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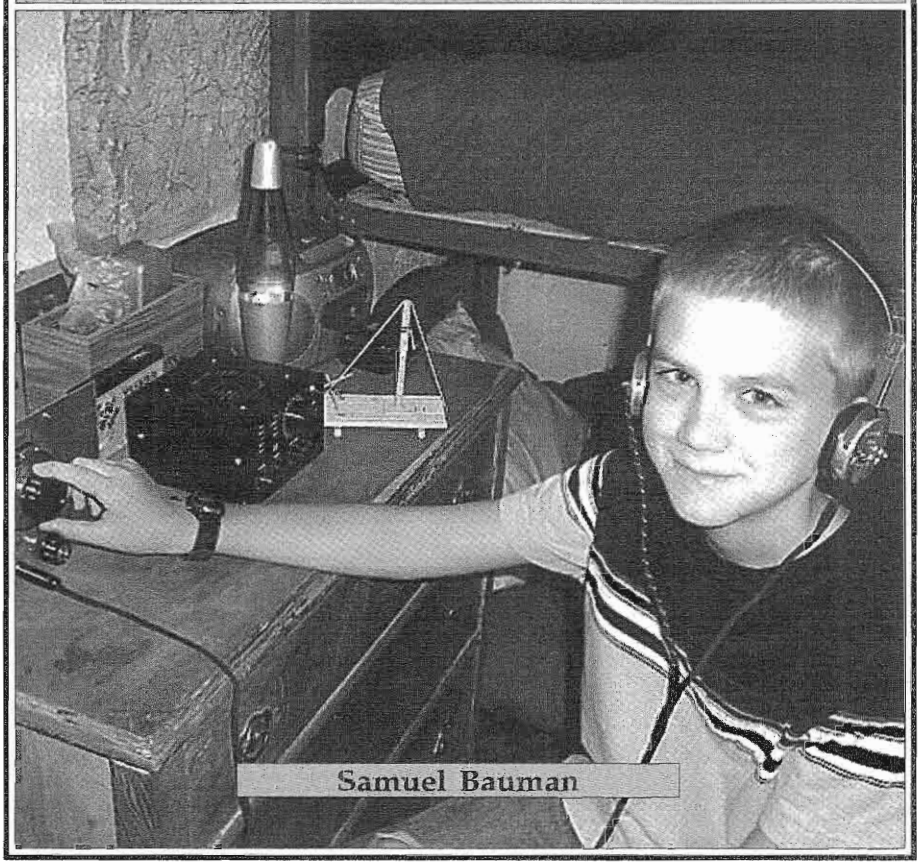
ELECTRIC RADIO

celebrating a bygone era

Number 195 August 2005



ELECTRIC RADIO

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Electric Radio is dedicated to the generations of radio amateurs, experimenters, and engineers who have preceeded us, without whom many features of life, now taken for granted, would not be possible. Founded in May of 1989 by Barry Wiseman (N6CSW), the magazine continues publication for those who appreciate the value of operating vintage equipment and the rich 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 and operating with a primary emphasis on AM, but articles on CW, SSB, and shortwave listening are also needed. Photos of Hams in their radio shacks are always appreciated. We invite those interested in writing for ER to write, email, or call.

Regular contributors include:
Bob Dennison (W2HBE), Chuck Teeters (W4MEW), Jim Hanlon (W8KGI), Tom Marcellino (W3BYM), Bruce Vaughan (NR5Q), Bob Grinder (K7AK), Bill Feldman (N6PY), Dave Gordon-Smith (G3UUR), Dale Gagnon (KW1I), John Hruza (KBØOKU), Brian Harris (WA5UEK), Hal Guretzky (K6DPZ)

Editor's Comments

The Easy Road to Ham Radio

It was bound to happen eventually. On July 19, 2005, the FCC released a Report and Order, WT docket number 05-235. Reading from Part I, Section 3: "Based upon the petitions and comments, we propose to amend our amateur service rules to eliminate the requirement that individuals pass a telegraphy examination in order to qualify for any amateur radio operator license. We believe that this proposal, if adopted, would (1) encourage individuals who are interested in communications technology, or who are able to contribute to the advancement of the radio art, to become amateur radio operators; (2) eliminate a requirement that we believe is now unnecessary and that may discourage amateur service licensees from advancing their skills in the communications and technical phases of amateur radio; and (3) promote more efficient use of the radio spectrum currently allocated to the amateur radio service. We solicit comments on our tentative conclusions. We decline to propose any other changes to amateur radio service licensing or operating privileges in this proceeding."

Personally, I am not in favor of eliminating the Morse requirement for the Amateur Radio Service. Like many operators, I spent many hours at the key getting my code speed up to where I could pass the 20-WPM exam. It is hard to understand why someone may now earn the same operating privledges by merely memorizing questions and answers from the public-domain question pool. I am also not in favor of turning all of the existing CW segments over to other modes of operation.

On the other hand, Hams who came before me had to pass even tougher exams. As I see it, there is an advantage to this new license structure. I would encourage all ER readers who are not currently licensed to get their ticket and join the AM community. Unlike the other modes, there is always something to discuss or a new project to share on the air when one operates AM or restored vintage equipment. There is nothing to prevent a new licensee from learning CW and joining the fun

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Cover: Samuel Bauman is a proud young man who is getting a good start in radio by operating his regenerative receiver that was built as a project with his Dad, John Bauman (KB7NRN). See the Photo Section for more photos of this receiver.

The Rocky Road to Ham Radio

Part Two

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

Mastery is not something that strikes in an instant, like a thunderbolt, but a gathering power that moves steadily through time, like weather. John Gardner (1933-1982), American author

What avenues were open to young people wanting to gain access to Ham radio during the depression years of the 30's? Very few I assure you. In small towns and villages you were pretty much on your own. My nearest Ham lived some thirty miles away. I decided that other than Gernsback publications, my best source would come from Hams themselves. I must listen to the actual QSO's on the bands to learn more about amateur radio. Apparently I was not skillful enough to build a radio capable of bringing in stations with reliability—especially the 160-meter, and 75-meter AM phone bands. Obtaining a workable short wave radio was now my number one priority. With what should I purchase such a set, you say?

Short Wave Craft Magazine—later Radio Craft, was full of dozens of ads for inexpensive kits. Most kits were offered as 'professionally wired and tested' for only $2.50 additional.

This was a tempting offer. I, at least, was honest in appraising my radio building talent.

Many of the radios offered were products of 'Radio Row' in New York City. I was drawn to a radio made by Haynes Radio. They offered a large beautifully built radio for $29.95. I wanted this radio, but there was no way I'd ever come up with that much money. I was really excited when Haynes offered a 'junior' regenerative receiver priced at $17.50. I believe they called the little radio the 'DX-4'. I do remember distinctly that the set used three 6J5 metal tubes, a 6V6G audio output, and an 80 rectifier. It did not have a RF stage. The inexpensive receiver had an enclosed speaker, and electrical band spread. Tuning was accomplished by two 3.5-inch, highly polished, direct drive knobs. The coils, one per band, were wound on tube bases.

I raised the $17.50 by selling off everything I had of value—a $3.00 guitar, a $5.00 Remington rifle, bottles, and assisting a man building sidewalks for ten cents an hour. But, eventually I got the money.

I was pleased with the way the set looked, but could not say much good about its operation. Today, I realize that most of my disappointment was due to my lack of knowledge when it came to tuning regenerative radios.

In 1936, Fred Norcross, owner of the local telephone company, decided that he should invest a little money in R&D. He purchased two Knight 5-meter transceiver kits from Allied Radio. Fred delivered the kits to Otto Grubbs (Grubb's Radio Service) for wiring and testing. I made a general nuisance of myself by standing at Otto's side asking questions.

I remember a few details about the transceiver. The case was about 16" high, by 8" inches square, and all controls were on the top of the radio. It had a leather carrying handle and was tuned by a velvet vernier similar to the SW-3. I believe that the set used only one tube, a #19. Small 45-volt "B" batteries and "D" cells powered the unit, and were installed in a compartment in the bottom of the case. The transceiver used a handset much like a telephone.

We, Otto and I, knew nothing at all

Bruce Vaughan is at the key in 1938, and his new Hallicrafters Sky Buddy (S-19R) does the receiving duties.

about the necessity of matching the radio to its antenna. It came with a small collapsible metal antenna that fit into a receptacle on the top panel. Extended, the antenna was about four feet long. Now, all this is 70 years ago—my memory might play tricks on me. If any readers have knowledge or circuits of this set, I would love to have a copy. I'd build up a couple and give 'em a try—legally of course. By the way, at the time Allied sold this complete kit for about $15.00.

When the two five-meter transceivers were wired up, as I was never over two feet from Otto's elbow, I was picked to test out the radio. At the time our operation was completely illegal—but harmless—the best DX we worked on it was something like two city blocks. I suspect that the range could have approached five miles or more had we known anything at all about what we were doing. I might mention here that less than ten years later Otto received his Amateur Radio license and for fifty years was active with a beautifully built station. He was a master craftsman in metal, wood, and electronics.

That fall I entered High School. I was 14 years old. The most dreaded course in school was General Science, and the instructor, Mr. Mears, was one of the most feared in the school. I remember my first class well. Mr. Mears looked out at the small class of freshmen and asked this question, "what is wind?'

He waited for some response. A young man near the center of the room held up his hand. "Yes," said Mr. Mears, "Please give the class your description of wind."

"Wind is nothing but air in a hurry," said the student. It seemed like a 'smart alec' reply to me. I waited for Mr. Mears to come down hard on the student.

"I think that is a very good description, Mr. Fowler," said Mr. Mears smiling. "Why don't we discuss it a little more?"

My fear of General Science, and of Murphy Mears, dissolved into thin air. Here was a teacher a student could talk to—and talk we did. We covered everything in that class from basic electricity to meteorology. Mr. Mears required three things of every student before they could pass his General Science course—they had to build an electric motor, a radio,

and a simple telegraph set. Once built, each student was required to demonstrate his project before the class, and explain the theory behind its operation.

As poverty was my constant companion, I was always alert to any possible way of making a few dollars. I got out my Allied radio catalog and put together a simple crystal radio kit. My cost for parts was low—I forget the exact cost, but I do remember that the crystal detector and stand cost 12 cents. It seems that I had something like 60 cents in the entire kit counting postage. I drew up diagrams for each set—there were no photo copy machines then. My kits did not contain earphones. We shared the one set of old Brandes phones in the science lab. I sold the kits to practically everyone in class and made about a dollar profit on each kit. Remember, at this time and place many men worked a 50-hour week for ten dollars or less.

My parents were having a much more difficult time financially than I realized. After much discussion they decided to move to Springdale, Arkansas. Then Springdale was a thriving fruit and poultry center with a population of almost 1500.

Dad went to work for the local Chevrolet agency; first as a car salesman, then a short time later as shop foreman. We moved in with my grandparents at Spring Valley, 14 miles east of Springdale. My parents told me it was because they had not found a place to live in Springdale, but I knew better—it was because we were dead broke.

Rural electrification was only a dream at the time. I could not afford batteries so all my radio experiments were put on hold. I rode the school bus to Huntsville, and completed my second year of High School. My parents drove the old Plymouth to Springdale to work while they looked for a suitable (cheap) apartment, and saved enough money for a month's rent. They found one within weeks—three rooms near the downtown area, and the rent was only $12.00 per month.

I remember the apartment well. There were no wall outlets in the room designated as a kitchen. Every room had a twisted, fly speck covered, green electric cord hanging down in the center of each room. Our 'cook stove' was an old electric 'hot plate' sitting on top of a wood stool in the middle of the room. By use of a 'triple socket' we could plug the electric plate into the light socket. To keep warm we had an old 'King Heater.' For those who do not remember the poverty years, a King Heater was a wood heating stove made from very lightweight sheet iron. They put out enough heat to keep you warm, and sold for less than four dollars. Of course their life-span was extremely limited due to the flimsy construction.

I thought I was in heaven. There were six Amateur Radio operators living in Springdale. One, W5GWA, a 14-year old boy, lived only a block and a half from our apartment. Wade held a Class-B license. He told me how he hitchhiked to Kansas City, a distance of over 200 miles, to take his Ham exam. He went up one day, spent the night sleeping in a chair in the bus station, and early next morning walked to the Federal Building for the semi-annual radio exam. After the exam, he walked five miles to the outskirts of the city and caught a ride home with a cross country trucker. His food for the three days was a pocketful of apples. In those pre-war depression years a Ham ticket did not come easy—you earned it.

If you failed the examination you went home and studied, then tried again in six months. Wade told me that the rules allowed those living outside a 100-mile radius of an examining point to take an examination administered by any Class-A Operator. Those choosing this route would be issued a Class-C license. A Class-C license carried all the operating privileges of a Class-B operator. The big difference was that before you could upgrade to a Class-A ticket, you must take the Class-B exam and, of course, pass it.

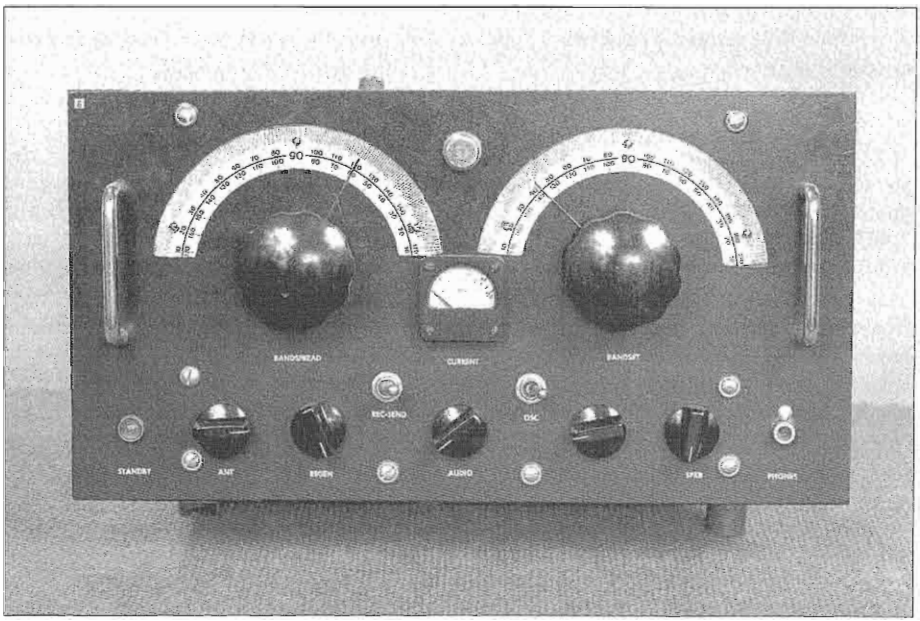
Later, Tulsa, Oklahoma became an examining point offering exams twice yearly thus eliminating the convenience of Class-C examinations in our area.

I got a job sweeping out a doctor's office every day and was paid $1.50 per week. In addition, I managed to get a job delivering groceries every Saturday—I was paid $1.50 for the work—15 hours. We started at 6:30 AM and finished the day at 10.00 PM. Of course, I got off 30 minutes for lunch and another 30 minute break late in the afternoon. I had money for the first time in my life. I was making about $12.00 per month. I decided I could make payments on a new Hallicrafters Sky Buddy. I ordered it from Bob Henry, W9ARA, (Amateur Radio Apparatus) in Butler, Missouri. Of course, I bought it on easy payments—only $2.75 per month.

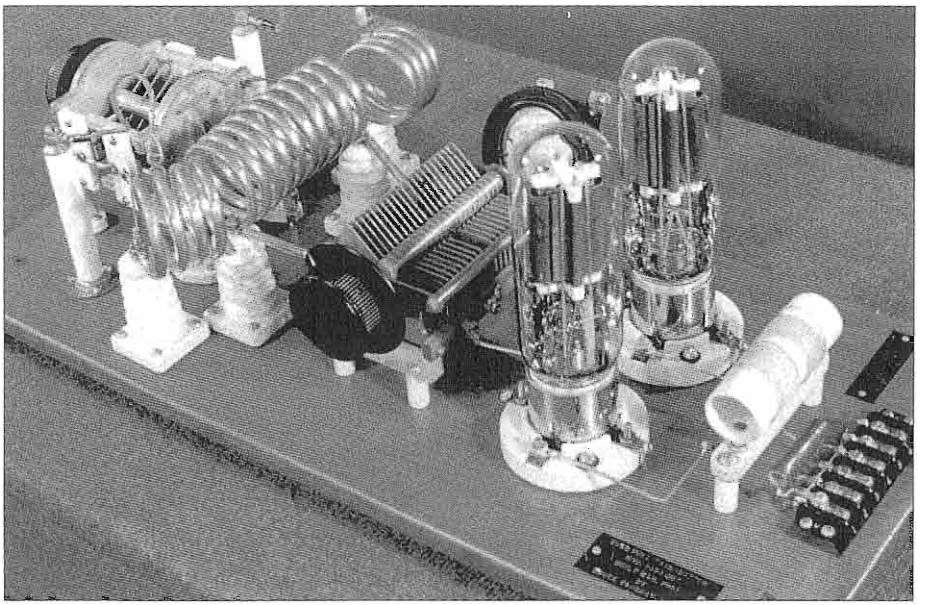
Wade introduced me to Clarence Pults, W5BQI, one of the finest radio builders I have ever known. Married, he had two beautiful little daughters, and worked as an auto mechanic for a man noted for his unpleasant disposition. His boss was also frugal—he paid his mechanics less than $15.00 per week. By the time he paid rent for a cheap apartment or house, paid his utilities, bought groceries, and kept the family healthy, he had absolutely nothing left. Clarence immediately became my 'Elmer.' Any ham problem I encountered could be, and most of time was, solved by Clarence.

I well remember the first time I went to Clarence's house. He was living in a small two room house, on the 'poor' side of the railroad tracks. One room was a combined kitchen, sitting room, and ham shack; the remaining room is where the family slept.

As I entered the living—eating area the Pults family was just finishing their evening meal. My eyes went immediately to Clarence's rig in the corner of the room. On a home built table about three feet wide and perhaps 20 inches deep, was an old Cathedral BC radio, and one of the prettiest transmitters I had ever seen. The rig was a desk type rack and panel job that glistened like a crown



Here is a receiver I built using Clarence's idea of dime store protractors for dial scales. I called it my '38 Special, and is now owned by Joe, WB6ACU.



This is a transmitter typical of the times when I developed an interest in Ham radio. This transmitter appeared on the cover of QST for November 1930. The cover caption called it a TGTP, but as you can see it is a TNT. I built it up as a display piece. It checks out, but no way would I operate it because I'd lose my ticket for sure. The bottles, as are all other parts, are NOS. I forget the number on the tube, but it is a WWII surplus triode of about 50 watts emission, I'd guess. A rig like this would probably operated at about 250 watts. Very lethal to have on the desk!

jewel. I wondered how someone so poverty stricken could come up with such a beautiful rig. As I stood there admiring the transmitter, Clarence began telling me how he had built it.

The rack was made from old bed railings he hauled from the city dump for free. He used the welder at the auto shop where he worked to weld the angle iron into a 19" rack about 30" tall. He constructed the panels and chassis' out of hardboard (Masonite®) obtained free from the junk pile behind a furniture store. At the time, mirrors were often shipped with hardboard packing. It was not unusual to find six to ten sheets behind the store in their dumpster. The power supplies were built on the bottom chassis, the transmitter proper on the center chassis, and all parts for the antenna tuning unit were panel mounted. All chassis and panels were sprayed with black lacquer in the paint shop at the garage where Clarence worked. I don't know how many coats he had used but they looked like black bakelite.

All the parts in the transmitter were salvage from old radios, or made from junk. The only thing he had to buy was a crystal and crystal holder.

The beautiful dials on front of the transmitter really caught my eye. They were 10-cent white protractors with the base cut out. The pointers were 3" long pointer knobs. The transmitter used a 47 crystal oscillator, a 46 buffer, and a pair of 45's in the final. He estimated the power output as 10 to 15 watts. He explained that it was rather difficult to copy CW without a beat oscillator, but Clarence was a good operator, and managed many early-

morning QSO's before he went to work at 7:00 AM.

These work hours I mention in preceding paragraphs may seem a trifle odd today, but during my first years in business after the war, our main street was lined with small shops and stores—all independently owned by local citizens. The town's largest retail store was the Famous Hardware. It employed about 8 people. Most stores were run by the owner and his family—plus one or two employees. Store owners who arrived at their establishment later than 6:30 in the morning were considered lazy. It was the custom for each business owner to sweep out his store, and the sidewalk in front of his store before opening at 7:00 AM. This chore was seldom delegated to an employee. By custom, it was the duty of each store owner to do the sweeping. Strangely enough, the duty of window washing was shared by the owner and his employees.

That evening, Clarence agreed to help me with any technical problem I encountered while studying for my 'ticket.' In those days the written exam consisted of ten essay type questions. Often two or more questions required the candidate for any class license to draw schematics. For example, you might be required to draw a circuit, showing all component values for a Push-Pull, Class C, RF amplifier. Or it could be an easy schematic such as a power supply using full wave rectification and filtered for a receiver.

I remember one question from my class B exam. What is said to exist when the plate capacitor in a crystal oscillator is so adjusted that the plate current is at a minimum? That may not be the exact wording but the correct answer was "Resonance is said to exist."

That fall, I started studying for the exam in earnest. My goal was to be on the air by Christmas of 1938. W9BSP, Marshall Ensor, of Olathe, Kansas, was on the air every night with code practice sessions. His text was always from the ARRL License Manual, and he offered a lot of theory along with his code practice. Running a full kilowatt on 160 meter AM, he reached thousands of listeners—many of us would be forever grateful for his help and encouragement.

Springdale had three dime stores on Emma Avenue—our main street. One store owned by an elderly lady had one employee—Allen Glass. Allen was Springdale's only Class-A license holder. I remember his station well—even though I no longer remember his call. He was on the air with a single type-10 tube in a self-excited oscillator. His receiver was a detector—one step. The antenna was a doublet fed with 600-ohm line. Spreaders for the feeders were the usual wood dowels boiled in paraffin. Allen agreed to give me the class 'C' exam. I told him I would let him know a month before I was ready. He had to order the exam from the FCC, and they moved much slower then than they do today.

