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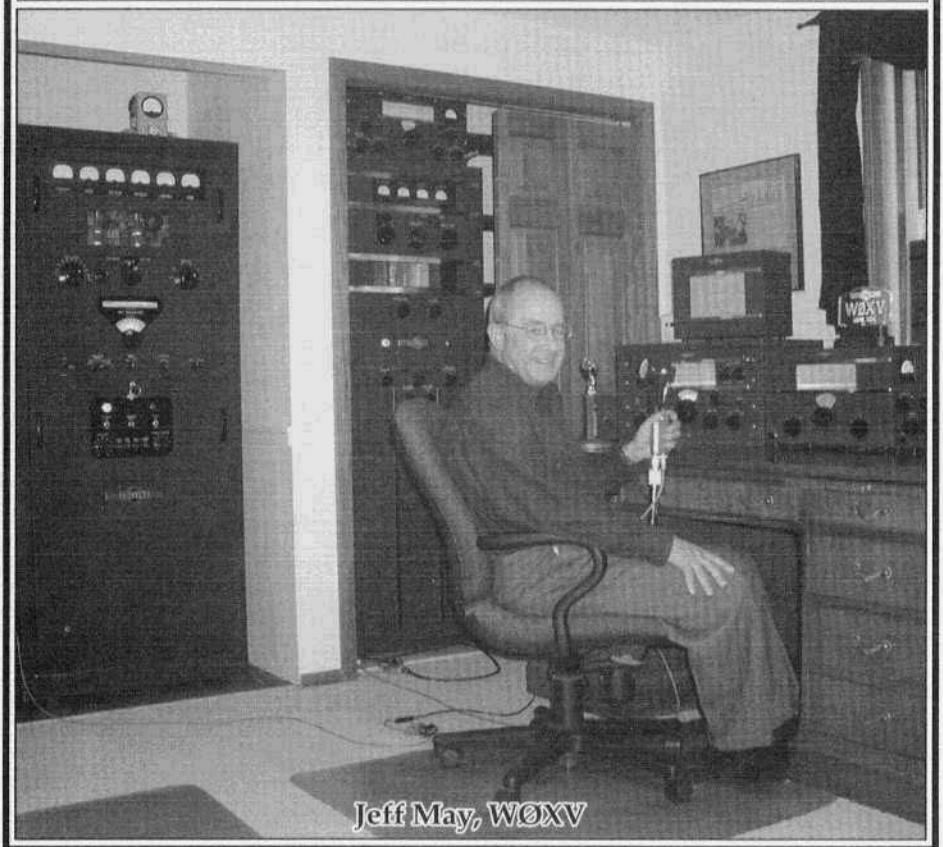
ELECTRIC RADIO

celebrating a bygone era

Number 145 June 2001



Jeff May, WØXV

ELECTRIC RADIO

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

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

Regular contributors include:

Bill Breshears, WC3K; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Bob Grinder, K7AK; Jim Hanlon, W8KGI; Brian Harris, WA5UEK; Tom Marcellino, W3BYM; Ray Osterwald, NØDMS; Chuck Teeters, W4MEW; Bruce Vaughan, NR5Q.

Editor's Comments

Selling Books and Back Issues

My Dayton book sale was an interesting experiment. It confirmed what I suspected about prices versus sales; there is a direct relationship. As soon as I knocked 20% off my book prices they started going out of here like they never had before. Of course I didn't make very much on all these sales but I do have a better understanding of the business. I've decided to continue selling books at reduced prices, but I'm now offering only 10% off. I think I'm still selling books for less than most everyone else so I'm hopeful that my book business will continue to contribute to our financial well-being.

I also sold a ton (literally) of complete back issue sets (the 1st 12 years) after announcing that there would be a $30 increase after May 30. I sold so many sets that I had to go to my printer and have him reprint several issues. I was rather shocked when he informed me that the cost was now double what it had been. In order to continue to make money on back issues I've had to up the price of a complete set to $345, a $50 increase over the old price. I've also increased the price on individual issues and sets of 12. But I'm offering a deal on the last four years (#97-#143) — $100.

Vintage Field Day, June 16/17

A last reminder to all the first class subscribers—who will receive this issue before VFD—that it looks like there will be an increased level of participation this year. Even if you can't get on the air from the field your support from your home station would be appreciated. Look for us on 10 (just above 29.0); on 15 (between 21.400 and 21.450); on 20 (14.286 late afternoon, early evening, Pacific time); 40 meters (7290 Sat. & Sun. mornings and evenings) and on 75 early mornings and nights. Next month we'll have a preliminary report on how it all went. N6CSW

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Cover: Jeff May, WØXV, in his Collins equipped vintage hamshack. The transmitter on the left is a KW-1 and the one on the right is a 30K. *Photo by Tom Moll, NØBS.*

June AMI Update

by Dale Gagnon, KW1I, President

Dayton Hamvention 2001

I left work in southern New Hampshire the Tuesday of Hamvention week about 1:45 PM and had a very good run to Mercer, PA near the Ohio border by 10:30 PM. I had a little console rigged up in the passenger seat with my 2 meter rig and an Elmac AF-68 transmitter and PMR-8 receiver. I had a number of good contacts on the way out that helped pass the time. I had left the HF antenna in the garage over the winter and it had some corrosion in places. It tuned up funny the last time I used it, so before this trip I completely disassembled it, cleaned all the antenna contacts and cleaned up the ground connections on the car. It performed flawlessly.

A week before the trip I put in a pair of air shocks. They worked great. It doesn't take many boat anchors to make a minivan ride low.

Wednesday morning I was on my way to Fair Radio at 7:30 am arriving there about 11:30. At Fair Radio I met up with my brother Dean, KK1K who had flown out to the mid-west earlier on business.

No matter how small my list is, I never seem to get out of Fair before closing time. In the months before the Hamvention trip I make up a list of bizarre items that I need for my shack and add to it what my friends in the Northeast need to complete their projects. I never come away from Fair Radio disappointed. The most interesting item there was what looked like a complete SCR-399 shelter. (More about that next month.)

Dean and I got to our motel around 7:00 PM on Wednesday night. We got a ground floor room so we could easily haul some of our stuff out of the car. We took a ride out to the Hara Arena just to make sure that the layout for the AM Special Event station had not changed from last year.

Thursday morning we went out to Hara Arena to set up. We had to work around some powerful thunderstorms that were going through the area. We got things unloaded into the tent space, but were delayed until later in the afternoon putting the antenna up. I had not gone through the process of getting approvals for the Special Event station again because I was doing the same thing as last year and I was working with the same people - Big Mistake. As soon as I started to work on the antenna, the golf carts, each with two guys talking on their handhelds, started to converge on us. It took a while before I was actually talking to my Outdoor Exhibits contact. He left just before the sky opened up with another downpour. He said he had one more person to get approval from. As soon as the rain let up, Dean and I put the antenna up. We never heard any more from the Hamvention administration, but I was reminded that I shouldn't assume everything will be OK this year just because it was last year! I am going to include pictures of the antenna and its supports and the 250 ft. run of ladderline over the parking lot in the Outdoor Exhibit request next year.

The antenna was 130 ft. long in the configuration of an inverted V with the center support up about 35 ft. It is set up in a grassy area on the other side of a large parking lot from our operating position. The special event station was in one of the end spaces under the outdoor exhibits tent. I brought the 300 lb. Meissner 150B transmitter and a Hammarlund R-270 (BC-794) receiver and power supply for the special event station. A 12-inch speaker and an antenna tuner were the

Andy Howard, WA4KCY (right), President of the Southeastern AM Radio Club presents Dale Gagnon, KW1I, President of AM International, a Life Membership in the Southeastern Club in appreciation of his tireless efforts on behalf of of the AM cause during the last ten years. *Photo by Wayne, WB4WB.*

important accessories. This equipment was a little overkill, but I knew that it would make a very good visual attraction in our high traffic tent location.

Friday was a wash out. Very heavy rain squalls came through in the vicinity of thunderstorms. The weather made the Outdoor Exhibits tent very busy with people getting out of the weather. The AM Special Event Station had plenty of onlookers and was definitely a crowd-pleaser. I was with the radios most of the day in the tent. Whenever we were in QSO with a good sounding AM station, people would stop, listen, leaf through a back issue of Electric Radio and more often than not, buy one or more issues. Probably could have sold more. Special thanks to Barry Wisemen of ER for his support of AM International, and specifically for his sponsorship of the AM Special Event Station.

Later in the day I ran into Steve, WB3HUZ, a speaker at our AM Forum, which was coming up in a few hours. I was relieved to know he had arrived. We got our speaker/moderator badges and checked out the meeting room. It was an ideal sized and equipped room. When the AM Forum commenced at 3:30 PM we counted 90+ people in the room. I gave an AMI Update, Andy WA4KCY gave an update on a new AMI affiliated club they have in the southeast, SAMARC. They have obtained the call W4AMI. While Andy had the mic he had some nice words for me and presented me a plaque giving me lifetime membership in SAMARC. Next Steve, WB3HUZ made a presentation on Synchronous Detection receivers. This was a very practical talk with suggestions how to get started. It was received very well. I think Steve plans to put the information up on his "AM

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The S-37 and its Predecessors:

The Surprising Extinction of Hallicrafters Ultra High Frequency Communications Receivers[1]

Part 2

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Postscript

Hallicrafters did not advertise the S-27, S-27B, S-36, S-36A, or S-37 in amateur or electronic magazines after November 1945. Two probable circumstances may have colluded to provoke the abrupt demise of the five receivers. The first relates to forecasts of economic prosperity made on the basis of lucrative military contracts during the war. The second pertains to the apparent fact that receiver engineers at Hallicrafters, during the war years, neither kept sufficiently abreast of swift developments in tube technology nor integrated them progressively into its line of UHF receivers. How these circumstances actually affected the course of history at Hallicrafters is a matter of conjecture. None of the responsible principals at Hallicrafters are living today and in-house records are unavailable. Thus, we may never obtain accounts of the debates and discussions that ensued. Nonetheless, the modus operandi of the engineers is inherent in their products; moreover, the voluminous outpouring of advertising by the Company provides a foundation for assessing the engineers' thought processes. These considerations inform the commentary below.

First, the S-27, S-27B, S-36, and S-36A fulfilled a niche in the scheme of military communications during WWII. Wartime contracts made it feasible economically to produce them. Intensified demand provided prima facia evidence that the receivers met military standards. In the absence of incentives to upgrade appreciably, and, perhaps, being preoccupied in making production quotas, Hallicrafters' engineers were lulled into an illusory sense of satisfaction. Why make more than cosmetic physical changes and minor circuit modifications when all is going well? Consequently, while Schor's design of the S-27 may have been viewed as state-of-the-art in 1940, no person, either in the Company or in the field, advanced a compelling reason to do other than clone it over and over again.

Why was the S-37 brought into production toward the end of WWII? For laboratory work? What purpose would it serve that a S-36A, modified for higher frequency reception, could not fulfill as effectively? One plausible reason stands out: Bill Halligan's primary goal was that of attaining greater recognition for himself and his Company. He was flush with an enormously successful range of products, e.g., SX-28 and BC-610; he had amassed a personal fortune of millions of dollars; and he was firmly ensconced as CEO of one of the more prominent manufacturing companies of communications equipment. He hardly needed a boost in status, but he was determined that Hallicrafters should manufacture a UHF receiver that manifested the farthest reaches of scientific progress.

Acclaim and honors, Halligan assumed, would accrue to the S-37 analogous to those attained in the transmitter field by the HT-4/BC-610. As noted

earlier, Halligan proclaimed that the S-37 is comparable "in every way" to the finest of traditional communications receivers. He appears, from his actions and statements, to have succumbed to the temptation of an ego-trip!

Second, there is no possibility that Halligan's intentions for the S-37 were attainable. On the basis of counsel by his engineers, he manufactured a relic—a representation of an earlier era—in physical appearance the S-37 is reminiscent of his German-silver dial receivers of the mid-1930s and its circuitry, namely the RF section, featured venerable RCA acorn tubes, which had been introduced a decade earlier.

Radio engineers were cognizant in 1934-35 that two principal factors influenced the effectiveness of receiving tubes at UHF: interelectrode capacitances and lead inductances in the tubes. They did not fully comprehend the role of a third factor, electron transit time, until 1938 ("Tube Problems at UHF," 1938). Transit-time effect becomes pronounced at UHF because the arrival rate of electrons to an electrode may be irregular relative to current flowing to the electrode. For example, a grid-cathode resistance may be greater than one megohm below 50 MHz but transit-time effects will reduce it to only a few thousand ohms at UHF. In the plate circuit, transit-time effects will cause a lag in phase between plate current and grid voltage and a decrease in the internal resistance of the tube. Whatever the source, a serious reduction will occur in tube transconductance [the tube amplification factor, which is measured in micromhos].

The decrease in both interelectrode capacitances and lead inductances in the acorn tubes of 1934-35 certainly enabled early UHF experimenters to investigate frequencies as high as 300 MHz. However, the acorn tubes are limited in critical ways: they necessitate an awkward, circular, ceramic socket, which complicates chassis layouts, and they are fairly fragile, since element leads protrude horizontally from their tiny glass bodies; more significantly, the transconductance of the 955 is a relatively low 2,200 micromhos and that of 954, only 1,400 micromhos.

The shortcomings associated with the transconductance of acorn tubes led to research that revealed the 955 has more gain as mixer than the 954. Grammer (1942) thus stated unequivocally: "The 954 is therefore decidedly not the tube to choose for the mixer in a u.h.f. superhet." Grammer went on to say: "until tubes are developed which are capable of performance equivalent to that of the standard varieties on ordi-

continued on next page

nary communication frequencies, we cannot hope to build u.h.f. superhets which are capable of the results that we now get from our communication-frequency receivers."

Early in 1940, RCA announced the development of a new line of miniature battery tubes [the 1R5, 1S4, 1S5, and 1T4 for compact, lightweight portable equipment], which proved to be prototypes for future VHF tubes. Each miniature tube was only about 2 inches long and 3/4-inch in diameter. The new design provided compactness without decreasing the relative size of essential electrode parts. Their short leads were ideally suited for VHF operation, especially since the closer spacing between the control grid and cathode led to higher transconductance. The compactness had been achieved by replacing the conventional base with a new glass-button, 7-pin base sealed to the glass envelope and by mounting the electrodes directly on the glass button.

The trend toward miniature, glass-envelope tubes accelerated during WWII, which in turn, led to displacement of metal tubes at lower frequencies and acorn tubes at VHF frequencies (Herold, 1962). For example, in 1942, RCA introduced the miniature 6AC5, with low input and output capacities and a transconductance of 5,000 micromhos. And in 1942, RCA also announced the 6J6, a miniature twin-triode with a transconductance of 5,300 micromhos. Both the 6AC5 and 6J6, therefore, yielded more gain than a 954.

RCA made the 6J4 available to equipment manufacturers in 1944. The 6J4 is a triode intended for use as an amplifier having very low signal-to-noise ratio. It possesses an astounding transconductance of 12,000 micromhos. In 1944, researchers at Bell Laboratories developed the 6AK5, a miniature pentode constructed for use as a broadband amplifier at very high frequencies. The distance between the control grid and the cathode in the 6AK5 is .0035 inch, and its grid is wound with tungsten wire whose diameter is a fraction of that of a human hair. Its multiple interelectrode spacings and element sizes are so small that the 6AK5 combines the desirable features of low input and output capacitance with a transconductance of 5,000 micromhos. Later, RCA released in 1946 the 6AH6, a sharp-cut off pentode designed for IF use at VHF, with a transconductance of 9,000 micromhos. Consequently, as WWII drew to a close, acorn tubes were increasingly regarded as obsolete for most purposes. One has to search far and wide through the pages of postwar QSTs and CQs to find construction projects employing acorn tubes.

Grammer's (1942) research and judgments appeared in print two years after Schor (1940) published details for constructing a state-of-the-art UHF receiver using the 954 as a mixer. And Schor and his colleagues at Hallicrafters might not have recognized the relevance to UHF work of the announcement in 1940 by RCA of a forthcoming line of miniature tubes. Surely, however, they were cognizant, before the S-37 was in production, that UHF miniature tubes were available for RF and mixer stages with greater gain than the 954. Whatever, they ignored the data.

The limitations of the S[BGH]-27, S-27B, S-36, S-36A, and S-37 collectively demolished Bill Halligan's expectations for his UHF receivers in the post-WWII marketplace. Although the five receivers were manufactured over a time span of five years, they are so similar that it seems they could have been produced simultaneously. Hard evidence belies the claim that Hallicrafters had clearly anticipated "the present trend" in facilitating development of the very high frequencies. Whether the S-36 was the "most versatile VHF receiver ever designed," that is, up to the time it was manufactured, is debatable. Further-

more, what criteria could Bill Halligan and his engineers been contemplating when they asserted-directly contradicting Grammer's (1942) findings about the 954—that the S-37 is *"in every way comparable to the performance of fine communications receivers on the standard frequencies"* (italics added)?

Shortly after the end of WWII, Bill Halligan, still convinced that his line of UHF receivers rated premier ranking, revealed forthrightly the goal toward which he had been striving for five years ("Advertisement," 1945f). The heading of his statement reads: "Claim staking-Hallicrafters and very high frequency." The body of text follows: "Based on the facts in the case, Hallicrafters can take out a very strong claim to leadership in the very high frequency field. The facts include such things as the Model S-37, FM-AM receiver for very high frequency work. The Model S-37 operates from 130 to 210 Mc.-the highest frequency range of any general coverage commercial type receiver. Hallicrafters further supports its claim to domination in the high frequency field with the Model S-36A, FM-AM-CW receiver. The 36A operates from 27.8 to 143 Mc., covers both old and new FM bands and is the only commercially built receiver covering this range." The text concludes with this vexing statement: "Further developments in this direction can soon be revealed-adding further support to Hallicrafters claim to continued supremacy in the high frequency field."

