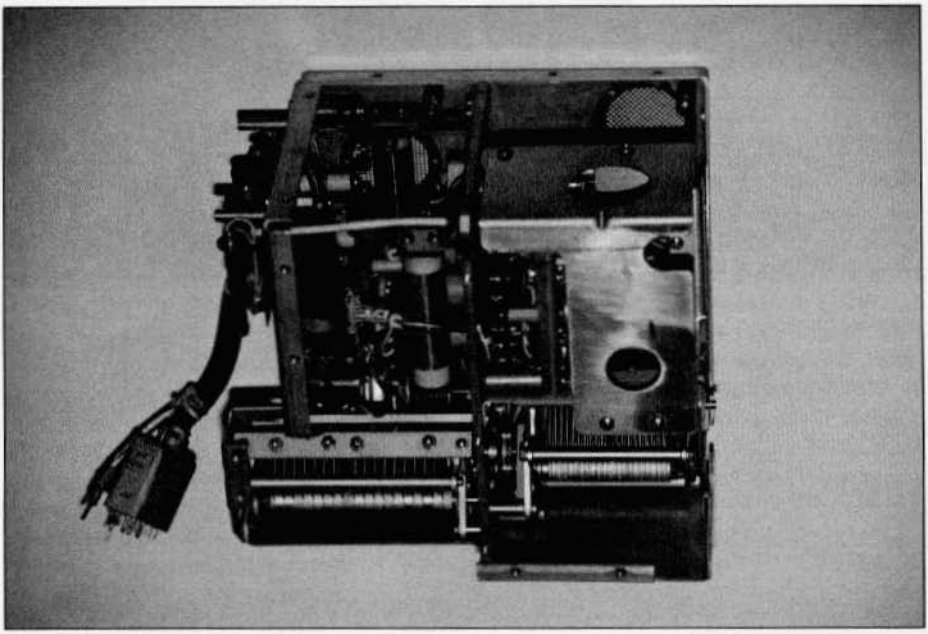
On April first Roger found a "You got a call" note on his desk with a number to return a phone call. The note said "call Mira Mains". He called . It was the local mortuary.

True Colors

Both Stu and Elmer were color blind. They shared an office. Passersby would occasionally overhear heated discussions between the two of them regarding the value of an Allen-Bradley molded carbon resistor. They would then come out of the office for help to identify the colors.

Upper Midwest

All of the engineers on the T-195 program came from either the University of Wisconsin or Minnesota.



The PA chassis. *Photo by Dennis DuVall, W7QHO.*

Continuous Tune

The antenna tuner was a remarkable device. Walt says: "One of the things we would do for amazement was to wind a few lengths of solder into a braid and connect it to the whip antenna terminal. With the transmitter set at about 10 MHz the coupler would tune the solder antenna and a corona would form at the end, melting the solder drop by drop. The coupler would keep tuning what was left down to about 4 inches long."

Shot-Effect

One time some Signal Corps Generals came by with Art Pengalley for a demo of some sort. The unit didn't work. One thing led to another and the high level group went to lunch. When they returned someone had put a sign on the unit which read: "A well known electrical phenomena is shot effect. Not so well known is the 'Big Shot effect', which causes equipment not to work in the presence of 'Brass'." The unit was fixed and the testing went well afterward.

Sharp Shooting

Some of our lab technicians noticed that 1-watt resistors were a remarkably neat fit with the inside diameter of bakelite tubing used as forms for RF/IF coils. OSHA hadn't been thought of yet, so compressed air hoses still delivered 175-lb pressure to the "blow-off" nozzles at the end of lab benches. By happenstance, a fire escape on a building right across the alley, aligned with an open window (summertime) and our lab benches. One or more techs taped 30-inch lengths of the bakelite tubing to the upper portion of the benches. By careful alignment the tubes were bore-sighted to a place on the fire escape where pigeons frequently sat. The 175-lb air fired the resistor bullets at the pigeons. It's disappointing to report that as we left the building in the evenings, we had to walk right under the fire escape. There we noticed quite a few dead bodies of resistors. No pigeons.

Bang

One of the lab techs would take a 2-inch length of plastic tubing and using

continued on page 40

Farewell Gaithersburg

by Paul S. Courson, WA3VJB
Box 73
West Friendship, MD 21794

Passing of hamfest triggers memories and hopes for the future.

After 41 years, the annual hamfest at Gaithersburg (Md.) has come to an end. The Foundation for Amateur Radio's event again included our AM special event station, but the weekend of September 12-13 also included reflection of time that has passed, and looking at the process of change as we try to look ahead .

There was something especially melancholy this time. Perhaps it was the nearby freight trains moving along through the night, their horns echoing in the trees at the Montgomery County fairgrounds. Or maybe it was the spontaneous rhythm-and-blues near the AM Corral by the guitars of WB3HUZ and N2JTD with WA1HLR on vocals. The gentle rain shower that came and went around 3 a.m. also set the mood.

It could also have been the memories triggered by the lovingly preserved old radios that people gathered from home to bring for enjoyment at the hamfest. The Gaithersburg event managed to avoid much of the computer clutter which competes for space at other hamfests along the East Coast. It instead kept the emphasis on radios and equipment of the hobby both past and present.

In the 25 years your author has attended this event in the suburbs of Washington, we've seen the rise of "vintage radio" from what most people once considered just so much old gear in low demand and of limited use.

I recall that my first "Gaithersburg" found me buying a dandy EICO 753 transceiver with both AC and DC power supplies for just $100. You see, I was about to upgrade from Novice, and this looked like just the rig to get on "phone."

Gone, I supposed, would be my faithful soldier serving through my Novice years, the Collins 32V-2, which had won a new lease on life from a hot, dusty attic in 1971 when my Elmer, W4CC, saw fit to sell it to me so I could get on the air. He had bought it new, but said it would have a good home with me. I was lucky that novices now had VFO privileges and were no longer limited to crystal control.

He pointed out that the transmitter lacked SSB capability, and that I should probably continue looking for my eventual long-term rig. So here was this rising General who was not really keen on running a transmitter so old, and an Eico 753 that loomed large and went home with me. I eagerly awaited being able to go portable someday with that DC supply, as I had done earlier with battery receivers, camping as an SWL.

Things didn't quite work out that way. There was something terribly wrong with this "mint condition" Eico as I plugged it in at home to get on the air. The rig was very unstable, there was raw hum on the CW note, and there were other uncertain problems which ultimately led to a dreaded Official Observer notice for out-of-band spurious emissions.

So my parents stopped payment on their check, and I was left to explain the new-found risks of buying gear at a fleamarket. Suddenly the old soldier looked mighty reassuring. Indeed, it would be many years before I bought any big-ticket ham gear, at Gaithersburg or anywhere else.

W3PRL-AM along the promenade at Montgomery County Fairgrounds.

Despite that sour experience, this hamfest remained the annual shopping spree as I accumulated components, hardware and other bits of equipment to refine what I later would come to know as a Classic Radio station. I also considered myself lucky to have met at this hamfest such AM luminaries as K3ZRF, WB4AIO, K3TCE, WB4ZVR, WA3JKB and others of the early-to-mid 1970s.

Deerfield Influence

Through the 1980s, certain hamfests began to display the benefits of a shift away from what had been a subtle disdain of vacuum-tube gear (and the mode of AM), toward a more friendly, nostalgic view of older equipment representing an era of American companies which no longer had a dominant place in the hobby.

This warmer reception and increased interested in such gear brought greater amounts of it to fleamarkets including the FARfest at Gaithersburg which was larger than local club tailgate-style hamfests. It meant quite a lot to the rising concept of Classic Radio to see it in a well-regarded light at this major event.

Diehard preservationists who had remained loyal to the use of hollow-state technology and AM on the short-wave ham bands felt vindicated by a slow-but-steady revival of interest among mainstream hams, who more often were trying to reclaim or seize a bit of the hobby's heritage.

One of the biggest gatherings of the faithful during this time had always been at the twice-yearly Deerfield, New Hampshire hamfest sponsored by

continued next page

Rick, W3RSW, left, and Bill, K1KV at the controls of the AM station.

Hosstraders. Here was the original "AM Corral" which typically included a couple of former school buses loaded with operational, vintage gear, parked in a specific area at a wooded site with evergreens and a soft floor of pine needles. It was as much a social gathering as it was a hamfest fleamarket.

I had long since upgraded and discovered an AM stronghold which seemed to be centered in New England. Deerfield was where the tall ships would gather—WA1QIX, WA1EKV, WA1SOV, WA1GFZ, W2WAS, WA2RII were still just voices on the radio for me (high fidelity voices, I might point out), and I envied that they had a place to meet and hang out with one another.

It made sense when Hosstraders decided to move the hamfest elsewhere that an effort should be made to preserve the AM Corral. I was among those who helped pass the torch to Gaithersburg, feeling a certain responsibility from having attended the final "Deerfield" and finally having met many of the AM-ers with whom I had talked for 20-some years.

Hamfests as a life-form

Have you ever been to a hamfest open in the middle of the night? That was Deerfield. I bought a like-new DowKey relay by flashlight around 11 p.m. that final year, and the moment stayed with me as we plotted the notion of an all-night radio extravaganza at Gaithersburg.

In the years that we established and maintained a brief tradition of having an AM Special Event Station at Gaithersburg, I would also find myself "camping" with portable radio gear, socializing with people who enjoy old-time radio, and indeed, collecting yet another Official Observer notice for out-of-band transmissions, again on 40 meters! (the rig was fine, let the record show — it was a user-oriented problem.) So for me, Gaithersburg had many connections with things in my ham radio past.

We knew as early as last year that the

Paul, N2JTD, W3PRL-AM station No. 2 for 10 and 160M.

Foundation would be leaving the Montgomery County fairgrounds because of rising costs. So as we prepared for a final AM Special Event station at the site, some of us also felt a sense of loss and less enthusiasm.

It was like saying farewell to a friend, since we don't know where or if we can again create the sense of community seen at Gaithersburg's AM Corral and at its spiritual predecessor, the one at Deerfield.

Yet, upon further reflection, we've already demonstrated that the spirit of radio nostalgia is portable — all it takes is a group of people to set it up and enjoy it. Here's hoping we will see yet another passing of the torch to bring an AM Corral to another venue for years to come.

Station lineup

About a hundred stations lined up to talk with us at the W3PRL-AM station on 40 and 75 meters. Many expressed regret they couldn't be there as they helped us bring down the curtain. The transmitter was a highly modified BC-610, with a pair of triode-connected 813s driving a single 833A. Dave, KB2APE saw to it this monster had both the quality and the durability it would take to serve as this year's flagship transmitter.

The receiver was the tried-and-proven 1967 R-390A, which is now a veteran of about a half-dozen portable campaigns, starting with the AM Expedition to Dobbins Island in 1993. As usual, the diode output of the receiver drove a hi-fi audio amplifier and speaker to help draw a crowd of spectators along the hamfest promenade.

The transmit audio rack is a custom-built assembly of broadcast and sound-reinforcement gear fashioned together by Steve, WB3HUZ. This system supplied the BC-610 with a speech amp for the 813 modulators, as well as pre-amplification, equalization, and hi-fi compression from the station microphones, which could be selected and mixed to suit the operators at the table.

The main mic was a Sennheiser MD-421, often found in commercial FM stations. Auxiliary microphones included an Electro-Voice RE-50 with a handheld wireless attachment. This was the mic we used during the "toast" on Saturday night as part of an on-the air QSO party known as Rock XV. (Rolling Rock bottles were quaffed after a clink heard 'round the band)

The air signal was monitored by a

Dave, KB2APE, installs the iron and the tubes for the modified BC-610—pair of 813s driving a single 833A.

Tektronics portable oscilloscope, to maximize modulation without splatter, and to make certain no stray hum or other anomalies crept into the otherwise hi-fi audio.

The antenna was a custom-built trapped doublet constructed by Dennis, the former WA3YXN (now W7QHO). Measured VSWR was an amazing 1.2:1 on both bands. We didn't do much with 20 meters this year, although the antenna, perched about 60 feet aloft in suitable hardwood trees, last year did quite well in the AM window around 14.285 mc.

We had planned to have a second station up and running. Paul, N2JTD brought with him a DX- 100 modified for good audio, and an R-390A. Tragically, he forgot to bring any coax, and the station then became a display piece rather than a potential 10 meter setup. None of us was inspired enough to root around the hamfest for a hank of feedline. Still, the pair drew positive response from onlookers and at least one offer to purchase.

Coordinated tables

We were fortunate to have been allocated a number of selling tables alongside the display and special event station. Here, one could find the likes of a Johnson Ranger (nice, $350), several R-390A (including the rare Collins variant), a 51S-1, two restored Rangers (up to $600), and a couple hundred pounds of plate and modulation transformers (including some RCA b'cst iron).

This proximity effect generated table sales and increased spectator traffic past the special event station. Concentrating the best of the hamfest like this is recommended at fleamarkets anywhere.

At the AM Corral, the dozen lawn chairs — no three alike — were nearly constantly filled by the 40-50 AMers who came through to reminisce, make acquaintances, and tell great stories of radio that we still can enjoy today.

Station operators

Here are the officially logged-in operators of W3PRL-AM heard at the microphones and liable for any OO notices:

Dave, KB2APE; Paul, WA3VJB; Randy, N3LRX; Gary, N2INR; Rick, W3RSW; Joe, N2YR; Nick, KG2IR; Steve, WB3HUZ; Paul, N2JTD; Bill, K1KV; Tony, WB3BEJ; Dave, W3NP; Rob, N3RLL; Norm, N3RZU; Tim, WA1HLR; Greg, K3EWZ; Warren, NY2H.

Station logbook (preliminary)

Here are the stations officially noted in the W3PRL-AM logbook on September 12-13, 1998.

Official QSL information will include times and frequencies of the contact. QSL via Steve, WB3HUZ, at Box 752, Savage, MD 20763. ER

1. W2VJZ
2. K1LKY/3
3. WA1HLR/2
4. WA3KZX
5. K1KW
6. K2JVM
7. W3DUQ
8. KA3BMS
9. K3VR
10. KB3CBC
11. W2GBY
12. W3DEF
13. K4OAH
14. WB4VVI
15. W2VCU
16. KB1CMR
17. W1JZ
18. AA3JO
19. KA3CES
20. NEJUH
21. WD4KZK
22. WA8SHR
23. VE3AAM
24. W3DA
25. W1LZX
26. W1ZZZ
27. K4HBI
28. N4FS
29. WN4DWW
30. W6XR
31. W4KYL
32. VE3GQD
33. W7HB
34. N1CRI
35. K1VZI
36. NF9Y
37. WD2AFJ
38. K1DPM
39. N1HCW
40. KW1I
41. W1VZR
42. W4RCW
43. W8QYT
44. WA2VCF
45. WA3WBC
46. WB2MQX
47. W1GIG
48. N3LHB
49. WB9TOW/8
50. WA2VCS
51. W1SUU
52. N3CHB
53. WA1UQM
54. WA2ECF
55. NY2H/4
56. N3EQF
57. K1ETP
58. KK1K
59. NE1S
60. N1ZSP
61. AA8HO
62. WB4MJF
63. KE7KK
64. W8VYZ
65. AA2GD
66. WA1ABI
67. KO6GNM/9
68. K2YB
69. KA0RFI
70. W9UD
71. W7FG
72. KB2QQM
73. N1BOT
74. KD2XA
75. W1QWT
76. WA3GPE
77. KB3SOL
78. N1ROZ
79. N2CNM
80. K2EM
81. WA1VOA
82. N2GBY
83. VE3FGU
84. VE3GQD
85. WB3HDA
86. ND4B/2
87. W8MNQ
88. N2UDF
89. K4WJM
90. WA2OAK
91. K4EDK
92. W8AC
93. K3NF
94. W1JZ
95. KN8AZN
96. KF4OWZ
97. WA4DDH
98. N9KGR

Colorado AM'ers at the Longmont hamfest in September. Top row, left to right: Arnie, KTØO; Bill, WØGM; Scott, KGØMR; Bob, K1YJK; Paul, WØOD and Arnie, KØAS. Bottom row, left to right: Musser, WØAS; Mike, WØFD and Horst, WAØNUH. ***Photo by Ann Standerfer, KBØQVC.***

A group of AM'ers that toured the KB9R shack this summer. Left to right: Joe Eide, KB9R; Dan Meyer, KB9W; Al Coil, KO9S; Butch Schartau, KØBS; Dale Braun, WB9GWH; Duane (Duke) Books, W9GDW and Bill Durspek, WØBVR.

