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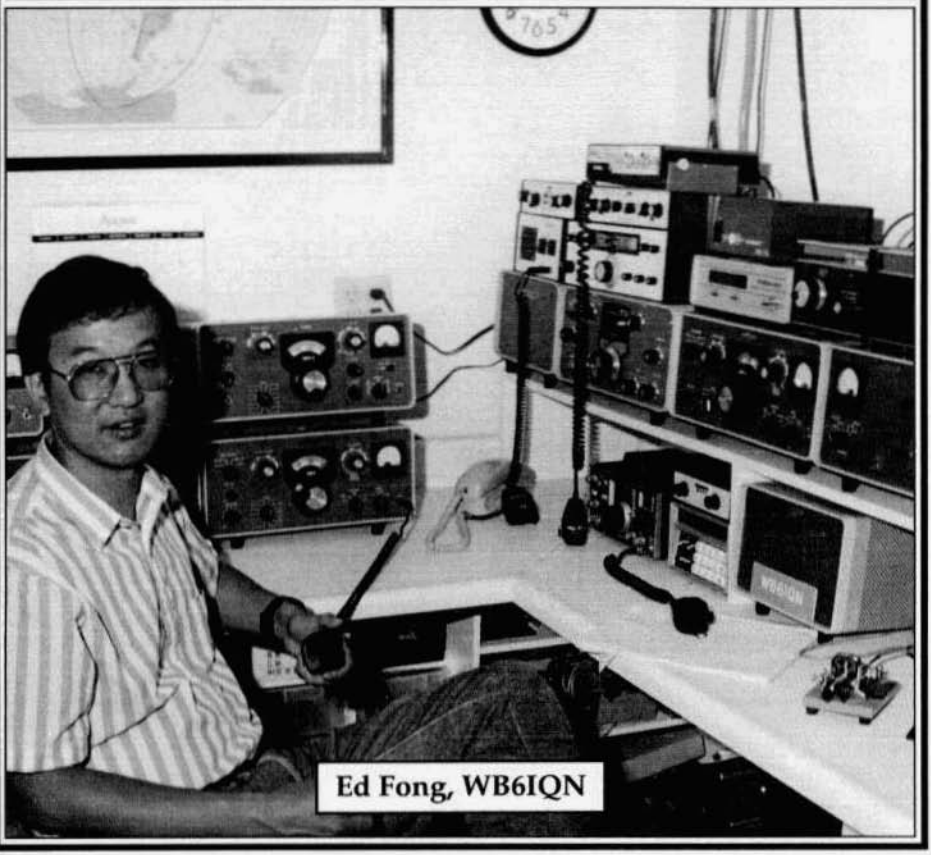
ELECTRIC RADIO

celebrating a bygone era

Number 85 May 1996



Ed Fong, WB6IQN

ELECTRIC RADIO

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; John Staples, W6BM; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Jim Musgrove, K5BZH; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Dick Houston, WØPK; Andy Howard, WA4KCY; Skip Green, K7YOO; Albert Roehm, W2OBJ; Steve Thomason, WB4IJN; Don Meadows, N6DM; Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS

Some good news for all of us: Ray Moore has FINALLY produced the transmitter book he's been talking about for years. "Transmitters, Exciters & Power Amplifiers, 1930-1980" is modeled after his book on receivers, "Communications Receivers, The Vacuum Tube Era: 1932-1981, 3rd Edition". This new book will become the definitive book on transmitters just as the early one became the definitive book on receivers. Congratulations Ray. See Jim Hanlon's review on page 2.

This year we're not able to go to Dayton. We're just too busy and we just can't take the time off. It's a big disappointment for me - Dayton is not only a lot of fun but it's also the best way I know to promote ER. I hope we'll be able to make it next year.

One of our bestsellers at Dayton has always been our boxed back issues. This year because we're not going we're offering them - while they last - at a considerable saving for everyone. The whole first seven years, delivered for $175. When what we have on hand is gone the price will go up to $195. So if you've been thinking about getting all the back issues, now's the time to do it.

Next issue Dale Gagnon, KW1I, has promised to provide us all with a report (with photos) on the Dayton Hamvention. I hope the change to May provides better weather and that this Hamvention is as successful as all those in the past.

If you're going to Dayton this year I hope you attend Dale's AM Forum. This event that he has spearheaded for several years has become a fixture at Dayton. The Forum consists of a panel discussion - usually regarding problems facing AM operation - and there are speakers, slide shows (of hamshacks of course) and it all takes about an hour. Try to attend. N6CSW

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Cover: Ed Fong, WB6IQN, in his mostly-Collins hamshack. Although he is an engineer involved in high-tech electronics he has a deep appreciation for vintage, vacuum tube gear.

Book Review

"Transmitters, Exciters & Power Amplifiers" by Raymond S. Moore.

Available from the Electric Radio Bookstore, $21.95 plus $3 S&H.

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

When I plunk down $21.95 for a book like "Transmitters, Exciters and Power Amplifiers, 1930-1980", by Raymond S. Moore, I'm looking for two things, enjoyment and trustworthy, thorough reference information. Ray's previous book on communications receivers ["Communications Receivers, The Vacuum Tube Era: 1932-1981"] met both expectations, improving as it progressed through second and third editions. This new book, covering American built, HF hamband transmitters, is very much like the third edition of the receiver book in format, picture quality, accuracy and completeness. And it's another one that I am certainly going to enjoy having on my shelf.

It starts with 8 pages of introduction and historic overview of the highlights of transmitter development by year. The remainder of the book's 144 pages is jam packed with brief descriptions and pictures. Entries are in easy-to-find alphabetical order by manufacturer. A typical entry will contain something from a sentence to a paragraph about the manufacturer, followed by a screened and silhouetted photo of the transmitter and a listing of its model designation, years made, price, bands covered, modes, tube lineup, power input or output rating, and output matching network type plus additional pertinent remarks. All the transmitters in a series are described and appropriately differentiated, so if you want to know the differences between a Heath DX60, DX60A and DX60B, for example, the information is right there.

Moore surveyed back issues of QST, Radio, CQ, Shortwave Craft, Radio News, Radio Craft, Ham Radio, Radio Handbooks, ARRL Handbooks, the Old Tymers Bulletin and even Electric Radio to obtain his information. It's almost inevitable that he missed a few sets, but the only ones I can identify are the World War II surplus Command Set transmitters. The only mistake I found in descriptions for the gear that I'm familiar with was listing the final of my Hammarlund Four-20 as an 805 instead of an 807. I checked the "years made" listings for Heath transmittters against Chuck Penson's info and found only occasional one year (later) differences in the year of introduction. This is probably because Chuck was working from Heath catalogs as additional sources. From my sampling, this book appears to be the trustworthy, definitive source I've been looking for. It's head and shoulders above any other book on this same subject on the market.

Ray was cramped to get all of this information into the 144 page budget for the book. Perhaps the next edition will allow him a little more room for the section he had planned on transmitting tubes and additional coverage for accessories like VFOs and transmatches. That is if we can get his attention back from other things like "cruising", tennis, and his XYL Marty, whom we have to thank for pushing him to get this edition done. ER

AMI Update

by AMI President
Dale Gagnon, KW1I

AMI Headquarters

Membership will reach the 900 mark by the end of the month. Plenty of brochures are in stock and new certificates have been printed. AMI's treasurer, Warren, NY2H, has moved from upstate New York to Eastern Massachusetts. He is in the process of establishing a new bank account for AMI there. 24 award certificates for last year's AMI Discovery Weekend were mailed out last month. Better late than never!

Armed Forces Day Operating Event

May 18th is Armed Forces Day and AMI is proud to sponsor an all day operating event to encourage the use of military radios. You can either operate a military radio and see how many contacts you can make or you can operate your regular gear and see how many stations of military significance or running military radios you can contact. Submit logs to qualify for awards. Logs should include enough data so I can determine number of contacts, number of military radios worked or used, military sites worked or operated from. Certificates will be awarded to all those who submit logs. Marty Drift, WB2FOU, has offered his newly created Heath-AMI log books as prizes for top contestants.

AMI at the Dayton Hamvention

The AM Forum will be at 12:15 PM in Meeting Room 2, on Saturday, May 18. This is the same larger room that we had last year. The tentative agenda for the meeting is an update on the Northeast AM QRP activity including pictures of some of the rigs. Vern, WAØRCR, will outline some important ways the AM community can utilize his AM bulletin service on 160 meters. He will also have pictures. In the evening we will congregate again at Marion's Pizza.

I find as I grow older the lure of the equipment in the flea market dampens a bit, but the opportunity to see old friends and make eye contact with radio acquaintances becomes more of an attraction. My brother and I will be manning flea market spot #2437. Stop in when you're in our aisle.

AM Operating Notes

1. Unintended interference between AM stations in different parts of the country is always a possibility when we tend to congregate on the popular AM calling frequencies. I can think of three things that would improve this situation. a. Expand the AM window by operating at nearby frequencies and not directly on the popular AM frequencies. b. If you are starting up a roundtable, have all stations listen for another QSO on frequency. If one of the stations can hear another QSO then you will probably end up QRMing each other to some extent. QSY to a nearby frequency. c. For local QSOs, have your AM group put up low dipoles with a height of less than a quarter wave. This should give very high wave angles causing big local signals and avoiding long distance interference.

2. Plan to take a picture of you and your shack and include it in with your QSL cards or letters to fellow AM operators. I have received numerous photos and photo QSLs with AMI applications as well as with QSL cards. Because AM'ers equipment is so diverse compared with what's on the market today, these photos are real conversation pieces and can really dress up the wall of your shack.

3. At hamfests have an AMI brochure handy for those you might meet who are not aware of AM operation. Let me know if you need a few brochures. ***KW1I***

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

The Collins R-389/URR Receiver

Low Frequency Specialist

Part 1

by Ray Osterwald, NØDMS
PO Box 582
Pine, CO 80470

Early one Saturday evening last fall my phone started ringing. Putting down what I was doing and picking up the receiver, I heard a friendly voice on the wire say "Oh, hello, is the fellow who has been advertising all over everywhere for an R-389 PTO?"

When I sufficiently recovered and could remember how to speak, I replied that I was, but that I had nearly given up hope of ever finding one. The caller identified himself as Bruce, K6BLI, in California. He went on to say ". . .well, I'm afraid I don't have just the PTO, but I do have a complete receiver I would be willing to sell!"

We talked for quite a while, and ended up striking a deal. Through the courtesy and perseverance of Ray Mote (W6RIC), in a few weeks time I had what seemed a miracle: my R-389 on the bench, undergoing restoration.

Up to that time, I'd been collecting information and doing research regarding the R-389 and its history. At the same time, I was hoping to somehow find a PTO and get my parts unit restored. I'd gotten comments such as ". . . those receivers are extremely scarce, and parts even more so. . .", so I was getting pretty discouraged. The ultimate goal of the research was to do an ER article. The R-389 itself I wanted to use for medium wave DX'ing, which is more than a passing interest with me. Most of the information I had on hand to date was gathered over a long period to time from a variety of sources. These consisted of former Collins employees, surplus dealers, trade journal clippings, and the very few hams who have one, or who used to have one. One common theme with everyone I talked to was that they remembered the receiver, but had only seen maybe one for sale in their lifetime. Fair Radio Sales Company has been out of stock on these receivers for nearly 20 years.

Finally, one event occurred which really allowed this project to come together. Through an associate in Virginia, Mr. Charles Mylod, I was able to get access to a recently declassified Collins engineering report which had been stamped "restricted security information" for 32 years. It was apparently gathering dust in some forgotten file of the NSA, and in 1985 someone decided that 1940s thermionic technology really didn't need security protection. The report has detailed information about every phase of the project, and is the sort of "goldmine" I wish I could have found several years ago when writing about other Collins equipment. It is written, in places, in a first person narrative. Reading through the report is almost like being able to actually go up to Cedar Rapids, check in at the front desk, and visit with the engineers for a while to get background information for this article. The report is dated September 1953, and with the results of my restoration efforts, will form the basis of this article.

The Birth of the R-390 Series

In January of 1949, the Engineering and Research Division of the Collins

The Collins R-389/URR low frequency receiver.

Radio Company received a bid request from the U.S. Army Signal Corps Engineering Laboratory at Fort Monmouth, New Jersey. The Signal Corps "had big plans for the development of a series of receivers, similar in design, which would provide superior reception between the ranges of 15 kc and 3000 Mc". The initial proposal received in Cedar Rapids requested the development of two receivers, one tuning 15 kc to 1500 kc, and the other which would cover 500 kc to 32 Mc. The engineering managers held a series of meetings to further define what the Signal Corps was requesting. This resulted in Collins submitting a formal engineering proposal to them by March of 1949.

A few more discussions were had, more letters were exchanged, and pretty soon Collins had received a valuable Signal Corps Development Contract, number W36-039-SC-44552. This contract called for the simultaneous development of two new receivers, which the Signal Corps decided to designate the R-389 and the R-390. The technical specifications for these receivers were spelled out by the Signal Corps in document SCL-1134-B, which I have not been able to locate. The general outline of the specifications is indicated by reference in the engineering report, however. Collins accepted the contract, and formal work on the development project began in June of 1949.

It should be pointed out that this preliminary contract provided only for the engineering necessary to develop the new designs, and for 6 prototype receivers, 3 each of the R-389 and R-390. Actual receiver production was handled later under separate contracts. This article will frequently mention the R-390 because of the simultaneous development and certain design similarities of the receivers.

These two new designs, it was hoped, would fulfil many of the needs of the Armed Forces. The two basic requirements were "stability and calibration accuracy similar to other Collins equipment, notably the commercial 51J". The other main requirement was to combine into one receiver as many of "the facilities and special circuitry that are now being used by the various branches of the Army and which now require many different receivers to provide." Additionally, the contract called for development of special power supplies, cabinets, and a certain number of sets of "complete manufacturing drawings".

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R-389 from previous page

As the development plan was laid out, Collins came to realize that the Signal Corps was requesting receivers which were beyond the state of the radio art in 1949. In order to be successful, and to fulfill the contract terms, new materials, new processes, and advanced circuit designs would be necessary.

Undaunted by the obstacles ahead, Collins' senior engineers and top managers were assigned to this special development project and they dug right into the work. For the first time that I'm aware of, detailed information is available concerning the background of the men who were responsible for the development of this new Collins equipment. These men were:

Lou W. Couillard: Section Head, Medium Frequency Receiver Section

Couillard was a 12 years veteran with Collins, working almost entirely on receivers and receiving equipment. As a graduate of the University of Minnesota in 1938, Lou spent 1500 hours on the project in all phases in a supervisory capacity. He was responsible for the overall success of the project, and was the author of the engineering report which is the primary source of this article.

R. F. Witters: R-389 Chief Project Engineer

Apparently hired for the R-389 development project, Mr. Witters had prior experience with the Rauland Corporation (a defense contractor) and with the Galvin Manufacturing Corporation (now Motorola). He spent 4500 hours as the project coordinator and as a design consultant to the various speciality areas.

D.M. Lewis: R-389 Chief Mechanical Engineer

A graduate of Iowa State College (Art Collins' Alma Matter), Lewis had previous employment with the Curtis Wright Corporation in aircraft electrical systems design. He spent 4500 hours doing the mechanical design work for the R-389, which, next to the RF mixing scheme, was the toughest part of the entire project.

R.L. Stimson: R-389 Development Engineer, RF Subchassis

Stimson was a 1948 EE graduate of Indiana Tri-State College. He spent 600 hours working on the R-389 RF deck circuit design.

D.M. Hodgin: Development Engineer, PTO Design

A 1947 EE graduate of Purdue University, Hodgin, served two years in the Navy as a radio technician. Mr. Hodgin spent 900 hours developing the PTOs for the R-389 and R-390. The R-389 PTO was by far the most difficult PTO Collins ever built.

R. Craiglow: Development Engineer, Crystal Circuits

A 1947 graduate of Ohio State University, Craiglow gave two years service in the Signal Corps. He spent 200 hours designing the crystal oscillator, the calibrator, and the crystal filter circuit.