Code was never a problem for me. I now had the Sky Buddy, and spent many hours copying QSO's on 40 CW. With the help of Clarence I soon felt comfortable with the written part of the exam. Near the end of October, I told Allen to order the exam from the FCC.

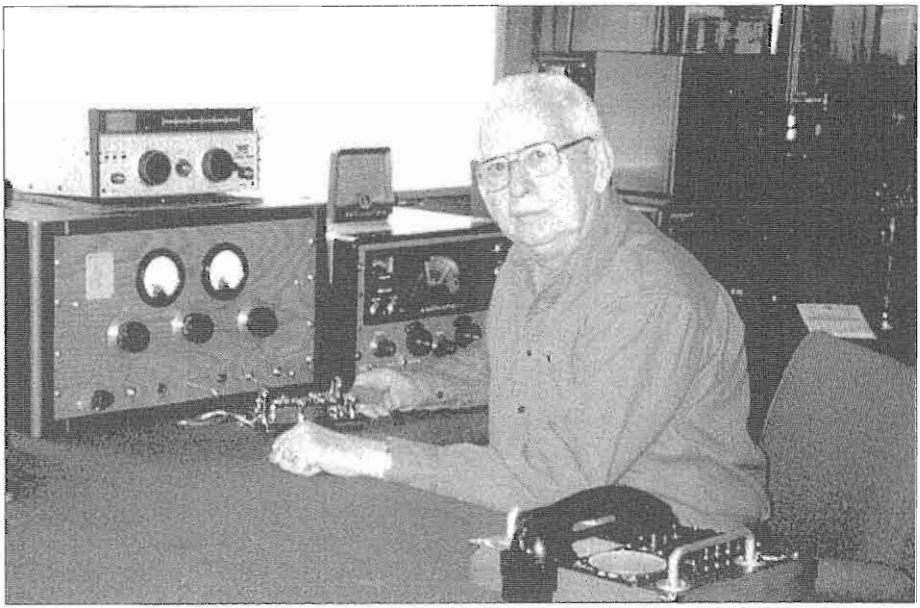
On one of my nightly visits to W5BQI, Wade, W5GWA, accompanied me. When Clarence came to the door with a smile so big I knew something great had happened. With a flourish he waved his hand toward his corner table. The old Cathedral radio had been replaced by a glistening new Sky Champion receiver.

"Now there is a real receiver," he said. "For the first time in my life I have finally worked DX. I had three QSO's before breakfast this morning."

We were both happy for Clarence. He really deserved a good receiver.

Some six weeks later on our regular visit I noticed Clarence looked extremely sad. Then I noticed his receiver missing. "Where's your Champion?" I asked.

"Well, fellows, it's like this. I never



This is a more recent photo of Bruce at his west operating position at NR5Q. Notice that he still uses a Hallicrafters receiver, but he's upgraded to a modern SX-115.

should have bought it in the first place. I got it from Bob Henry, and when the first payment came due I simply did not have the $3.45 payment. The girls needed school clothes, and my wife had a little doctor bill. The family is more important than Ham radio, so I let it go back."

I thought it over that night. I was using the Sky Buddy in preference to my regenerative receiver. I was sure Clarence could make my DX-4 regen work better than his old cathedral BC set.

I walked up to Clarence's the next evening with a plan in mind. I was sure it would turn out well for all concerned.

"Clarence," I said, "I have a proposition to make you. I'll give you my DX-4, if you will help me put together a 40-meter transmitter."

Notice I said '40-meter transmitter'. Back then most of us did not have enough money to think in terms of multi-band operation.

"Sure, I'd be glad to help," replied Clarence.

I'll be brief as I have covered much of this in a previous article. Three weeks later, using parts from both his, and my, junk box we had a rig working. It used a 47 oscillator, and a pair of 45's for the final. These tubes were plentiful back them as they were widely used in early 30's radios. I only had to buy a crystal and holder, and some filter capacitors.

Clarence got back on the air with a modest station, and I prepared my station for the day when I would receive my license. I only had to throw two switches to go from transmit to receive. My antenna change-over switch was a ceramic knife switch from the dime store. It cost twenty-five cents. Every day I'd tune up the rig using a 6-volt taillight bulb and a loop of wire. I was thrilled at how brightly the bulb glowed—I even burned out one when I got the loop too close to the tank coil.

One cold winter Sunday about 2:00 PM, Allen knocked on our front door. I answered the door. "I have your exam papers," he said, "Are you ready to take the exam?"

"I think so," I replied, "Let's get it over with."

The first thing Allen had me do was turn on the Sky Buddy and tune in a 40-meter QSO. "Get a pencil and write down that QSO," He said.

I copied CW for perhaps five minutes—Allen was standing behind me reading what I was writing.

"Turn the receiver off," Allen said, "You have passed the CW part of your exam."

As we sat beside the old King Heater wood stove I completed the written exam. Allen looked the paper over. "I cannot tell you if you passed or failed. I cannot grade your exam. However I will tell you this much—I'd be getting my rig in order if I were you. I feel you will be on the air soon."

I waited, impatiently, for the exam results to arrive. One day in December, I could wait no longer. Wade had urging me to use his call, and try out the rig. I arrived home from school about 3:45. My parents were both working and would not be home until after 6:00 that evening. I tuned up the rig and checked the 40 meter band. Not much activity. I decided to call just one CQ. I nervously sent CQ a few times, and signed my friends call, W5GWA.

I started at the low end of the band, and tuned upward. My lone crystal was cut for 7209 kc. There it was—a reply. The station calling me was W5HHR. I panicked—I had not planned on this. I was shaking so badly that I could hardly send CW. I did give a report and QTH, and kicked it back to W5HHR. I will never know what he sent I was too excited to copy CW. I did reply when he stood by and then for some reason—panic I suppose—I just pulled the big switch.

A few days later, near Christmas day, my ticket arrived. At last I was on the air legally, and a real, legally licensed, Amateur Radio Operator. Yes, the road was rocky. Yes, it was a long hard haul, but now 67 years later I feel it was worth the ride. I am still at it, though I do a lot more building than operating. Some day when I can no longer stand at the bench perhaps I can get back to chasing DX once again. **ER**

NR5Q in 2005

The AM Broadcast Transmitter Log

Part 2, The Collins 20-V Series

By David Kuraner, K2DK
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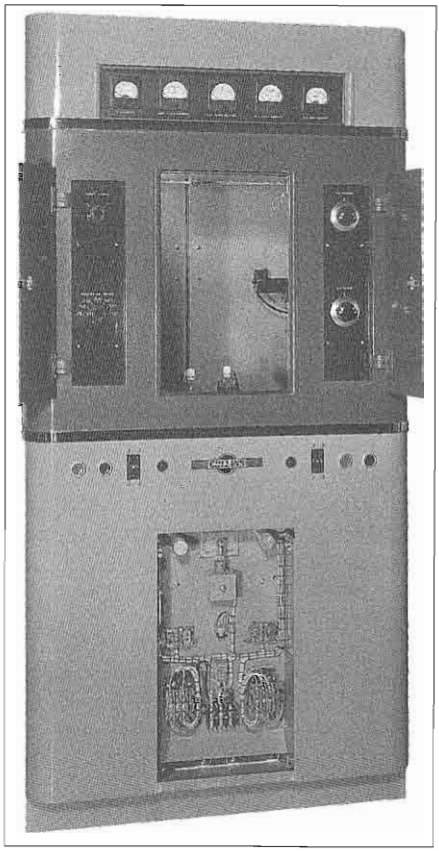
This series of broadcast transmitter articles will now be going into the specifics of some individual transmitters. The two that I have are the Collins 20V-2 and the Bauer 707. They will be used as examples to show the different schemes and approaches toward the objective. The 20-V series is considered by many to be the premium 1-kW rig of its era (1950s to early1960s) and one of the more commonly available transmitters. The Bauer is most unique in that it was sold as a kit. Yes, it's the broadcasting response to Heathkits! The parts were shipped and the station engineer was to build it. Then, a factory technician would arrive and get it fired up and checked out. The Bauer really is well built, and is easy to work on and modify.

Tuning the Collins 20-V Series to 160 Meters

Once all the components are set for the high end of the broadcast band, ***disable the high voltage*** by removing the plate connections on the high-voltage rectifiers. Remove the modulator tubes, as screen voltage without plate voltage is going to be present. Now, the tuned circuits for the buffer and driver stages should easily peak with maximum final-amplifier grid current. Once done, shut the rig down and replace the plate caps and modulator tubes. (When using an amateur crystal, you will have to rewire the transmitter's crystal socket or fashion an adapter for correct pin-outs.)

Going to the back, remove the compartment cover for the final tank circuit. Locate the large horizontal coil (L108) in the middle. Set the tap nearest to you at 13 turns from the front end. Set the tap furthest from you for 11 turns from the far end. On the smaller vertically mounted coil (L109), select the third tap from the top. No taps are selected at the bottom. You may need to move taps just a bit for perfection. But, here is where the rig should tune up for 1885 kc. Do your initial tests at low power. Switching to high power should not need retuning.

There are two things to consider in this



Collins 20-V broadcast transmitter, from a factory promotional photo supplied thru the courtesy of Jay Miller, KK5IM.

process. Of utmost importance, remember that the high voltage of a DX-100 can kill. The three thousand volts in the 20V and similar rigs is 50% greater than they used in the electric chair. ***Just make sure that those power supply capacitors are discharged and that the transmitter is disconnected from primary power.*** I use a clothes dryer power cord into a 30-amp wall receptacle. In addition to killing the circuit breaker at the panel, I also pull the plug. I want the rig to be dead — not me!

The second thing is, don't trust those old meters. After decades of use and storage they are probably not accurate and may be way off. I read 3000 volts at 240 mils and measured 800 watts of carrier. If your math skills have deteriorated and you don't have a calculator handy, that's 720 input yielding 110% efficiency. The thing gives more out than you put in! Get the point; don't trust these old meters.

Now, if you wish to explore the possibility of other bands for this beautiful rig, I suggest a visit to the W9AD web site and click on the link to WØVMC. Robert has pictures showing how he bandswitched the buffer and driver stages and brought out tuning controls. The conversion to 1885 kc was provided by Phil Galasso, K2PG. Thank you Phil! It would not have gone as smoothly without your guidance.

Controlling the Collins 20-V Series

Here is where we must do some construction of a control box. I elected to used an existing 24-volt DC power supply to control some relays I mounted at the remote-control terminals inside the transmitter, and a coaxial T/R relay on the top of the cabinet near the output terminal. All relays are 24 volt DC except for the coaxial relay. It operates on 12 volts.

The power supply sits on the operating desk. The panel has its power-on switch, transmit PTT switch, and red and green LED status indictors for transmit or standby. Internally, a small relay is used for muting the receiver. At the rear are RCA jacks for an external PTT switch and the receiver-muting circuit.

With the supply powered up, the remote relay used for starting the filaments is energized. When the PTT line is grounded, the antenna relay activates first. This relay has two additional contracts. One set, when closed, permits the remote plate relay with the 24-volt coil to close. The transmitter's high voltage (HV) is now commanded on. This way, there is both a fail safe for the antenna switchover and a delay in raising the plate voltage. The second set of contacts provides the status voltage to the control box's LEDs.

One of the pitfalls of the 20-V series is that the power output does not go off instantly when the HV is shut down. Instead, the HV discharges through the tubes as well as the power supply bleeder resistors. To prevent the receiver from being barbequed, an electrolytic of about 5000µf is placed in the antenna relay coil's circuit to hold it closed for about 1 second. This circuit keeps the receiver muted as well.

Many broadcast transmitter control circuits (referred to as a "control ladder") are designed so that a momentary switch latchs a control relay closed. Then, the actual contactor for the primary of the power transformer activates. The plate-off control is a normally-closed momentary switch which opens to shut down the high voltage. This is for several reasons. It is compatible with protective interlock switches on the cabinet doors and it necessitates an actual plate-on command in the event of an overload. My original design thoughts were to duplicate this method via the 24-VDC relays. I decided against that in favor of the simpler switch-up power on, switch-down power off scheme.

20-V Control Schematic

Referring to the 20-V control circuitry schematic, **Figure 1** on page 12, here is what was done. Find terminal block E-

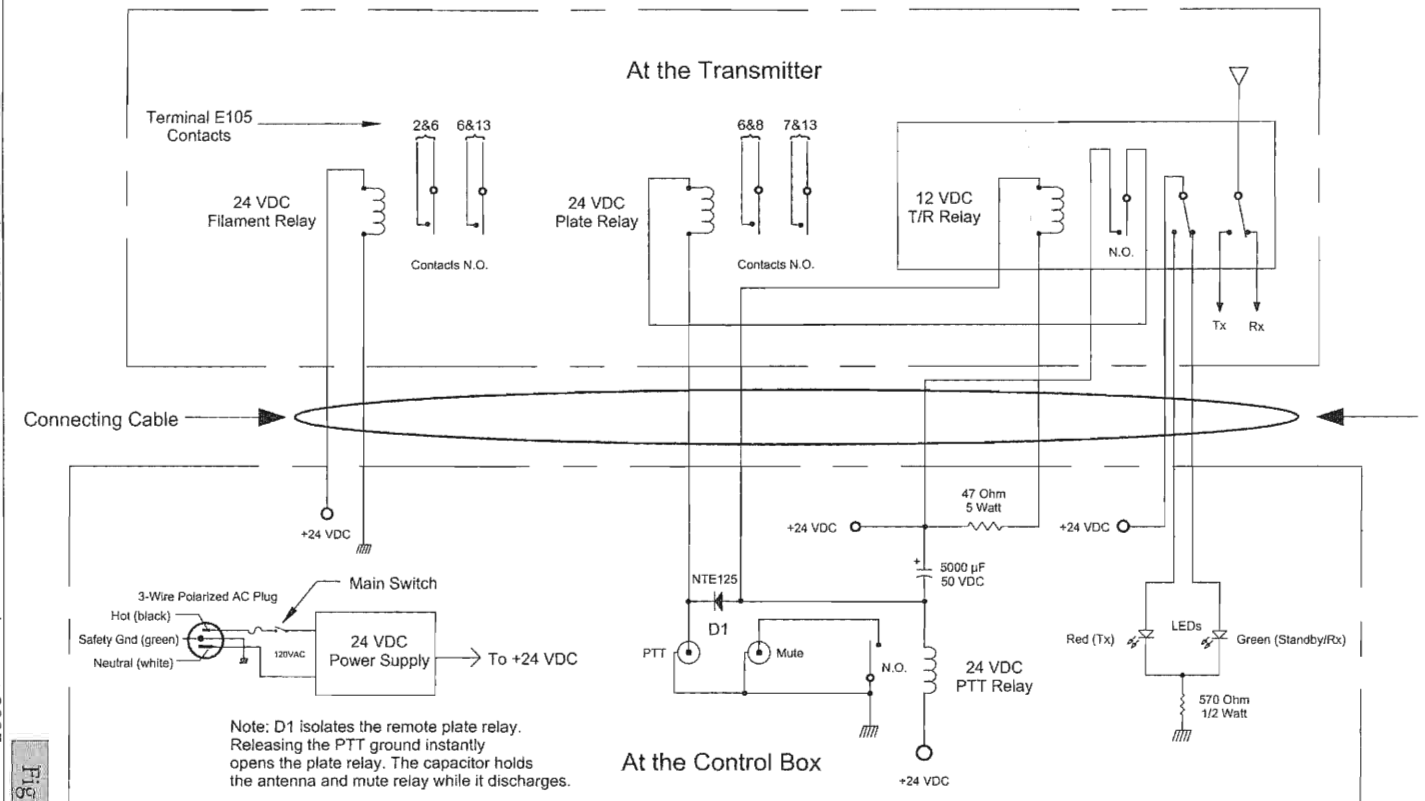


Figure 1

Collins 20-V Control Circuitry K2DK, August 2005

A classic Collins 20-V that is currently under restoration in Colorado at KØOJ.

105 (no suffix) that is located on the bottom-left side of the cabinet, and wire the new relay contacts to E105 as follows:

Filament On: Terminals 2 & 6 momentary contacts (normally open) — to the normally open relay contacts that have been added,

Filament Off: Terminals 6 & 13 momentary contact (normally closed) — to normally open relay contacts,

Plate On: Terminals 6 & 8 momentary contacts (normally open)— to normally open relay contacts,

Plate Off: Terminals 7 & 13 momentary contacts (normally closed) — to normally open relay contacts.

The scheme commands a constant normally-off for both filament and plate circuits and retains the protection of the interlocking switches. Some overload protection is lost, but after the transmitter's relays cycle with an overload I'm in the room at the switch to shut everything down. When it happens, it gets your attention and you do react very quickly. Thus far only an antenna mismatch has caused an overload and my hand was on the PTT switch at the time.

There are as many approaches to control as there are transmitters. The 24-volt relays in the transmitter can be made to operate as momentary contacts. You may need this if the rig is in the garage and you are not. The control schematic shown in **Figure 1** has performed well for over three years. A momentary closure system control will be featured in an upcoming issue.

The Maintenance Log

Indicator bulbs (type 10S6) for the 20V are 220 VAC, and the florescent bulb are readily available at Home Depot, Lowes etc. The 20V's front panel circuit breakers may still be available at Newark Electronics but they will be pricy. A standard distribution breaker panel could probably be used with some modification. I found something that would work in a hamfest junk box. Look around at "festers" because that critical part may be buried just out of sight and can be had for pennies.

Again, we invite you to share your knowledge and experience with these majestic rigs.

73, Dave, K2DK

Tale of a 3-Tube, Swap Meet, Homebrew Radio Part 1

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ER #187, December 2004 has an article by Don Meadows (N6DM) on the 1944 "Little Giant" radio built from plans published by Popular Mechanics magazine. Well, here is possibly another Popular Mechanics radio as its circuit may well have been copied from Popular Mechanics Radio Plans set No. R-219. It is a regenerative set with three metal tubes like the R-219 and most likely the same circuit as the R-219. However, my radio is a scratch-built homebrew purchased at a Ham radio swap meet this past December. My only reference to the real R-219 is my 1936 Allied Radio catalog where it appears on page 118 as a complete parts and plans kit under the Allied stock No. H8912. The only apparent differences between the homebrew I bought and the Popular Mechanics / Allied version are the substitution of a 6SJ7 for a 6J7, a National 180-degree dial for a Croname 270-degree dial and a different physical layout. The set is an example of a classic receiver circuit architecture that has been copied over and over so many times in as many different versions as there are people to think them up. It features a 6K7 RF amplifier, a 6SJ7 electron coupled Hartley regenerative detector, a 6F6 audio amplifier, and plug-in coils wound on old 4-pin tube bases. It came with a separate power supply with a 6X5GT rectifier that was built inside a vintage 1920s B-battery eliminator case from which the original parts had been removed.

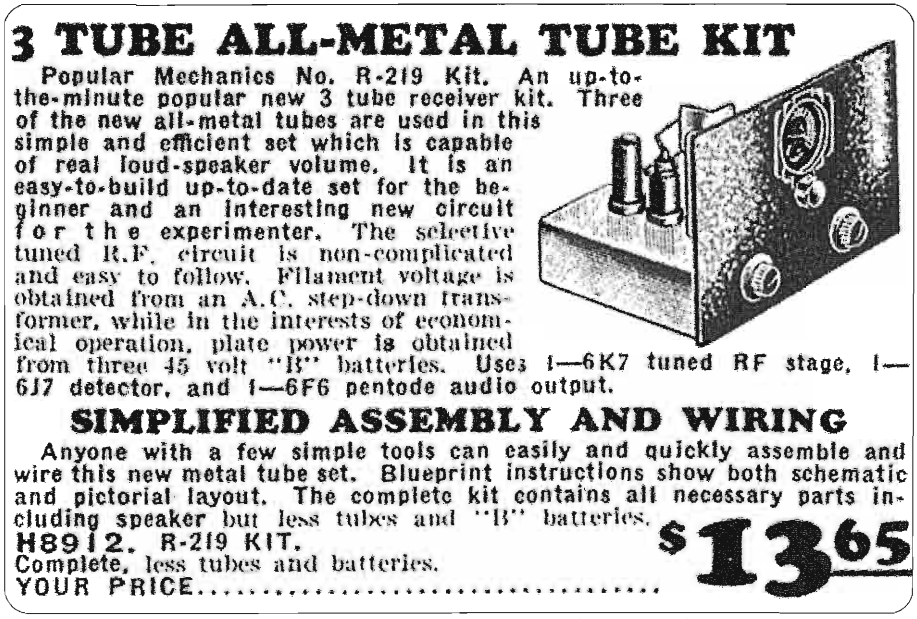

Figure 1: Popular Mechanics R-219 receiver kit as shown in the 1936 Allied Radio catalog.

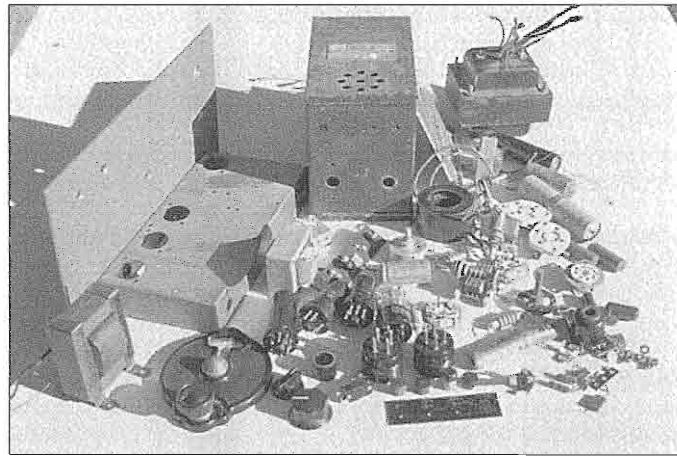

Figure 2, right: Parts as removed from the swap meet radio prior to their refurbishment.