Phil Morse, W2WAX, on the air with a BC-474-A under field conditions—battery, inverter and AC supply—at Oxford Furnace Lane, New Jersey. Oxford Furnace is where George Washington's cannon balls were cast for the revolutionary war.

John Phipps, K1KHP, ("Old Buzzard John") visiting ARS W7QHO. *Photo by W7QHO.*

AMI Update—November

by Dale Gagnon, KW1I, President

Calling for Comments on NPRM

One of the chief reasons AM International was formed was to provide a organizational focus for AM enthusiasts for the purpose of preserving our favorite mode against policies and procedures that would threaten its existence. I think we are facing a crisis of that magnitude now. I believe the Notice of Proposed Rule Making (NPRM) - WT Docket No. 98-143, if not opposed, will in the short term lead to increased QRM and additional infractions of amateur service rules resulting in less freedom for, and enjoyment of, our AM operations. This will be true because less qualified amateurs are expected to crowd into the HF band segments as license requirements are reduced. In the longer term, well meaning problem solvers who suggest that a "spectrum hog" mode like AM be retired to alleviate band crowding will again find sympathetic listeners at the ARRL and FCC. The way the FCC has posed its questions in the NPRM, the AM community, as well as all amateurs concerned with conserving our present license qualification system, can significantly impact the outcome by submitting responsible comments. I would suggest we support continued CW testing of 13 wpm for general HF operating privileges. I am not against license simplification, but if you keep the 13 wpm HF license, then an entry level CW HF license requiring 5 wpm, like today's Novice or Tech Plus, is still necessary. I also support CW testing by checking a solid minute of copy instead of asking a series of multiple choice questions.

The deadline for comments on this NPRM is December 1. By the time you receive this ER you will have two weeks or less to write a single page letter to the FCC that may preserve amateur radio as you now know it.

See the September 1998 AMI Update on page 3 of issue no. 113 for more information and details on submitting comments. Page 14 of the same issue includes thought provoking letters on the same subject. See the August 1996 AMI Update on page 3 of issue no. 88 for arguments for continuing to require significant CW proficiency in the amateur licensing system.

Your comments need not be technical or legal in nature. Just let the FCC know how you feel about their proposals and do it now!

Results AMI Discovery Weekend

The AM Discovery Weekend was on the weekend of September 11-13. The band conditions were fair, but a lot of AM activity was evident. I received a number of logs and letters. George, KB5WWO, reported difficult operating conditions from Louisiana, but he still turned in a log with contacts covering three bands. He hoped conditions would improve later in the fall. We'll look for another report from him after the Thanksgiving AM Jamboree. George, W4BDG turned in a log with 27 contacts across the US on 75 meters. He noted that he tried 20, 15 and 10 meters, heard lots of SSB, but no AM! George, N2GBY, was heard early on 75 meters Saturday morning gathering contacts on the Military Radio Net we have here in the Northeast. His log contained 34 contacts, including two on 10 meters and one on 15 meters. James, W8AC, sent in his 26 contacts from 160 and 40 meters. Jerry, K1GUP, and Mike, W1JZ both qualified for the Level 3 certificate by making more than 20 contacts on the lower frequencies, making a contact on the 14.286 MHz AM net and making at least one AM contact on 10 or 15 meters. The AMI certificates awarded for these operating events are meaningful and colorful and are suitable for a 5x7 frame. If you go through all the trouble of accumulating a decent number of contacts, how about sending a copy of your log to AMI Headquarters?

continued on page 42

VINTAGE NETS

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
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 3:00 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 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html
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 freq. 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.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
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 Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating.
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the first Sunday of every month on 14.165 at 1900Z and 3760 at 2000Z. Net control is Dave, VA3ORP.
Beer Town Traders Net: On 3885, 5:30 Central Daylight Time on Saturdays.
Westcoast 40M AM Net: Sunday afternoons from 3-4 PM westcoast local time until 4-5 PM on 7160 +or- QRM.

Nets that are underlined are new or have changed times or frequency since the last issue.

A Cool KW

Part 1

by Bruce Vaughan, NR5Q
504 Maple Drive
Springdale, AR 72764

It's really quite amazing! Some of our tubes today are capable of 1 KW plate dissipation, yet they are about the size of a golf ball. Unfortunately the cost is considerably larger than the tube. I love my big Henry amplifier even though I know sometime in the future it's going to cost me over $350 to replace the two 500Z's. And what if the power transformer should go west? Of course I can get it rewound but the freight alone on a hunk of metal that heavy would knock a real hole in the budget. Thinking of things like this takes some of the pleasure out of operating.

Let's take another scenario. Perhaps you would like to have a good amplifier--maybe even try for the Century Club during the present cycle--but a good amp can cost two grand or more. You simply cannot afford that kind of big bucks right now.

A few amps can be had for less than one thousand dollars, but they seem rather fragile--they are missing the quality you like in high power amplifiers. This feeling is much more common among old timers. Those who cut their 'ham teeth' on transceivers the size of a 'Prince Albert' can seem to be less concerned with solid construction. "What's a 'Prince Albert' can"? If you don't know, chances are this last paragraph does not apply to you.

When I started building amplifiers some fifteen years ago I had some definite ideas about what I wanted, and I knew there were features I did not need. If your needs happen to be similar to mine, read on. If you desire a broadband amp that allows instant band hopping, if you love to run full QSK, and if you hate the smell of solder burning a hole in the carpet, this project is not for you.

Here are my amplifier requirement:

1. An amp that runs a full KW all day long without problems. Not key-down all day long--just normal operating.

2. My amplifiers should be easy to build and easy to repair.

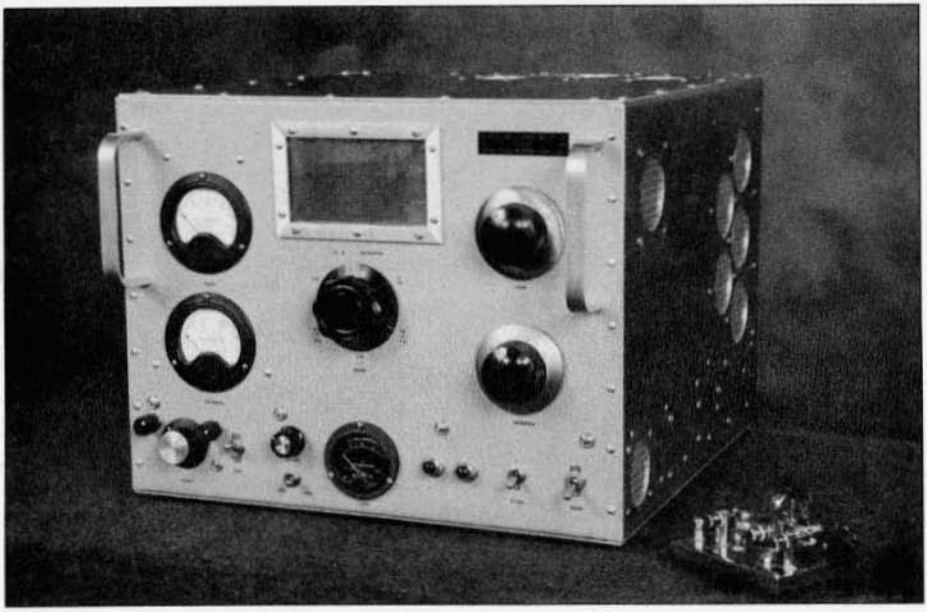
3. I prefer an amp I can re-tube without taking out a mortgage on my home.

4. Parts should be relatively inexpensive and easy to find. Please understand--the days are long gone when you can pick up an Allied Radio Catalogue and order everything you might need for a project. Today, easy to find means parts that are available at reasonable cost by searching through normal channels.

5. I like rugged, good looking ham gear. I prefer an amplifier that looks like it belongs in a ham-shack, not a science fiction movie set. The soft glow of big vacuum tubes, the gentle hum of large transformers, the solid thump of multiple relays firing in unison, and yes, even the warmth and odor such gear creates is pleasant to my senses.

6. And finally, I like to operate knowing I am not tearing up every TV in the neighborhood. TVI has never been a problem with any of my amplifiers due in part to an excellent TV cable system in our town. Nonetheless, a liberal use of bypass capacitors, proper shielding, good solid ground connections, and attention to recommended construction practice is good insurance.

7. Things I can live without in an



Front panel was sanded, primed and sprayed with ordinary spray can enamel. Center black-face meter is the old standard 'Monimatch.'

amplifier: instant band changing, full QSK, lightweight construction, and compact size. While such things are nice to have they come with a price tag attached--they are more difficult to build, harder to maintain, and cost more initially. Simplicity has always been my goal.

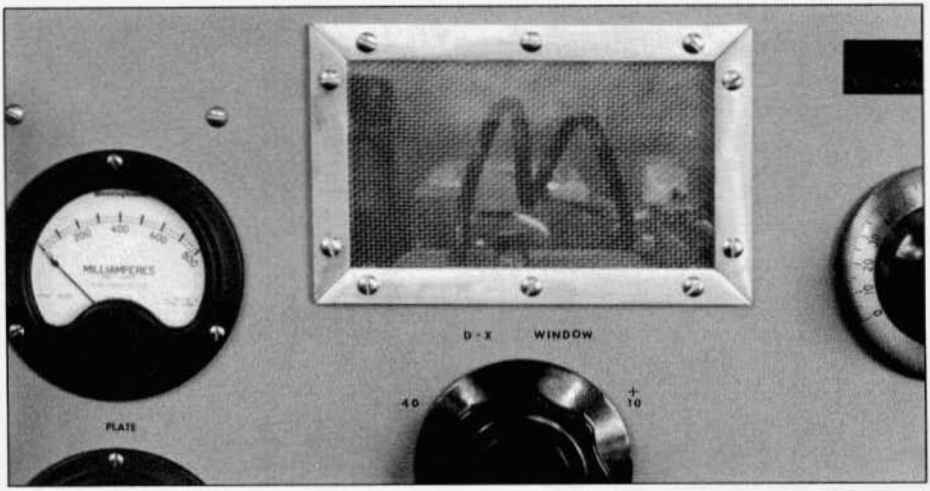
Few radio circuits are more simple in construction than linear amplifiers. I have built simple regenerative receivers that required more parts. HOWEVER, there is a big difference in the parts used when high voltage is required. If you have not built QRO equipment, a few words of caution might be in order here. High power linear amplifiers--those in the KW class--employ voltages capable of delivering a shock resulting in serious injury or death. I speak from experience. In 1947 I got across my 1500 volt supply. It is an experience I do not care to duplicate. At the end of this article I will remind you of a few safety rules to follow when working with high voltage gear. Sure you've hard them before--but maybe by repetition I can help you remember one that might save your life.

The circuit

This is a conventional grounded grid amplifier. There is nothing new, unusual, innovative, or startling in this entire article. I do believe that I may provide you with a few ideas, a few construction tips, and quite possibly save you some headaches by sharing with you some of my building experiences.

I have built amplifiers using everything from a string of 807's to a pair of 500Z's. My favorite amplifiers use the old reliable 813 tube. The tube is rugged, cheap, and available from many sources. I have found them at hamfests, brand new in original boxes for $15.00 each. I have bought used ones for as low as five bucks. The 813 is relatively easy to drive. Remember, 813's had the very best proving ground and development environment possible--World War II. This explains why the tube seems to be

continued next page



DX Window... for those who love the glow of large tubes. Window is screen wire sandwiched between two sheets of Plexiglass. Screen is grounded at several points around the edge. Frame is made from aluminum stock available at home supply stores. It was cut with a hacksaw 'freehand' and then corners were filed to fit.

indestructible. I was a radio repairman in the Ninth Air Force during the war when the 813 was considered state-of-the-art electronics.

At the present time I have three 813 amplifiers in the shack. One uses a pair of 813's; the others employ three 813's. The smaller amp runs between 600 and 700 watts, while the two using three tubes loaf along at a KW.

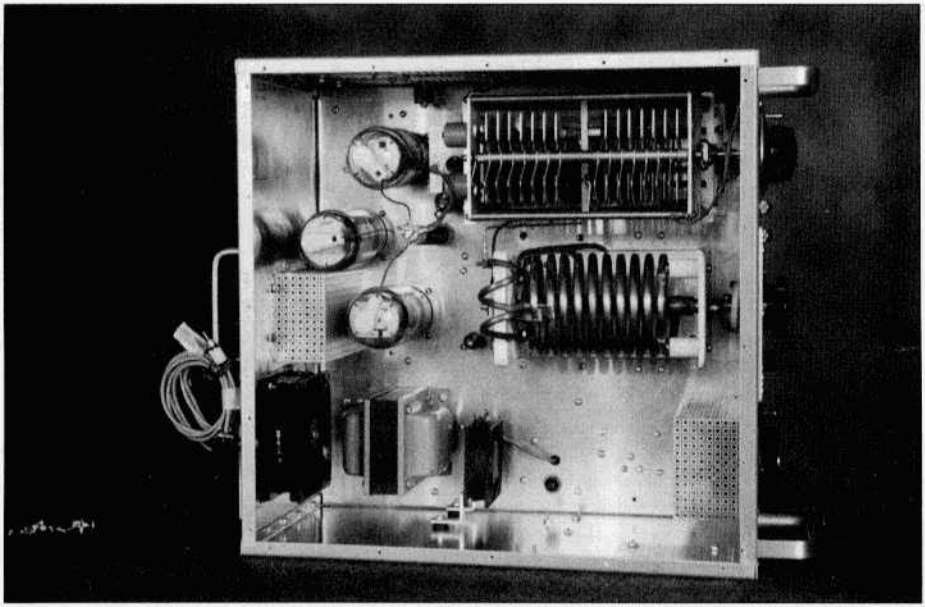
There is a problem with the 813 tube—tube sockets are in short supply. Oh, they are available and show up from time to time at local hamfests, nevertheless my advice is to find the sockets first. They are rapidly disappearing and when found the cost is rather steep, usually from $5.00 to $10.00 each.

Though some few parts may prove difficult, I believe that constructing a KW amplifier is a worthwhile project for those who love to build. Rather than writing another 'paint by numbers' article I will offer component options as we progress. This approach should simplify construction by providing a certain degree of latitude. For example: the input circuit, tank circuit, control circuit, and power supply all offer a number of choices.

The amplifier

Let's start with the RF section of the amp and work our way through the circuit from the input to the antenna. Input circuit...Here we have a choice of using a tuned or untuned input. Even though some commercial amplifiers use untuned inputs I urge you to use some sort of tuning, especially if you intend driving the amp with a solid state rig. The only way I'd omit a built-in input matching network is if I intended to use a small transmatch between the rig and the driver--an approach that works very well indeed.

So, I've convinced you to use a tuned input. A conventional pi input will work fine. You will find the input very easy to tune. Now you are faced with a whole passel of choices--more than we can cover in this article. Here is my suggestion. Look at various input circuits in old handbooks. Pick one that fits your parts on hand. If there are no parts on hand, the easy way is to use a tapped coil, and a wafer switch--in a conven-



Inside view shows clean, uncluttered interior with lots of working space. Small muffin fan aimed at transformer is needed because we are exceeding the transformers rating by 33%. The fan seems to do the job.

tional circuit. Now, how many taps? Oh, at least four...six is better--ten is great--whatever switch you can find. I would hope that you might find a ceramic switch. Remember this switch is going to have RF on it and arcing can become a problem.

What value variable capacitors should I use in the pi input? Where do I place the taps on my coil? Good questions. If you are adept at formulas, reading charts, graphs and things, you just may be able to hit on the correct answers. I never could. There are just too many variables involved. That's why they have knobs on transmatches. Here is what works for me.

The coil itself can be any reasonable size--but why make it too large and take up a lot of room. Wind about twenty turns of number #18 wire on a piece of PVC pipe--two inches long should be enough. One inch in diameter is plenty large, and 3/4 inch is OK. Space the windings enough so that you can solder the taps on easily. I place taps at 1 1/2 T, 3 T, 5 T, 7 T, 10 T etc. Forty meters seldom requires more than 10 T-- usually less. In this article I am assuming that 7 MHz is the lowest frequency. There is no reason why operation on 3.5 MHz should not be built in if desired by adding more inductance and capacitance. The difficulties are more mechanical than electrical.

Input variable capacitors are not critical. I would prefer a capacitance of 250 pF or so, but I have had good luck with the old standard 140 pF variables made by Hammarlund, National, Johnson, etc.