H. Stover: Development Engineer, BFO Circuitry

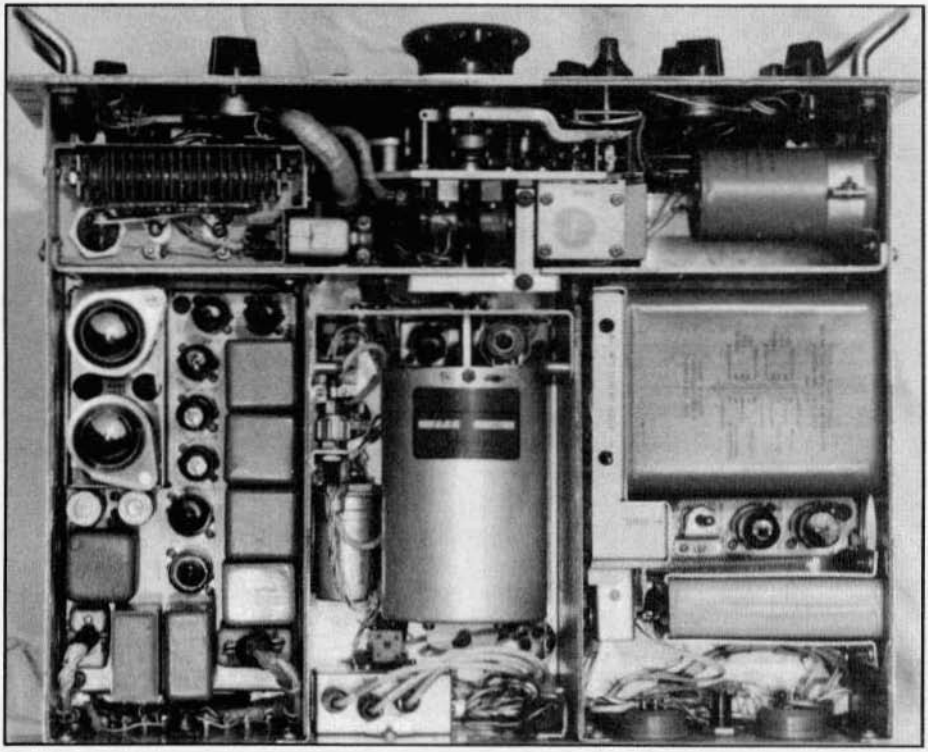
Stover graduated from Iowa State College in 1950. He had 2-1/2 years service in the Signal Corps. At Collins, he spent 300 hours designing the BFO circuitry.

R. Newmire: Development Engineer

An eight year veteran at Collins who came up through the ranks, Newmire spent 600 hours working on spurious response problems and overall system testing.

A.E. Eberhardt: Development Engineer, IF Subchassis Design

Eberhardt was a 1949 EE graduate from Purdue University, after serving two years in the Army as a Technical Sgt. He devoted 1500 hours to the design of the IF subchassis unit. Collins regarded IF performance as a critical function, due to the nature of the specifications.



R-389, top view.

N.E. Houge: R-390 Project Engineer

A 1950 graduate of the University of Wisconsin, Houge spent 3000 hours on the R-390 design. He is mentioned here because he designed the audio subchassis and the power supply units, which are common to the R-389.

The Development Contract

As stated before, the development project began in June of '49. However, the first prototype R-390 was not out the door until January 1951, over a year and a half later. How they spent all of this time, and how the design evolved, is a fascinating study of the "inner workings" at the Collins Radio Company. All together, Collins estimated 30,000 man-hours were invested in the project, including the lab technicians and drafting time. This is roughly the equivalent of one man working better than 15 years with no time off!

To put this schedule in perspective, the delivery of the remaining 5 prototype receivers shaped up as follows:

R-389 #1 - March, 1951
R-390 #2 - September, 1951
R-389 #2 & R-390 #3 - February, 1952
R-389 #3 - May, 1952
Accessories - February, 1953

Soon after the development contract was received, they decided the project would be broken up into three task areas: planning, model building, and the final report and drawings.

The planning task took the greatest amount of time, and obviously had to be completed before any models or prototypes could be built. Planning started with the electrical design. Mechanical design followed, as it generally depended upon whatever electrical requirements had been established. It's interesting to note that the word "elec-

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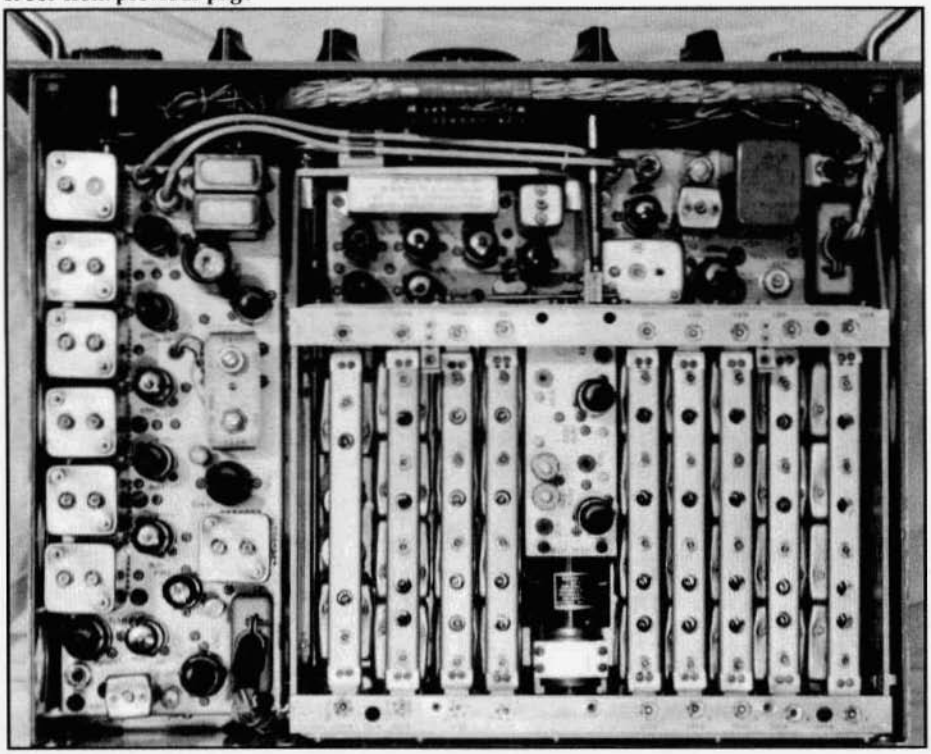
R-389 from previous page



R-389, bottom view.

trical" is used, not "electronic", when the report discusses design theory. This truly was the era of electric radio.

The contract called for one experimental working model of each receiver, which would be followed by two engineering models of each. The two engineering models would serve as a two-stage evaluation platform, so that any desired changes could be incorporated in a final production design.

Once all the planning tasks were complete, the model makers went to work. The model building department built a paper mock-up of the overall concept. This was used by engineering to visualize all the parts, to locate all the subassemblies in relation to one another, and to allocate the required amount of space.

The paper version was followed by actual breadboard modules which were "the first attempt to fit the required circuitry into the space allocated." These breadboard receivers, "while operational in some respects, were never completely functional, and were never delivered to the Signal Corps." They were secret, classified material and kept under guard at Collins.

From what was learned with the breadboard designs, work soon started on the first prototypes actually delivered to the Signal Corps. These were what they termed the "engineering models", one each R-389 and R-390. The first two were built in a rush, and Collins apparently knew about many problems and deficiencies in them. To compensate for these problems, the design of the second two was started even before the first units were taken to Fort Monmouth. This allowed them to get ahead a little bit, and keep the develop-

ment contract on schedule. The Signal Corps engineers were working very closely with Collins engineers during this time, so there "was a chance for many of the Signal Corps' opinions and changes to be incorporated in the second version before its delivery".

The third set of two models was done a little differently, however. They held off on delivery of the third set until the second models were completely evaluated. This allowed all of the changes brought on by Signal Corps evaluation to be built in. This took extra time and delayed the program, but "the result was a more complete design which was more acceptable to the Signal Corps". After acceptance of the third model, the design was "frozen", and not allowed to change.

It is interesting to speculate on the possibility of some of the prototypes surviving. In discussing R-390s with an east coast surplus dealer several years ago, he mentioned having a very old Collins R-390 that nobody wanted. This particular unit had an unusual front panel layout, and a different dial bezel. He indicated that the serial number and contract number were strange, and wondered if it might have been some kind of a prototype. I wish I knew what happened to that receiver, as I didn't take note of it at the time.

The final phase of the development project, the delivery of the final prototypes, was considerably delayed when the Signal Corps decided they liked what they saw and placed an unexpected order for production quantities of R-390s! This would put the first order for the R-390 in mid 1951, but the exact date is unfortunately not mentioned. Collins was now really under some pressure, as they did not consider the receiver to be ready for production, and had to divert engineers away from the development project. The development contract still had to be completed, and so to relieve the situation, Motorola was set up as a "directed subcontractor for a large quantity of R-390 receivers". Using Motorola this way allowed production and development to go on simultaneously, and finally explains why there are numerous early Motorola R-390s and relatively few Collins examples. It also might explain known subtle differences in early production R-390s.

I have never found any evidence that R-389s were produced anywhere but at the Collins Radio Company.

Collins knew there were many improvements which could be made even after delivery of the third model, but in the words of Lou Couillard, "In a development project of this kind where a group of engineers design and build a piece of equipment, there is one problem always to be faced. That is, to decide at what point in design work can be stopped and it can be definitely said that this is it. Of course, the design objectives and specifications should be the answer to the problem, but no good engineer who is striving for the optimum in his design likes to stop work when he can see further improvement possible even though minimum design objectives and specifications have been met. . ."

I think this summarizes pretty well the attitude of the Collins employees. They built receivers which changed the state of the art and were destined to outlive many other pieces of equipment, but they were still not satisfied and found it difficult to accept the lowest common denominator. What a contrast to the present! It seems like outsourcing, downsizing, layoffs, budget cuts and mergers have reduced morale to a point where it's amazing anything gets done. **ER**

The author welcomes correspondence about the R-389. Next month will feature part 2, the R-389 electrical design.

The Hallicrafters HT-17

(my lesson in link coupling)

by Brian Harris WA5UEK
3521 Teakwood Lane
Plano, Texas 75075

Introduction

Like Mikey, who will eat anything, apparently I will buy anything, provided it is attractively priced, uncommon or supports a worthy cause. My HT-17 fit all three categories when it came up for auction at the 1995 Antique Wireless Association annual conference. Because of its size, I felt confident I could find a suitable cubbyhole for it in my already stuffed BMW and decided to bid. Competition for the baby boat anchor was not terribly stiff and soon it was mine. After the 1500 mile trip home, I placed it out of the way, with over 100 other pieces that were waiting for me to finish their new home. During Thanksgiving week, with our ham shack construction complete, it was time to take a closer look at my auction prize.

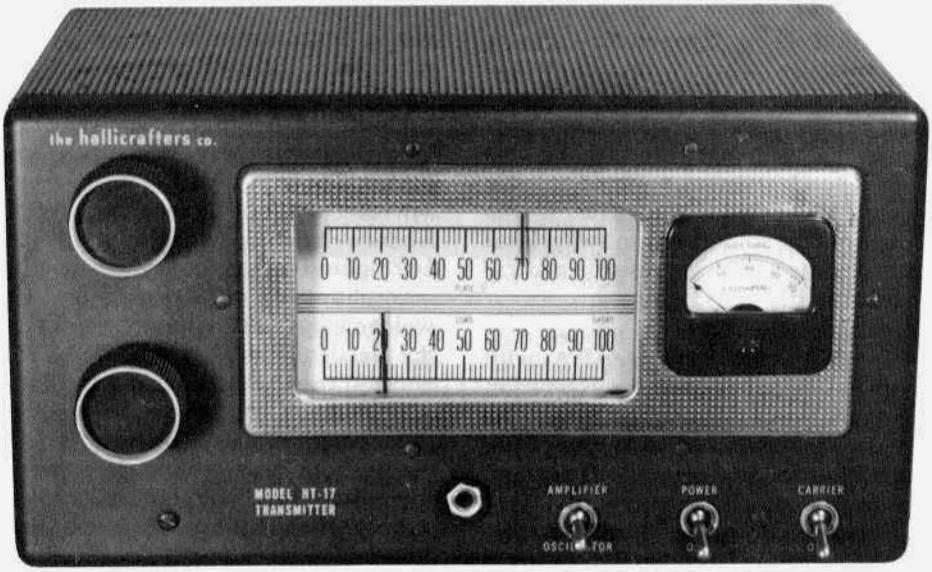
Marketing

After scanning many QST advertisements, I discovered a one- pager in the July 1947 issue (page 5) which touted the HT-17 as a new low price transmitter selling for $69.50. It seemed odd the ad mentioned the 6V6 crystal-controlled oscillator but not the 807 final amplifier. Was Hallicrafters ashamed of its mere 15 watts output on 80/40 meters? Or was it the drop to 10 Watts on 20/15/10 meters?

After reading the ad several times, another thought came to mind. Considering no coils were included, why was this transmitter priced so high? A quick look through the same QST revealed the HT-17 had stiff competition. The better known TBS- 50 cost $99.50. With 50 watts input, band switching and a built- in AM modulator, it seemed a much better value to me. At the lower end, the Millen 90800 cost but $42.50. It also boasted 50 watts input and came with one coil set. Missing was the 6V6 and 807. Granted, neither of the two included a built-in power supply like the HT-17, but power supply components were abundant and inexpensive and almost any ham (then) could build one, even Novices. I am reasonably certain the HT-17 didn't sell well, for they are seldom seen. Perhaps most beginning hams then shared my opinion and opted for other rigs. My unit's serial number is 8197, which makes me think it was the 8,197th unit built or that it was the 197th one made in 1948. Clarification anyone?

Mechanical Details

The HT-17 appears to use the same cabinet and polished aluminum bezel as the HT-18, a VFO with which it shared advertising. A similarly styled receiver, the S-53, was introduced in 1948. The HT-17 tips the scales at 21 pounds and measures 13" X 8" X 7.5". The units depicted in the QST ad and the operator manual do not have a meter, but rather a large jeweled pilot lamp. An optional 150 mA meter was available to replace the lamp. My HT-17 has a 200 mA Simpson meter, installed in a machine-punched main hole, but in hand-drilled mounting holes. Chuck Dachis assumes with the availability of WWII surplus meters that most HT-17 buyers chose to decline the meter option and add one themselves. Like mine, his also has a non-Hallicrafters meter.



The Hallicrafters HT-17 came on the market in 1947 and sold for $69.50.

At a distance one might assume the HT-17 is a receiver because of its slide rule dials. I did. The string-driven dials display the relative positions of the tuning and loading capacitors, a task more economically performed by a dot or line on a knob. What was the motivation for including these dials? Perhaps it was thought the dials would simplify tuning the pi network, a circuit new to many. My guess is the decision was made by mechanical engineers and/or marketing, for any self-respecting ham/EE would rather have had additional budget to increase the power output. I found it peculiar that the dials read opposite one another. In other words, a "0" on the plate dial is maximum capacitance and a "0" on the loading dial is minimum.

The upper knob and dial are for plate tuning and the lower knob and dial are for loading. At the right end of the loading scale is the word, SHORT. The loading control is to be in this position for link coupling, which is the other output configuration supported. The OSCILLATOR/AMPLIFIER switch is leftmost in the toggle switches. In addition to metering selection, it enables the oscillator or the oscillator and the amplifier, respectively. In both cases, metering is in the cathode circuits. The POWER switch is in the center. The far right switch, labeled CARRIER, merely activates the high voltage. Not happy with the lack of a key jack, a former owner chose to improve my HT-17 by installing one in place of the Hallicrafters emblem.

On the rear apron are a terminal strip and an octal socket. The terminal strip has five connections, two for a modulator, two for a key and one for an earth ground. The octal socket enables the use of an auxiliary power supply, typically for mobile operation. When using internal power, an octal plug with jumpers is required to complete the paths for the filaments and the HV center tap. A hinged lid provides easy access to the top of the chassis for band changing, adjustments and maintenance.

Restoration

As you can tell from the pictures, I went to no great lengths to restore this

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The Hallicrafters HT-17 from previous page
transmitter. After a little cleaning, I started checking components. It was no surprise when I found all the electrolytics were bad, along with several carbon resistors. What did surprise me was that three of the five wirewound resistors were open. No wonder the thing was for sale! By the time I put the soldering gun away, I had replaced nearly every resistor and capacitor in the transmitter.

Electrical Design

The HT-17 is a basic M.O.P.A. with nothing special to describe except for, perhaps, the oscillator circuitry and the final output tank. The 807 amplifier operates straight through, without neutralization, on all bands.

The configuration of the 6V6 oscillator is determined by what is installed in the octal socket adjacent to the 807. When the adapter plug is installed, a grid-plate circuit is formed to support 80/40 meters. For 20/15/10 meters, the appropriate oscillator coil transforms the circuit to a tri-tet. In this mode only 40 meter crystals are allowed. This conversion scheme is clever and, at first, baffled me. My confusion came from not having a schematic and that all three of the oscillator coils that came with the transmitter had been modified. Not knowing the adapter plug was required for 80/40 meters, I merely thought the oscillator coils were missing for those bands. Upon obtaining a manual, I realized my error. The adapter plug connects the non-grid side of the crystal to the plate, provides oscillator plate voltage and shorts the tri-tet cathode inductor. On the higher bands, the oscillator coil routes the non-grid side of the crystal to the cathode and places a resonating capacitor across the cathode coil.

Although provision was made for connecting a modulator, there is none such for a VFO, short of entering via the single crystal socket. An adapter accompanied the transmitter, enabling the use of the more available FT-243 crystals in the socket that accepts crystals with pin spacing of 0.75 inches and a pin diameter of 0.0125 inches.

Limiting the output power of the HT-17 is its power supply. The single transformer design, with a 5Y3 rectifier and a pi filter of two 30 uF capacitors and an 8 henry choke, provides only 450 volts key up and 385 volts key down. Another hundred volts would be very welcome here. Having no regulation, the bleeder/divider network (R11, R12 and R2) tries to stabilize the oscillator plate and screen voltages. In the oscillator position, a 10K resistor (R14) is placed from B+ to ground, presumably to simulate the load placed on the power supply when in the amplifier position. Why?