Further revelations associated with these receivers, however, were never forthcoming. The above composition, published in November 1945, is the last public statement that either amateurs or private sectors of the electronic industry heard about the S-37 and its four predecessors. **ER**

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Electric Radio in Uniform

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Annual Military Group Meet

The sixth annual meeting of the Military Radio Collectors Group (MRCG) was held on Friday and Saturday, May 4th and 5th at the NCO club, Camp San Luis Obispo, CA. The weather was great, enthusiasm was high and a good time was had by all.

The 2001 meeting followed the two day format of previous years with the first day devoted to setup, informal get-togethers and operating events. As in previous meetings, early activity began in the NCO club and adjacent RV park Thursday afternoon, and by 5:30 seven equipment setups were in operation.

Friday

Friday morning working setups were led off by the very impressive AN/TRC-75 owned by Dave Ross, N7EPI (see picture). PRC-47, GRC-9, RT-68, PRC-10 and various other examples of GRC/VRC hardware were also observed along with a very nice RAL receiver. In the modern equipment category, Can Ogan, WA6VVC, led the way with his mint PRC-1099A/RAT-20/AT-1011/U setup.

Operating exhibits inside the club included Hank Brown, W6DJX's ART-13 and ARC-5 displays, Tony Lissona, N7APL, had an ancient BC-32A lit up and Mark Blair, KE6MYK, had his GRR-5 in operation along with Paul Thekan, N6FEG's RBZ Raider Receiver. Al Tipsword, W6GER, was there with his GRC-19 based RTTY setup configured as used operationally in the AN/GRC-46 and VRC-29 systems. My own GRC-19 was running from my van parked outside the club and I was also providing antenna services for Al's system.

On static display, Ludwell Sibley's radar tube exhibit, Bjorn Forsberg's collection of British field sets (see below), and and W6GER's AN/GRC-14 system (R-808 and T-631) deserve special mention. Additional fine equipment examples on display included SCR-508, AN/GRC-8, GP-7, BC-1000, GRC-9, PRC-25, PRC-6, TBY, TBX, BC-474 and SCR-274N hardware.

A series of 6 meter FM fox hunts was organized Friday afternoon. In the first of these, Cam Ogan, WA6VVC, came in first followed by Mark Blair, KE6MYK, and Mike Brown, N6WIG. In the next hunt, Cam won again followed by Tom Horsfall, WA6OPE, and Bart Rowlett, WB6HQK. In the final run, Lynn O'Connell, KG6DNY, was first followed by Cam and Mike Brown, Seven hunters participated and the "fox" transmitter was a 100 mw home brew unit provided by Cam Ogan.

Friday's activities concluded with pizza and salad in the club. Attendance at the end of the day stood at 61 with 41 signing on for the evening feed.

Saturday

The Saturday program began with the swap meet which opened officially at 5:30 (AM) with approximately 35 sellers participating. Notable among the offerings were Hank Brown's still considerable stock of command sets and parts. A BC-375 complete with tubes was quickly sold, and Paul Keys of Columbia Electronics was there with a selection of newer radios and accessories.

The technical program got underway at 0945 with a presentation by Trish

Fleamarket Saturday morning. *Photo by K6TUY.*

Gibbons, WA6UBE, on the Automatic Link Establishment (ALE) techniques now used in some modern radio systems. ALE is an automated system allowing the radios themselves to manage channel selection and linking with other stations in the network. Trish led us through the fundamental techniques employed including the current applicable federal and military standards (FED-STD 1045/46/47, and MILSTD 188-401A and 187/721C). A live demonstration followed the talk.

The second presentation was by Paul Bernhart, KF4FOR, entitled "Radio Amateur Use of High End Communications Systems." Paul gave us an interesting and informative walk through of the Harris AN/URC-122 and Collins TSC-60 (HF-80) systems in their various configurations. These high end systems have become available on the surplus market in recent years albeit at rather high prices ($1800 to $28,000 depending on the configuration). Paul led us through the various configurations available for both systems including a discussion of the practical aspects of getting the hardware on the air (documentation, cabling, operating peculiarities, etc.). These are both complex, multimode radios with capabilities far in excess of normal amateur needs (four channel ISB, for ex.). Paul reported the major user complaint from hams (old timers at least) is the absence of a normal tuning knob on either system.

The final talk of the morning was by Bjorn Forsberg, SM5UR/6 on British Wireless Field sets of WW II. Bjorn began with the WS 17, an early set used primarily by searchlight battalions. A power output of 300 mw gave a range of 3-5 miles. Frequency coverage was 46-64 mHZ for the MK-I version and 44-61 mHZ for the MK-II. The WS 18 was the work horse pack set used by the infantry. This robust transmitter and receiver combination covered 6-9 mHZ with the use of plug-in coils and provided a power output of 250 mw. The final system discussed was the WS 46, a later,

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Dave Ross, K7EPI's AN/TRC-75. *Photo by W7QHO.*

more compact unit with a power output of 1.5 W over a frequency range of 3.6 - 9 mHZ. Excellent examples of these three sets from Bjorn's collection were on display in the exhibit area throughout the meet.

Lunch was served immediately following Bjorn's presentation. This excellent BBQ was again provided by Dave Ragsdale. A total of 67 meals were served.

The final technical session, a discussion and slide show on the T-195/GRC-19 transmitter by the author, began at 1:30. This 1950s transmitter along with its companion R392 receiver was designed as a replacement for the WW II SCR-506 system. The T-195 provides a nominal 100 watts output on CW, AM, and also RTTY with external modulator and FSK conversion equipment. The latter operating mode was probably predominate by 1960 and beyond. These transmitters have become reasonably available in recent years, especially following Desert Storm. (For a full technical run down on the T-195 see ER #104.)

The meet concluded with a discussion of a proposed fall gathering at Ft. MacArthur in San Pedro, CA, and a short business meeting. The club was cleared by 5:00 PM and turned over to a Civil Air Patrol group who had rented it for the evening.

Antenna Presentation

In previous meetings, it had been noted that the radio antenna on the tank included in a WW II memorial near the entrance to the Camp was not authentic to the period. Following lunch on Saturday, Trish Gibbons presented a restored MP-48 base with authentic WW II "MS" mast sections to the camp in appreciation for their continuing hospitality. Capt. Gruner accepted the gift on behalf of the Camp and the ceremony concluded with the new antenna being mounted in place by Carla Satra.

Equipment Judging

This year attendees were offered the opportunity to register their equipment setups to be judged in one of three categories: (a) Outside Operating, (b) Inside Operating and (c) Inside Display.

SM5UR's WS-46 and WS-18 (see text). *Photo by W7QHO.*

Blue, Red and White ribbons were awarded in each of these categories by a panel of judges. Judges were also allowed to register equipment, but no judge evaluated his own entry.

In the first category, Cam Ogan, WA6VVC, came in first with his PRC-1099A setup followed by Dave Ross, N7EPI, with the TRC-75 and Al Tipsword, W6GER, with his PRC-47/RTTY. Al won the Blue ribbon in the second category with his GRC-46 operating in the exhibit area followed by Mark Blair, KE6MYK's GRR-5 and Paul Thekan, N6FEG's RDZ. In the final category Howard Krinsky, K5KE, came out on top followed by Ludwell Sibley, KB2RVN's Radar tube display, and Jay Coward, KE6PPF's R-113.

Congratulations to all the winners and our thanks to the judges, Trevor Sanderson, PA3BOH, Tony Lissona, N7APL, and Cam Ogan, WA6VVC. This new event was conceived and managed by Hank Brown, W6DJX.

Alternate Program

This year's Saturday program for wives and girlfriends provided a tour of the San Simeon Hearst Castle. The tour took in the estate's extensive gardens, terraces and walkways and included an exploration of the hidden terrace rediscovered during a modern restoration. Casa del mar, the elaborate cottage where Mr. Hearst chose to live, the Neptune Pool Dressing Rooms, and the Wine Cellar of Casa Grande were also included. Our sincere thanks to Jeanne Reed for organizing the event.

Finally

This year's official attendance totaled 87 with participants from VA, AZ, OR, WA NY, MI, MO and NV as well as California. Trevor Sanderson, PA3BOH from The Netherlands also returned this year. Our sincere thanks to Hank Brown, Jeanne Reed, Trish Gibbons, Carla Satra, Bob and Bunny Heusser, Dave Ragsdale, and all the others who helped make this year's meet a success.

The meeting was taped by Bob Heusser, K6TUY. Copies of a VHS video covering the event should be available by mid-summer. Call Bob or check our

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Radio Connections

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The chassis was quite spartan for a transmitter. This homemade device didn't seem like much: a heavy steel box with the components connected with zip cord, two knobs, no switch and no meter, a hand wound coil, two tubes, a coax connector, a power cord and a round octal socket for a crystal. As I said, it wasn't much but it was pretty much all I had. So... armed with a pair of dikes, needlenose pliers, and a Weller 120 watt soldering gun that I had received for my 15th birthday, I attempted to repair this sorry-looking apparatus before my Novice license arrived in the summer of 1961.

We lived in an old Pennsylvania farmhouse on a place called High Larches Farm. For the benefit of you Westerners like Barry, a larch tree is related to the tall pine and quite bountiful in this part of Penn's Woods. In support of the war effort, my parents had actually raised cows, chickens and pigs during World War II. However, my father was a full time insurance man and my mother was busy at home with five children, so they could hardly be classified as farmers. These spacious surroundings provided me with an extensive experimental station for antennas. My aerials were mostly of the dipole variety because that was the only kind I knew how to build. Aided by my "high larches" I erected my first 40 meter doublet to be connected to the 6L6 transmitter that I couldn't fix. You see, my most daunting problem at the time was that we lived so far from anyone civilized that I didn't have my very own "Elmer," so I had to learn the hard way -by myself- which is why I learned little or nothing at all. After nearly killing myself climbing larch trees, I managed to get my dipole up about 25 feet with the coaxial feed line running from the third floor of our old house. I had read in a Harvey Radio Company or E.F. Johnson ad that you'll require RG-59/U coax for a 75 ohm, 40 meter dipole or if you wish, you may use 300 ohm "TV" twin lead with a homebuilt tuner. Now mind you, I had no idea what twin lead, coax or a tuner was, but it made me sound very authoritative when discussing my ham radio activities with my classmates at Devon Prep where I attended high school.

One Devon classmate, Bob Roethe, was one of my first connections to this magnificent hobby. Since Bob and I shared a mutual interest in ham radio, we became friends. Bob actually did his homework and studied for tests. Bob was an excellent student and his family encouraged this highly scientific hobby of ham radio. Bob was later licensed as KN3TUN, and is now NE6J; he went on to become a noted physician in Southern California. I, on the other hand, was a terrible student, so my father disapproved of this activity entirely, telling me that this radio stuff would help me flunk out of school. Naturally, armed with this kind of encouragement, I charged ahead!

Then another surprising connection revealed itself. One night I was up in my room practicing CW on a code practice oscillator when my dad yelled up the stairs, "When are you going to learn some numbers!" I was speechless. Could it be that my father, who had done everything possible to discourage me from ham radio, had some sort of idiot-savant knowledge of CW?

He slowly came up the stairs and sat down beside me and said, "Let me show you." He grasped the key with his right hand in way I had never seen. His thumb and index fingers seemed to "fit" my J-38 key like old friends. Then my dad

Lloyd Roach, W3QT

started sending CW with just about the most perfect fist I have ever heard- then or since. At no time during my long life of 15 years, had I known that my father, had not only once been a ham, 3AWF, but had sailed as a merchant marine operator in the 1920's. He had served on three U.S. flagged merchant ships and had been to sea as shipboard operator all over the North Atlantic. He and his fellow operators used rotary spark and quenched gaps. With that kind of experience, why then did he not want me to do this? Well, as I later learned, his early departure from high school was partly because of his consuming interest in wireless. He never attended college, and I'm pretty sure he felt he would have done better in life if that damned ham radio hadn't ruined his studies. It was an amazing revelation. After that evening, he never mentioned it again and remained totally uninterested in my pursuits. By a total coincidence, several years later I followed in my father's footsteps and spent four years in the Navy as a shipboard operator. It may be genetics, but I do have a talent for CW, especially with a straight key.

When my new license arrived with KN3QNT typed neatly at the top by the FCC's Ben Waple, I was ready to go except for a working transmitter. No matter what I did I couldn't make my 6L6 oscillator play, so I finally succumbed and used my grass-cutting money to purchase a brand new Heathkit DX-20 for $35.95. This became part of my "H" Line, along with my postwar Hallicrafters S-40-B, which my friend Bob Roethe dubbed the S-40-BAD! This receiver would drift off the table if you didn't glue it down.

Finally, my DX-20 transmitter arrived and I vowed that I was going to do things right. I took my kit out into the barn where we had a little unheated room near the hay mow; there I commenced building my very first rig. The first thing I noticed in small cellophane bags were little round things with wires

continued next page

sticking out; the manual referred to them as resistors. All the little bands appeared to be the same color, but I did my very best to assemble the kit and the finished product looked great... But nothing worked... That's when I decided: I've got to get connected... I gotta get an Elmer!

Houston "Tex" Hendricks, W3AK, had a nice ranch house right down the road from the Paoli train station on Philadelphia's legendary Main Line. My first contact with Tex was through my mother's friendship with his wife, Helen. I never really knew if Tex was from Texas, but with a name like Houston, he sure wasn't from the Main Line! Tex had been a ham for many years and was an awesome homebrewer. He had built his own receivers, transmitters, amplifiers, and even his own 70-foot lattice tower!

I sheepishly explained to Tex over the phone that I had assembled my Heathkit DX-20, 50 watt, six band CW-only transmitter precisely according to the instructions in the manual but it wouldn't work. He graciously invited me to his wonderland shack, told me to bring my rig, and said he would take a look. Tex looked at my transmitter, compared the renowned Heathkit instructions with what I put in there and said, "Are you colorblind?" I was stunned. It never occurred to me that maybe THIS was the cause all of my troubles. It turned out that nearly 40% of the resistors and the mica capacitors were in the wrong place. Tex ever-so-discretely never told a soul what I had done.

Needless to say, after that experience things became easier for me. I knew in my heart of hearts that, no matter how many hams I knew, I was not headed toward a career in electronics, electricity, or any field that required correct voltage and current. Nonetheless, ham radio was too much fun to let a minor inconvenience like color blindness get in my way. I took to getting help when I built things. Years later my poor children were often summoned to, "help Daddy with his colors." It's not a pretty picture to see me with a 50 pair telephone cable!

Like many hams, my interests gravitated toward operating, building antennas and seeing how things worked. With the help of ham friends, I have learned enough about electronics to keep from electrocuting myself and have some fun. After my tour in the Navy, I went off to Emerson College in Boston to study mass communications. I entered the commercial broadcasting profession as direct result of a QSO on six meter AM. It was the end of my freshman year and I needed summer work. Larry Will, K3ADS, now W3VU, was chatting with me on 51.6 khz. He told me about a guy who was the head of engineering for Philadelphia's Triangle Communications in Philadelphia, parent owner of the largest stations in town, WFIL-AM-FM-TV. Lew Wetzel, W3SML, now W1LI, became my first connection with the world of commercial radio when he helped me get that summer job at WFIL-AM. Later I was hired at WHDH-AM-FM-TV in Boston as a result of meeting Bob Jennings, W1DKD, on 40 Meters. While working there, I had the pleasure of knowing Jim Lighthoot, WA1KRL, who was General Manager of WBZ-AM and cofounder of EASTCARS. In 1978 my family and I moved to Chicago for a job as VP/General Manager of WEFM. Both of our engineers were hams. In 1985 a group of investors helped me purchase my first radio station, WCZN, which operated on 1590 khz. Of the five shareholders, three were hams, W3QT, W3VU and K3RF. Our Chief Engineer was K3KW. Our production man was KB3FAB. Our part-time copywriter was KA3NWM and our FCC attorney was W3KD. As a result of the phenomenon, I wrote a press release for QST with the headline, Area Hams return to 200

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Rich Smith, W9LDB, Silent Key

From David Olson, W6PSS

With heavy hearts we regret to announce the passing of Richard Smith, W9LDB. He slipped away peacefully Wednesday, 25 April, after a resolute battle with cancer. Richard was laid to rest in a beautiful little country churchyard near Rochester, Indiana.

Many will recall Richard's hospitality and goodwill during those years he hosted annual Southern California AM social gatherings at his QTH. As a matter of interest, the Wednesday Nite AMI Net evolved from the efforts of W9LDB. In the early 1980s, following a long AM silence, Richard began an AM renaissance by organizing an AM net on 3885 that later moved to 3870 kHz. It began with only a few of us - KD6OS, K7YOO, WC6D, K7POF, W6CC, WA6ZJC, W6HDU, K8MLV, W6PSS and others. This in no way diminishes the noteworthy contribution of SPAM, AMI and Fred Huntley (W6RNC) of ER's "Reflections Down The Feedline" fame, to grow the net.

Rich loved good audio! This passion was highlighted each time he would counsel AM newcomers in making their station sound as good as his. It was a pleasure to witness this missionary effort. I'm honored to have been Richard's friend.

From Norm Johnson, W6CC

I had the pleasure of knowing Rich for over 20 years. I first met him shortly after he got on the air in San Diego.

He was, even in the earliest days, an avid collector. When you entered his home, you would see older ham radio equipment all over the place. His love of collecting never decreased during all the time I knew him.