Is there a better way? Yes, I believe the very best approach is a tuned circuit for each band--that circuit being selected with a good wafer switch. The use of adjustable, iron core coils and fixed caps seems to be the choice in better commercially built amps. Exact specifications are available in almost any handbook. If band hopping is not of prime importance I would go for the less complex pi input.

continued next page

What's RFC-1 doing over here in the input circuit? Back in December of 1988, CQ magazine published an article by Lawrence W. Stark, K9ARZ, on building an 813 amplifier. The amplifier described by Mr. Stark was conventional--with two exceptions. He omitted parasitic plate chokes and inserted one at the input. After building a number of amplifiers using this basic circuit I have yet to encounter parasitic oscillations in any of them. Yet, it is only fair to mention that a friend of mine took my advice and used this circuit and had parasitics galore. We eventually calmed down his amplifier--after installing plate suppressors and rewiring the tank circuit. So...it is possible to encounter parasitics with this circuit--but not likely. After all, I had a Heath amplifier self-destruct from parasitic oscillations, not a unique experience according to reports from other hams. Still, I'm sure Heath engineers felt their design was a sound one.

By the way, if you have a chance by all means read the CQ article. It is one of the best amplifier articles I've read. I tried installing plate suppressors and encountered numerous problems. I used the recommended input suppressor on four amps with no problems at all. So my advice is to go ahead--wind seven turns of #16 wire around a 100 ohm resistor. This will probably be all you need.

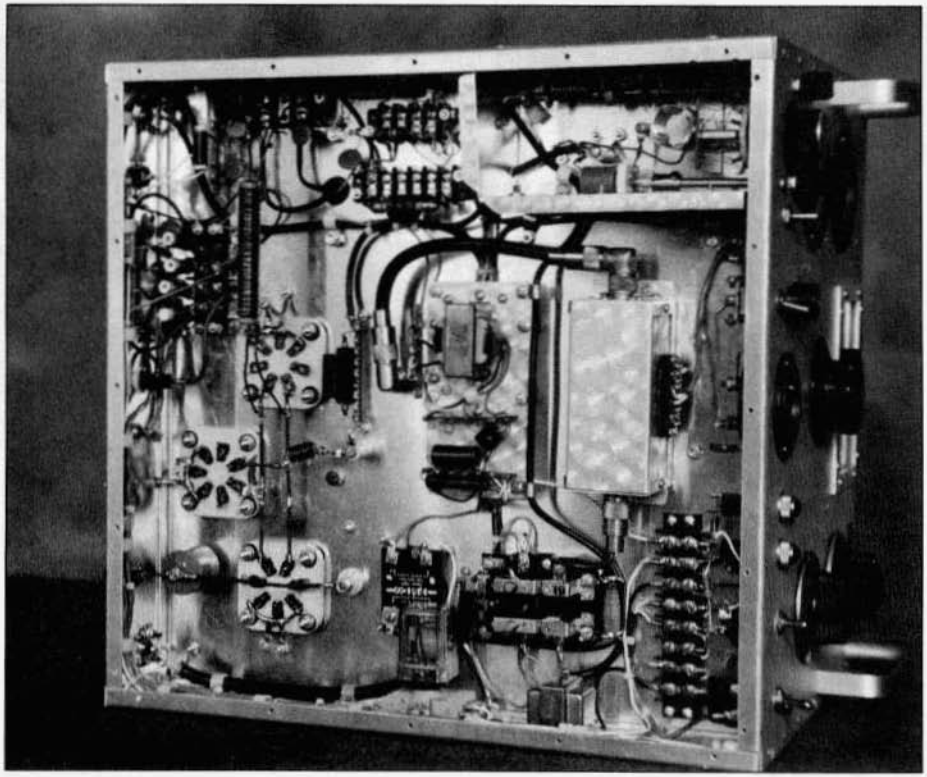
C-10 is a 10 KV .005, and C-6 and C-7 are 500 pF at 20 KV. PLEASE, look for these carefully at every hamfest you attend. They are getting scarce. Do not be afraid to depart from the values given--they are not all that critical. If you must buy them new--be prepared for a shock. The cost is staggering.

Let's tale a look at RFC-2.....The Filaments in directly-heated cathode tubes used in a grounded grid circuit must be maintained above RF ground. This is accomplished with a bifilar choke. Such chokes consist of two windings of heavy wire--normally #12 Teflon coated--wound around a 1/2 inch ferrite rod. Search current radio magazines for ads of companies supplying such 'kits.' A few years ago I purchased several for about $6.00 each. I would expect they have doubled or tripled in price. Tip: I held the turns in place on each end with plastic cable ties. When completed, I gave the chokes two coats of coil dope. No brackets are needed to support the coils--the #12 wire does the job nicely.

RFC-5, is a safety precaution. Take a look at the diagram. If C-10 developed a short your HV supply would be connected directly to the antenna. If someone should contact the antenna when the plate power was on it could ruin their entire day. RFC-5 would divert the HV to ground, and in the process burn up a few things--probably itself included. Hopefully, the fuses would go first.

Let's discuss C-8 and C-9. On the first 813 amp I built I was fortunate enough to find several beautiful new transmitting capacitors at a hamfest for only $25 each. The capacitors had good wide spacing and appeared to be about 300 pF each—by counting plates and applying 40 years experience. I was wrong--they were even less. Still, they were so pretty and well made that I used them anyway...maybe all the experts were wrong and I did not need 1000 pF or more at C-9.

Guess what? The rig loaded up beautifully on 20 meters and was in operation for several months. I then built a second amplifier...very similar to the first but with a few goodies like Lew McCoy's monimatch added for convenience. The same type loading cap was used. The amplifier would load to about 400 watts--no more. I added fixed capacitors in parallel with C-9. Apparently I kept missing the proper capacitance as the rig never would load up to anything near the 500 watt level. At a hamfest in Monett, Missouri I ran across a nice heavy four sec-



Bottom view... Though it appears somewhat complex the wiring is really quite simple. Most of the under chassis wiring is control circuits. In the center of the chassis is a 24 VDC power supply for relays. The box with coax fittings on either end is the Monimatch sampling circuit. Shielded area in upper right corner is tuned input circuit.

tion variable cap. It cost me $10. After installing the cap in the amplifier it loaded up to a KW very easily--though the original cap looked much better.

Moral---use enough capacitance for C-9. You might get by with less--but it is doubtful.

The 'tank' coil--plate coil if you prefer--offers a number of options. Save yourself a lot of problems and try and find a B & W 850A or an 852--I prefer the 850A. This is a very fine coil with switch built in. Cost at hamfests in our area runs from $25.00 for one in poor condition, up to $75.00 bucks for one that is excellent. I have three of them in amplifiers. One was almost beyond repair when I got it as a gift. With a lot of effort, it was restored to near original condition. Another was purchased for $25.00. A third coil in mint condition was bought for only $40.00.

A second choice for the plate coil would be a good husky roller inductor and a reliable turns counter. If you don't have these on hand they can be difficult to find. Of course if you have two pumping oil wells you can buy them brand new. The cost of these two items today will astound you. It may be the ideal way to go, but it is neither easy or cheap to come by the needed items. Expect to pay from $200 upward for a new roller inductor and turns counter.

continued on page 41

The Hallicrafters SX-43

Part 1

by Jim Hanlon, W8KGI
P.O. Box 581
Sandia Park, NM 87047
jthanlon@att.net

The first time I saw an SX-43 was in 1949 or 1950 when I was in the sixth grade. My brother Bob was a freshman at St. Xavier High School in Cincinnati and he had joined the school's Ham Radio Club. I had gone with Bob and our Dad to an evening program at the school, and Bob took me up to the Radio Club shack. St. X was in an old, downtown building dating back to 1831. I can vaguely remember climbing from the basement gym/auditorium up to the fourth floor on a concrete and metal staircase and walking down a dark hall with at least a twenty foot ceiling and a creaky wooden floor to the Physics Lab, through the old wooden double doors, past the black experiment benches with their short, wooden stools shoved underneath, past a bank of black storage batteries and their humming charger on the wall to my right, and then just beyond there was the open door to the radio shack. There in the semidarkness of an attic room were the glowing green dials of an SX-43. Wow! I think it was then and there that I knew I was going to have to become a radio ham.

By the time I'd actually achieved the lofty status of High School Freshman myself in the fall of 1952, the SX-43 was gone, replaced by a more sturdy and serviceable HQ-129-X. The older members of the club remembered that the SX-43 had been mechanically unstable, quite likely to jump frequency if an exuberant freshman would stomp on the floor or slam the hamshack door. Brother Bob tells me that they had even tried to stiffen up the tuning capacitor mounts using Erector Set girders. The SX-43 also reputedly choked up on the S9+ noise level that so often pervaded downtown Cincinnati. The HQ, in contrast, was solid and wouldn't choke on a lightening bolt.

My next SX-43 encounter was in 1958 when I decided to set up a ham shack in my fraternity house room at Ohio State. Steinburgs in Cincinnati had a used SX-43 and a used Elmac AF-67 that I could just afford with my income tax refund. This SX-43 and I became good friends for several years, and it played the AM and FM broadcast bands for me while I was studying a lot more than it played the ham bands. I remember that I added a 100 kc crystal calibrator to the back of the chassis, and I changed the tone control from a high-low toggle switch to a pot with its on-off switch wired to control the calibrator. I also remember that I had to replace the bandspread tuning dial cord. I kept pulling the string tighter to get the backlash out of the drive, but past a certain point it didn't do any more good. It was then that I noticed that by pulling the string tighter I was just bending the chassis! No wonder the SX-43 was a little bouncy. Stupid me, I traded the '43 in 1960 for a Gonset Super 12 converter, a Johnson Whipload 6 antenna and a dynamotor so I could get on the air from my new Chevy. If anyone out there knows of an SX-43 with a calibrator and a tone control pot, please pat it on the head for me.

Since I realized that I was actually collecting vintage ham radios rather than just hanging on to my older gear because I thought I couldn't afford the new stuff - that dawned on me some-

where in the early 70's - I've been keeping an eye out for another SX-43. But it wasn't until early this year that ER reader Don Jeffrey, WB6DFV, from Monrovia, CA answered my ad and offered me a slightly the worse for wear SX-43 for a good, flea market bargain price that I "could afford." Thanks, Don!

Don also filled me in on some of the history of this particular radio. Says he, "I got this receiver from Ward Becht, who was known for his stories in QST and even a few restoration articles in Electric Radio. He was about to restore this SX-43 and an SX-42 when he was ordered into the Cancer Center at St. Joseph's Hospital in Burbank. I visited him several times while he was in the hospital and at home when it was found his treatments were not doing much good. He put much of his collection up for sale but never got back to the SX-42 and 43.

"After Ward 'left us,' I helped his widow run several successful garage sales. Since the SX-42 was in such poor shape (white paint spattered over the face plate and cabinet, no power transformer or knobs) it became a parts set, although Ward would have made it look like it came out of the box new. He had pulled the knobs off of the SX-43 and was about to start cleaning the blemishes off of the front panel when he became ill. I bought the two units and an SX-24 from his widow. I put everything into storage and there it all sat until a local fellow I know was looking for SX-42 parts and I saw your ad wanting an SX-43.

"Therefore, by the power vested in me and your 50 bucks, I send to you Ward Becht's SX-43 ready for restoration, or just carefully check it out and plug it in."

As it turned out, despite Don's best packing efforts, UPS dropped the boxed SX-43 over my four-foot fence and they managed to dent the main tuning dial cover and to smash the dial glass to bits. Why do they do these things? I'm amazed that they didn't do a lot more damage, really. But with some judicious bending and hammering, I managed to straighten the dial cover to the point where a coat of flat black spray paint covered its remaining blemishes. I then cut a replacement "glass" from a sheet of Plexiglas and spray-painted an almost vertical red line on it using black plastic electrical tape as a mask—after paper masking tape failed on my first

continued next page

try. So if you didn't know that a real SX-43 has numbers on the dial glass corresponding to the range settings of the bandswitch, you'd almost not notice that this poor little guy had been so badly treated and patched up.

Beyond that, I haven't done any other cosmetic work besides a good cleaning. This particular SX-43 would benefit from some additional face lift work, since there are several rusty patches emerging from under the panel paint, and its sheet steel chassis is liberally decorated with rust rosettes on top of what is probably zinc plating. I wish I could have talked to Ward Becht about what he had in mind to do with that can of automobile rubbing compound of his that Don sent along with the receiver. I'm afraid that I'd wipe out all of the silk-screened control labels if I tried anything with it myself. Do any of you guys have experience with such things?

That, however, is the worst of the bad news. The good news is that after only a few interesting repairs and a realignment, the SX-43 is now up and playing again in my Summer Shack in the garage. It's making sweet CW music on 40 as well as entertaining me on the AM and FM broadcast bands when I have things to do like cleaning the garage or working on still other boatanchors at my bench. What goes around, comes around.

The repairs were a mixture of the ordinary and the not so obvious. It wouldn't be fun if there weren't a few challenges, and this receiver was definitely "fun." Don warned me that the filter caps would probably be bad, so I started by running them up using a silicon diode in place of the 5Y3 and a Variac in the power transformer primary. The only problem was that absolutely no B+ voltage at all showed up on the filter caps. No, it wasn't a dead short on the B+ line or a bad power transformer, but rather a missing connection between the 5Y3 filament and the input to the power supply filter. Someone before me had replaced the power transformer, and I suspect that he just forgot to include that piece of wire. (Sabotage of this sort is something often found in flea market bargain sets.) So after I fixed that and completed the filter cap reforming run, I put a speaker on the audio output and was greeted with fairly substantial hum - and nothing else. Extra filter caps in parallel with the original ones cooled off the hum. A little checking with signal generator and oscilloscope confirmed that things from the first IF stage on out were working. But the front-end local oscillator, half of a 7F8 dual triode, wasn't making a peep despite the fact that the tube tested OK and the B+ supply to its socket was healthy. As best as I could see, the filament in the 7F8 wasn't lighting up in the receiver the way it did in the tube tester. I was not looking forward to getting into the RF amplifier/mixer sub-chassis which is perched on top of the main chassis beside the tuning capacitors! So out of frustration I started to wiggle things to see if anything good or bad would happen. When I got to the 7F8, the set sputtered to life! Turns out the 50 year old, molded plastic tube socket - perhaps aided by a little too much California sunshine - just wasn't conducting on all eight pins any more. A liberal dose of De-Oxit later, the set settled down and made at least some noise on all bands, even the FM broadcast band.

From there on out, it wasn't too complicated - for a while. The bandswitch responded to another liberal dose of De-Oxit. The 6J5 that doubles as both the 455 kc BFO and as an 11.115 mc second conversion local oscillator quit, also due to an uncooperative tube socket. I replaced one paper bypass cap that was "sweating" after the radio had been turned on for a while. Almost all of the other paper caps had already been replaced; the only original remaining is the high frequency bypass on the

tone control switch. I re-soldered the mixer padder on the FM section of the Bandspread tuning capacitor—it may have broken loose during the drop test.

Alignment went almost by the book, but there are several things I'll share just in case someone out there is also trying to align an SX-43. First off, the Main Tuning dial chart was loose on its shaft, perhaps due to the UPS bounce and the fact that there is only one setscrew holding it in place. A little correspondence with Chuck Dachis (many thanks, Chuck!) verified what the setscrew marks on the shaft also seemed to indicate, that the dial should be set on "0" with the main tuning capacitor fully meshed. Tune-up for the four general coverage ranges below 44 mc is just like any ordinary, single conversion superhet. First align the IF at the crystal filter frequency, approximately 455 kcs. Then adjust the local oscillator, mixer and RF amplifier padder capacitors at the high frequency ends of the bands and the coil slugs at the low frequency ends for proper calibration and tracking.

As is usual for this type of receiver, the Bandspread capacitor is a small, three gang variable capacitor that is switched in parallel with the main tuning capacitor. There are also separate sections on the Bandspread capacitor used only to tune the FM broadcast band. Hallicrafters must not have been satisfied with the amount of bandspread provided on 20 meters, because they included a "3A" position on the Bandswitch just for 20 meter bandspread that switches extra trimmer capacitors in series with the bandspread capacitor sections. The manual alignment directions say to set the Main Tuning dial to the 20-meter mark at 14 mc, the Bandspread dial to 14 mc, and then to adjust the oscillator trimmer "for calibration." This is followed by "Check bandspread calibration and reset trimmer if necessary. Increase trimmer capacitance to decrease bandspread, etc." I quickly found out that it would take a very long time to get the bandspread range properly adjusted following these instructions. What worked for me is the following. 1) Set the main tuning dial at the 20-meter mark and the bandswitch at the 3A position. 2) Set the signal generator and the bandspread dial both to 14.4 mc, and adjust the main tuning dial until the signal generator is received. 3) Reset the signal generator for 14.0 mc, and then adjust trimmer capacitor C27 at position L until the signal generator comes in at 14.0 on the bandspread dial. Iterate (2) and (3) until the 20-meter bandspread coverage is correct.