I was tempted to immediately put this one on the old variac and isolation transformer and slowly bring it up to speed. However, upon bringing it home and getting a closer inspection of the set, I was discouraged from trying this. Instead, I decided to completely rebuild it. That is, to carefully disassemble it, restore its good components to like-new condition, substitute new components where needed and then rebuild it in a different physical form that is a compromise between the original set and the Popular Mechanics R-219 set. During the disassembly process, I made a wire-by-wire, component-by-component sketch of the wiring as I went along, and then reduced this to a schematic diagram for use in the rebuild phase. I believe this is called reverse engineering. My specific reasons for taking this approach rather than using the set as-is or restoring it to working condition in its original physical form are detailed in Part 2 of this article. Suffice it to say here that I had no complaints regarding its electrical design and take no credit for design originality in the minor circuit changes I made in the rebuild. My main reasons for rebuilding centered on its mechanical design, poor workmanship and defective parts which, in some instances, presented possible electric shock and fire safety hazards. These factors alone might indicate just junking the set. However, the classic nature of its circuit plus the set's inclusion of so many nice '30s vintage components cried out for a rebuild with the safety issues corrected and, hopefully, better quality workmanship. Since I had no idea I would be writing this article when I started this project, I failed to take a picture of the set as bought. However I did take a picture of the collection of parts that came out of the set after I decided to rebuild it. The rebuilt receiver differs from the original in four ways as described below.

Design and Symmetry

The receiver, as bought, was an example of non-design as exemplified by its somewhat haphazard asymmetrical panel layout due in part to the use of an undersized prepunched chassis and oversized panel that were originally meant for some other uses. I redesigned the receiver with a smaller, symmetrical panel layout similar to the Popular Mechanics R-219 kit radio. Part of this process was the addition of an RF Gain control. This does have some operating value when compared to the original situation where the only control over receiver gain was the regeneration control. See "Circuit Changes" below [page 16] for further explanation. Unlike the R-219 set, my receiver had an On/Standby switch and the phone jack on the front panel. These, together with the regeneration control, comprised an odd number of auxiliary items on the front panel resulting in asymmetry. This could be corrected, as it was in the Popular Mechanics set, by putting the phone jack on the back of the

chassis, or alternatively by eliminating the On/Standby switch. However, I decided to keep these items on the front panel as in the original homebrew and add an RF Gain control to balance them out for symmetry and for better circuit operation.

Parts Substitution

I could have rebuilt this receiver with the all of the original parts except for the defective ones. However, I chose to make certain substitutions as follows:

- Modern ceramic disk and Mylar capacitors were replaced by tested vintage paper capacitors, just to keep all parts from the same time period.
- Modern control knobs were replaced by knobs shown in late 1930s catalogs and ARRL handbooks, again to use all parts from the same time period.
- Hammarlund straight-line capacity, 180-degree variable capacitors that came with the set were replaced by National straight-line frequency, 270-degree units for better band spread. I'll use the Hammarlunds on another project.
- A completely new chassis and shield plate were fabricated. The original set's chassis was a pre-punched unit apparently originally meant for some sort of 4-tube radio or intercom set and had a form factor inappropriate for this receiver. The shield plate also had an incorrect form factor and was crudely made.

Parts Refurbishment

After disassembling the set, nearly all of the old parts needed some treatment to bring them up to near-new condition.

- Tube and coil sockets were desoldered, and then cleaned first by sloshing in a jar of lacquer thinner, then scrubbing with Comet™ cleanser, then rinsing under hot running water, and finally blow drying with compressed air. Also, rust was scrapped off of some spots on the sockets that had metal mounting flanges and then these spots were covered with a light coat of clear nail polish which is basically perfumed nitrocellulose airplane dope.
- Plug-in coils were cleaned inside and out with Q-tips under hot running water and then blow dried with compressed air. Loose windings were pushed back into place and secured with clear nail polish.
- Audio and filter chokes, transformers, large resistors and capacitors were cleaned off with paper towels and/or Q-tips dipped in lacquer thinner.
- Nickel plated parts were polished with metal polish.
- The original front panel was cut to a new, smaller size, extraneous holes were filled with metal filler compound, and then it was repainted.
- Electrolytic capacitors were reformed and measured to ensure that capacity and leakage were within limits on my surplus Navy ZM-11B/U RLC bridge. Incidentally, the ZM-11 is one nifty and versatile piece of test gear. It was made by Clough-Brengle in 1952 and whenever I turn it on, even after long periods of non-use, it always works.
- All paper and mica capacitors and resistors were checked to ensure that their values had not drifted out of limits. Where needed, these items were replaced with good vintage units from my junk box. Some body-end-dot resistors from which the paint had flaked off were cleaned with lacquer thinner and repainted with enamel intended for plastic model airplanes. I have a set of tiny bottles of this paint with the colors of the electronic color code.

Circuit changes

Before starting the rebuild, I looked up articles on other homebrew sets of this general kind with an eye toward benefiting from the experience of others (see the references at the end of this article). As a result of this search, I made some minor changes in component values. Also, I made changes to the RF amplifier stage and regeneration control. For these changes, I copied the relevant circuits shown in the referenced RCA Tube Manuals. In previous regenerative sets I've built, I've found it useful to have some sort of gain control besides the

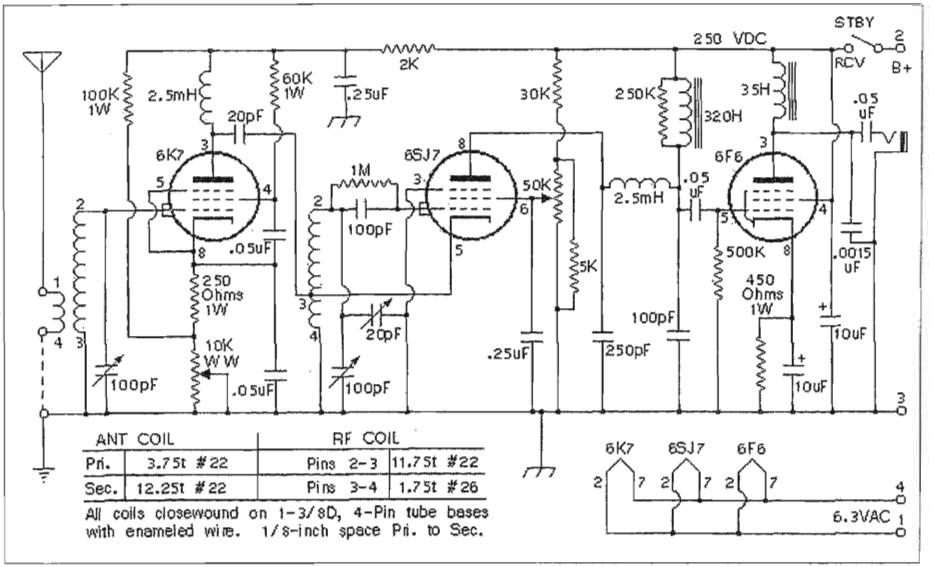

Figure 3: Schematic diagram of the rebuilt set.

regeneration control. Without this, and only the regeneration control to lower gain on strong stations, the selectivity is lowered along the gain reduction, and the detector can't be operated at maximum efficiency. The RCA Tube Manual circuits include the desired RF gain control. Another approach is shown in the referenced "Jones" Radio Handbook.

Power Supply

As of this writing, I have not attempted to rebuild the power supply. Eventually, I will make one using the often-used trick of back-to-back filament transformers to develop both heater and B+ voltages. Such a setup should easily fit in the B-battery eliminator case that came with my set and should be useful for other projects as well. The transformer that came with my homebrew was hopelessly oversized (probably liberated from an 8-tube BC set) and will be saved for another, more appropriate project. In the mean time, I am using my trusty Heathkit PS-4 regulated power supply.

Planning the Rebuild

I have found that, even for the simplest 1-tuber, and whether the chassis is wood or metal, the most efficient way to get the job done and start operating a scratch-built homebrew is to plan out the whole thing ahead of time so that there's *no need for inventing while building*. After being satisfied with the final configuration of the schematic diagram, I set up the major components on a piece of 1/4-inch ruled quad paper that represents the top of the chassis. The 3-tuber's major components are the two coil sockets, the three tube sockets, the three variable capacitors and the audio choke. Then some coordination with the front panel was required. This was simple in this set but in more complicated sets it may be useful to use cardboard mockups as described by our friendly editor on page 38 of ER #187, December 2004. In any case, the basic idea was to arrange the parts as required to get the shortest possible grid and plate leads, and provide physical isolation between circuits that were likely to interact with unwanted feedback. After making an approximately full-sized rough sketch of the resulting arrangement, I flipped the paper over and then, while looking through it from the back with the help of some back lighting, I made another rough sketch

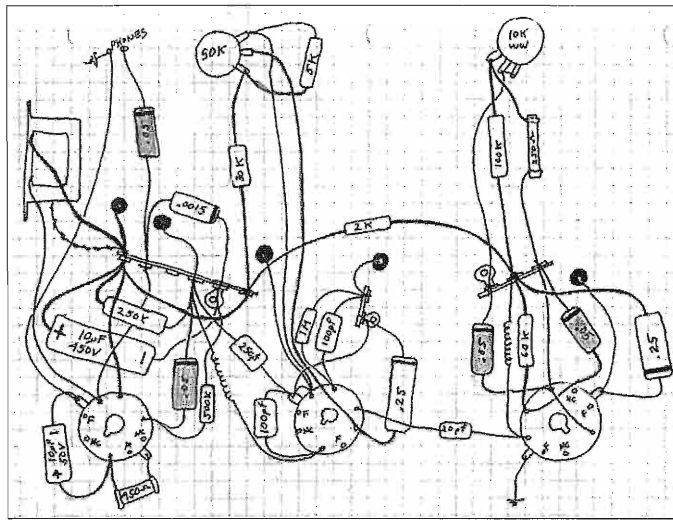

Figure 4, right: Under-chassis wiring diagram. Obvious wiring such as heater supply, standby switch, antenna and ext. ground not shown. showing the parts as they would be seen from underneath the chassis. When doing this, it's necessary to make sure that you have the index pins on the tube sockets torqued around to their proper positions. It's easy to make a mistake here (I did) as everything will be backwards from the way it is on the top of the chassis. With the pin positions of all the sockets and other component terminals sketched in and using the schematic diagram as a guide, I proceeded to draw in every single wire, resistor, capacitor, etc. to make a Heathkit-like wiring diagram. Throughout this process, I found all the mistakes I would have made if I had started soldering before planning and consequently made at least as much use of the eraser as the pencil. It's so much easier to erase and redraw than to have to unsolder and then resolder the real parts. Actually, rather than using pencil and eraser for these trial and error sketches, I use different colored ballpoint pens (black for the parts and ground wires, green for grid wires, blue for plate wires, red for B+, etc.) and Bic™ quick-drying whiteout, which is a brand of typing correction fluid. This process reveals all the places where terminal strips may be required due to too many leads converging on a single tube socket pin or an otherwise unsupported junction of several leads such as the B+ bus. It also reveals how the bypass capacitors must be arranged in order to have all the bypasses, for any given stage, converge on a single grounding point which is usually the cathode or cathode ground return of that stage.

Dimensioned Drawings

With the wiring problem solved, I then made serious full-sized and fully dimensioned mechanical drawings showing a top view of the chassis, its front and back sides, a front view of the panel and a side view of the shield plate. These were not drawn to any industry standard and would definitely get no better than a C-grade from my very strict, high school mechanical drawing teacher. However they contained all the information I needed to know to fabricate the parts including all dimensions, hole sizes and locations, bend lines, etc. I established the center lines of the chassis and panel and located the side-to-side positions of all controls, socket holes, etc. with respect to these center lines. Their front-to-back positions on the top of the chassis were located with respect to the faying line between the front of the chassis and the panel. The vertical positions of holes on the panel and on the front and back sides of the chassis were located with respect to the bottom edges of these parts. These procedures ensured that the parts would fit together correctly after

fabrication, assuming I didn't make a mistake.

Getting Started with the Construction

To start the chassis fabrication, I used my sheet metal shear to cut out a blank rectangular piece of .050-inch thick aluminum. I made the blank slightly larger than its finished size (add two times the finished height to its respective length and width dimensions plus a little extra) and then sanded both sides with a 5-inch random-orbit sander using 150-grit sand paper. Since this aluminum came from a scrap yard it required considerable sanding to remove corrosion and scratches. The random orbit sander makes a pattern on the aluminum's surface that is attractive and also leaves it ready for paint or chemical treatment. For the 1/8-inch thick front panel of my 3-tube regen, I had to resort to the old hacksaw and filing routine on this part because my sheet metal shear cannot handle thicknesses over 1/16-inch. Actually, I found that my wood-cutting band saw easily cuts through this thick material though I don't recommend it for thinner material without some sort of sacrificial backup material such as quarter-inch hardboard under it. Without this backup material, the band saw blade will tend to bend and distort the thinner material rather than cut cleanly through it. I cut down the original panel to a size slightly larger than the desired final dimensions and then filed down all the edges to their final scribed dimension lines. Blanking out the only other sheet metal part on this set, the shield plate between the RF amplifier and the detector, was done using the procedure described for the chassis except here there were only two quarter-inch flanges to be accounted for rather than four sides. The final step in preparing these parts for layout is coating one side of each with layout dye. This is a special kind of lacquer that sticks to metal, won't flake when lines are scribed in it, and washes off easily with a paper towel dipped in lacquer thinner. I've found it most convenient to do the layout on the underside of the chassis and on the front of the front panel. Therefore, these are the only surfaces that need to be coated with layout dye.

Layout

This step consists of using the dimensions from the mechanical drawing to scribe lines on the parts that show all outside edges, bend lines and hole center points. The front panel was pretty simple and requires no further explanation other than to scribe a vertical center line between the left and right sides. This line is the baseline for establishing all hole locations in the sideways direction. The bottom edge of the panel is used as the baseline for establishing all hole locations in the vertical direction. The chassis layout is more complicated than the panel layout because one must make allowances for the expansion of the material at the bend lines after bending. The following procedures are written as a set of instructions to myself that you also may find helpful. For making the measurements, I used the 20ths scale on an engineer's triangular ruler. This is very convenient since one division on this scale is equal to the .050-inch thickness of the material.

Locating the Finished Edges of the Chassis Blank

Scribe two lines that represent the finished edges of any two adjoining sides of the blank. To locate lines representing the finished edges of the sides of the blank that are opposite the first two lines, and using the width or side-to-side dimension of the chassis as an example, add the full width of the finished chassis to two times the full height of the finished chassis and subtract two times the thickness of the material for each sharp 90-degree bend. For my receiver, the finished width is 8-3/4 inches, the height is 1-5/8 inch, the material is .050 inch thick, and there is a bend for each of the two sides. At this point, it's convenient to convert to decimals. Thus; 8.75" + 2(1.625") – 2(0.050") x 2 = 11.80". Make

a similar calculation for the depth or front-to-back dimension of the chassis blank. For my receiver the finished depth is 6-5/8 inches. Thus: 6.625 + 2(1.625) - 2[2(.05)] = 9.675.

There are more complicated formulas for these bend allowances in industry. However, subtracting just two times the material thickness from the finished dimensions for each sharp right-angle bend, as was done above, is good enough for the thin material used in amateur work.

Locating the Bend Lines

The bend lines will be located by measuring inward, from each edge established above, a distance equal to the chassis height minus one material thickness. Thus; 1.625" – .050" = 1.575 inches. Scribe lines parallel to all four edges at this distance from each of them.

Establishing the Base Lines for Locating the Chassis Holes

Decide which side of the chassis is going to be the front. If there is a side that has deep scratches or other imperfections, use this side for the front as it will be hidden when attached to the front panel. The bend line for this side will be the base line for locating holes in the front-to-back direction on the top of the chassis. However *you must subtract one material thickness from each hole-locating dimension measured from this line* to account for the difference in locations between the under-chassis bend line and the actual location of the front of the chassis after bending. Next, find the side-to-side center of the chassis blank and scribe a line from front edge to back edge. The centers of the various holes on the chassis top and its front and back sides will be located left and right of this line by the exact distances shown on the mechanical drawing. Use the lines representing the finished front and back edges of the chassis blank as baselines for establishing the vertical distances of all holes on the front and back sides of the chassis. You now have all the baselines necessary for locating the two-dimensional position of each hole to be punched, drilled or filed out of the chassis blank.

Locate and Center Punch the Holes

Use the mechanical drawing to locate each hole, and remember that you are working on the underside of the chassis so everything will be reversed from the top view in the mechanical drawing. With the chassis blank resting on a hard surface, center punch the center of each hole except for the holes used for the screws that fasten the tube sockets to the chassis. For these, wait till you have punched the socket hole and then, using the socket itself as a guide with the socket inserted in the hole, scribe and center punch these holes. This trick also applies to other components that have mounting holes which may have manufacturing tolerances of their own.

Fabrication

With all the layout work done (it wasn't that hard) proceed as follows.

- Shear off the excess material around the edges of the blank at the scribed lines that represent the finished outside edges of the chassis blank.
- Punch, drill, or file all remaining holes on the top and sides of the chassis blank and debur them.
- Now comes the one tedious job that is left. The chassis blank will require square cutouts in each of its four corners before the sides can be folded up. Professionally, this would be done with four quick strokes of the handle on a corner notching machine. For the rest of us, cut out these square corner pieces slightly undersized with a small hacksaw such as a Nickelson "Little Nick"™ and then carefully file down to the scribed lines that outline the finished sizes of the corners on the chassis blank.
- If using a press-brake, just center any given bend line directly under the fingers of the brake and press. If using a bending brake, the fingers of the brake should be moved back and tightened in position one material thickness back from the front edge of the brake's working

table. Then place the blank under the fingers with the scribed bend line directly even with the front edge of the fingers. Then operate the brake.

• After all holes have been made and the sides have been bent, wash off all the layout dye with a paper towel dipped in lacquer thinner.

• Give the chassis top and sides a final going over with the random orbit sander to clear up any scratches that may have occurred during the layout and fabrication.

• Prepare the chassis for chemical treatment by dipping in, or brushing on, a cleaning solution such as Alumiprep™ No. 33 or Metal Prep™ No. 79. Then rinse it under running water. Wear Nitril disposable gloves when doing this and the next and final step.

• Dip in, or brush on, Alodine™ No. 1001 for a clear brightened finish, or Alodine™ No. 1201 for a gold colored finish. Then give a final rinse under running water. Follow the instructions that come with these preparation and finishing materials. These materials are available from Aircraft Spruce and Specialty Co. (www.aircraftspruce.com) or other aircraft supply houses.

Painting

The original R-219 Kit from Allied Radio probably had an unpainted, zinc-plated steel chassis and panel, but with black wrinkle paint on the front side of the panel. My radio, as bought, also had the chassis unpainted but the front panel was finished with gray wrinkle paint. I decided to finish my rebuilt panel this same way because the gray paint makes a nice contrast with the black bakelite knobs and dial. Before painting, I placed round Avery™ labels over certain holes where I wanted to keep paint out of these holes and from their peripheries to ensure good electrical grounding of controls when mounted in these holes. I then masked the back of the panel with masking tape and a piece of cardboard and placed it on a small wooden block resting on a place on the garage floor that I had protected with old newspapers. This setup allowed spraying the edges of the panel as well as its front surface without getting overspray on the panel back or the floor. For the actual spray painting, I just follow the directions on the spray can for whatever paint I'm using. Now comes *the hardest part of the whole project* which is *having the patience to let the paint dry* thoroughly while that panel is just begging to have its controls mounted on it and be fastened to the chassis. I helped the drying process by placing the panel under a 100-watt lamp overnight. In the mean time, I started mounting parts on the chassis.

Labels

Labeling the various controls of a simple set like this is optional, but is definitely recommended for more complicated sets such as the famous HBR series of receivers featured in QST (see http://www.qsl.net/k5bcq/HBR/hbr.html on the web). Labeling is also a definite plus if you intend to enter your set in a homebrew radio contest. I use DATA MARK™ dry transfer (rub-down) labels. After applying them, I cover them with a protective coat of DATACOAT™ No. 04176. Just follow the directions that come with these materials. I bought these materials over-the-counter from Orvac Electronics (www.orvac.com). For labeling component reference designations on the chassis of a more complicated receiver, some people use Dymo™ tape labels. However, I prefer to write them with block letters in India ink, and then protect them with a dab of clear nail polish or lacquer.

Assembly

Mounting the front panel, the shield plate and all the major components on the chassis is the fun part. When completed, you will have for the first time something that looks like a real radio and the tendency is to sit back and admire your work. OK, but keep going, there's still more to do.

Wiring and Soldering

This should go quickly if you made an

Figure 5: Front view of the rebuilt receiver.

under-chassis wiring diagram as described in "Planning the Rebuild" above. Since this is not a mobile unit, let alone an aircraft or spacecraft, there is no need to wrap wire leads around each solder lug for protection against vibration. Just poke them through the holes in the lugs a short distance and then cut off their loose ends with a pair of flush-cutting diagonal pliers fairly close to the solder joint after soldering. At this point I would offer my own opinion about the well-meaning and endlessly repeated myth about heating solder joints with the soldering iron before applying solder. This is meant to preclude cold solder joints, but it's also a good way to ruin components. The idea is to bring the solder joint up to solder-melting temperature quickly before the heat from the soldering iron flows down component leads into the components and ruins them. The quickest way to do this is to get some melted solder flowing around the solder joint while holding the iron against the joint. The solder will then quickly adhere to the joint creating the filleted appearance of a well wetted joint rather than the bubbled appearance of a cold joint. If the solder does not create nice fillets around the component leads and solder tabs, it is most likely due to insufficient cleaning of corrosion from them rather than insufficient heat. The best way to ensure that the soldering job goes quickly and doesn't get hung up on some irritating joint that just won't take the solder, is to make sure that all parts are cleaned of corrosion, even before assembling them on the chassis.