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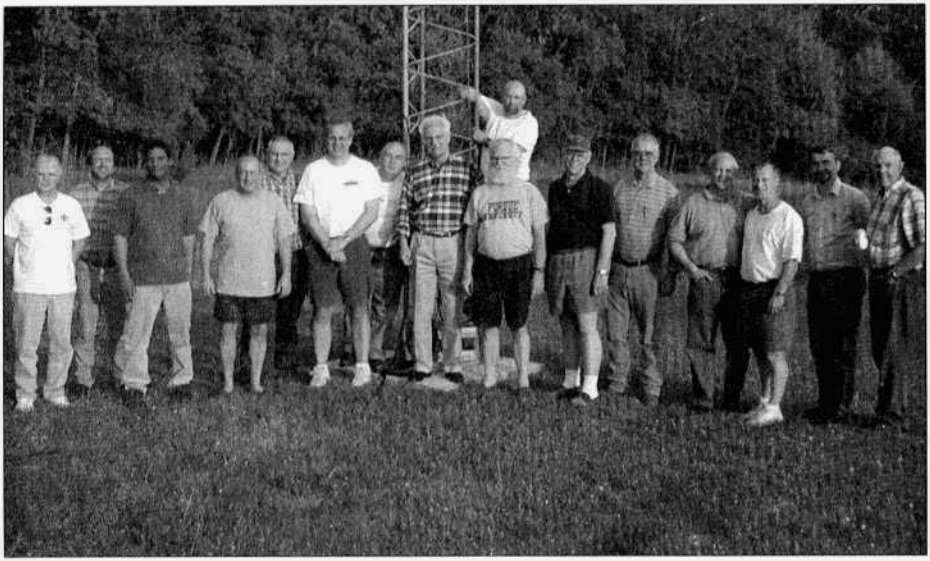
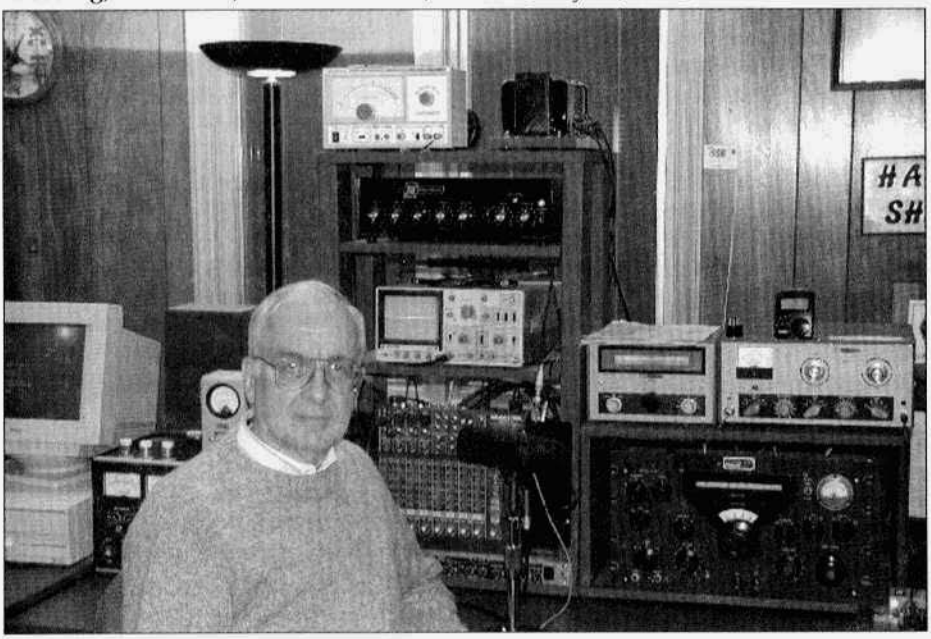
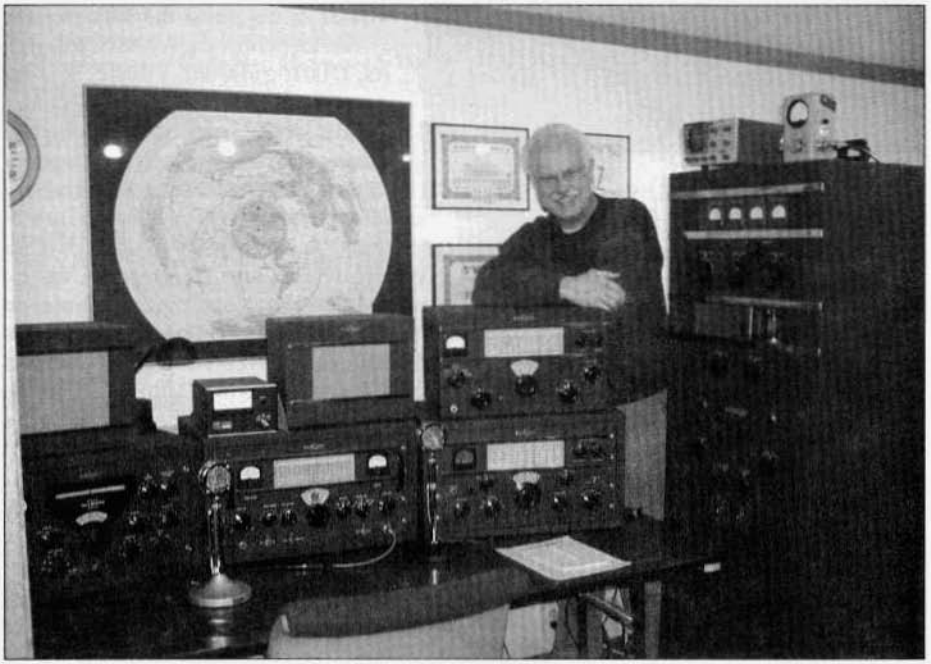


A get together of AM'ers organized by Jeff May, WØXV. L to R: Don Hansen, WDØI; Wayne Kuzelka, KBØMV; Robert Smith, NØVMC; Jeff May, WØXV; Dale Hagert, WØIR; Michael Sell, KØCOM; Mike Warren, KØMAZ; Tom Lutz, WØZR; Hugh Jaeger, K4ESQ; Larry Menzel, NØXB (on tower); Dennis Petrich, KØEOO; Lon Cottingham, K5JV; Ken Wessels, WØSX; Tom Moll, NØBS; Scott Freeberg, WA9WFA; Butch Schartau, KØBS [May 14, 2001]



Ken Barber, W2DTC in his hamshack. The DX-60B (which he runs into a linear amplifier) is his main AM transmitter. He also uses an external modulator.

Michael Sell, KØCOM with some of vintage gear. *Photo by Tom Moll, NØBS*



Tom Lutz, WØZR, with some of his pristine Collins gear. What a beautiful station! *Photo by Tom Moll, NØBS*

Jack McCullough, W6CHE, Silent Key

by Ludlow Sibley, KB2EVN
102 McDonough Road
Gold Hill, OR 97525

Jack A. McCullough, Sr., founding partner of tube maker Eitel-McCullough Inc., died April 28. He was born in 1907 in San Francisco, California, and received the callsign 6CHE about 1924. After two years' college, he was hired by Heintz & Kaufman in January 1930. H & K was a local producer of shortwave communication gear and transmitting tubes. At H & K, he pumped-down and sealed tubes and tested them. He and Bill Eitel, W6UF, left H & K in 1934, after the company decided not to sell actively to the amateur market, and started Eimac.

The new company introduced a line of power triodes, starting with the 150T, with innovations in design. "Bill and Jack" were apparently an unusually strong partnership, sharing a common office in the early years. They were listed as co-inventors on most of Eimac's patents in the early years. During WW II, the company massively increased production of its power tubes. After reconverting the company to postwar civilian tube production, Eimac expanded into microwave power tubes. Eitel and McCullough sold control of the company to Varian Associates in 1965 but remained as officers of Varian-Eimac into the '70s.

The U. S. Navy gave McCullough its Distinguished Public Service Award in 1950. He was elected a Fellow of the Institute of Radio Engineers in 1953 for "pioneering contributions to power tube design." He became a Fellow of the Radio Club of America, receiving its Ralph Batcher Award in 1979 and its Sarnoff Citation in 1994. He was a strong contributor to Stanford University, where the McCullough Engineering Building is named for him. McCullough was an enthusiastic amateur operator, holding the call letters W6CHE for more than 70 years. He wrote transmitter-related articles in "Radio" and "QST" during the 1930s. He was active in DX work, moonbounce communication, and amateur satellite operation. ER

VINTAGE NETS

Arizona AM Nets: Sat & Sun, 160M 1885 kHz at sunrise,75M 3855 kHz at 6 AM MST, 40M 7293 kHz 10 AM MST, 6M 50.4 MHz on Sat. at 8 PM MST; 2M 144.45 MHz, on Tue. at 7:30 PM MST.

West Coast AM Net meets Wednesdays 9PM Pacific on or about 3870kc. Net control alternates between John, W6MIT and Ken, K6CJA.

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.

California Vintage SSB Net: Sunday mornings at 8 AM PST on 3860 +/-

Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net controls are Andy, WA4KCY and Sam, KF4TXQ. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.

Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.

Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.

K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours.

Colorado Morning Net: An informal group of AM'ers get together on 3875 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.

DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.

Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0800 ET on 3885 + or - QRM.

Westcoast Military Radio Collectors Net: Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.

Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. http://www.crompton.com/grayhair

Vintage SSB Net: Net control is Andy, WB0SNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.

Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet on Tues nights on 3805 at 2100 Eastern and on Thur nights on 3875. West Coast 75M net that takes place on 3895 at 2000 Pacific.

Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.

Collins Collector Association Monthly AM Night: The first Wed. of each month on 3885 kHz starting at 2000 CST (0200 UTC).

Drake Users Net: This group gets together on 3865 Tuesday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, W8NS; Rob, KE3EE and Huey, KD3UI.

Drake Technical Net: Sunday's on 7238 at 8PM Eastern time hosted by John, KB9AT.

Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.

Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.

K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.

JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.

Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.

Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. NC is Will, AA6DD.

Old Buzzards Net: Meets daily at 10 AM. Local time on 3945. This is an informal net in the New England area. Net hosts are George, W1GAC and Paul, W1ECO.

Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745.

Midwest Classic Radio Net: Sat. mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.

Boatanchors CW Group: 3546.5, 7050, 7147, 10120, 14050. 80 on winter nights, 40 on summer nights, 30 and 20 meters daytime. Nightly "net" usually around 0200-0400 GMT. Listen for stations calling CQ BA, CQ GB.

Wireless Set No. 19 Net: Meets the second Sunday of every month on 7.175 +/- 25 kHz at 1900Z (3760 +/- 25 kHz alternate). Net control is Dave, VA3ORP.

Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22:00 UTC on 7220. Net control is Dennis, VE7DH.

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

The Repair Bench

Mail in response to the Receiver Repair Article

Compiled by Jim Hanlon, W8KGI
Sandia Park, NM 87047
W8kgi@arrl.net

I want to thank the guys who wrote e-mail notes about my recent receiver repair article. It's always encouraging for an ER author to get some feedback, and in this case they made some improvements on my suggestions that now I can share with everyone. I'm going to repeat their letters below, and I'll intersperse some comments of my own in italic type. Hopefully Barry can find some in his computer too, so that you can tell who is saying what.

The first letter comes from Bill Fizette, W2DGB. He wrote it after the first installment appeared in March. Bill is the President of the Antique Wireless Association, and he writes a column in their Old Timer's Bulletin, "The Communications Receiver." So when Bill speaks, I certainly do listen!

Hi Jim,

U asked for comments... so here goes!

Very nice to see your great article on fixing sets... and I am so glad that Barry gave you the space to do it right. I have been doing this thing strictly as a casual and hobby approach for many years, but I still learned quite a bit from you, as for example where to get manuals. Am looking forward to the next session. And it is very obvious that you and I are of the same generation and share common interests. At any rate, use the following if it will be of use.

1. At the bench I use two fixed lights... a dual 40 watt fluorescent, and below that a 100 watt incandescent for the times that I can't use the former. I also have a small Tensor lamp sitting on the bench for the times when I have to shine light directly into a shadowed area. Most convenient.

In addition to my lighted magnifying glass, or is it a magnifier light, anyway I have a 60-watt bulb in one of those clamp-on aluminum reflectors that I call on for help. And then there's always a flashlight for those hard to illuminate crannies.

2. For aid for these aging eyes that don't focus as they should, I use a 2x head magnifier that I bought from Radio Shack years ago... I went back to get another one and they didn't know what I was talking about!

Yea, those things are neat! I use one in the lab at work. I just happen to have a Techni-Tool catalog that lists them. They are called "High Impact Opti-Visor." The 1.75, 2 and 2.5 power variety are $31, and the 2.75 and 3.5 power ones are $32. Call them at 800-832-4866 or e-mail at <sales@techni-tool.com>. They have a web page at www.techni-tool.com.

3. For soldering I use a 40 watt GE pencil type, that has some sort of alloy tip that seems to last quite a while. These are no longer available, and since the heating element is in the tip, I will have to make plans for the next generation. I frequently plug it into the Variac and that seems to help. I also have a 75 watt gun, but don't use it too much anymore since I discovered the GE.

I have a Weller WTCP pencil iron that I use for semiconductor projects. My 100 watt Radio Shack soldering gun does a bit better job on the tube stuff where things are more massive and require a more rapid injection of phlogiston.

4. For small tools, I would add a set of spline wrenches (as for Collins) and a

set of Bristol wrenches for Hallicrafters radios. Also a Hytron soldering aid...are they still available? *Good suggestion if you are working on those guys. I had to borrow a set of spline wrenches from Barry to tighten the knob on my 75A-3 last year. The Soldering Aids are still available from Antique Electronic Supply, www.tubesandmore.com, for $3.50. They are a good source for all sorts of vintage radio tools too.*

5. I also use the LM as a signal source...it works fine and has modulation. I too use an IG-42 for rough work. The condenser checker (Heath) is used for checking replacement caps, and to sort the pile of stuff that I pick up, and also to get the feel of the caps used in a particular receiver. If I want the radio to work, and they have the older paper by-passes, after checking 3-4 of them I have the picture. I am familiar with your procedure of using the VTVM to check caps, and I can't fault it. I know a lot of guys that I have respect for, yourself included Bill, who often replace most or even all of the paper by-passes. In my experience, though, only a few receivers have "worn-out" paper bypass caps. They may be a little leaky, but as long as they don't get so warm that they start dripping wax, I tend to leave them in.

6. Re electrolytics, I find that it is a pain to disconnect the numerous B+ lines, although that is really the way to go. If the can cap looks good, I use the Variac and bring the voltage up slowly, while making and breaking it several times. Usually this works, as the (more recent) cans are tough. The older tall cans, single section, as in the National receivers, are usually BAD (except for the paper ones that look like electrolytics). I leave them in place and cut them out of the circuit, and use cartridges underneath.

If you have a Variac, using it to bring up the voltage slowly is a good way to reform electrolytics. I would suggest that you substitute a half-wave silicon diode rectifier for the vacuum tube rectifier if you do this, because the vacuum tube rectifier won't start to conduct until its filament gets pretty warm. Since they are a little expensive, I suggested something the guys could do without buying a Variac.

7. Excellent point on setting up an information and record folder ...most guys pay far too little attention to the paper work.

8. I would add one item to your paragraph on resistors...many will look good, but be way out of spec...I can do a rough and fast survey with the ohmmeter scale, with the resistors in place, and this will usually show how many need replacing.

9. Q: What is 'Big Bath'?

AES says its an "All purpose degreaser and cleaner for electrical contacts, switches, pc boards and components. Evaporates instantly and leaves no residue." The can says it contains Dichlorofluoroethane and Methanol. They sell it for $6.50 for a 12-ounce spray can and $10.95 for a 22-ounce can.

10. Q: I often use WD40 on pots...it cleans them nicely, although one old service fellow in Syracuse ("Cuz'...now a SK) wouldn't touch the stuff...said it had kerosene in it. Do you have any experience with this approach, or any comment?

Several guys report good luck with WD-40, and I use it to lubricate sticky dial gears and pulleys too. But about 20 years ago when I was at Bell Labs, we sprayed down the telephone exchange at Holmstead AFB with WD-40 after it had been soaked by a hurricane. The WD-40 displaced the water, that's what "WD" means, and the exchange did work for about 6 months. Then the relay and crossbar switch bearings started to get gummed up and the contacts started going high resistance. So I avoid using WD-40 on electronic contacts. If Big Bath won't get it clean, I escalate to Deoxit D5, also available from AES.

continued next page

11. Re stuck knobs, several years ago I devised a method to remove the stuck PW dials from National receivers, where the hard set screw had splayed the soft metal on the tuning shaft and effectively frozen the dial on the shaft. Reason: I absolutely did not want to destroy the large tuning knob by sawing it off. The write up is back there in the OTB somewhere. For other knobs, if you can get a narrow vice grip behind the knob, on to the shaft, it can make the removal job a bit easier. If the knob is one that can't be easily replaced, and there is absolutely no other way, cut the shaft off behind the knob and replace the component, as for example, a volume control.

That was a neat method you worked out. It's in the August, 1994 issue, starting on page 17. I used it to remove the National Micrometer dial that was stuck on an RCP. Barry, maybe you could get Bill's permission to reprint that OTB article in ER.

12. Re sheet metal work, I appreciated your descriptions and approach. I can only add that I have had poor luck using snips to cut long runs...I prefer to go to the sheet metal shop and have him use his shears.

13. Re crackle paint, a local auto supply here often has good black..seems the car guys like it. Price is reasonable, and there seems to be more in the can.

14. Re badly rusted chassis, as when a National chassis is too bad, I drill out the rivets, go back to bare chassis, sand blast the thing, or use stripper, and then repaint. If only a bit of rust, I can mask off the parts (tube sockets and tuning cap, for example), and sand blast only that area that is bad. I recently had to do this on a Philco 1935 farm radio basket case..Not too elegant, but it sure looked a lot better than when I started. (I may write this one up for the OTB beginner column.)

15. When I got to the paragraph on applying power, I thought, I wonder if he will present the component smoke theory. I wasn't disappointed!

My hat is off to whoever discovered the smoke theory. Maybe he will read this and fess up.

In rereading the above, I have to conclude that there is no end to what we can tell people. However, I must commend you on an excellent article and even if we can all add something here and there, you have nicely covered the basics. I am unable to find the footnotes, however. Barry: Did I miss them in there somewhere?