Another alignment oddity was the general coverage tune-up on band 4, 15.5 to 44 mc. The manual says to align at 18 and 36 mc. When I tried that, I kept arriving at an adjustment that had the padder capacitors screwed hard all the way closed and the coil slugs all the way out of the forms! I even dropped the oscillator slug on the garage floor during this operation, and I had several rather anxious moments till—through the intercession of Saint Anthony—I found it again under the workbench. What I finally did was to align the set at 18 and 30 mc, which covers the range of the ham bands that I'm interested in. The capacitors and slugs for this more limited range wound up being within adjustment range, although I dripped some candle wax on the slugs to make sure that they wouldn't work their way out of the coil forms later. Has anyone out there had this trouble with an SX-43 on band 4, or is mine just somehow "different?"

Also, I couldn't adjust the coverage on the FM broadcast band, range 6, so that calibration was accurate on both ends of the dial. But no bother, I can still find my favorite stations by the music they play.

After completing the above repairs and alignment, I really thought that most of the "fun" was over and that I had the SX-43 pulled together into pretty decent func-

continued next page

tional shape. Indeed, I installed my typical QSK circuit[1], added it to one of the stacks in my garage "summer shack" sitting atop the HQ-129-X and being held down by a Knight T-150A and an Elmac AF-67, and integrated it into group of switch selected operational receivers. Everything went pretty well for a month or so, I made several QSO's on 40 CW and it was running nicely as an FM broadcast receiver while I worked on other projects. Then one day I tried to switch it back to 40 meters and it refused to work—not a peep. A little more checking showed that it was functioning normally on both the AM and FM broadcast bands. Also it was working after a fashion with the bandswitch was set to the 3A, 20 meter bandspread position—signals went by when I turned the main tuning knob although the main tuning dial calibration was not correct, and turning the bandspread tuning knob didn't change the received frequency. Beyond that, it wasn't playing at all on shortwave bands 2, 3, 4 and 5. What the heck was going on???

Back to the bench, off with the cabinet, and a look-see with the oscilloscope told be that the local oscillator was dead on the nonfunctional bands, but that it was working on bands 1, 3A and 6. Hmm ... I decided to start measuring resistances associated with the local oscillator tuned circuits and their bandswitch section with my VOM. And when I did, things weren't coming out the way they should—was the schematic in the manual possibly wrong? There were several fancy functions going on in that bandswitch, maybe it had started to fall apart—no, nothing I could see wrong in there and several sprays with Big Bath cleaner and De-Oxit didn't change the funny resistance readings. What could it be? ER

References:

1)"Mercury Relay Break-In for the Classic CW Station," Electric Radio #90, October 1996, page 20.

Ed. Part two next month.

Canadian Diamond Jubilee...

Ladies / Gentlemen:

The historic 27th November 1923 Trans-Atlantic QSO between Mssrs. Reinartz & Schnell in the U.S., and Leon DeLoy in France, deserves prominence in the annals of Amateur Radio history...

However, we Canadians too have something significant to celebrate this year, specifically, the 75th anniversary of the first (recorded) Trans-Atlantic QSO between one of our own (A.W. Grieg, c1BQ of Halifax, Nova Scotia), and England (E.J. Simmonds, g2OD, of Ascot, Berkshire). This contact took place on 16th December 1923—mere weeks after the American achievement...

To commemorate this uniquely Canadian event, Industry Canada is permitting Canadian Amateurs the use of the following special prefixes throughout December 1998:

"CF" in place of "VA"
"CG" in place of "VE"
"CJ" in place of "VO"
"CK" in place of "VY"

Work a special prefix bearer and help celebrate 75 years of achievement on both sides of the Atalantic!

73, de Eddy VE3CUI - VE3XZ a.k.a. CG3CUI - CG3XZ

Editor's Comments from page 1

Finally, I'd like to remind everyone about the December 1 deadline for comments to the FCC on their NPRM WT Docket No 98-143. For information on the NPRM see KW1I's AMI Update on page 18 of this issue and his column in the September issue. I think that all of us should send our comments to the FCC with the hope that we can influence the outcome of the NPRM. If enough of us get involved, I'm sure that we can. N6CSW

Chassis Cleaning Using "Super Clean"

by Thomas Bonomo, K6AD
81 Lakewood Circle
San Mateo, CA 94402
tom@cpic.net

Everyone has their favorite way of cleaning a dirty old boatanchor chassis. I have tried them all, and my garage is just chock full of cleaners like *Simple Green, 409, Windex*, ammonia, etc, etc. These cleaners all work to varying degrees, depending on the type of dirt you are trying to remove. There is, however, a brand new type of cleaner on the market that is quite remarkable. This product, made by Castrol, is called *"Super-Clean"* and it is based upon a whole new chemistry in cleaners. This truly amazing product is designed to instantly solubilize oil, grease and dirt. It is not just another simple soap-based cleaner, yet it is biodegradable and phosphate free.

I have never been a fan of the dishwasher approach (yes, I know this is popular), unless the rig was really a complete basket case. Instead, I used to do chassis cleaning the hard way: rubbing the top of the chassis with a rag dampened with a cleaning fluid like *Windex* or *Simple Green*, using *Q-tips* to get into the tight spots. This usually produced OK results, but it was impossible to got the dirt removed from in between the tight areas, so the chassis really never looked like new.

Super-Clean to the rescue. After removing and cleaning all the tubes, I spray it on the chassis, but avoid getting it into IF cans, on dial scales and painted surfaces. You will notice that the dirt immediately begins to run off. It will even clean the nicotine out of tube socket contacts, producing better electrical connections. I have never seen any other cleaner solubilize dirt so quickly, and I think I have tried them all. After spraying on *Super Clean*, use a small, clean paint brush to quickly go over all surfaces to help loosen the dirt. After about one minute, rinse the chassis liberally with water and let it dry thoroughly.

A few words of caution are in order because *Super Clean* is pretty strong stuff and must be used carefully. First, before spraying, dilute it 50% with water: a 50% solution is sufficiently strong to produce the result you want. Second, keep it away from painted surfaces (like the front panel) as it can begin to soften it leaving streaks and changing the sheen of the finish. Third, do not leave it on very long. You do not want to dissolve any of the silk-screened tube designations and other part numbers on the chassis. Test a small spot before proceeding. Fourth, do not get it on your hands. It will eat your skin and leave you with dry, chapped skin in a day or two. Following these guidelines, I have never had a problem. *Super Clean* is available at most hardware stores and discount chains like Wal Mart. $9 should get you about 1/2 gallon.

To help protect the chassis from tarnishing and corrosion, it is a good idea to spray on a thin coat of silicone and let it dry. Use silicone in a water base (often referred to as food-grade silicone) rather than a petroleum base because petroleum-based products can attack rubber and some plastics. A commonly available water-based silicone is *LPS Heavy-Duty Silicone Lubricant* (part #01516). If you can't find it at your local hardware store call 1-800-241-8334.

This cleaning technique can often make a chassis look nearly brand new (unless it is permanently rusted or tarnished). When I'm selling a rig at a swap meet, people marvel at how good the chassis looks—and yet the secret is so simple: clean with *Super-Clean* and then preserve with water-based silicone.

continued on page 42

Midget In A Lunchbox—Tales of a Re-Born Sixer

by Bill Meara, N2CQR
996 N. Roosevelt St.
Falls Church, VA 22046
wmeara@erols.com

This is the story of a receiver that came together through a process very similar to spontaneous combustion. In the corner of my basement hamshack, I'd been slowly but surely filling up a cardboard box labeled "good junk" (I'm sure many of you have similar boxes.) In the aftermath of each hamfest, a few new (old) pieces would be added to the pile. Variable capacitors, tubes, sockets, transformers—you know, the good stuff. Close-by, a collection of ham radio magazines from the '50s and '60s grew at a similar rate.

The accumulation seemed very innocent. Little did I know that I was approaching critical mass.

The spark came from the April 1966 issue of QST, page 49. In his "Beginner and Novice" article Lew McCoy presented a little three tube superhet receiver for 80 and 40 that promised to be "a real performer." This was the receiver companion to the "Mighty Midget" transmitter project that had been presented a few months earlier. (The transmitter was presented as a contest: The first novice to finish building it and make contact with stations in ten ARRL sections won!) I liked the looks of the circuit, but at first I was uneasy about the metal work that would be required. I have some deep, primordial ham radio memories of hacking away (with inadequate tools) at the chassis of a homebrew power supply for an HW-32A. The experience made me a believer in PC boards. But this receiver circuit looked very cool. The thought of tuning in CW, SSB and AM signals through all of 80 and 40 on a homebrew rig was very appealing. I could even do some shortwave listening on 40! But still, there was the metalwork problem...

Suddenly, while pondering a photograph of Lew's receiver, it occurred to me that the size and layout was remarkably similar to that of an old Heathkit Benton Harbor Lunchbox (Sixer) that I'd picked up a while back. The wheels started turning. A quick check of the junkbox revealed that I had most of the "hard-to-find" parts on hand. A look at the Sixer chassis showed that it would save me almost all of the hated metal work—I could make use of holes that were cut in Benton Harbor during the 1960s! Soon I knew for sure that that Sixer would never again vibrate the ether of the "Magic Band." I justified my decision by noting that the rig had been moded almost beyond recognition (I swear) and would not therefore be of historical value. I started gutting it with gusto!

The old handbooks recommend covering a new chassis in wrapping paper so that the placement of every socket and screw can be carefully planned. (I often wondered if there were real hams who were patient enough to actually follow this good advice.) On this project I just took the major parts and moved them around on the chassis until I had a satisfactory layout. I tried to keep the tubes away from the local oscillator coil and cap. There was one big hole where the old electrolytic capacitor had been. I used some spare PC board material to patch over this hole, using it as the mount for the FT-243 crystal holders for the IF filter. Underneath, I just threw in a large number of terminal strips wherever I thought they'd be useful (those with lots of grounded terminals are the best!).

The 'Mighty Midget' is paired up with a DX-60B at N2CQR. This station is used on 40M AM. Note the Radio Shack computer speaker on the right. On the left is a solid state HB QRP station for 20M CW.

My junk box provided most of the components. The conveniently-timed Manassas, VA hamfest helped me fill some of the gaps in my parts list. The slug-tuned coil for the BFO was a particularly happy discovery at that 'fest. I used the variable caps out of an old junker Swan 240 transceiver. The power and audio transformers came from the Sixer.

I had to make a trip to the local pharmacy to pick up the empty pill bottles for the coils. I figured they would be suspicious about my request for what could (I suppose) be considered drug paraphernalia, so I brought with me a copy of the April 1966 QST and showed the pharmacist the picture of the Mighty Midget chassis, with its very cool-looking pill bottle coil forms. I immediately "scored" four free pill bottles! It was a lot of fun to wind the coils and I think they look very fine on the chassis. They add a real HB touch to the project.

The really difficult components were the two 455 kc crystals for the lattice filter. I discovered that these rocks have become quite rare! A major manufacturer of crystals (who will remain anonymous) gleefully offered to make me the rocks—for a mere $75 dollars each. Ouch! But then the amazing fraternity of cyber-space solder melters came to the rescue: James, W5LWU, donated three surplus FT-241A crystals. Unfortunately I was unable to get them to function in the filter. I get the impression that these rocks do not age very well. I'm also told that even under the best of circumstances homebrew lattice filters were hit and miss affairs, with more misses than hits.

Anxious to get the radio going, I substituted a 455 kc IF transformer for the crystal filter. This was very easy because the IF can fit perfectly into the two adjacent FT-243 crystal holders on the chassis. A quick rearrangement of a few leads and I was in business. This setup left the receiver a bit broad, but I kind of like it that way. Phone signals (particularly AM sigs) sound very nice. While I couldn't get the complete "single signal" effect with this system, with careful placement of the BFO frequency I did notice a very significant attenuation of the "audio image." I may eventually experiment with lattice filters, but for now the IF cans are doing

continued next page

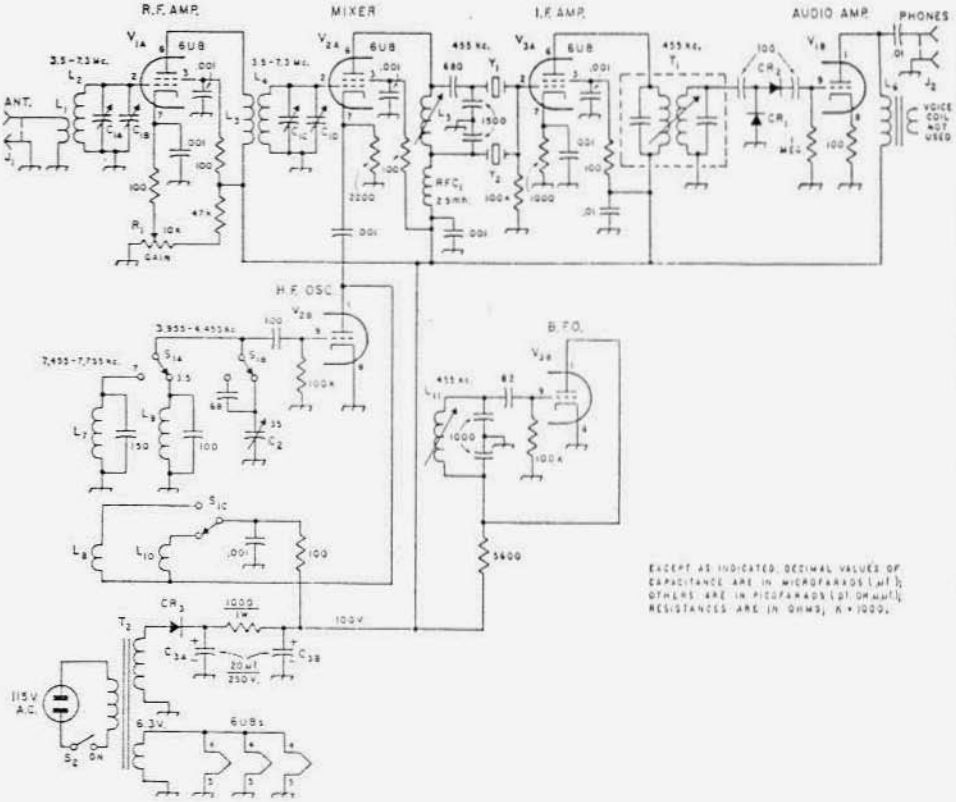


Fig. 1—Circuit diagram of the Mighty Midget Receiver. All decimal value capacitors are disk ceramic. Other fixed capacitors are silver mica with the exception of C_2 which is electrolytic. Resistors are ½ watt unless specified.

C_1—Dual-section 365-pf. variable (Miller 2112 or equivalent). Sections B and D are trimmers furnished on capacitor.

C_2—35 pf. variable (Miller 19035).

C_{13}, $_{14}$—20 μf., 250 volt electrolytic.

CR_1, CR_2—1N34A germanium diode.

CR_3—Silicon rectifier, 400 volt p.i.v. minimum, 100 ma. (Barry Electronics 600/750).

J_1, J_2—Phono jacks.

L_1, L_2—5 turns wound directly below L_2 and L_4 respectively.

L_2, L_4—10 turns.

L_3, L_{11}—Approximately 300 μh. slug-tuned (Miller 4411).

L_5—Standard type output transformer, any range from 2000 ohms to 10,000 ohms primary winding is suitable. Voice-coil winding not used (Knight 61 U 400).

L_7–L_{10}, inc.—See Fig. 3.

Note: L_1, L_2, L_3, L_4, L_7, L_8, L_9, L_{10} are all wound with No. 26 enamel wire, all turns are close spaced and are wound on plastic pill boxes, ⅞-inch diameter, 1½-inches long.

R_1—10,000 ohms, ½ watt control.

RFC_1—2.5 mh. R.f. choke (C Miller 34300-2500).

S_1—3-Pole, 4-position rotary switch, 2 positions used (Mallory 3234J).

S_2—Single-pole, single-throw toggle.

T_1—I.F. transformer, output type, 455 kc. (Miller 12-C2).

T_2—Power transformer, 125 v., 50 ma., 6.3 v., 2 amp. (Knight 61 U 411, Chicago/Stancor PA-8421).

Y_1, Y_2—See text.

The 'Mighty Midget' on the right, with a 2M Lunchbox on theleft.