Output Tank

According to the manual, the output tank configuration chosen depends on the band of operation and the impedance of the transmitting antenna or feedline. A pi network is to be used with high impedance antennas and link coupling is for low impedance applications. As it was assumed low impedance antennas would be fed with ladder line, there is no provision for coax connectors. Operation on 80 meters is supposedly restricted to a pi network and, therefore, a high impedance antenna. Indeed, the 80 meter coil photographed in the manual doesn't even have a link. What is not clear is how the SHORT across the loading capacitor was to be implemented (see schematic). I assumed this would be a mechanical function built into the loading capacitor but it is not. Perhaps the fully meshed 250 pF loading capacitor was just considered a short in comparison to the reactance of the resonated tuning capacitor.

My transmitter came with only two Hallicrafters tank coils, both for 20 meters. They have a flexible wire with a spring clip that routes to antenna ter-

minal #1 via the coil plug. This wire either clips to the link, for link coupling, or to the output end of the tank coil for a pi network. The low end of the link is always connected to antenna terminal #2. The 5-pin coil bases are of 807 size and pattern. There were also two B&W coils, a JEL10 and a JEL160. The 160 meter coil had half its turns removed and I assumed it had been cut down to work on 80 meters. It also had a 3 turn link, which, remember, was not supposed to be used. Both these coils were hard wired with the output end of the tank coil to antenna terminal #1. Although the low sides of the links were still connected to antenna terminal #2, the high sides of the links were not connected, suggesting they had been used in the pi network fashion. I later located a 40JEL coil that I hoped would fulfill my 40 meter tank coil requirements.

Tuning

With a pi network, regardless of the band, the manual suggests first dipping the plate with no antenna connected. After doing this, the antenna is to be connected and the loading control set to 85. From there, dip the final, increase the loading (toward a lower number) and dip again. When you can no longer see a dip, the loading is to be backed off a bit and the plate dipped one last time. The link coupled tuning method is simpler. You are instructed to move the loading control to 100 (SHORT), leaving only the plate capacitor to tune. On 40 meters, with 72 ohm line, three turns are to be clipped on the link, slightly more if using higher impedance transmission line. There are no comments on link adjustments for the higher bands. On the bands requiring an oscillator coil, the oscillator current must be peaked before attempting to tune the output tank. This is accomplished by adjusting the knob on the top of the respective oscillator coil.

Low Z PI

With several antenna tuners (pardon the technical misnomer), lots of coax and a desire to avoid link coupling, I was curious to know if the transmitter would work into a low impedance load using a pi network. With plate and loading capacitors of only 150 and 250 pf, experience told me success on 80/40 meters was unlikely. Nonetheless, I decided to analyze pi network operation using a 2K ohm plate impedance and a 52 ohm load.

On 80 meters, with an ideal inductance of 9 uH, the plate capacitor needed to be about double its current value and the loading capacitor needed to be over seven times larger! However, I was not dealing with the ideal coil. The halved 160JEL unit measured a whopping 40 uH! With this much inductance, I was sure I could reach resonance, but knew the Q would be low. I also had a sneaking suspicion that it would work link coupled.

The 40 meter picture was similar. With an optimum tank coil and stray capacitance, the plate capacitor was marginal and the loading capacitor was still too small for every band but 10, and perhaps 15, meters. However, the calculated inductance of the non-optimum B&W 40JEL coil was about 20 uH. Like the 80 meter coil, I was confident it would work too.

Blessed with an almost made-to-order inductance of 2 uH, operation with the factory 20 meter coil seemed to be a cinch. Neither coil for 15 meters came with the transmitter. This was no surprise as I assume the transmitter was purchased before operation on that band was allowed (1952). Lastly, with a nearly perfect measured inductance of .87 uH, there was no question that the JEL10 coil would handle 10 meters.

Bench Check

Having returned the HT-17 to nearly new electrical condition, I decided to

continued next page

The Hallicrafters HT-17 from previous page
try it into a dummy load. The only coil modifications I made enabled the use of link coupling where that function had been disabled. Mini-clips from Radio Shack proved helpful in making link adjustments. The results are below.

Both tank circuit configurations worked on 80 meters, as I anticipated. Power output with the pi network was low, but this was expected with the known low Q. In fact, so much power is wasted in the tank coil that it becomes noticeably warm after a few minutes of key down. Of course the loading capacitance had to be set to maximum for maximum power output. Link coupled output was higher and will likely increase with a few more turns in the coupling link. So much for the link coupling restriction stated in the manual.

Performance on 40 meters picked up a bit, but some of the problems that plagued 80 meters also plagued 40 meters. Heavier link coupling should help. Although the pi network Q was low, no coil heating was observed. Again, more loading capacitance was needed.

Tuning the pi network on 20 meters was easy, but more loading capacitance would increase the power output, for link coupling won by 3 watts! The link tap location was critical on this band. Skipping 15 meters due to the lack of coils, I went on to 10 meters where the pi network was simple to tune and both capacitors had more than adequate range. Link coupling performed equally well. Although the location of the link tap was not critical, output power in both configurations was disappointing. In tuning 20/10 meters, I discovered I could increase the power output marginally by detuning the oscillator coils slightly, but didn't bother investigating why. Explanations are welcome.

Considering the performance results, low Q and small variable capacitors, I have abandoned the low impedance, pi network idea. But don't fault me for trying, for in 1968, when I was first licensed, link coupling was old technology and pi networks were commonplace. This exercise has dramatically changed my feeling about link coupling. As time allows I intend to try to increase the power output of the HT-17 using different coil and link combinations.

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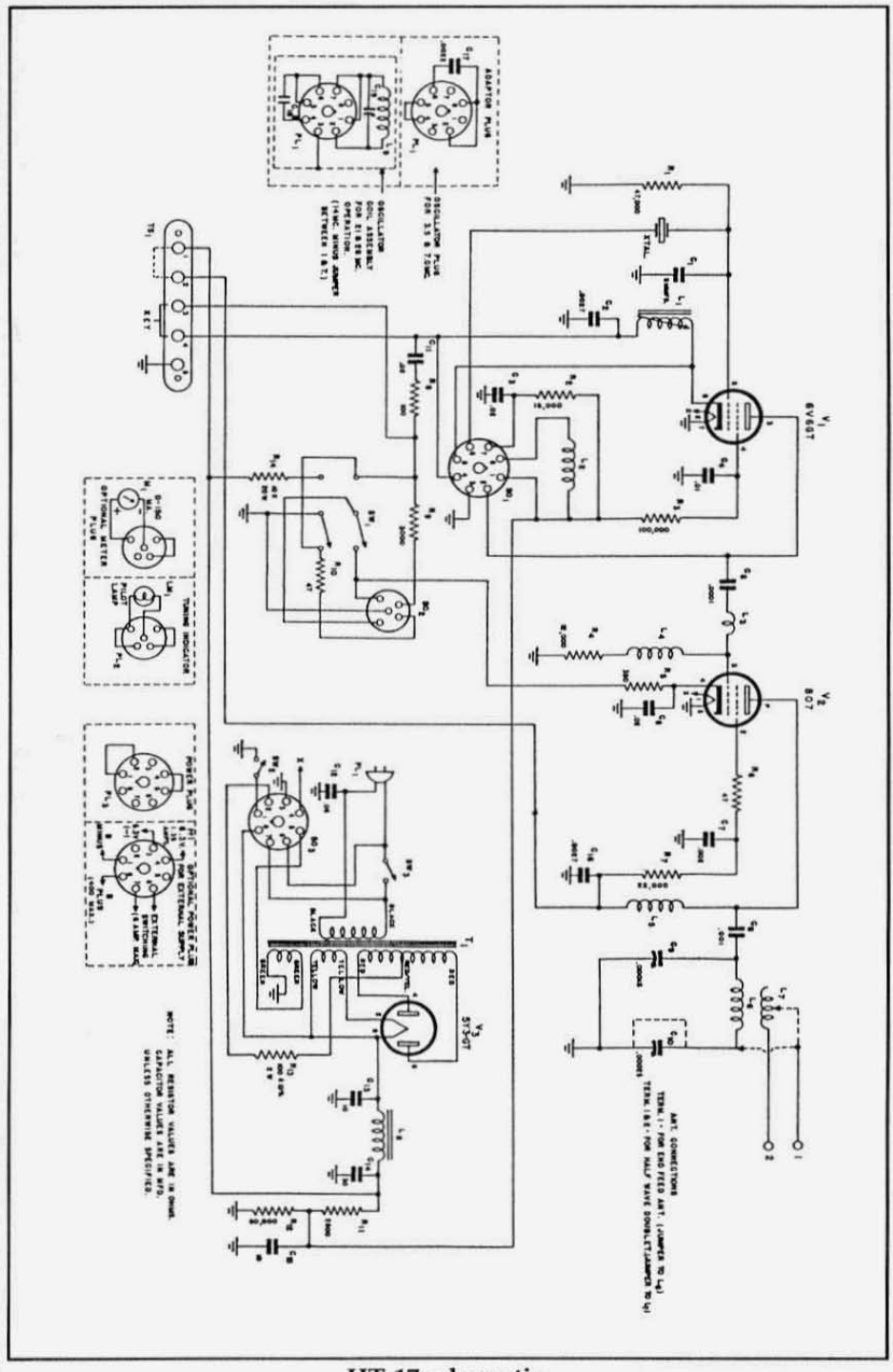
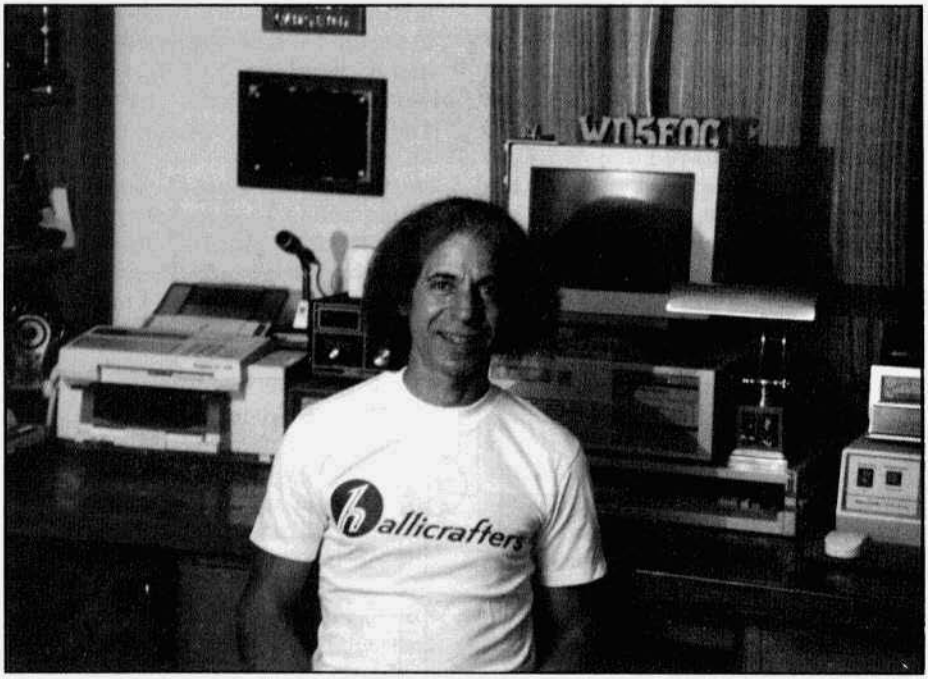
Band	Mode	Power(W)	Tune	Load	Ip(mA)	Links
80	pi	6.0	68	100	42	n/a
80	link	8.5	62	100	55	3*
40	pi	9.0	82	100	49	n/a
40	link	10.0	74	100	52	3*
20	pi	5.0	59	100	70	n/a
20	link	8.0	54	100	66	2-1/3
10	pi	6.5	87	67	50	n/a
10	link	6.5	86	100	52	2

* maximum



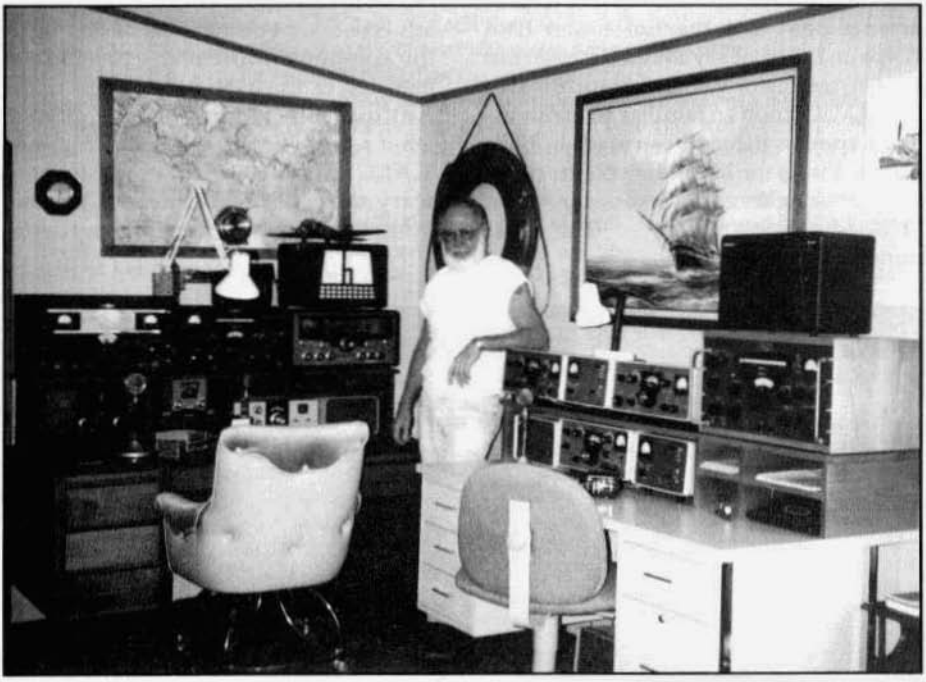
HT-17 schematic



Chuck Dachis, WD5EOG,"The Hallicrafter Collector", author of "Radios By Hallicrafters" a book on Hallicrafters radio gear.

Sam Ash, N4VIB, (on the left) at the Prater Mill, Georgia, hamfest, September, '95. ***Photo by Hank Clark, W2IQ.***

Joe Westbrook, NY5Z, and granddaughter at his operating position.



Dick Dixon, W7QZO, a recently retired merchant marine 'Sparks', in his mostly-vintage hamshack.

A 10-Meter Mystery - The Siltronix Comanche

by R.W. (Berk) Berkemeyer, WØREP
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Recently, while browsing through the used equipment department of Gateway Electronics, I came across a transceiver which interested me to the extent that I bought it. It is a 300 watt PEP, 60 watt AM transceiver which only covers 28.5 MHz to 29.0 MHz in the transceiver mode. It also covers the CB frequencies in receive-only mode.

So far nothing unusual, however, it was made by a company called Siltronix in Oceanside, California, and uses a 8950 tube in the final. The mysteries are that I can find nothing in my fairly extensive library on either the company or the final tube! Also, it looks like a Swan product. The cabinet layout, bottom plate, control arrangement and the horizontal trim stripe on the front say SWAN! It even has the two transistor VFO setup and the two speed VFO knob so familiar to Swan users. It appears to have been made in 1976, at least that is the latest date on the original manual, although there is a notation of 01-64 also on the cover. The serial number is in the 01990s.

After replacing a couple of weak tubes and cleaning a lot of dust and dirt out of the insides, I turned it on and it worked up to specification. An unamplified D-104 mic drove it to 300 watts PEP at about 50% gain setting, and monitoring the signal indicated a good (if SSB can be called good) signal. AM left something to be desired which can only be expected with one sideband and an injected carrier, but I do get about 45 watts carrier out. The drift is not excessive after a short warmup and the dial calibration is fairly good after being reset.

I have searched all of my QST, CQ, HR and 73 magazines and can find no advertisement or mention of this rig or the company. Moreover I can find no mention of the 8950 tube except in the Antique Electronic Supply catalog where it is listed with the notation 'CALL' in the price column (always a scary thought). If any reader has any information on this rig, the company or

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Front panel of the Siltronix Comanche

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Saturday mornings at 8 AM PST on 3885.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3808 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Westcoast Military Radio Collectors Net: Meets Fri. at 2200 local on 3990 and Sat. at 0800 local on 3990 + or - QRM. Net control is Tom, WA6OPE or Andy, KD6TKX.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
Vintage CW Net: For CW ops who enjoy using vintage equipment. This is not a traffic net; speed is not important. The net meets on 14.050, Saturdays at 1 PM PT. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Chuck, N5SWO. The group meets on 14.293 at 1 PM CT, Sunday afternoons.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Heath Users Net: A new net started by Marty, WB2FOU/5. Net control is shared by Fred, AA5LW. It meets on 14.275 at 4 PM CT Sundays. Check in on either AM or SSB.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Night 6 Meter AM Net: 8 PM Sundays on 50.4. Net controls are Dan, KV6I and Scott, K6PYP. Informal, supports restoring old gear and using it on the air. Loan gear available for those wanting to join in.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Old Buzzards Net: Meets daily at 10 PM EST on 1945. This is an informal net in the New England area .