As you have no doubt discovered, Barry put them at the end of the third article. I'm writing another article on fixing up transmitters; and if it's too long winded for one issue as usual, we will have to twist his arm to put them at the end of each installment.

One more comment: As I wander through my treasures, trying to make them work, I sometimes run up against teasers that stop me. Right now, for example, I have an NC-100 on the bench that is not working properly because there appears to be something wrong with the AVC. And so far it has defied me, although I will get it in due course. Would you mind if I ran some of my questions your way? You might have just already fought a particular battle.

I'm always happy to be a consultant and to consult others. That's one of the great things about the Boatanchor Reflector that I mentioned in the receiver article. Maybe if there are enough "questions" Barry would publish them now and again in ER and we could farm them out to experts who could answer them.

My apologies for the wordy message...

73, Bill W2DGB

The next message comes from John Bookout, K7JB. John has been a ham since 1958, is a QCWA life member and belongs to the Collins Collectors Association, and he is the Assistant Director of the ARRL North West Division. John wrote after the April issue came out,

and he has a number of good suggestions too.

Hi Jim:

I am truly enjoying your ER article and I am looking forward to the 3rd installment. I wanted to write to you with some comments that you may wish to consider. My comments are not necessarily connected together; but, more or less just there for your consideration.

1). I once heard a comment about how to go about discovering when circuit is not functioning properly. We as human beings use our minds in a comparison mode. We first need to know how a circuit is supposed to function; in order to determine when it is not. Only then can we make a judgment between what is normal and abnormal. Sometimes this is a difficult thing to get a handle on because circuit theory may not take us far enough to know what is a properly functioning circuit. When you were given the task of writing this article, many thoughts must have gone through your mind. Where to start, how much to include, what is important and what is not. Personally, I think you are doing a fine job and you should continue to provide more insight as page space permits.

John, your insight on how our minds function is quite interesting. Quite often I will be stumped on a repair problem, but if I leave it for a little while and go do other things "inspiration" very often happens. My SX-43 story about suddenly realizing what was wrong while I was sitting at a wedding is not an isolated event.

2). In part 1, you talk about the various equipment you use in your lab. For example, some of us who restore own more than just a Heathkit type Signal gen. I for one have an HP-8640B signal generator. I was surprised that you didn't mention this kind of special tool simply because there may be some new folks who might like to own such gear if they knew more about it. I think the fact is that it and its older brothers HP-606A/B offer a superb calibrated output attenuator. This is a big PLUS. One of course can use it to accurately provide very small signals into the tenths of microvolts. I think there is value to be had in taking a receiver that is in good working condition and using say the HP-8640B to provide accurate input signal of known RMS or Ep-p value and a voltmeter like the HP-410C with RF probe or Scope to measure stage gain. Then use this data to work on receivers that are not operating at full capabilities. We may work on a receiver and get it operating to let us just hear a signal. But, if we know what to expect in terms of individual or overall stage gain, we can have an analytical tool to use in trouble shooting to exactly determine when stages are operating or not as originally designed. This I think is the difference between saying it just works as opposed to saying I have made measurements and I know that each stage has the gain it should have.

It would be nice if one could take an oscilloscope probe and see microvolt signals. But, it won't happen when scopes only go down to millivolts. So the next best thing is to inject a known reference signal and expect to see a known value of volts at the detector!

You sound like an engineer, John, or a very good technician. Certainly the better instruments by HP, General Radio, and Measurements Corporation just to name a few are a lot better than the inexpensive kits, and they can be found fairly often at swap meets and surplus stores. My approach to receiver repair for a beginner is to help him put it back the way it was when it was made. Generally if he can do that and if none of the components, in particular the rf and mixer coils and IF transformers, are bad, and if he performs an alignment, the receiver will work just about as well as it did when it was new. But it's always satisfying to see how well each stage is actually working.

continued on next page

3). In part two, you made a comment that if an IF transformer were to end up with an open winding, one might repair it by scraping the wire. I have found that a hot soldering iron with a small pool of solder on it can often burn off all insulation leaving a nicely tinned wire to solder to. This may be of value to those who do not know this trick.

4). Test equipment having low Ohms/Volt specifications can load a circuit under test to the point were the circuit barely works or stops working! In such cases, the user should be made aware of this loading problem so they don't fool them selves into accepting what appears to be a good and correct measurement! Grid bias on some oscillators is a good example. I felt in part 1 that you kind of hinted at an answer when you said: "that can be an important thing to know sometimes", but, didn't actually tell the reader why!

John is quite right. What I did say was, "My Simpson 260 is one of the better meters and is rated at 20,000 ohms-per-volt on its DC-Volt scales. This rating tells you what the resistance of the meter is when you put it across a circuit, and that can be an important thing to know sometimes. For example, on its 1000 VDC scale, the resistance of my Simpson is 20,000,000 ohms or 20 megohms. Heath, Eico, and RCA all made very good VTVM's. They are usually a constant 10 megohms on DC-Volts and 11 megohms on AC-Volts regardless of the scale."

The point is that when you put meter probes into a circuit to measure a voltage, you are also introducing the resistance of the meter between those probe points. That resistance may be enough to alter the operation of the circuit. Usually, the 10 or 11 megohms of a VTVM won't make much difference, but if I were measuring something with my Simpson 260 on its 2.5 volt DC scale, I would be shunting the circuit with 50K ohms. That could make a big difference in some high impedance circuits.

5). If you can, it may be important to talk about noises in a receiver. Do you know any good tricks for finding noisy parts? That would be good to share with ER readers. It would seem to me that this could nicely fit in after the receiver is working. One may for sure like to replace the noisy part then do the alignment.

That's a good suggestion. As I mentioned in my RME-70 story a few issues back, E. G. "Shaw" Shalkauser, the co-founder of RME, wrote a very good article on noises in a receiver in the instruction manual for the RME-70. I'll have to send that to Barry to see if he would like to publish it.

I know that my 75A-4 had noises that were caused by its small red silver mica caps. I made this discovery in 1974, when a friend pointed out to me that my A4 was noisy and one could see the S meter needle jump along with each noise pulse! Most people know about the deadly Black Beauty paper caps (perhaps not new comers). But, I for one was surprised to find bad micas. Now I know about silver migration. By the way, I found so many of them leaky that I just replaced them all!

Sounds like that 22 pF mica in my SX-43.

Now I just replace all Black Beauty's with Orange Drops and red silvers with the new brown micas. By the time you spend disconnecting a parts lead to get a proper test you are 50% of the way toward its complete removal and replacing it removes all doubt. Newark, Mouser and Antique Electronic Supply are all good sources for parts.

I personally shy away from doing a wholesale replacement of any kind of part unless I have evidence that they are reaching end of life, like those @#%&!!! Black Beauty bypass capacitors in my SP-600. Especially with small capacitance micas, the reactance at the operating frequency of an old capacitor with its associated leads and its internal construction might be substantially different from that of a new part. Certainly silver

migration can cause micas to become leaky, shorted, or open, and the repairman should certainly suspect them if strange happenings are associated with them.

Many of us on the R-390A reflector warn newbys about these caps and carbon resistors that are notorious for changing their Ohmic value over time. The new metal film resistors are much more quiet than the noisier carbon types.

6). I am always checking coupling caps between plate and grid. It might be an interesting exercise to point out that if a cap is leaky, the previous stages plate voltage will raise the next stage's grid voltage thereby resulting in a bias problem for the subsequent stage. This shows the importance of replacing them. One case in particular, in the R-390A, a shorted C553 will destroy a mechanical filter and if you change the bandwidth switch to a new filter, you can wipe all of them out! See Dave Curry's Longwave ad. That's $200 buck a POP!

John makes a very good point. If an AC signal is coupled through a capacitor from the plate of one stage, which is at B+ potential, to the grid of a following stage which is at or near ground, leakage in that capacitor can pull the grid voltage up. It will generally drive the grid positive with respect to its cathode and into conduction. That will cause the following stage to draw more plate current than it was designed for and generally to distort the signal. If that's happening, measure the grid-to-cathode voltage. If the grid is not negative with respect to the cathode, suspect leakage in the coupling capacitor.

7). I don't know how far you want to go with your article. But, I think new people really don't know much about striping, filling in, powder coating, painting and lettering of front panels. There are even Hams out there who do this kind of work and for a price you can send yours to them and get back a "new" panel!

The subject of cleaning up corrosion and refinishing a chassis and panel is well worth another ER article. I tend to leave the "battle scars" on my old gear because they are a proof of age and service, but I must admit that a brand new looking Ranger or HQ-129x is a thing of beauty. Maybe you might want to write an article about this yourself, John.

Thanks again for your great article.
73's John

Cormac Thompson, W7JHS, writes the next e-mail.

Jim:

Enjoyed your article in this month's ER. Got a question for you that I don't want to wait until next month in case you might now cover it anyway.

I have been restoring these old radios for many years myself but one area I have never encountered because I didn't have the equipment is the use of a sweep generator.

I am just finishing up an old Super Pro 210X and have done it all except for the alignment of the grid coil . As the book says, " This circuit may, however, be correctly aligned by the 'visual' method employing a frequency modulated oscillator and cathode ray oscillograph".

I haven't a clue as to how to perform the "visual" method. I have a Hickok 288X and a good HP scope.

Can you give me a little advice and a quick lesson?

Thanks in advance.
73, Cormac, W7JHS

I did not properly cover IF alignment for the Hammarlund HQ-120 and Super Pro family receivers in the article, and for that I apologize. As Cormac points out, you really do need a sweep generator to align the IF's properly on these guys. A sweep generator is not an electric broom but rather an oscillator whose frequency is electronically "swept" across the IF passband. One synchronizes the horizontal trace of an oscilloscope with the sweep signal's frequency and displays the IF output on the vertical

input. This gives a picture of the passband and allows the service tech to tune the IF transformers for the desired passband shape. One important point is to keep the sweep slow enough so that a highly selective passband is not distorted. A 60 Hz sweep frequency may be a bit fast for the Hammarlund IF's.

I have a Knight Kit RF Sweep Generator on the shelf in my garage that just might do the deed. I need to get it out and try it one of these days. I also have a home made sweep generator, currently lost under my bench somewhere, made out of an Exar XR-2206 Monolithic Function Generator integrated circuit. I got it several years ago from Radio Shack. The output frequency is controlled by external resistors and capacitors and it can range from 0.01 Hz to over 1 mHz. It can generate sine, triangle, ramp and pulse waveforms, and its output frequency can be swept by drive from an external voltage source. I have a Tektronix 454 oscilloscope, and I use its horizontal time base ramp output signal to drive the sweep frequency input on the 2206, so the swept frequency is automatically synchronized with my scope's horizontal trace. It's a great little IF alignment generator, all I have to do is find it or buy another 2206 somewhere. I've used it to align the IF's on my HQ-129x and it does a great job. I promise to write up the details one of these days for ER.

After I gave Cormac some sweeper advice, he came back with the following.

Jim:

Thanks for the prompt reply. I started to fiddle around with this old Hickok sweep generator and discovered my HP scope has a digital display mode instead of an X-Y mode which is going to complicate things with the sweep generator! More fooling around is in order! We'll keep our ears to the ground for more info and thanks again. If I ever figure out the easy way to do this, I think I'll write an article for dummies. Looking forward to seeing the rest of your writings on receiver resurrection.

Looks like boatanchor repairmen need boatanchor scopes, Cormac.

I'm just starting on a BC-342 which the guy who sold it to me last weekend said worked. Yeah, right. All I got was a big fat hum and no wonder since the filter cap in the military power supply had no filtering at all left inside the can. I should have been tipped off by the spinning bow tie with the flashing lights and white shoes the guy was wearing! Oh well, just another project for the bench.

73 and thanks again, Cormac, W7JHS

I've seen that guy at Dayton and Flagstaff too. I think he does a lot of selling on e-bay.

The next bit of mail comes from Don, WA2EWP. Don has an answer to my question about how to remove a stuck knob.

Jim

"Electric Radio" Part 1 and part 2, articles on "How to Repair a Receiver" GREAT STUFF!!!!!

Your first article asked if anyone had a suggestion on how to remove old "Volume Control Knobs" (my terminology) from the proverbial 1/4" shaft. I have a vintage Hammond B3.

I purchased it about 10 years ago. There was a typically round knob mounted on a 1/4" brass shaft. Shaft was in a vertical position through a plate-mounted bushing on the mahogany console. I was hardly able to turn the shaft with the knob. I removed the knob (more later on knob removal) from the flat on the 1/4" shaft. Placed an absorbent cloth around the plate area to protect the mahogany. Sprayed the shaft with WD 40. Within minutes the shaft worked free, good as the day manufactured, and I NEVER had to lubricate the shaft again.

Well I can't argue with success, but I'm

still shy of WD-40 around electrical parts.

Re knob removal, the knob on the organ did not have a set screw. However if a set screw is removed from the knob and the knob still won't come off, put the plastic tube in the hole and spray the WD-40 into the hole. I've had knobs that wouldn't come off after removal of the set screw because the shaft metal was deformed by the end of the set screw which had been set too tightly. Then I use creativity, a flexible shaft tool, dental bits and burs to resolve the problem. If the knob is intact after the surgery, make a new hole in the knob and tap the hole for the screw size.

I've had trouble with half of the mesa on the top groove breaking off on a set screw. I guess for that it's back to the dental bits and burs or to a small diameter drill bit.

New subject, unrelated. I have an Ampex 7" reel to reel tape deck. Previous owner tried to resolve a "tired" belt problem on the fly wheel on the capstan drive with some non slip fluid. Wrong! Melted the belt, what a mess stuck to the flywheel and elsewhere. Couldn't remove the stuff no matter what I tried. Told an amateur buddy of my dilemma. He said put the unit in the freezer. Then, after several hours, I should be able to pick off the frozen rubber mess. No Good. Went to a hamfest at Beacon, N.Y., met an audio engineer, told him of my problem. He said spray (you guessed it!) WD-40 on the mess and it will solidify the mess and you will be able to remove the material. I did. It is a labor of love and a slow process.

Hmm, I'm going to have to buy some stock in WD-40!

One final thing, I have a Collins KWM-1 with DC and AC power supplies. There is a problem in the receiver IF section. I want to sell this unit if I get a good offer, as is.

Don, try advertising it in ER. Or maybe you already did. I'm sure some handy person will make you a decent offer.

73,Don, WA2EWP

Dennis Olmstead, WB9EMD, made the following contribution.

Jim:

Wow, good article.

I have an old Navy FRR13A, one with very small tubes. It had a "smoke session" a while ago and I fixed it once. But would like to do so again and your article will help.

My usual method is to look for what is burned and replace it, a method which does not always work.

Dennis, when you find something burned you definitely need to replace it. But you need to look for the reason why it burned and fix that too. For example as I found out in my SP-600 Super Pro, the resistors isolating an RF or IF amplifier from the B+ line may be burned because the tubular bypass capacitor connected beyond them has shorted out. Or that very expensive power transformer in your HRO-50T1 or 60 may have just burned out because that stupid paper bypass capacitor from rectifier plate to ground shorted out. So fix not only the burned out part but also the cause.

Ron Samchuk, VE4SR, contributed the following.

Jim:

Greetings from Birtle, Manitoba. I want to tell you how much I have enjoyed reading and re-reading your article on repair of boatanchor type receivers. I look forward to all future segments and, as far as I am concerned, I would like to see you as a regular column in ER. Could I suggest a series on transmitters and related accessories. Also, how about suggestions on restoration like how to wash, clean and refurbish, repaint, etc. etc.

Ron, you're getting me into trouble! I still have a job and a life. But, seriously, a column on repair hints would be a good one for ER. Perhaps Barry could get several authors to contribute answers to questions

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A 160M Converter for the Heathkit SB-301 Receiver

by Edward P. Swynar, VE3CUI
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Background

What does the Heathkit SB-301 receiver have in common with a Johnson 500 transmitter? It's simple: neither one of these classic rigs is blessed with 160-meter capability!

The reasons for what we now perceive to be such an obvious and glaring shortcoming doubtlessly were quite sound to the engineers who designed them "...away-back-when". But this is 2001, and most of us have become quite accustomed to—dare I say "spoiled by"...?—the multi-tasking, multi-band, extremely flexible rigs of to-day. Is the inclusion of Top Band in our vintage hardware really all that much to ask for? In the case of the Viking 500, the response is probably affirmative... however, when it comes to the SB-301, there is something we can do to increase its utility in this way.

The classic answer lies in the utilization of the receiver as a tunable intermediate frequency amplifier for 160, through the construction of a simple, self-contained, external, homebrewed converter.

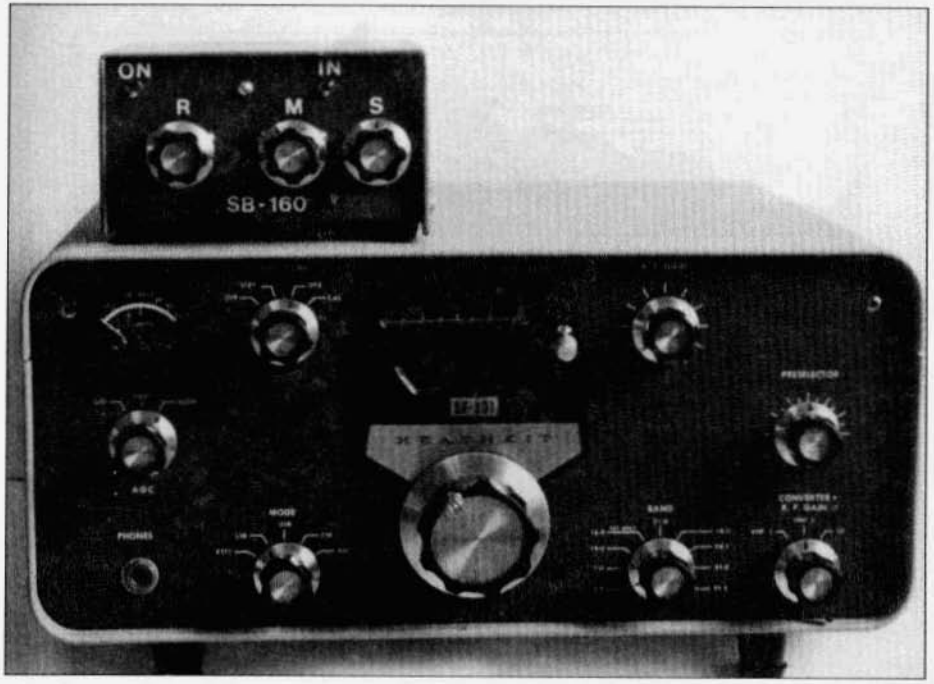
Design

In keeping with the hollow-state heritage of my SB-301, the converter would—naturally!—have to employ tubes as active devices. Research into my QST magazine archives unearthed an intriguing "Gimmicks & Gadgets" piece written by James P. Gillespie (W4LQC/W8BKK) in the May 1969 issue entitled, "A 160-Meter Converter For Ham-Band-Only Receivers". This design is quite simple and straightforward, and served as the foundation for mine, but with some noteworthy modifications.