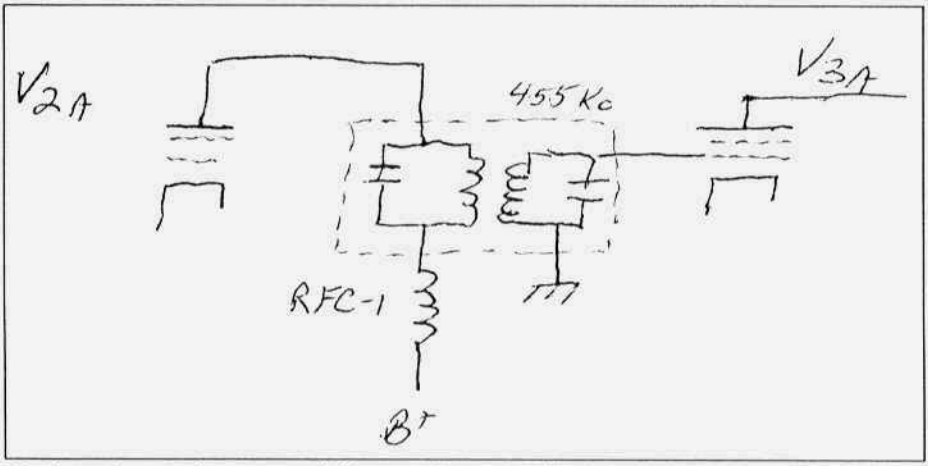
just fine. I received many suggestions about making the IF stage regenerative or using a Q multiplier — I haven't tried this yet.

I'd originally planned on making a completely new front panel, but I came up with an alternative that allowed me to make use of the old Sixer panel: Home Depot sells some very light, thin aluminum sheeting material (used for storm or screen doors). Using tin shears, I cut out a "false front" for the Heath front panel. I got mechanical stability from the sturdy Lunchbox panel while covering up the scars of mods from days-gone-by. I secured the main tuning cap to both the chassis and the front panel - this provided a very noticeable improvement in stability. I found that I really didn't need a reduction drive for the main tuning cap. I put on a DX-60 knob with pointer on it. An old CD cut in half and affixed to the front panel serves as the dial.

The receiver went together very smoothly. Debugging was unusually easy. I was amazed to find absolutely no unwanted oscillations to be stamped out —this was particularly surprising given the small size of the chassis, the use of pill bottle coils and the fact that I didn't pay a lot of attention to shielding. I had to experiment a bit with the coils for the local oscillator to get it vibrating on the proper frequencies. I also had to put a little trimmer cap on the tuned circuit in the RF amplifier's plate to get it to track well with the grid circuit. Putting the RX inside the cabinet seriously detuned the BFO, so I had to come up with some way of adjusting the chassis-mounted slug-tuned inductor. I ended up putting another hole in the already well-perforated cabinet. With a slightly widened plastic nut-starter I could easily reach down and adjust the BFO. Coming up with little solutions like that is one of the little joys of homebrewing.

I added a few mods to Lews original design. With AM operation in mind a "BFO OFF" switch was obviously a necessity. I also put a fuse in the power supply circuit. I mute the receiver by lifting off ground the IF amplifier's cathode and the ground connection on the RF gain control.

continued next page



Mod used to replace crystal filter with 455 kc filter.

I thought about adding an additional stage of AF amplification but things were getting a bit cramped so decided to leave well enough alone. When I want to use a loudspeaker I simply plug one of those little computer speakers with an internal AF amp into the headphone jack. I realize many tube purists will find this distasteful, but let me point out that I briefly considered an even more unpleasant option: placing a little LM386 AF amplifier chip in there among the 6U8s, variable caps and pillbox coils. Somehow it just didn't seem right —the external AF amp option seemed to the be the lesser of two evils.

Lew McCoy was right when he promised that this receiver would be a real performer. The two tuned circuits in the RF amplifier seem to take care of all the image problems and very effectively keep the intense Northern Virginia AM broadcast energy out. Sensitivity is very good—I often have to back off on the RF gain and I can easily copy the Australians on 40 SSB in the morning. After a warm-up period the receiver becomes very stable.

Even though we're dealing with the beloved technology of yesteryear, let me throw in a good word for something that we didn't have back in 1966. My enjoyment of this project was greatly enhanced by a very active Internet discussion that accompanied the building process. We used the rec.radio.amateur.homebrew USENET group and the GLOWBUGS and HOMEBREW mailing lists. It was great fun to share progress reports with a large group of fellow solder melters. As a result of this Internet chatter, a number of other Mighty Midget receivers are now under construction: Sandy, W5TVW, has experimented with 6T9s in place of the 6U8s. Rod, N5HV, is building one on the chassis of a dead Heath Twoer. (Will there be no end to this carnage?) Giovanni, IT9XXS, is planning an Italian version. Jose, EB5GAV, (a well known boatanchor fan) is gathering 6U8s in Valencia, Spain. Cedrick, N9YXA, hopes to use the MM project to take his mind off the snow this winter. Collin, N4UTA and Chris, KXØY are both planning MM projects. Michael, AB5L, found a Frank Jones article that suggested a way of powering this receiver without a transformer: rectified and filtered AC line voltage to the plate with the AC voltage dropped to filament levels via a lightbulb in series. (You get a desk lamp in the bargain!) Finally, Eddy, VE3CUI, was delighted to learn that he is not alone in his enthusiasm for this simple receiver. Stimulated by the 1969 ARRL Handbook, Eddy built a version of the MM three years ago. His is a very "souped up" version that operates on 160 and 80

continued on page 42

The Army and SSB

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

U.S. isolationist policy and Army doctrine left the Signal Corps behind the eight ball at the start of WW II. The Army Headquarters station, WAR at Fort Myer, Virginia had only manual and hi-speed CW HF communications with our overseas bases. The shortcomings of Army overseas was demonstrated the morning of December 7th 1941. When a Japanese message was decoded and a warning needed to be sent to Hawaii, the Army circuit was out due to an ionospheric disturbance.

Because of Pearl Harbor the Signal Corps was told to get reliable, secure, fast communications to our overseas bases. 400 new Signal Officers were recruited from the telephone and communications companies. The Army radio net was the Army Command and Administrative Network, ACAN. Reliability was upped by providing alternate routes. Hawaii, in addition to the link to WAR, was tied to Anchorage, San Francisco, Panama, and Australia. Relay stations were built in Greenland, Brazil, India, Ethiopia, Australia, and several islands.

To provide fast relaying of messages teletype tape relay was installed. A message typed on a keyboard made a punched paper tape that could be fed into the transmitter keying circuit. At the distant station a duplicate tape was punched out by the receiving terminal. This tape could be retransmitted to the next station or converted into a page copy with a teletype machine. To make TTY work with Army CW radios, frequency shift keying was used.

The system was overloaded by 1943. There were not enough usable frequencies to add links. Ex Bell Telephone Signal Officers suggested multichannel carrier to send several teletype signals over each radio. The WECo 40C1 terminal could send 6 TTY signals using tones between 425 and 2550 Hz over one voice circuit. To provide the long distance voice they said try AT&T overseas radio telephone.

A test was set up in May 1943, using the AT&T HF-SSB telephone link between Deal, NJ and Rugby, England. While it sent 6 TTY signals successfully, the messages were not always good copy. The 40C1 did not have diversity and fading was a problem. Also the SSB transmitter was overloading when the tones added in phase.

Frequency diversity was added to overcome fading. The 40C1 was modified to send two sets of tones 3 kHz apart, and the receiving channel equipment changed to select the better tone. This took care of most fading. An 85 Hz oscillator was installed and the transmitting tone oscillators locked to it for phase stability.

The WECo SSB transmitter was the 2000 watt D-15600. It could transmit upper and lower sidebands simultaneously and independently. The WECo 99945 SSB receiver could detect the upper and lower sidebands separately also, so they provided two voice channels. The transmitter sent a 20-watt carrier that was used in the receiver for frequency control. 6 kHZ wide 125 kHz crystal filters were used for sideband selection. All modulators/mixers were balanced and the amplifiers push-pull. Transmitter tuning was done with rotary inductors. WECo tube types were used exclusively. Frequency range was 4.5 to 22 MHz.

The upper sideband, "channel A", was used to send TTY tones, while the lower sideband, "channel B", was for voice. Military communication in WW II was mostly written message traffic. Voice was used in combat radios only. Lack of secure voice cryptographic sys-

tems was one reason, but tradition was more so. In any event, with only 2000 watts the TTY channel reliability suffered when transmitter power was diverted for the voice channel.

Army ingenuity converted CW transmitters into linear amplifiers. The 15 and 40 Kw Press Wireless made very effective linears. With additional power the TTY was more reliable and the voice channel could be used. Unofficial traffic was passed by voice. With the higher power, two 40C1s could be used, providing 12 TTY and one voice per system. By 1945 the Army had 18 duplex SSB systems circling the globe.

Because of the delay getting SSB radio in North Africa after the invasion, Signal was asked to put together a mobile SSB for D-day. Fort Monmouth built a three van configuration with the WECo equipment. They trained a 35 man detachment to install, operate, and maintain the station. It landed in France 15 days after D-day, and provided a direct link to Washington.

A second set was built for the Pacific and was the first SSB radio on a Navy ship. It was off loaded in Japan in September 1945. The transportable set in Europe was returned to Monmouth in 1945 for training. One of the original men trained stayed as an instructor. Dudley "Bow Tie" Kahn will be remembered by those who went through the Army SSB school between 1945 and 1965.

Short Range Radio at Monmouth was interested in the transportable SSB. Other than size, a problem was frequency stability. A high failure rate was noted with the crystal SB filters. In 1945 Zenith Radio sent 455 kHz mechanical filters to Monmouth for evaluation. SSB looked like the ideal place to test them.

Since money was limited, Short Range "borrowed" the school radios and modified them to test the filters. They were not usable for TTY due to phase shift and ripple, but worked with voice. The Frequency Control branch had vacuum crystals that were tested. They held frequency within 200 Hz, which was OK for voice.

SSB conferences were held at Monmouth in '48 and '49 with Bendix, Collins, Gates, GE, and RCA. GE brought SSB equipment for tests. It was phasing and did not meet specs. The Air Corps/Force Lab, still at Monmouth even though they were now separate, liked the GE equipment and took it when they left Monmouth.

Mike Villard, W6QYT, brought his AM+FM=SSB transmitter to Monmouth. He said we could convert AM sets to SSB using this technique. While it was very simple, it had spurious and transmitted carrier. We said thanks anyway. RCA brought a 75-watt SSB transceiver using RCA built mechanical filters to Monmouth for tests. It met specifications but was turned down due to poor reliability. The Fort kept it however, as a training device for the SSB school.

With the shortage of money, tactical SSB was shelved in 1949. The Army was committed to FM for short range and its performance was excellent under tactical conditions. The low-power requirements of FM transmitters, and the constant level audio and noise limiting of nonlinear FM receivers was ideally suited to tactical communications.

Money flowed in 1950 because of Korea. Most went into equipment procurement for long distance. In 1951 a WECo 4 Kw SSB transmitter, their LD-T2 became our T-265/409, and their SSB receiver, the LD-R1 was purchased as the R-369. A new carrier terminal was developed under Army contract by Western Union, the AN/FGC-29. It provided 16 or 32 TTY channels and 2 or 3 voice over SSB.

Short range committed money to new HF AM/CW sets such as the AN/GRC-19 so tactical SSB remained on the back burner. A few bucks were spent on test-

ing the Kahn envelope elimination and restoration system as a way to convert existing AM equipment to SSB. It was passed up due to critical adjustments.

A group of Officers, pushing SSB, got outside funding in 1955 and ended up with Collins KWM-1s. The end result, in 1961, was Signal nomenclaturing the AN/FRC-93, the Collins KWM-2A. It would not meet mil specs for a tactical radio so it was purchased as a limited standard. In 1968 a replacement was needed for the AN/GRC-19. A contract was awarded to General Dynamics for a tactical SSB radio. Four years later, the AN/GRC-106 radio was the first and the last Army developed, mass produced tactical SSB radio.

In 1959 AT&T completed the first Trans-Atlantic telephone cable. In 1960 the Army launched SCORE, Signal Communications by Orbiting Relay Equipment, the first communications satellite. These two events signaled the beginning of the end for military and commercial HF SSB. By 1970 the Army was shutting down overseas radio stations. Tactical radio got its first digital satellite set in 1974 and by 1985 HF radios were back up. Today HF SSB is only a fond memory to more mature Army people. **ER**

It is with extreme sadness and regret that I learned of the passing of my friend Melvyn Stoller, K2AOQ of Rochester, New York. He passed away peacefully in his sleep on August 29th at the age of 57.

Mel had a great love for vintage radio gear that kept him very busy over the years. He always liked to use three basic phrases when dealing with a particular piece of equipment: "Grab it!", "keep it!" or "get rid of it!" He had a straightforward way of giving helpful advice, and he had a wonderful sense of humor as well. Mel and I spent many evenings in his shack reminiscing and tinkering with old radios. We made a great team. I'm certainly going to miss him. To quote Fred Weir, W2UB: "Mel's passing has left a great hole in my life. I've lost one of the best friends I ever had." I couldn't have said it better myself.

God bless you Mel, your presence will always remain with us.

Steve Davis, KD2NX

Designing the T-195 from page 9
washers and a 6-32 screw would seal one end. He then filled it with dry ice (for cold temp testing at the bench), and would then seal the other end and dump it in a wastebasket. The forming gas would ultimately swell the tube and explode it. Depending what you were working on, it could be funny.

Trolley Tour

Stu and Art Pengally gassed up a jeep in Cedar Rapids and went out toward Iowa City for field trials with a full GRC-19. They had the Jeep mount and all production-grade accessories for a full trial. The 16-ft whip was up and all going well. As they approached the Cedar Rapids airport they went on a side road that crossed the Crandic tracks. Crandic was a trolley that in those days connected Iowa City and Cedar Rapids for passenger and light freight. Just as the whip antenna was about to contact the overhead trolley power wire, Stu slid the Jeep to a halt. No problem, but a few anxious moments. There was not time to think about how conductive the tires were.

Environment

In summer the windows were open all the time. At night large moths would come in and perch on the walls because lights were left on. In the morning, when we came to work, the moths were in a stupor with their wings folded up as an invitation to be picked off. Someone discovered that birds were perched above and when a moth was tossed out the window he seldom got across the street before a darting bird got him. Swallows got 'em, sparrows tried but failed. We did have a little fun along with our hard work!

The Green Room

No account of a Collins product development would be complete without some explanation of the term "Green Room". For full details see my earlier writing in ER. Despite some rumors and second hand accounts that differ, the original Green Room name occurred quite by accident. Ernie Pappenfus gathered a small crew to do a fast production design of the 30-L. The guys in the team were sequestered for lunch and dinner and had essentially "evaporated" from their day to day programs. When asked "Where's so and so?", the secretaries would say, "in the green room". The room for the 30-L team had been used for secure programs before and had been painted light green. It was the only different color room in the entire "industrial drab" plant. So, by naming the color it became an address recognizable to everyone. My earlier writing goes into a little more detail.

The Rest Of The Story

Well, I guess it's natural to remember with a bias toward the pleasant things. I hope this doesn't have too much of that. The T-195 design program launched a good bunch of eager beavers into careers that provided growth, accomplishment, and ultimately security in retirement. Yes, almost the whole crew is retired! Only Walt continues working. He jokes that Elmer should have called him when he couldn't get good crystals in a previous situation.

The retirees have gone on to many and varied endeavors. Most have stayed in, or returned to electronics-related activities. Some have passed along what they learned via consulting arrangements. Walt said it nicely: "I have to agree that this was one of the best project teams I ever worked on. Throughout my career I have tried to emulate Ernie Pappenfus. He was the best boss I ever had. Stu had a wonderful dry sense of humor. Elmer was an outstanding theoretical person as was Roger. Many times over the years I have talked of the amazing detail we had in the design layouts".

I hope that at least a few Hams have the enjoyment in restoring and operating the T-195 that Dennis DuVall has reported. Those of us who designed it enjoy seeing it still operating usefully. I

hate to see the GRC-19's stacked like cordwood in the salvage yards.

Thanks to Dennis DuVall for stimulating this article. A long time ago Arthur Collins said to me one day: "Fred, you owe it to your profession to write that up". That comment had to do with something I had done that's now forgotten. However, Arthur's words are burned in nonvolatile memory and may be partially responsible for this article. **ER**

A Cool KW from page 25

Third choice...good, heavy, 4 and 5 pole war surplus ceramic switches are still available at very low prices. (Check with Fair Radio) You can wind the coil yourself and by cut and try arrive at the proper turn taps. I can tell you very closely where the taps should fall. Let's wind a 2 1/2 diameter coil, about 7 inches long. There are plenty of ceramic forms floating around the surplus market and can be bought for practically nothing. Wind your coil with number 12 or 14 wire.