The Smoke Test

Nothing unusual to report here. With a final check of the wiring done and antenna, phones and power supply connected, I slowly cranked up the voltage on the Heathkit power supply. Signals became audible at 50 volts and just got louder on up to the design voltage of 250 volts where there was 50 mA total B+ current and no smoke.

Performance

The tuning range turned out to be 5 to 10 MHz, as confirmed by strong WWV signals at both ends of the dial. 40-meter CW and SSB signals came in from all over the western U. S. as well as all the

usual high-power international broadcasters and utility stations within this tuning range—this was on a 20-foot indoor wire antenna and no ground connection. At first, there was a persistent high-frequency whistle (I'm guessing at about 4 kHz) with the regeneration control set at any point above where the detector breaks into oscillation. This whistle did not change pitch with any changes in control settings, was unrelated to tuning and remained even at zero beat. I suspected feedback between the RF stage and the detector, so I pulled the 6K7 RF amplifier tube. Signals still came through but weaker and the whistle remained, proving that the problem was in the detector itself. Changing the value of the grid leak resistor from its initial value of 3 Meg to 1 Meg solved the problem, though I still don't understand why. I'm not convinced that the grid leak resistor and capacitor are optimized yet. The RF gain control works perfectly and I'm glad I put it in. It's especially helpful when the detector is running flat out to demodulate strong local sideband signals or when it would otherwise be necessary to back down on the regen control on strong AM stations. However, the regeneration control is a bit sensitive, so some changes could be made there. I'd really like to hear from anyone with more information on the real Popular Mechanics R-219 receiver.

References

"3 Tube All-Metal Tube Kit" (Popular Mechanics No. R-219 Kit). Allied Radio catalog, 1936, Pp. 118.

J
ones, F. "Continuous Coverage T.R.F. Receiver", (6K7, 6J7, 6C5). The 'Radio' Handbook, 1938, Pp. 140.

Staff. "TRF with Metal Tubes" (6K7, 6J7, 6D5). Shortwave & Television, June 1937, Pp. 90.

Birdwell, J. W. "The Hamset Receiver" (6J7, 6K7, 6K7, 6F6). Radio, April 1936, Pp. 40.

RCA Mfg. Co. Inc. "Non-Radiating Regenerative Short-Wave Receiver" (6K7, 6K7, 6C5, 6F6). RCA Tube Manual No. RC-13, 1937, Pp.182.

Hayward, E.E. "A Receiver for Flat Purses." QST, June 1954, Pp. 34. The circuit of this receiver appears to have been copied directly from the above referenced RCA Tube Manual No. RC-13. It has an innovative approach to shielding involving tomato cans.

Broderson, L. V. "And Now, a Portable Receiver" (6J7, 6C5). Radio, June 1938, Pp. 24.

Lewis, D. "Build this Beginner's 2-Tube All-Wave Set" (6J7, 6F6). Radio-Craft, June 1936, Pp. 733.

Borst, J. M. "The Radio Beginner, Part 6, Two-Tube Regenerative Tuner" 6K7, 6J7). Radio News, October 1936, Pp. 212
Middelton, D. A. "Portable C-W Equipment for 3.5, 7 and 14 Mc" (6K7 or 6J7, 6J5 or 6C5). CQ, October 1946, Pp. 23.

Bowman, H. A. and Goddard, W.A. "The Amateur Newcomer, Receiver theory and construction of a two-tube regenerative receiver" (6J7, 6J5). CQ, December 1947, Pp. 31.

Grammer, G. "A Low-Cost Single Signal Receiver". QST, October 1938, Pp. 14. While this article is about a superhet with a couple of regenerative stages, it contains many useful tips on layout and wiring practice, and regenerative circuit operation. It uses metal tubes, and its panel layout is similar to the layout I chose for my rebuilt set.

[Editor's Note: Mike continues next month with Part 2.]

ER

Highlights of February 2005 Classic Exchange "CX" and Changes for the September 2005 Event

By J. D. "Mac" MacAulay, WQ8U
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The February 2005 CX continued the battle for top score between W8KGI, Jim, and N6KN, Rocco. Jim won this time with a record score of 26,356,096 edging out Rocco by using more and older classic rigs even though Rocco had more QSOs. A demonstration that age is superior to activity? W7ID, Jeff, was a solid third with his 16 transmitter-receiver pairs followed closely by K2TOP, the only CX team entry, again displaying its multitude of Navy-origin rigs as well as homebrew gear. If you operated CX, you probably had at least one QSO with each of these four – they seemed to be active everywhere and all the time – guess that's how you finish with high scores. Other high scorers included K9VKY, N2AK, W7FOX, K4CHE, K4JYS, NZ0T, WB2AWQ, WQ8U, W8TM, and W7DRA. Honorable mention goes to N2LO with his S-19 Sky Buddy and homebrew 6L6 rig and to KU4AF, John, running a homebrew 6V6 transmitter and a 1-tube regen receiver; not high scores but lots of fun.

Some of the many really classic transmitters heard on the air were:
Meissner 150-B and several Signal Shifters,
Harvey-Wells TBS-50 C & D
WRL Globe King, Globe Chief, and Globe Scout
Lakeshore Phasemaster 2B
Central Electronics CE-100V
Lettine 240
Lysco 600
B&W 5100B and 6100
Elmac AF-67 and AF-68
Gonset Commander
Johnson Desk KW, Valiant, Ranger, Viking I & II and Navigator
Hallicrafters FPM-200, HT-32, HT-37, SR-150, and SR-400A
Heathkit AT-1, DX-40, DX-60, DX-100, HW-16, HW-100, SB-301/401, SB-303
Drake T-4-X/A/B/C
Collins KWS-1, 32V2, 32V3, 32S-1, ART-13
Command Sets T21/ARC-5, T19/ARC5, BC-696, CBY 52209
BC-610.

The receivers were of similar age and diversity including:
National FB-7, SW-3, HRO Sr., HRO-50&60, NC-57, NC-101X, NC-173, NC-183, NC-200, NC-303
Knight R-100A
Collins R-388, R-390A, 75A-1/2/3/4, 75S-3, and 51J-4
Hallicrafters S-19 Sky Buddy (1939), S-38C, SX-28, SX-43, SX-71, S-76, SX-115,
Drake 1A, 2B, R4-A/B/C
Hammarlund HQ-129-X, HQ-170, HQ-180, SP-600
RME-69
BC-453, BC-454, and BC-348.

Among the more interesting combinations were W7DRA, Mike's, 80-meter ARC-5 VFO into an AF-67 driving three parallel 805s and his 40-meter ARC-5 VFO driving a Globe Chief 90 driving a 304TH. Perennial CXer WB2AWQ, Howie, was a big signal with his 1929 push-pull Hartley running a pair of 211s (90 watts) teamed with an HRO and a 1934 Doerle twinplex regen receiver. K4JYS, Bill, was on with a 1929 TNT (31 watts) running 10 CX QSOs.

Probably the most unusual CX call and QTH was WW2LST, which is on a restored WWII LST ship. AA4RM, Marty, and W8AU, Perry, operated an SB-102 with the antenna clamped to a 40mm AA gun tub and a TCS with a 24 foot wire antenna.

Aside from RTTY QRM, the February CX was a lot of fun with many folks

hauling good old Classic rigs out from under the bench and filling the airways with memory stimulating signals. The Grand Order of Melodic Chirp was awarded to K4EJQ, W0VLZ, WQ8U, and W7ID. (No "OO" postcards were reported.)

For full details see the February 2005 Newsletter on the CX website at http://qsl.asti.com/CX.

September 2005 CX

Several significant changes have been made for the next CX. First, the CX will be held on two Sundays: September 25th for AM and SSB, and on October 2nd for CW. This should allow more concentrated operating making it easier to find other CXers. The second change is the inclusion of 6meters and 2 meters. There are many classic VHF rigs out there so this should add a lot of fun. Third, the scoring has been simplified! Scoring will now consist of multiplying the number of complete QSOs times the age of gear you used in each mode. Complete QSOs will include the same information as in past CXs: name, QTH, RST, transmitter type, and receiver type. Hopefully this will keep the tradition of CX in bringing out classic gear and providing a venue to enjoy it.

The full announcement is shown below on this page, and is posted on the CX website, http://qsl.asti.com/CX.

Fall 2005 Classic Exchange "CX"

September 25, 2005 – AM and SSB

October 2, 2005 – CW

Operating on

160 – 80 – 40 – 20 – 15 – 10 – 6 – 2

The CX is a no-pressure contest celebrating the older commercial and homebrew equipment that was the pride and joy of ham shacks many decades ago. The object is to encourage restoration, operation and enjoyment of this older "Classic" equipment. See the CX website for history, rogues gallery and recent contest newsletters: http://qsl.asti.com/CX.

This Fall CX will be conducted on two successive Sundays.

The first will again be held concurrently with the *AM International AM Discovery Weekend* to encourage more participation in both events as well as addressing the desire for more CX operating time. The AM Discovery Weekend brings many classic AM transmitters on the air and raises the awareness of the presence and fun of AM. Also, there are many "Classic" old SSB rigs, such as the Central Electronics 20A and Hallicrafters HT-30 that would be fun to hear back on the air again. By restricting CX to AM and SSB the first Sunday, we will avoid the RTTY contest QRM in the CW bands.

The second Sunday will be CW only.

There will be CX recognition for high scores in AM, SSB and CW as well as overall. Additionally, there will be special honors for all getting into CX with Classic 6 and 2 meter rigs, e.g. Bandmaster, Heath Lunchbox, Gonset Commu-

nicator and Johnson 6N2.

You need not operate a Classic rig to participate in the CX. YOU MAY USE ANY RIG in the contest although new gear is a distinct scoring disadvantage. You can still work the "great ones" with modern equipment.

WHEN - WHERE - WHAT

The first CX Sunday will run from 1300 UTC September 25th to 0700 UTC September 26th (9 AM Eastern Time on Sunday to 3 AM Eastern Time Monday)

Phone: Call "CQ Classic Exchange"

The second CX Sunday will run from 1300 UTC October 2nd to 0700 UTC October 3rd (9 AM Eastern Time on Sunday to 3 AM Eastern Time Monday)

CW: Send "CQ CX"

SUGGESTED FREQUENCIES

AM: 1.890 3.880 7.290 14.286 21.420 29.000 50.300 144.300 Mc.

SSB: 1.855 3.870 7.280 14.270 21.370 28.390 50.125 144.200 Mc.

CW: 1.815 3.545 7.045 14.045 21.135 28.050 50.100 144.100 Mc.

Exchange your name, RST, QTH (state US, province for Canada, country for DX), receiver and transmitter type (homebrew: send final amp tube or transistor type), AMI number if available (AM only) and other interesting conversation.

The same station may be worked with different equipment combinations, on each band, and in each mode for score.

Only direct QSOs, no repeater contacts for score.

Non-participating stations may be worked for score.

SCORING

Calculate your score for each mode (AM, SSB, CW) and total those scores for your overall CX score.

For each mode, multiply total number of **complete QSOs** (all bands) by your **CX multiplier**.

A complete QSO includes successful exchange of name, QTH (state or country), RS(T), type of transmitter and type of receiver.

CX Multiplier: Total age in years old of all receivers and transmitters you used in that mode.

Each receiver and transmitter must be used in **a minimum of three complete QSOs** to be counted in the multiplier.

If the equipment is homebrew, score it as a minimum of 25 years old unless actual construction date or date of its construction article (in the case of a 'reproduction") is older. Transceivers score as separate receivers and transmitters of equal age.

Certificates and appropriate memorabilia are awarded every now and then for the highest score, the longest DX, exotic equipment, best excuses and other unusual achievements.

Send logs, comments, anecdotes, pictures, etc. to J.D. "Mac" Mac Aulay, WQ8U at WQ8U@ARRL.COM or by mail to:

WQ8U
104 W. Queen Street
Hillsborough, NC 27278

The CX Newsletter and announcement of next CX will be posted on http://qsl.asti.com/CX.

ER

A Quick and Easy Audio Monitor

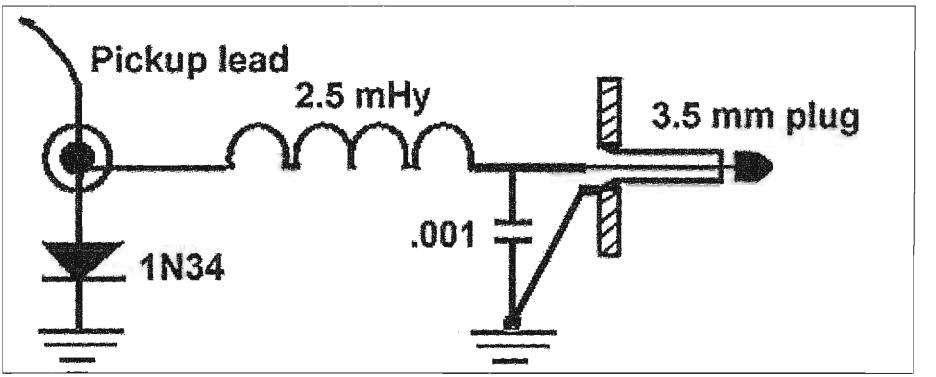
By Breckinridge S. Smith, K4CHE
104 Brookfield Drive
Dover, DE 19901

We have all tried monitoring our transmitter audio using a receiver and a pair of head phones, awkward at best and you will always hear hum because of the over loading of the receiver and its interaction with the AC mains. I have tried asking my wife to monitor the audio with a receiver from another part of the house but she always says the same thing, "It sounds pretty bad." I love my wife.

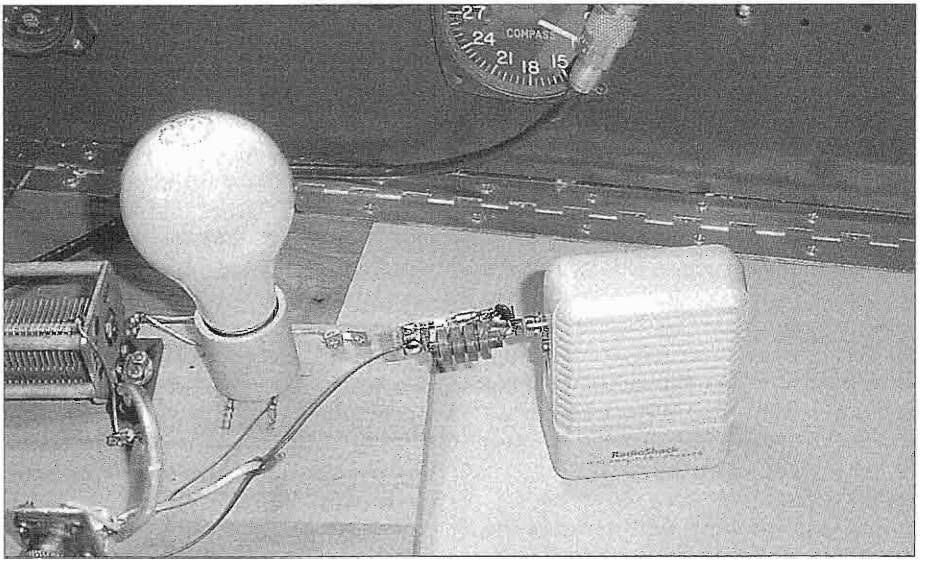
The main problem with some of the previous published audio monitor circuits is that to pick up the RF you needed a special pickup coil or circuit and then you needed to build an amplifier for the sampled RF.

I have developed an aversion in the last several years to building any circuits that involve using those little itty-bitty jobby-dos that have the three tiny leads. I needed a foolproof and tested plug-and-play circuit that was already constructed. This circuit required a lot of gain and should be self powered, small, and have an internal battery. Then I remembered Radio Shack's "Mini Audio Amplifier," a compact amplifier-speaker combination, part number 277-1008. This little box contains everything including its own speaker and it is battery powered.

The Radio Shack amplifier/speaker combination specifications call for an input sensitivity of 1 mV and a whopping output of 200 mW into a 16-ohm load with a low distortion figure. It is small and easily fits into the palm of your hand. Small is good, there is less chance of RF



Above: The simple schematic of my simple audio monitor pickup circuit.
Below: Parts placement of the completed pickup unit, the lead is on the right.



sneaking into the circuit through the "back door." These Radio Shack amplifiers seem to be immune to RF. They can be used as a mic preamp, but there is a lot of gain. If you use this little amp for testing vacuum tube circuits then you will need to use an isolation capacitor.

The basic circuit is simple; a 15-inch piece of insulated wire to pick up the RF and a diode. Feed this into the Radio Shack amplifier and you have an instant monitor with a built-in speaker. I later added an RF choke and a bypass cap just in case, but the circuit worked fine without these components. A variable pot really is not needed as you can vary the amount of RF picked up by placement of the antenna. As far as I know, the first published use of a miniature diode with axial leads (1N34) to detect RF for audio monitoring was published in QST's "Hints and Kinks" in 1950 by W2PFU[1].

Placing the 15 inch "antenna" near a dummy load light bulb produces more than enough audio, see photo above. You can position the antenna near the transmitter RF section with the ***usual safety precautions***. Construction of the diode detector assembly was accomplished on a small single-sided PC board and soldered to a standard 3.5 mm plug, fitting the RS amplifier. A Dremel® tool or razor blade can be used to make the pads on the PC board. You can use the internal speaker or plug in a set of your kid's CD player headphones into the amplifier's external-speaker jack. If the headphones have a stereo plug, only push in the plug part of the way.

Now you can quickly check that new microphone or your audio levels using the best piece of test equipment available, your own hearing.

References:

1. "How's My Modulation Indicator", Dallas T. Hurd, W2PFU, Hints and Kinks, QST, 10/1950, p. 67.

2. "How's my Modulation Indicator," Dallas T. Hurd, W2PFU, Hints and Kinks, Volume Six, 1960, p. 53.

3. "Using the Heathkit AM-2 Reflected Power Meter as a Modulation Monitor," Emil P. Sulkosky, K1HSR, Hints and Kinks, QST, 3/1959, p. 54.

4."TX-Rx Audio Monitor," Tom Marcellino, W3BYM, Electric Radio, 8/2001, issue #147, p. 11.

5."Workbench Audio Monitor," Tom Marcellino, W3BYM, Electric Radio, 6/2004, issue #181, p. 27. **ER**

This is a Hobby, Not a Business

Making SX-101A Reproduction Tuning Knobs

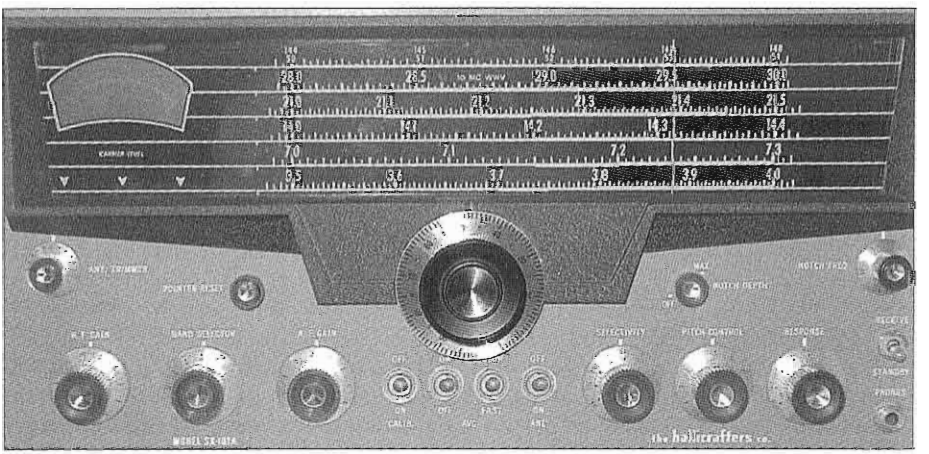
By Mike Langston, KL7CD
1933 Diamond Ridge Dr.
Carrollton, Tx 75010

Like most of you reading this article, I was first licensed when amateur radio equipment used tubes. That was 1962 and I was 14 years old. By 1978, I was on the cutting edge of solid state technology when I purchased an Icom 701 and sold my entire station of boat anchors to a couple of young hams in Anchorage, Alaska.

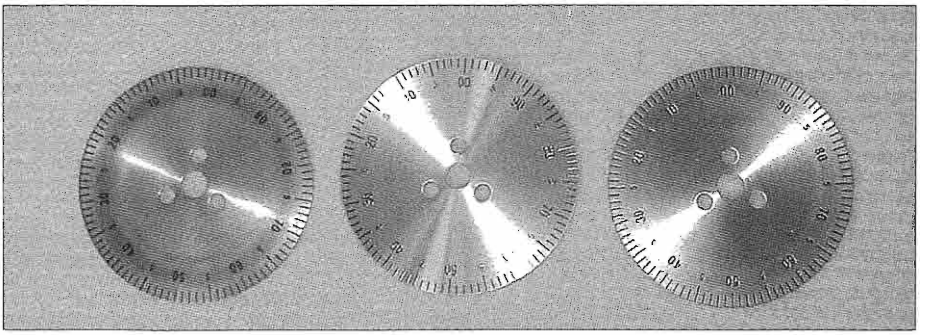
About 3 years ago, the boat anchor bug bit me and I began buying some of the gear that was popular when I first entered the hobby (trying to reacquire my youth, I suppose). This included a nice Hallicrafters SX-101A with one problem; the main tuning knob had a big chunk out of it. After getting the 101A operating like it should, I spent the next year trying to get an original main tuning knob. I tried all the usual commercial parts sources, advertised on the Hallicrafters web site and watched Ebay without even a hint of anyone who might part with one of these knobs. In fact, I found I was not the only person out there looking for one. These knobs were indeed made of 100% pure "unobtainium". In early January, 2004, I began thinking about having a plastic reproduction knob made.

My first contact was Larry Bordonaro at Old Time Replications[1]. I sent him some pictures of the knob and his first reaction was that yes, he could make a plastic reproduction but it would not include the metal inlay because he did not do metal work. Also, he would need a perfect original knob (with the metal inlay removed) to use for making the molds. I figured the metal inlay could be re-used from the old broken knob so that wasn't a show-stopper. But where could I find a perfect original?

I got on the Hallicrafters email reflector and put out an APB for a good original to be used for making a mold. I even offered a cash deposit to guarantee the safe return of the original. Marshall Dues, WB5MYO responded by shipping me his knob with no deposit required (talk about



A not so "close-up" view the of reproduction knob and dial skirt on my SX-101A



The reproduction aluminum dial skirt with a silk-screened scale is shown above between 2 original skirts having brass with nickel plating. Note how the brass shows through where the plating has worn off from handling the originals over the years.

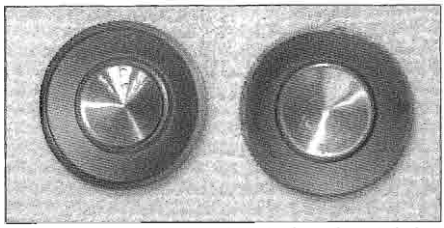
faith!). As suggested by Larry, I soaked the knob overnight in water to soften any glue that might be holding the inlay in place. Then, slight pressure from the backside (through the hole in the center of the knob) using the eraser end of a skinny pencil popped the inlay right out.

I shipped the knob to Larry and about a month later he shipped me a prototype plastic reproduction. It was beautiful. It fit perfectly on the tuning shaft, the set screws worked, the dial skirt and weight attached to the knob using the original hardware and the color, finish and luster were identical to the original bakelite. There was just one problem; the original metal inlay wouldn't fit in the recessed area of the reproduction knob, almost, but not quite. Talking to Larry, he explained that silicon molds wouldn't allow tight tolerances like an injection mold would. It was obvious that if this project was to go forward, I would have to find a source for reproduction metal inlays that were slightly smaller in diameter than the original.

I contacted Charlie Talbot (K3ICH)[2] because I had seen inlays for other knobs offered by him on eBay. Charlie confirmed that the concave metal inlays could be produced to any diameter I specified. I sent him an inlay from my broken knob to use as a pattern and gave him an outside diameter that would allow it to fit in the reproduction knobs.

Now that I knew the knob project was physically possible, I needed to determine if it was economically feasible. I asked Larry and Charlie for quotes to produce various quantities of the individual components. After analyzing the quotes, I determined I would have to sell 50 knobs at $35.00 each to recover my costs. A smaller quantity would make the knob cost-prohibitive and I wasn't sure if there was a large enough demand to justify a larger quantity. A few days after inquiring on the Hallicrafters Reflector, I had interest expressed for about 20 of the knobs. I decided to go for it and gave Larry and Charlie the production orders and payments.

That was mid-May, 2004. It had taken 4 months to get to this point but I knew in 6-8 weeks I would have the knobs and inlays so I began taking orders (and payments). 6-8 weeks turned out to be VERY optimistic. I received the knobs in September and the inlays in November. While waiting on the inlays, I checked every knob for correct tapping for the set screws and skirt/weight attachment screws. This revealed 2 knobs that were tapped incorrectly. When the inlays finally arrived, I glued them in place on the knobs and began packaging and shipping to fill the orders. My SX-101A also got a new knob and is now very happy.



The reproduction plastic knob with its metal inlay is at the left, next to a bakelite original. Note how the inlay is slightly smaller due to silicone mold tolerance.

If you want to try producing a plastic reproduction of a scarce bakelite part, I would offer the following advice based on my experience:

Make sure there is a sufficient market at a price point that will allow you to recover your out-of-pocket costs (including packaging and freight).

Don't plan on making any money because you won't, especially if you keep track of the time you spend on the effort. Remember, this is a hobby, not a business.

Every separate step required to make the item (molds, pouring, drilling/tapping, painting, gluing etc.) will make the item more expensive to produce.

Make sure the molding process will allow re-use of any attached pieces.

Make sure you have access to an original in perfect condition. Any imperfection will be faithfully reproduced by the mold.

Make sure you are not in a hurry. Remember, this is a hobby, not a business.

Contact Information:

[1]Old Time Replications
Larry Bordonaro
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[2]Charlie Talbott, K3ICH
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ER

[Comments from page 1]

on the lower edges of the bands. It is quite common to work other stations who also run classic equipment, and there is no doubt that CW is the original "heritage mode." I think we should all be looking for opportunities to recruit new operators who have an interest in AM and restoration of vintage equipment to get their license and join in.

BPL Continues

From my point of view, BPL is deliberate trashing of the radio spectrum. There are better ways to hook up computers to the Internet. Millions of dollars in corporate cash are pouring into the BPL vendors, and new BPL trials and "roll outs" are underway around the country. Some states have passed legislation regarding BPL systems. It looks like the industry lobby group "UPLC" that I have previously mentioned in ER is going to be placed in charge of the BPL license database.

In July 2005, a BPL vendor, "Current Communications," announced that it received at least a 100 million dollar investment in BPL from Goldman, Sachs & Co., from Google, from the Hearst Corporation, as well as from Current's existing investors – EnerTech Capital and Liberty Associated Partners. Google declined to disclose its share, but stated that its investment was part of its "corporate mission to promote BPL." On the day of the announcement, Google's stock price closed $4 higher than the previous day, a 1.4% increase. (UTC 7-14-05)

[Continued on page 43]

Comparison of Popular Front-End Minature Tubes in Modern Receivers

By Ray Osterwald, NØDMS
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Bailey, CO 80421

In modern radio receivers using tubes, the type 6DC6 was nearly universally used as a front-end RF amplifier. Two other tubes that were originally developed for television receivers, the 6BZ6 and the 6GM6, may be directly substituted for the 6DC6 and have been recommended for years as an improved tube to be used in this application.

While rebuilding a Hallicrafters SX-101A for an ER article, I became curious about how these three tubes perform as RF amplifiers and I ran a series of tests. The first test was to find out what happens to each tube's transconductance as the grid bias voltage changes. The plate and screen voltages were fixed at those used in the SX-101A. Then, RF performance tests were made in turn, with each tube installed in the unmodified SX-101A. (Modified receivers will behave differently.)

Most of the tube manuals describe the 6DC6 as a remote-cutoff type, except for some of the Radio Handbooks of the early 1960s, edited by Bill Orr. Bill always called the 6DC6 a semi-remote tube. The other two are always described as remote-cutoff types.

All three tubes used in these tests were new RCA tubes in the boxes.

To test them for transconductance versus bias, I used a military-surplus tube tester type TV-2. The TV-2's "Percent of Quality" meter is actually reading percent of full-rated transconductance for a given tube type. The plate and screen voltages may be directly set at any required value. This made the TV-2 ideal for comparing these three tubes. The chart in **Figure 1** shows "Percent of Rated Transconductance" on the vertical axis, and is plotted against the changing negative grid bias. The 6DC6 data is represented by the line with the square box, the 6BZ6 has a line with a triangle, and the 6GM6 line has an "X" symbol.

Clearly, the 6DC6's transconductance changes at a nearly-constant rate from negative 1 volt to -7 volts of bias. It's slope levels off somewhat at -8 volts, and the tube cuts off all together at -11 volts. As used in the SX-101A, the constant slope of the 6DC6 transconductance curve lies exactly in the range of typical input signals encountered in the HF Ham bands. Negative 1-volt bias is developed at an RF input of about -100 dBm (2.2 µV) and -7 volts develops at an input of -40 dBm (2.2 mV). -40 dBm is an extremely strong signal. Typical signals on our bands hardly ever exceed -70 dBm, except of course during the contests when anything is possible!

The other two tubes are simply not as linear in resonding to AGC bias. The 6GM6's transconductance remains nearly constant until about -1.5 volts of bias is developed, at which time it drops very rapidly to about -4 volts. After this, the rapid drop levels off and is nearly a straight line until reaching -15 volts. It cuts off at about -28 volts. This tube would be ideal if used in a TV set front end. It would have a lot of gain in fringe reception areas, but would rapidly drop to very low levels in high-signal city areas to protect the later stages from overload.

The 6BZ6 behaves in a similar manner, only having a slightly reduced initial drop. The 6BZ6 cuts off at about -27 volts.

Next, the tubes were tested individually in the SX-101A, and the input circuits were peaked up for each tube be-

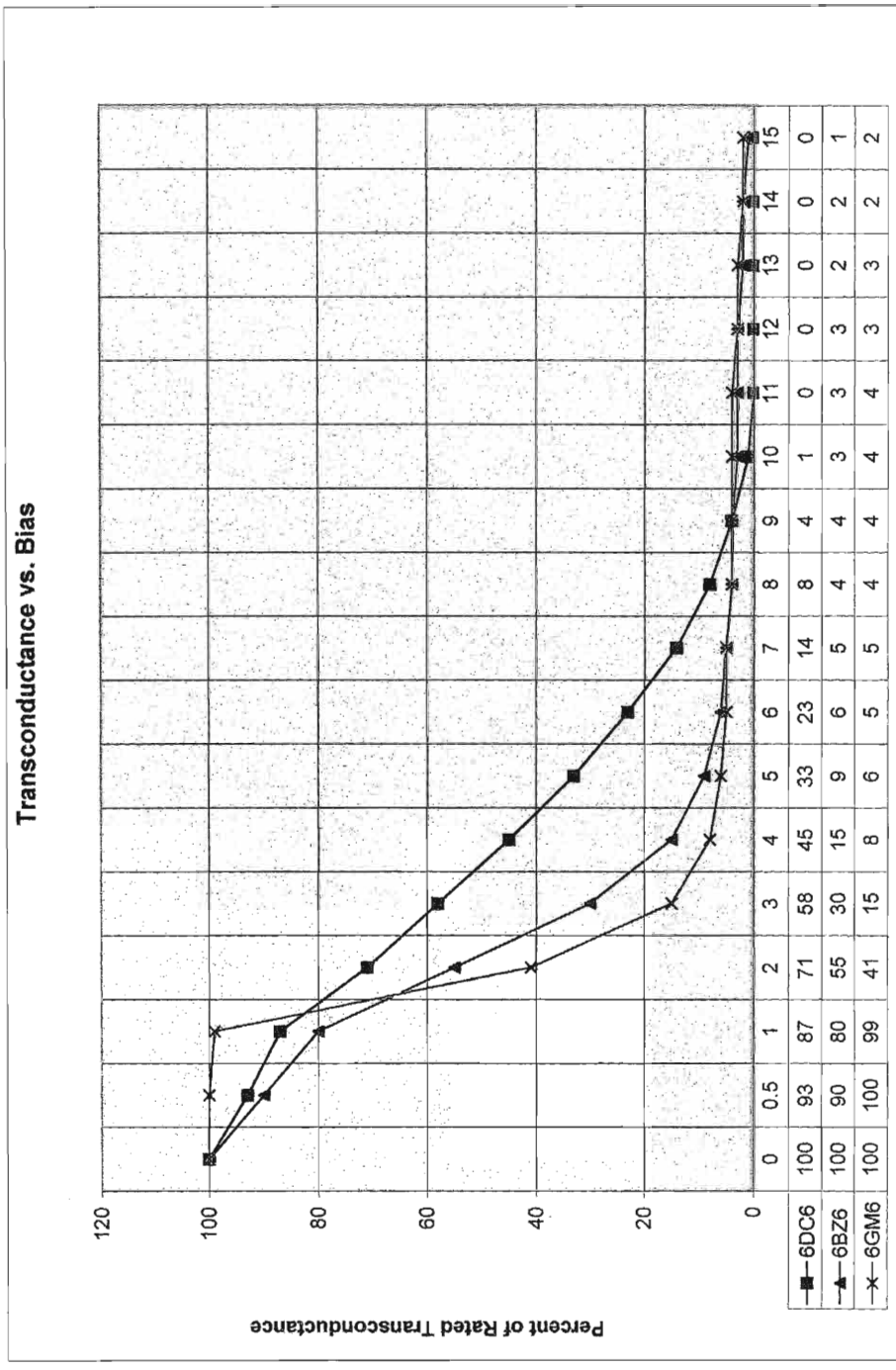


Figure 1: Transconductance vs. grid bias

Tube Type	2-Tone Dynamic Range, 10 kc spacing	10 dB S+N/N AM Sensitivity	Noise Figure	+3 dB Minimum Discernable Signal
6DC6	56 dB	-130 dBm	7 dB	-139 dBm
6BZ6	57 dB	-120 dBm	10.5 dB	-137 dBm
6GM6	60 dB	-126 dBm	9.5 dB	-137 dBm

Table 1: Results of RF testing in the Hallicrafters SX-101A.

fore the test to compensate for different input and output capacitance in each tube type.

The results of this testing are shown in **Table 1**. To summarize the results, in the SX-101A, the 6DC6 has a lower noise figure and higher sensitivity than the others, in spite of having the lowest initial transconductance. The 6BZ6 has lower sensitivity and a higher noise figure. The 6GM6 is quiet and makes the receiver sensitive, and in this receiver it is 2.5 times as resistant to blocking when compared to a 6DC6.

The last test was to compare the three tubes for AGC performance. An AC voltmeter calibrated in dB across 600 ohms was connected to the 500-ohm speaker terminal on the SX-101A. An RF signal generator was used to find the RF level where a 30%-modulated AM signal increased the audio output 1 dB. I used this level as "AGC threshold" because the SX-101A has amplified AGC without AGC delay. The AGC threshold was my zero-dB reference, and was increased in 10-dB steps while the output meter watched the resulting audio output level. **Figure 2** shows the results. The 6DC6 and the 6BZ6 produce nearly the same initial audio output levels, but the way the 6GM6 responds to bias voltage makes the audio output change rapidly at low-level signal inputs. **ER**

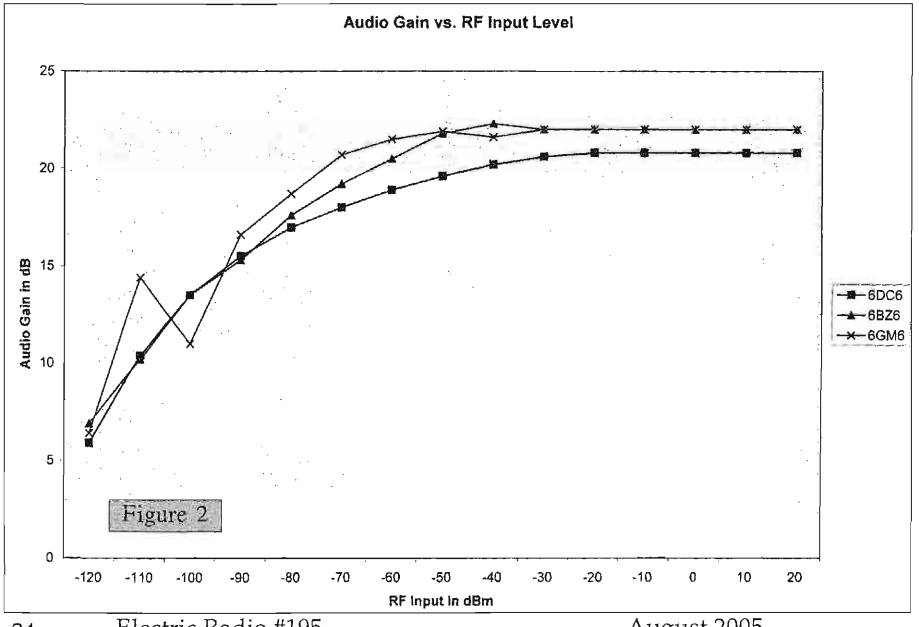


Figure 2

This Radio isn't from Kansas, Toto!

The Chinese Military 102E

By Doran S. "Jeep" Platt, K3HVG
12196 Overlook Dr.
Monrovia, MD 21770

The radio isn't from Cedar Rapids, either. Sometime last year I began to notice a series of eBay offerings for Chinese military radios. One such set was the 102E (or XD6) HF portable radio set, as offered by Harry An, of Red Star Radio, Ontario, Canada. Prior to this date, the only foreign radio set that was in my collection was an RCAF AR2 aircraft receiver, described in an earlier issue of *Electric Radio*. After some deliberation, last April I successfully bid on one such radio set. I currently have it on the air and have been quite successful in making reliable contacts. I haven't talked 102E to 102E yet, but I suspect its only a matter of time, inasmuch as a number have been bought and put on the air. The radio set is said to have been used by the Chinese Army and exported to various countries, including North Viet Nam during the conflict there. Construction of the radio set is robust, although with not quite the solidity of its US equivalent! Components are of reasonable quality and the radio is entirely serviceable. What follows is how to get one of these sets on the air, with a historical tome.

My GRC-9 clone radio set arrived from Canada in 5 wax-sealed boxes containing the Type 81 transmitter, Type 139 receiver, hand crank generator, accessories including a mic and 2 headsets, a cw key, an original tech manual set with English translation, various canvas carrying accouterments, antennas, tools, and some repair parts and a complete set of spare tubes. Also included is a copy of a Simpson 260 multi-meter. Regarding manuals, the translated manual discusses the basic 102E radio set (also referred to as an XD6) as it appears as an integrated system in a single case. This manual shows a photo of the front panel of the set, *in English*. All other manuals are in Chinese, although the diagrams are entirely usable. I chose to make enlargements of the original schematics as they are much clearer than those in the photocopied English translation. I found that some circuit references and designations are different (but inconsequential) when comparing the original and translated manuals. I've also been fortunate, in that several members of the scientific staff at NOAA who are also native speakers of Chinese have helped me to decipher additional parts of the manuals.

The system, as received, requires only the addition of receiver batteries for full operation. Out of the box, I first separately fired up the receiver, via a group of D-cells and a bench B+ supply, followed by the transmitter. Both units worked independently pretty much as expected, though periodic references to the translated book were required to remind me of what the non-English marked controls did. The transmitter put out about 6 watts AM and about 18 watts on CW. A slight chirp on the transmitter note on CW was evident, but not bad. Modulation via a 50's-GE 2-way looking carbon mic was actually good. Out of curiosity, I tried both T-17 and RS-38 mics but found the original mic sounded best.

I then set about to construct the jumper cable required for transceive operation. This equipment conveniently uses standard octal plugs (86-CP8) for this interconnecting cable. Note also that standard US military type PL-55 and PJ-068 phone and mic plugs (although a snug fit!) are used on this set. The transmitter, receiver, and generator power plugs are, however, proprietary to the Chinese and

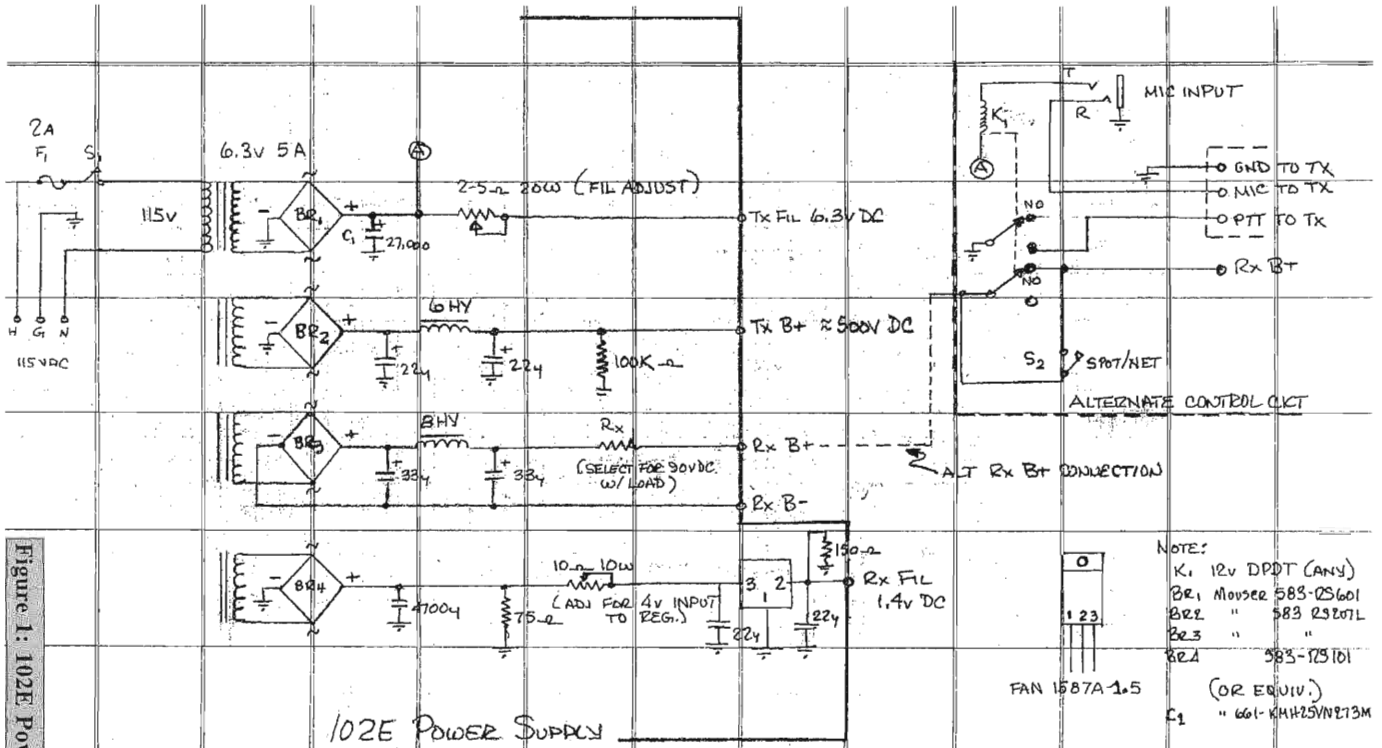


Figure 1: 102E Power Supply

spares, to date, are unavailable. To allow operation from both an a.c. supply and the generator (actually it's an alternator), I cut the original 4-conductor power cable about 6 inches from the generator end. I then added mating Molex connectors such that I can plug the transmitter side of the cable into the generator pigtail or directly into my a.c. supply. The 102E transmitter requires 6.3v DC at about 3 amps and 425-500 volts DC at about 150ma. The receiver calls for 1.5v DC at 400ma and 90V DC at about 35ma. Note that the receiver B- floats! I built my a.c. supply using one of several scavenged HP 608 signal generator transformers, a Radio Shack 6.3vct 1A filament transformer and a couple of appropriate filter chokes. I utilized one-half the secondary of the 6.3 filament transformer to get the receiver filament voltage in range for the selected regulator chip, the Fairchild FAN-1587A-1.5 . You will need to insulate this TO-220 package and secure it to the chassis for heat-sink purposes. Receiver B+ is not critical and will function from 80-105 vdc. Transmitter B+ may range from 425 to 500 volts. A voltage selector switch in the transmitter is set for either 425v or 500v.

After building my supply, I found that 15,000µfd was insufficient for filtering the transmitter 6.3v for use as carbon mic bias, resulting in considerable hum. I ended up using 27,000µfd in the basic filter and a 100µfd, 25-v capacitor on the low side of mic transformer T-101. This cap was physically located at R117, a 220ohm resistor, mounted on the rear, drop-down panel of the transmitter see **Figure 2**. Position the capacitor as shown in the photo so as to be in the clear when the panel is retracted. The schematic provided herein is of my power supply and shows a typical transformer suite. Other transformers may require changes to accommodate the variance in output voltages, of course. In my power supply,

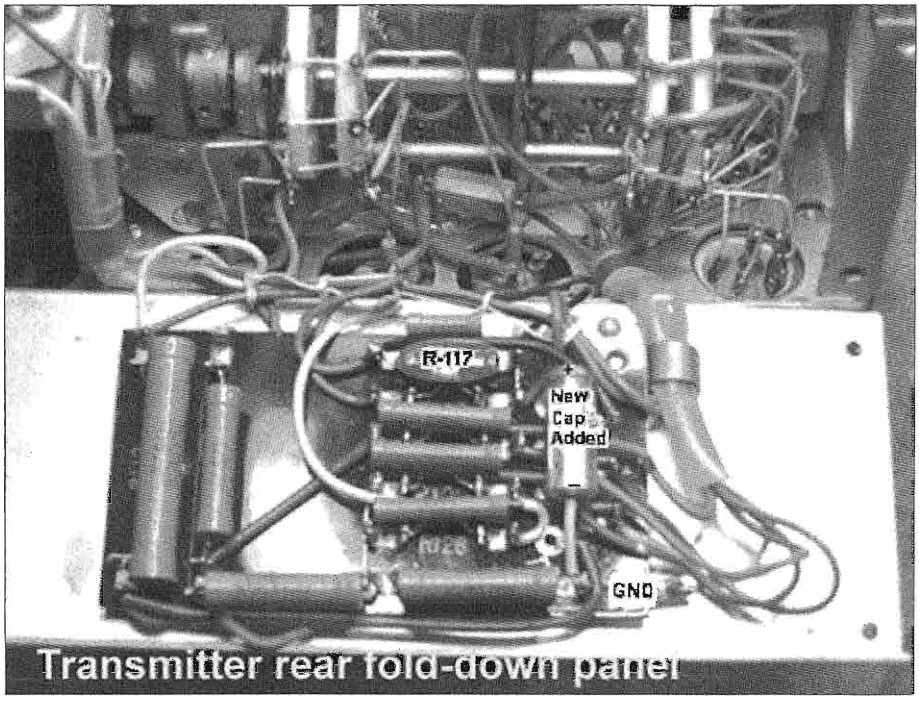


Figure 2: Locations of the new components as described in the text.

all electrolytic capacitors, power resistors, and semiconductors were obtained from Mouser.

With the power supply complete, and the receiver internal power selector switch set for "combined" use, I tested all components as a system. Tuning up using my 75 meter dipole, I discovered quickly that the neon tuning lamp on the transmitter was all but useless. Yes, it lights up on transmit owing to some applied keep-alive voltage, but there's no change in brilliance while tuning up (unlike the GRC-9). Fortunately, there's a panel meter. Continuing with the testing, I also discovered that the system does not have break-in keying. Once the mode switch is placed in the CW mode, the oscillator and driver stages in the transmitter are continuously keyed and the receiver is muted. Because of this feature, there's no good way to NET or zero-beat the receiver and transmitter. However, by jumpering the receiver B+ muting circuit (octal plug pins 3 and 4) and receiver filaments (octal plug pins 2 and 7) via a small toggle switch I mounted on the receiver accessory case, the receiver can be kept alive for zero-beating and netting. For information, at 3885 kHz, the switch settings for best output were position 1 for Antenna Load and 3 for Antenna Coupling. As an aside, I installed a 3885kHz FT-243 crystal to see if crystal operation was normal. I got no output or drive until I recalled that every band doubles the oscillator frequency. Using a 160 meter crystal, I got output on 75 meters. In actual operation, I'd recommend some sort of output power measuring device. Optimum power can't be really appreciated simply by dipping the plate using the panel meter. I'm currently using one of those small, military thru-line watt-meters for this purpose. I'd imagine that the field-strength meter used with the GRC-9 might be a good bet, too!

One point not mentioned thus far is that neither the transmitter nor receiver cabinet makes accommodation for ingress/egress of the interconnect cable. When colocated, these units are normally mounted in an integrated cabinet and, as such, provide an internal pathway for the cable. I elected to simply mount an octal receptacle on the rear of the receiver accessory cabinet and, using an appropriately sized Greenlee punch and accurate measurements, created an access directly above the octal socket located just inside the back of the transmitter cabinet. The cable now conveniently plugs into, and interconnects, each unit. An alternative might have been to use ½" grommeted holes on each unit and internally connect the octal plugs, to use individual pigtail plugs, or smaller plugs. It would not be as convenient, nor eliminate holes altogether, but may look a bit less obtrusive. Update: On a second unit I used small, DB9 connectors mounted on the back cabinet of each unit. These are very unobtrusive and virtually invisible after a few daubs of OD paint. I also incorporated the receiver antenna jumper in this interconnection cable. As mentioned elsewhere, this antenna jumper can be internally connected to the octal plugs in each unit via a vacated Pin 8.

In accomplishing the above modifications on my system I appreciate that some of the above is mechanically irreversible. Although not yet of the kin of 75A-4s or SX-88s, punching holes in cabinets may not be the best way to preserve pristine, potentially collectable, equipment. One could do things a bit differently, albeit with loss of some ancillary functionality. Recall that the interconnect cable provides 3 or 4 func-

tions; it provides receiver muting, sidetone feedback, receiver voltage monitoring, and potentially to carry the receive antenna. By installing a receiver muting/PTT relay within the selected external power supply (mobile or fixed station), keyed directly by the mic, thence to the transmitter mic plug, basic functionality can be established. Receiver voltage monitoring is not a critical requirement, nor is sidetone. Use of the net/spot switch can suffice for monitoring the transmitted signal, if so desired. If the spot/net switch function were also located on the power supply, there will be no requirement, whatever, to drill, punch, or perform any mechanical modification. Placing the receiver power selector in the "independent" mode, the remote relay will accomplish what's basically needed. This remote control circuitry is depicted on the power supply schematic. If full system functionality is desired, however, an interconnecting cable would be required If you end up with one of these radio sets, just consider carefully beforehand which method you consider best.

What remains are a few additional technical subjects to discuss:

I have, I believe, been able to ascertain via TV-7 testing and tube manuals that the tubes used in the 102E are traceable to those used in the GRC-9. The tube cross reference is as follows:

Type 4001 is 1R5, Type 4002 is 1S5, Type 4003 is 1L4, Type 4004 is 3Q4, Type 4005 is 3A4, Type 2101 equiv. 2E22 (I'm told the 2101 is an improved 2E22, although in this set the filaments are not turned on and off with keying). The only anomaly I can find is with the Type 4003 tube. The 4003 does not have an internal suppressor to filament jumper, whereas the 1L4 does. In this radio set, however, circuit wiring does that job. Absent in the 102E radio set is the VR-105 regulator tube.

In my unit, I elected to keep the receiver filaments lit, full-time, and have thus jumpered pins 2 and 7 (filament mute) of the octal plug/cable. I perceive that its easier on the tubes and filament regulator circuit. I believe also that, like the BC-1306 and GRC-9, the reason to shut the receiver down whenever possible is/was to conserve battery power and/or generator load.

I understand that a few folks are using various GRC-9 power supplies for their 102E radio sets. I can see that that's a nice, convenient source of mobile power, except for the fact that 102E receiver B- is above chassis ground whereas the low B+ voltage in the GRC-9 power supplies is at chassis ground. It may well be that the grid bias for the receiver audio amplifier can ignored. I haven't tried a DY-88 or DY-105, but I may.

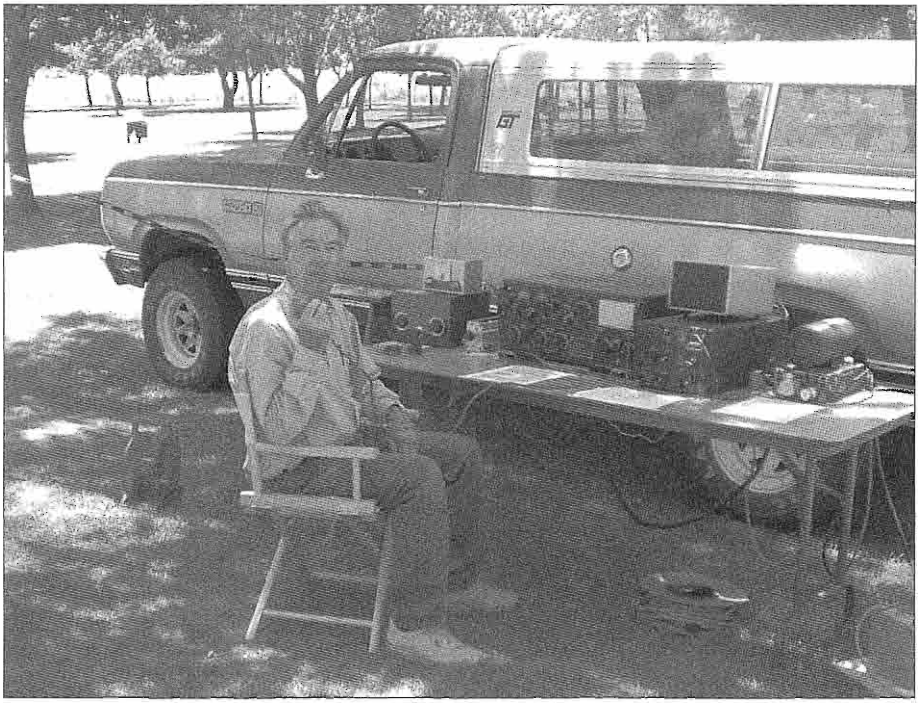
In closing, I'd recommend the 102E for anyone interested in a quite usable radio set, and close clone of the GRC-9. It's genuinely neat to be able to open up a brand new radio, especially given its origin and age, and to have all the goodies and accessories, to boot! I'll also add that the Folks at Red Star Radio are quite accommodating and nice to do business with. For information, total shipping and customs handling costs to the lower 48 will be upwards of $100-$125 , a factor to be kept in mind. If anyone wishes to contact me regarding the 102E, I'd be happy to provide or exchange information and ideas.

73, Jeep

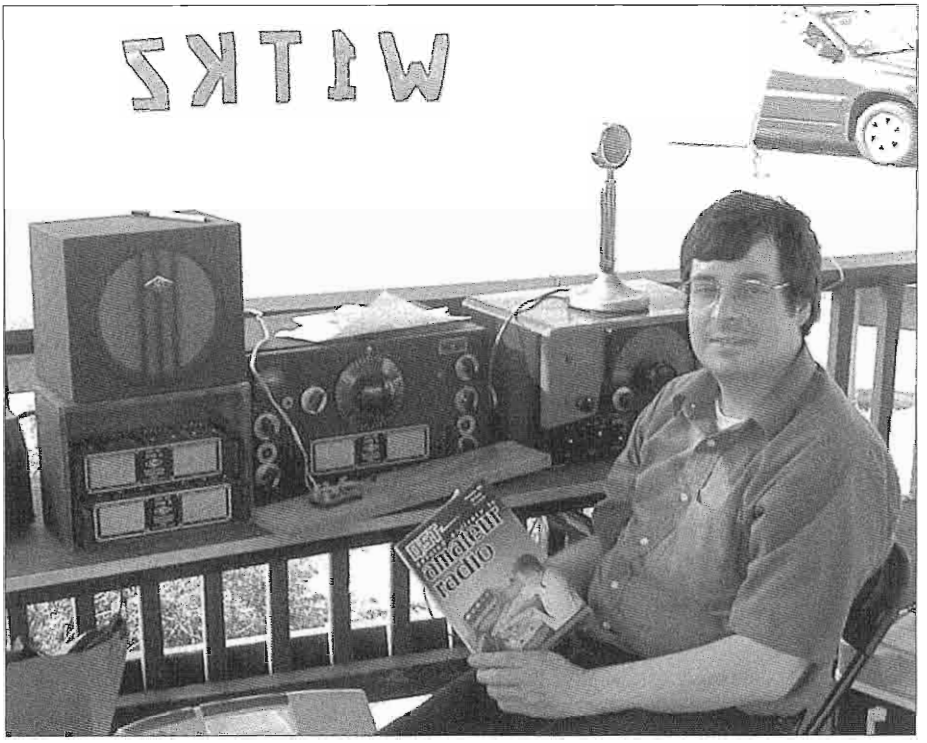
[Editor's note: Next month, Jeep describes the alignment procedure for the 102E]

ER

PHOTOS

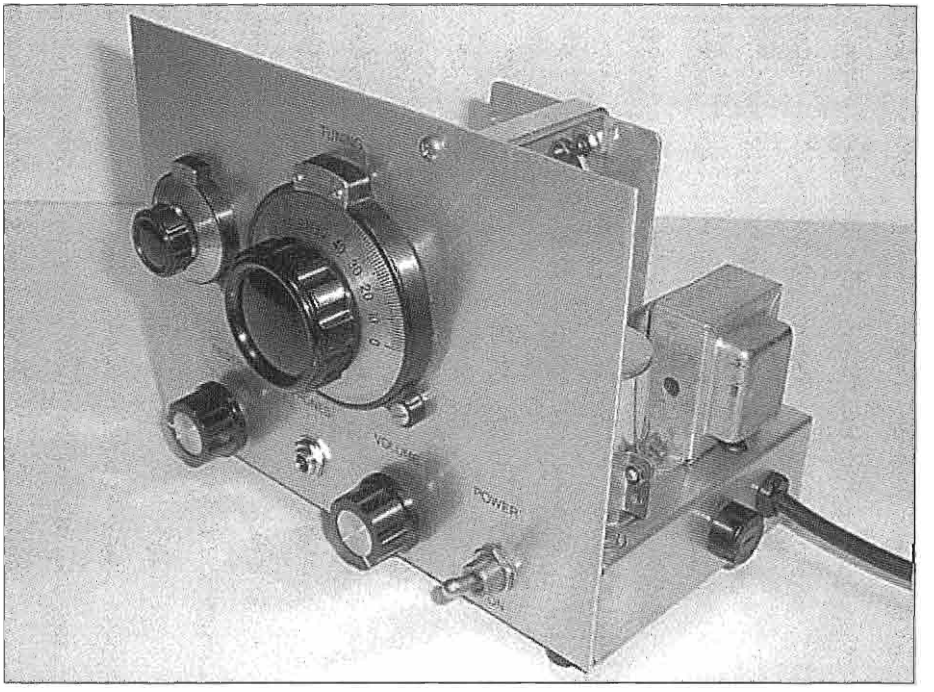


Bill Feldmann (N6PY) operated a vintage military station for display at the K6OX ARRL Field Day site in a Lancaster City, CA park. Bill is shown operating the ATC, an early ART-13 Navy transmitter, and its companion ARR-15 receiver. The antenna system Bill used was a 150-foot long doublet fed by 300-ohm ladder line, used on both 75 and 40 meters. The antenna support was made out of eight, five-foot sections of M-44 army mast for a total center heigth of 40 feet for the doublet. The doublet and ladder line were tuned by a small Johnson Match Box, shown to the left of the transmitter. One Navy radio operator who stopped by said that he hadn't seen an ART-13 and ARR-15 run for over 40 years. He said the sound of the autotune working was music to his ears. One Air Force operator had used an ART-13 on a C-97 but couldn't identify the receiver. The Navy guy informed him the Navy had a better receiver with the ARR-15 and the AF operators had to suffer with the BC-348 while trying to find stations! The Navy operator said that he could sit down and drink coffee and let the receiver do the work for him. Even young visitors were much more impressed with the old military station than with the SSB rice boxes at the normal field day stations. Many visitors, especially women, comented on the much nicer sounding audio from the ARR-15 than from the rice box SSB rigs.

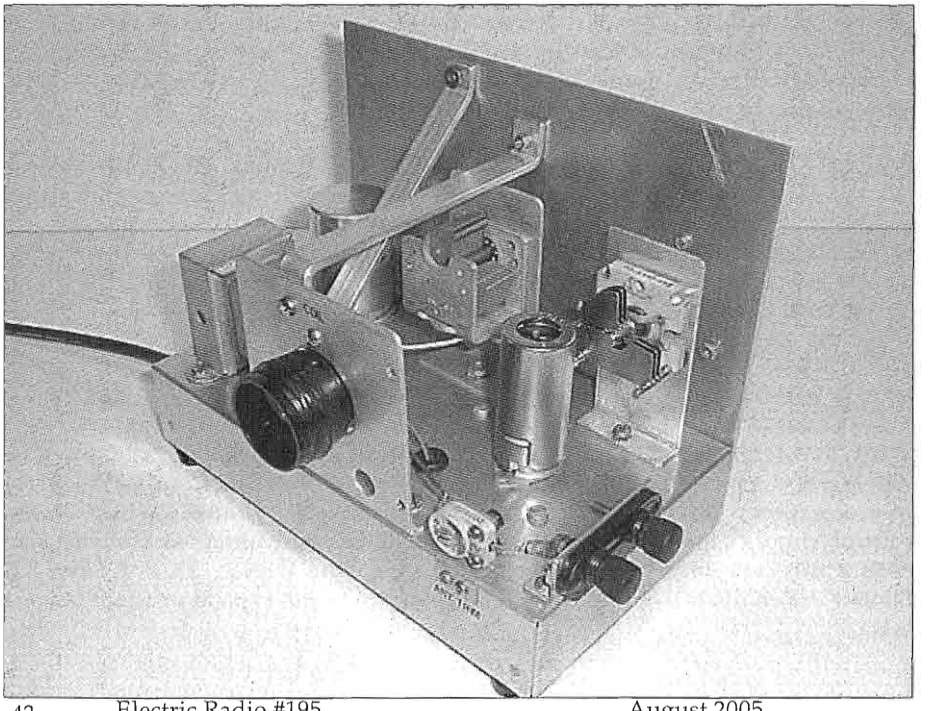


Above: Dan Brown (W1DAN) set up a vintage station during ARRL Field Day at the Wellesley Amateur Radio Society (W1TKZ) in June of this year. In addition to the regular HF, VHF and PSK-31 stations Dan operated CW and AM with his Johnson Ranger and HRO-5TA1 into a dipole.

Page 42: Samuel Bauman's 1-tube receiver that is shown on this month's cover is a simple 12AX7 dual-triode affair from a '60s design, and was a project that was built with the help of his father, John Bauman (KB7NRN). As John mentions, "I encourage all the dads and granddads to build a regen for their sons, daughters, grandsons or granddaughters. We need to get these kids interested in the thrill of the discovery of science, and this is a great start and it's RADIO! All of the parts came from Dad's 'junk box.' 12AT7, 12AU7 & 12AX7 tubes were all tried with good results. The 12AX7 seemed to give the best gain for audio quality so that's what's in it. Four coils were wound, covering 540 kc to 10.5 mc. The 1/8" x 1/2" aluminum flat bar bracing was necessary to keep the 'wobbles' away. As anyone who has built a regen, or plans on building one has learned or will learn, mechanical rigidity is the most important factor in building regenerative receivers Other considerations were functional controls with volume control, simple construction with parts on hand or easily obtained, compact size with a self-contained power supply and good loud audio. This '1-Tube All Bander' filled the bill. Designed well and easy to build, expand or adapt to your taste."



Above and below: Two views of Samuel Baunam's 12AX7 regenerative receiver.



[Comments, from page 31]

Contract proposals for BPL systems have been announced by the Hagerstown Light Department in Hagerstown, MD (United Telecommunications Council, UTC, 3-15-05).

The Texas state legislature has passed a bill that bans a municipality from offering RF-based BPL alternatives unless it is free to residents. (UTC 3-31-05). The same legislature has also paved the BPL highway by passing bills encouraging growth of BPL systems (UTC 4-28-05).

Other industry groups--those with RF alternatives--have gone on the record opposing such legislation (UTC 4-14-05).

Also in Texas, CenterPoint Energy and IBM are coordinating efforts in a trial of a BPL system. CenterPoint has launched a pilot program serving 220 homes in Southwest Houston, Texas that is slated to serve 50 residents and will run through the end of August 2005. IBM will "help" CenterPoint Energy assess customer satisfaction. IBM is "managing" the BPL rollout for CenterPoint (UTC 7-14-05).

In California, the California PUC approved a report on broadband deployment in the state. The report, "Broadband Deployment in California," satisfies the requirement of California Senate Bill 1536, which directed the PUC to develop a plan "for encouraging the widespread use of advanced communications infrastructure." The report, originally presented in a February PUC hearing, indicates that California leads the nation in broadband deployment." (UPLC 5-17-05)

Meanwhile, over in Arkansas, Representative Mike Ross introduced legislation encouraging the FCC to "reconsider and revise rules governing broadband over power line systems based a comprehensive evaluation of the interference potential of those systems to public safety services and other licensed radio services." (UPLC 5-17-05)

In Michigan, the Michigan Broadband Development Authority (MBDA) announced that it closed a $520,000 loan with the Shpigler Group, Inc., which is deploying BPL in two mid-Michigan communities, Grand Ledge and St. Johns. The deployments will be commercial this fall and will offer the service under the name "Lighthouse Broadband" (UPLC 6-21-05).

In Nebraska, Governor Dave Heineman signed LB-645, which bans municipalities and public power companies in Nebraska from offering any broadband service, Internet service or telecommunications service on a retail or wholesale basis. The wholesale ban is actually a moratorium lasting through December 31, 2007, but the retail ban is permanent. (UPCL 6-21-05)

There is some hope, at least. During a trade show that occured May 2005, Motorola Inc. announced its low-voltage, end-to-end BPL solution. Uniting two existing, proven technoloigies that operate on low-voltage power lines, Motorola's system reportedly ***significantly reduces HF interference.*** The Motorola engineers on this project are reported to be Hams, and Motorola has added RF notch filtering, which guards against interference with amateur radio transmissions. The Motorola solution requires only three pieces of equipment, keeping start-up costs and installation requirements to a minimum. Something we could all do on a local level would be to request that the Motorola system be included in any future BPL system evaluations. (UPLC 6-21-05).

73, Keep Those Filaments Lit!

Ray, NØDMS

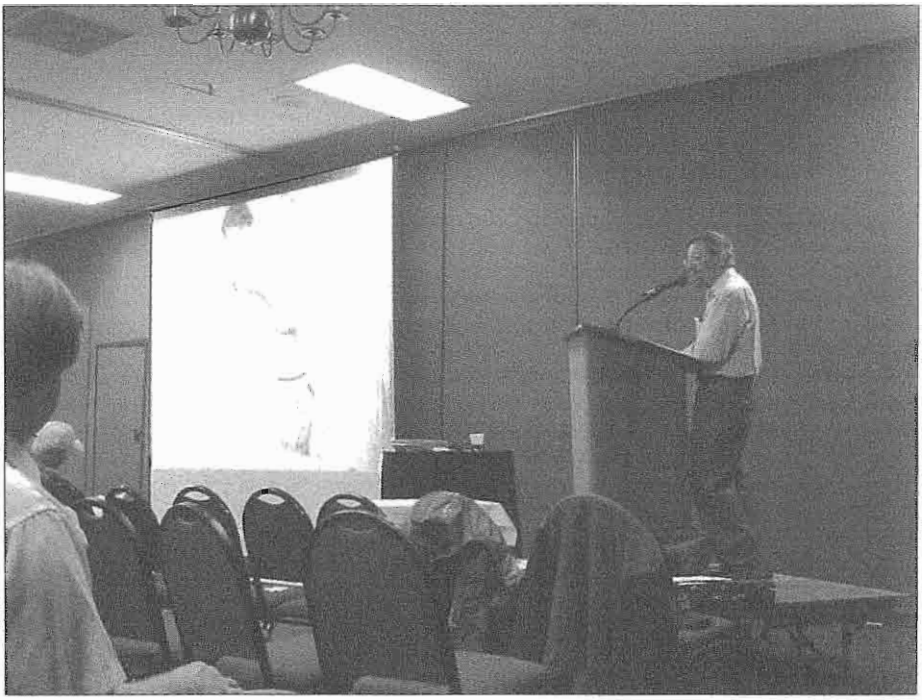
AM International Update – August 2005

By Dale Gagnon, KW1I
AMI President
PO Box 1500
Merrimack, NH 03054
aminternational@earthlink.net

Dayton Hamvention 2005 – The weather this year was the best in recent memory. There were many empty parking positions in the flea market, but still many nice pieces of AM gear were bought and sold. It was fun to enjoy the 3885 kHz Military Backpack Radio Net at noon on Saturday without fumbling with raingear as we did the last two years. At the AM Forum on Friday afternoon Dennis DuVall (W7QHO) had a pictorial presentation about southern California's Military Radio Collectors Group. Recent get-togethers and field events were highlighted with many pictures of vintage military gear in use. Dennis had a few images of similar activities from the Military Radio Collectors Association on the East Coast. A good number were out for the AM pizza party Saturday evening. This year the Hamvention hosted the ARRL National Convention so the attendance numbers were up a bit.

AMI Discovery Weekend - This year's event is scheduled for September 23-25 concurrent with the Classic Exchange. Remember the purpose of this event is to have the rest of the amateur radio community "discover" AM activity. Certificates are awarded for three levels of participation. 20 or more AM contacts on any band will earn the "Participant" certificate. On top of those 20 contacts, an AM QSO on 20 meters, e.g. 14.286 kHz qualifies for a "Participant Plus" certificate. One more contact on a higher band, e.g.15m, 10m, 6m or 2m earns the "Participant Primus". Write up any unique Discovery Weekend experiences and send it in with your log to AMI, Box 1500, Merrimack, NH 03054. You do not need to be a member of AMI to participate. Please record AMI certificate numbers, if available, and total your contacts for the various achievement levels and keep track of the number of states worked to make paper work easier on AMI office staff! If you have lost your AMI number or have questions about the event, e-mail: aminternational@earthlink.net. Certificates suitable for framing are awarded.

ARRL Readies Bandwidth Recommendations – The ARRL Executive Committee has completed work on it recommendations for the ARRL Board of Directors on a regulation-by-bandwidth proposal. If the board accepts these recommendations a petition will be filed with the FCC requesting regulation of the amateur spectrum by emission bandwidth rather than mode. Within the AM community, there are differences of opinion whether this is a good thing or not and many AM ops have written comments to their directors and to headquarters expressing their varied opinions. The committee's final report recommends continuation of rules that would permit double sideband full carrier AM. This fact should not cause AM'er to relax their vigilance. The AM community should communicate with their ARRL directors to make sure that the final bandwidth proposal they approve, that will be sent to the FCC, still has the exception for AM. Ultimately, the FCC will receive this bandwidth proposal from the ARRL and ask for comments from the amateur community. There may be other proposals to comment on as well. *At that point, AM operators should send in a landslide of comments in support of an AM exception*. We cannot depend on an exception for AM in the ARRL proposal to get us to the other side of this major change in regulation. We must have a powerful response in the rule making comment period to make sure the FCC understands the number of amateurs who operate AM and our commitment to the mode.



Dennis DuVall speaking at the May 2005 Dayton AM Forum

Attendees at the AM Forum

VINTAGE NETS

Arizona AM Nets: Sat & Sun: 160M 1885 kc @ sunrise. 75M 3855 kc @ 6 AM MST. 40M 7293 kc 10 AM MST. 6M 50.4 Mc Sat 8PM MST. Tuesday: 2M 144.45 7:30 PM MST.

Boatanchors CW Group: QNI "CQ BA or CQ GB" 3546.5, 7050, 7147, 10120, 14050 kc. Check 80M winter nights, 40 summer nights, 20 and 30 meters day. Informal nightly net about 0200-0400Z.

California Early Bird Net: Sat. mornings @ 8 AM PST on 3870 kc.

California Vintage SSB Net: Sun. mornings @ 8AM PST on 3860 +/-

Colorado Morning Net: Informal AM'ers on 3875 kc Mon, Wed, Fri, Sat, and Sun@ 7 AM MT. QSX KØOJ

Canadian Boatanchor Net: Daily 3725 kc (+/-) @ 8:00 PM ET. Hosts are AL (VE3AJM) and Ken (VE3MAW)

Collins Collectors Association (CCA) Nets: Tech./swap sessions every Sun. on 14.263 Mc @ 2000Z. Informal ragchew nets meet Tue. evening on 3805 kc @ 2100 Eastern time, and Thu. on 3875 kc. West Coast 75M net is on 3895 kc 2000 Pacific time. **10M AM net starts 1800Z on 29.05 Mc Sundays, QSX op 1700Z. CCA Monthly AM Night:** First Wed. of each month, 3880 kc starting @ 2000 CST, or 0200 UTC. All AM stations are welcome.

Drake Technical Net: Meets Sun. on 7238 kc, 2000Z. Hosted by John (KB9AT), Jeff (WA8SAJ), and Mark (WBØIQK).

Drake Users Net: Check 3865 kc, Tue. nights @ 8 PM ET. QSX Gary (KG4D), Don (W8NS), and Dan (WA4SDE)

DX-60 Net: Meets on 3880 Kc @ 0800 AM, ET on Sun. QSX op is Mike (N8ECR), with alternates. The net is all about classic entry-level AM rigs like the Heath DX-60.

Eastern AM Swap Net: Thu. evenings on 3885 kc @ 7:30 PM ET. Net is for exchange of AM related equipment only.

Eastcoast Military Net: Sat. mornings, 3885 kc +/- QRM. QSX op W3PWW, Ted. It isn't necessary to check in with military gear, but that is what this net is all about.

Fort Wayne Area 6-Meter AM net: Meets nightly @ 7 PM ET on 50.58 Mc. Another long-time net, meeting since the late '50s. Most members use vintage or homebrew gear.

Gulf Coast Mullet Society: Thu. @ 9PM CT, 3885 kc, QSX control op W4GCN in Pensacola.

Gray Hair Net: One of the oldest nets, @44+ years ,160 meter AM Tue. evening 1945 kc @8:00 PM EST and 8:30 EDT. Also check www.hamelectronics.com/ghn

Hallicrafters Collectors Association Net: *Sun.* , 14.293 Mc, 1:15 PM EST/EDT. *Sat.* , 7280 kc, 1:00 PM EST/EDT. *Wed.* , 14.315 Mc, 6-8:00PM EST/EDT. QSX op W8DBF.

Heathkit Net: Sun. on 14.293 Mc 2030Z right after the Vintage SSB net. QSX op W6LRG, Don.

K1JCL 6-meter AM repeater: Operates 50.4 Mc in, 50.4 Mc out. Repeater QTH is Connecticut.

K6HQI Memorial Twenty Meter Net: This flagship 20-meter net 14.286 Mc running daily for 25+ years. Check 5:00 PM Pacific Time, runs for about 2 hours.

Midwest Classic Radio Net: Sat. morning 3885 kc @ 7:30 AM, CT. Only AM checkins. Swap/sale, hamfest info, tech. help are frequent topics. QSX op is Rob (WA9ZTY).

Mighty Elmac Net: Wed. nights @8PM ET (not the first Wed., reserved for CCA AM Net), 3880 +5 kc. Closes for a few summer months QSX op is N8ECR

MOKAM AM'ers: 1500Z Mon. thru Fri. on 3885 kc. A ragchew net open to all interested in old equipment.

Northwest AM Net: AM daily 3870 kc 3PM-5PM winter, 5-7 PM summer, local. 6M @50.4 Mc. Sun., Wed. @8:00 PM. 2M Tues. and Thurs. @ 8:00 PM on 144.4 Mc.

Nostalgia/Hi-Fi Net: Started in 1978, this net meets Fri. @7 PM PT, 1930 kc.

Old Buzzards Net: Daily @10 AM ET, 3945 kc in the New England area. QSX op George (W1GAC) and Paul (W1ECO).

Southeast AM Radio Club: Tue. evening swap, 3885 @7:30 ET/6:30 CT. QSX op Andy (WA4KCY), Sam (KF4TXQ), Wayne (WB4WB). SAMRC also for Sun. Morning Coffee Club Net, 3885 @ 7:30 ET, 6:30 CT.

Southern Calif. Sun. Morning 6 Meter AM Net: 10 AM on 50.4 Mc. QSX op is Will (AA6DD).

Swan Nets: User's Group Sun. @4PM CT, 14.250 Mc. QSX op Dean (WA9AZK). Technical Net is Sat, 7235 kc, 1900Z. QSX op is Stu (K4BOV)

Texoma Trader's Net: Sat. morning 8:00AM CT 3890 kc, AM & vintage equip. swap net.

Vintage SSB Net: Sun. 1900Z-2000Z 14.293 & 0300Z Wed. QSX op Lynn (K5LYN) and Andy (WBØSNF)

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Brian (NI6Q), Skip (K6LGL), Don (W6BCN), Bill (N6PY) & Vic (KF6RIP)

Westcoast Military Radio Collectors Net: Meets Sat. @ 2130 Pacific Time on 3980 kc +/- QRM. QSX op Dennis (W7QHO).

Wireless Set No. 19 Net: Meets second Sun. every month on 7270 kc (+/- 25 Kc) @ 1800Z. Alternate frequency 3760 kc, +/- 25 kc. QSX op is Dave (VA3ORP).

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Deadline for the September 2005 issue: Tuesday, August 30

SERVICE FOR SALE: Repair and restoration on all vintage equipment; over 50 years of experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. 303-770-5314

MANUALS FOR SALE: Military Radio manuals, orig. & reprints. List for address label & $1. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, wa5cab@cs.com

FOR SALE: Fuse holders, switches, tube sockets, 16 chassis, filter caps, chokes and transformers both 400 & 800 c.p.s, terminal blocks, 13.8 V power supply, goose neck mike, grid dip meter, meters, Harmon-Kardon AM-FM tuner, tube tester fil. xfmr, SO-239 coax fittings. E.F. Hayes, WØJFN, 3109 N. Douglas Ave, Loveland, CO 80538.

FOR SALE: Collins KWM-1 with power supply. Collins 75A-4, one filter. Best offers. George Stevens, WØATA, PO Box 704, Longmont, CO 80502, 303-776-9036 vintage1@prodigy.net

FOR SALE: Complete BC-375E transmitter system w/all tubes & connectors, including: 24V/1000V dynamotor for HV, BC-306A antenna coupler, tuning units TU-(B) 5, 7, 8, 9, 10, &22LF. Lambda reg. pwr supply for filament & DC control, LNS-P-24 24 volts @ 9 amps. Full size manuals for 375 & BC-191 included. Also, VFO unit w/FM modulation Hallicrafters HT-18. Can deliver to October NEARC. Make offer. Robert Enemark, W1EC, POB 1607, Duxbury MA 02331, 781-585-6233

FOR SALE: ART-13 with new DY-17A dynamotor still sealed in box, all connectors, telegraph key w/remote, transmitter shockmount, best offer, PU only, negotiable. Rudy Lazzazero, W2ZIA, 3411 Home Rd, Alden NY 14004 1-716-937-9279

FOR SALE: Used National NPW-0 dial w/ box/documentation. Best offer. Gary, KØCX, kzerocx@rapidcity.net 605-343-6739 evenings

FOR SALE: Misc. ARC5 chassis for parts or fix up. $25. Bill Coolahan, 1450 Miami Dr. SE, Cedar Rapids, IA 52402 1-319-393-8075

FOR SALE: Nice DX60B $75. Beginner transmitter kit $25, complete instructions, tube, crystal, postpaid. Robert Larson, 1325 Ridge Way, Medford, OR 97504. W7LNG@arrl.net

FOR SALE: Hallicrafters CR3000 w/ manual. National Co. NC2000 atomic clock, PU only, 800 lbs. **WANTED:** URM25 & URM26 sig gens. Dean, 6725 Portland Ave. S., Richfield MN, 55423 612-869-9264

FOR SALE: Scott Model 800-B, excellent condition with new 15" speaker and Sams Photofact. Best Offer plus shipping. John, W9MHS, 1910 Remington Ct., Andover KS 67002, 316-733-1856

FOR SALE: Complete set of QST in binders, December 1915 to now, $7,000 including shipping Richard Shelar, K8CCV, 330-427-2303

FOR SALE: Galena crystal radios and parts. Radio tubes and parts. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150

FOR SALE: Military whip antennas, AN/GRR-5 $200, U-ship. Bruce Beckeney, 5472 Timberway Dr., Presque Isle, MI 49777 989-595-6483

FOR SALE: Hallicrafters S-40B $125. Realistic DX-300 $125. Bill Garbutt, 307-235-4799

FOR SALE: Three USAF Lambda regulated power supplies. 1 Model 28, 2 Model 29. Tubes (2) 6L6-5V4 6X5-6SJ7-OA3 VR75. Lambda Ele. Corp. College Point NY. Gordon Shimmel, PO Box 101, Hanna Falls, NY 13647 315-265-4638

FOR SALE: Heathkit HW-18 160-meter single-bander w/HP23 pwr supply. Original manual and mic. $200 shipped. Virgil, W4OLJ, 847 Old Sweetwater Rd, Sweetwater, TN 37874, 423-337-6484

FOR SALE: 13V @ 10 amp regulated supply, $20 + shipping. 5 element 10 meter beam. 56 ft. self supporting tower. 5 ft rack. Pick up only. K9GTB, 22756 White Park Ln, Litchfield IL 62056 618-362-6269.

FOR SALE: Hallicrafters HT-40 Transmitter, $50; National Type"N" Velvet Vernier Dial, NOS, $32. Richard Prester, 131 Ridge Road, West Milford, NJ 07480. 973/728 rprester@warwick.net.

FOR SALE/TRADE: Manuals: Hallicrafters, National, Hammarlund, Gonset, EICO, WRL, Swan, Drake, Collins, Heathkit, Johnson, B&W. NI4Q, POB 690098, Orlando FL 32869, 407-351-5536, ni4q@juno.com

FOR SALE: Simpson 370 AC ammeter $45. Simpson 373 DC milliammeter $45. Ross Wollrab, 229 N. Oakcrest Ave, Decatur IL, 62552. 217-428-7385. REWollrab@aol.com

FOR SALE: Cleaning house after 70 years a Ham. Many old and antique items. LSASE for long list. John Snow, W9MHS, 1910 Remington Ct., Andover, KS 67002 316-733-1856

FOR SALE: RCA TR-800 television recorder, TBC-8000 control and video imager 1010. All $2000. Stuart T. Carter, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904. 321-727-3015

FOR SALE: Hallicrafters S40B A/O $80. S38 grey plays @9 $55. Realistic Navaho TRC30A w/mic $65. Bernie Samek 113 Old Palmer Rd. Brimfield, MA. 01010 413 245 7174 fx 0441 bernies@samnet.net

CRYSTALS FOR SALE: AM and CW FT243 CRYSTALS - NEW LIST: 1885, 1900, 1930, 1945, 1970, 1985, 3721, 3837, 3855, 3870, 3875, 3880, 3885, 3890, 7018, 7050, 7123, 7143, 7250, 7255, 7260, 7280, 7285, 7290, 7293, 7295, 8400, 10106, 14286 kc. Many others available - See list at http://www.af4k.com/crystals.htm or call Brian, AF4K on 407-323-4178 af4k@hotmail@com

QSLs FOR SALE: Your old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, NZ5M@arrl.net

FOR SALE: ER back issues: full years 1999-2002 & 2004. $10/yr ppd. 1998 no jan, 2003 no nov. $8/yr ppd. Condx vg. Robert Wheaton, W5XW, 16015 white Fawn Dr. San Antonio TX 78225, 210-695-8430.

DRAKE INFO FOR SALE: Drake C-Line Service Information. Hi-Res Color photos of boards and chassis with parts identified. CD also includes Hi-Res scans of R-4C and T-4XC manuals, various version schematics and more. Garey Barrell, K4OAH@mindspring.com, 4126 Howell Ferry Rd, Duluth, GA 30096. 404-641-2717

HALLICRAFTERS PARTS: Hallicrafters SX101/101A reproduction main tuning knob. Includes silver inlay and set screws. $35.00 Mike Langston KL7CD, 1933 Diamond Ridge Drive, Carrollton, Texas 75010, 972-392-5336 mlangston@hcpriceco.com

JOHNSON PARTS: EFJ replacement parts: Valiant tie bolts-4 for $18.50. Ranger tie bolts-3 for $17. 80-2CM mic connector (also for Heath/Collins/others) 10 All ppd. Contact Cal Eustaquio, N6KYR/8, 823 W. Shiawasee St, Lansing, MI 48915, catman351@yahoo.com

FOR SALE/TRADE: Transmitting/Receiving tubes, new and used. LSASE or email for list. **WANTED:** Taylor 204A, 211, TR40M and Eimac 500T. John H. Walker Jr., 13406 W. 128th Terr., Overland Park, KS. 66213. PH: 913-782-6455, Email: jwalker83@kc.rr.com

DRAKE SERVICE FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covelli, WA8SAJ, 440-951-6406 AFTER 4 PM, wa8saj@ncweb.com

FOR SALE: QRP transmitter kits. Step-by-step instructions. Wood model, up to 5 watts 40/80M $15. "Tunatin" one watt 40M $10. You furnish crystal and power. Robert Larson, 1325 Ridgeway, Medford, OR 97504 W7LNG@arrl.net

FOR SALE: R-390A's, R1051's, Harris RF-550's, URM-25D signal generators, military 28VDC gas generators, AS-2851 antenna kits. Call, Lots more stuff! S. Daniels, 636-343-5263

SERVICE FOR SALE: Repair, upgrade, performance modification of tube comm. & test equip. Accepting most military, all Collins & Drake, & better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, 1115 S. Greeley Hwy, Cheyenne, WY 82201. 307-634-5858 feltondesign@yahoo.com

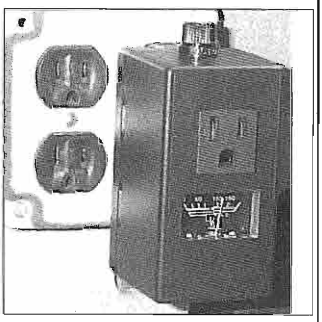
FOR SALE: Send for Free list TT for obsolete Triplett transformers, chokes and manual copies. USA only. Bigelow Electronics, POB 125, Bluffton, OH 45817

ZIM ELECTRONICS INRUSH CURRENT LIMITERS

Inrush Current Limiters are now available from the Electric Radio Store or on-line! These inrush limiters were reviewed in the September 2004 issue of Electric Radio and are available in three versions:

Model AB-1M (With Voltmeter) $34.95
***NEW! Model AB-300M* 300 watts (2.5 amps x 120 VAC) with meter $39.95**
Model AB-1 (With Pilot Light) $29.95
Shipping, each limiter $4.95
(4 or more limiters are shipped free for US orders. Overseas customers please ask for shipping quotes.)

The Inrush Limiter provides a gentle, slow startup for your valuable vintage radio equipment. They also reduce the line voltage closer to original design values due to the voltage drop across the limiter element. Both models come with a full money-back guarantee.



Model AB1-M

Electric Radio Store
720-924-0171

TUBES FOR SALE: Tested good globe 201A and 226 $14, 227 $10 and others. Slightly weak 226, 227, 245, 280 guaranteed to work in early radios ½ regular price. Write or e-mail: tubes@qwest.net for a new price list or see www.fathauer.com. George H. Fathauer & Assoc., 123 N. Centennial Way, Ste. 105, Mesa, AZ 85201. 480-968-7686 or toll free 877-307-1414

SERVICE FOR SALE: Vintage Radio Service. We repair radios, record changers, radios home, auto, tube & transistors. 1930-1980. Ken Hubbard, KA9WRN, POB 792, Beloit, WI 53512. 608-362-1896

SERVICE FOR SALE: Authorized repairs and sales of all types of amateur radio, communications, and test equipment. Please call Land Air Communications, 718-847-3090, visit our web site: www.landaircom.com. We have over 3,000 items in inventory and carry all types of communications parts.

BOOKS FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hi-fi, parts. Send 2 stamp, LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857. ka1edp@juno.com

SERVICE FOR SALE: Repair, Restore, Sales of antique, vintage tube radios. John Hartman, NM1H, www.radioattic.com/nm1h

JOHNSON PARTS: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig.-$17.50 ppd. Bruce Kryder, W4LWW, 277 Mallory Station Dr., Ste. 109, Franklin, TN 37067. b.kpvt@provisiontools.com

ACCESSORIES FOR SALE: KWM2/S-line metal logo pins. Meatball or winged. Excellent replica of the original. Put one on your hat, badge, or replace a missing logo on your panel, $6.25 shipped. W6ZZ, 1362 Via Rancho Pkwy, Escondido, CA 92029. 760-747-8710, w6zz@cox.net

REPAIR! Radio repair reasonable charges. Manuals for sale. I buy Radios. J. Dan Rupe 998 Whipple Ave, Grayland, WA 98547 360-267-4011 W7ddf@yahoo.com

FOR SALE: PK232MBX data controller in new condition w/book $125. Bill Riley, W7EXB, 863 W. 38th Ave, Eugene, OR 97405, 541-345-2169

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

NOTICE: Visit Radioing.com, dedicated to traditional ham radio & vintage radio resources. Let's Radio! Charlie, W5AM. http:/ /www.radioing.com.

BOOK FOR SALE: Heath Nostalgia, 124 page book contains history, pictures, many stories by longtime Heath employees. (See ER Bookstore.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028

TREASURES FROM THE CLOSET! Go to www.cjpworld.com/micromart to find some unique items many hams would lust for! Gus, WA, 360-699-0038 gus@wa-net.com

MISC FOR SALE: Vintage equipment at the K8CX Ham Gallery Classified Ads section. Visit the largest Antique QSL Card Gallery http:/ /hamgallery.com

BOOKS FOR SALE: Lots of old radio & related books. Eugene Rippen, WB6SZS, www.muchstuff.com

PARTS 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. 631-653-5350

PLEASE VISIT: RadioWorld-Online. Come to see our ham gear, parts, and more. Carl Blomstran PO Box 890473 Houston Tx. 281-660-4571.

ACCESSORIES FOR SALE: Spun Aluminum Knob Inlays for most Boatanchors. Collins Dial Drum Overlays. Dakaware Knobs. Charlie Talbott, 13192 Pinnacle Lane, Leesburg VA 20176-6146. 540-822-5643, k3ich@arrl.net

PLANS FOR SALE: Build your own "Midget" bug replication by KØYQX, ca 1918, featured by K4TWJ in CQ Magazine, May '98. 10 detailed blueprints. FAX: 507-345-8626 or bugs@mnic.net

PARTS FOR SALE: Parts, tubes, books, ECT. Send two stamp SASE or email for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761 letourneau@wiktel.com

SERVICE FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W9OJI/ N4FZ, IL, 815-734-4255 or N4PZ@aol.com

PARTS FOR SALE: Complete hardware set to connect Collins PM2 to KWM2 - $19.95 ppd. Warren Hall, KØZQD, POB 282, Ash Grove, MO 65604-0282.

PARTS FOR SALE: New Release. For details send 2-stamp LSASE to: Olde Tyme Radio Co, 2445 Lyttonsville Rd. Ste 317, Silver Spring, MD 20910

EQUIPMENT FOR SALE: Military and commercial communications items. Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. 619-444-7717 www.Murphyjunk.com

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

ACCESSORY FOR SALE: RIT for Collins KWM-2/2A; No modifications needed. $79.95 SASE for details. John Webb, W1ETC, Box 747, Amherst NH 03031 bigspndr@yk.mv.com

PARTS FOR SALE: Aluminum heat dissipating plate and grid connectors for all 3, 4 and T series Eimac tubes including 3-500Z, 4-1000, 304T's and others. Alan Price, 1545 S CR 1150 W, Parker City, IN 47368

SERVICE FOR SALE: I build hot-rod receivers: R-390A, SP-600, R-388/51J. NC-183D and transmitters: Valiant, DX-100, T-4X-A-B, HT-32, AF-67. 51J-4 filter replacements, R390A Hi-fi AM $245.00 ea. Chuck Felton, KDØZS, Wyoming, 307-634-5858, feltondesign@yahoo.com

SERVICE FOR SALE: COMPLETE SERVICE JOHNSON "TURBO" RANGER, Valiant, Viking 500, Viking II, include panel / cab refinish. Also Hammarlund 180(A), National 300, 303,

R390(A), others. http://w4pnt.8k.com Patty & Dee's Marina: 534 W. Main St. Waynesboro, Va. 22980. 540-249-3161 Cell: 540-480-7179 w4pnt@highspeedlink.net

WANTED: National NTE CW xmtr in working Condx. I love National. Sylvia Thompson, 33 Lawton Foster Rd., Hopkinton, RI 02833. 401-377-4912. n1vj@arrl.net

WANTED: Scott Special Communications receiver, EA4JL. Please call Kurt Keller, CT, 203-431-9740, k2112@earthlink.net

WANTED: Navy WW2 shipboard receivers and transmitters. Need equipment, manuals and general operating information. Receivers of the type RAK, RAL, RBA, RBB, RBC, RLS etc, Transmitters of the type TBA, TBK & TBM (with modulators), TDE TBS etc. Equipment is for the restoration of Radio facilities aboard the USS Alabama (BB-60), now part of the Battleship Memorial Park, Mobile, Alabama. I was a Radio Technician aboard the Alabama in WW2 and would like to hear from other WW2 RTs and Radio Operators concerning radio operating and maintenance procedures aboard other Navy WW2 ships. Please call Stan Bryn, AC5TW, at 1-800-984-9814 week days between 0800-1100 MST. Or email intor@zianet.com.

WANTED: Mounting base FT-151A for BC-375/191. Bill Ford, VE3CK, Box 606, Smiths Falls, ON Canada KA7 4T6 613-284-0700

WANTED: Trimm Type K headphones, Trimm Professional headphones, Trimm Featherweight headphones, FT-243 Xtals for 80 40 CW 30s-40s-50s-60-70s QST Jeff, KEØMT, ke0mt@aol.com 303-819-4492

WANTED: Manual schematics etc. Submarine VLF loop antenna tuner Borg Warner CU-352A/BRR. Weber, 4845 W. 107th St., Oak Lawn, IL 60453

WANTED: Heath SB104, SB102, SB301, SB303, HG108. Hallicrafters SR series transceiver 150-2000. BC348, T195, R392 and others. Jimmy Weaver, KB5WLB, 870-238-8328

WANTED: Hallicrafters receiver S-53 (Not the A model) and the HT-17 transmitter. Please call Jerry, N5KYE, at 405-373-4727

WANTED: Johnson Invader 2000 power supply. Transformer for P-P 6V6. Joe, 520-886-3087. POB 18436, Tucson, AZ 85731

WANTED: Pearce-Simpson VHF marine service manuals/schematics, (radios with manuals), All models. JR Linden, K7PUR, PO Box 4927, Cave Creek, AZ 85327, jrlinden@usa.net

WANTED: Lafayette HE-25 transmitter, HE-35 transceiver or Heathkit AT-1 transmitter. Thomas Nickle, W8AI. hl9xx@yahoo.com or 713-502-7799 weekends.

WANTED: Crystal set parts: Square slider rods. Old binding posts. Galena, iron pyrite pieces. Philmore type detectors, others. 2000-ohm headsets. 1920s large bakelite dials. Ray Fisher, PO Box 488, Charleroi, PA 15022 catfishandray@aol.com

WANTED: Knight Kit T-150A transmitter, no rust, original knobs a must. Gary Mayfield, WAØEAF, 102 South Jackson, Marquette, KS 67464. 785-546-2369 or email wa0eaf@kans.com

WANTED: Denchum model W-446 by Wilmak. Variable tuning model only. J. Myers, W8KJU, POB 485, Jenison, MI 49429 616-669-6599

WANTED: Seeking unbuilt Heathkits, Knight kits. Gene Peroni, POB 7164, St. Davids, PA 19087. 215-806-2005

WANTED: INTECH COM 6000 Service Manuals: COM3648, COM1000, COM1005 HF SSB Marine radio. Wes, K5APL, 870-773-7424, k5apl@cableone.net.

WANTED: Meter movement for a Knight KG-600B tube tester or the complete tester for parts. Johnny Umphress, 1415 Moore Terrace, Arlington TX 76010, 817-915-4706

WANTED: Harvey Radio Labs Tri-Tet Exciter or FT-30 Transmitter. $1000 reward! Robert Enemark, W1EC, PO Box 1607, Duxbury, MA 02331, 781-585-6233

WANTED: Any TMC Equipment or Manuals, what have you? Will buy or trade. Brent Bailey, 109 Belcourt Dr.,Greenwood, S.C. 29649, 864- 227-6292 brentw@emeraldis.com

WANTED: Top prices paid for globe shape radio tubes, new or used. Send for buy list or send your list for offers. Write or e-mail: tubes@qwest.net See www.fathauer.com or send for catalog of tubes for sale. George H. Fathauer & Assoc., 123 N. Centennial Way, Ste 105, Mesa AZ 85201. 480-968-7686, Call toll free 877-307-1414

WANTED: Old military radar displays, scopes, antennae, receivers, manuals, etc. Even half ton items! William Donzelli, 15 MacArthur Dr., Carmel, NY 10512. 847-225-2547, aw288@osfn.org

WANTED: Western Electric horns, speakers, amps, and mics. Barry Nadel, POB 29303, San Francisco, CA 94129 museumofsound@earthlink.net

WANTED: Manuals, manuals, and manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. 732-238-8964

WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, 631-360-9011, w2krm@optonline.net

WANTED: Searching for RME CT-100 or 3R9 xmtrs and info about them. David Edsall, W1TDD, 156 Sunset Ave., Amherst, MA 01002. 413-549-0349, dedsall@crocker.com

WANTED: Info on xmtrs made by Clough-Brengle Co. Used by the CCC, in the mid to late 30's. Any help would be greatly appreciated. Ron Lawrence, KC4YOY, POB 3015, Matthews, NC 28106. 704-289-1166, kc4yoy@trellis.net

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: Looking for information on radio and radar equipment aboard the Navy PB4Y-1. Warren, K1BOX, NC, 828-688-1922, k1box@arrl.net

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW 3Oth, Oklahoma City, OK 73112. 405-525-3376, bglcc@aol.com

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

WANTED: Incarcerated ham seeks correspondence. w/others on mil (R-390's &backpacks) & tube radios. Also copies of postwar-90's surplus catalogs, backpack specs & photos. W.K. Smith, 44684-083, FCI Cumberland Unit A-1, POB 1000, Cumberland, MD 21501.

WANTED: Looking for a National NTX or NTE transmitter/exciter for use in my vintage hamshack. Any condition, even basket cases or parts, considered. Will pick up in New England, or arrange shipping if outside of area. Paying any reasonable price, and most unreasonable ones! Please email with details or photos, all considered and most likely bought! Thanks! Bruce, W1UJR, 207-882-9969 or w1ujr@arrl.net

WANTED: Commercial or kit-built 1930s and 40s transmitters. Doc, K7SO, 505-920-5528 or doc@cybermesa.com

WANTED: Schematic and related info on Halowatt TR5 broadcast rcvr made mid-1920s in Portland, OR. Fern Rivard, VE7GZ , PO Box 457, Cranbrook, BC V1C4H9 Canada crc@cyberlink.bc.ca

WANTED: Collins 312A1 speaker, National SW5, Eldico R104 and T102, QSL cards from 1920's, 9CXX or W9CXX. Scott Freeberg, WA9WFA, 327 Wildwood Avenue, Saint Paul MN 55110. 651-653-2054 wa9wfa@qsl.net

The Hats Are Back!

By popular request, we are offering another run of the popular Electric Radio baseball caps. These new hats are a nice 5-panel all-cotton style with an adjustable rear headband and a 3-inch front brim. The background color is light tan, and the ER logo is embroidered in 3 colors, not printed. These hats will hold up for a long time.

$19.95, including priority shipping.

ER Store
PO Box 242
Bailey, CO 80421
720-924-0171
Or on-line: www.ermag.com

WANTED: Parts for HT-33 amp. Need T1 & amplifier compartment. John, W8JKS, 740-998-4518

WANTED: Will buy SP-600 and some other Hammarlund equipment, working, not, or incomplete. Al, W8UT, anchor@ec.rr.com 252-636-0837

WANTED: Hallicrafters SX115, SX88, Collins 75A-1, AM broadcast transmitter in New England area, Heath DX100B. Will pay good price for good equipment. w1txjohn@aol.com, 802-775-7632 Eves.

WANTED: DAVID GRIMES: radio model 3XP, and advertising, ephemera, literature, references, parts; please contact: Mike Grimes, K5MLG; 5306 Creekside Ct.; Plano, Texas, 75094, 972-384-1133. Email: grimesm@flash.net

WANTED: Top dollar paid for WWII radios, PRC-1, PRC-5, AR-11, SSTR-1, SSTR-5, British B2, need pts for PRS-1 mine detector. Steve Bartkowski, 708-863-3090

WANTED: Sonar CB transceiver model J23 mobile set. 23-channel, tube-type CB radios, also 23-channel mobile sets. Ed, WA7DAX, 1649 E. Stratford Ave., Salt Lake City, UT 84106. 801-484-5853

WANTED: TCS & TBY Navy radios. Ken Kolthoff, K8AXH, PO Box 215, Craig, MO 64437. Work #913-577-8422.

WANTED: PYE, Fairchild, Syncron, Langevin. Richard P. Robinson, PO Box 291666, LA CA 90029 323-839-7293 richmix@erols.com

WANTED: Scott Special Communications rcvr. EA4JL, please call Kurt Keller, CT, 203-431-9740, k2112@earthlink.net

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 900 N. San Marcos Dr. Lot 15, Apache Junction, AZ 85220

WANTED: ANY Harvey-Wells speaker, aircraft unit, or military surplus component. Will answer all. Kelley, W8GFG, 9010 Marquette St., St. John IN, 46373, 219-365-4730

WANTED: Collins 310B-3, basket case OK, 70E-8A PTO per 1948. Chicago CMS-2, pair of Taylor T-21. Jerry, W8GED, CO, 303-979-2323.

WANTED: Books about flight simulators, aircraft instruments, panel meters, or tube computers. Chris Cross, POB 94, McConnell, IL 61050.

WANTED: Collins R-389 LF receivers, parts, documentation, anecdotes, antidotes. W5OR Don Reaves, PO Box 241455, Little Rock AR, 72223 501-868-1287, w5or@militaryradio.com or www.r-389.com

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. 501-318-1844, Fax 623-8783, www.boatanchor.com

WANTED: Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. 661-259-2011. FAX: 661-259-3830

The Collins Video Library

NEW PRODUCT INFORMATION!

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Introduced at the 2005 Dayton Hamvention, the Collins (and Hammarlund) Video Libraries are now available in DVD format! Now you can work on your Collins (and Hammarlund) classics with the help of our world famous videos but in digital format on your computer or DVD player! All the prices are the same as the VHS video tapes, except for the 75S-3/32S-3 DVD. It is $89.95 as it is now a full 4 hours long and includes the removal and rebuild of the 70K-2 PTO!

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The Collins 30L-1 video or DVD (1 hour, $39.95)
The Collins 30S-1 video or DVD (1 hour, $39.95)
The Collins KWS-1 Video or DVD (2 hours, $39.95
The Collins 75A-4 Video or DVD (4 hours, $89.95)
R-390A Video or DVD (7 hours, $109.95)
R390A Addendum Video or DVD ($49.95)
SP-600JX Video or DVD (4 hours, $89.95)

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Produced by Floyd Soo, W8RO

ER BOOKSTORE, PO BOX 242, BAILEY COLORADO, 80421-0242
720-924-0171

WANTED: Westinghouse MW-2 Transmitter (RF unit, modulator, power supply, coils, transformers, parts). Will pickup anywhere. Gary, WA4ODY, Seabrook, TX. 281-291-7701, myctpab@earthlink.net

WANTED: WWII Navy GP-7 transmitter in any condition, with or without tuning units or tubes, etc. Ted Bracco, WØNZW, braccot@hotmail.com A.C. 717-857-6404 X306

WANTED: Receivers. Telefunken E1800, Rohde Schwarz, EK-56/4, NC-400, Racal 3712, Hallicrafters SX 88, Collins HF8054A, Collins 851S-1. Manual for Racal R2174B(P)URR 310-812-0188(w) alan.royce@ngc.com

WANTED: WW I era and 20' s hi-end sets, amps, detectors: SE 143/IP 500; SE 1420/IP 501; CN 112; RCA 106; SE 1000; SE 1071; Kennedy 110,220; Grebe CR 18; early supers: Norden Hauck Navy 10; Golden Leutz; others; WW I, WW II RDF gear; need DU 1 Loop set-up; others; WW II spy radios. Always buying vintage

broadcast gear, tube pre's, compressors, mics, stands, mic flags, by Altec, RCA, Sony, WE. I've got lots of cool radios and stuff to trade or pay cash. Ward Kremer, KI4JHA, 1179 Petunia Rd., Newport, TN 37821, Ph/fax: 423/625-1994. Please note: new e-mail: witzend99@bellsouth.net

WANTED: Manuals/data on the following: Johnson Matchbox, the 300 watt variety, Johnson VFO, model 122, RCI 2950 26-32 MC transceiver. MacDonald CE 100 UHF/VHF scanner, Adzen PCS 3000 two meter FM transceiver. Also need mic/controller for same. Manual/data DZ 2 radio/RDF receiver, 19" case 10 1/2" high, 13" deep. Ward Kremer KI4 JHA, 1179 Petunia Rd., Newport, TN 37821. Ph/fax: 423-6254-1994, Email:

witzend99@bellsouth.net.

WANTED: 7x8x10 metal cabinet, NOS, Bud CU-879 or equivalent. **FOR SALE:** Loudspeaker tube C.P.O $20 postpaid. Louis L. D'Antuono, WA2CBZ, 8802-Ridge Blvd., Bklyn, NY 11209. 718-748-9612 AFTER 6 PM Eastern Time.

WANTED: Hallicrafters HA-7 calibrator as used in SX-101A, SX-117, SX-100. Ray , NØDMS, at ER, 720-924-0171

WANTED: Hammarlund ED-4 transmitter. Any condition or information. Bob Mattson, W2AMI 16 Carly Drive Highland NY 12528. 895-691-6247

WANTED: Circuit for the "Mitey-Mite" transmitter-receiver. Harold Schaffner, W2GMX, 519 Perine St., Elmira, NY 14904.

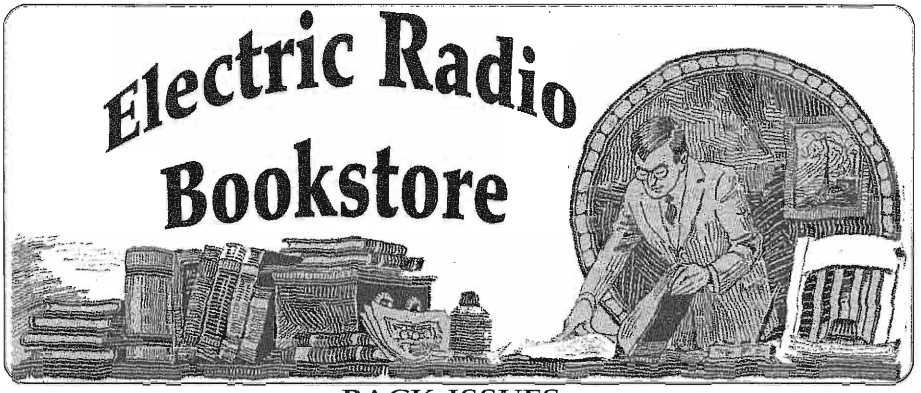
WANTED: QSL card from W9QLY, Frank (Mac) Maruna, from 1956 or before. WILL PAY TOP DOLLAR. Don Barsema, KC8WBM, 1458 Byron SE, Grand Rapids, MI 49506, 616-451-9874

WANTED: Copy or photocopy of 'R9 Sigs - Angle Radiation' by A.L. Munzig, W6BY, 1933. Dave Gordon-Smith, g3uur@dg-s.fsnet.co.uk or Whitehall Lodge, Sailhouse Road, Norwich, NR13 6LB, UK.

FOR SALE: Tempo RBF-1A, SWR + output meter, 3.5-150 Mc, 0-200 + 0-2kW, (SWR + pwr on seperate meters) $20 + ship. Henry Mohr 1005 W. Wyoming St. Allentown PA 18103

FOR SALE: HP606B sig gen, HP870A sync, $75 ea. Tandburg TR2075 $100. Buddy Herring 1310 Andover Rd Charlotte NC 29211 704-366-6600

NOTICE: Expert HRO-500 alignment done with modern test equipment (HP, TEK, etc.) www.nortrex.net or nortrex@bigplanet.com 650-529-9180



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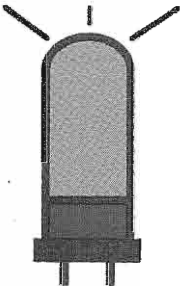

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