The HQ-170 - Another Bargain Receiver

by Rob Brownstein, NS6V
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Two years ago I wrote an article about the HQ-110, describing the receiver, and offering my opinion that it is a real bargain when selling for about $100 or so. Since then I've heard from several readers who've acquired HQ-110s and agreed with my assessment. It's nice to get positive feedback, and it gives me the courage to opine once more.

This time I'd like to turn the spotlight on Hammarlund's HQ-170. Introduced in 1959, it sold for $369 equipped with a built-in clock ($10 less if you didn't care about the time). As such, it was less expensive than National's NC-303, and Hallicrafters' SX-101, its competition among ham bands-only, triple-conversion receivers.

The HQ-170 covered the ham bands from 160 meters to 6 meters, and according to a February 1959 QST product review (p. 42), the receiver was no slouch on 6 meters, either. It offers reception of AM, CW and SSB, a slot filter, and switch-selectable selectivity of 0.5, 1, 2, and 3 KHz. It also provides switch-selectable sidebands - upper, lower, or both.

A vernier tuning knob permits very precise tuning of signals, an especially useful feature for tuning SSB signals and CW signals at 0.5 KHz. The AVC time constant is adjustable in three settings - fast, medium and slow - and the S-meter operates on all signal modes, and operates even with the AVC switched off.

Did I mention that the RF gain control controls the gains on the RF amplifier and IF amplifier using different tapers so that RF gain is reduced more slowly than IF gain when backing off? And did I mention that the audio gain offers wide-band response at low settings for strong signals, and progressively narrows the response as gain is increased for weaker signals? The upshot is higher signal-to-noise when listening to the weaker ones.

The AVC signal is clamped so that at low levels, when listening to weaker signals, it is delayed before it initiates a cut back on gain. And a dual-diode noise limiter cuts ignition noise.

The point is, the HQ-170 is a feature-rich receiver that once sold for $369. Now, look in this issue's classified section. If there's an HQ-170 listed, and there's a good chance there will be, compare its price to that of an NC-303, or even an NC-300 in comparable condition. I'll bet it's significantly less expensive. I've seen HQ-170s listed for less than $100 within the last year, and rarely selling for more than $200. That makes it a bargain receiver in my book.

The Basics

Working back from the antenna input, signals are amplified by a 6BZ6 utilizing tuned grid and plate for early-stage band-pass filtering. A high-frequency oscillator (6C4) is mixed (6BE6) with the input signals producing a 455 KHz output on 160 and 80 meters, and a 3035 KHz output on 40 through 6 meters.

The 455 KHz output on 160 and 80 meters is amplified in a following 6BE6, which also serves as a converter for mixing the higher bands' 3035 KHz output with a 2.58 MHz crystal oscillator to produce a 455 KHz IF.

A 6BA6 amplifies the 455 KHz signal

Front panel of the Hammarlund HQ-170 receiver.

which is then passed through a slot filter with a 40 dB rejection notch. The slot filter output is mixed in a third converter along with a variable 392 to 398 KHz signal (the vernier tuning circuit). This produces a 60 KHz IF that can vary up or down by 3 KHz (the vernier tuning range).

This 60 KHz IF is amplified by a pair of 6BA6s and the triode portion of a 6BV8. It is in this portion of the circuitry that the switch-selectable selectivity is implemented using LC networks having high C to L ratios.

AM signals are detected in the 6BV8 which also develops the AVC signal, and CW and SSB signals are diverted to a 12AU7 product detector. Another 12AU7 dual-triode provides the BFO and S-meter amplifier circuitry.

AM, CW and SSB signals then pass through a 6AL5 noise limiter and a 6AV6 first-stage audio amplifier and AVC clamp. The output of the 6AV6 is then amplified by a 6AQ5 to produce about one watt of audio output power. A 5U4GB is used for full-wave rectification in the receiver's power supply, and an OB2 regulator provides regulated screen voltage for the RF amplifier, HF oscillator, mixer, first converter, 455 KHz IF amplifier, and S-meter amplifier.

Look And Feel

The HQ-170 looks a lot like the HQ-180, but it is a single-knob, ham-bands-only receiver instead of a general-coverage receiver. So, the large right-hand knob on the HQ-170, which corresponds to the band-spread knob on the HQ-180, is the vernier tuning knob. It controls a planetary drive that turns the variable capacitor of the 392 to 398 KHz oscillator. The tuning rate is a very precise 2 KHz per revolution!

The two dials on the HQ-170 look like a typical main tuning/band spread type receiver face. But both dials turn with the rotation of the large, left-hand tuning knob. The left-hand dial turns 180 degrees for 5 and 1/3 revolutions of the tuning knob covering the 160, 80, 40 and 20 meters. The right-hand dial turns 270 degrees for the same knob rotation, and covers 15, 10, and 6 meters. It also includes a 0 - 100 scale for logging, in the earlier models, and a 2-meter scale in the later models.

The dials are turned by a rim-drive mechanism, and a heavy fly wheel on the tuning-knob shaft provides plenty of inertia.

continued next page

Hammarlund HQ-170 from previous page

I find that when I use the HQ-170 on CW, after initially tuning the station in with the tuning knob, I make subsequent adjustments exclusively using the vernier tuning control. The combination of 0.5 KHz selectivity and offset BFO control provide very satisfactory single-signal CW reception.

On AM, I do not use the vernier tuning control. When conditions permit, I run the selectivity open to 6 KHz (e.g. 3 KHz selectivity, "both" sidebands). This provides a very nice AM response with decent low end and high end. When there is QRM on one side or the other, however, I can usually mitigate the damage by switching to either the upper or lower sideband, and reducing the bandpass to 2 KHz, if necessary. At 2 KHz, the AM response sounds a bit pinched, but it's better than full-fidelity mixed with adjacent-signal crud.

I really like the HQ-170, and particularly on CW. Although I've heard from some others about "drifty" 170s, this one settles down fairly quickly after a bit of warm-up drift. While I prefer the tuning feel of the NC-303 to that of the HQ-170 or the HQ-110, I have to say the selectivity of the 170 is tighter than the 303's. What's more, the HQ-170's notch filter is steeper and sharper, too.

As an interesting historical footnote, my HQ-170's user manual included a letter dated March 11, 1965 from Frank Lester, Hammarlund's sales manager. In essence, it said that he'd received several complaints from HQ-160 and HQ-170 owners about faulty slot-filters, and the letter goes on to try to explain just how to adjust and use the slot filter. There is a strong admonition against leaving the slot filter in the zero setting while tuning, since this obviously puts the slot right smack in the center of the pass band. Who says the hams of the '50s and '60s were more technical than today's amateurs? Or is the problem a case of poorly written owner's manuals?

The owner's manual is a 25-page document that does a fair job of describing how to use the receiver, and a good job of describing how it works. Sounds to me like it was written by an engineer. My major gripe is with the service section's diagrams. In describing the alignment procedures, there are references to several transformers, none of which are identified in the diagrams. Of course, one can figure out which is which by referring to the schematic and poking around under the chassis. But why make us work so hard?

To sum up, if you're looking for a decent receiver, that covers 160 through 10 meters, has good selectivity and decent sensitivity, take another look at the HQ-170. They're plentiful and they're affordable. **ER**

HQ-170 History

The first HQ-170 was advertised in 1958 and the last one was built in 1962. The HQ-170C was the model identifier for an HQ-170 with a built-in Telechron clock. From 1962 until 1968, Hammarlund offered the HQ-170A which included a silicon rectifier in place of the 5U4G, a 2 meter dial scale, an accessory socket, and a socket for transmitter/receiver control. In addition, the cabinet featured a flip-top lid for access to tubes. A rack-mounted version was also available designated the HQ-170ARC, and from 1964 through 1967 Hammarlund offered the HQ-170A-VHF version featuring built-in 6 and 2 meter converters employing 4 nuvistors.

LETTERS

Dear ER

Over the last two years that I have subscribed to "Electric Radio", contests for AM stations have been announced. As I am very interested in contesting and DX'ing, I looked forward to trying to work some of the AM stations during these contests. I really wanted to get some of my B&W rigs back on this mode. However, when I've listened at the appointed times and frequencies, I have not heard very much activity. Whether poor band conditions or a lack of AM stations is not clear: the published results would indicate that there is a lot of interest in AM contesting.

However, I think a better use of my classic rigs is to operate in some of the major contests. I used a Drake R-4A and a B&W 5100B in the ARRL CW sweepstakes in November, 1995. Since I was on-call to the hospital during the weekend of the ARRL DX phone contest earlier this month, I decided to use a NC-300 and B&W 5100B/51SB-B for this contest. Since I would not have a lot of time for the contest, I operated 20 meters only and used the B&W barefoot (about 100 watts output). I did not use a paper dupe sheet - as a concession to the computer, I used K1EA's CT program.

I set some modest goals: more than 100 contest QSOs and more than 50 countries. I was really interested to see what I could do with a classic rig (the B&W uses phasing SSB generation.) Overall I was quite pleased: using the "search and pounce" technique with fair band conditions, I ended up with 143 QSOs and 64 countries (27,456 points total score). This score will definitely not be in the top 10 in 1996. However, it would have been a good score in 1963, my first year in amateur radio. The leader in the North Texas section that year had an all-band high power score of 41,000 points with 60 hours of operation during the contest.

I was quite pleased with the performance of the equipment. I found that I needed to back off the RF gain of the NC300 to pull the weak stations out of the QRM caused by strong East Coast contest stations incessantly calling "CQ contest." The audio of the B&W without a speech processor lacks the punch of the modern transceivers (I'm still looking for a processor that could be used with some of the older rigs). The phasing of the 51SB-B sometimes had to be adjusted depending on where in the 20M band I was operating. Having to zero-beat each station required an "ear" for proper tuning. My physical operating position was not conducive to long periods of operating because of poor placement of the transmitter, receiver, and computer. Finally, I'm glad the weekend was on the cool side, since the equipment definitely heated up the shack!

I'd like to suggest a separate category for the major contests for those using "classic equipment." As a starting point, my suggestion for this category would be anything manufactured or built before 1970. It would be appropriate to recognize those with an interest in operating as well as preserving classic rigs. If the sponsors of the major contests such as ARRL or *CQ Magazine* won't recognize such a separate category, perhaps *Electric Radio* could publish results in this category. Some say that winning a contest or getting the results published is just for ego gratification, but at least in my case, I really got a lot of pleasure using my B&W rigs and I don't really care about winning. I just like to know whom I'm competing against.

I have a B&W LPA-1 and an L-1000 being rehabilitated now, and hope to use them for an all-band attempt during some of these contests in the future

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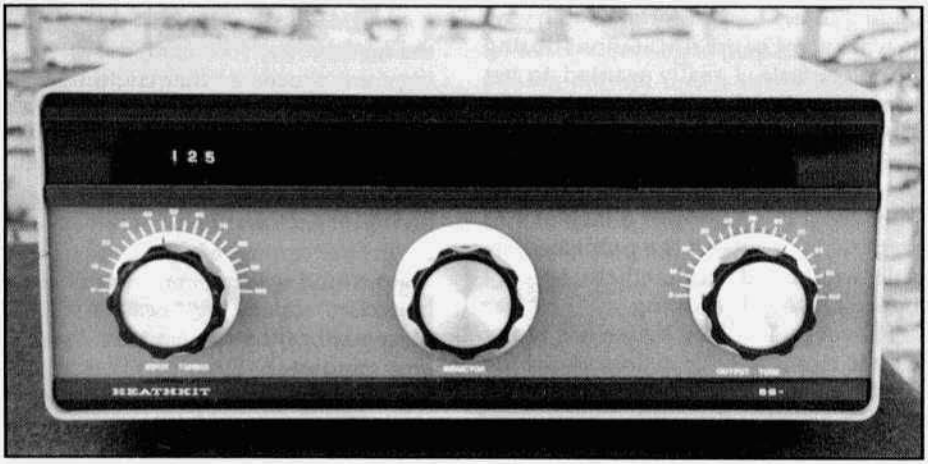
Heathkits That *Weren't*

Part One, the SB-670 antenna tuner

by Randy Kaeding, K8TMK
5965 Clearbrook Drive
Stevensville, MI 49127

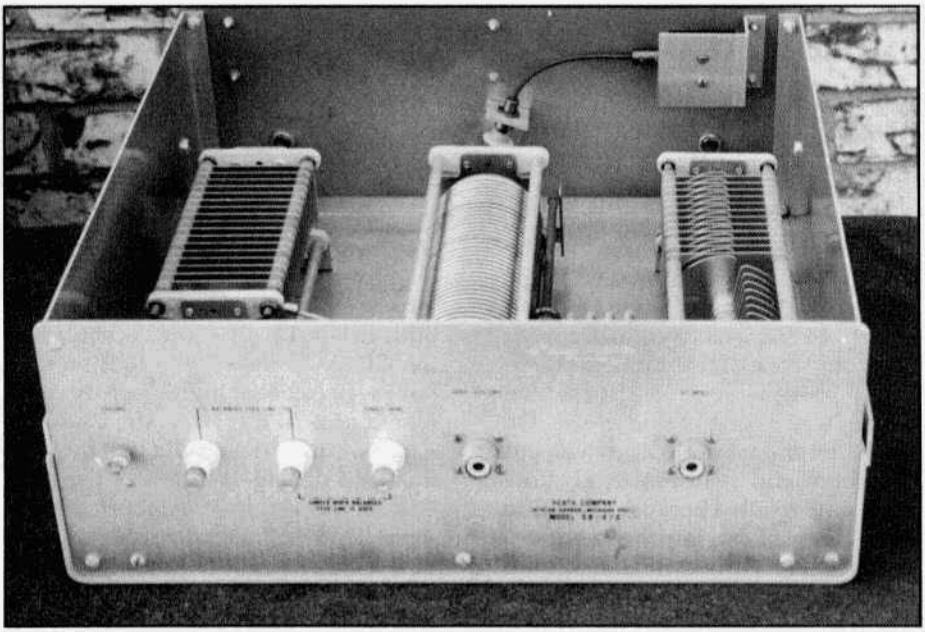


Front panel of the SB-670 antenna tuner.

This is the first part of a 4- or 5-part series of articles about Heathkits that never went into production. Unless you were a company employee, you probably never even heard of these products, much less see them. Any information about these products was generally kept inside the walls of the company, and most existing units were destroyed. But now that several years have passed since their inception, and because the company is no longer in the kit business, I will let you in on some of these "secret" projects. This month, we will take a look at the SB-670 Antenna Tuner. The accompanying photograph is a picture of the author's SB-670, which may very well be the only one still in existence.

After several previous attempts at marketing an antenna tuner capable of handling full legal power, the SB-670 probably came the closest to shipping without actually doing so. Not that anything was really wrong with previous designs, in most cases engineers were taken off the project to work on something more important. In addition, the changing look of Heath amateur radio equipment would require a few cosmetic alterations.

The SB-670 Antenna Tuner was designed around 1977 and was styled to match the SB-104 series. Its design was typical of many antenna tuners, with an input tuning capacitor, a roller inductor, and an output tuning capacitor. It also contained a 4:1 balanced-to-unbalanced balun transformer for use with balanced feed lines. It was designed to convert a reactive and/or resistive load to a nonreactive 50-ohm load, and would match into coaxial lines, random-length end-fed wires, or balanced feeders.



A view of the SB-670 from the rear with top section of cabinet removed.

The actual specifications read like this:
Frequency Range:3.5 to 30 MHz.
Power Rating; SSB: 2000 W PEP, CW: 1000 W.
Input Impedance:50 ohms.
Impedance Transformer: 4:1 (balanced-to-unbalanced) balun.
Output Impedance: Wide range.

This was a real Heathkit in that you even got to build your own variable capacitors. Imagine reading a parts list that had quantities like "84 small spacers", "41 Stator plates", and "44 Rotor plates" (just to name a few)! Assembly went pretty fast; you just mounted a ceramic insulator to an end plate and then fastened a couple of long rods to the insulator. It was then just a matter of sliding spacers and stator plates onto the rods. The rotor assembly was similar, but used a single hex-shaped shaft and larger spacers. Once the capacitors were assembled, you only had to assemble the roller inductor, and then mount parts to the chassis.

Operation was pretty straightforward, the printing on the front panel for the input and output capacitors went from 0 to 100, and the shaft of the roller inductor was coupled to a mechanical counter. These indicators allowed you to write down settings for future reference.

The only reason I can think of why the SB-670 never shipped was because engineering was planning on a new, completely restyled series of amateur radio products, and the SB-670 would not match. Although the SB-670 was never produced, it was restyled in 1979 and eventually did ship as an SA-2040. The only differences inside were that a 4-turn coil was removed between the input capacitor and the roller inductor, and several large bare interconnecting wires were replaced with 3/8" wide copper straps.

This completes a look at the SB-670 antenna tuner. Next month we will take a look at the SB-240 2KW linear amplifier. **ER**

Field Radio Set AN/GRC-13

by Brian J. Ryan, NØLES
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The military has progressed through a variety of HF field radio sets during the second WW, with improvements made in areas of size, weight, frequency range, and ease of use. Some radio sets had improvements in all these areas and enjoyed a long period of use. Others fell by the wayside as newer units had successful features in all areas, while others failed because they didn't offer much of an improvement over what was currently available.