As good practice dictates, your ten meter coil should be about four turns of heavy wire, 1/4 inch copper tubing, or maybe even a piece of flat stock--say 1/2 in wide by 1/16 thick--approximately. No big deal...use something close. This ten meter coil should be of a smaller diameter, say 1 1/2 inches, air wound. If a change in this coil is needed for resonance on ten meters it will probably need to be shortened to a little less than four turns. It depends upon several things--not the least of which is the length and dress of leads in the plate circuit.

Assuming that the four-turn coil is OK for 10 meters, then the large coil will probably need to be tapped at turn 2 for fifteen, 4 to 5 for 20 meters, and about 12 to 14 turns for 40 meters. These are ballpark figures only. Keep in mind that the ten meter coil is in series with the larger inductor.

Control circuits.... You can get by just fine without a two speed fan if noise doesn't annoy you. Option: The dropping resistor could be left in the fan line all the time, thus running the fan at slow speed. Unless you are running full bore, and are exceptionally long winded, I doubt that your 813's will suffer immediate damage. My suggestion--put in the relay.

No doubt you will notice that I have omitted voltage ratings on transformers and relays. I have no way of knowing what is available to you. In my area most relays fall into three groups--120VAC, 12VDC, and 24VDC. Relays requiring 120VAC are no problem. Relays in the 12 and 24 volt DC range will require a small DC power supply. Twelve volt transformers are easy to find--usually for less than one dollar. I have even supplied relay voltage by using an inexpensive doorbell transformer.

I have also omitted designations for the diode rectifiers. Rectifiers and rectifier circuits are dictated by the required voltage and by the transformer you intend to use for the relay power supply.

When grounding the grids of the 813 tubes I use heavy copper wire, copper braid removed from used coax, or a combination of the two.

Keep leads short, and solder well. I prefer to ground each grid individually. Some will think this practice borders on witchcraft but it seems to be a preferred construction practice of many old timers. **ER**

Ed. Part two next month.

A complete index of the entire 9+ years of ER is available for viewing or downloading at the following website:
http://www.qsl.net/n9oo

AMI Update from page 18

Thanksgiving AM Jamboree

I look forward to hearing a lot of AM activity over the coming Thanksgiving weekend. Ten meters has been open frequently in the last few weeks. Many of the old familiar voices and quite a few new voices have been rolling in. Make sure your 10 meter station is ready this Thanksgiving. The AM Jamboree will formally begin on Friday evening and end on Sunday evening, November 27-29. All bands will be included. Certificates will be awarded for logs sent in with over 20 AM contacts during the event. An endorsement will be cited on the award certificates for those stations whose logs show in total, ten or more different AM transmitters in use by the stations worked. For homebrew transmitters, log the final and modulator tubes in use. Exchange of AMI certificate numbers is suggested, but not mandatory. I also suggest asking your AM contacts if they have sent their comments on Notice of Proposed Rule Making, WT Docket No. 98-143 into the FCC. Have the FCC docket number, the FCC address and a few talking points ready if your contact is willing to send in comments. Send logs to AMI Headquarters for award certificate processing. ER

Looking Back from page 3

ing was the second poorest, next was the antenna that was wound with wire. I used a bamboo rod and wound it with wire and top loaded it. This is similar to the "Outbacker"—the wound whip didn't do too well. A center-loaded whip with a large high-Q coil was the best performer, even better with a disk of loading above the coil.

Now keep in mind that this was back in the early 50's—I don't know how many readers know the results of the modern shootouts but the information is worth passing on. All of my early tests and results have been verified by these shootouts. The popular screwdriver antenna rates very high but it doesn't win the contests, it misses, but not by much. The winner seems to be the Texas Bug Catcher type with a large coil and a loading disk above the coil.

I got the usual arguments at my talk but one can dismiss the shootout tests. I have always argued that anything a little bit better is really a lot better when we compete on crowded bands. If any of you want to argue with me-my email is mccoy@zianet .com. Happy contacts. W1ICP

Chassis Cleaning from page 31

This new cleaning chemistry has sure cut down on the amount of time I spend cleaning old boatanchor chassis and the results are sure much better. The dust is already beginning to collect on all of my other cleaners! ER

Midget In A Lunchbox from page 36

with additional stages of IF and AF amplification.

This was my first tube-type construction project and I really had a lot of fun with it. When you build solid state gear on PC boards, it's all very one dimensional, very flat. But this tube project was like building in 3-D! As you add components above and below the chassis, you really get the sensation that you are building something substantial. And of course there are other aesthetic rewards: the warm glow of the firebottles and that wonderful smell that comes from oil and rosin heated by filaments.

For those of you who are (like me) metal-shop challenged, I strongly recommend the recycling of old junkbox chassis. This project has caused me to take a new look at some of the old junkers sitting around the shack. There's another Lunchbox that may end up as a companion transmitter for this receiver. And then there's that DX-60 carcass that could serve as the foundation for the 160 meter rig I've been thinking about... Hmmm let's see... ER

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 20 word- ad per month. **Extra words are .20.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word**. Your name, call, address and telephone number count as **6 words**. Hyphenated words count as **2 words**. **Please count the words in your ad and if you're over 20 words send payment for the extra words.**

Non-subscribers: $3 minimum for each ad (up to 20 words). Each additional word is .25. **Please call or write for display rates.**

VINTAGE EQUIPMENT ONLY

ER
14643 Road G
Cortez, CO 81321-9575

Phone/FAX (970) 564-9185
e-mail: er@frontier.net

DEADLINE for the DECEMBER Issue: DECEMBER 1

FOR SALE: Repair and restoration on all vintage equipment; 45 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: R-390A Orig. Maint. Manual,TM11-5820-358-35,189 pgs - $28 incl. Dom Priority Mail. Aben, POB 4118, Jersey City, NJ 07304. avidov@aol.com

FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hifi, parts. Send 2 stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805. aq253@osfn.org

FOR SALE: KWM-2 fan bracket - $12 ppd. Dave Ishmael, WA6VVI, 2222 Sycamore Ave., Tustin CA 92780. (714) 573-0901.

FOR SALE: Heathkit Warrior - $350; Apache - $175, both beautiful condx. **WANTED:** C-Line. Bob Ryals, KIØGF, 3390 Blodgett Dr., Colorado Springs, CO 80919. (719) 265-9950, rryals@pcisys.net

FOR SALE: Antenna tuner parts. Handbook balanced output circuit. Capaitors, inductors, chassis, velvet verniers - $125. JeRB, K8WPI, MI, (616) 382-5401, jerb@view2earth.com

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 20176. (540) 822-5643

FOR SALE: Hallicrafters, RME, Gonset, others. Also some military, test equipment, VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

FOR SALE: Tubes, Penta Labs, 811A- $20.; 572B- $55.; 3-500Z- $170.; ZG also avail.(these are Amer. made); NOS 811A- $35.. Many other US NOS. VISA/MC. Dee, W4PNT, VA (540) 249-3161, soundnmind@rica.net

FOR SALE: National NCX-3 w/matching pwr sply/spkr, exc condx - $190; Heath SB-400 exc - $150. Cliff Fleury, AI7Y, POB 1233, Goldendale WA 98620. (509)-493-8203

FOR SALE: Hammerlund HQ100A - $100 and National RCK rcvr - $100. Both plus shpg. Dennis, KEØQM, KS, (913) 782-9092, wbfim@sound.net

FOR SALE: NC100x w/spkr - $169. Ed Sauer, KC9SP, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483

FOR SALE: Hallicrafters, Drake, Heathkit, Military, etc. Send e-mail request or SASE for list #2. Fenton Wood, 109 Shoreline Dr., Star Harbor, Malakoff, TX 75148. fenton@tvec.net

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: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard Coyne, POB 2000-200, Mission Viejo, CA 92690.

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 105 Sweet Bay Ln, Carrollton, GA 30116. wa4kcy@usa.net

WANTED: E. F. Johnson Co. HAMALOGs, unusual photos and information 1923-70. Bruce Hering, 41120 State Highway 13, Waseca, MN 56093. (507) 835-5619. bhering@efjohnson.com

WANTED: Homebrew xmtrs and rcvrs or parts, working or not. George, N1TNQ, (401) 724-5516

WANTED: Top dollar paid for Winchester Radios and Winchester related items. Donald Daggett, 122 Hall Rd., Grahamsville, NY 12740. (914) 985-7249, wc2e@webtv.com

WANTED: German W.W.2. military radio/avionics gear. Clandestine sets all periods. Cash or swap. Rag Otterstad OZ8RO. Hosterkobvej 10. DK 3460 Birkerod, Denmark, otterstad@inet.uni2.dk

WANTED: Owners of the John Leary, W9WHM, re-engineered Hammarlund SP-600 rcvr, seeking info and serial number of rcvr. Bill Mills, KC4AA, (912) 452-2957, wmills@gmc.cc.ga.us.

WANTED: Galaxy V accessories (F-3, DAC-35, SC-1, RV-1, etc); cabinet for 600L. Tom Hoitenga, K8NGV, GA, (770) 426-8682, hoitenga@bellsouth.net

WANTED: HRO-5 coils J (50-100 kc) and H (100-200 kc), wood coil box, misc HRO-5 stuff. Don, (616) 541-9874, fsmv34a@prodigy.com

WANTED: Navy equipment from the 1930s Bureau of Engineering days. Parts, manuals, junkers, small or huge. William Donzelli, 15 Gen. MacArthur Dr., Carmel, NY 10512. (914) 225-2547, william@ares.net

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: Collins 310A-1 &/or 310A-3, any condx; 30J, 30K (any); 302C-1, 312A-1. **FOR SALE:** SC-101 lamp hoods & grills. Butch, KØBS, MN, (507) 282-2141

WANTED: Heath Gear, unassembled kits, catalogs and manuals. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI 49009. (616) 375-7978, billrobb@net-link.net

WANTED: Books by Thomas Adams published by Howard W. Sams in the Basic Electronic Series, circa 1961. Dan Langston, KO4RA, (912) 453-9066, danman@accucomm.net

WANTED: Historical info on development of 12AT7, 12AU7 and 12AX7. Which of these was first, when, production info, etc. Tech info not needed. Kurt Miska, 3488 Wagner Woods Ct., Ann Arbor, MI 48103. (248) 641-0044 (w), Fax 641-1718, khm@tir.com

WANTED: Variometers. Steve Gross, W9OJI, 602 W. First St., Mt. Morris, IL 61054. (815) 734-4255

WANTED: Call-letter automobile lincense plates for collection, will repay you for postage. Thanks, Marvin, 2957 Gaffney Rd., Richmond, VA 23237. (804) 275-1252, wa4toj@juno.com

WANTED: Collins KWM 1, RE 75S3B/C, KWM380/HF380. Any condx considered. Schaaf, (740) 965 5331.

WANTED: Raytheon RK20, Eimac 35T tubes; Temco 75GA xmitter or Supreme AF100. Robert Perlstein, POB 642, Old Orchard Beach, ME 04064. (207) 934-9206, perls@compuserve.com

WANTED: Swan 160X and any accessories. 160 meter monobander. Richard San Antonio, K1MD, RI, (401) 738-2601 days, (401) 732-4026 eves.

WANTED: I wish to correspond with owners of National FB7/FBXA/AGS coil sets. Jim, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511. j.c.clifford@juno.com

FOR SALE: Genuine new surplus: Unused R-390A cabinets #CY-979A/URR w/shock supports and misc hardware package - $305; top and bottom cover sets - $75. Mac McCullough, TX, (214) 324-4849, Fax - 324-4844

FOR SALE: Hallicrafter's manuals, copies starting at $5, some Johnson, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Vintage radio owners, retire the variac, new solid state SofStart available SASE. Rick Paradise, KE4OCO, 515 Wood Forest Ct. NE, Marietta, GA 30066-3519.

FOR SALE: K7FF Super-List for vintage parts and other stuff. Sierra wattmeters & slugs, Bird 43's & slugs, cane metal, dummy loads, meters, etc. etc. Request the 'Super-List', <k7ff@inreach.com>, Derek, K7FF.

FOR SALE: Heathkit SB-10 SSB adapter w/ manual; ARC-5's, T-19, T-20, T-21. Marvin, VA , (804) 275-1252, wa4toj@juno.com

FOR SALE: Collins 32S1 Heath supply. **WANTED:** VT4C for BC375; BC342 parts; 837. Steven Gajkowski, KD3HT, RR#6 Box 6712, Saylorsburg, PA 18353, 717-992-6768, jmb1@epix.net

FOR SALE/TRADE: HRO-50T, NC-300, SX-25, S-40A, S-40B, S-120. R-1051. RBM-3, RBC-1. DX-40, QF-1. TR-4C. SASE. Sam Timberlake, KF4TXQ, POB 161, Dadeville, AL 36853. (256) 825-7305, stimber@lakemartin.net

FOR SALE: Collins KWM-1, 516F1 - $1400; 32S1,75S1,516F2 - $775; KWM2A, RE , 312B5 WE - $1575. Fred, W6YM, (209) 223-2376, days, fhonnold@juno.com

FOR SALE: Sencore TC136 tube tester - $15; Sprague Tel-Ohmike TO4 - $15; both for $25. HP608C sig gen - $30; HP6130B programmable voltage source - $40; Heath IO-12 scope - $30. Shpg extra. Bill McCombs, WB0WNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212, (316) 722-7669, wmmccombs@aol.com

FOR SALE: Heath HW-104, SB-644, SB-604 & pwr sply w/manuals - $375 + shpg. Chuck Klawitter, W9VZR, WI, (414) 962-9366 or cokwfb@juno.com

FOR SALE: WACO-5NWX telephone filters. Just plug in. 1/$13.95, 2/$25, 3/$34. Money back. Cecil Palmer, 4500 Timbercrest Ln., Waco, TX 76705. (254) 799-5931, w5nwx@juno.com

FOR SALE: Join SPAM, the society for the promotion of AM. Lifetime certificate $1, SASE. W4CJL, 202 Baker Dr., Florence, AL 35630.

FOR SALE: British WW2 Telegraph key, No.2 MKIII - $25 + shpg. George Rancourt, K1ANX, MA, (413) 527-4304.

FOR SALE: Collins 30L1 owners new Cetron 811A's - $19; 32V owners Raytheon 4D32 - $19; major credit cards accepted. Don, W4GIT, FL, (352) 475-3306.

FOR SALE: Cleaning part of shack. SASE or email for equip & parts list. Earl, K6GPB, 5319 Sierra Vista Rd., Murphys, CA 95247. earlw@goldrush.com

FOR SALE: Nice Ampex 300 audio tape deck, portable case, w/pre-amps, cables. Fred Clinger, OH, (419) 468-6117 after 6 PM.

FOR SALE: Hallicrafter S-85, FC - $35; Yaesu rcvr FRG-7700, EC - $225; TV-7BU tube tester, VGC - $95. John Walsh, W3GCE, 577 First St., Whitehall, PA 18052. (610) 264-4645

FOR SALE: Heath Nostalgia, 124 pg book contains history, pictures, many stories by longtime Heath employees. (See BOOKS inside back cover.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028.

FOR SALE: B&W LA-1000 amp & pwr sply - $350; DB-20 pre-selector & LF90 accessories for RME-69 rcvr - $45, both. **WANTED:** HRO-50/60 coils, have 'A' coil for HRO-5 to trade or sell. Bruce, N9KGR, WI, (920) 693-3247

FOR SALE: GRC-9 spares kit - $39; pair Hallicrafters HT2-A Village Radios, new w/ manual - $99. Harve Nye, Box 424, Long Creek, OR 97856. (541) 421-3053

FOR SALE: 1990 ARRL Handbook - $15; ARRL Operating Manual, 3rd ed - $10, both mint + shpg. Bill Riley, W7EXB, 863 W. 38th Ave, Eugene, OR 97405-2375.

ELECTRON TUBES FREE Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 8311, Essex, VT 05451. (802) 879-1844, FAX (802) 879-7764

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). Softwave, 2 Dept. ER, 1515 Sashabaw, Ortonville, MI 48462.

FOR SALE: Strong steatite antenna insulators. Lengths from two to fifteen inches. SASE for list. John Etter, W2ER, 16 Fairline Dr., East Quogue, NY 11942. (516) 653-5350.

FOR SALE: Dial/clock covers. Send bezel, old or drawing, make/model, guaranteed satisfaction - $10 ppd. William P. Turner, WAØABI, 1117 Pike St., St. Charles, MO 63301. (314) 949-2210.