The originally specified 6AK5 radio frequency amplifier tube was replaced with the more modern 9 pin 6EH7, based solely upon comments made by Walt Hutchens (KJ4KV) in his excellent article, "A Few Miniature Tubes You Might Have Missed", in the November 1996 issue of Electric Radio. Run the right way, the 6EH7 displays tremendous cross-modulation resistance, according to Walt, and the specs reveal it to be certainly no slouch in the amplification department, either, with a transconductance of 12,500 mhos, as compared to the 5,100 mhos for the 6AK5.

A second change to the original circuit again plays upon the theme of the importance of designed-in adjacent strong signal handling capability in receiving setups, specifically, the crucial matter of front-end selectivity. The original simple parallel-tuned "set-and-forget" L/C network ahead of the 6J6 mixer stage was replaced with a link-coupled tuned circuit, virtually identical to that employed ahead of the RF amplifier. It may well seem to be a nuisance, initially, to have two controls to peak up a received frequency, but believe me, the extra effort really is ultimately worth it. The addition of the potentiometer in the cathode lead of the RF amplifier permits a reduction of some 20 db. on incoming signals, and affords yet an additional measure of flexibility for the operator.

The last change to the original QST piece was the incorporation of a built-in, simple a.c. supply. As a homebrewer, I'm becoming more inclined of late to move away from the traditional "...one-power-supply-fits-all" school of construction (with its associated spaghetti mass of inter-connecting power leads linking up different peripherals), in favour of having everything self-con-



The "SB-160" receiving converter sitting atop its tunable IF, aka a Heathkit SB-301 receiver.

tained, with the only common thread being the a.c. mains.

Construction

A 5-1/4" x 3" x 5-7/8" two piece metal cabinet (Radio Shack #270-253) houses the converter and its supply, with little room to spare. As can be seen from the photograph, a piece of aluminum bent into a simple "L" supports the two tubes (mounted horizontally, to conserve space), and their associated components.

The variable capacitors are beautiful NOS Jackson Brothers dual 365 pfd. units, which I picked up for pennies apiece at a recent Hamfest. The two sections of each unit are connected in parallel, for a total effective maximum capacitance, per capacitor, of 770 pfd. Obviously, I could have used just one such variable for both stages, thus eliminating a control...but the drawbacks to such a scheme would have included the complications of proper tracking of the two stages, as well as the use of larger inductors—both electrically, and physically—for the RF amplifier and mixer.

Room is at a premium: in order to replace either of the tubes in my specific layout anytime in the future, the power transformer will have to be temporarily removed first! Likewise, with the coils "wedged-in" as they are, the original steel top of the Radio Shack enclosure had to be replaced with a fabricated Plexiglas lid. During preliminary trials on 160, I discovered to my disappointment that the close proximity of the coils to the assembled enclosure adversely affected the sensitivity of the converter. Such a situation could only be remedied by either 1) re-locating the coils further away from any nearby metal surfaces (which was impossible that late in the game), or, 2) constructing a new top of non-conductive material (which I ultimately did). A little forethought with your own design might spare you this aggravation. The incorporation of self-shielding toroid

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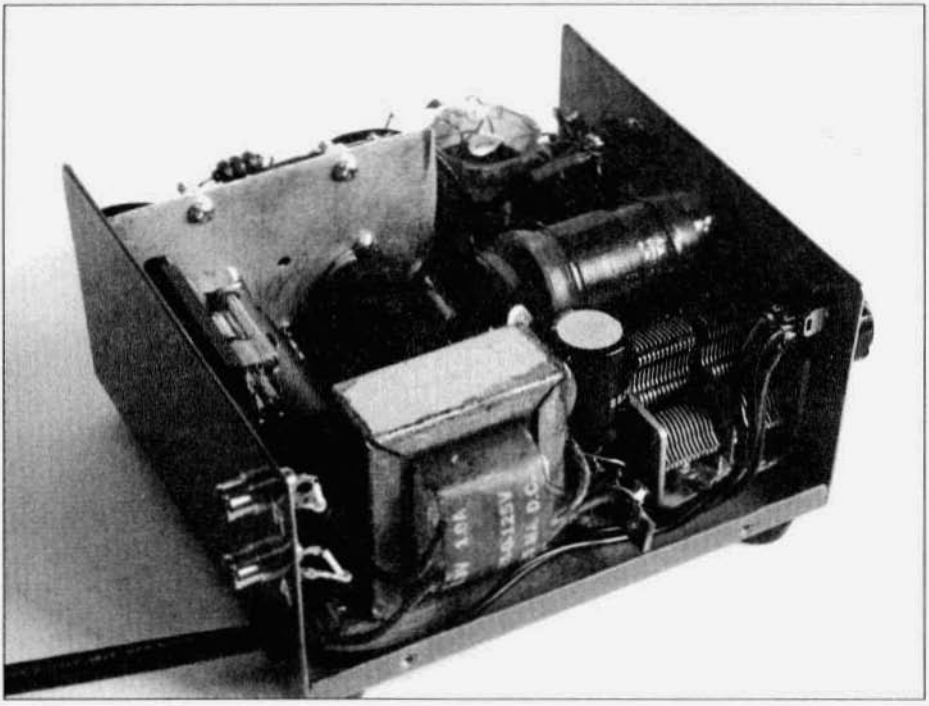


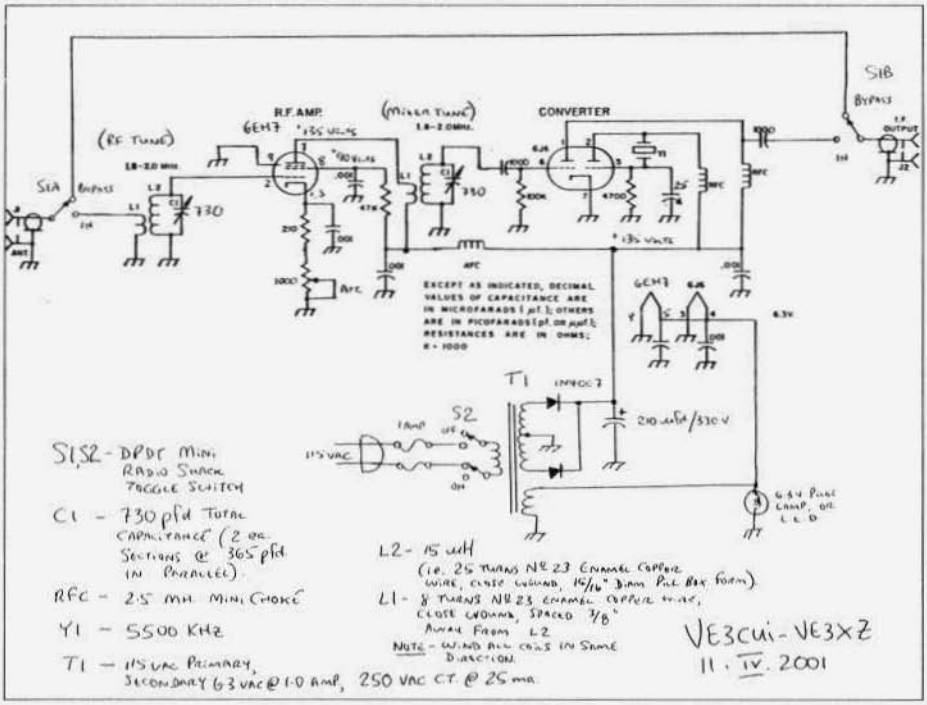
Side 3/4 view showing pill box coil construction. The vertical coil in the background is the mixer tune coil and the horizontally mounted coil in the foreground is for RF tuning. Note the power supply filter glued to the side of the power transformer.

coils—as opposed to my classic air-core pillbox inductors—would doubtlessly preclude the need for any such modification.

The coil turns themselves are effectively secured and sealed with the help of two coats of ordinary clear nail polish. In order to match the original SB-301 paint scheme as closely as possible, I took a factory-finished enclosure and front panel with me to the local hardware emporium for on-site colour comparisons. While not exact, the finish on the converter is near enough that it certainly does not look out of place sitting atop the receiver. The final touch to any such project is the lettering of the individual controls. In the past, I have enjoyed great success with the semi-professional look afforded me by the usage of vinyl "...peel & stick" letters, as manufactured by "Blaine Graphics" (Washington). These come in a wide variety of styles, sizes, and colours, and may be readily found at the better office supply stores. Lastly, the original Heath knobs on the converter make it look even more like the proverbial long-lost "prototype wannabe", and complement both converter and receiver quite nicely...

Alignment and Operation

After having first visually cross-referenced your wiring to the schematic for any obvious gaffs (I confess to finding no less than two major ones in mine!), ensure that the crystal oscillator is operating before proceeding with any attempts at alignment. This is easy: just apply power to the converter, and tune 5500-KHz (plus or minus) with a nearby general coverage receiver. A loud carrier indicates proper operation. If nothing is



heard, tweak the trimmer capacitor connected to the crystal until oscillation starts, and then adjust the trimmer just a hair past the setting that first initiated oscillation, to ensure it readily starts the next time the unit is powered up.

The converter allows reception of 1.8- to 2.0-MHz signals with the SB-301 tuning from 7.3- to 7.5-MHz, respectively. With the unit properly installed between a 160-meter antenna and your receiver, turn on the power to both, and allow the rigs to warm up for a minute, or two. Be sure you do not have the bypass switch in the bypass position! Now, set both capacitors in the converter to maximum, and tune the receiver dial to 7.4-MHz (which is now 1.9-MHz). Peak up the background noise with the receiver's preselector control. Next, turn the RF amplifier tuning control on the converter away from maximum, looking for another increase in background noise (it will be fairly sharp). Repeat this procedure with the mixer tuning control, remembering that with 15 uh of tank inductance, it will take just under some 500 pfd. of capacitance to resonate on 1.9-MHz. With the converter peaked on frequency at this point, the plates of both capacitors should be more than half meshed.

Again, the tuning of both controls is sharp enough that you might initially be inclined to think the converter is not working properly...remember to adjust both S-L-O-W-L-Y at first, until you've become accustomed to the routine.

Sensitivity of your system as a whole may be noticeably increased if you violate slightly the Heathkit manual's RF amplifier alignment procedure for the 7-MHz band on your SB-301. First, adjust the preselector control, and the internal antenna and RF amplifier plate coils, exactly as detailed in the manual. Next, move the dial up to 7.2-MHz, re peak the preselector control on the crystal calibrator signal, and then repeak the two internal SB-301 coils on this new frequency.

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Radio Service in the Golden Age

1930's through the 50's

by Bruce Vaughan, NR5Q
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Episode 1

I've known many radio servicemen, some good, some bad, the majority somewhere in between. I have however, never met a serviceman who started out life intending to make radio service his life's work. It seemed to be a career that attracted those with a love of electrical devices, and those who preferred working in surroundings of their own choosing. It is only natural that many ham radio operators were assimilated into the profession thru 'osmosis.'

When my family moved to Springdale in the mid-30's I was in the 10th grade. Although I had been building radios for four years I did not have a ham license. The town we moved from had no ham operators; without an 'Elmer' it is difficult for a youngster to get started in Amateur Radio. I was overjoyed to find we had moved into a 'hot bed' of radio activity. Springdale, a city of 1800 population, had a ham population of six. Better still, one was 14 years old, near my age, and lived only two blocks from our modest apartment. By 1938, I was on the air signing W5HTX.

Our town had one radio service shop. The owner and only employee of the radio repair shop was a small, physically handicapped middle aged gentleman who had a reputation as the most cantankerous, ill tempered person in town. The reason he had any business at all was because he ran the only game in town. Customers approached the shop with trepidation—with good cause. Many potential customers were ordered out of the establishment before they could lower their ailing Philco, or RCA onto the crude front counter.

The shop was not small and was located on main street in a prime business area. Every spot in the shop was occupied by customer's radios awaiting service. They were stacked on the floor, on and under tables, even in the front windows of the shop. The only clear area was around the small workbench-and even it seemed to be growing smaller as the backlog of inoperative radios grew larger with each passing day. Obviously something had to give.

Soon after arriving in town I started dropping by the shop after school. I never asked Mr. Cantrell questions or attempted conversation. I simply made myself as inconspicuous as possible. Gradually, the ice started to melt. He would smile when I came in the door and occasionally take a ten minute break for a cigarette during which time I learned a great deal about him.

His wife had died years before leaving him with two small boys to care for. Soon after, his dad and physically handicapped mother moved in with him. He had stomach ulcers, and had undergone surgery two times—the last time part of his stomach was removed. I found out he kept a little daybed in the back room, and quite often had to lock the door and rest before he could continue working. Long hours, a body that was not awfully strong, trying to service radios with practically no test equipment, and even fewer new replacement parts, being the sole caregiver and provider for two young boys as well as

Bruce Vaughan in his radio shop circa 1948. The Hickok tube tester, VOM and 288X signal generator represent the latest in test equipment.

his older parents was taking a heavy toll. In addition to all those problems he was servicing radios with no training, and not a lot of experience. Is it any wonder that he sometimes became frustrated and ill tempered?

One afternoon he turned to me and asked, "Would you be interested in helping me out after school and on Saturdays? I know you don't know much about radio service work, but you could help customers and keep them off my back. You could remove radios from the cabinets and set them on the bench for me. Then, after I repaired the radio, you could put it back together and fill out the paper work. I would pay you well if you could give me a few hours a week."

It was late Friday afternoon when he offered me the job. "I'll be here when you open in the morning," I told him.

Saturday morning I showed up about ten minutes before 8:00 AM, his usual opening time. I grabbed a broom and swept up the area around the workbench-it was impossible to sweep the room as it was nothing but wall to wall radios.

After sweeping out the area I rearranged a bunch of radios and emptied a small work table. "Do you have an extra meter (meaning VOM) that I could use on this bench," I asked.

He rummaged around under his workbench and pulled out an old Triplett. "Better run over to the hardware and get batteries for this-I know they need replacing."

I got the meter working though I wondered how accurate the old thing was. I turned to the stack of radios nearest the workbench and picked up a cathedral RCA and placed it on my 'workbench.' "Is it OK if I start on this one," I asked.

"There is no need to waste time on that he said, I've been thru it two or three times and it is a real 'booger'. I'm gonna give it back to the customer and tell him it is not worth fixing."

"Well, sometimes two heads are bet-

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An Antenna Controller

by Tom Marcellino, W3BYM
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W3BYM@arrl.net

This project would be suitable for those of you using coax feed lines and multiple antennas. If you don't want the expense and hassle of running a cable into the shack for each of your antennas, this project is just what you need. Remote operated relay antenna switches have been around for some time now. I've been using one here for the past 15 years and except for the routine maintenance on the contacts, it has performed without problem. Although these relays were housed in a moisture tight box, the contacts still corroded and had to be cleaned on a regular schedule.

My new version of this unit uses a pair of upgraded vacuum sealed 26 volt relays. Use of this type relay required a new design in the controller unit because of the higher DC voltage on the coils. I also took this opportunity to incorporate some additional features that were not on the original unit. The latest version places the shack dummy load on the transmitter when the controller is in the OFF position. This turns out to be a real nice feature. Anything done automatically around this shack is a real help. A 3 ampere RF ammeter was placed in the line giving another indication of power going out the feed line. One final feature added was a pickup coil for the shack frequency counter. Since the RF line was there, it was a simple matter to install a small toroid core with a few turns for this purpose.

This upgraded project was going to include the RF pickup, detector, and AM transmitter audio monitoring capability. Many problems were encountered because of the switching polarities for the remote relays and the problem of the hum monster mixing with the audio. The decision was made to

The antenna controller is housed in an HP VOM case.

abandon the audio portion and make it a separate project. That project, the Tx_Rx Audio Monitor is completed and will appear in a later article.

This Antenna Controller is designed to operate three separate antennas using a single coax feed line. This is accomplished by sending DC in various polarities with the transmitted RF from the controller to the remotely located relay switch box. For long relay life I picked the antenna that I use most often and it uses the two remote relay's N.C. contacts in their de-energized position. You can see by viewing figure 2 that 40 meters is my band of choice. Selecting a second antenna applies positive 26 volts to the coax center and pulls in relay K2. Selecting a third antenna applies a negative 26 volts to the coax center and pulls in both relays, K1 and K2. The relay action is controlled by a steering diode in the remote relay box.

The power supply is the standard bridge rectifier with capacitor input filtering using a 25 volt @ 1.2 ampere transformer. The controller uses three LEDs to indicate conditions. LED 1 is red and stays on whenever the unit is ON. LEDs 2 & 3 are green and are on corresponding to relays K2 & K3 being energized. These LEDs are Radio Shack number 726-271A rated for 12 volts @ 15mA. Notice the 3k ohm resistors used to reduce the current to the LEDs when fed from the 26 volt line. This value lowers the LED current below the rated 15mA because they were just too bright at rated current.