As a background, one of the first HF practicle field radios was the SCR-131 (BC-148) used between WWI and WWII, but was sans the gas engine generator and multivoltage power supply. There were several versions that covered different frequency ranges, but this one tuned from 3.96-4.36 MHZ. Limitations besides the limited frequency range were the modulated oscillator transmitter and regenerative receiver which limited netting operations due to oscillator radiation interferrence.

One of the next major HF field sets was the SCR-284 (BC-654) which saw extensive use during WWII. This unit had a wider frequency range, although still only 3.8-5.8 MHZ, a varity of power supply options besides the hand crank generator, such as the ubiquitous PE-103 55 lb dynamotor that still shows up at many swap meets, a vibrator pack that presumably does that same thing, and a gas engine generator. The transceiver alone was not particularly light at 44 lbs for field use, but performance was significantly better than the predecessors, ie., superhet receiver and the transmitter has a power amp driven by a master variable tuned oscillator. It was packaged in a chest type rectangular box whose front lid folded down into an operating table complete with built-in key. I suspect the vocabulary of the GI's that lugged this unit on their backs increased significantly with length of field travel.

The next HF field radio that saw limited use during WWII was the AN/GRC-9. This unit was pictured in an April 1946 CQ magazine showing potential surplus radio equipment soon to be available to amateurs. This unit was somewhat smaller and lighter than the SCR-284, it had the versatility of a wider frequency range of 2-12 Mhz, and more power supply and accessory options. Incidentally, the AN/GRC-9 was apparently preceeded by the SCR-694 (BC-1306) which looks almost identical, but is slightly smaller and its frequency range is only 3.88-6.5 Mhz. The AN/GRC-9 was the next logical improvement in technology, the transmitter had a buffer stage between the MO and final for increased stability, an optional six crystal transmitting channels besides the variable tuned oscillator, and the receiver used the small 7 pin miniature 1.5/3 volt filament tubes. The smaller tubes and enhanced packaging techniques allowed more features and somewhat better performance than that previously provided by the SCR-284. This radio set saw wide use in Korea and Vietnam, and until recently was available surplus with most accessories at Fair Radio Sales.

The AN/GRC-13 that inspired this article was dug out of a garage by a fellow packrat in Duluth, MN. He initially turned it down, as it was in a large

Receiver-Transmitter RT-136/GRC-13

compartmentalized shipping case with all accessories weighing 300 lbs. The initial owner expressed interest in sending it to the dump if a reasonably offer was not given. A call to my fellow packrat indicated interest on my part, even though I never heard of it, because collectors are naturally interested in something they never heard of. Unfortunately I arrived in Duluth on Mothers Day to pick up this item and take in-laws out to dinner. The empty box, which alone weighs 150 lbs, took up all the space behind the rear seat in my Plymouth Voyager. The radio set with numeruous accessories, along with some items picked up at a local swap meet now occupied most of the remainder of the rear seat. Spouses and relatives of radio collectors should be awarded medals or similar commendations for their understanding in these important matters.

The radio set itself showed no resemblance to the AN/GRC-9 although the frequency range was identical, 2-12 Mhz. The accessories were very similar but not identical; hand crank generator with stool, key, mike and headset, two bags of antenna poles, wires, and stakes, and a spare parts bag. A significant difference is that there are no variable frequency controls for the receiver or transmitter other than antenna tuning. Frequency selection for both receiver and transmitter is by a single 10 position knob. A box of 110 crystals was provided with the set, indicating this unit is only crystal controlled.

Fortunately the manual was included in the top of the shipping chest. A cursory review indicated a nearly identical tube line-up as the AN/GRC-9, same 2E22 transmitter output tube, a similar receiver layout with the exception of 3 rather than 2 IF stages, and a silancer (squelch) circuit not found on the AN/GRC-9. The set, as previously suspected, is totally crystal controlled, using one crystal for both receiver and transmitter for each desired frequency.

The crystal frequency tuning revealed an interesting method of assigning frequency selection. As previously stated, only 110 crystals were provided for assigned frequency selection. This unit

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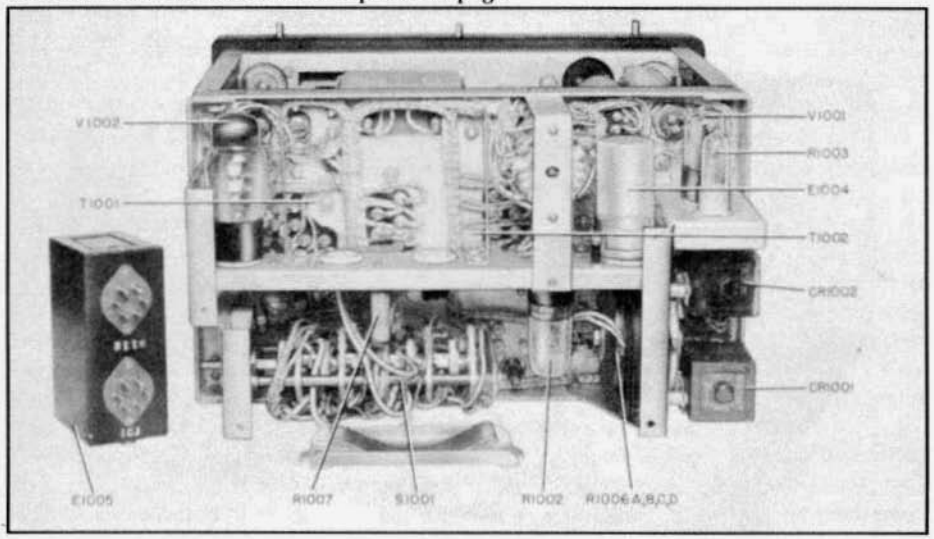
Field Radio Set AN/GRC-13 from previous page



GRC-13 power supply chassis, rear view, cover plate removed.

was designed for "crystal saver" operation. The receiver has an IF of 1.6 Mhz. That meant, that the crystals provided 110 channels of frequency selection with the receiver tuned for low side LO injection, however, an additional 35 crystals could be used over again on the high end by tuning the receiver for high side LO injection. Correspondingly, the transmitter, while using the same crystal oscillator, also has a 1.6 Mhz oscillator and mixing circuit, that brings the selected crystal to the desired carrier frequency. Mixing above or below this 1.6 Mhz oscillator provides the same function for saving crystal count.

The ten selected channel crystals are located inside the radio set, requiring case removal for changing. The manual recommends a signal generator for alignment for each crystal, although the receiver can be aligned on noise in an emergency. An absorption wavemeter is part of the accessories, and is required to assure either the high or low oscillator injection is selected by the transmitter intermediate or final tuned circuits. This meter has two switchable bands to provide the required frequency selectivity to assure this happens with certainty. This meter is also placed near the antenna to optimize antenna loading. Changing frequency is probably not an endeavor normally performed in the field due to the time comsuming operation of tuning individual variable capacitors for each stage for each channel changed.

The crystals provided reveal an interesting and random pattern in frequency selection. The frequencies allowed varied from a low of 2 Khz between adjacent frequencies, to a high of 425 Khz, and a median channel spacing of 68 Khz. No neat or obvious even or otherwise memorable frequency were assigned. Possibly the frequencies are previously used channels that were normally used for Army or Marine nets.

An examination of the interior of the set revealed normal construction for the era, with the exception of the stages that are tuned individually for each channel. Approximately half the the interior is devoted to individual substages that are organized in a square donut shape, with 10 individual screwdriver adjustable variable capacitors arranged around a centrally located channel wafer switch. These square

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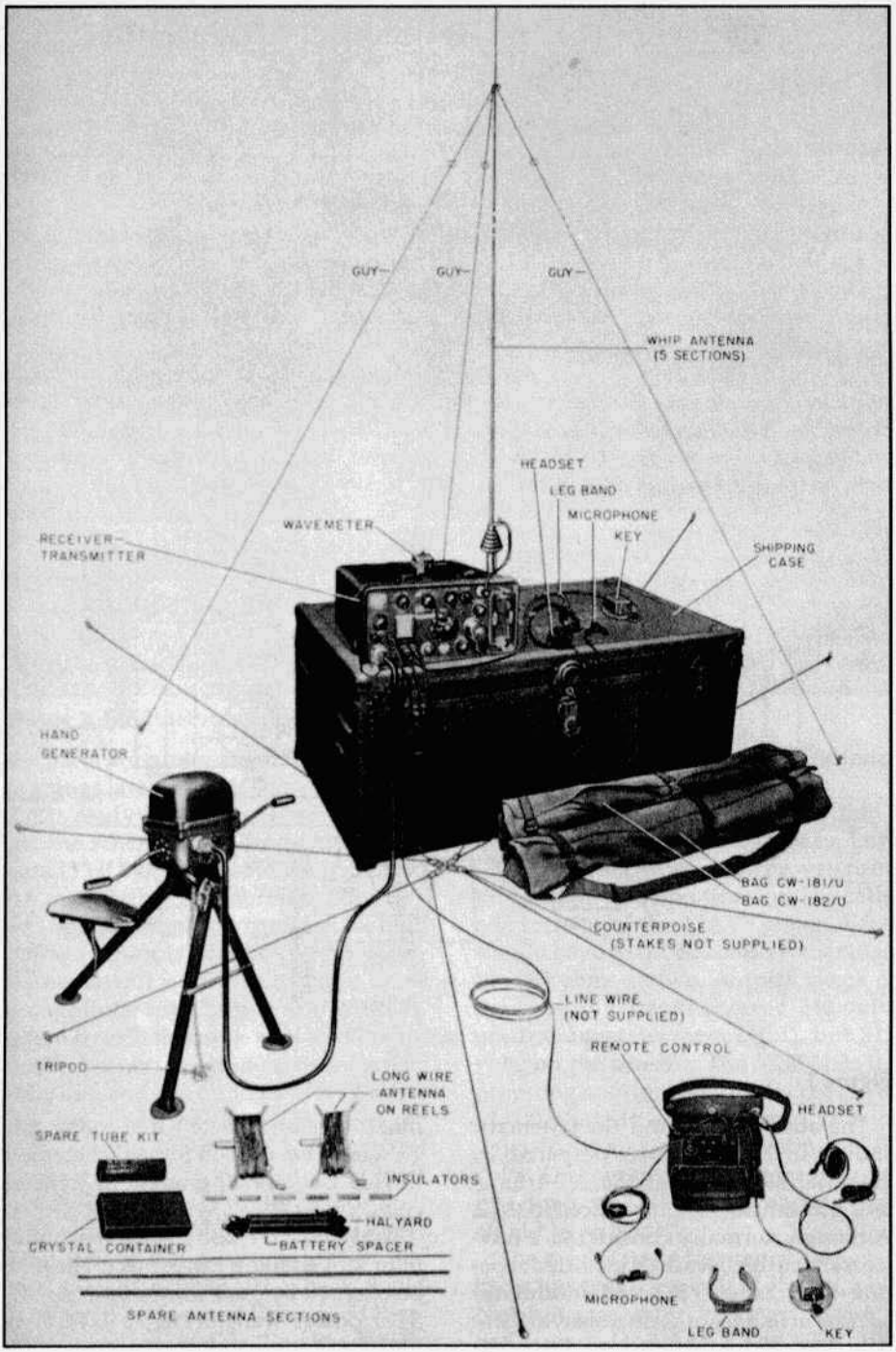

Radio Set AN/GRC-13

A Modulator For The Heathkit AT-1 Transmitter

by John Kelly, N3GVF
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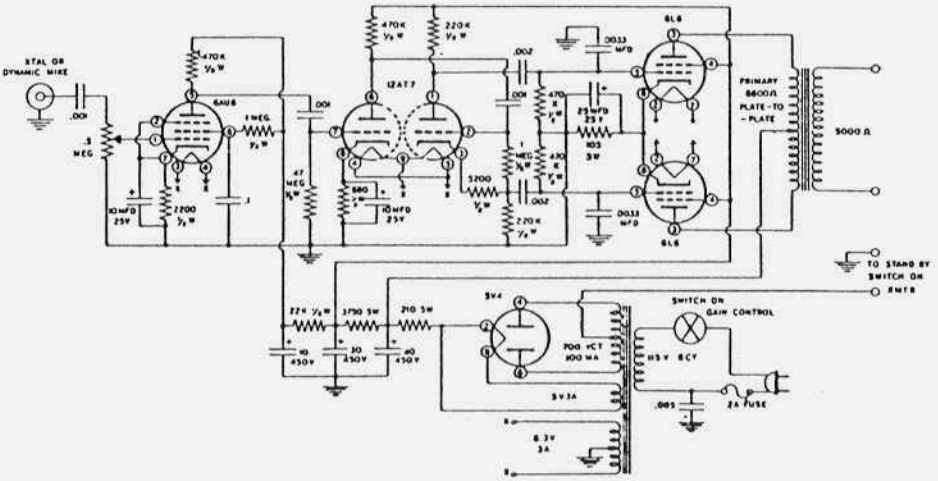
Ashton, MD 20861

"Suggested . . .Modulator Circuit For Model AT-1 Transmitter.

In response to many requests we are presenting herewith a schematic for the construction of a modulator for the Heathkit Model AT-1 Transmitter Kit. This is merely a suggested circuit - and is not a Heathkit. We do not sell a modulator kit for the AT-1, nor can we offer to sell parts for the construction of this circuit. Parts should be obtained locally, or purchased from one of the large mail-order radio parts suppliers.

"Our tests have indicated that this modulator circuit will function satisfactorily with the AT-1 transmitter. The information is presented here for those who wish to use it, but the project must be undertaken on each user's own initiative. The circuit is straightforward, and the parts are standard, readily available items - so that with normal care in construction, no trouble should be anticipated."



SUGGESTED MODULATOR CIRCUIT FOR AT-1 TRANSMITTER

Figure 1

The above notice and the schematic shown in Figure 1 was prepared by Heathkit shortly after the AT-1 amateur transmitter was introduced in 1952. Although normally considered a novice transmitter, Heathkit included separate rear panel VFO and modulator sockets in its design. Remember, in those days the novice license was a one year non-renewable privilege and Heathkit must have anticipated that many AT-1's would be used on phone when their novice owners upgraded to general class.

I have an AT-1, so building the modulator looked like a fun project. The junk box helped by providing a Stancor PC-8410 power transformer, a UTC S-19 multimatch modulation transformer and a 7 x 9 x 2 inch chassis. The rest of

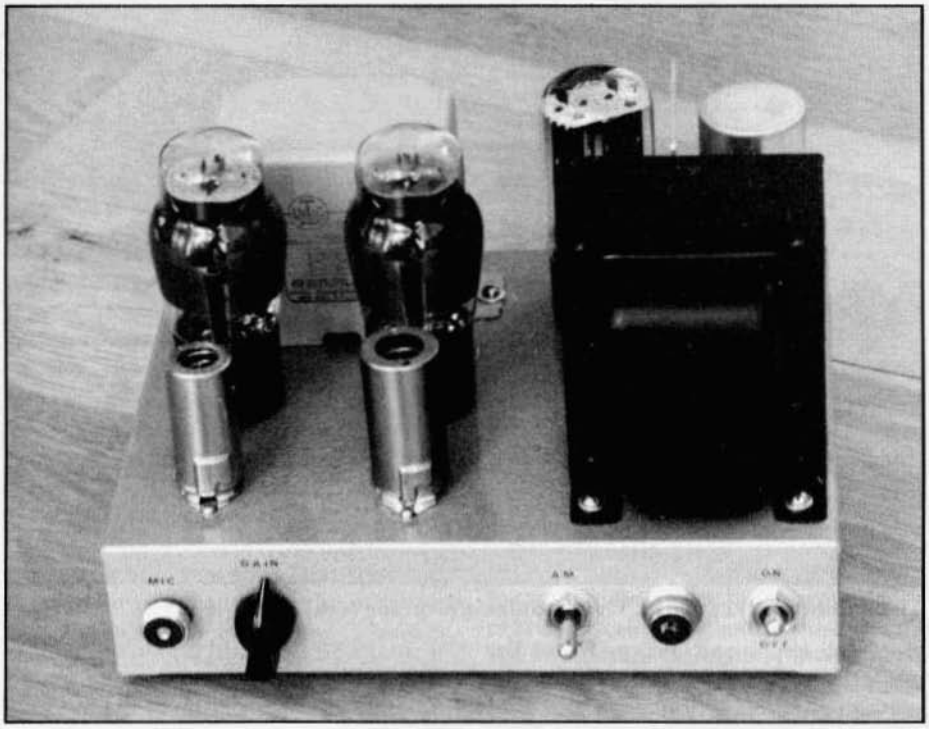


Figure 2. Modulator for the AT-1 built by the author.

the parts are pretty standard and three evenings later the unit shown in Figure 2 was ready for testing. I built the unit per the schematic, adding only a front panel PHONE-CW switch that shorted the modulation transformer secondary and opened the power transformer high voltage center tap in the CW position.

The layout and construction were straightforward. The power and modulation transformers were placed on opposite corners to minimize magnetic coupling and a ground buss (#12 wire) was run down the chassis between the 6L6's and the input stages. All ground connections were made to the buss which was attached to the chassis only at the power supply end. I put the rectifier tube a little too close to the twist lock filter capacitor, so a heat shield between them seemed like a good idea. After punching and drilling the chassis I painted it with a gray hammertone spray paint which gave a "professional look" to the project.