FOR SALE: Free info on many topics related to vintage amateur radio equipment & operations at http://www.mnsinc.com/bry/hamlynx.htm Everyone welcome. Brian Carling, G3XLQ/AF4K.

FOR SALE: New Ranger I, Valiant I & Navigator plaster dials, 160-10 freq no's in green, w/all holes like orig - $17.50 ppd. Bruce Kryder, 4003 Laurawood Ln., Franklin, TN 37067. (615) 794-9692.

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

FOR SALE: Collins 75S-3, 32S1, 516F2, cabinet, HP23A pwr sply - $775; GLA1000 amp, 8 extra new tubes - $275; Drake MS-4, AC4 pwr sply - $125. **WANTED:** Hammarlund HQ215 rcvr. Mike, WA6NGF, CA, (209) 568-0345, morning only.

FOR SALE: Factory manuals in binders for Zenith, GE, Magnavox, Motorola. 17 total for years 1959-1970 - $5 ea or $50 for all. U ship. John, W9MHS, WI, (414) 964-0194 or snow@execpc.com

FOR SALE: EF Johnson ceramic 100 watt xmtg coils, some w/end link & some w/center link, NOS, never used; used coil forms for Pilot Super Wasp. Roland Matson, K1OKO, POB 956, Lake Pansoffkee, FL 33538.

FOR SALE: Hallicrafters HT-37; Heath Apache & National NC-155. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603.

FOR SALE: (6) RME radios, all need work & restoration - $50 ea. **WANTED:** Hammarlund HQ100, any condx. Noonan, SC, (843) 726-5762.

FOR SALE: Magazines, manuals, surplus books, some surplus xfmrs, & other parts. Call your needs. Vic Edmondson, W4MYF, RT 1 Box 2599, Lee, FL, 32059. (904) 971-5580.

FOR SALE: Collins 516F-2 bias mod, parts/instr - $12, ppd/US. Cory, N2AQS, 1000 E 14th/178, Plano, TX 75074-6249. hinec@ccgate.dl.nec.com

FOR SALE: Sell/Buy/Wanted/Trade: Vintage equip at the "K8CX Ham Gallery." http://paradox2010.com/ham/ a free service.

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. (307) 322-5858, feltoned@coffey.com

FOR SALE: 7 & 9-pin tubes, my choice, untested - 10/$1; Xmtg tube sale, list free. L. Gardner, 458 Two Mile Crk Rd., Tonawanda, NY 14150.

FOR SALE: Dr. Radio repairs vintage ham gear. Steve Trimble, K5DJH, Box 73, Weston, TX 75097-0073. (888) 73-K5DJH. k5djh@texoma.net

FOR SALE: Hammarlund HQ105 TR xcvr, GC w/manual - $100. Jim, W8HPL, OH, (740) 927-2592.

FOR SALE: Naval rcvrs RAL, RBA, RBB, RBC, RBL, RBM, some checked, pwr splys available, prices from $75 to $350 depending type, condx. Carl Bloom, CA, (714) 639-1679, 3778111@mcimail.com

FOR SALE: 0-50 mA RF 3-1/2 round Weston mfg NOS - $30 ea + shpg. Steve Bartkowski, 4923 W. 28th St., Cicero, IL 60804. (708) 863-3090.

FOR SALE: Accepting bids on 1921 Signal Corps Manual, 619 pgs, leather bound. Send SASE for index. Charles R. Lackey, W4QBE, HC10 Box 567, Lakemont, GA 30552-9718.

FOR SALE: Books, Eimac-Care & Feeding of Pwr Grid Tubes - $22. List, LSASE. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. brett37298@aol.com

FOR SALE: Jones Micro-match VSWR - $25. **WANTED:** XF-30C CW filter for Yaseau FT-101. Clarence Filley, W7KE, 1109 S. 2nd St., Hamilton, MT 59840. (406) 363-1946.

FOR SALE: Heath HW-2036 & HW 12, both need repair - $60 + shpg. Bill, TN, (931) 433-7453.

FOR SALE: BC669 - offers; WRL Globe King 400, mint w/xtra 814 final - offers. Pete Anderson, W5VYV, 601 N. Turner St., Hobbs, NM 88240. (505) 392-8866, w5vyv@gte.net

FOR SALE: Galena xtal radios or parts to make your own. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447.

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), 998 Whipple, Grayland, WA 98547-0697. (360) 267-4011

FREE SAMPLE: Transistor Network Magazine for collectors of regular & novelty transistor radios, & related items. Articles & ads. Subscribers get a free 50-word ad monthly. Subscription: $17 (US); $28 (Canadian); $36 (Foreign). POB 43, Live Oak, FL 32064-0043. Visit our Web Site at: http:www.suwanneevalley.net/~rmorison/

FOR SALE: Military and commercial communications items: www.maxpages.com/murphyjunk. For up to date lists: murphy@cts.com. Mike Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. (619) 444-7717

FOR SALE: Mint Collins 75S3C RE; KWM-1 & 516F1; National SW5 w/pwr sply. W2AO, NY, (914) 691-7957.

FOR SALE: Perfect replica of Atwater Kent Twin Crystal Detector Type 2A - $95, includes certified mail. Roland Matson, K1OKO, POB 956, Lake Panasoffkee, FL 33538.

FOR SALE: Collins Z70-G2 spkr in VG orig condx w/new Mort Jones grill - $125. Harve Nye, POB 424, Long Creek, OR 97856. (541) 421-3053

FOR SALE: Collins KWM-380 CCA, exc - $2850; Heath SB-300 - $150; amp sply LK-450 - $600. Dan, K8WOZ, TX, (281) 361-3847. k8woz@aol.com

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: Collins repair: FCC Licensed Technician, we repair the Collins Gray Line i.e. S-Line, KWM-2/2A etc. & other select models. Merle, W1GZS, FL, (352) 568-1676

FOR SALE: R-390A Repro nameplates - $9 shpd. N5OFF, 111 Destiny, Lafayette, LA 70506. trinit698idt.net, (318) 989-3430

FOR SALE: R-390A #8817 by EAC on 1967 contract, exc, unmodified, orig condx, includes new cabinet, new matched Jan tube set & NAV ships manual, experience the ultimate Electron Tube rcvr for - $750. Harve Nye, POB 424, Long Creek, OR 97856. (541) 421-3053

FOR SALE: Merchant Marine rcvrs, Mackay 128AY, Radiomarine/RCA AR8506B, AR8510, EH Scott SLRM, any rcvr - $250. Carl Bloom, CA, (714) 639-1679 or 3778111@mcimail.com

FOR SALE: TV-2B/U tube tester in exc orig condx, manufactured 1962, includes spares, manuals & supplements - $375. Harve Nye, POB 424, Long Creek, OR 97856. (541) 421-3053

FOR SALE: Homebrew dummy load; RF ammeter; Ige HV capacitor & resistor, should handle 500 watts. RJ Eastwick, N2AWC, Unit 109 The Commons, 400 N Haddon Ave., Haddonfield, NJ 08033. (609) 429-2477

TONY'S LIST AT LAST!!

Tony Snider has finally compiled his complete list of vintage/military gear.

The list can be accessed at the webpage below. Just click on the button that says "online classified". It has "Marine", "Communications" and "Test Equipment" sections. It will be updated every 2 weeks with new items and people can sign up for a e-mail update right on the page.

http://www.meob.com

WANTED: Hallicrafters Village/Hamlet radios TR-5/TR-20 & Gonset Civil Defense 6m radios/ accessories, manuals also. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Fx/msg (310) 398-7159 or danielc411@aol.com

WANTED: Japanese WW2 Chi 4 radio plugin coils. Yes, Chi 4 not Chi Ichi. Stan, JA1DNQ fwgf84316@tnb.infoweb.or.jp

WANTED: Command sets ART-13's; Collins radios & all accessories top $ paid; most radios repaired reasonable. FCC licensed. W1DEJ, MA, (781) 485-1414 eves, hobfact@tiac.net

WANTED: EV638, 641, 605; Shure 520/707/CR41, CR88, 705; Turner VT-73; Astatic UT-48, JT-30/40, T-3. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225 or tomsmics@flexcomp.com

WANTED: HQ129X S-meter; HQ170 pwr xfmr; UTC S19 mod xfmr, Bob, K6GKU, AZ, (602) 816-0660, CTXP98A@Prodigy.com

WANTED: Drake 4 or 6 kc AM filter and noise blanker for R4C. John Miller, AK7DX/SWL, AK, (907) 337-9168

WANTED: ART-13 Mounting Base MT-284 and dynamotor Mounting Base MT-164. Tony Stalls, K4KYO, (703) 522-1568, bc348@sprintmail.com

WANTED: E.H. Scott Philharmonic rcvr. EA4JL. Contact in the States, Kurt Keller, CT, (203) 431-6850.

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

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. danielc411@aol.com

WANTED: Any military entertainment radio (Morale rcvr), manuals, accessories, or data plates. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. ph/fx (707) 544-5179

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

WANTED: WW II Japanese, German, Italian radios & communication equip for display in intelligence museum. LTC William L. Howard, 219 Harborview Ln., Largo, FL 33770. (813) 585-7756, wlhoward@gte.net

WANTED: Copy of MIL-T-27A spec, RCA, Gates, Langevin B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763, richmix@erols.com

WANTED: RCA 140, 141, AVR5A. GE K80, K80X, K85. Any condx. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. treherne@erols.com

WANTED: Broadcast gear; tube or solid-state, compressors, limiters, equalizers, microphones, consoles, micpreamps, recorders. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax or mstates@polarnet.com

WANTED: National HRO 500 & LF10; Hammarlund SP600-JX21A; Johnson AN/FRT-505. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Drake 1A spkr (1AS) & Kenwood R599 spkr (S599). Pay reasonable price. San, K5YY, AR, (501) 756-5010, weekends only.

WANTED: Front bezel and freq pointer Navy RBO-2 or 1. Keith, KK5FE, 31 Claudia Dr., Covington, LA 70435-9513. (504) 892-4538 kk5fe@communique.net

WANTED: Collins 32W-1 & 30L-1. Paul, DC, (202) 363-8593 res/ 226-1128 work.

WANTED: Schematic and information on Signal Corps tuning indicator I-234. Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612, after 6 PM

FOR SALE: B&W JTEL coil turret - $20; BTCL - $15; Dow-Key dkc-trm-t ,1 kw ant sw - $30; RME MB3 control unit for RME 43/45 - $30; Drake TR-3 - $150; UTC LS-60-A audio xfmr - $50; Johnson T-R switch 250-39 - $75; National MB-40-DL tank assembly - $50; Johnson counter dial 116-208-1, NIB - $50; Johnson directional coupler 250-37 - $30; Johnson SWR bridge 250-24 - $25; Heath electronic keyer HD-1410 - $30; National Velvet vernier dial - $25; National R-175 choke - $20; ARRL 1942 spcl defense edition handbook - $25; QST's 1933-1947 - $4 ea; The Principles Underlying Radio Communication, Signal Corps, US Army 1922 - $40; Radio Operating Q&A, 1932 - $25; ICS Handbook For Radio Operators, 1924 - $50; ICS Telephone And Telegraph Engineer's Handbook, 1912 - $65; Radio Q&A, Nilson 1921 - $40; Radio Communication Laws Of The United States, 1919 - $50; Radio For The Millions, 1945 - $20; Frank C. Jones Antenna Handbook, 1937 - $50. Lots of other tubes & parts, call for your wants. Jerry Fuller, W6JRY, POB 363, Forest Ranch, CA 95942. (530) 343-1131 or jefuller@juno.com

FOR SALE: Viking Valiant, working, w/book - $285; Heath HM-102 SWR/pwr meter - $30; TCS xtals - 5 for $20; Bliley BC-3 xtals - 3 for $15; BC-221 - $12; LM-18 w/plug - $15. U-shp. WA7HDL, ID, (208) 756-4147 after 0030Z.

FOR SALE: HQ-180 in exc condx w/manual - $250 + shpg. Vern Snyder, GA, (770) 307-145

FOR SALE: Collins Radio Engineering Report Reprints, Final Engineering Report on R-389, R390 URR, September 15, 1953, 147 pgs - $20; Cost Reduction Program R390/391URR-Development of the 390A, Feb 20, 1956, 59 pgs - $10. Pete Grave, POB 250, Ottsville, PA 18942-0250.

FOR SALE: National NC200 Silver Anniversary w/matching spkr - $185; NC100 - $135; HRO-50, 3 coils, NW - $195; NC183 - $200; Hallicrafter SX24, no meter - $55; SX42 - $150; SX62A - $125; R46 spkr - $55; RCA ACR 155 recapped - $375; AR77 rack mt - $250; AR88 - $250; CR91 - $275; RME 50 - $200; 69 - $175. Pete, PA, (610) 847-2214 eves.

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: Hallicrafters SR-500 w/spkr & pwr sply - $225; SX-140 & HT-40 - $150; Sideband Engineers SBE-34 - $175; RF Communications RF-301B - $175; Heath HR-1680 & spkr - $125; 400 Hz CW filter - $45; TR-7 filters 2.3 kHz, 1.8 kHz, 300 Hz - $42 ea. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881

Please remember to count the words in your ad and if you're over 20 words send 20 cents for each extra word.

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WAØAKG, NE, (402) 464-8682.

WANTED: Test equipment & tube audio amplifiers. Mike Nowlen, WB4UKB, 2212 Burgee Ct., Reston, VA 20191. mike@3dnet.com

WANTED: McKay Dymek radio literature & info. Gene Peroni, KA6NNR, POB 58003, Philadelphia, PA 19102. (215) 665-6182

WANTED: Collector/builder seeks lge & small vacuum tubes & vacuum tube collections, sockets, etc. Will pay good prices. Please call Marc, OR, (800) 330-2004.

WANTED: Keys - keys - keys - keys - keys - keys - keys - keys - Jim, KØYLW, KS, (785) 364-3989

WANTED: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1, 51S-1; 75S-3A, C 32S-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: TM listing communication equipment, (similar to TM-487H for test equipment). David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4. Canada. (418) 877-1316.

WANTED: Collins R-105A/ARR-15 or 51H3 & manual w/without set. John Snow, W9MHS, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194

WANTED: Manual, schematic, etc., for Mason FG, model 3C rcvr, tunes DC-10 Gig. Bob Bakinowski, 1524 Saint Tropaz, Tucson AZ 85713. (520) 624-8029

WANTED: Modulation & driver xfmer for 250 Watts, multimatch preferred; also 849 tube. Steve Taylor, W6FL, 2030 Sombrero Dr., Los Osos, CA 93402. (805) 528-1604

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: 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: Hallicrafters HT-1, HT-9, HT-31, 5-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attws.com

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: Navy xmtrs: MQ, TCA, TCE, TCN, TCX, TDE; rcvrs: RAW, RAX, RBD, RBJ. Steve Finelli, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211. navrad@enter.net

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265

WANTED: Information-WW2 TCS Radio System: Design, Manufacturing & Operation for article. Any help appreciated. Thanks. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. (707) 523-9122 (message) greg6fzh@aol.com

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. (501) 318-1844, Fx 623-8783, james.true@ibm.net

WANTED: TMC GPT-750, TAC Tuner, GPR-90/92 & GSB-1. Alan Gray, W3BV, PA, (215) 795-0943.

WANTED: Limpanders or other equip by ESECO. Richard P. Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

WANTED: RME VHF 2-11 AM/FM/CW RX for 2, 6, 10 & 11 meters. Jim Eberwine, W4APV, 8118 37th Ave., N, St. Petersburg, FL 33710. (727) 347-0942, let ring at least ten times.

WANTED: Two aluminum instruction plates for CPRC-26 Canadian Manpack radio. Chris Bisaillion, VE3CBK, 1324 Old Carp Rd., Kanata, Ont K2K 1X7 Canada.

WANTED: Bandcoil sets for HRO-50 & HRO-60. Tom Bonomo, K6AD, CA, (650) 578-1897.

WANTED: WW-2 Japanese military radio of any kind. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069 or taka-doi@kk.iij4u.or.jp

WANTED: JW Miller 1709, 1710, 1711 IF xfmrs, 100 kc. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

PURCHASE RADIO SUPPLY

Electric Radio enthusiasts. Tired of antiseptic electronics stores? The answer to this sad condition is a heavy dose of Purchase Radio Supply.
Looking for transmitting and receiving tubes, components, hardware, and publications? You name it, we may have it.