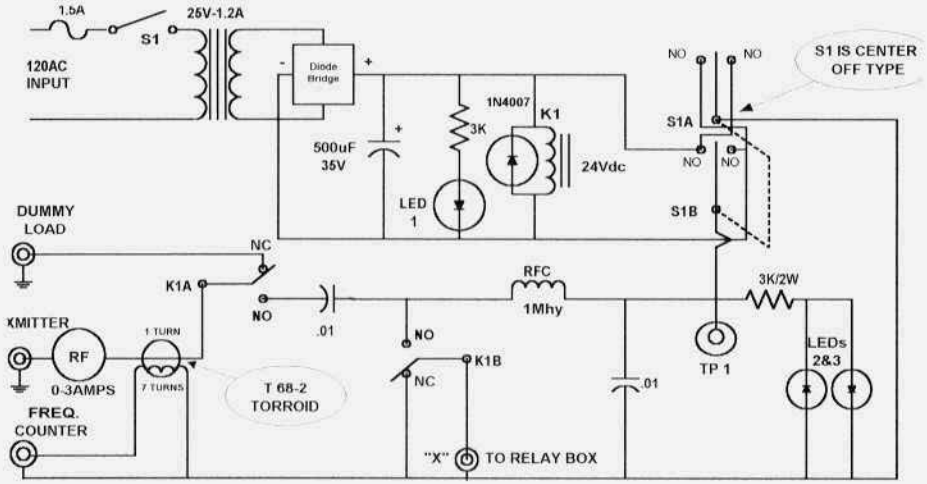
Switch S1A/B is a DPDT type with a center off position. The center off position is necessary to provide the condition of zero DC on the coax line thus neither K2 or K3 is energized. The 1mH RFC used in both units is critical for the DC current handling capability and high impedance to the back flow of RF into the DC power supply. The vacuum sealed relays are real current hogs demanding 250mA each to energize. Therefore the RFC must have the ability to carry at least 500mA when both relays are pulled in. I tried several types of RFCs and found that the pie wound type worked the best for RF isolation. In this application I use two in parallel for each position. Each RFC is rated at 2.5 mH and 10 ohms DC resistance. The DC resistance must be kept low to minimize heating. Many pie wound RFCs have a much higher DC resistance, therefore make sure to measure this parameter prior to installation. I also tried the simple ferrite one turn RFC but it didn't offer high enough RF impedance. K1 is shown in Figure 1 as de-energized and in the N.C. position.

The pickup for the frequency counter uses a small Amidon toroid number T 68-2. The core is placed with the main RF feed line passing thru its center. This is equal to one turn. Toroid turns are defined as the number of wires going thru the center of the core. The seven turn pickup winding uses #22 solid insulated close wound but there again spacing doesn't make any difference just so 7 wires go thru the core center. Of course in this application the number of turns depends on the amount of drive needed for your counter. I use an old Nixie tube HP5326C that requires more than normal drive for a stable reading during modulation.

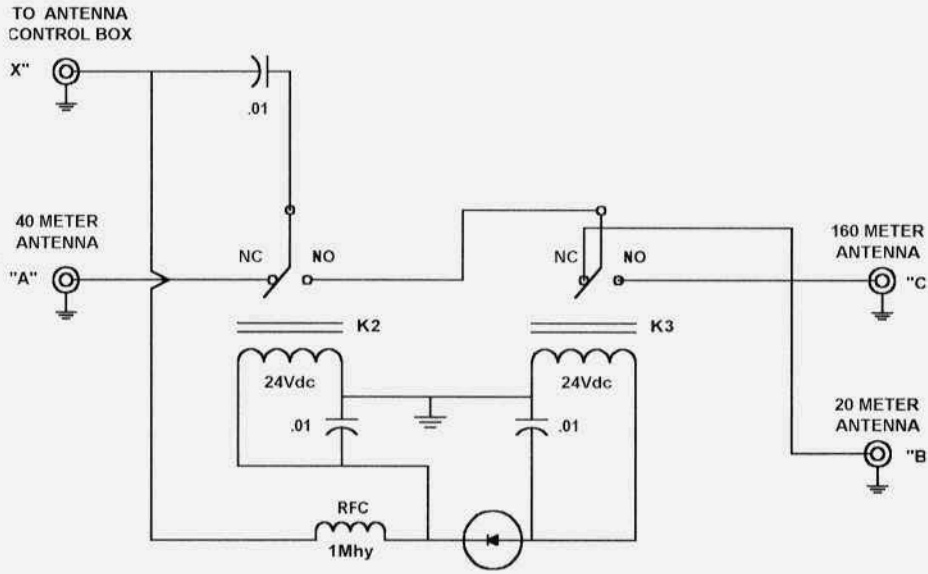
The case for this project was constructed from a discarded HP 427A VOM cabinet. I picked this one up at a hamfest for five bucks. After making a new front panel, the electronics fit very nicely inside. There are several partitions for mounting the various components. All the sides are removable giving great access to all the electronics. Now where could you get a case like this one for five bucks and it even comes with a built in handle on top.

The remote relay unit uses an outside electrical gray plastic box purchased from the local Home Center. It is the type with no holes and has a lid gasket.

continued next page



Antenna controller circuit.



Remote relay box ciruit.

Mounting of the vacuum sealed relays is shown in the photo. A single "L" bracket is used on the bottom relay flange and the top relay connects to the bottom one via its flange. The RF connections were completed using small copper strap. In this case I used Solder Wick and it worked very well. Only four external SO239 connectors are required for this installation. All bypass capacitors are disc types rated at 1Kv.

Using the Antenna Controller and Remote Relay box are pretty much self explanatory. The point "X" of each unit is connected via the main RF feed line. Connect the antenna of choice to position "A" and the two remaining antennas to positions "B" and "C". Turn on the power to the Antenna Controller and K1 will energize thus lifting the

dummy load from the transmitter and connecting the antenna of choice. This new unit with the remote vacuum sealed relays has been in daily operation for the past six months and trouble free. There is no relay maintenance due to outside weather elements and the additional features have made it a useful addition to the shack. A basic circuit for a controller of this type was published in 73 Magazine, May 1980. ER

Radio Service from page 33

ter than one-do you mind if I give it a fast look?" I asked, as I started removing the knobs.

Mr. Cantrell smiled, "Go ahead if you want, but you are wasting your time."

Now I knew I was no whiz at radio, and that if I was fortunate enough to get the radio working it would be more luck than knowledge that did it.

I grabbed a small box and removed the four wood knobs. Then a pair pliers were used to remove the four chassis bolts in the bottom-the shop had no nut-drivers. I unplugged the speaker and slid the chassis from the cabinet. Then for convenience I decided to go ahead and remove the speaker and get the cabinet out of the way.

I plugged in the radio and noticed that all tubes were glowing. Next I measured the HV and found that it was about 260 volts. That seemed like a reasonable reading. Then I resorted to my scientific method of testing audio. I touched my finger to my tongue and then placed it on the volume control CT. I got a loud hum. So...my power supply, speaker, and output stage was working. I went back to my first audio grid and got the same hum. Good. Now I got down the old tube manual and looked at the base diagrams of the IF tubes. I measured the plate on the first IF and found no voltage. I then checked the voltage to the IF transformer....it seemed OK. My heart was beating faster-had I actually found the trouble this soon? I measured the resistance of the winding-as expected the winding was open.

"Where do you keep your IF transformers?" I asked.

"Oh, I don't try to stock many parts, I just order them out as I need them," replied the shop owner.

Now, I was frustrated. I would have to put the set together, order a part, wait two weeks, then tear the set down and install the part. I decided I had been lucky so far why not keep the ball rolling. I unsoldered the IF can, removed it from the chassis and then removed the winding from the can. I could not believe my luck. In plain sight the hair-like wire was broken at the solder joint. I carefully scraped the wire with a razor blade, tinned it, and re-soldered it in place.

Approximately thirty minutes after starting on the radio I had it back in the cabinet and playing. My boss was amazed. He was sure I was some sort of genius. He was to find out differently on many repair jobs down the road-but for today, I was king.

I managed to get his stack or radios smaller by about six or seven radios that day-a number that made the boss very, very pleased with my effort. When we closed at six that evening he turned to me and asked, "Where are you going now, I suppose you have a hot date?"

"No, not tonight," I answered. "My girlfriend is in Tulsa this weekend."

"Then, it's all settled," Mr. Cantrell replied, "I'll treat you to the biggest steak that Penrod's have on the menu. Let's go across the street and eat."

Though I little realized it at the time, the course for my future was finalized that wonderful Saturday evening many years ago. ER

Ed: This series will be ongoing for at least the remainder of this year.

AMI Update from page 3

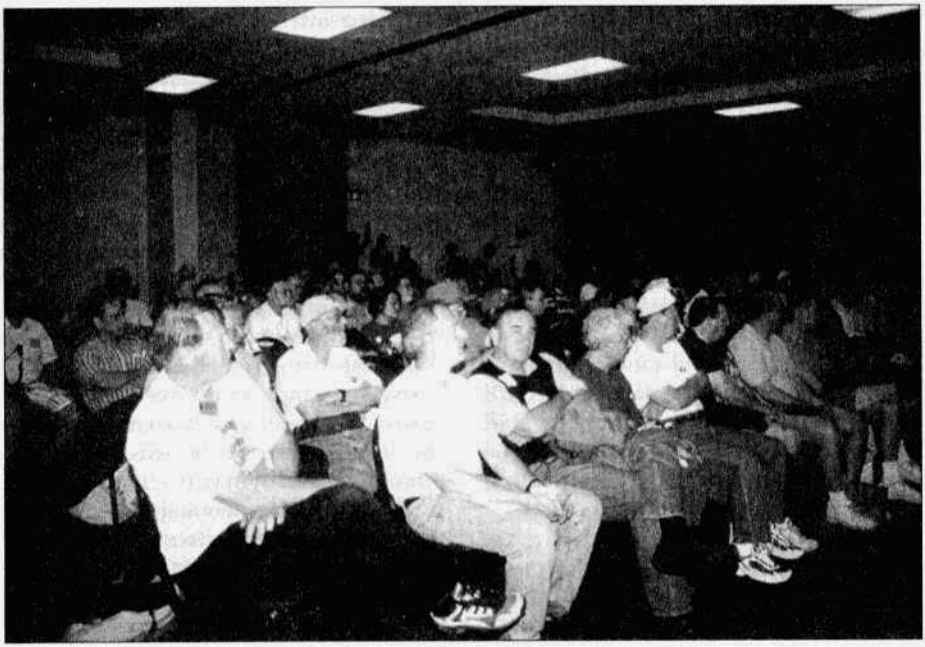
The AMI station operated on 75 and 40 meters. From left to right: Gary Taylor, WB8BEM; Dean Gagnon,KK1K and an unidentified visitor.

Window" website. Then there was a pictorial presentation of broadcast transmitters in amateur service accompanied by an audio track. Paul, WA3VJB had gathered these images, edited them and provided the informative and entertaining audio track descriptions. Steve had put it on VHS tape to facilitate delivery. It was a big hit. It included some sound effects and on-air sound. After an hour or so of program, knowing how AM'ers like to get back to the flea market, I dismissed the meeting. But, I invited people to stay to view a video of Tim, WA1HLR walking around the shortwave station WBCQ describing the operation and all its equipment in his unique style. Very few people left and all were entertained by the video.

Saturday dawned grey, but brightened and warmed up to become a very good flea market day. Lots of AM activity in our station, principally on 40 meters. Vendors enjoyed the boost in sales from the pent up demand. There was a lot of vintage gear and some of it was very nice. There were at least two fine looking Globe King transmitters. A BC-610 in not too shabby condition was marked down to $150 at one point. There were many classic AM receivers and AM transmitters from all the major manufacturers.

We had about 30 people at the AM get-together at Marion's Pizza that evening. Members of the Collins Collector Association who are AM enthusiasts meet with us there every year as well.

Got to the flea market about 7:00 am on Sunday. It was a perfect cloudless day. A lot of people leave on Saturday, but there are still many set up by mid-Sunday morning. Just like last year, it was a very busy morning at our AM station on 75 and 40 meters. We started by checking into the 75 meter DX-60 "pre-net" and then into the net proper. Later on 40 meters many people were



Over 90 AM'ers attended the forum.

waiting for us to show up on frequency. The QSL we sent out last year was a big hit and it motivated a number of stations to line up for whatever confirmation we will send out this year. I finally got most stations worked by 11:30 am and closed the station. Our logbook had about 120 entries for on air contacts and about 70 signatures that represented a fraction of the AM'ers that visited our special event station.

It took a couple hours to pack up the station. We stopped back at the motel for showers and final packing and left at 2:00 PM. I dropped Dean off in Troy, NY at 1:30 am. I had the pleasure of passing some time with "Uncle Ed", WA3PUN (People Understand Nothing) for a while on 75 meters in the early morning hours. I got home at 4:30 am, was in bed at 5:00 and up at 9:00 am to unpack the car and leave for work.

One amazing find at Dayton was a coil drawer and coils for a Meissner 150B exciter. The drawer stores coils, three for each of six frequency bands that cover 1.5-12.5 MHz. I got the drawer for Pete, WB2JWU who lives in New Hampshire and who recently acquired a Meissner 150B, but whose exciter was missing a coil drawer and most of the coils. Pete didn't go but he will always remember the Dayton 2001 Hamvention!

Coming Attractions:

Mark your calendars for July 21-22 Museum Ships Special Event. 35 ships around the world are currently signed up, including five US battleships. See www.qsl.net/k1usn/event.html for additional information including AM operations times and frequencies.

Plan to attend the Military Radio Collectors Association (MRCA) fall meet at the Tobyhanna Army on Sept 13-16. See www.milradio.org for more. ER

To Join AMI send $2 to:
Box 1500
Merrimack, NH 03054

continued next page

160M Converter from page 31

The manual has you peaking everything on 7.0-MHz, with the pre-selector capacitor set at maximum. If you've ever listened to short wave broadcast stations in the evening with your SB-301 above 7.3-MHz, you will have noticed, I'm sure, that the pre-selector literally runs out of capacitance rapidly above that frequency. By tweaking just the coils on 7.2-MHz after a routine alignment (as described), you'll find that a distinct peak is possible now above the normal 40-meter Amateur band frequency limit, and that you'll still have the ability to peak signals at the bottom of the band (albeit with the pre-selector capacitor now at something less than maximum capacitance).

Results

Despite the fact that I have no AGC controlling the gain of the 6EH7 RF amplifier (as outlined in Walt's piece in ER), my converter most assuredly does not "fold" in the presence of nearby big signals. The dual tuned circuits contribute tremendously in this regard, I'm sure: indeed, each one has to be repeaked with excursions around the band as small as some 20-KHz, or so. At first glance, this may well seem like a hardship that you'll never get used to. However, if you've experienced the "joy"(!) of trying to carry on an evening AM QSO on 1890-KHz during the weekend of the CQ WW 160-Meter SSB contest with a "wimpy" receiver, you will quickly come to regard this nuance as the asset that it is, and not a liability.

Reception is possible on the receiver tuning from 3.7- to 3.5-MHz as well, if you don't mind having everything read "backwards". The 2.0-MHz top end of 160 will appear at 3.5-MHz on the SB-301, with 1.8-MHz at 3.7-MHz on the dial. Remember, as well, to switch your receiver to copy USB when listening to 160-meter LSB signals. Personally, I prefer things to read "normally", converting up to the 7-MHz band: life is full of confusion enough already as it is, without introducing an element of it into my radio time!

The precautions taken in the 1969 article with cross-socket/cross-chassis shielding to prevent feedback, etc. were (happily) not found to be necessary in this instance. Mounting the coils at right angles to one another as I did (for minimum coupling), as well as using shields on both tubes, doubtlessly help to prevent undue feedback. There is some fundamental 40-meter signal feed-through with the converter, but the carriers of these few and far between signals are extremely weak, and have not proven to be troublesome in the least. However, should the purist in you not rest until any and all such extraneous signals are eliminated, a good place to start might be a review of the shielding techniques employed in the original piece in QST.

In summary, the converter has proven itself to be a very useful adjunct to my SB-301, making an already great receiver just that much better. Perhaps best of all, I no longer have to switch receivers, etc. around whenever I want to get in on the action on Top Band—a flick of two switches, and I'm there!

Just be prepared as I was, though, for repeats in your on-the-air conversations when fellows question your usage of an SB-301 on 160-meters. Who knows? It could lead into a nice, long technical QSO about homebrewing, much like used to happen so regularly on the bands back in "...the good old days"! **ER**

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-Grammer, George, Understanding Amateur Radio (first edition), American Radio Relay League, Newington, Conn., U.S.A., 1963, pp. 143-149, and,
-Hutchens, Walt, "A Few Miniature Tubes You May Have Missed", Electric Radio, November 1996, pp. 4-40.

The Repair Bench from page 27

that the readers generate. I am writing a companion article on fixing up transmitters. It should be ready in a couple of months.

I have several AM boatanchors, many of which need work. I have been lucky enough to collect replacement tubes and much of the test equipment you have mentioned. Hints on use of the equipment would also be useful to me.

Hmm, interesting suggestion. Us oldtimers sometimes forget that new folks don't automatically know what to do with a VTMV, VOM, Scope, Grid Dip Meter and such. Maybe that would make good material for the first column or two.

I like your easy to understand style of writing. Actually, I have been thinking about dropping my subscription to ER, because many articles are specific to rigs which I don't have. Also, the segments on military gear are of no interest. But if you can keep a series going similar to the one in ER #142, I will have to keep subscribing. Thanks.... Keep up the good work.

Regards.... 73, Ron Samchuk, VE4SR

One of the things I like about ER is that it gives me the low-down on a lot of gear that I don't have but might like to acquire some day. While there is no such thing as a "bad" boatanchor, with the possible exception of my Eico 753, some of them are sure a lot more functional than others. Hey, you might even want to write an article yourself, Ron. Barry is a real push over for a good yarn.

Bill Tipton Jr., K5JRI, sent the following.

To: w8kgi@arrl.net

Good article—something that has been needed for those ER readers who are not experienced in repair and calibration and don't have someone they can call on for help and guidance.

73, Bill K5JRI

Thanks for the encouragement, Bill. Maybe if the readers send in enough questions, we can make this into a regular event like Ron suggests.

And finally, Bill Smith, W5USM, sent this short message.

w8kgi@arrl.net

The receiver repair article series by W8KGI is wonderful.

73 from Bill Smith, W5USM

Playing Shortwave Radio Since 1950

Gee Bill, thanks for the kudos. One of the reasons why I write for ER is the notoriety I now have when I go to hamfests. A few guys actually know me from my articles. And I've been playing shortwave radio since 1952 myself. I was WN4VIV back on 3702.3 kilocycles with my HRO-50 and 6AG7/6146.

So, thanks to everyone who replied to the receiver article. If you have more suggestions or questions, please send them and I will get to them as soon as I can. Just leave me a little time to go to work and to write that transmitter article, HI. **ER**

Military Radio Collectors Assoc. 2nd Annual Meet, Sept. 13-16 at Tobyhanna, PA

The Military Radio Collectors Association will hold its second annual meet at the Tobyhanna Army Depot, Tobyhanna, PA, 13-16 September 2001. The event will once again be held in conjunction with the Red Ball Military Transport Annual Rally. "Offical" hours are 08:00 to17:00. This is a golden opportunity for anyone interested in vintage military electronics.

Activities include equipment displays, on the air operation, formal presentations, and a swapmeet.

See the MRCA webpage for complete informaton http://www.milradio.org/

Or contact :

Pete Hamersma, WB2JWU

PO Box 467

Holderness,NH 03245

E mail : pehamers@worldpath.net

Radio Connections from page 14

Meters. They never published it.

During the annual NAB* convention in Las Vegas, literally hundreds of radio & TV professionals who are licensed hams show up for the Ham Radio reception. It is one of the most popular events at the industry's largest convention. If you want to locate an old broadcast transmitter for 160 meters, this is the place to go!

Despite the fact that I never did make that 6L6 transmitter work, nearly fried my brand new DX-20, and still can't read a resistor, ham radio has connected me to my vocation and a world of friends. Today, I own and operate WCOJ, a 5 KW AM station in suburban Philadelphia. Our station's photographer is N3FXR and WCOJ's Chief Engineer is Jeff DePolo, WN3A. Well, I could go on....

Oh yes. This winter, Jeff and I do plan to disconnect the transmitter and try to load up my four tower array on 160!

* National Association of Broadcasters

W9LDB, Silent Key from page 15

Rich did not only collect but he had a strong interest in restoring and, most importantly, using the equipment. He had a very keen ear for the audio quality both received and transmitted. For me, he was the person to help diagnose an audio problem. When Rich liked your signal you knew it was good.

Because of Rich's strong interest in the hobby and the energy he put into it, he made the hobby much more interesting for me. I especially enjoyed working with him in diagnosing and repairing the old gear. Ham radio for me will not be the same without W9LDB.

From Jeff Hartling, WA9QJV

Rich did things that most of us only dream about. While in the Air Force he was attached as a Communications Liason to President Lyndon Johnson and travelled all over the world with him. Rich installed radio communications equipment in Africa, South America, Vietnam, Indonesia, China and Japan. Later he went to sea as a Radio Officer on a US mapping vessel working in the South Pacific.

There was one common thread throughout his life and that was radio. I first met Rich via radio when he was at the Johnson's ranch in 1965. We began talking regularly and later went to college together at Ball State in Muncie, Indiana. Rich had a beautiful Mustang with a mobile installation that we would all die for. After College he moved to San Diego which remained his home base. I will miss Rich.

W9LDB Memorial Net

Jim Wiggins, K7EWE has suggested that it would be most fitting to establish a W9LDB Memorial Net on 1885 kHz just as was accorded K6HQI on 14286 following his demise. As one of a handful getting AM restarted on 1885 kHz in 1982, Jim has a vested interest in honoring Richard in naming this net. This would ostensibly be an informal southwest AM Net meeting 7 PM fall/winter and 8 PM spring/summer. This net would respect Rich's modus-operandi of sounding the best that you can while always maintaining a spirit of congeniality - even when you disagree. Richard always conducted himself accordingly. Thank you.

David, W6PSS

A complete index of the entire 12 years of ER is available for viewing or downloading at the following website: http://www.qsl.net/n9oo

The S-37 and its Predecessors from page 7
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Footnotes

[1]I wish to express my appreciation to George H. Fathauer and Jim Riff, K7SC, for helping me clarify portions of the text.

[2]The Interservice Radio Propagation Laboratory (see reference above, "Radio Propagation") in 1945 classified officially the frequency range 30-300 MHz, "Very High Frequency," and authorized the abbreviation, "VHF;" it designated the range 300-3000 MHz as "Ultra High Frequency," with the abbreviation, "UHF". The arbitrary division signified technical progress. In the 1920s, frequencies above 30 MHz were viewed as UHF; in 1934, the FRC regarded all frequencies above 110 MHz as UHF.

Confusion among manufacturers and amateurs prevailed, however, following the IRPL designations. For example, Hallicrafters identified its nominally VHF receivers with the UHF abbreviation, yet occasionally it used VHF in its advertisements. I have attempted in this paper to adopt Hallicrafters' practices.

ER in Uniform from page 11
web site for availability (see below).

Announcements and background music from the WW II era were provided throughout the meet via an AN/TIQ-2 PA system on loan from the Ft. MacArthur Military Museum (ER #123).

Points of contact
Dennis DuVall, W7QHO, (818)240-7907, W7QHO@aol.com.
Hank Brown, W6DJX, htbrown@earthlink.com
For video
Bob Heusser, K6TUY. (818)790-3870, k6tuy@mindspring.com
Web Site: http://www.syzen.com/users/milradio/

TUBE COLLECTORS GROUP FORMED: The new tube collectors association is now in operation. This is a non-profit, non-commercial organization of collectors & history enthusiasts focusing on all phases & vintages of tube design. The founding president of the group is Al Jones, W1ITX, who is known for his award winning tube collection. For more details & complimentary copy of the association's bulletin contact Al Jones, CA, (707)464-6470, Ludwell Sibley, OR, (541) 855-5207, or mail request to POB 1181, Medford, OR 97501.

Clatternet: 850 shift RTTY roundtable, on 10137 kcs USB Saturday, starts 0930-1000 Pacific time.

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FOR SALE: Repair and restoration on all vintage equipment; 45 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

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

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

FOR SALE: New Ranger I, Valiant I, & Navigator plastic dials, freq numbers in green, with all the holes just like orig. - $17.50 ppd. Bruce Kryder, W9LWW, 336 Sliders Knob Ave., Franklin, TN 37067

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

FOR SALE: Set of three 6JB6 tubes for Drake T-4 / TR-4 - $60 plus shpg. Duane, KK4AM, POB 84, Forest, VA 24551 erbyd@worldnet.att.net

FOR SALE: Standard Handbok For Electrical Engineers 1915; Most Often Needed Radio Diagrams 1942, others- $5 ea, includes shpg. Allan Lurie, W9KCB, 605 E Armstrong, Peoria, IL 61603. (309) 682-1674

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 20176. (540) 822-5643

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

FOR SALE: 30 yr accumulation of radios & parts (xcvrs, tcvrs, amps, pwr splys). Call w/wants. Donald Baird, WB7VNC, AZ, (602) 953-0279.

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: New Collins winged lapel pin, still have meatball version, either type - $5.95 + 75¢ s/h. W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029. (760) 747-8710

FOR SALE: HT-9 tuning units - $25; tank coils - $50; BC-610 crystal set - $100. **WANTED:** Yaesu FL-2100B. Robert Braza, W1RMB, MA, (508) 222-5553

FOR SALE: 1930s Hallicrafters spkr cabinet w/ orig spkr, very good to exc, no dents, lge Hoo grill missing - BO over $35 + shpg. TX, (956)584-7840 or w5mhsaxon@webtv.net

FOR SALE: OEM Heath belts - $2.50 each shpd; or 10+ for $2 each shpd. Send check or money order. Roberta Hummel, 202 Midvale Dr., Marshall, WI 53559

FOR SALE: Manuals for old ham gear of the '30s to the '70s. Check WEB Catalog www.hi-manuals.com

FOR SALE: NOS TCS baseplates still in factory shipping wrap - 2/$15 plus shpg. Carl, KN6AL, POB 3531, Laramie, WY 82071. (307) 742-0711 kn6al@uwyo.edu

FOR SALE: 2001 COLLINS CALENDAR now shipping. 15-months, all color! $14.95 postpaid USA and Canada. Trinity Graphics, 5402 1/2 Morningside, Dallas, TX 75206. www.kk5m.com

FOR SALE/TRADE: Misc. parts, tubes, for tube gear. Sandy Blaize W5TVW, 40460 Edgar Traylor Rd., Hammond, LA 70403. ebjr@i-55.com

FOR SALE: Vintage equipment at the K8CX Ham Gallery Classified Ads section. Visit the largest AntiqueQSL CardGallery http://hamgallery.com

NOTICE: T-368 Registry. For info w2zr@aol.com. Subscribe to the T-368 & BC-610 reflector at: http://groups.yahoo.com/group/T-368_BC-610

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

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

FOR SALE: Riders Vol 5-14; military whip antennas, dynamotors, all ppd. Bruce Beckeney, 5472 Timberway Dr., Presque Isle, MI 49777. (989) 595-6483

FOR SALE: Older type electronic parts & hardware; free vintage flyer. Mail orders since 1954. Bigelow Electronics, POB 125, Bluffton, OH 45817

FOR SALE: VM parts, new boxed electron tubes, new Heathkit parts, new panel meters. Norm, 1440 Milton St., Benton Harbor, MI 49022

FOR SALE: Books, all electronics related. 300 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. watoki@email.msn.com

FOR SALE: Build your own "Midget" bug replication by K4YQX, ca 1918, featured by K4TWJ in CQ Magazine, May, '98. 10 detailed blueprints. FAX (507) 345-8626 or e-mail <bugs@mmic.net>

FOR SALE: Parts, tubes, books, ect. Send two stamp SASE or email for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761. wb0cte@arrl.net

FOR SALE: Tubes. We specialize in early receiving & collector tubes & tube related books. Send for free catalog or see tathauer@home.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281. (480) 968-7686, tubes@qwest.net

FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W9QJI / N4PZ, IL, (815) 734-4255 or N4PZ@juno.com

FOR SALE: Tubes, NIB or tested good, priced low. SASE for list. WA7HDL, 167 Hwy 93S, Salmon, ID 83467

FOR SALE: Collins 30S-1 amp, CCA: very good+, no wear on front panel or knobs - $2200. Grayson, KI7UM, Tucson, AZ, (520) 906-0440

FOR SALE: ERs #81 to 139 - $40; scope OS-8C/U - $30. Both + shpg. Les Mathews, WB2DQV, 2405 Thistledown Ct., Sewell, NJ 08080. (856) 218-8838

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

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 133 Cartbody Rd., Carlton, GA 30116. andy@wa4kcy.com

WANTED: SW3 #33A and #35 coils. I will trade my extra coils SW3 coils. Hank Bredehorst, 2440 Adrian St., Newbury Park, CA 91320. (805) 498-8907

WANTED: Parts for a TMC GPT-750 xmtr. I need the AM modulator deck and other parts to restore this unit. John, KF2JQ (716) 873-0524 jprusso@acsu.buffalo.edu

WANTED: Long wire ants AT101, AT102, GRC-9; DY88/105; PP327/GRC9; counterpoise CP12 & 13 GRC9; BC348 pwr conn PLQ102/103. KA1ZQR, 348 N. Main St., Stonington, CT 06378.

WANTED: Globe King 500 B/C; Viking Valiant I/II; Viking 500; Heathkit Mohawk. Frank, (916) 635-4994, frankdellechaie@sprintmail.com

WANTED: National SW-3 model1, version 3. Uses 32-32 30 tubes. Dean Showalter, W5PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: Collins 32V & Collins 75A series; Globe Scout; National SW54. KBØW, CA, (916) 635-4994. frankdellechaie@sprintmail.com

WANTED: Rhode and Schwarz model EK07 rcvr. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453.

WANTED: Radio News, Electron 1940 to '50. Alan Mark, POB 372, Pembroke, MA 02359

WANTED: Acc. for BC-610I; BC-614, BC-639, tank coils xtals. Frank, K4BVQ, POB 35430, Charlotte, NC 28235. (704) 348-6488

WANTED: National Company emblems, escutcheons, logos from equipment. Also WW II rcvr's manufactured by National. Don Barsema, 1458 Byron SE, Grand Rapids, MI 49506. (616) 451-9874, dbarsema@prodigy.net

WANTED: Amplifier AM3007 for T-827/FR-1059B AN/WRC-1 Set. Don, WA2ELD, KY, (859) 254-1886, wa2eld@myexcel.com

WANTED: Code practice tapes & machine for advanced beginner. Charles Graham, 4 Fieldwood Dr, Bedford Hills, NY 10507. (914) 666-4523

WANTED: Signal/One CX7 series parts unit, parts (esp. CW filters, switch cards). Dave, AB7B, 12080 SW Faircrest St., Portland, OR 97225. (503) 626-3488, davidbe@us.ibm.com

WANTED: Manuals/copies: Hallicrafters HO-1, Autronic (Electrophysics) Keyer, Wavetek 166, Tektronix T-912. Cash/trade. Thanks much! Robert, (303) 988-2089, rgbdenver@att.net

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

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

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

WANTED: Hallicrafters SX88 or SX115. Larry Redmond, 413 Bedfort Dr., Duluth, GA 30096. (770) 495-7196

WANTED: Any info on the Eldico company and the Eldico SSB Twins for future article. Joel Thurtell, finder@radiofinder.com

WANTED: 1930s Army Navy control boxes, pwr splies, dynamotors - any wierd types. William Donzelli, 15 MacArthur Dr., Carmel, NY, 10512. (845) 225-2547, aw2886@osfn.org

WANTED: Back issues of QRP or RADIO AGE magazines. Gary Fender, W5UUO, 450 Cunningham Rd., Celina, TN, 38551. (931) 243-5323, gdfender@multipro.com

WANTED: Antique tubes. Paying $40 ea for good used type 201 tubes (not A). Buy list & new 2000-2001 catalog of collector tubes available. See fathauer@home.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281. (480) 968-7686, tubes@qwest.net

WANTED: HQ170/180X noise silencer and crystal holder/switch; tuning knob for HX500 (Hammarlund). Ed, N5BFW, (817) 222-5355, ecuevas@juno.com

WANTED: GP-7 WWII Navy xmtr, MT-284 shockmount for ART-13, Eldico SSB Twins T-102 TX w/ACPS and R-102 RX. Steve Davis, KD2NX, 11 Vineyard Ave., Middletown, NJ 07748. (732)495-3241, kd2nx@worldnet.att.net

WANTED: Main tuning knob for Allied SX-190 or AX-190 receiver. Joe Filice, KQ6GL, (858) 625-2223, jpf@photon.com

WANTED: Friction drive and knob for Heath SB series frequency display calibration. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123 (724) 758-2688, K9vky@stargate.net

WANTED: To recover one of my own early QSL cards from the 50s. Any ole tymer have an Iowa KN0CER or K4CER card in your archives? Tnx. 73. w5usm@aol.com

WANTED: Origianl output modulation xfmr for B&W 5100 or the mod deck. What have you got? lets talk. W8JKS, 1344 McDonald Hill Rd., Frankfort, OH 45628. (740) 998-4518

WANTED: WW II Military Television

Looking for the following for a restoration project: round & square cameras, #AXT, CRV, ATH; transmitters, #AXT-6, 7, ART-26, 28; dynamotor CRV-21; test set, I-232, 231, 206, TS-93, CRV-60058.

Maurice Schechter, 590 Willis Ave., Willis Park, NY 11596
516-294-4416, mauricsch@cs.com

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

FOR SALE: Military radio TM's, origs & reprints. New list. Send $1 & address label to Robert Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043-2410. (713) 467-5614

FOR SALE: I repair all tube type amplifiers. Licensed in 1955. Steve Gross, N4PZ-W9OJI, IL. (815) 734-4255.

FOR SALE: 51J-4 filter replacements, direct plugin—6.0 kc Collins mech. filter, 3.3 xtal lattice, 2.3 kc xtal latice ,500 cycle xtal latice - $215 each; R-390A 16 kHz flat phase filter, for Hi-Fi AM - $245. Chuck Felton, KDØZS, WY, (307) 322-5858, feltoned@coffey.com

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

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

FOR SALE: Military and commercial communications items: http://www.maxpages.com/murphyjunk. Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. (619) 444-7717

FOR SALE: Tube list, new & used, wide variety audio, ham. Recently expanded. SASE 52¢. Bill McCombs, WB0WNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

NOTICE: A website dedicated to traditional ham radio & classical radio resources. Visit Ham Radio USA, http://www.hamradiousa.com

FOR SALE: Ur old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, CRBCS1@prodigy.net

FOR SALE: B&K 500 tube tester - $60; crystal radio - $30; Collins tubesters, Yaesu YD-844a mic - $40. Carter Elliott, (804) 979- 7383, CElliott146@aol.com

NOTICE: AMECO AC-1 owners interested in making AC-1 to AC-140 meter QSO please contact w5usm@aol.com, and 73 de Bill

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (248) 391-6660, hires@rust.net

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

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

FOR SALE: I am making aluminum plate and grid connectors for T series tubes. If interested contact Alan Price at fixr752668cs.com

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

FOR SALE: KWS-1; D-104, 75A4 w/spkr; Viking II, D-104, 122 VFO; NC-303 w/spkr; SR-2000, D-104, HA-20 remote VFO, PS-2000; HA-1 keyer; Cakepan xmtr, all manuals, other stuff. Dick Bean, K1HC, 422 Everett St., Westwood, MA 02090. (781) 461-0101, k1hc@aol.com

FOR SALE/TRADE: Numerous EICO, Conar, B&K, Knight, Heath, RCA, Paco, Superior, Precision test equipment manuals. Bernard, N4Q, FL, (407) 351-5536, n4q@juno.com

FOR SALE: Heath Signal Tracer, well-made,no manual - $22 + $5 shpg. R.J.Eastwick,W2RJE, 400 N. Haddon Ave., Unit 109, Haddonfield, NJ 08033. (856) 429-2477.

FOR SALE: Equipment, parts (connectors, meters, relays, etc), crystals, manuals. List $1. Joe Orgnero, VE7LBL, 1349 Leask Rd., Nanaimo BC V9X 1P8, Canada josephi@pacificcoast.net

FOR SALE or TRADE: NC-100/ASD -$275; HRO-7/ps/spkr/ABCD coils - $400; HQ-140X - $175; BC-348Q/AC - $200. Sam Timberlake, KF4TXQ, Dadeville, AL 36853. (256)825-7305, stimber@lakemartin.net

WANTED: Swan VX-1 VOX or other Swan stuff. xcvrs, meters, etc. Working or not. Butch, WA8X, (989) 275-3420, jpeitsch@voyager.net

WANTED: TCS pwr sply, need not be pretty. Dennis Olmstead, WB9EMD, 431 Ridgewood, Glen Ellyn, IL 60137. phone/fax (877) 469-0531

WANTED: Manual for Collins 20V3. Rolynn, K7DFW, OR (503) 728-4157, k7dfw@clatskanie.com

WANTED: HD2 or 3 tubes (made only by Taylor?). Tom Berry, 16171 Highland Ave., Chicago, IL 60660. (773) 262-5360, 262-0016

WANTED: Globe King 500/A/B/C xmtr. Will pick up anywhere near Chicago. Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (630) 852-4704. JandRJor@interaccess.com

WANTED: Johnson Desk KW. Scott Freeberg, WA9WFA, (651) 653-2054, scott.freeberg@guidant.com

WANTED: ARC-5 xcvrs, racks, dynomotors. Jim Hebert, 1572 Newman Ave, Lakewood, OH 44107.

WANTED: Millen coil's 74001 or 74002. Mike, wljz@hotmail.com

WANTED: Stancor/Chicago PCC200, PCO/PS0150, RC8150; Triad A-9-J, A-10-J, A-11-J, A-12-J. **FOR SALE:** Books, send SASE. Richard Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

WANTED: Small 1" panel meters, especially DC ammeters. Send price info. Chris Cross, POB 94, McConnell, IL 61050

WANTED: RBB/RBC rcvrs, pwr splys, cables & RAK/RAL equip. Andy Miller, KD6TKX, CA, (831) 484-2389, amillertkx@aol.com

WANTED: Mics: Astatic JT 30/40; UT-48; Shure CR80/81/41; 707A; Turner VT-73; CD/BD; parts for same. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. tomsmics@flexcomp.com

WANTED: Desperate for museum display: lge AC cooled or water cooled xmtg tubes. Certain types including RCA, 898, 862, 893A or R & 5831s; other manufacturers such as Federal Telephone & Radio F 124R. Name your price. Tommy Bolack, 3901 Bloomfield Hwy, Farmington, NM 87401. (505) 325-4275

WANTED: R-390A rcvrs, parts rigs or restorable, will restore yours at reasonable prices. Walter Wilson, KK4DF, (706) 733-8323, wewilson@knology.net, www.knology.net/~wewilson

WANTED: Popular Electronics 1960 Electronic Experimenters Handbook; Johnson Viking Valiant I, orig manual. Louis L. D'Antuono, 8802 Ridge Blvd, Brooklyn, NY 11209. (718) 748-9612 after 6 PM EST.

WANTED: HRO pwr sply 697, any condx. Ivan, WA6SWA, POB 248, Reno, NV 89504. (775) 329-7738, idh@cs.unr.edu

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

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. danielc4116@aol.com

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

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

WANTED: Seeking unbuilt Heathkits, Knightkits. Gene Peroni, POB 7164, St. Davids, PA 19087. (610) 293-2421

WANTED: GP-7 xmtr in any condx w/without tuning units or tubes. Ted Bracco, WØNZW, 203 E Main St. #730, Teutopolis, IL 62467. (217) 857-6404 x 306 or braccot@hotmail.com

WANTED: Drake 1A rcvr; 399C1 Collins VFO; JRC 505 twins. K5YY, AR, (501) 756-5010. k5yy@arrl.net

WANTED: Collins 310B3, basket case OK - welcomed; & Chicago 500W CMS-2, high-level modulation xfmr; Taylor T21. Jerry, W8EGD, CO, (303) 979-2323.

WANTED: Clean Mackay 3010C & Kenwood R599D w/all filters & manual. Rs, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Electronics, radio (cables for TCS), nav, SO radar for WW II PT boat. Roger, PA, (610) 998-0380

WANTED: Collins 70K-2 PTOs working or not; IN82A diodes; Bretting 14/14AX manual. Clark, WØBT, KS, (785) 286-2132

WANTED: National NTE. I love National. Sylvia, N1VJ, 33 Lawton Foster Rd., Hopkinton, RI 02833. (401) 377-4912

WANTED: Collins 30K1 xmtr; also need orig manuals & literature for 75A1, 32V1, 30K1. Paul Kluwe, W8ZO, POB 84, Manchester, MI 48158. (734) 428-2000

WANTED: Hammarlund HQ-180; Scott Special Communications xcvr; RCA Channelist. EA4JL, phone Kurt Keller, CT, (203) 431-9740 or k2112@earthlink.net

WANTED: Mode switch for Ranger II. Will buy junker for parts that has a good switch. Bob Blaney, W9FRU, 127 Westlawn Dr., Decatur, IN 46733. (219) 724-4575

CDs From the ER Bookstore

By Radio Era Archives

R390-R390A/URR Technical CD-ROM - $ 57.
RCA HB-3 Tube Handbook - $ 75.
RCA Radiotron Handbook, 4th Edition - $ 62
Radio Boys on CD-ROM - $ 39.
80 years of QST - $ 39.95 per set (generally 5 or 10 year set).
All 11 volumes - special package price - $ 373.
Collins Radios Technical CD-ROM series. Vol. 1 - Collins Receivers; Vol. 2 - Collins Transmitters & Amplifiers; Vol. 3 - Collins Transceivers; Vol. 4 - Accessories, Power Supplies, VFO's, etc. Each CD - $ 79, Complete Set - $ 279

By Hamanuals

Drake equipment operator and service manuals on a two CD set by Bill Turini, KA4GAV - $79.95

By August Johnson, KG7BZ

Military Boatanchor Manuals, Volume 1 - $45. This CD is one of the best manual CDs on the market. It contains the following manuals: ART-13, -A, B; BC-221-A, B, C, D, E, F, J, K, L, M, N, O, P, Q, R, AA, AC, AE, AF, AG, AH, AJ, AK ,AL; BC-312, -A, C, D, E, F, G, J, L, M, N, HX, NX; BC-314, -C, D, E, F, G; BC-342, -A, C, D, F, J, L, M, N; BC-344, -D; BC-348-J, N, Q; BC 375-E; BC-610-E, F, G, H, I; BC-614-E, F, H, I; BC-779-B Hammarlund Super-Pro; BC-794-B Hammarlund Super-Pro; BC-1004-C Hammarlund Super-Pro; GRC-19; PRC-6; PRC-8, 9, 10; R-388; R-389; R-390; R-390A; R-391; R-192; T-195; SCR-274, includes: BC-453-A, B; BC-454-A, B; BC-455-A, B; BC-456-A ,B; BC-457-A; BC-458-A; BC-459-A; BC-696-A; BC-946-B.

Military Boatanchor Manuals, Volume 2 -$45- contains the following manuals: ARR-41; BC-611-A,B,C,D,E,F; BC-939B; CV-157; CV-591A; GRC-26-A,B,C; GRR-2; R-274; R-274-A,C; R-320A; R-483,-A; R-520; SCR-578-A,B; T-368,-A,B,C; TV-3B; TV-7,-A,B,D; TV-8; TV-10; URM-25-C,D,F,G,H; SX-28-A; SX-73; Hammarlund SP-600; Zenith Transoceanic; Gibson Girl.

Please add $4.50 S&H for each order
Visa, Mastercard, American Express

ER Bookstore, 14643 County Road G, Cortez, CO 81321
970-564-9185, er@frontier.net

WANTED: Old Callbooks, especially those covering the years before 1930. Alan, W3BV, PA, (215) 795-0943 or W3BV@arrl.net

WANTED: National HRO black wrinkle spkrs, oak coil boxes, coils; Western Electric horns, spkrs, amps, mics. Barry Nadel, POB 29303, San Francisco, CA 94129. bnadel@ccnet.com

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

WANTED: Mohican, SB-200, SB-220, SB-100, SB-101, SB-102, Knightkit Band Spanner II, Heath GW-12A, GW22A, GW42. Debbie, AR, (870) 857-3366.

WANTED: New or used unmodified BC-459A, BC-696, TH8/ARC-5, T19/ARC-5, CBY52232. Louis Lytch, K2DCT, 117-33 230th St., Cambria Heights, Jamaica, NY 11411-1806. (718) 528-5065

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

WANTED: Collecting military electronics including radio, radar, RDF and test, manuals & literature. William Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6033

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug in coils) for restoration & ER articles. Ken Lakin, K1ME, 63140 Britta St., Ste. C106, Bend, OR 97701. (541) 923-1013. klakin@aol.com

WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, (631) 360-9011, george2@aol.com

WANTED: SP600-JX21 HF tuned circuit, 7.4-14.8 mcs, part #31394-G1. Art, WA5OES, winterbauer@qwest.net

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

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

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

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

WANTED: WW II military remote control rcvrs #ARW/CRW, xmtrs, dynamotors PE186 PE126, joy sticks, Gyroscopes for the GB, Azon glide bombs. Maurice Schechter, NY, (516) 294-4416 or mauricesch@cs.com

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 516G-1; 398C-1; 625-1; KWM-1; 302C-3; 515-1; 75S-3C, 325-3A. I buy any Collins equip. Leo, KJ6HI, CA, Ph/Fx (310) 670-6969. radioleo@earthlink.net

WANTED: QSL cards from old/pre WW II Ham DX countries; old regen kits. Hajime Suzuki, Nishikuniyoshi 1644-24, Ichihara-Shi, Chiba-Ken, 290-0231 Japan

WANTED: Manual for TS-36Ap, copy ok; parts, & acc. for same. Steve Bartkowski, 4923 W. 28th St., Cicero, IL 60804. (708) 863-3090

WANTED: Code practise tapes & machine for advanced beginner. Charles Graham, 4 Fieldwood Dr., Bedford Hills, NY 10507. (914) 666-4523

WANTED: Loop for Drake SPR-4; orig. interconnect cables for R4C-T4XC; orig pwr sply cable/fanning strips for Hammarlund SP200/400. Dick George, WØTRF, 15245 Lynn Terrace, Minnetonka, MN 55345. (952) 934-3839, jgeorge@isd.net

The Collins Video Library

The Collins KWM-2 Video 4 hours - $89.95. Highly detailed video on operation, rebuilding, alignment, troubleshooting and neutralizing of this classic! A must for anyone who owns and operates a KWM-2/2A. Printed documentation included.

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The Collins 30S-1 Video 1 hour - $39.95. Finally, the one everybody has wanted! This extraordinary video describes operation and user safety, maintenance and modifications of this classic Collins amplifier. Very informative—truly a must for all 30S-1 owners. Printed documentation included.

The Collins Amateur Radio Equipment Video Spotter's Guide 1 hour, 40 minutes - $24.95. Close to 90 individual pieces of Collins Radio equipment are shown in the video. Examples of some of the gear covered are: KW-1, KWS-1, 30K-1, 20V-3, 75A-4, KWM-2, S-Line, KWM-1, 30S-1, 30L-1, KWM-380 and much more!

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R-390A Addendum Video - $49.95. Another 3 hours and 40 minutes of R-390A information from Chuck Rippel, WA4HHG.

SP-600-JX Video 4 hours - $89.95. Chuck Rippel, WA4HHG, takes us through all aspects of the SP-600-JX—repairs, restoration and modifications. This video is a must for any newcomer attempting to work on the SP-600.

All videos are now available in PAL version!

Purchase three or more videos and get 10% off the retail price!

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Produced by Floyd Soo, W8RO (ex-KF8AT)

ER Bookstore, 14643 County Road G, Cortez, CO 81321

FOR SALE: RCA tube manuals, RC-15, RC-20, RC-25; ARRL Handbooks, 1965, 1968, 1972 & 1978. LSASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660, brett3729@aol.com

FOR SALE: Collins drum overlays. 75A-2, 3, 51J#. For 75A-4 & KWS-1, specify new/old - $8.50 ea. 2/$15 ppd. Correct colors. Charlie Talbott, K3ICH, 13192 Pinnacle Ln., Leesburg, VA 20176-6146. (540) 822-5643.

FOR SALE: Repro Nameplates, R-390A generic - $9; 51J-3 and 51J-4 exact replicas - $12. Tom Marcotte, N5OFF, 242 Chestnut Oak Dr., Mandeville, LA 70448. marcotte@iamerica.net

FOR SALE: (3) new handline coax connectors, Hoffman radio model A200M, (1) Emac 4-65A; (3) JAN 3828; (2) JAN 811A; (1) GE GL813 marked Marconi Radiotron in red; Kantronics KPC-2 Communicator II; Lafayette SWR field strength meter No. 99-25835, NIB; Micronta 3 range pwr/swr tester 10/100/1000 watts; Eico Model 1180 capacitance decade box; large ceramic SW 4 pos 4 pole 7 1/2" long 5" wide; 177 receiving tubes from 1G3 to 22KV6A; like to sell as a lot. OFFERS on all above + shpg. E.F. Hayes, WØJFN, 3109 N. Douglas Ave., Loveland, CO 80538.

FOR SALE: R-390A covers, case SSB converter, exc - $1150; Heath HA-10 - $545; NC-57 w/manual - $100. Ron, MI, (517) 374-1107.

FOR SALE: Hallicrafters: Sky Buddy, S38-B, S38E, S85, S120, SX11 w/spk, SX28A, SX101A, SX130 w/spkr; Hammarlund SP600JX17, BH30M w/pwr sply; HQ100A w/spk, also 12 pge list of misc items, test, ham, audio. I would like PU on heavy items or will meet you approx 100 or so miles from Albany, NY. Email me your mailing adrs & I will mail a copy to you. Clayton Vedder, 1037 Rte 23A, Catskill, NY 12414. (518) 678-0475 or cvedder@mhonline.net

FOR SALE: 6" PM coaxial spkr, HF-20 oz, magnet 30 watt 8 ohm - $10; 8" PM w/tweeter - $8; 6x9, 4 ohm, mint - $7; 5x7 8 ohm, exc - $7; 3x5 4 ohm, mint - $5; tubes NIB 6SN7GTB - $4; 6L6 - $5; 6K6GT - $3; xmt'g tubes, new 826 - $4; 829A - $3; 6AS7G - $3; used 807, 1625, 2E26, 866A - $3, all + UPS. Osorio Sabetto, W8PIU, 1717 Burgess Rd., Cleveland, OH 44112. (216) 481-1036

FOR SALE: Tuning capacitors; xfmrs; radio books; SASE for list. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405.

FOR SALE: Stancor ST-202A xmtr (811 final) - $235. National R-175A plate choke (new) - $33. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (973) 728-2454. rprester@warwick.net

FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. List: $1 (stamps OK). Softwave, 2 Dept. ER, 15155 ashabaw, Ortonville, MI 48462

FOR SALE: Johnson & Hammarlund panels, cabs refinished. Done in same finish as new cars. Ranger-1, II (price, call), Valiant-1, HQ-180 (series), $250, + shpg. Visa/MC/AMX. Dee, W4PNT, VA, (540) 249-3161, cell (540) 471-7023 or w4pnt@vaix.net for jpg's

FOR SALE: Copies: Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip, ham gear. Contact me for prices, availability. Duane Ballew, KI7QJK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

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FOR SALE: Hallicrafters S-38 - $70; S-38E - $65; (4) Clegg 22er - $65 ea. Above working & clean. Stuart T. Carter II, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904. (321) 727-3015

FOR SALE: RC-348Q - BO; S8E-33 - $135; Collins R-105 - $45; Collins R-648 - $90; Tek 545 scope, HQ-100 w/clock - BO; Gonset G66B rcvr/G77 xmtr; misc: HF scopes; sell or trade all for 12V, HF xcvr. W7ESJ, POB 18436, Tucson, AZ 85731. (520) 886-3087

FOR SALE: Collins sq meter 2-1/8" 500 ma, new box - $20; metal box 10 xtals Signal Corp - $15; Sangamo new caps - 95¢ ea. Joe, W6CAS, CA, (916) 731-8261

FOR SALE: National NC-125 - $125; Johnson Challenger - $100. All + shpg. Ed Sauer, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483

FOR SALE: Books, 200+ radio titles. Great prices. SASE or email for New Revised List. Paul Washa, 4916 Three Points Blvd., Mound, MN 55364. w0tok@msn.com

FOR SALE: Gates 1000 Watt AM broadcast transmitter complete. In Las Vegas, you pickup. Rich Baldwin, KD6VK, (702)-222-9941, richard@wizard.com

FOR SALE: Collins 30K-4; KWS-1, 75A-4. Bruce, N9KGR, WI, (920) 693-3247

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

ELECTRIC RADIO STORE

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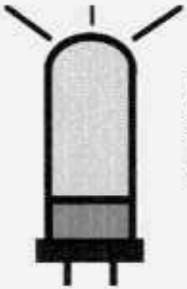

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