When power was applied it didn't take long for problems to surface. Low output and high distortion proved to be the result of a schematic error. The cathode resistor of the 12AT7 preamplifier should have been 6800 ohms rather than the 680 ohms shown. A quick check of the supply voltages showed 340 volts on the 6L6 plates (just right), but 312 volts on the screens. The 3750 ohm B+ dropping resistor had to be increased to 12,000 ohms to get the screen voltage down to the maximum 6L6 rating of 260 volts. The measured output into a resistive load was 13 watts, about what would be expected.

The modulator's frequency response had a lower -3 dB rolloff of 350 Hz, a bit high but acceptable, however, the high end extended to 6.5 kHz. The .0033 mFd capacitors across the 6L6 grid resistors

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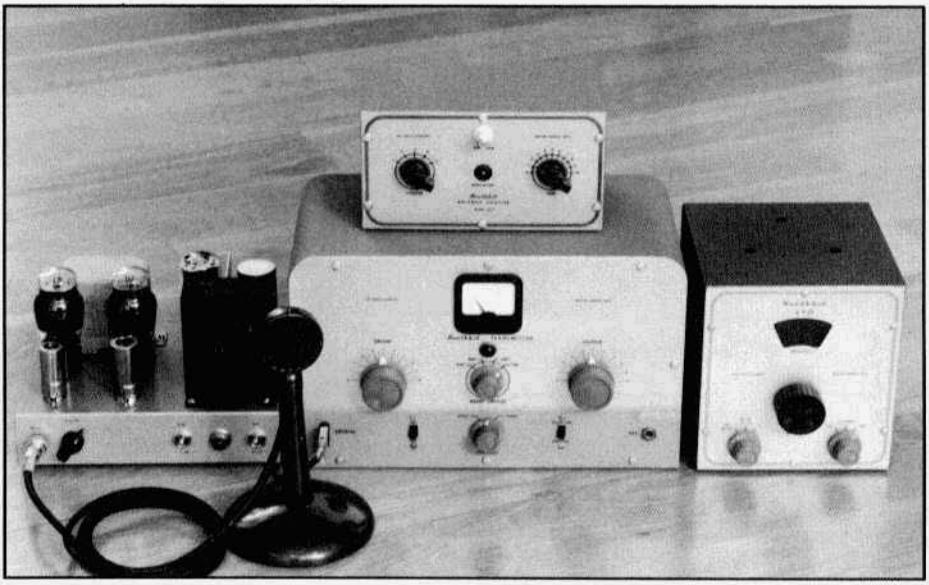
AT-1 modulator from previous page



The author's AT-1 station. The modulator is on the left.

were too small and also reduced the overall gain by about 8 dB due to the voltage divider action with the grid coupling capacitor. Not a good design! The .0033 capacitors were removed and the following high frequency rolloff capacitors were added; 100 pF from the 6AU6 plate to ground, 470 pF from the 12AU7 preamp plate to ground, and finally, 4700 pF between the 6L6 plates. These moved the high frequency rolloff to 2.7 kHz and provided a steeper rolloff skirt.

Although the AT-1 has a modulator socket, its design did not provide for control of the modulator or other send-receive functions. This was tolerable on CW but an inconvenience on phone. I replaced the original SPST STANDBY-TRANSMIT switch with a similar 3PST slide switch and wired the two additional poles to the modulator socket to control the modulator and antenna relay. If you don't want to change your AT-1 switch, extend the two STANDBY-TRANSMIT switch wires to the modulator socket and use an external send-receive switch.

In the 50's a "build it yourself" ability was still common and anyone undertaking the construction of the modulator could probably have sorted through its various problems. High frequency rolloff did not get much attention back then; even the typical ARRL Handbook modulator designs only had a single high frequency rolloff capacitor.

The modulator worked fine when connected to the AT-1. Add a Heathkit VF-1 VFO and an AC-1 antenna coupler (if you have a long wire) and you have an "authentic" Heathkit general class phone transmitter setup. A rewarding exchange for a week of evenings! ER

The 'Pile'

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I love ER. But sometimes it depresses me. Why? Well every month after retrieving it from my mail box, I thumb through its small but firm pages and read its well-written articles about pieces of radio gear that have been lovingly given a new lease on life, if not brought back from the dead. These articles have one thing in common. They all have happy endings with the labors of their love proudly displayed in positions of prominence all across this great land. Well, to those technicians/authors who conquer all in the face of overwhelming cosmetic if not electrical adversity to resurrect and then to write about these forgotten and many-times discarded diamonds in the rough, I congratulate you. However, I come not to praise you Caesars, but to speak for the other 90 percent of us who have from one piece to a literal "pile" of gear, little of which may work correctly and probably won't for a long while given the time and circumstance restraints on daily life. Since I am more author than technician, or put another way, less technician than author I am going to write of my own "pile" as it were, with the hope that once this article is in the public domain, the rest of my fellow pile possessors along with myself may feel a bit better about our not measuring up to the impressive time and quality specifications of the Greats of radio restoration found almost exclusively within the pages of ER. Further I do this (I think) with Barry's blessing as he called me personally to offer encouragement (I think) after receiving my late subscription dues along with a note in which I outlined the idea. So with that as overblown introduction, here goes.

Lets face it, I love tubes, all tubes equally well, whether short or tall, fat or skinny, cloudy or clear. Well, actually upon reflection that's not exactly true. I must admit I find the blue-electron glow dancing on the clear bubble-bulb glass envelope of a slightly gassy 6V6-G in an overvoltaged class-A audio output stage to be a bit more sensuous than the meditative grindings of a squat stubby metal 6H6 invisibly and unceremoniously working away in detector and AVC service.

However, while tubes were my first love they are not my only love. I also love knobs, lots of knobs. Give me knobs so I can control everything. Give me variacs for power line voltage, separate switches for each little function, pots for this and pots for that, wafer switches that go all the way around, I don't care just give 'em to me. In some circles the overabundance of knobs is called "bells and whistles" and if it be so, color me guilty. I love em.

Now as we all know (because I think we've all made the same discovery) the combination of the vacuum tube with the knob as expressed by the past-day military and ham radio manufacturing industry has led to what I call, "A 7th heaven at 6.3 volts".

And for me, it is in my "pile" of military and old ham gear that my love of tubes and my love of knobs comes together in a symphony of metal, glass and phenolic, the weight of which is almost beyond my ability to lift. But lift I do with the result being a four-rack-wide glorious collection of radio gear, almost all of which has something wrong with it.

It's not that I'm lazy, well actually upon reflection that may not be exactly true, but anyway it's not the point. I guess the point is that as long as the tubes and knobs in my "pile" work fairly well, I'm happy. Perhaps it's better to say, I'm not a perfectionist, how's that? And so for fun and no profit, let me detail the imperfections of my "pile" and you may judge and indeed relate for yourselves.

At the top far-left of the picture is a

continued next page

The Pile from previous page

Radio Receiver, BC-224 D, SN 235, made by RCA, SN 94-Phila-42. It's a lovely thing except for the fact that it spent most of its life in a chicken barn out in the country somewhere. Inside, it's in remarkably good condition considering its past, but outside it's only fair. It works, but it's almost impossible to tune SSB even on 80 meters because of the scratchy and unstable nature of the local osc. I've done everything I dare do cleaning-wise to correct the problem, but the corrosion on the variable tuning cap just won't clean up. P.S., I did determine it's not the pot at the end of the tuning shaft. By the way, for those who don't know as I didn't, the BC-224 covers from 1.5 to 18 MHz in six bands while the almost identical BC-348s did it in five. IF alignment at 915 kHz here in Spokane is a real pain as a local AM radio station, KXLY, is at 920 kHz and bleeds into everything at my location. However after I did the alignment, the crystal filter came out as sharp as a tack. How'd I do that?!? Well, on to the next piece of gear.

The BC-224 is sitting on top of an old AM proof-of-performance test set which I purchased at a local radio/TV station's garage sale last summer. It contains an HP model 325B distortion analyzer, an HP model 205AG audio signal generator, and a station-built audio monitor amp with speaker. This is old stuff. The station it came from was KHQ which transmitted at 590 kHz, 24 hours a day at 5 kW to a 700 foot tower. A few years ago, the tower was taken down, the station sold and relocated, and the call letters transferred out of town, but I can still remember as a kid in the '50's riding up into "Radio Range" as we called our south-of-town Moran Prairie back then, and going into KHQ radio's concrete bunker-like building and staring at the blue glow of the mercury vapor rectifiers through the door glass. But I digress.

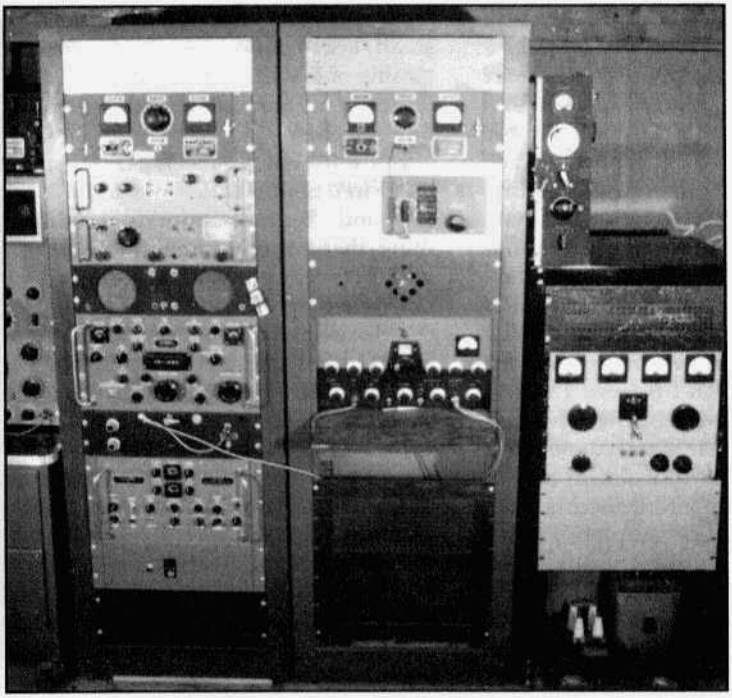
This test set is very nostalgic and I'll keep it intact and that includes all the old Aerovox paper caps that have dripped their life-blood (wax) out and all over the bottom of the units. The audio gen is quite off in calibration, but according to the manual I got from Fair Radio, it contains many factory selected parts with very few field adjustments. The distortion analyzer is kind of a mystery to me as I can't find a manual. I think it may need some parts replaced as it's hummy and unstable. However the single meter on the front panel which is the one indication of it's internal well-being has a problem I've never encountered.

At first I thought the meter movement itself was bad as it stuck with operation, but upon closer examination it turns out the meter scales were printed on paper which apparently was glued to the metal meter backing plate and that paper is peeling off forward, and obstructing the needle movement. Oh boy.

Moving over to the right one rack we come to some recognizable stuff. However, at the top of this rack is a blank panel. I did have a CV89/URR frequency shift converter in there, but out of the two I had I could barely get one to work at all, and at that only part of the time. Each had intermittence in the wiring harnesses which would have been a nightmare to trace so in a move that goes back on everything I believe in, I removed 15 some vacuum tubes and 10 some knobs from my "pile".

Next down is an intriguing piece of gear, and incidentally, the only one in the pile that is complete and works just fine. It is Regulated Output Amplifier, made for the CAA by Maxon Industries (who?). Actually it's an audio limiter amplifier with lo-Z mic-level input and 600 ohm line, 0 to +18 dB output. The left meter reads the screen current on a variable mu pentode amplifier and the right meter is a standard dB VU type. I run the audio output from either the R-390A, CV157 or CV591 through this unit to level out amplitude variations before the signal goes to the AM-413 D/G speaker amp.

And as luck would have it, next below



The 'Pile'

is the AM-413 D/G Audio Frequency Amplifier made for the Navy by the National Sintering Corp (again who?). It supposedly has a limiter section but it sure doesn't seem to work correctly. The fellow I got the unit from had traced out the circuitry trying to figure out the cause of the limiter section distortion, but he never solved the problem. It's a distortion with a fixed amplitude no matter what the volume level is set to. So at low volume levels the distortion is quite high, and at high volume levels the distortion is lower, but still noticeable.

Next down is the familiar and venerable CV591. Unfortunately, this poor devil was probably left on for too many years, at the top of some unventilated rack in some back water tropical or desert location. Although surprisingly it's electrolytics either withstood the onslaught or were replaced as they are plug-in units, the rest of the unit fared far worse. Tar was leaking from the transformers. Almost every high voltage paper cap was leaking or shorted. The AVC circuit acts as though it died and didn't go to heaven, the BFO osc apparently has some leaky or noisy components which ends up in the speaker as noise akin to lightening crashes, and there is several kHz of drift over time in the 1st conversion osc. In response to all of this, I dissolved away the leaking tar, cleaned all the relay contacts, pots and switches, checked the tubes by substitution, replaced every paper cap in the unit, and yet still most of the problems persist. One of these days I'll ...Well lets not get into that now.

And next down is everybody's favorite, the R-390A, this one made by EAC, SN 6278. I bought it at a local air base auction 12 years ago for $80. I was amazed at how pristine it was. Indeed it looked like it had never been used and it was complete with covers, etc. It's surplus declaration ID tag said it had low sensitivity and was not repairable, in response to which my eyes lit up as they did in those days when I felt I might be getting a deal. I got the radio home and after just a few minutes I determined that the tag's comments were an understatement. There was no sensitivity. After hours and hours of exploration I found that the cathode resistors of the 1st and 2nd conversion 6C4 oscs were cooked and so I replaced

continued next page

them. Next I found that the output RF transformer on the selectable-crystal RF osc chassis had a couple of bad solder joints. Resoldering greatly improved sensitivity as it increased the 2nd conv osc injection voltage, but only above 8 MHz. I found that the 1st mixer wasn't getting enough injection voltage either and that I couldn't peak the output RF transformer on the 18 MHz 6AK5 1st conv osc. I then noticed that its output RF transformer was the same as the other one I'd just fixed, and so I thought it might have the same problem which I reasoned would cause the insensitivity below 8 MHz. I tried to resolder the internal connections of the transformer while still in the RF chassis, but to no apparent success. I decided if I were to take it completely out of the RF deck, I might as well just replace it so I ordered a used one from Fair Radio and did just that. Just a note here. I found that the original RF transformer had been incorrectly wired internally. The secondary output coupling loop had been wired on the high or plate end of the primary and not on the low or B+ end. I thought this could have led to RF arcing through the epoxy.

Anyway, once the Fair-supplied transformer was installed I got a good solid peak and was happy, for a while that is. I don't know the whys or wherefores of what I'm about to say, but over time that peak slowly flattened out and left me back where I'd started - with low sensitivity below 8 MHz. I have since resolved that the next solution will be either to rewire and recomponent the whole damn 6AK5 osc section or simply replace the whole RF deck. So much for hard work and diligence eh?

Now to continue our trip down, below the R-390A we come to a black 5-1/4 panel whose purpose in life is to cover up a slide-frame which supports the R-390A during its installation or removal from the rack, and to hold a great big fan to cool the ever-and-over-hot CV157 single sideband converter below. I don't know about the rest of you, but an R-390A to me is no small sack of potatoes and trying to rack-mount one with nothing to hold it in place but my back is tantamount to vertebral suicide.

Below the black panel is a CV157 made by Orion, SN-88 which has more tubes (44), and also more pounds (100 something) than any other single piece of radio gear I currently own. And believe it or not, when it was first designed, they simple covered it with a perforated metal shell (I have a large photograph of the original Hoffman Electronics, SN 1 unit showing same). By the way, I wrote a review of the CV157 for ER, #25. Anyway, while the primary SSB circuits are OK, the secondary AVC, "carrier fade", and "noise squelch" circuits are in a tizzy.

This unit is built with lots of little phenolic terminal boards mounted in all kinds of impossible positions under the chassis and it's on one of these buried boards where a defunct 1 meg 1/2 watt plate resistor resides. Though it's open as my measurements indicate, it's also inaccessible without removing its terminal board. It's one of those situations where everything else must be moved out of the way first before access to the board is possible. And as this resistor is in the AVC circuit, the consequence to date is, there is no AVC circuit. Oh well someday.

Next in the CV157 problem line are the carrier fade and noise squelch circuits with their problem being that they're on all the time which disables the carrier tracking circuits. To disable them I had to pull their respective tubes to keep them from locking up the electro-mechanical phase-lock system. Now this problem is a bit more interesting. Both circuits are fed 100 kHz energy through a .5 mHd 600 volt oil-filled bathtub cap which by the way I can get to. This cap interfaces between a circuit impedance on one side of about 1 megohm and on the other of about 10 megohms. So the slightest leakage through the cap can bias the circuitry which is exactly what's happening.

Solution? Find a replacement? Hollow out the cap can that's in there and fill it with parallel disc ceramics? I know, either would work, but again I'd have to remove the whole CV157 unit from the rack, flip it over, fix it (the least of the effort), flip it back over, and reinstall it. While my imagination says "yes", my back says "NO".

It's at this point we leave the receiving world behind and move on into the realm of the transmitting. And it is the rack on the middle right that we shall now focus. At the top, again is nothing but an empty panel although you might notice just to the right of this rack standing vertically is a tall black box with knobs (excuse me while I tingle). This box is the remnants of the far right side (the antenna tuning section) of what was once a whole BC-357 transmitter. Before the hate mail starts let me assure you that I had no part in this butchery. Indeed I got the unit from a ham radio estate and I have since learned that many, many a ham cut off these tuning sections and used them to feed their long wires. I know it's hard to imagine but there was a time when this stuff was cheaper and less valued than chicken feed.

Well the plan is to turn this tuner on its side and mount it at the top of the rack where the blank panel is now. However the tuner's rotor coil has a cracked ceramic back plate which I need to either glue or replace. Someday...sometime.

Next down is another audio limiter just like the one I described earlier. However this one is made by Columbus Electronics Corp, and is missing its right-hand VU meter. I found a similar sized meter and stuck it in there to fill the hole, but it doesn't indicate anything. Also this unit has a mic jack for a PL-68 plug on the front while the other jack accepts a standard 1/4 stereo phone plug. What were they thinking? It does work although it has a bit of hum from somewhere which I'll trace down. Don't rush me.

Next down is another project in progress. It's the VFO/exciter unit out of a T-368. As of yet, no power supply nor other wiring, but I did put Cinch Jones terminal strips on the chassis and wired the cut harness to them. Also I determined that for my use a type 6AU5 or 6AV5 tube would work in place of the type 6000 which I've never even seen. Sitting in the bottom of this rack is an old Navy power supply which contains a 350 volt DC supply with no filters and I'm planning to finish it off and cable its power up to the exciter. Or not, I'm not sure yet.

Beneath the T-368 exciter is a simple gray-painted piece of masonite cut to the size of a rack panel. I think it was used as a speaker panel, but I put a 100 watt light bulb behind it which acts as a dummy load for the Viking II. Come on now, isn't a light bulb a kind of a tube, just a little? What would it be called - an onode or a monode? Anyway, I don't dare put much of anything behind this panel or in its place as the heat streaming out of the Viking II would probably cook what ever I put there.

And speaking of the Viking II, lets. It has a history. I bought it in 1974 from a then older ham who since has become a silent key. I kept it for a few years and then sold it to another older ham who kept it for a few more years and then I bought it back from him. That ham also is now a silent key. His name was Dean Bula, W7GBU, and he was one of the kindest, most beloved people I'd ever known in or out of radio. I first met him in 1960 when I was 12 years old and he worked at a local radio shop. He used to sell me parts, one-at-a-time, and tell me stories of how he'd worked as a civilian out at the local air base installing radio stuff in bombers headed to Russia on lend-lease during WW II. Anyway I digress.

This lovely little Viking II has blown two caps since I've owned it. The first was a bypass at the bottom of the final plate choke and the second was a fixed loading cap on the front-panel loading switch.

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The Pile from previous page

Both were tough, miserable, time consuming muthus to replace but I prevailed. Another less serious, yet more nagging problem though that is harder to fix is the fact that sometime before I got the unit the first time, it either fell or was placed face-down on its knobs (cringe) which damaged the cranking mechanism on the final plate tank. To this day I'm not sure exactly what the problem is and I suspect I'm going to have to remove the whole thing from the chassis and do some body work on it. When cranked it has a grinding, out-of-alignment feel if you know what I mean.

Moving on, below the Viking II, so far is nothing, just an empty space waiting for something/anything to fill its void. And I sure hope that happens soon as the rack right now is quite top-heavy and its somewhat of a fear-evoking job to push around its weight on its already sticky and flattened rubber casters.

Finally moving to the far right is another shorter rack which contains I suppose the least-operational piece of gear in the "pile". It is a home-brew (not by me) 4-1000A grounded grid linear. I don't know who made it, where it originally came from, where it was going or frankly what I'm likely to do with it. It was sitting in a shed when I found it where it had been for years and years. Fortunately the chassis was painted gray or the whole thing might have turned into solid rust. As it was, I had to steel wool away all the accumulations of crude around the edges and under panel joints. The unit has what electrically appears to be a strange L input network to load the cathode. The output circuit is a standard Pi network with a completely home built rotor coil. Someone sure had access to some strange phenolic and steatite pieces and they used flat-wound silver-plated copper ribbon for the coil. I disassembled and cleaned up the coil with Brasso and other noxious chemicals so it looks lovely. The nightmare came when I went to reassemble the unit. Trying to keep the coil turns in their respective slots on three different notched phenolic bars which were flopping around was something just short of maddening, but the job got done. At this point the rotor coil is clean and in working condition, just waiting for an RF overload to arc across the phenolic and start a small camp fire.

Below the linear is where its power supply will go. Sitting in the back is the biggest meanest filter cap I've ever encountered and frankly I'm afraid to take off the shorting bar! It looks so demonic I swear if left alone, it would charge itself. It measures 13 x 15-1/2 x 6 inches and bridges out at 39 mFd. There is no ID of any kind on it anywhere but I'm betting it'll take over 600 volts, wouldn't you!

Next to it is the power transformer, a UTC measuring 10 x 11 x 9 inches with ratings of 5760 VCT @ 321 mA or 4800 VCT @ 475 mA. I doubt the thing would even get warm at those ratings, but we'll see. Now all I have to do is wire all this together along with a series diode board and vwalla - maybe output, maybe fireworks. I'm never quite sure.

And with that my fellow friends I bring to a close this description of my "pile". To me it translates out as a whole lot of good intentions combined with a fervor for thinking about it some more. Oh yes, I'll get around to doing something about all these less-than-100-percenters, but you know what? It gives me something to think about, sometimes too much to think about, but either way, it's the plan that counts don't you think? It's the gestalt of the pile, not the pristine-ness of the unit I relate to. It's the numbers of tubes and knobs I relate to, remember?

Most importantly however and to return to my original theme, I hope I have lessened the guilt that some of you might feel as ER continues to publish the lofty but realized goals of the best and brightest among us. To them I say Hurrah. To us I say, "Lets think about it some more." ER

Field Radio Set AN/GRC-13 from page 28

donuts are then ganged one behind the other and are driven by the front panel channel selection switch. The mechanical interaction between the individual stages and the front panel is not trivial, and borders on a nightmare. The channel selector knob itself is unusual in that it requires a full 360 degree turn before the channel advances one position, and it does so with a significant klunk. This may have been an intentional move to prevent operator channel surfing that could wear out the switches. Servicing individual components beyond tubes requires removing the entire group of switched tuned subchasses, and splitting the offending unit apart from the group to work at the components inside that particular subchasses "donut". This again is not a trivial task, and had to be a maintainability issue with the government procuring agency.

Accessories

The accessories provided are basically similar to that of the AN/GRC-9 with the following exceptions.

The tripod legs for the hand crank generator, G-28A/U, are only locked in place when the generator is installed at the fulcrum, and failure to complete this operation will assure a quick ride to the ground by a potential crank operator. The generator itself has a female power connector rather then the male connector used by the AN/GRC-9 equivalent, making them non-interchangable. A male to male adapter is provided to apparently make this happen for other radio sets such as the SCR-284, but it is still the wrong size to fit AN/GRC-9 cables. The generator has a notched tooth feature on the bottom, along with a chain, to allow fastening the generator to a log rather than the tripod if this is desirable.

The key, Navy type 26026, differs in that it can be detached from the leg band so that it can be used on a table. This is a good feature, but it was never incorporated in the AN/GRC-9 accessories.

A remote control box connected by telepnone line wire allows remote operation of the mike, earphones, and key, but not channel selection.

The mike and headset are different from the AN/GRC-9, but are interchangable.

Two canvas bags containing antenna rods, support wires, ground stakes, and various long wires and insulators are similar to the AN/GRC-9, but are noticably different in subtle ways. It almost seems that everything was sufficiently different to assure new procurement of accessories rather then have commonality with other radio sets.

The manual indicates that this particular AN/GRC-13 was built by RCA and it is painted in Marine green, with a contract date of February 1948. It is the writer's opinion that the AN/GRC-13 was intended to be a potential improvement over the AN/GRC-9, or possibly it was a unit designed for a specific use requirement. The fact that it didn't become produced in quantity, (the writer's unit is S/N 54) indicates that it didn't provide an improvement over the AN/GRC-9 to warrant further production. Note that the AN/GRC-9 already had six channels of optional transmitter crystal control, and crystal frequency could be changed readly at the front panel without disassembling the radio set. The difficulty in changing a frequency beyond the initial 10 previously aligned, along with potential maintainability issues probably doomed future procurement of the AN/GRC-13. **ER**

The Hallicrafters HT-17 from page 15

Miscellaneous

Having answered most of my tank circuit questions, I focused my attention on the metering and keying circuits. In the oscillator position, the cathode currents of both the 6V6 and the 807 are routed through the meter. This current is 10 mA unkeyed and increases to between 35 and 55 mA when keyed, depending on the band. In this position, a 3K ohm resistor (R9) severely limits the 807 current but the transmitter will still put out a little power. In the amplifier position, only the oscillator is keyed and the 807 has 50 mA of idle cathode current. Questioning this, I changed the circuit to also key the 807. This introduced minor chirp. Since there had been none before the modification, I returned the HT-17 to its original state.

R14 was still bothering me. It is merely a power supply load connected in the oscillator position. Dissipating 15 watts, it ran so hot it melted the plastic cover on one of the new electrolytics. Seeming useless to me, I disconnected it. The only observable change was an increase of 4 mA of oscillator current during key up, caused by the increased supply voltage. Based on those findings, the resistor remains disconnected and the power supply rests easy.

Summary

Novice class, late forties transmitter in my collection, it would not be an HT-17, for there are many that are better. If, however, you like the unusual, the HT-17 is a decent and stylish low-end rig. Finding one may be difficult and you'll be lucky to find one with a complete coil set. I have operated mine on 80/40/20 meters and have always received high quality signal reports. After optimizing the coils, I'll try a new set of tubes with hopes of bringing the output up to factory specifications. Other plans include connecting a VFO to see how the 6V6 takes to being driven and modification of my extra 20 meter coil set to work on 15 meters. Until then I am rock-bound, running near-QRP and, yes, link coupled! ER

The Siltronix Comanche from page 18

the 8950 tube, I would greatly appreciate hearing from him or her.

All this brings up another mystery - why is a fairly sane (as hams go) radio amateur buying a 10 meter rig when 10 meters is dead as a dodo? Hey, this is the best time to snap up a bargain 10 meter rig so that when the sun gets its pockmarks back in a few years, you will be ready to go without having to take the big rig off 20 or 160 or wherever you hang out. The 10 meter only rigs are going begging at the hamfests and their disillusioned owners are open to all kinds of interesting (read CHEAP) offers. So maybe you can't find that mint 75A-4 for $50 or a Globe King that the owner will pay you to haul off, but you can probably make a real fine deal on a 10 meter rig that will work a lot of DX in a few years, and in the meantime you can get on locally in the evenings and HAVE FUN. ER

Letters from page 23

especially as the sunspots return. I would be very interested in hearing from anyone else who might be interested in using their classic gear for contesting in this modern age.

Thanks for publishing a very informative and helpful magazine.

David Stewart, N1SM

Letters can now be sent to ER via e-mail; er@frontier.net

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

WANTED: Manual/schematic for Heath AR-2 rcvr; IM-25 VTVM. Les Lampitt, VE3HN, RR 2, Lansdowne, ONT K0E 1L0, Canada. (613) 659-4076

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WANTED: SM-3 Collins mic. Ron, NE4S, GA, (770) 664-6931

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TRADE: HRO60 E & F coils, Vibroplex Zephyr s/n 180943, ARA CBY-46129 Command RX w/ auxiliary output adapter. **WANTED:** RAL, RBB, SCR-506 (BC-652-653); Hallicrafters T-54 TV, AT-2, AT-3 tuners, any Millen pwr sply; Patterson PR-16 cabinet or parts radio, any condx. Or??? Don, N3RHT, PA, (412) 234-8819 EST wkdys.

FOR SALE: Collins external gear drive & orig. knob for 75A 2, 3, 4; mechanical filter adapter w/ 3kc filter for 75A 2 & 3; xtal filter for 75A 2 & 3. **WANTED:** IF xfmrs for 75A2. Jerry Boles, N5KYE, 14857 Redbud Ln., Piedmont, OK 73078. (405) 373-2228

WANTED: Very early Hallicrafters and Hallicrafters/Silver Marshall equipment including Skyriders with entire front panel dull aluminum color, S-30 radio compass, S-33 Skytrainer, S-35 panadaptor, wood console speakers - R-8 & R-12, HT-2, HT-3, BC-939 antenna tuner, parts, advertising signs, paper memorabilia of Hallicrafters. Also want RCA model AVR-11 airport tower receiver. Chuck Dachis, WD5EOG, "The Hallicrafters Collector", 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

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

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

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

WANTED: Glass dial face for Hallicrafters SX-130 rcvr. John, WW1R, 216 Grove St., Rutland, VT 05701. (802) 775-6732 eves

WANTED: Central Electronics 458 VFO; National Select-O-Ject; NC-300TS spkr; Heath VF1. Mike Raskin, K4KUZ, 561 W. Tropical Way, Plantation, FL 33317-3345. (954) 583-4026

WANTED: Old tube amps, spkrs & xmfrs by Western Electric, ALTEC. Have Hallicrafters SX9 w/cabinet to trade. Mike Somers, 2432 W. Fargo, Chicago, IL 60645. (312) 338-0153

WANTED: Hammarlund SP600JX-21A w/orig. manual & desk top cabinet; Swan 508 VFO & 600R custom rcvr. Ciano Strachan, POB N4106, Nassau NP, Bahamas.

WANTED: Collins 30L-1 amplifier, basket case or parts unit. Michael Hutnuk, PA, (717) 389-5540, FAX 389-5582.

WANTED: Ready made coils for Rx's & Tx's (Hammarlund plug-in type or similar & ceramic). Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439. ken.seymour@attwes.com

WANTED: Drake 2BQ spkr/Q-multiplier. Myron Cherry, WM4Z, Rt 2 Box 159, Tahlequah, OK 74464. (918) 456-9573

WANTED: EF Johnson capacitors 100D70 (153-11-1), 150D70(153-21-1), 100DD90(153-514-1). Martin Piepenburg, W9OLD, RR1 Box 56B, Monterey, IN 46960. (219) 542-2591

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

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

WANTED: Mics-Shure 545S, 54PE/D, 588, 533VC-Hi/dual Imp.; Turner BX/D, CX/D; VT-73; EV641, 638, 619, 605-Hi Imp. Ready buyer. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. Fax, 328-4217.

WANTED: DXCC certificate stickers, old style translucent ones over 300. Dick George, WØTRF, 15245 Lynn Terrace, Minnetonka, MN 55345.

WANTED: Military technical manuals w/respect to space diversity reception; R390/391 or SP600 related. Peter, NY, (212) 725-7163

WANTED: Front panel ID plate for R-388 rcvr; manual/copy for Atlas-210X xcvr; manual/copy for HP-403B RMS voltmeter. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

WANTED: CE 100V parts radio or parts to activate spare band position. Tim Constable, WB1EXG, MA, (617) 491-2283.

WANTED: Old transistor radios used w/oval transistor; pre-war Japanese QSL cards. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, Japan. FAX 011-8145-301-8069

WANTED: Information, techniques & reference materials on solid state VHF & UHF super-regenerative rcvrs. Stuart, KI6QP, 308 Nevada St., Redwood City, CA 94062. (415) 369-0575

WANTED: Heathkits in either unbuilt or collector quality, unmodified condx: AC-1, AM-2, AR-1, AT-1, CA-1, DX-20, DX-35, DX-40, DX-100, HA-10, QF-1, RX-1, SB-10, TX-1, VF-1, VX-1. Dick, N1WJP, ME, (207) 767-5143. FAX 799-2505. rsmall016@aol.com

WANTED: GN-44 hand crank generator & filter box FL-10 for BC-474 radio; BC-474 parts set; ATD control box; manuals/schematics for REO, REP, REH entertainment radios of WW II. Henry, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

WANTED: Collecting a few military rcvrs, please state price, wt., freq., condx. of units; also need pwr sply dynamotor unit for TCS-12 or 13, 12 volt DC #COL-21881-A or #COL-20309-115V/60 cy pwr sply. C.R. Filer, 1163 Hawksbill Ln., Sugarloaf Key, FL 33042-3159. (305) 745-1801

WANTED: Hammarlund SP-600-JX37 general coverage communications rcvr; collector quality, not military surplus. Mark, K7HPH, 1040 S. Bountiful Blvd., Bountiful, UT 84010. (801) 298-2388

FOR SALE: Repair of TV-7 tubes testers w/ calibration. I will fix & then verify calibration of your TV-7 tube tester - $45 + shpg or return it no charge. Daniel Nelson, 1025 E. Desert Ln., Phoenix, AZ 85040. (602) 243-7421 eves. djn@indirect.com

FOR SALE: Typetronics has a large supply of repair parts for Teletype machines - mostly for models 28 & 35, which were much used by the military. In view of the decreased activity in use of these repair parts, it is incumbent upon me to try to have these parts find a good home, or as last resort, to scrap them. Included would be a large library of literature relating to description parts and repairs of various Teletype models. Any suggestion you might make for preservation of this large supply will be welcomed and seriously considered. I have in mind a target date of August 1, 1996 for action hereupon. Frederick G. Schmidt, POB 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340. FAX 954-583-0777

FOR SALE: Military Panoramic adapters w/ manuals, IP-69/ALA-2, near mint - $85; AN/APA-38, fair, converted for 60 Hz pwr - $25. All + UPS. Mike Bittner, 27215 Sunnyridge Rd., Palos Verdes, CA 90274. (310) 377-4797

FOR SALE: Collins 75S3B, W-CW filter, manual - $550; Viking Valiant - $350; RME 4350, like new - $250; Tek 7604 scope w/plug-ins, new - $400; military WW II RDF - $200. Fred, W6YKM, 17890 Sharon Ct., Pine Grove, CA 95665. (209) 296-5990

Message: Talk to me again at Dayton. Look for the WW II uniform w/Corporal stripes. Sam Hevener, W8KBF "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: New 1996, 50 pg. WW II Military Radio Catalog, 100s of items - $2 US, $5 Foreign. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

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

FOR SALE: Antenna goods: 40 foot mast sets, nylon guys w/aluminum tubing, two for $100; high pwr terminators for V antennas (10 kW), new @ $200 ea, used @ $100; 100' 3/4" RG line w/LC connectors, new - $200; LC to 1-5/8 EIA adapters - $35; 10 kW dummy load, good to 110 MHz - $800; SPDT vacuum relays, 1-5/8 EIA flanges, new - $1000. All + shpg. Dennis, AZ, (602) 710-0803. gilliam@rio.maricopa.edu

FOR SALE: RME-45, nicely refinished, matching spkr, manual - $180 + UPS. **WANTED:** TMC GSB SSB slicer for GPR-90. Gus Stellwag, 117 Edgewood Dr., Orangeburg, NY 10962. (914) 359-0769

FOR SALE: Collins xtals - $8 ea; Drake T4XC - $165; T4XB - $145; AC-4 - $95; National NCXA spkr sply - $65. Bill, WA1APX/8, MI, (810) 781-9717.

WANTED

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

WANTED: McIntosh and Thordarson amplifiers any condx. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. (414) 297-9310

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

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

WANTED: Collecting: Pre-1950 commercially built amateur gear; xmtrs, rcvrs & accessories. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

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

WANTED: Black front covers for Burlington model 331, 3.5" round meters. Will buy whole meter. Brian, KI5SG, OK, (918) 494-6823

WANTED: Any info on Meccano xtal radios; any radio parts made by AC Gilbert (makers of Erector Sets) or any catalogs or copies of Gilbert literature. James Fred, R1 Box 41, Cutler, IN 46920. (317) 268-2214

WANTED: Literature or catalogs (copies OK) of P & H Electronics, Lafayette, IN, circa 1954. James Fred, R1 Box 41, Cutler, IN 46920

WANTED: Tube audio amps, WE xfmrs, BC 229, 230, 429, 430, sets + coils; #19 MKII wireless. Robert, CA, Tele/FAX (707) 967-9854.

WANTED: Information from the following WRL catalogs: '37, '38, '39, '46, '47, '48, '50 & '63. If you can help call - Leo Meyerson, WØGFQ, CA, (619) 321-1138.

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

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

WANTED: Restorable or parts rig Viking Ranger; reasonable HQ170. Ron, 10701 W. 54th St., Shawnee, KS 66203. FAX (913) 268-0461

WANTED: Hallicrafters HT-6 xmtr. Winston Burt, 185 N. Poland Rd., Conway, MA 01341. (413) 369-4469

WANTED: Set of audio & RF probes for Eico 147A signal tracer. Louis D'Antuono, 8802 Ridge Blvd, Brooklyn, NY 11209-5649. (718) 748-9612 after 6 PM

WANTED: Hallicrafters S39 Sky Ranger in exc. to mint condx. only, top dollar paid. Gordon W. Hullin, K2ZBU, 3666 Cold Springs Rd., Baldwinsville, NY 13027. (315) 622-0141

WANTED: Knobs for DX100B; looking for good looking but not necessarily working Drake C-line or TR-4. Lee Bahr, WØVT, 914 Golden Bear Ln., Kingwood, TX 77339. (713) 359-5284

WANTED: XCU-303, XCU-300 or similar crystal calibrator for NC-303 rcvr; Heath DF-2 Navigator rcvr. Al Kaiser, W2ZVR, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: S-meter for Hallicrafters SX-100 rcvr. J. Thomas, 1130 Pleasant View Ln. RR3, Colorado Springs, CO 80921-2234-3.

WANTED: Will pay $75 for a Brown Brothers straight key, mint to exc. condx. Gary Wagner, K3OMI, 11124 Oak Hollow Rd., Knoxville, TN 37932. (423) 690-4217

WANTED: Any historical info on British "Voltron" tubes, circa 1925. Gary Payne, 5251 N. Fresno #202, Fresno, CA 93710-6947.

WANTED: National 2.5V type 5897 ps; Zenith Transoceanic. **TRADE:** RAS-5 coils for SW-3 coils. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

WANTED: Gonset model 3201 pwr sply & modulator; Heath HO-10 scope; Eico 722 VFO. John Lewis, WB9NWO, 3526 N. Elmcroft Terr., Peoria, IL 61604. (309) 685-5865

WANTED: 1101A memory IC's or PC boards containing them. For HB keyer circa 1973. Dave Dameron, KC6BP, 819 Boundary Pl., Manhattan Beach, CA 90266-6621. (310) 318-5311

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

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

WANTED: Collins 30J, 30FXB/C, other pre-1940 Collins amateur gear for my collection. John Firey, WB5HRI, 14818 Delbarton, Houston, TX 77083. (713) 5615-KW1

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

WANTED: WW II Japanese xmtrs & rcvrs (and parts) for restoration and ER articles, information on T1083 30's vintage British aircraft xmtr. Ken Lakin, KD6B, POB 310, 701 SE Salmon Ave., Redmond, OR 97756. (503) 923-1013, e-mail klakin@aol.com

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

WANTED: RCA AVR5A, AR60, Western Electric, or equipment marked Civil Aeronautics or any airline. James Treherne, 11909 Chapel Rd., Clifton, VA 22024. (703) 830-6272

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

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

WANTED: Unassembled Heathkits, Heath catalogs and older Heath Amateur gear. Bill Robbins, WA8CDU, 5339 Chickadee Dr., Kaaalamazoo, MI 49009 (616) 375-7978.

WANTED: Kenwood T-599A, xmtr only. Dennis WAØWAB 316-225-2861

WANTED: Heathkit Six Meter Lunchbox in good cosmetic condition to complete the set. Andy, WA4KCY, 105 Sweet Bay Lane, Carrollton, GA 30116, (770) 832-0202. E-mail 102452.3628@compuserve.com

WANTED: NC-183D rcvr. Harold Deppe, NY7Y, POB 31656, Tucson, AZ 85751. (520) 290-1190

WANTED: PP-1175/SR AC sply for RT-68/GR. MT-652 and CY-590 for RT-70. Joseph Pinner, KC5IJD, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766, kc5ijd@net-connect.net

WANTED: Hammarlund HQ-150 rcvr. Will arrange shpg or pickup. John, WAØJYJ, 62639 Ohlm Rd., Montrose, CO 81401. (970) 249-2751,eves

WANTED: Heath DX-40 and SB-303; Collins 75A-4. Must be in exc. condx. Don, K8POU, (616) 649-4646

WANTED: Schematic of HP-400E meter. John, POB 905, Grover Beach, CA 93483.

WANTED: PRC-25 re-transmission cable; AS-1887/PRC-74 antenna & mount; TBY access's; BC-611. Roger Sewing, N6TNF, CA, (415) 898-4412.

HELP: Need info regarding RCA Institutes, Home Study Course, O'scope. Randy Hull, POB 501, Halifax, PA 17032. (717) 896-2435

WANTED: WRL Globe Scout 65B xmtr, exc. condx. Norm Hegyi, KC9D, 9200 Henry St., Dyer, IN 46311. (219) 365-4089

WANTED: Stancor Hamanual, about 1938 or purchase a copy. Wayne, NØTE, 1212 17th Rd., NW, New Strawn, KS 66839. (316) 364-5353

FOR SALE: Oldies: Western Union 0 to 4 uF loading cap, 1920s - $50; WE 205-D, metal base, perfect - $125; Amperex 4-500, good - $50; Machlett 357-B, ions - $25; GR 457A mod. monitor, OEM unit - $75; Eimac 2-450 (yes) new - $75; Eimac 100TH, perfect - $65; Westinghouse WL-860, new - $125; 4CX250B, new - $50; 13 uF @ 4 kV HV caps, new - $35; Ampex 350 mono, tube elx, works - $300. All + shpg. Dennis, AZ, (602) 710-0803. gilliam@rio.maricopa.edu

FOR SALE/TRADE: SBE 36 w/manual, untested; Millen NOS 90801 TX, Millen 90881 amp. **WANTED:** Millen 90711 variarm VFO, Stancor 10P. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 h, 957-6420 w.

FOR SALE: Classic test equipment, no offers refused, all untested; Heath Capaci-tester CT-1 magic eye; Eico Signal Tracer 147A w/magic eye; RCA voltmeter Voltohmyst WV77E; Heath signal gen. IG102; Hewlett Packard wide range oscillator model 200CD; General Motors living room BC radio from '30s (stand up wood console); orig. 1944 ARC-1 operating & maintance manuals; 51S1-F missing mode switch & T3 otherwise good (real $ or trade for 51J or other RX). Tom Mackie, WB2ILA, 14 Washington St., Jamestown, RI 02835. (401) 423-2474

FOR SALE: Early wireless; WE 323BW carbon PTT candlestick microphone - $250; WE 509W headphones - $175; RCA UP-1658 filament xfmr - $100; Finch Type B radio relay - $250. All VG/exc., working. U shp. Bob Bakinowski, 1524 St. Tropaz, Tucson, AZ 85713. (520) 624-8029

FOR SALE: Heathkits: Mobile pwr sply HP-13B - $50; HV probe IM-5210 - $15; Hustler Mobile antenna w/coils - $50. Frank, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415

FOR SALE: National NCX-1000, factory incomplete unit, w/meter, hardware, RF components, etc. - $35 shpd. George, K1ANX, MA, (413) 527-4304.

FOR SALE: Homebrewers, custom chassis & panel fabrication, 15 years prototype tech experience, vacuum tube literate. Brian, KA9EGW, IL, (708) 487-5359/FAX 487-5424.

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

FOR SALE: Viking 6 & 2 - $50; National ACN dial - $15; Sylvania VT 52 - offer. Thomas N. Berbari, 870 Wales Rd. NE, Massillon, OH 44646.

FOR SALE: Auto xfmr 0-125 pri, 0-250 out, 6 A, 15 KVA. Francis Waggoner, W2PTI, 268 Barben Ave., Watertown, NY 13601. (315) 788-1621

FOR SALE/TRADE: Sonar SRT-120 TX; Codome CPO; HEC 300E amp; Collins R390-A S/N 20. Ray, MO, (314) 428-1963.

FOR SALE: VFOs: Ameco model 621; Globe 6/2, both exc., have internal pwr - $35 ea + shpg. Henry Mohr, W3NCX, 1005 W. Wyoming St., Allentown, PA 18103.

FOR SALE: Vintage equipment manuals, low cost, prompt service, free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (201) 728-2454

FOR SALE/TRADE: 805, 715B, TZ-40, 1627, 2C40, 4B32. **WANTED:** EL38/6CN6. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

FOR SALE: Heath HW-101/HP-23C, w/manuals - $150 +#38 UPS; Lettine 240 xmtr, w/8 coils- $85 + #36 UPS; S-38C - $45. Robert, CO, (303) 988-2089, 6-9 PM MDT

FOR SALE: Heath HD-15 phone patch, nice w/ manual - $35. **WANTED:** Manual copy for TS413CU. Bill, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

FOR SALE: RCA CR88 rcvr, exc. condx - $350; Collins 32S3/pwr sply - $320; HP universal/freq. counter 500 MHz, 9 digit LED, high stability time base - $125; URM/118B Hickock Cardmatic tube tester w/card set - $195; military sweep gen. w/ built-in oscope, SG-132A, w/3 manual set, VGC - $85; Khronhite tube amp 50 watts dc-500 kHz, massive - $175; ESI ES-250 Precision LCR bridge, self contained and portable - $80; Simpson 269 VOM, high-grade, 100 Kohm/volt - $40; Leader FM stereo alignment gen. - $70; HP 606A - $110; HP606B - $140; HP606B syncronizer, for very low drift - $70; HP612A UHF gen., 480-1250 MHz, VGC - $80; GenRad portable servo controlled Variac for constant line voltage - $80; HP410B - $30; TEK Scope 7000 series plugin extender - $120; CRTs 12BP4A, 7EP4, 7JP4 - $35 each; TEK 2901 Time Mark gen. - $40. Parts sets: Hallicrafters S19R - $28, R40 - $15; URM/25D RF gen - $20. UPS xtra. Stan Krumme, KO6YB, 16432 Lakemont Ln., Huntington Beach, CA 92647. (714) 841-5866

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

FOR SALE: "Teletype" T-shirts. The Teletype Corporation's "T" symbol in black on a yellow (what else?) Hanes shirt - $15 ppd. Sizes L or XL only. Jack, WA2HWJ, NJ (201) 927-7784.

FOR SALE: Hallicrafter manuals. Most photocopies - $5 + $1 shpg; Johnson, Heath, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

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

FOR SALE/TRADE: Navy T827E/URT solid state TX, auto tune .5 to 30 mc; MFJ 406 keyer; SB 301/401; HW16/HG10; Micmold 6AG7/6L6 TX. Joe, K2QPR, FL, (407) 220-7362.

FOR SALE: Halicrafters HT-32 xmtr. Fresh alignment. Good condition. $100.00 plus shipping. Dennis WAØWAB (316) 225-2961

FOR SALE: General Radio 605-B sig. gen., 0.1 to 30 Mc - $25 + shpg. Jim, (614) 927-2592

FOR SALE: Rare BC-191 WW II xmtr (12V version of BC-375), w/manual, all tuning units, antenna tuner BC-306A, dyanamotor BD-77C, very good/exc. condx - $500. Can deliver to Dayton. Bob Karow, 620 Cortleigh, York, PA 17402. (717) 757-4321 after 8 PM.

FOR SALE: TU-7-B; TU-8-B, NIB; TU-10-B, fair condx. **WANTED:** Collins 180-S1 ant. tuner. David Owens, NC (704) 345-0875

FOR SALE: Heath HW-16 - $75; Heath W4-AM Williamson type audio amp, w/WA-P2 preamp, very clean - $125; Heath HM-2140A wattmeter - $90; Clegg 99'er, 6M AM - $100; DeWald 6M AM - $75; HP 410B - $45; HP-606A - $75; HyGain 18AVT - $50; Cubic ST-3B tuner - $125; CDE AR22XL rotator - $45; Johnson Challenger, no cabinet - $40; HP400D meter - $20; Collins R-391, w/orig. manual, works well, looks good - $300; National NC183 w/ matching spkr, no manual, works well, cosmetically fair - $150; Hammarlund SP-600 JX, works well, looks good except lower right corner of front panel broken off, no manual - $175. Most items have complete manuals. All plus shpg or I can transport to Ft. Tuthill in July. Donzil, WS6F, AZ, (520) 772-1297

FOR SALE: Orig. Collins 75A-4 manual - $25. Art Rideout, WA6IPD, 2235 Gum Tree Ln., Fallbrook, CA 92028.

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

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

FOR SALE: Legends of Amateur Radio, a 42 minute video featuring W6HX, K6OJ and W6EA. "Tall Tales and Big Antennas", produced by the Southern California DX club "...enjoyed running it" - Hugh Cassidy, WA6AUD - $10 + $3 shpg. Please send check and make payable to: Harvey Laidman, N6HL, 4923 Encino Terrace, Encino, CA 91316.

FOR SALE: Conar xmtr - $50; Ameco TX86 - $95; Sonar NBFM - $25; Transcom 10 - $125; Silitronix, Swan, spkr - $35; Swan 14-X DC sply - $40; others. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (201) 728-2454.

FOR SALE: Hammarlund Comet Pro, AVC, xtal filter, coils, exc. - $325. John Hurst, KU6X, 2512 Euclid Cresent E, Upland, CA 91784. (909) 981-6759.

FOR SALE: 312B4 RE, exc. - $150 shpd. John, AK, (907) 337-9157.

FOR SALE/TRADE: Heath TX1 - $175; SB10 - $90; DX60B - $60; much more, SASE for list. John Hruza, KBØOKU, 2521 S. Holly St., Denver, CO 80222. (303) 758-4377.

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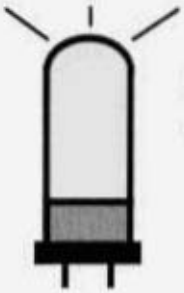

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