Purchase Radio Supply
327 East Hoover Avenue
Ann Arbor, Michigan 48104

TEL (313) 668-8696
FAX (313) 668-8802
e-mail: purchrad@aol.com

New from **VINTAGE RADIO KIT** for '98
Introducing the CPSTR H.F. Transceiver Kit

CW, AM FONE, FULL QSK, SOLID 5 WATTS OUTPUT
160 THROUGH 40 (30 METERS OPTIONAL)

With a handful of crystals & a headfull of nostalgia, you can still feel the warm glow of old time radio at your finger tips. For more info & spec sheet on the CPTR send for new expanded '98 catalog. Enclose $1.50 or a 9x12 self addressed envelope with $1 for postage & mail to:

VINTAGE RADIO KIT
427 N. Main St. * Sharon, MA 02067
Web site @ http://www.mosinc.com/bry/vintage.htm

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: Drake 2B & 2BQ - $175; National NC-98 - $125; Heath SB-620 - $100. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

FOR SALE: Complete AN/GRR-5 rcvr set in exc operating & cosmetic condx, correct canvas, spares kit, tools, accessories, antenna bag & manual - $400. Harve Nye, POB 424, Long Creek, OR 97856. (541) 421-3053

FOR SALE: HP 330B dist analyzer, HP206A AF generator - $30 ea + shpg. Jim, W8HPL, OH, (740) 927-2592.

FOR SALE: Get the K7FF super-list of amateur parts & stuff via e-mail by request at k7ff@inreach.com

FOR SALE: We still make WD-11 replacements, adapters, tube bases & SW-3 plug-in coil forms. Call for prices. James Fred, 5355 S. 275 W, Cutler, IN 46920. (765) 268-2214

FOR SALE: (2) Heath rcvrs GR81 & AR2, both working, GR81 has book. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373. (937) 339-1546

FREE: Encyclopedia of Amateur Radio Equipment. Hundreds of photos & descriptions spanning over 80 yrs. http://www.aade.com/hampedia/hampedia.htm

FOR SALE/TRADE: Transmitting/Rcvg tubes, new & used - 55¢. LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR TRADE: (2) good RCA 833A's for one Taylor 833A. Also looking for Taylor 803, 813, 875A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR SALE: Johnson Matchbox - $85, $135; Lafayette HA-410 - $145; HE-50A - $125; HE-35 - $50; HQ-150 - $285; HRO-60 - $450; SB200 - $375; HO-10 - $95. Richard Prester, 131 Ridge Rd., W Milford, NJ 07480. (973) 728-2454

FOR SALE: Exc condx GPR-90 & spkr - $700 or trade for complete T-368 del. Phoenix. **WANTED:** PE-73-C dynamotor. W7RBF, AZ., (602) 864-9987.

FOR SALE: Radio Handbook, 10 & 15th edition; ARRL Handbook 1952, 1963, 1968; GE Ham News, hardbound. All - $25 ea. Gary, MN, (612) 496-3794.

FOR SALE: Collins TCS rcvr, looks/works good - $125; Multi-Elmac PMR-6A rcvr, exc - $65; TBS-50C, exc - $75; APS-50 ps - $75. Gary, MN, (612) 496-3794.

FOR SALE: Heath SB301 w/3 filters - $125 + shpg. **WANTED:** Cabinet for RME84. Henry Mohr, W3eNCX, 1005 Wyoming, Allentown, PA 18103.

TRADE: My AN/PPN-2 Eureka Paratroop beacon for your wireless set (Canadian) 29A set. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

FOR SALE: ARC-5 xmtrs. Ken Kolthoff, 8967 Scott Dr., DeSoto, KS 66018. (913) 585-1196 or kkolthoff@gvi.net

FOR SALE: SCR522 VHF radio set, new, unused, includes rcvr BC624, xmtr BC625, pwr sply RA62, cables & control box - $120 or BO. Robert Martin, 111 Bancroft, Rochester, NY 14616. (716) 663-4182

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: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: Books, all electronics related; 200 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. watok@email.msn.com

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

FOR SALE: Our new 54 pg 1999 catalog of WWII military communications items - $3 Sam Hevener, W8KBF, The Signal Corps, 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

FOR SALE: Orig Collins black rubber feet w/ washer - 50¢ ea; dynamotor type 51S1; Hammaulund HQ145C; Hammarlund S-200 spkr; Yaesu rcvr FRG7 w/manual. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: 1 KW broadcast xmtr, Wilkinson AM 1000B, uses 4 ea 4-400 - $550. Dan Mason, POB 3493, Santa Fe, NM 87501. (505) 455-3416

FOR SALE: QST's: Any issue 1930 to date - $6, ppd; Bakelite panels & straightened lengths of #10,#12,#14 tinned wire - SASE for info. Parker, W1YG, 87 Cove Rd, Lyme, CT 06371.

FOR SALE: Boatanchor paints; Heathkit Tech Journal Subscriptions; phone filters - call or write for free catalog. R&R Designs, 202 Midvale, Marshall, WI 53559. (800) 372-4287

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. (248) 391-6660, hires@rust.net

FOR SALE/TRADE: Transmitting/rcvg tubes, new & used - $0.55 LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & lge tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 11015 W. 126th Terr., Overland Park, KS 66213. (913) 782-6455, johnh.walker@alliedsignal.com

FOR TRADE: Two good RCA 833A's for one Taylor 833A; also looking for Taylor 803, 813, 875A. John H. Walker Jr., 11015 W. 126th Terr., Overland Park, KS 66213. (913) 782-6455 or johnh.walker@alliedsignal.com

FOR SALE: Cubic 3030 solid state mil-spec dual HF rcvr 40 kc to 32 MHz, two separate rcvrs in one, exc condx - $1700. Pete, PA, (610) 847-2214, eves.

WANTED: Keyer paddles of all kinds. Cap, WØXC, CO, (970) 247-0088. capallen@frontier.net

WANTED: Manuals (copies OK) for Lysco 381 VFO, Wavetek 134 sweep generator. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (831) 373-7636

WANTED: Hallicrafters S40, S40A or S40B; S76 & SX42. Bill Smitherman, KD4AF, 9401 Hwy 67, E Bend, NC 27018. (336) 699-8699 after 5 pm.

WANTED: Electric Radio; Antique Radio Classifieds; Old Timers Bulletin. Alan Mark, POB 372, Pembroke, MA 02359.

WANTED: National S-101 impedance coupler; SW3 coils; HRO black wrinkle spkrs. I love National. Sylvia Thompson, N1WVJ, 33 Lawton Foster Rd., Hopkinton, RI 02833. (401) 377-4912

WANTED: Collins 310B3; spare 70E8A linear glass scale; Bud JEL coils any band & Chicago 500W CMS-3. Jerry, W8EGD, CO, (303) 979-2323.

WANTED: Heath HW-100 SSB xcvr. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

WANTED: ARC type 12 control units C-44, C-53, C-56, mechanical link cable. David Boardman, 10 Lemaistre, Sainte-Foy, Quebec, G2G 1B4. Canada (418) 877-1316

WANTED: Booster unit for the NAVSHIPS AN/SRT-14 xmtr group. Booster contains the MD-230/SRT Radio Modulator, PP-1096/SRT Power Supply, MT-1423/SRT Mounting Blowers, CY-1573/SRT & CY-1572/SRT Cabinet and CW-341/SRT Cover. Paul Metzger, 10940 Rio Hond Dr., Downey, CA. 90241. (562) 928-4332 KQ6EH@juno.com

WANTED: Tube-type audio amplifiers; Hi-Fi and guitar output transformers & power triodes. **FOR SALE:** ARRL 8th ed & 11th ed handbooks, worn, but complete - $60 ea; Two Hundred Meters & Down 1st (1936), good - $75; Collins antenna coupler CU 168/FRR, good condx - $150/BO. Robt, 24 hr voice mail, LV specific msg, CA, (510) 845-2625

For Sale
Cliff's Collection

Receivers: SP-600JX-21, R-390A, R-390, CV-157 URR SSB adaptor, SX-42 w/spkr, 51S-1 w/spkr, R-388 w/prod detector & hang AGC, HQ-145A w/prod detector, NC-190, HQ-100 w/spkr, S-36A 28-144 mc, Collins 353B 3.1 mech filter adaptor, Rycom 2170 3 kc-200 kc.
Transceiver: KWM-2 w/ps/spkr +NB & xtal pack.
Test equipment: of all types by General Radio, Boonton, Measurements Corp, TEK, HP and others.
Military gear: BC-610E, new condx w/manual and BC-614 speech amp; BC-312H, 1.5-18 mc rcvr; TB-70A junction box; DY-88/GRC-9 dynamotor; PRC-6 handheld xcvr; BC-221D wavemeter; TS-323UR wavemeter, UHF; C847-U radio set.
Misc: blank rack panels, rack cabinets, power supplies, large xfmrs, chokes, capacitors, towers, masting, cable, coax, multi-conductor cable and much more.

Chuck Felton, PO Box 187,
Wheatland, WY 82201.
(307) 322-5858
feltoned@coffey.com

WANTED: North American callbooks 1961-1969. Bob Tapper, K1YJK, CO, (303) 768-9200 or k1yjk@aol.com

MESSAGE: Flyer 198. For details send 2-stamp LSASE to: Olde Tyme Radio Company, 2445 Lyttonsville Rd. Suite 317, Silver Spring, MD 20910. oldetymeradio@juno.com.

FOR SALE: Beautiful BC-610 (T-213), exc electrical and cosmetic condx. Comes with BC-614 speech amp, most coils and tuning units, spare NOS 250TH, spare 100TH, spare 2A3s, spare 3B28s, dow key relay, manual. Pick up only in Rugby, ND - $750 firm. Ron, W8ACR, (701) 776-5492. skipperclan@stellarnet.com

CONVERT YOUR WATTMETER TO READ TRUE PEP FOR LESS THAN $20! The PDC-1 will convert your Average Reading wattmeter to Peak Power! Even works on the Bird 43!
$19.99 postpaid in the USA and Canada
HI-RES COMMUNICATIONS, INC.
8232 Woodview, Clarkston, MI 48348
(248) 391-6660 or hires@rust.net

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

NEW HQ-129X FRONT PANELS
Photo Available
Ron Hankins
555 Seminole Woods Blvd.
Geneva, FL 32732 407-349-9150
rh8421@usa.net
www.bitstorm.net/rh8421/

WANTED: Hallicrafters S-2, S-33, S-35; HT-2, -3, -8, -12 (old series); AC p/s for HT-45; BC-669 or parts; complete BC-729. **Chuck Dachis, WD5EOG, "The Hallicrafters Collector"**, 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

WANTED
WWII MILITARY TELEVISION
Army/Navy SCR, ATJ, ATK, ARK, ARJ, CEK, CRV receivers, cameras, monitor, transmitters, dynamotors. Maurice Schechter, 590 Willis Ave., Williston Park, NY 11596. Ph/FX (516) 294-4416

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

WANTED: Compressor amplifiers & other pro-audio gear: mics, preamps etc-tube or solidstate. Mark Linett, CA, (818) 244-1909.

WANTED: Tube type shortwave converters, preferably pre-war. David L. Muse, 510 Minturn Ave., Hamlet, NC 28345.

WANTED: Western Electric sound reenforcement equipments - mics, amps, tubes, spkrs, horns. Barry Nadel, POB 29303, S.F., CA 94129. (415) 346-3825

WANTED: Filament choke for ground grid linear. David L. Muse, 510 Minturn Ave., Hamlet, NC 28345.

Mil-Spec Communications
R-390, R-390A, R-388 & other mil. receivers
Sales - Service - Manuals - Parts
Box 633, Englewood, FL 34295-0633
941-474-6818, Fax - 941-474-7874
milspec390@aol.com
"Since 1985"

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

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. (541) 923-1013. klakin@aol.com

WANTED: Collins S-line, KWM2A, 30L-1, etc. Mark pays the most for clean gear. WD4AAS, FL, (954) 776-5996 (d), 566-0014 (n).

WANTED: HQ100A or HQ110, HQ145, HQ160; dead HF tube rcvrs, xmtrs. Prefer complete. John KF7OM, NV, (702) 727-8171.

WANTED: National SW-3, model I version 3 (uses 32-32-30 tubes). Dean Showalter, W5PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: To buy or trade military surveillance & countermeasures rcvrs & jammer or related gear 1960 - present. Tony Snider, VA, (757) 721-7129.

WANTED: J Miller Co., Broadcast Band AM tuner model 565. Al Kaiser, W3LEQ, 713 Marlowe Rd, Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: S-meter SM-40 for Hallicrafters S-40. Paul, KU6T, CA, (310) 825-1564 or pkcwang@ee.ucla.edu

WANTED: Pre-war Collins goods; Vibroplex Zephyr bug; McElroy bug; B&W JEL coils; 4CX1000. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688

WANTED: Tuning knobs for a National NC-173, NC-183, NC-109, NC-188; RME 4350; 6900 spkrs. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

WANTED: BC375 or BC191, RBB rcvr. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Swan HF amplifier & 600 & 700 series equip. Ted, NØTTZ, CO, (303) 680-3922 or nøttz@aol.com

WANTED: Military junction box JB-70-A for BC-610-E. Bob Richmond, W8MNQ, 3360 W. Water St., Pt Huron, MI 48060. (810) 984-2439

ELECTRIC RADIO STORE

BACK ISSUES

All back issues are available at $34 per year or $3.25 for individual copies. Buy the entire first 9 years (#1-#108) for $240. This price includes delivery in the U.S. Foreign orders please inquire.

COMPENDIUMS

Collins 75A-4 Modification Compendium- all the factory modification bulletins from Collins Radio Co., all the articles printed in CQ, Ham Radio, QST and ER, 85 pages- $20 plus $3 S&H

Service Modification Compendium for the S-Line, KWM-1/2/2A series - 260 pages - $45 plus $4 S&H

Service Modification Compendium for the KWS-1, 32V and 75A series - 42 pages - $15 plus $3 S&H

T-SHIRTS

The front displays the logo from the cover of ER (the tube outline, Electric Radio, and 'celebrating a bygone era'). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio).The T-shirts are U.S. made by Hanes and come in S-M-L-XL-XXL. The color is just a little lighter than the cover of ER - $15 del. ($16 for XXL)

BOOKS

Vintage Anthology - Book 1 by Dave Ishmael, WA6VVL.....$14.95

The First Fifty Years: A History of the Collins Radio Company and the Collins Divisions of Rockwell International $49.95

Fixing Up Nice Old Radios by Ed Romney.....$24.95

Communications Receivers, The Vacuum Tube Era: 1932-1981 by Raymond S. Moore.....4th Edition $19.95

Oscilloscopes, Selecting and Restoring a Classic by Stan Griffiths.....$19.95

McElroy, world's champion radio telegrapher by Tom French $19.95

The Pocket Guide to Collins Amateur Radio Equipment 1946 to 1980 by Jay H. Miller, KK5IM.....$19.95

Heathkit A Guide to the Amateur Radio Products by Chuck Penson, WA7ZZE.....$24.95

Heath Nostalgia by Terry Perdue, K8TP.....$14.95

Radios By Hallicrafters by Chuck Dachis----------$29.95

Transmitters, Exciters & Power Amplifiers by Raymond S. Moore----------$21.95

The Cathode-Ray Tube, Technology, History and Applications by Peter Keller ------$29.95

Receivers Past and Present, Communications Receivers, 1942-1997, 3rd Edition, by Fred Osterman, ----------$24.95

Hiram Percy Maxim by Alice Clink Schumacher.....$19.95

Please add $3 S&H for one book and $1 for each additional book.

Three or more books shipped free!

ER Parts Unit Directory

If you need a part for a vintage restoration send $2 and an LSASE (.32 postage) for a list of parts units. If you have a parts unit, consider putting it on the list.

ER, 14643 County Road G, Cortez, CO 81321-9575

Subscription Information

Rates Within the U.S.

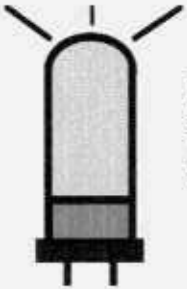
$28 per year 2nd class
$38 per year 1st class, with envelope $42

Canada (by airmail only) - U.S. $42

Other Foreign Countries (by airmail only) - U.S. $54

Electric Radio
14643 County Road G
Cortez, CO 81321-9575

Phone/FAX (970) 564-9185
e-mail: er@frontier.net



ELECTRIC RADIO
14643 County Road G
Cortez, CO 81321-9575

FIRST-CLASS MAIL
U.S. POSTAGE
PAID
MAILED FROM ZIP CODE 81321
PERMIT NO. 23

FIRST CLASS

TO: