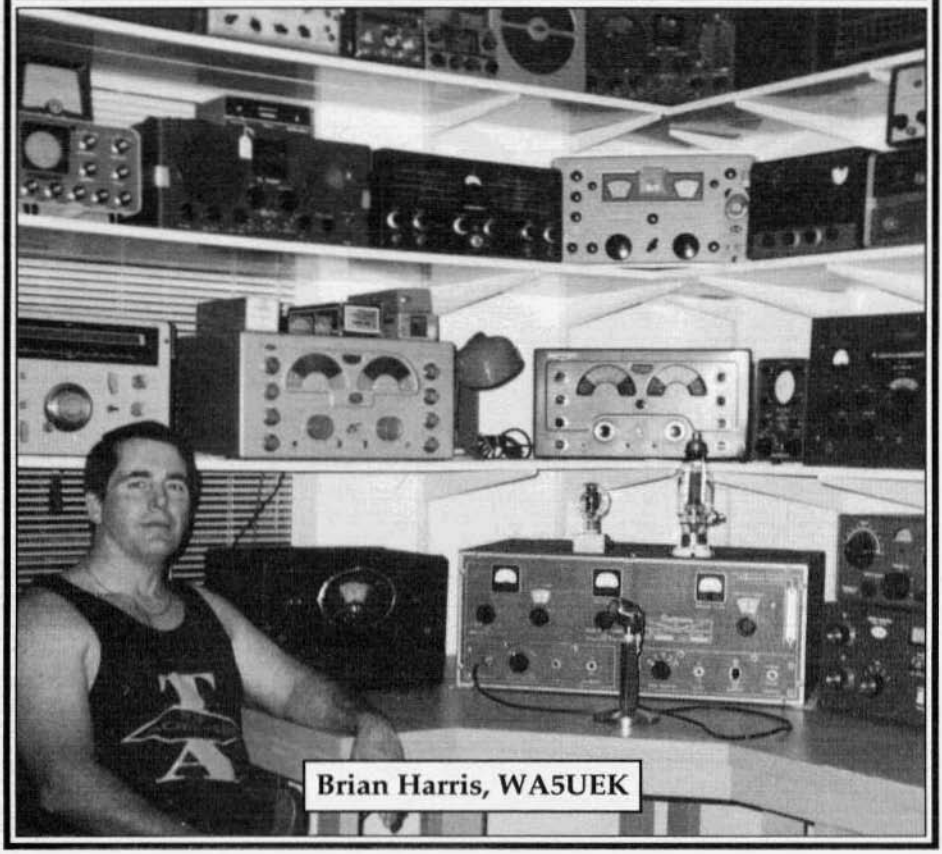
$2.50

ELECTRIC RADIO

celebrating a bygone era

Number 82 February 1996



Brian Harris, WA5UEK

ELECTRIC RADIO

published monthly by Barry R. Wiseman and Shirley A. Wiseman
1590 Baby Bear Rd., Durango, CO 81301

Second Class postage paid at Durango, CO. and additional offices
Authorization no. 004611
ISSN 1048-3020

Postmaster send address changes to: Electric Radio
Box 57
Hesperus, CO 81326

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

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

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

Regular contributors include:

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

EDITOR'S COMMENTS

The 7th Annual ER 160 Meter Contest/Jamboree on December 26 was not a huge success. This year's winner, with 62 points, David Smith, N2KZ, summed it all up, "absolutely lousy, summer-like conditions on 160 for the Jamboree". He went on to say that "it was great fun anyway". The other logs we received were from Second Place winner Butch Schartau, KØBS, with 45 points; Third Place winner John Peterman, AB9G, with 42 points; Norman Hegyi, KG9D, 28 points; Lawrence Szendrei, NE1S, 27 points; Bill Bogart, KA9CWK, 26 points and Doug Beard, KFØVF, 17 points. Congratulations to the winners. Hopefully conditions will be better next year.

Since the passing of Les, K6HQL the 20 meter net on 14.286 is almost out of existence. There's a couple of reasons for this. First of all we're lacking a dedicated net control with a big signal and secondly propagation at net time has been very poor this winter. I suggest that if we might start an hour earlier at 4 PM Pacific I've been listening at this time and I think conditions are better than an hour later. Let's give it a try.

Since I annouced last month that I was starting a new Parts Directory we've received 23 units. That's a long way from the 250 or so we had on the old list. I'd like to remind everyone to consider putting any parts units you might have in the new parts directory. And I'd like to ask all those who still have the units they had on the old list to give me a call or write so I can get those units on the new list. The parts directory has been a benefit to all of us, let's keep it going. N6CSW

TABLE OF CONTENTS

Cover: Brian Harris, WA5UEK, in his hamshack. The rig in the center is a very rare Supreme AF-100 transmitter. See the story on page 4.

LETTERS

Dear ER

I was shocked and saddened to receive the news of the passing of Gary Whitcher, K7MHE, of Portland, Oregon. He died January 16th from a massive heart failure.

Gary had a unique wit and sense of humor that earned him the honor of being the northwest AM entertainer of the decade.

I remember one Saturday afternoon on 75 meters there was a large roundtable, about 11 AM hams, and I put out a want for a 12-pin Jones plug that would fit the Gonset Twins I had got from Gary. When Gary got his turn he said, "Do you want the one that is 3 rows of 4, or 4 rows of 3?" Well, this caused a big discussion on Jones plugs, because Gary said it in a way that sounded as if he was asking a serious question. One ham remarked he had a 4 rows of 3, would it work? When it came my turn I said yes, send it to me and I'll use it vertical to make it the 3 rows of 4 that I need. A good laugh was had by all.

Gary will be missed. (See ER, June '95, pg 37.)

Sam Champie, KD7XX

Dear ER

I thoroughly **enjoyed** reading the story about the 32V-() transmitters in Jan.'96 *Electric Radio*. I started working at Collins on November 6, 1939, and retired May 30, 1984, so I was there when most of the things happened that the article covered.

Ted Hunter, W9NTI, was hired in 1940 specifically to develop a more stable VFO. Up to that time nearly all Collins transmitters used crystal oscillators. The Autotune, a mechanical repositioning system, could automatically retune the transmitter to any of 10 preset frequencies in a few seconds. The military wanted the flexibility to tune to any frequency, therefore PTOs were developed for the ART-13, TDO and TDH series transmitters. As I recall those PTOs used a large diameter powdered iron tuning slug and were not hermetically sealed. Roy Olson was the engineer on the ART-13, but I don't know if Ted Hunter designed the PTO or if he just worked with Roy on it. Engineers and managers talked things over then and rank wasn't very important.

During WW II nearly everyone was of draft age, even Art Collins, so our deferments came up for review every 6 months. Most of my effort was spent on the Navy TDH family of transmitters. They used a pair of 750TH tubes in the final with a pair of 450TH modulators. All of the company's production was for military equipment. We didn't have any engineers above draft age that could be put to work developing equipment for production after the war ended. Therefore, when the war did end and the company was ordered to stop all military production, we had to scramble to develop new postwar products. John Green was placed in charge of developing a new line of broadcast equipment, for example.

Hermetically sealing the PTOs was one of the final breakthroughs that helped achieve frequency stability. I don't remember just when that happened, but it must have been shortly before the war ended. The company also had a project to develop a frequency synthesizer. As I recall it occupied about 4 feet of rack space. It was never manufactured but provided a lot of know-how.

The company decided to produce a new line of ham equipment using the recently developed PTO. Lou Couillard was assigned to develop the 75A receiver. I think that Roy Olson probably

established the basic circuit concepts, but Lou did the detail design. Lou and I were office mates. I was assigned to develop the 30K using the new Eimac 4-125A tube and the 310A exciter to be placed on the operating table beside the receiver. I wanted to retain a family resemblance to the prewar 30J transmitters which is the reason for the decorative trim strips. I tried hard to keep the cost down. This was my first complete transmitter design project. Before this, I just designed parts of transmitters.

The design of the 32V transmitter was assigned to Ted Hunter. KW rated 72-ohm twin lead was available and coax was starting to appear on the surplus market. Ted was having trouble matching down to 25 ohms (on the bottom side of an SWR circle) with a pi-network because of the very large value of loading capacitance required. I suggested that he add a coil to the output, and I think that this became the first use of the pi-L circuit in production.

In the 1950s I was very much a part of the Collins SSB effort. SSB transmitters developed by Bell Labs for overseas radiotelephone use employed a pilot carrier system to overcome the frequency stability problem. Art Collins thought that a suppressed carrier system would be better for military and general communications. "Spend the money on better stability rather than on the AFC circuitry." I gave many talks around the country pushing the SSBSC system at IRE meetings and at Standards Committee meetings. It was often referred to as the Collins Single Sideband system. I served on the MIL-STD-188C Standards Committee, which set the standards to which all new military SSB equipment would be built. It chose the SSBSC system, partly because it would be much less susceptible to jamming. Before that time, SSB equipment procured by the different services often couldn't talk to each other. There were also competing systems such as Compatible Sideband promoted by Leonard Kahn - which was really a hybrid AM system which confined most of the sideband energy to one side of the carrier by adding phase modulation to the carrier. The other was the double sideband suppressed carrier DSBSC system promoted by John Costas of GE. It had the same power advantage as SSB but it took twice the bandwidth. Time has proved that Art Collins was perceptive enough to choose the best system at an early stage in SSB development.

Although I didn't realize it back in 1946 when the frequency scheme for the 75A was established, it later became clear to me that Art must have had SSB in the back of his mind way back then. **Warren B. Bruene, W5OLY ex W9TTK, WØTTK**

Dear ER

I'd like to take the opportunity to add the proverbial 'two cents' to the article "Uncrossing the R-388 Cross-Modulation" that appeared in the January, '96 *ER*.

Not to detract from the author's successful and painstaking research in converting this receiver to a low-impedance input - but as always, there are a number of approaches to resolving a given problem.

I would like to suggest that in unbalanced applications where a receiver's high-Z antenna input presents an operational problem one could advantageously use the impedance matching properties of broadcast RF autotransformers. I have constructed small toroidal autotransformers consisting of around twenty turns of #24 wire wound on a 1" diameter ferrite core. One end of the winding is designated "ground" and connected to same; the other end of the winding is the high-Z unbalanced feed to the receiver. The first ten turns from the ground end are tapped and the 50

continued on page 34

Supreme AF-100

Brian Harris, WA5UEK
3521 Teakwood Ln.
Plano, TX 75075

Dominating one corner of my ham shack is an uncommon, vintage transmitter, the AF-100. I know little of the history of this transmitter, or of its manufacturer, the Supreme Transmitter Corporation. Apparently its sales life was brief, as the earliest and latest advertisements I have found are in *QST*, December 1946 and July 1947, respectively. The advertised selling price was $450. To date, I know of the existence of only four of these units, but surely there are more. I am not positive where the serial numbering scheme began, nor the complete nature of the serial number, but the unit in the manual and advertising photographs is numbered 10/2/101. Mine is marked 7/F/284. Another number I know is also in the 200's. If #101 was the first, I assume no fewer than 184 units were manufactured.

From inner and outer appearances, as well as tube complement, the AF-100 closely resembles the Model 75/100GA, by the Transmitter Equipment Manufacturing Company. In a May 1946 *QST* advertisement the TEMCO unit sold for $495. Both tout only two tuning controls - one for the VFO and one for the final amplifier. These similarities and the advertising timing lead me to believe the AF-100 was, in part, a copy of the TEMCO unit. With both manufacturers being New York based, one might suspect the transmitters shared common engineering roots.

The AF-100 covers six bands (80-10/11 meters) in five bandswitched settings. Interesting is that it offered 15 meter coverage prior to amateurs being granted that privilege. Its output rating of 100 watts likely prompted the -100 designator. Operating modes include CW, ICW, AM and FM. For readers unfamiliar with the term, ICW refers to a CW mode in which the transmitted RF is actually a keyed AM tone, taking advantage of the increased peak amplitude available in the AM mode. If one believes the advertising, the AF-100 was the first amateur-specific transmitter to support the newly approved 10/11 meter FM mode. The deviation is adjustable by the modulation control for either narrow or wide band operation but the manual has little detail describing how to achieve proper bandwidth from band to band.

What is also unique about the transmitter is the design of the buffer/multiplier section. Its tuning tracks the position of the VFO knob, eliminating an additional adjustment following a frequency change. Of course when using one of the two crystal positions (only 80 meter crystals are allowed), the VFO knob must be set to the approximate crystal frequency so this section will be tuned correctly. Mid-stage tracking was not the norm in the mid-to-late forties, placing this transmitter technically ahead of others. On the other hand, bandswitching is not so modern with the AF-100, due to its plug-in final tank coil. This engineering decision puzzles me, as other transmitters of the era abandoned such technology. The cabinet had sufficient room to allow inclusion of a final tank bandswitch, although it would have been difficult to do so and maintain the split tank-link coupled output configuration.

On the subject of cabinet room, the AF-100 wins my award for being easy to work on, as it likens to my '57 Chevy. Raise the hood and crawl inside. The bottom side is equally spacious, with room for large hands and a larger soldering gun. The thick, one-piece, plated steel chassis slides out more easily from its equally thick steel cabinet than one might expect considering its mass.

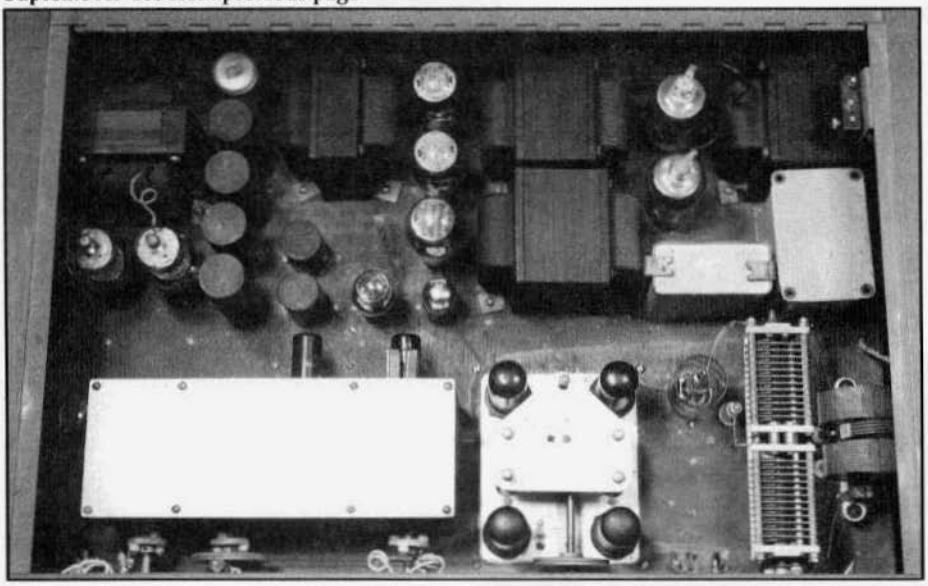
Front view of the Supreme AF-100.

At 145 pounds, it earns a spot as my next heaviest transmitter, second only to the better known Johnson Desk Kilowatt. Having U-shaped steel feet, instead of rubber, the unit is definitely hard on the operating surface. With the exception of the tubes, all components for the FM modulator, VFO and associated buffer are neatly isolated inside a three-chamber casting which provides excellent mechanical and electrical isolation.

Boasting a complement of twenty-two tubes, the RF design is typical of its day, the exception being the final amplifier. The VFO is a 6J5 in a grid-plate configuration, with a range of 3.4 to 4.0 megacycles. During FM operation, a 6AC7 performs as a reactance tube modulator. Following the VFO is another 6AC7, doing double duty as a Class A amplifier or crystal oscillator. This stage drives the four 6L6's in the buffer/multiplier section. Depending on the band selected, one or more of the 6L6's double or triple as required. The tuning of these stages is interesting. A wire cable couples a pulley on the VFO shaft to a miniature rack-and-pinion assembly, which does the necessary rotary-to-linear movement conversion. The rack gear slides a quintet of brass slugs within the B&W mini-ductor coils mounted under the chassis. Unlike ferrite, increasing the penetration of a brass slug into a coil decreases its inductance. Knowing this might save you grief when grid dipping or aligning similar circuitry. The buffer/multiplier section drives a rare 3D23 final amplifier, an at-the-time state-of-the-art tetrode manufactured by both United Electronics Company and Lewis Electronics. This is one significant difference in the AF-100 and the TEMCO unit, which uses a more common 814. Five plug-in B&W coils (Model 2175 through 2179) fulfill the output tank inductance needs. These link coupled coils are the same type often used in push-pull amplifiers, however, in this single-ended design the unused coil half creates negative feedback for neutralization.

In the audio department the AF-100 is predictable, but how many truly different ways can you design a speech amplifier and modulator? A 6SJ7 serves as a speech amplifier whose output capacitively couples to the 6J5 driver grid. Transformer coupling links the 6J5 output to a pair of push-pull 807 modulators, running AB2. The modulation transformer is hefty and runs cool and quiet during operation. As mentioned earlier, the AF-100 can operate ICW. In this mode, a 6SN7 is employed as an astable multivibrator, oscillating between an adjustable 400 to 1000 cycles.

continued next page

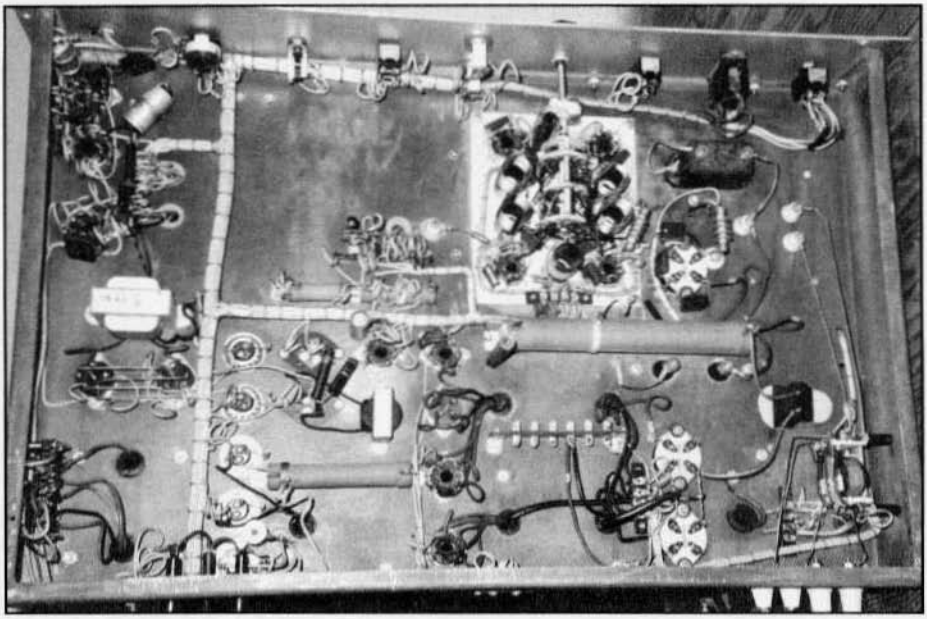


Top view, looking through the lid.

When keyed, it drives the input of the 6J5 driver, bypassing the 6SJ7. Along with keying the audio section, the VFO is also keyed, resulting in an intermittent, yet modulated carrier.

The power supply was designed well, with its duties delegated to three transformers and three chokes. A pair of 866's provides 1400 volts (key down) for the 3D23. The 807's receive 650 volts from a 5R4. Using a different set of taps on the modulator supply winding, a second 5R4 produces low voltage for the RF stages. Supplying low voltage to the audio section is an 80, which affords further isolation. A 6X5 fulfills the bias supply requirement. Regulation of the plate voltage to the reactance tube modulator and VFO, along with the screen voltage to the VFO amplifier comes from a single VR150. Attesting to the overkill design of the power supply, I know of an AF-100 with modifications which include replacing the 3D23 with an 813 and replacing the 807's with 6146's. These changes roughly doubled the transmitter's output with no reliability issues. On the other hand, the high voltage choke in mine must have failed as it has been replaced with an incorrect (yuk) version.

Controls for the AF-100 are simple yet adequate, with all but one being on the front panel. The exception is the frequency adjustment for the ICW tone, which resides on the rear panel next to the two AC fuses. On the opposite end of the rear panel are two pairs of ceramic standoffs for connection to an antenna and receiver, directed by a transmit switch-controlled internal T/R relay. The microphone and key connectors are conveniently located on the spacious front panel, which is a restorer's dream with its raised features. The front panel was apparently stamped with a negative pattern die, leaving the lettering, logo and other features higher than the rest of the surface. Although my panel did not require it, restoration would merely require stripping and repainting, followed by a light sanding of the raised areas to expose the native aluminum. The script Supreme in the logo block is bright red, adding color to an otherwise bland panel. A touch of



Bottom view.

personalization was offered with the purchase of a new AF-100, with the purchaser's call sign being engraved in a plastic plate located in the top right corner. Admittedly, I am partial to transmitters with abundant metering, for I have caught myself more than once trying to dip either the final grid or modulator plate current on my single-metered DX-100. With three panel meters constantly showing modulator plate, amplifier grid and amplifier plate currents (from left to right), the 3D23 final can rest easier when I am at its controls! The front panel might be more aesthetically pleasing if greater symmetry had been achieved by slight repositioning of the meters and two tuning controls. This would have been at the expense of reduced isolation between the final tank, the VFO and the buffer/amplifier section, so it was probably best avoided. Designed and built when big was good and bigger was better, AF-100 mechanical dimensions read 29-1/2" x 20" x 11-3/4" (W/D/H), not exactly the rig you would want to take camping. On the plus side, its rugged and serviceable design suggests it will be useful long after we are not.

When I acquired my AF-100 it was mechanically and cosmetically in good condition. Due to other projects, it didn't rise to the top of the restoration cue for almost a year, when my good friend Dennis Petrich, KØEOO, came to visit. Dennis anticipated a three-day weekend of boat anchor restoration, but instead I enlisted his help to install laminate on desks destined for my ham shack. On the last day of his visit we were out of construction tasks so we decided to tackle the mechanical and electric restoration of this formidable monster. After a quick cleaning and lubrication, Dennis attacked the rig with his normal vigor and expertise, quickly making measurements and observations (he had all the fun). Since the original design contained only a few paper and electrolytic capacitors, we decided to do an across-the-board replacement, although the original components were not that bad. Out came

continued next page

Supreme AF-100 from previous page

CQ means *Commercial Quality* in the *Supreme* Model AF-100 Transmitter

Compare these features...

Simplest "rig" to install and operate. Efficient with either balanced or unbalanced transmission line of 50 to 600 ohm characteristic surge impedance.

Highly stable Variable Frequency Oscillator followed by slug-tuned buffer and doubler stages ganged to oscillator dial. Simplifies working through severe QRM. Readily establishes and holds QSOs.

A six-band job — 10, 11, 15, 20, 40 and 80 meters, for CW, ICW, AM and FM Phone.

Narrow, medium or wide-band FM transmission obtained by adjusting same volume control that controls level for amplitude modulation!

Because of ICW feature, it maintains QSOs under severest conditions of QRM and QRN! Peak power for ICW approximately four times average carrier level. ICW output fully 200 watts!

Each AF-100 subjected to four-hour locked key square-wave 100% modulated heat run before leaving plant. Same life test as for U. S. Signal Corps equipment!

And ALL for only $450.00 complete with tubes and coils!

Yes, despite the within-reach cost, the Supreme AF-100 is designed and built in accordance with the best commercial practice. And that means for continuous operation when desired—hour after hour, day-in-and-day-out—today, tomorrow, and for years to come.

This six-band 100-watt desk-type transmitter is one of the most versatile "ham rigs" yet offered. It embodies those features most desired by the majority of amateurs. Above all, it's the first transmitter offered to "hams" which has the very latest feature of Frequency Modulation in the band of frequencies now assigned for this purpose—27.185 to 27.455, and 29 to 29.7 megacycles. And it is continuously tunable throughout the range of each amateur band!

Come what may by way of frequency changes, (F.C.C. allocations) and whether AM or FM, the Supreme AF-100 will always be ready to function at a mere twist of the knob. It's built for the present and the future!

ASK TO SEE IT! All leading distributors handling "ham" equipment are now stocking the Supreme Transmitter line. Ask your favorite distributor to show you the AF-100. Ask for latest literature—or write us.

Supreme TRANSMITTER CORPORATION

Manufacturers of Communications Equipment

280 Ninth Avenue • New York City 1, N. Y. • WIsconsin 7-6413

Export Division: The Radelma Company, 53 Park Place, N.Y.C.

Ad from QST, May, 1947

the soldering gun and I carefully installed a small handful of new parts. We had a break as every resistor we measured was within tolerance. A check of the tubes brought similar good news. A junk box look-alike replaced the broken plate switch.

Within a few hours it was time to apply power (slowly) and we did. We made it to first base - no smoke, no sparks. One 866 glowed a little too blue for comfort. A used pair of 3828's replaced the questionable mercury unit and its mate. With the final tube and tank coil out and with the help of a nearby receiver, we determined the VFO was working - so far so good. It was time to install the final. After determining where the controls had to be for CW (reading the manual first would have saved time), a tap on the hand key got us to second base with more than adequate grid current. Remember, no mid-stage tuning required. Dare we try transmitting? After gently installing the 80 meter tank coil and attaching a dummy load we applied plate voltage and tapped the key. We arrived at third base with only slightly high plate current - still no smoke. A few outward moves of the coupling link netted the desired 100 mA reading. Grabbing the closest D-104, we tried the modulator and were pleased when clear audio poured from the monitor receiver. Was this home plate? Not yet. Off went the dummy load and on went the tuned feeder. Shortly after tweaking the final we logged a successful AM QSO and we were home. It was no surprise when that first contact replied he had never heard of an AF-100, on the air or off! Don't we all wish our restorations went so smoothly? Looking back, the hardest part was hauling the transmitter to and from the garage for compressed air cleaning.

Now that I am familiar with the rig, I can say its operation is straightforward and predictable. Although it has the capability to directly drive either a coaxial or balanced line, I prefer using an antenna tuner. This allows me to fully load the final without having to vary the link coupling, an act that requires raising the lid and waiting for the HV to discharge. In a hurry, I have done it with the plate voltage on and the microswitch on the cabinet lid bypassed. I don't advise this. After all, 1400 volts are nearby and hazardous to one's health. My only complaints surround the VFO. There is inadequate VFO bandspread, as the semicircular rotation of the VFO tuning capacitor is traversed in a mere 2-3/4 turns of the vernier knob. On 80/40 meters this is not objectionable, but on the higher bands one needs a steady hand to zero beat the receiver. There is also excessive backlash when decreasing the VFO frequency. This comes from gravity trying to pull the slug tuning assembly down. Another related peculiarity is that increasing the VFO frequency is easy but decreasing it is difficult, as gravity and friction often combine to overcome the vernier clutch torque capability, causing slippage. From a cold start on 80 meters, the VFO drifts down about 2 kc over 1-1/2 hours, with most of the delta occurring in the first thirty minutes. Temperature compensation will soon correct this errant behavior.

I have grown accustomed to having to explain the AF-100 during QSOs and do it with pleasure, for while the AF-100 is not my favorite transmitter to operate, it is my favorite. This, I suppose, stems from its rarity, ruggedness and mass. Should you encounter one for sale and have a big friend to help carry it, go for it. I doubt your purchase will be regretted. If anyone can add to my meager AF-100 history, or if you have one, please contact me.

Lastly, I offer my sincere thanks and appreciation to Bob Vasilow, W2VDX, for providing AF-100 related information, to Dennis Petrich, KØEOO, for assisting with the restoration, and to Adam Tober for his patient photography. **ER**

A 1927 Hartley Oscillator

Part 1. The AWA 1929 QSO Party

Bob Dennison, W2HBE
82 Virginia Ave.
Westmont, NJ 08108

In 1971, the Antique Wireless Association (AWA) initiated the Old Timer's Contest in which members work each other using pre-1941 transmitters and receivers. This contest uses the bands from 160 to 20M. Normally held in early spring or late winter, this contest was so popular that the AWA decided to introduce another contest to be held in the fall or early winter. This new contest, known as the 1929 QSO Party has the following rules:

1. The transmitter must be a self-excited oscillator. No MOPA or crystal.
2. Power input may not exceed 10 watts except that from midnight to 8 AM, 20 watts is permitted.
3. Any antenna system may used.
4. Frequencies: 3580-3600 kHz.
5. Exchange: RST and power input.

It is suggested that a straight key be used. It also adds to the fun if you use a regenerative receiver or other vintage receiver.

It is not necessary that your transmitter be one actually built before 1930. An article in the AWA's *Old Timer's Bulletin* (OTB) in December 1987 stated that it is perfectly acceptable to build a replica transmitter using new parts just as long as you use old-time circuits and tubes that were available during that era. This opens the door so that anyone who wishes to join the fun can now do so. Naturally, for maximum enjoyment, you will want to use as many genuine old-time parts as you can find.

The efficiency of most low-power self-excited oscillators will usually range from 25 to 50 percent so your power output will typically run form 2.5 to 5 watts. Now some of you are going to wonder if its possible to work anyone if you are limited to such low power. The contest results listed each year in the OTB clearly show that low power is only a minor factor - skill and patience are much more important. The 1929 QSO Party often attracts up to 40 or 50 entrants and many operators succeed in working the majority of those stations. Table I shows that even stations running much less than the maximum authorized power can do quite well. Of course, many of these fellows are well known crackerjack operators. But they need to work you so they will always slow down to your speed. In fact, most QSOs in this contest seem to be rather laid back and friendly - reminiscent of the early years of ham radio which, after all, is the whole idea of this QSO party. I have met many of these operators at the AWA's annual Fall Conference and they are without exception extraordinary people whose friendship I treasure. All of us look forward to this event like kids waiting for Christmas.

Typical Old-Time Circuits

Most contestants favor the Hartley oscillator, see Figure 1-A. A well-built Hartley is normally very stable and gives a good T9 note. For best results, a high-C tank is necessary. This results in a large circulating tank current so the tank coil is usually made from 1/4" copper tubing and is supported on a pair of horizontal glass towel bars or on beehive insulators. The Hartley is easy to adjust for proper excitation and loading but it does have one problem. As usually constructed, the rotor of the tuning condenser is not at ground RF potential so there is a hand-capacity detuning effect.

YEAR	STATION	TUBE &/OR CKT USED	INPUT WATTS	# QSOs
1983	W2AN	112A	4	8
1984	W4COC	10, TNT	6	11
1985	W2BJI	UV-202	7.5	20
1986	W2FFU	CX-301A	1.5	8
1987	W1DX	45	6	17
1988	WB2MVK	210	6	22
1989	K2LP	210	7	23
1990	W3BYM	45	5	20
1991	W1YG	p-p 45s	5	40
1992	K2OA	10	5	28
1993	W3INV	10	3	15
1994	K3DZ	Hartley	2	29

Table 1. Representative scores of some stations running less than ten watts input.

Some constructors provide an insulated shaft extension or, better yet, a grounded metal panel. These precautions were not common in the early rigs and often led to considerable frustration and, not infrequently, out-of-band operation. In those days, no one knew what his exact frequency was - he simply tried to stay inside the band. When he called CQ, he tuned the whole band looking for a reply. The ARRL suggested that hams make use of QLH (tuning low to high) or QHL but few followed this procedure.

The Colpitts oscillator, Figure 1-B, eliminates the problem of the 'hot' rotor but introduces a new problem. There are now two tuning condensers and the ratio of their capacitances determines the excitation level. Thus they should be ganged. You may recall that nearly all grid-dippers employ the Colpitts circuit and use a split-stator tuning condenser. The frequency band used in the AWA contest (3580-3600 kHz) is so narrow that it would suffice to vary just one of the condensers. Thus the Colpitts really should find wider acceptance in the 1929 QSO Party.

A few hams use the TPTG oscillator, Figure 1-C. Feedback is by means of the grid-plate capacitance of the tube. You tune the plate for minimum Ip and then tune the grid for the desired frequency. The advantage of the TPTG is that the rotors of both tuning condensers are at ground RF potential. The TNT, Figure 1-D, is similar but omits the grid tuning condenser. Instead, the grid coil has more turns and is broadly self-resonant at the desired frequency. The TNT is well named - in the hands of a novice, it is very tricky and difficult to tame. It is infamous for its atrocious note and tendency to drift.

The circuit is deceptively simple and therefore attractive to the beginner. My advice is to shun it unless you are an electronics expert or really do desire a 1925-ish signal. In the old days, a ham might report that "ur sigs pdc" where pdc meant 'pure direct current'. But, with a TNT, it well might mean "pigs devouring corn!" Even so, you will hear a few stations using TNT rigs - they add an unmistakable old-time flavor to the 1929 QSO Party.

All self-excited oscillators should be

continued next page

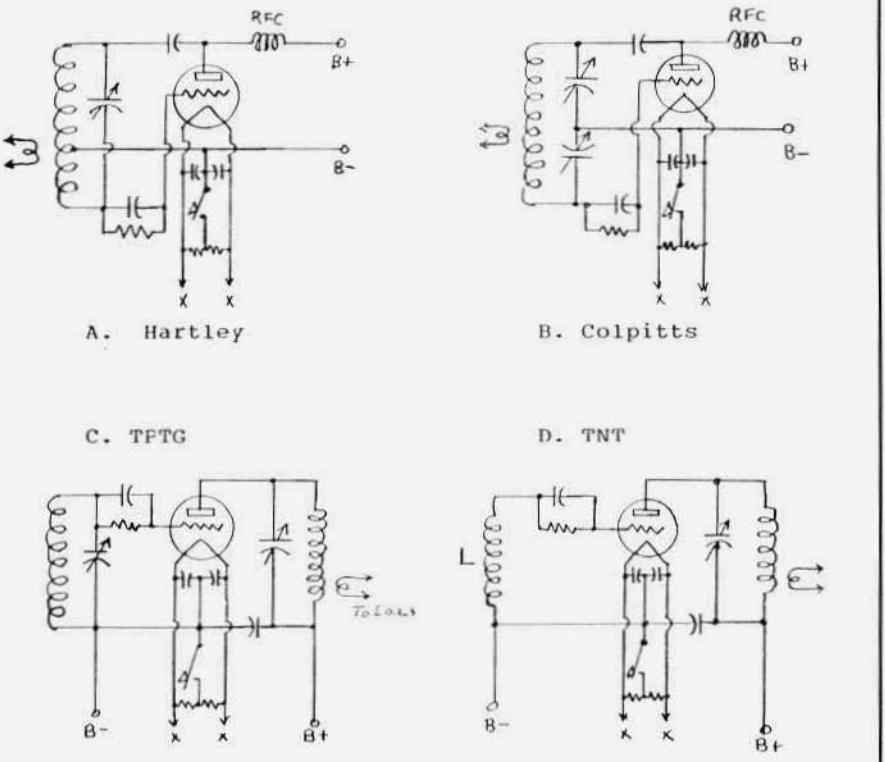


Fig. 1. Basic self-excited oscillators.

powered by a well-regulated and well-filtered power supply; otherwise, the signal will exhibit chirp and a buzzing sound due to AM and FM modulation. You will hear a lot of this during the AWA 1929 QSO Party. Not a few of these stations will receive OO notices. I received one in the 1984 spring contest for chirp. I quickly modified my transmitter to eliminate the chirp - see ER #74, June 1995, A "1937" Transmitter.

One of the highlights of any AWA contest is working W2AN - the AWA's headquarters station in Holcum, NY. Bruce Kelley is the chief operator. During the spring contest, he uses an 807 rig with primary keying that results in a beautiful bell-like tone. You will also be very pleased when you receive the distinctive and unique QSL card from 2AN.

Old Time Tubes

Most contestants use the 210 tube which RCA introduced in 1925 as a new, powerful audio output tube. But '10s are getting scarce and if you find one it will probably cost anywhere from $15 to $25. Even the wartime version (VT-25) is hard to find.

Next best choice is the '45 which came out in 1929. But these also are very scarce and expensive. Some fellows have

continued on page 35

Plate Current Versus Maximum Power Ip.pwr

by George Watson, WØLOB
13546 Omega Dr.
Littleton, CO 80124-2522

I'm sure that most amateurs, at least of the AM type, have tuned an amplifier and found that the maximum power may not occur at the point of minimum plate current. A few weeks ago I found this condition to exist in a Valiant transmitter I had pulled off the shelf to evaluate. Except for this power problem, the unit worked well and sounded good on the air. It was still a little touchy in tuning, as I had remembered from previous experience with the Valiant.

The condition would probably have gone unnoticed except for the fact that it seemed to go to extremes. That is, tuning a little to the high frequency side of resonance caused the output power to rise from 110 watts to 140 watts, the current to rise from 300 mA to 450 mA. I know some commercial transmitters even recommend tuning slightly off resonance but this extreme condition in the Valiant made me curious as to what was amiss and why.

My first thought was neutralization. However, checking, and even re-neutralizing made no change in the problem. A few fellows I talked to on the air had seen the condition exist at one time or another - some had never checked to see if the condition existed in their equipment - but no one had any ideas as to the reason or the solution.

The bias settings were normal, the final tubes were of the same manufacturer (RCA) and very similar transconductance and I was making the checks into a dummy load to preclude output reactive effects. The next thought, then, was to look into Pi-network design to see if I could find any insight into the problem.

An examination of Equation 3 shows that $(Q^2 + 1)$ must be equal to, or greater than R1/R2. (The main tank coil calculated to be 4 uHy, the aux, 1.4 uHy).

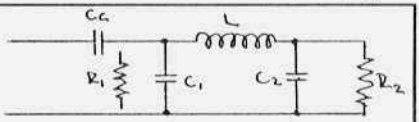
The Valiant plate load, R1, at the point where I was testing is plate voltage divided by twice the plate current, or, Ebb/2Ib = 660/2X.330 or 1000 ohms. The Pi network thus has to match 1000 ohms to the 50-ohm coax (R2), or a ratio of R1/R2 of 20:1. The question then is, is $Q^2+1 \geq R1/R2$?

Q must be greater than $\sqrt{20-1}$ or 4.4. In turn, from equation 2, Q = R1/XC1, or, 1000/XC1. XC1, worst case, is C8 (two 120 pF var.) in parallel with the 350 pF-C39 combination, when the variable is near its minimum setting, or say, 20 pF. C total is then 350 + 2x20 or 390 pF. XC1 = 1/2 Pi FC or 105 ohms at 3880 kHz.

Q, then, is 1000/105 = 9.5, a value that exceeds the minimum requirement, assuming that all the capacitors are correct. A quick check showed one capaci-

continued on page 36

Four equations define the Pi-network:



1. $R1 \geq R2$

2. $XC1 = R1/Q$

3. $XC2 = R_2\left[\frac{R_1/R_2}{Q^2+1-R_1/R_2}\right]^{1/2}$

4. $X_L = \frac{QR_1 + R_1R_2/XC2}{Q^2+1}$

The Hallicrafters SX-18 Sky Challenger II

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

1938 was a good year for Hallicrafters, with a line of receivers from the DDR-1 Diversity Skyrider to the S-19 Sky Buddy. Other than the DDR-1 the top of the line was the custom order SX-17, followed by the SX-16. The bottom end was the S-20 Sky Champion and the S-19. In the middle of the line, the 1936 S-15 Sky Challenger was repackaged as the SX-18 Sky Challenger II using the same new cabinet as the SX-16 and -17. The Sky Challenger II did not have an S-meter and the meter cutout in the panel had an image rejector dial. Hallicrafters called this the Infinite Image Rejector, and promoted the receiver as a great engineering advancement eliminating image response.

While I read the catalogs in 1938, my grass cutting income made it a fantasy land. I did have an S-14 Sky Chief however that was my ticket to amateur radio. The S-14 made me well aware of images and I wondered about the SX-18.

Before the days of double conversion receivers, images were something you put up with. Most receivers from the 30's used 465 kHz IF. This gave a receiver an image which was 930 kHz from the dial reading. With one RF stage, my Sky Chief heard the image just about as well as the desired signal. While QRM was not as great in those days, having an image from a high powered short wave broadcast, complete with a long winded foreign language announcer in the middle of 20 CW didn't help QSOs in the slightest.

The SX-18 was billed as having no images, due to the revolutionary infinite image rejector, and I looked for that to be the panacea for all the cheaper receivers like my S-14. Apparently it was not to be, as the SX-18 did not show up in 1939 nor was the image rejector ever mentioned again.

At the '95 Shelby, NC, hamfest I saw a very decrepit looking SX-18. A little

dickering and I was out twenty dollars but 40 pounds heavier. Some previous owner had painted the knobs red, and had hand lettered the controls with yellow paint and a 2 inch brush, but it appeared to be complete. One aisle over I found a manual for the SX-18 for $2. Obviously the SX-18 was to be my next project, and I could find out about the image rejector first hand.

The SX-18 had been in damp storage, judging from the rust, but only had two bad caps, an open audio output transformer, needed a new line cord, and 6K7 and it talked up on the broadcast band. I cleaned the band switch and it worked on all bands. The 6 to 16 MHz band wouldn't track and I found the oscillator on the low side. With this corrected 40 and 20 meters fell into line with the dial calibration. I pulled the front panel off, stripped, repainted, and labeled it. Cleaned the red paint off the knobs and the SX-18 looked like a communications receiver. I found W3KT? penciled in on the chassis, so I wonder if he was the original owner of this SX-18.

The SX-18 has great bandspread for an old receiver. The tuning rate is less than 20 kHz per revolution of the bandspread knob. And it's a gear drive with no backlash. Too bad it doesn't have a calibrated bandspread dial. Two problems however are BFO hum and IF leakage. Heater cathode leakage in the VFO produces 60 Hz modulation when receiving CW or SSB. It's not a problem on CW, in fact it gives a pleasant buzz to the signals. On SSB however it produces a gravelly sound on all the voices that is not very pleasant, and makes tuning SSB difficult. DC on the BFO filament was the only good cure. The crystal phasing capacitor is hot on both sides, so when you touch the phasing knob you act like an antenna and any signal or noise at 465 kHz is passed into the grid of the first IF amplifier.

The image rejector dial connects through a flexible shaft to a metal box 6" by 2" in front of the rectifier and audio tubes. Taking the cover off the box revealed a right angle drive to a 15 pFd variable, with a wire going under the chassis to a coil, nothing else. The image rejector is a series tuned circuit connected between the RF amplifier grid and ground on the 6 to 38 MHz bands. The rejector tuning dial is calibrated 930 kHz from the resonant frequency of the series circuit, to correspond with the main dial frequency. It provides a low impedance between the RF grid and ground at the image frequency.

To find out how effective it is I connected up my HP signal generator to the -18. On 40 meters the image was 23 dB down regardless of the rejector tuning. On 20 meters the image was 13 dB down without and 20 dB with the rejector tuned for max rejection. On 10 meters the image was down 4 dB without and 7 dB with the rejector. On 20 meters the desired signal was also knocked down 2 dB and on 10 meters 3 dB by the rejector tuning. Tuning the rejector also pulled the oscillator frequency a little. Varying the RF gain control had more effect on oscillator frequency than the rejector tuning however.

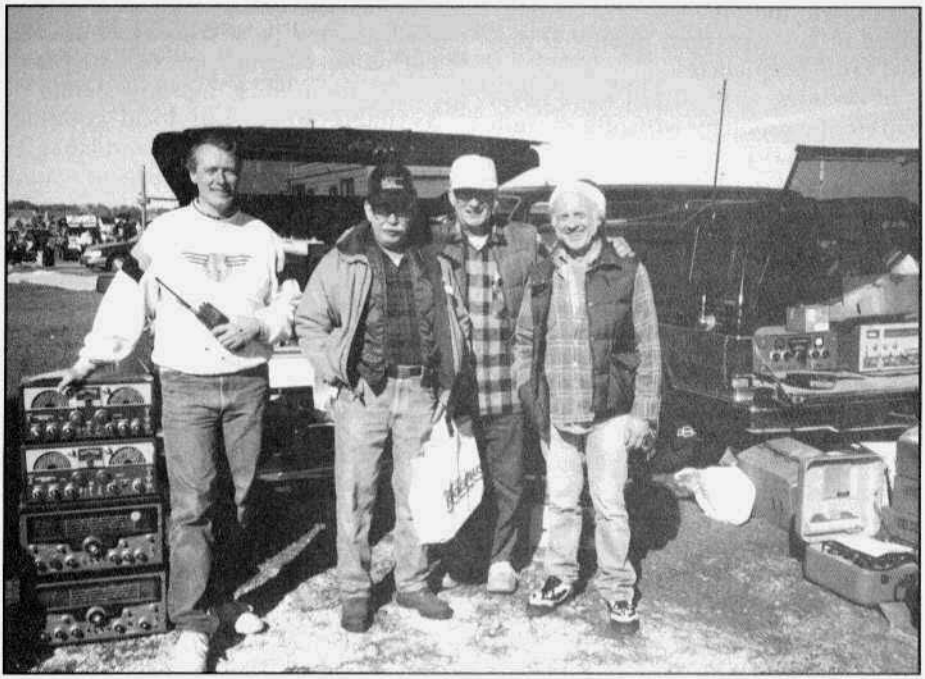
Surprisingly the -18 is very good about warm-up drift and overall stability. From a cold start on 80 meters it drifts about 1500 Hz and on 20 about 4 kHz. Line voltage changes of 5 volts cause the VW pitch to jump 200 Hz. On 40 meters after a 15 minute warm up it needs a slight touch up about every 10 minutes during an SSB roundtable. It is much better than my 1946 HQ-129-X in stability and warm-up drift. When it comes to sensitivity the Hammarlund has the edge on 10 and 20, but they are about equal on the lower bands. In selectivity it's also a draw, but the -129 has a better crystal filter. The -129s noise limiter is good, and there are times I wish the -18 had one. I would sure like to compare the SX-18 to a Sky Chief but Marty, AA4RM will not let go of his.

continued on page 36

Michael Collins, WBØAGU, at his AM/vintage operating position. He operates 160, 80 and 40 meters.

AM'ers at the Walla Walla, Wash. hamfest September, 1995. From the left: Brent, KA7FFB; Sam, KD7XX; Craig, K7SKP; John, KA6GQE; Jeff, W7ID; Dick, WA7EHE; Al, K7IEY; Pat, K7YIR; Jerry, K7LFE; Darryl, W7NVB. ***Photo courtesy of K7YIR.***

Hank Brown, W6DJX, in his hamshack. There's lots of interesting gear in this photograph. *Photo courtesy of K6PFW.*



Some well-known AM'ers at the Grays Lake, Illinois hamfest, September 1995. From the left: Pat, WB9GKZ; John, KF9XH; Bruce, W9QAH and Terry, KB9AUP. *Photo courtesy of K9RJ.*

Collecting/Repair/Restoration Tips

Servicemaster Tubes

Recently I serviced a HW-101 which was not functional. I tested all the tubes in an emission tester (my quick method) and they were good. When things still did not work, I used my transconductance tester. The tubes still measured good. Finally I pulled out the signal generator and scope and traced it to the defective areas. Substituting tubes for the existing tubes, the rig roared back to life. I placed the tubes back in the tube tester and they still checked good. As I was placing them in the trash, I noticed they were "Servicemaster" tubes. A few months earlier, I had the same experience with another "Servicemaster" tube. These are foreign tubes sold at the end of the tube era. My belief is that the insulating material in the tube is either contaminated or has very poor quality at normal radio frequencies.

In decades of repairs, I have never had similar problems with other brands - yet I have now found three "Servicemaster" tubes that failed at normal frequencies, even though they are good at DC. These tubes were 2 (6EA8) and 1 (12AT7).

Colin Lamb, K7FM

Coax-Seal

No doubt most hams have experienced this frustrating scenario: You are busy working on an electronic building project, or trying to repair or service a rig, when suddenly a vital piece of hardware, or small component drops into the innards and appears irretrievable. This situation calls for use of longnose pliers or tweezers to aid removal, but due to the close quarters they just don't work. The level of aggravation and angry verbiage then begins to rapidly rise!

As an avid builder and restorer of electronic gear, I was often confronted with this problem. This led me to arrive at a rather neat, workable solution, namely:

Take a small amount of "Coax-Seal" * and form it into a ball about the size of a pea. Firmly mold, and adhere it to the end of a small diameter plastic or wood rod. Coax-Seal is a very tenacious material and virtually adheres to almost anything. By lightly touching the prepared end of your new retrievable tool to the lost part, it is readily plucked from the depths of your equipment. It is also useful to start nuts, place lockwashers or put screws into hard-to-reach holes. It's also great in retrieving wire cuttings and solder spatters.

* Coax-Seal Material is normally utilized to seal coax fittings, antenna connections and parts from moisture and corrosion. It is manufactured by Universal Electronics, Inc. and should be available from your local supplier. Many hams have used it, and you may still have a partial roll left in the junk box.

Roger C. Zaun, W9UVV

Broom Straw for Meter Needles

I have recently found an old Mercury Electronics model 204 tube tester. This model was formerly used in the electronics stores so that customers could check their tubes. The tester features a 7"x5" meter. The needles in these meters were originally made of paper, which of course deteriorates over time. To replace the missing needle, I glued a small piece of straw from a broom to the meter movement with crazy glue. Other materials I had tried were found to be too heavy, restricting proper movement of the meter.

Al Persichino, WA2BMB

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: Wednesday nights at 8 PM PT 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.
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 Users Net: The oldest of the 'users nets'. It meets on 14.263 Sunday afternoons at 2 PM CT. The net control revolves. This group also gets together for an informal ragchew on 3805 Tuesday evenings at 7 PM CT.
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 has been meeting since 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.

Heathkit Manuals
Part 3

by John Hruza, KBØOKU
2521 S. Holly St.
Denver, CO 80222

This article concludes our list of Heathkit manuals, covering all manuals not covered in our two previous articles, along with their Heathkit order numbers. As in those articles, all manual numbers should be preceded by "59". For example, the complete number for the DX-35 Amateur Transmitter, shown below as 5-123, is 595-123. Exceptions to this are old style numbers like FM32 (for the FM-1 FM Tuner) and special numbers like 390-1405 (for the H-11 reference card).

But first, there is a correction to the Communications Equipment list, printed in ER #78, for October 1995. The article listed the manual number for the HP-10 Transistorized Power Supply as 595-332; this should have been 595-322.

The Test Equipment article, printed in ER #80, for December 1995, included additions to the Communications Equipment list. **Here are more communications equipment manuals:**

Model	Manual	Equipment
DX-35	5-123	Transmitter
DX-60	5-365	Transmitter
HA-201A	5-2084	2M FM Amplifier
HD-20	5-332	Crystal Calibrator
HP-13A	5-1158	DC Power Supply
HR-1680	5-1830	Receiver
HW-12A	5-829	75M SSB xcvr
HX-1681	5-2240	5-Band CW xmtr
PS-1175	5-2315	AC Power Supply
SA-2060A	5-2971	Antenna Tuner
SA-5010	5-2505	uMatic Keyer
SB-201	5-2207	HF Linear Amp
SB-301	5-822	5-Band Receiver
SB-303	5-1124	5-Band Receiver
SB-401	5-823	5-Band xmtr
SB-401	5-947	5-Band xmtr
SB-500	5-993	2 Meter Transverter
SB-630	5-1178	Station Console
SB-650	5-1401	Dig. Freq. Display

And here are additional manual numbers for the Test Equipment list itself:

Model	Manual	Equipment
AV-3	5-147	Audio Voltmeter
C-2	5-8	Condenser Checker
CI-1040	5-1466	Auto Timing Light
CM-1550	5-2273	Engine Analyser
CO-2600	5-2010	Ignition Analyser
"	5-2011	Ignition Analyser & Accessories
IB-102	5-1298	Frequency Scaler
IB-1101	5-1402	Frequency Counter
IM-5218	5-1972	VTVM
IO-21	5-456	3" Oscilloscope
IO-4235	5-1986	35 MHz scope
IO-4510	5-1619	15 MHz scope
O-7	5-1	Oscilloscope
TS-3	5-77	T.V. Align. Gen.

The above correction and additions are thanks to KB4CM, KE6NGW and WØJHS. KB4CM and WØJHS, as well as K8WPI and N2TVL, also contributed to the following lists of Entertainment and Computer Product manual numbers.

The Heathkit Manual Cross-Reference List, Entertainment Products:

Model	Manual	Equipment
AA-18	5-972	Amplifier
AA-60	5-359	Hi-Fi Preamp
AA-100	5-398	Stereo Amplifier
AA-151	5-421	Stereo Amplifier
AC-11	5-471	Multiplex Adapter
AJ-11	5-420	AM/FM Tuner
AJ-12	5-605	FM Stereo Tuner
AJ-1510	5-1373	FM Digital Tuner
AR-13A	5-715	AM/FM Receiver
AR-27	5-890	FM Receiver
AR-29	5-1117	AM/FM Receiver
AS-104	5-1384	Three Way Speaker
BC-1A	5-167	Broadcast Tuner
EA-2	5-187	Hi-Fi 12W Amp
FM-1	FM 32	FM Tuner
FM-2	5-13	FM Tuner
FM-3	5-111	FM Tuner

FM-3A	5-142	FM Tuner
FM-4	5-260	FM Tuner
GD-28	5-997	8-TrackTape Player
GD-325D	5-1083	Electronic Organ
GR-21	5-450	FM Radio
GR-100	5-1423	Color Television
GR-121	5-505	Clock Radio
SA-2	5-291	Hi-Fi 14W Amp
SP-2	5-206	Hi-Fi Preamplifier
SRA-8100-10	5-2537	Earth Station Site Survey
TCR-1	5-279	Clock Radio
TD-17	5-987	Metronome
TD-1257	5-2168	Metronome
UA-1	5-186	12 Watt Amplifier
UA-2	5-295	14 Watt Amplifier
W-2	5-50	Williamson Amp
W-3AM	5-162	Williamson Amp
W-4B	5-302	Williamson Amp
W-4M	5-86	Williamson Amp
W-5M	5-103	Hi-Fi Amplifier
WA-P2	5-89	Preamplifier
XR-1	5-222	Receiver

The Heathkit Manual Cross-Reference List, Computer Products:

Model	Manual	Equipment
H-8	5-2013	Computer assemb.
H-8	5-2014	Digital Computer operation
H-8	5-2048	Digital Computer Software Reference
H8-1	5-2028	4K Static Memory
H8-2	5-2033	Parallel I/O Interface
H8-3	7-1651	4KChip Set
H8-4	5-2248	Multiport Serial I/O Card operation
H8-5	5-2032	I/O & Cassett Interface Card
H8-9	7-2187	H-8 Modification Kit
H8-21	5-2285	Microsoft BASIC Software Reference
H8-52	5-2462	Cassette Debugging source
H8-53	5-2463	Cassette Text Editor source
H8-54	5-2460	Cassette Assembler source
H8-60	5-2461	Cassette BASIC Interpreter source
H-9	5-1996	Video Terminal Assembly
H-9	5-2017	Video Terminal operation
H-10	5-1970	Paper Tape Reader/Punch
H-11	5-2018	Digital Computer assembly
H-11	5-2019	Digital Computer operation
H-11	390-1405	Reference card
H-11-1	5-2009	Memory Expansion Module
H11-5	5-2037	Serial Interface Module
H-11A	5-2224	Digital Computer operation
H-17	5-2161	Floppy Disk assembly
H-17	5-2160	Floppy Disk operation
H-29	5-2965	Video Display Terminal assembly
H-29	5-2992	Video Display Terminal operation
HOS-817-1	5-2474	Disk Operating System Reference
HOS-847-1	5-2474	Disk Operating System Reference
HDOS	5-2475	General Operations Reference
HDOS	5-2476	DBUG Console Debugger
HDOS	5-2477	EDIT Text Editor
HDOS	5-2478	ASM Assembly Language
HDOS	5-2479	Extended Benton Harbor BASIC
HT-11	5-2225	H-11A Software Reference
IC-2008A	5-1492	Desktop Calculator
PAM-8	5-2348	Front Panel Monitor
WH8-4	5-2206	Multiport Serial I/O Card
WH8-14	5-2082	Line Printer
WH8-16	5-2082	16K Static Memory
WH8-41	7-1836	Adapter Cable
WH8-51	7-1836	Adapter Cable

continued on page 35

Amplifiers Canadian No. 19

by Chris Bisaillion, VE3CBK
Whiskeytown Wireless Collection
1324 Old Carp Rd.
Kanata, ONT K2K 1X7
Canada

One of the prides of my collection is a Wireless Set (Canadian) No. 19 with High Power Amplifier also known collectively as a Wireless Set No. 19 High Power. It has taken many years to track down all the bits and pieces to assemble a complete system.

In the Pubic Archives of Canada, a letter was found that marks the introduction of the amplifier for the No. 19. On 3 June 1942, Canadian Military Headquarters (CMHQ) sent a letter to The Ministry of Supply, stating that CMHQ had been advised that the Director of Signals Design at Ottawa was working on the development of a linear amplifier for use with the No. 19 set. A brief description then followed with the following points:

1. Automatic linear class B amplifier with an "Expanding Circuit", i.e. the unmodulated drain is 15 amps at 12 volts; this drain increases with modulation to 40 amps at 100%.

2. The use of this amplifier does not involve any disturbance of the wiring or components of the 19 Set proper, except for one lead in the relay press-to-talk circuit and the aerial co-axial connection drive.

3. These modifications are both sufficiently simple to enable their being carried out in the field by means of adaptors.

4. A vibrator power supply has been designed to fit exactly in the standard case of the No. 19 Set with the amplifier utilizing an 813 tube located to the left off the power supply in a separate case. The whole combination is said to be mounted with convenience above any No. 19 Set.

The letter continued to say that this amplifier had been demonstrated successfully to the Canadian Marconi Company who were assembling twenty-five sets for life tests. They had concerns regarding the reliability of the vibrator at the required rating. It was then concluded that the output of this amplifier when compared on the same 16 foot antenna with a Canadian No. 9 Set showed about five times the power, i.e. approximately 100 watts.

Figure 1 shows an early Amplifier C-19*(Experimental) that was mounted above a No. 19 MK II. The Amplifier was at the top left and the Vibrator Power Unit was at the top right. Working Instructions were published in May 1943 in the standard 5-1/2" x 8" format with the brown wrinkle cover (36 pages and 5 figures). The class of operation had been changed to an expanding linear class B-C amplifier with 100 watts output when fully modulated and 125 watts output on CW. It was found that the voltage induced in the receiving antenna when transmitting with the amplifier was enough to damage the variometer. Therefore, a Variometer Protector Unit (V.P.U.) was introduced to open the connection between the antenna and variometer. This cylindrical unit was fitted to the back of the standard variometer. The current required to operate the internal relay was obtained from the Control Unit No 3A MK II. The Amplifier appears to have been manufactured by The Royal Canadian Corps of Signals, and the Vibrator Power Unit Power Supply label reads "Wireless Sets No. 19 MK II Amplifier Power

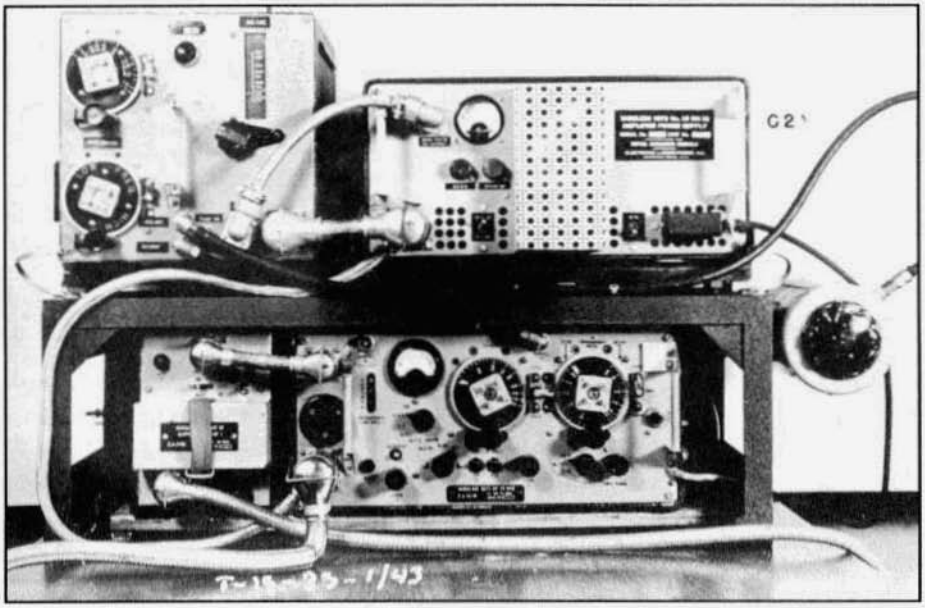


Figure 1. Amplifier C-19 *(Experimental)

Supply, manufactured for Royal Canadian Signals, Contractor, Electronic Laboratories Inc., Indianapolis, Indiana". Twenty-five Experimental Amplifiers were received in the UK by the Canadian Army Overseas (CAO) for user trials in May 1943. The following information was found in the Public Archives of Canada:

"Field tests were made and the sets, although more than meeting the range requirements, were found to radiate spurious (adjacent channel) and harmonic interference. The spurious radiation was present in the output of the WS No.19 which the amplifier merely amplified but which, after amplification became a serious nuisance. The harmonic radiation was produced mostly by the amplifier itself and was a function of design. Consequent to the field trials, Canada was urged to rectify these troubles and, when this had been accomplished, the War Office would be asked to adopt the Canadian Amplifier. In the meantime it was decided that the CAO would equip itself with the British equivalent amplifiers."

Also from the field trials, the Chief Signal Officer of 2 Cdn Corps to Canadian Military Headquarters stated:

"The Amplifier C19 was very well liked and is unquestionably very much the electrical superior of the British equivalent - the Amp RF No. 2. The reliable day and night range with 12' V aerial on freqs between 2.1 to 3 Mcs was found to be approx 20 miles. The three major criticisms were: i) High harmonic radiation, ii) Electronic vibrators failed frequently, iii) High battery drain."

Canada then produced a "Gremlin" box or filter unit for insertion between the WS No. 19 and the amplifier, designed to reduce spurious radiation. Two "Gremlin" boxes were tested in the UK and favorable reports were received. The first 25 experimental amplifiers were to be returned to Canada for salvage since they were occupying valuable space and were not considered suitable for field use.

In 1944, a new Amplifier Canadian No. 19 and Vibrator Power Unit, for use

continued next page

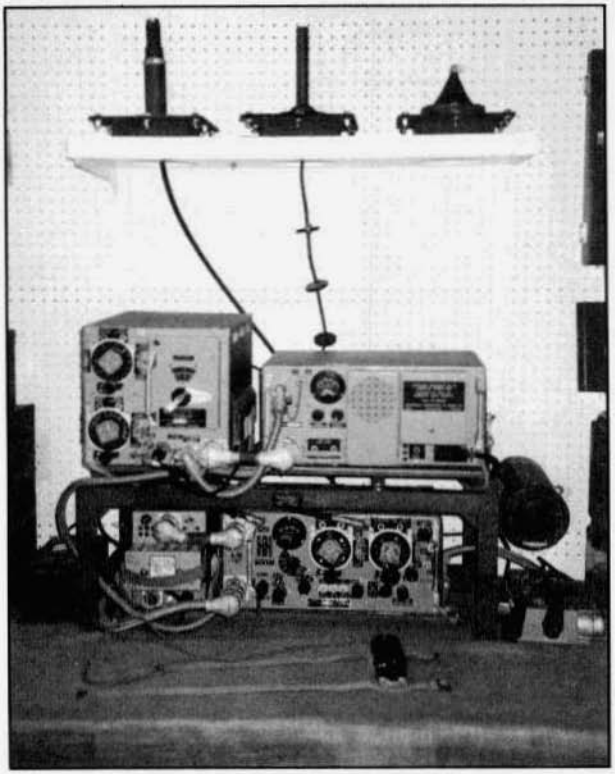


Figure 2. Amplifier Canadian No. 19

with the WS No. 19 and the WS No. 22, was introduced. This amplifier incorporated a very selective internal filter to suppress any spurious RF signals from the No. 19 set. Figure 2 shows the amplifier system in my collection. The amplifier is at the top left, and the vibrator power unit is at the top right. The amplifier was made by Rogers Majestic and the Vibrator Power Unit was made by Electronic Laboratories of Canada Ltd. It was very similar in appearance to the Amplifier C-19*(Experimental) with slight differences in the layout of the front panels. The class of operation remained the same, i.e. expanding, linear, class B-C. The weights of the units are quite notable. The amplifier weighs 47 lbs, the vibrator power unit weighs 77 lbs, the mounting frame and leads weighs 48 lbs, for a total installation weight of 172 lbs! If this is then added to the standard No. 19 Set weight of 88 lbs, the weight of the equipment totals 260 lbs. A good starting point of assembly is a very sturdy table! It is interesting to note that the WS Cdn No. 52, that was introduced in the spring of 1944, uses virtually the same output circuit as the amplifier. I tend to think of the WS 52 as a repackaged WS No.19 High Power. The No. 52 weighs 245 lbs! Many accessories were supplied with the amplifier system but two stand out as very specific to this system as follows. Two wooden boxes with metal handles known as "Amplifiers Canadian Boxes, Tool" and Amplifier Wireless Set No. 19 Case Spare Valves and Parts" are shown in Figure 3. I have found that the specifications for the output power of the Amplifier are very conservative: "Approximately 60 Watts on R/T fully modulated and approximately 75 Watts on CW." I have been able to achieve 215 Watts output on 80 metre CW and 127 Watts output on 40 metre CW.

The original order for the amplifier system was for a quantity of 500 units. The highest serial numbers that I have seen are Amplifier Serial No. C452 (produced Feb 8, 1945) and Vibrator Power Unit Serial No. C485. Many instructional documents for the Amplifier Canadian No. 19 are dated as late as October 1946. The No. 19 complete with high power amplifier and all accessories was available for $350 Canadian on the surplus market. This was roughly equivalent to two months of average wage in 1946 or $5,000 Canadian dollars in 1995. The

Figure 3. "Amplifiers Canadian, Boxes, Tool" and "Amplifier Wireless Set No. 19 Case Spare Valves and Parts"

The author with his No. 19 set.

shipping weight was 1302 lbs, shipping charges extra! Interestingly, the WS No. 19 and amplifier system was again used in action in the Korean War.

Not many Wireless Set No. 19 High Power are known to exist today, and I am glad to share this information with fellow collectors. I welcome any additional information and anecdotes from readers to further complete the picture.
ER

Editor's Note: This article was previously published in the British magazine "The Military Wireless Amateur Radio Society" (MWARS).

Anatomy of a Heathkit Manual

by Randy Kaeding, K8TMK
5965 Clearbrook Dr.
Stevensville, MI 49127

One of the secrets of Heath's success is its excellent manuals. The following paragraphs will lead you through the process of generating a typical Heathkit manual. Although the nature of a particular kit and time constraints sometimes required the tried-and-proven procedure to be modified, the majority of manuals followed these steps. This procedure only applied to kits; due to the nature of the educational courses Heath is producing today, they do not follow this procedure. To make it easier to read and follow, the procedure is broken down into logical cycles.

Manual Planning Cycle

About the time the product engineering was being finalized, the Manual Department supervisor would estimate the cost of the manual. Several formulas that had been developed over the years were used for this. For example, the number of parts in the kit would be plugged into two different formulas to determine the number of parts list pages and assembly pages. Other areas of the manual would be estimated by looking at manuals for similar existing products. The Graphics Department would use similar devices to estimate the number of pieces of art. The number of pages and the number of pieces of art would then be used to determine the amount of hours (and therefore cost) to develop the manual.

The Manual Department Supervisor would also decide which writer would be assigned the project, depending upon individual interests and workload. On larger projects, several writers would be assigned, with one writer being designated as the "lead writer" who would assign work to the other writers and then organize the individual pieces into the finished manuscript.

Engineering would work toward a "transfer date" when the product would be handed over to the Manual Department for manual development. The design was supposed to be finished at this time, though seldom was.

Original Writing Cycle

The transfer from engineering to the Manual Department consisted of six complete sets of parts, a working prototype, and written material (schematic, suggested assembly sequence, circuit description, installation, operation, troubleshooting, etc.).

The writer assigned to the project would use parts set #1 to assemble a unit and take notes of how the assembly should proceed. He would also make a rough art list that an illustrator would later use to generate sketches of the necessary drawings.

The writer would then use parts set #2 to assemble another unit while he actually wrote the steps. At the same time, the Illustration Department would begin creating the artwork sketches. They would also get a set of parts (#3) to look at. While the Illustration Department was completing the needed artwork, the writer would work on the other non-assembly portions of the manual.

When the writing and sketches were done, the writer would then use parts set #4 to assemble his third unit using his steps and the sketches. At this time, any necessary changes were made to the steps and artwork, and the writer added handwritten labels to the artwork.

While the illustrations were corrected

and then put in final inked form, the writer would finish any remaining non-assembly portions of the manual. Parts set #5 was then sorted and packed to match the writer's assembly breakdown. This set of parts was saved for use during the preproof cycle described later. When the writer was finished writing, his manuscript (either typed or hand-written) was then transferred to an Editor.

The Editor would read the manuscript and check for proper grammar, spelling, consistency with other manuals, ambiguity, etc. One rule of thumb was that a person with at least an eighth grade education should be able to successfully assemble any Heathkit. Another rule of thumb was to personalize the steps by making the builder the "first person" (by freely using the word "you", and avoiding phrases like "the builder" or "the user"). A third rule was to write in active voice (start a typical step "Use a small flat-blade screwdriver to tighten. . ." instead of "Using a small flat-blade screwdriver, tighten. . . "). This third rule was probably the hardest for newer writers to grasp. When the editing was finished, the manual was transferred to the Typesetting Department, who would generate the text in proper format (type sizes, column width, and justification). The finished artwork and typesetting galleys were then transferred to the Layout Department who would past-up the artwork and typeset into pages. Work would proceed toward a "Preproofbuild" date.

While all of the above was being done by other departments, the writer would pack parts set #6 according to his manual and then transfer it to the Packaging Department, along with copies of his parts list(s). The Packaging Department would add the necessary packaging to make sure the kit arrived at the customer's door safe and sound.

Preproof Cycle

When the preproof date arrived, a finished manual and parts set #5 was assigned by the Manual Department manager to another individual for review (the manual writer very rarely got to preproof his own manual). The idea was that a new set of eyes would be more likely to catch errors. That person was responsible to thoroughly check the manual for accuracy and check to see if the unit operated as specified. At the same time, one or two people in the Engineering Department would also do a preproofbuild (they would keep their own sets of parts for this). Each builder would write his corrections, suggestions, and notes in his preproofbuild. Since preproofs and proofbuilds were done at home, the payment for the builder's time was that they got to keep the finished product. The downside was that the product could be recalled at any time for one year (although this didn't happen very often and except in extreme circumstances, you usually got it back).

When the preproof was done, the writer would collect the builder's manuals and create a new master manual. This manual would contain all of the necessary corrections. The marked up manual would then again be passed through an Editor to the Typesetting, Illustration, and Layout Departments, much like it did during the original writing cycle. Work would now proceed toward a "Proofbuild" date.

Proofbuild Cycle

Just prior to the proofbuild date, several proofbuild manuals were printed, and several sets of parts packed to the writer's and Packaging Department's specifications were assigned to a few individuals as a final check of the manual and parts pack.

When the proofbuild was done, the proofbuilder's manuals would be reviewed by the Evaluation Department who would create a master proofbuild manual that contained all of the necessary corrections, suggestions, and com-

continued next page

ments. The Evaluation Department was kind of a clearing house that eliminated any unnecessary changes due to a builder's own preferences, prejudices, etc. A meeting was usually held with the writer, evaluator, and proofbuilders to discuss any proposed changes and allow the builders to clarify their suggested changes. When an agreement was reached, the master proofbuild manual was given to the writer so he could make the final corrections. The corrected master would then again be passed through an Editor to the Typesetting, Illustration, and Layout Departments, just like it did during the preproof cycle. The next important date everyone worked toward was the "ship date".

The Product Ships!

After the printed manuals were received from the printer, a number of units based on sales projections were packed up by the Production Department and then transferred to the Shipping Department. But before the unit could be shipped, the Quality Assurance Department took one unit out of shipping stock and assembled it as a final check of the manual and parts. Since it was too late to make any manual corrections at this point, this is when any necessary Insert (addendum) was created by the writer before the Evaluation Department would allow the unit to be shipped to customers.

Maintaining the Manual

Even though the product was now shipping, the Manual Department's involvement was still not finished. Feedback concerning assembly problems and operation would occasionally be received from customers either directly by letter, or via Technical Consultation Department. In addition, sometimes a particular component became NLA (no longer available), and a replacement had to be found.

If a manual required immediate changes, an Insert was created and added to the units in shipping along with any additional parts. Other changes were written in a master manual and would be fixed prior to the next printing of the manual (which usually occurred just before each run of the product).

As you now know, Heath took their manuals very seriously. The large amount of time put into every Heathkit manual would probably surprise most people. This extra care is what made Heath manuals "the best in the world".

Changes through the Years

Until personal computers started becoming commonplace, Heath writers either hand wrote or typed their manuscripts. The finished manuscripts would then be transferred to the Typesetting Department, where they would be typeset and printed out and then pasted up into pages by the Layout Department.

Shortly after Heath got into computers, Zenith Electronics Corporation purchased Heath (mostly for the computer part of the business). Manual writers who had a personal computer in their offices began using a word-processing program called "AutoScribe", which happened to be marketed by Zenith. At the time, everyone thought this was a great program because we had limited editing capabilities and could do a large part of the typesetting ourselves. It certainly was better then using a typewriter. The drawback was that our files had to be stored on single-sided, single-density, 10-track, hard sector disks. A single manual required lots of disks! All our typesetters would have to do is add various codes to specify type sizes, fonts, column width, and justification. The Typesetting Department supervisor wrote a program to convert our AutoScribe files over to their Mergenthaller system. Eventually all of the writers had their own PC and used AutoScribe.

One day I began looking for something even better than AutoScribe. What

I found was a popular word-processing program called Wordstar. Even in its early versions, Wordstar's capabilities ran circles around AutoScribe. A new conversion program was written, and writers all switched to Wordstar.

The most recent improvement was in 1987 when electronic desktop publishing was born and we got our first Macintosh computer. Three of us sat huddled around its tiny screen and produced the entire HA-2513 manual, including artwork. This was a big step from Wordstar, but in spite of its small screen, the advantages were obvious. We could do our own typesetting, artwork (either drawn ourselves, or scanned in using drawings from an Illustrator), and layout. By reducing the number of people involved, we could make the finished manual look exactly the way we intended it. Eventually, we all got our own Macintosh II computers, Megascreen 19" monitors, and scanners. We were all networked to the same laser printer. Although some of the computer hardware and software has been updated in recent years, this technology is still in use by Heath's educational authors.

As you can imagine, Heath manuals were expensive to produce. Several things were tried over the years to help reduce this cost. One thing that was tried was to eliminate some of the non-assembly sections of the manual (such as the circuit description), but this brought complaints from our customers and they were eventually put back in.

One cost-reduction experiment that didn't receive many complaints, if any, was putting the larger artwork in a separate 11" x 17" "illustration booklet" as opposed to it being on foldouts from the manual pages. Foldouts are very expensive to print, and our layout people had to use special care to make sure it was placed so that a particular pictorial was visible from all of its associated steps.

Finally, the most recent change concerned the circuit board step-by-step pictorials. As you may remember, circuit board assembly pages for many years consisted of a drawing of a circuit board with steps positioned on one or both sides of the drawing. Each of these steps required an illustrator to cut and place an arrow between the step and its outline on the circuit board drawing. In addition, the illustrator had to cut and place a cross-hatch pattern on the part's outline to make it stand out from the other parts. In 1983, with the approval of my boss, I tried something entirely different to reduce illustrator time. I added horizontal and vertical lines across a drawing of the circuit board to divide it into sections, and then labeled these sections. The accompanying steps called out one of these sections and then had the builder install some parts in a logical top-to-bottom, left-to-right sequence. The builder would then be referred to the next section and install parts there. This procedure was first used on the HD-1418 and worked so well for kitbuilders, and cut down on illustrator time so much, that it was used on every new kit that followed. **ER**

About the Author

I received my first amateur radio license, KN8TMK, in 1960 and worked my way up to Extra Class. I still have the same callsign, except for dropping the N when I upgraded, and am an active DXer. I'm a life member of the ARRL and am currently on the DXCC Honor Roll with 333 countries (including deletes). I also hold a General Radiotelephone License (formerly First Class Radiotelephone License) and at different times have moonlighted as chief engineer for a couple of local radio stations (WHFB-AM/FM and WCSE-FM).

I began working in the Service Department at Heath Company in March

continued on page 36

Designing A Vacuum-Tube VFO Crystal Substitute

by Don Meadows, N6DM
1683 Daphne Ln.
Yuba City, CA 95993

Using crystal control with vacuum-tube transmitters on today's bands can be a great nostalgia trip. But sooner or later one will relive that longing of yesteryear for VFO flexibility. Most manufacturers of Novice ham transmitters once offered a separate VFO option. Those of us who have one or more of these original VFOs often find that their drift and/or keying quality may not always measure up to today's standards. So I set out to design a vacuum-tube VFO to drive the typical Novice transmitter of yesteryear.

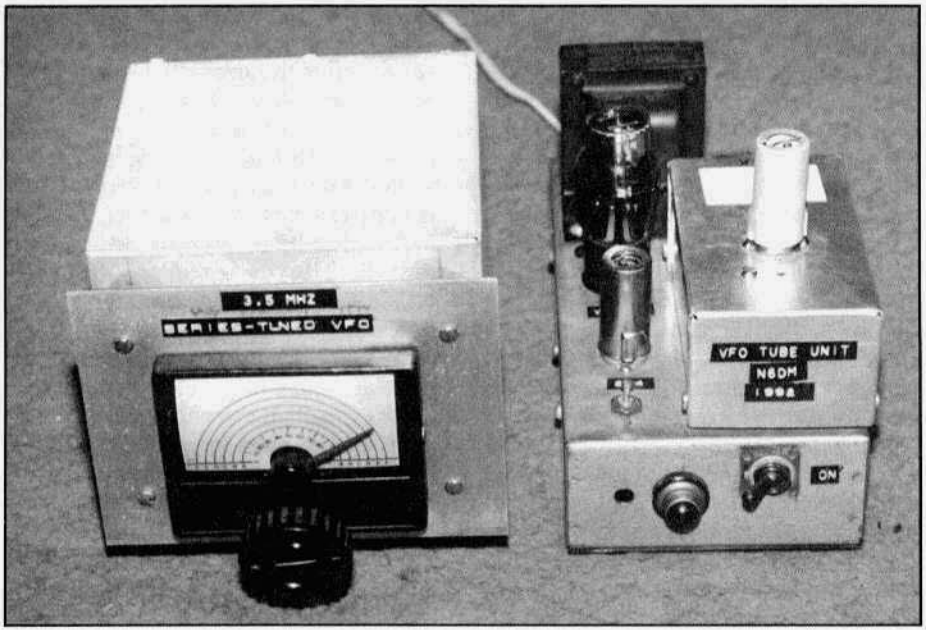
There were four basic requirements. The VFO design should work with a variety of tubes. It should require no keying relays or negative biasing voltages. It should show minimal drift (less than 50 Hz per hour after a 20-minute warm up). Its keying quality for full CW break-in operation should equal the performance of current solid-state transceivers. I discovered, after much trial and error, that it is indeed possible to build such a VFO.

One must utilize the highest state of VFO circuit design that evolved during the vacuum-tube era. The series-tuned Colpitts VFO circuit, also known as the Clapp oscillator, appeared frequently in published ham vacuum-tube VFO designs from the fifties on to the end of the vacuum-tube era. The series-tuned Colpitts VFO circuit has three important virtues. First, the series-tuned configuration minimizes the heating effect of circulating current through the coil. This reduces drift. Second, this frequency-determining circuit is very loosely coupled electrically to the oscillator tube. This minimizes the loading effect of the tube on the tuned circuit. Third, such electrical loose coupling permits one to separate the shielded tuned circuit mechanically from the oscillator tube by several feet of coaxial cable, thus further reducing drift from heat sources. This VFO design technique gradually became the standard, based on literature published by the amateur-radio press during the closing decades of the vacuum-tube era.

The soundness of the series-tuned Colpitts circuit as a low-drift oscillator is supported also by professional sources. Perhaps the best of these is *Henney's Radio Engineering Handbook*, Fifth Edition, 1959, page 16-15 to 16-24. This handbook is a digest of published research by professional engineers. It is a treasure trove of data for vacuum-tube homebrewers. Henney's work should not be confused with *Terman's Radio Engineer's Handbook* (1943) - which also was (and still is) a monument in its field.

However, neither the amateur nor the professional literature ever fully explored the ramifications of directly keying such series-tuned VFOs. Some commercial amateur VFOs using this circuit provided a key jack in the oscillator cathode for those who insisted on break-in capability regardless of signal quality.

One example is the Heathkit VF-1. It keyed fairly well. Chirp was scarcely noticed on the fundamental frequency, but announced itself clearly on harmonics. Key clicks were there but didn't stand out among other CW signals of the time. Also, its drift was quite pronounced. Ham handbooks throughout the vacuum-tube era stated flat out that direct VFO keying must always be a compromise between clicks and chirp. Professional literature seemed uncon-



The tuned circuit and tube units are separate structures, mechanically and electrically isolated. One can experiment with each independently.

cerned with this VFO keying problem, which had little bearing on commercial requirements.

Ham designers striving to overcome impediments to perfect VFO keying -- "perfect" meaning without perceptible clicks or chirp - devised differential keying circuits which were quite successful. The principle was to turn on the oscillator quickly, before following stages could pass signal. This masked key-down clicks and chirp reaching the antenna. On key-up, the following stages were turned off quickly, while the oscillator was still running, again masking clicks and chirp reaching the antenna. Many such circuits appear in the literature. I reviewed the various successful differential keying circuits of yesteryear. The bottom line was always circuit complication: at least one extra stage (a "keyer tube") plus a source of negative bias voltage. Sometimes a VR tube was included and sometimes a keying relay.

Curiosity overcame obedience to tradition, which said that direct oscillator keying must always be a compromise. Just what does a series-tuned Colpitts VFO with a mechanically remote tuned circuit sound like with cathode keying? I built a prototype and keyed the oscillator tube directly between the cathode choke and ground. This, by the way, permits keying the oscillator cathode in parallel with the cathodes of the driven transmitter. The end result of this experiment was a unit whose keying quality is actually superior to that of some vintage transmitters with crystal control.

Most Novice transmitters used a crystal oscillator stage driving a final amplifier and keyed the cathodes of both stages in parallel. This approach was simple, effective, and did not require a source of negative voltage to cut off the tubes under key-up conditions. Keying my prototype VFO by itself and monitoring its signal on my Kenwood TS-

continued next page

9405 indicated no chirp or clicks. The absence of clicks was further confirmed with an oscilloscope. Keying the prototype VFO tube's cathode in parallel with the cathodes of the driven nostalgia transmitters sometimes produced a slight click, which was eliminated by a capacitor of at least .5 mFd in series with a 47-ohm resistor across the key. These are ballpark values, subject to optimizing adjustment. Any reaction of the following stages on the oscillator frequency is minimized, because all stages' cathodes are keyed simultaneously and because the series-tuned Colpitts oscillator circuit with the proper tube provides electron-coupled isolation between input and output of the oscillator stage. This approach, I found, provides cathode-keyed oscillator quality with vacuum tubes that can equal modern solid-state standards.

Let us now examine in detail this applied VFO design principle. I stress here the term "principle." Its precise application depends on the resources of the nostalgist's junkbox. The following items are based on my findings.

1. The VFO must use a series-tuned Colpitts circuit with the tuned circuit isolated from the tube through several feet of coaxial cable. Four to six feet is a realistic length. Many handbooks and articles of the sixties and later explain this principle in detail. The series-tuned circuit is in a shielded box well away from the heat generated by the tube. The capacity of the two connecting cables is in parallel with the much larger capacity (1000 pF typical) of the coupling capacitors to the tube. These capacitors are installed in the tuned-circuit box.

2. In this circuit the tube loads the tuned circuit minimally, which further reduces drift. But the on/off state of the keyed oscillator tube still presents a small variation of the load across the tuned circuit. Normally, this variation should not result in noticeable chirp, especially if the cathodes of all stages are keyed in parallel. But if the cathode emission of the oscillator tube is poor due to low filament voltage or a weak tube, there may be a slow but audible frequency shift with keying--maybe 20 to 100 Hz during a five second key-down period. Perhaps this is a manifestation of cathode interface resistance as described in the excellent article by NØDMS ("Thermionic Mysteries," ER, #54).

3. Successful cathode keying of the oscillator tube requires a pentode with high transconductance. I've found the following tubes to be trouble free, assuming a good tube with correct filament voltage (measure it at the socket): 6AG7, 6GM6, 6GU5, 6CB6, 6BZ6, 6AU6, 6BA6. Other pentodes with a transconductance above 5000 micromhos should also work well, although I haven't tried them. The 6AU6 and 6BA6 types with a transconductance of 5000 or less seem to be more sensitive to individual tube variations. The other listed types have posed no problems. The 6AH6 tube, an early high-transconductance pentode, the miniature version of the octal 6AC7 (not tried here), was especially poor, showing unusually high key-down frequency drift.

4. The oscillator grid-leak resistor (typically between 27K and 100K ohms, not critical) should be returned directly to ground, not to the cathode as in some published circuits. Retuning it directly to the cathode will prevent the oscillator from cutting off completely during key-up if the tube's cathode is keyed in parallel with the cathodes of following stages.

5. The VFO series-tuned circuit and the oscillator-tube stage are constructed as separate units. The series-tuned circuit is contained in a completely shielded box and covers only one range: 160, 80 or 40 meters. Separate, manually plugged-in boxes are used for each

range. The mechanical and electrical problems of switching are thus avoided. Phono plugs and jacks, currently available from Radio Shack, are cheap and effective for coax coupling between the units. Any type of shielded cable designed for RF use will work; its capacity per unit length and velocity factor are unimportant. The need for mechanical rigidity of the tuned-circuit box unit, however, cannot be overstressed. The one drawback of the series-tuned Colpitts VFO is that the tuned circuit is sensitive to the slightest mechanical vibration. The parts inside the box must feel zero influence from the outside world's slings and arrows. A vernier drive without backlash should be used for frequency control. Its mounting must be in perfect mechanical alignment with the variable tuning capacitor's shaft. The drive's adjustment must place zero torque or mechanical stress on any component within the box. The variable tuning capacitor itself should have a smooth rotor bearing. One should be able to turn the rotor between the thumb and index finger. With this type of VFO, the short-term stability factor depends more on mechanical than on electrical design of the tuned circuit.

6. The oscillator tube unit is on a separate chassis with its own power supply including VR tube. Experience has shown that tapping power for the VFO tube from the driven transmitter sometimes causes trouble through inadequate voltage regulation, incorrect voltages, and the possibility of RF feedback.

7. This tube unit feeds the VFO or crystal input ports of the nostalgia transmitter. One can include additional isolating and frequency-multiplying stages in this tube unit if one wishes, but such extras may not be necessary. One can easily test the unit's isolation. Let the VFO run free and key the driven stages. Any change in beat note indicates less-than-perfect isolation. This should not affect signal quality if the oscillator's cathode is keyed in parallel with those of the driven stages. Often one finds there is no change in beat note, even without isolating stages. This depends on internal shielding of the chosen oscillator tube. The tube unit's output is fed through a length of coaxial cable to the driven transmitter. Typically, around 5 volts of RF is available at the end of 4 feet of RG-58U coax. This voltage is taken directly from the oscillator tube's plate, which is untuned, being fed through an RF choke. I've found this quite adequate to drive a 6AC7 crystal-oscillator stage, even when it operates as a frequency doubler.

8. There is a bonus feature in this VFO design principle for homebrewers who are experimentally inclined. Since the tuned circuit and tube units are separate structures, mechanically and electrically isolated, one can experiment with each independently. For example, one can electrically modify the tube unit while working with the same tuned-circuit box. This helps clarify the subtle performance variations of different oscillator tubes.

9. The oscillator tube's screen voltage must be regulated under all circumstances. In the series-tuned Colpitts circuit the oscillator tube's screen functions as the oscillator's anode. The DC resistance of the oscillator's cathode choke (typically 2.5 millihenries) may be significant in some instances, as this resistance adds cathode bias to the tube. Chokes with a lower inductance and thus lower DC resistance will probably work just as well.

10. The VFO coupling capacitors (contained in the tuned-circuit box) should be silver mica or other high-stability types. Their value should each have a capacitive reactance of around 45 ohms at the tuned circuit's design frequency. The reactance of the series-tuned inductance should be around 700 ohms.

11. The oscillator tube's plate choke is

continued next page

Letters from page 3

ohm antenna input is connected to the tap which presents the best overall impedance match.

Where it is desired to match a 50-ohm unbalanced antenna to a high-Z balanced receiver antenna input there is an even easier option available. Small broadband 4:1 baluns are used with computers in offices where the machines are tied together in local networks (LANs). These inexpensive encapsulated baluns are designed to match the low-Z unbalanced coax output of a computer's LAN card to balanced high-Z twisted-pair phone circuits. As purchased, these little 4:1 baluns come complete with a BNC connector on the unbalanced side - the high-Z balanced output terminates in an easy-to-remove modular telephone plug - the middle two pins on such plugs are the ones used. While designed for data transmission, these little ferrite-cored baluns work just superbly for matching the balanced input of a receiver to an unbalanced low-Z antenna. I've measured the loss of several models of these guys over the HF spectrum - in every case loss was virtually unmeasurable from the broadcast band to at least 30 MHz, dropping off somewhat below the six meter band. I use them on receivers ranging from the R-390A to the SX-28 with great success.

The use of such outboard broadband matching devices may present a viable option to those who wish to optimize their receiver's performance without making any internal modifications to same.

Bill Kleronomos, KDØHG

Dear ER

Sorry to hear some people were upset with the old parts list for various reasons. It was a great help to me and several rigs were brought to life here because of it. Wasting phone calls or postage is just part of the game. Most of us spend time, fuel and even a motel bill to attend a distant hamfest, but we don't complain to the hamfest sponsor when we don't find something we want or someone beats us to it. As to the complaint that the Parts Unit Directory rigs should be "restored", anyone who says that should first personally inspect each rig on the list to see what they look like. This stuff isn't that rare yet!

Geoff Fors, WB6NVH

A Vacuum-Tube VFO from page 33

not critical. Its value should be at least 100 microhenries. I've found sometimes that a value of 90 microhenries may resonate with stray wiring and tube capacities to boost slightly the tube's voltage output between 160 and 80 meters. Radio Shack currently offers such a choke for 99 cents. Its catalog number is 273-102.

Applying the principles described above should result in a successful vacuum-tube VFO, with full break-in capability, that the homebrewer can use with confidence to drive that old Heathkit, Knight or Johnson Novice transmitter. On the air, CW operators accustomed to today's solid-state perfection sometimes indicate surprise when I tell them what I'm keying. **ER**

Heathkit Manuals Part 3 from page 21

WH9-61	7-1836	Adapter Cable
WH11-51	7-1836	Adapter Cable
WH-17	5-2195	Floppy Disk
WH-27	5-2167	Floppy Disk

The Heathkit Manual Cross-Reference List, Educational Products:

Model	Manual	Equipment
EB-1010	7-2023	Electronics Dictionary
EE-3105	5-2230	Oscilloscope course
EI-3133	5-1884	Soldering course
EK-1	5-253	Basic Electricity course
EK-2B	5-352	Basic Radio course, Part 2
ER-3701	5-2008	Amateur Radio Novice Lic. course
ER-3702	5-2249	Amateur Radio General Lic. course
ES-600	5-150	Function Generator
EUW-17	5-660	Transistorized Power Supply

The Heathkit Manual Cross-Reference List, Miscellaneous Products:

Model	Manual	Equipment
CS-2048	5-2181	Speed Control
GB-1201	5-1820	Digital Stopwatch
GB-1201E	5-1820	Digital Stopwatch
GC-1195	5-1886	Digital Floor Clock
GC-1197	5-1886	Bookcase Clock
GCA-1195	5-1896	Clock Chimes
GD-51A	5-728	Wireless Intercom
GD-160	5-1297	Intercom
GD-1187	5-1903	Touch Switch
GD-1246A	5-2364	Rechargeable Light
GD-1287	5-2067	Touch Switch
GD-1297	5-2458	Air Cleaner
GD-1776	5-1971	Heating Control
GD-3510	5-2453	Lighting Control
GDA-19-4	5-1230	Digital Servo
GDA-20-1	5-427	Garage Door Opener
GDA-47-4	5-954	Digital 5 Proportional Servo
GDA-1380-1	5-2007	Target Accessory
GP-1044	5-1585	Battery Charger
GTA-18-2	5-1097	Light & Horn Kit
GTA-101-2	5-1328	Lighting Kit
GU-1820	5-2571	AC Power System
ID-1290	5-1544	Weather Station
MI-1031	5-1439	Depth Sounder
MI-2900	5-1456	Fish Spotter
MI-2901	5-1457	Fish Spotter
MI-2916	5-2332	Depth Sounder
MI-2917	5-2333	Remote Readout
PT-1500	5-2236	Darkroom Timer
PTA-1500-2	7-1855	Dual Foot Switch

A 1927 Hartley Oscillator from page 12

used the 201A, 71A, and even older receiving tubes. A few people have used 100 watt transmitting tubes such as the UV203 and the WE-211D. But all these tubes are rare and expensive. While pondering this situation, it occurred to me that there is a low-power triode that is widely available at reasonable cost and that everyone has overlooked until now. I refer to the type 27, which RCA introduced in 1927. All the published data shows the tube used as a detector or class A audio amplifier so there was a question - how would it stand up in a ham transmitter? I built a breadboard Hartley oscillator and discovered that here was the answer for anyone wanting to get into the AWA 1929 QSO Party at low cost!

Part 2 of this article will give complete details on a simple 1-tube '27 Hartley oscillator that puts out 3 watts and which I used in the most recent 1929 QSO Party to work 27 stations. ER

NOTE: If you want to join AWA, write to Joyce Peckham, Box E, Breesport, NY 14816. Dues are $15 per year.

Plate Current Versus Maximum Power from page 13

tor in the 350 pF bank was shorted and one in the 150 pF bank was shorted. Each of the 2 capacitor banks was replaced with a 2500V mica. This did not cure the problem as the current dip was still not the point of max power. However, a little head scratching did indicate that if Q is low, the tank will not reproduce a sine wave from the Class C pulses it receives and the tuning range will be so broad that the resonant point (XC=XL) may or may not occur at the point of max power. So the C/L ratio has to be maintained at a certain level (Q = 12, typically, so the Q=9.5 above is marginal) to cause the minimum dip and the max power point to be coincident.

To help verify that the C/L ratio was the culprit, I checked for the Ip/pwr condition on bands other than 80M. On 160, 80 and 40M the problem existed, on 20, 15 and 10M there was no problem. In other words, the C/L ratio was adequate on the higher frequencies, even though some capacitor/inductor switching is accomplished on the different bands.

With these thoughts in mind and with all capacitors checking good (or replaced), the next place I looked was at the tank coupling capacitor, C37. This capacitor is in series with the Pi-Net, the Pi-Net input being approximately 982 - J150 (ideally 1000 ohms) when it is reduced using the conditions that exist on my unit when loaded at 3880 kHz. The coupling capacitor is 500 pF (*) and this value seems a little small for the lower bands. I replaced this cap (C37) with a door knob 2000 pF unit and this did correct the Ip/pwr problem. The 500 pF cap has an Xc of 80 ohms, four times that of the 2000 pF cap, thus having much more impact on the Pi-Net, making the C/L ratio worse.

(*) I later found that some Valiants have a 2000 pF capacitor for output coupling, so apparently at some later date Johnson made a change to their Valiant circuitry.

Summary: Try to keep a tank Q of 12 or greater for AM operation while a somewhat lower value is acceptable for CW work. Check the output capacitors - coupling and loading. **ER**

Heathkit Manuals from page 29

of 1970 and mostly repaired audio equipment, although occasionally I worked on other types of equipment as well. In 1974 I was promoted to a Technical Writer in the Manual Department, and advanced to Senior Technical Writer in 1976. This title was later changed to Senior Media Designer to reflect the times. During the 18 years I was in the Manual Department, I wrote or co-wrote the manuals for all product lines, including some 50 amateur radio-related products. I left the company in August of 1991 as Heath was phasing out the kit part of the business.

In June of 1994 my former boss invited me back to help out in the Educational Department, where I am still employed.

The Hallicrafters SX-18 from page 15

and I haven't been able to find any other S-14s around.

Despite the advertising claims the rejector seems hardly worthwhile. It would be my guess that the rejector was an expedient to fill up a hole in the panel and was a lot cheaper than a meter or a new panel. Otherwise the SX-18 is a nice receiver, a real step up from the S-19 and S-20, because of its great bandspread tuning and crystal filter. Even when they added bandspread to the S-20R in 1939 it didn't compare. But I think the SX-16 with the same great bandspread, and boasting an S-meter, at only $21 more, spelled the end for the Sky Challenger II. Whatever the reason I now have a nice experienced receiver and got my questions answered after 57 years. **ER**

CLASSIFIEDS

Advertising Information

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

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

VINTAGE EQUIPMENT ONLY

ER
P.O. Box 57
Hesperus, CO 81326 **Phone/FAX (970)247-4935**

DEADLINE for the MARCH Issue: MARCH 3

FOR SALE: Repair and restoration on all vintage equipment; 35 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

FOR SALE: Surplus military gear. New BA-386 batteries. SASE for current listing. Tim Banse, POB 2522, Iowa City, IA 52244-2522.

FOR SALE: "Introduction to Key Collecting", 64 page softcover illustrated guide - $11.95 ppd USA. Start now in this fascinating hobby. Artifax Books, Box 88-E, Maynard, MA 01754.

FOR SALE: New Ranger I, Valiant I & Navigator plastic dials, 160-10, freq. numbers in green, w/all holes, like orig. - $17.50 ppd. Bruce Kyder, 4003 Lauarawood La., Franklin, TN 37064. (615) 794-9692

FOR SALE: Nice front panel for CE-20A - $15; rare Drake HighPatch - $15. Both + shpg. Larry, W5VHP, 4212 Beacon Ct., Bartlesville, OK 74006. (918) 333-2891

FOR SALE: Drake AL-4 loop; Dymek DA3 AM broadcast ferrite loop antenna. Rick, N6NVG, CA (510) 687-2719.

FOR SALE: NC300 - $125; NC303 - $160; Apache - $120; Mohawk - $135. PU only. Ron, K1VYU, 179 Malabar Dr., Westbrook, CT 06498. (203) 399-5634 after 6 PM EST.

FOR SALE: Waters model 369A reflectometer, pwr meter, fwd & ref pwr to 2 kw, good condx. - $75. Cliff, W3LVC, MD, (410)-796-1070.

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 22075. (703) 822-5643

FOR SALE: Many radio tubes. **WANTED:** telegraph keys. Premium paid for "bugs" & rare, unusual, or unique straight keys or related telegraph items. Vince, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013. (800) 840-KEYS

FOR SALE: HT-32 - $150, PU; HT32A, parts. F.W. Nicholas, POB 37094, Phoenix, AZ 85069. (602) 864-9987

FOR SALE: T-368 one working & two for parts + a BC-939 & ME-165D. Lee, K7MBJ, WY (307) 587-9506 or 864-3286

FOR SALE: 110 issues Popular Electronics; 32 meters; 100 Electronics Books; 100 orig. Sams; 70 original owners manuals; 100 transformers & chokes; 51 crystals; 31 pieces test equipment; 67 pieces audio equipment; 16 pg list, LSASE. Clayton Vedder, POB 2823, Durango, CO 81302.

FOR SALE: Hallicrafter S-38-E, VGC, no manual - $50 + UPS (about $6). Ken Tountas, 2309 N. 51st St., Waco, TX 76710. (817) 772-7307

FOR SALE: Heath HW101 xcvr, w/ps, spkr, desk stand mic, mint - $175; Hallicrafters HT32A xmtr - $100. Prefer PU, otherwise + shpg. Bill Riley, W7EXB, 863W. 38th Ave., Eugene, OR 97405. (541) 345-2169

WANTED: Old meters & any aircraft stuff. Chris Cross, Box 94, McConnell, Il 61050.

WANTED: Urgently need copy of "The Phillips Code" formerly sold by Vibroplex. Will gladly pay any reasonable price. Thank you for your help. Donald R. Kelly, K7RM, 27973 Bush Ln., Scappoose, OR 97056. (503) 543-6548

WANTED: BC-969 rcvr; manual for same; Squires-Sanders SS1BS. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252

WANTED: JAN or Navy 860s & 861s, new or used, good or weak. William Donzelli, 304 S. Chester, Park Ridge, IL 60068. (708) 825-2630. integra@usr.com

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

WANTED: Hallicrafters SX-115. Bob Kemp, POB 470, Lake City, MN 55041. (612) 345-5345 d, 345-3600 eves

WANTED: XCU-303 crystal calibrator for NC-303 rcvr; Heath DF-2 Navigator 200-1620 kHz rcvr. Al Kaiser, W2ZVR, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: Johnson gear, all models, any condition. Please state asking price. Wen Turner, AD7Z, Box 451, Cal-Nev-Ari, NV 89039-0402.

WANTED: Drake 2BQ spkr/Q-multiplier for the Drake 2B. Myron Cherry, WM4Z, RT2 Box 159, Tahlequah, OK 74464. (918)456-9573

WANTED: Meter for Johnson Ranger II. Robert Hannon, N7LEH, 101 Roncroft Dr., N Tonawanda, NY 14120. (716) 695-8070

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

WANTED: Military sets, US GRC-13, ABK, APX-1; British WS No.21, Canadian WS No. 29 A & B sets. Leroy E. Sparks, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Eico 717 electronic keyer. Al Hubbard, WB9SAX, 1934 Fallen Leaf Ln., Los Altos, CA 94024. (415) 940-6304

WANTED: Johnson VFO 122; General Radio 650A impedance bridge manual. Manny Block, WØPIG, 70 Orme Ct., St. Paul, MN 55116. (612) 699-7932

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

WANTED: Octal sockets & small output xfmr's, used OK; 365 pF variable capacitors. Dave Dameron, KG6BP, 819 Boundary Pl., Manhattan Beach, CA 90266-4621. (310) 318-5311

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

WANTED: Centeral Electronics 200V xmtr. Greg Roecker, N4OSJ, 100 Chickering Prkwy., Roswell, GA 30075. (770) 552-0604

WANTED: Collins 312B-3 spkrs (2). John Miller, AK, (907) 337-9157.

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

WANTED: Collins 51S1, 18051, 75A3/75A2 parts source; 8R1 calibrator; front panels for 32S3A. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. 9412) 931-4646

WANTED: Rcvr's: Guthman U17, U50, Meissner 8-9, tube scout. Henry Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103.

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

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

WANTED: Main tuning knob for HRO-50; back issues of Electric Radio. Ron Beaver, 740 Brookdale Dr., Greer, SC 29651. (864) 879-3133

WANTED: Ameco VFO-621 for Ameco TX-62 xmtr. Fred, WØBMT, 205 E 4th St., Neligh, NE 68756. (402) 887-5201

WANTED: 1942 Radio Amateur call book. John McCollum, 6078 Price Rd., Loveland, OH 45140-9125.

WANTED: Hallicrafters HT-9 xmtr & spare parts. Robert Braza, N1IRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

WANTED: Meter for mil-spec HQ120X; straight cinch-Jones socket #S-312; manual/schem. for 51J2. John, KF7OM, NV, (702) 727-8171.

WANTED: Hallicrafter HT-1, HT-4 & HT-9 series xmtrs; reasonably priced QST/Handbooks 1932-1952. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439. ken.seymour@attws.com

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

FOR SALE: Used radio books, magazines, handbooks, databooks, etc., List $1 (stamps OK); tube list SASE. Softwave, 1515 Sashabaw, Ortonville, MI 48462.

FOR SALE: BC-650/1E-98/SCR-535, mint - $200. Gary, MN, (612) 496-3794.

FOR SALE: Allied AX190 rcvr, works ok - $50; 3 new Eimac 35T's - $15 ea; 4PR400 used, fil. good - $25; 2 new 592-200A3 Eimac - $25 ea. Don, WA6GYD, CA, (408) 378-3275.

FOR SALE: Type I-70-D tuning meters by US Army Sig Corps, all new sealed in orig. packing - $5 ea, you ship. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194.

FOR SALE: Shure T-30-V throat mics for US Army WW II & Army Air Corp, NIB - $15 ea, you ship. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194.

FOR SALE: BC-645-A (IFF) w/conversion manual to 420-450 mc, new in orig. box - $30, you ship. John Snow, 4539 N. Barlett Ave., Shorewood, WI 53211. (414) 964-0194.

FOR SALE: Cleaning house, SAMS photofacts - 50¢ ea in lots of 10, you ship. SASE for list of 1 thru 1500. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194.

FOR SALE: Vintage Airborne equip., Narco modulator-pwr units (2) model V12 MP-2A - $15 ea; Narco rcvr model LFR-3 - $15; Piper OMNI model 01 - $15; Ranger rcvr/interphone model 114C - $15; radio compass indicator I-82-F - $15. All units, you ship. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194.

FOR SALE: Viking Challenger, G - $50; HT-40, VG - $75; HQ-180C w/manual & spkr, VG - $275; HG-10B, G, VFO - $30; HW-16, needs work - $25. All + shpg. Jim, KC5GWU, NM, (505) 325-3557 d, 334-8063 eves.

FOR SALE: Eico 324 sig. gen. - $30; Atwater Kent model 46; 8YP4 & 5AXP4, new picture tubes - MO. Jack, KL7GKY, OR (541) 839-4423.

FOR SALE/TRADE: SX42, 51J, R388, S118. **WANTED:** Dark NC183; Select-O-Ject. Sam Champie, KD7XX, 105 W. McKenzie, Hermiston, OR 97838. (541) 567-2879 wk-ends only.

FOR SALE: Hammarlund HQ110, manual, exc.; Zenith 9-band Transoceanic radio. $125 each. Jack, W9FQK, AZ, (520) 634-2028.

FOR SALE: Collectors: mint Eldico S-119 Collins S-line clones, T-102, R-114, P-109 ps, M-135 CU. All new, factory fresh tested by unused, w/manuals - $800 ppd. Pete Patton, W3EWQ, PA, (215) 898-1787 (d) or message.

FOR SALE: SP600JX rcvr w/genuine Hammarlund cabinet, xtra nice & works perfectly - 500 kc to 55 Mc; Heath SB102 xcvr w/SP600 spkr, HP23 pwr sply, collector condx. - $295; SB101 w/HP23 sply, xtra clean - $245; SB401 xmtr, SB301 rcvr, w/xtal pack, + CW, SSB & AM filters & matching Electrovice 638 desk mic, spotless condx. - $375; HQ-100 rcvr, VG - $175; SX122 Hallicrafter rcvr, near perfect - $175; DX60B & HG10B, like new - $135; Cubic-Swan HF xcvr model Astro 102BX w/PS6 pwr sply-spkr, 160 thru 10 built in watt meter/SWR meter, dual VFO's, passband tuning notch, speech processor, looks & operates new, collector item - $500; HW12A monobander w/AC or DC sply, mic, bracket, very clean - $125; Hewlett Packard HP612 sig. gen. 450 to 1200 Mhz, a steal at 75 but weighs 85 lbs or so. Dick, W4NFN, WI, (715) 866-8704.

FOR SALE: New mechanical filters: Ditmore-Freimuth type 2850-AY39B, P/N DF 500-L-2.7-A - $50; Collins type F455 Q 5 8 S 2, P/N 526 9367 00 - $90; type F455 N 40 3 V 2, P/N 526 9160 009 - $75, shp'd in USA. Clint Hancock, KM6UJ, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: Navy WW II fighter instrument panel w/gauges, VG - $300 PU only. Jim Riff, K9JSC, 81 N. Ela Rd., Barrington, IL 60010. (708) 576-7832.

FOR SALE: Heath filters, 3395 kHz IF, AM & CW - $65/pair ppd. Dan Merz, 312 Sierra, Richland, WA 99352. (509) 375-1334.

FOR SALE: RME-69 w/DB-20 preselector, fair condx. - $200; SW-3 w/coils & spare forms - $250. Can trade for other interesting items. Pat Keogh, WB9GKZ, 3767 Fairview Rd., Green Bay, WI 54313. (414) 434-9016.

FOR SALE: Books & manuals: mint 4th edition RCA Designer's Handbook; Elgar 351SL & 501SL; HP 214B pulse generator; Sorensen DCR-B series, 500 watt; Fluke 8050A; HP 8900C; HP 5238B; Simpson & Triplett VOM. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075.

FOR SALE: Communication: Collins 75S-1; KWM spkr; 51S-1 spkr manual; Hammarlund HQ spkr; US Navy R-1/ARRL; National 2 meter convertor; Heath VFO; old CB Webster 4-11 & Tealberry tele "T"; 15 assorted plug-in coils; Western Electric 242 A tubes in cermic EF Johnson tube sockets. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075.

FOR SALE: Radio parts, old & new, tubes, galena crystals, etc., very low prices. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: Vintage equipment: Johnson; National; Hallicrafters; Hammarlund; GPR-90; Racal 17C12; Scott; RCA. Ozona Bob, W5PYT, POB 1105, Ozona, TX 76943. (915) 392-2585

FOR SALE: 32V-3 - $700; 75A-2 - $400; 51J-4 - $550; R-388 w/product detector - $500; HQ-170 - $300; SP-600-JX - $450; T-Bolt - $700; Valiant - $400; 100-V w/maint. & mods by Wes Schum - $500; TS-820-S - $375; Knight T-150 - $125; Globe Scout 680A w/WRL VFO - $150; Globe Chief 90 Deluxe - $75; Elmac AF-68 - $100; Lafayette HA-225 - $100; Heath Twoer - $50; 1949 Motorola 7-inch TV - BO. **WANTED:** R-390, R-390A, CV-591A, 75A-type rcvrs, R-388, 51J-4. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (313) 454-1890

FOR SALE: World's most popular WW II only communications merchant, over 1300 past customers worldwide, huge inventory, earn our free "Historic Military Communications Award" completely revised 1996, 50 page catalog - $2 US, $5 foreign. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244

FOR SALE: 4-1000A new sockets - $30; NOS 866As - $5; 6360s - $5. **WANTED:** 810 sockets. Norm Roscoe, POB 402, West Bridgewater, MA 02379. (508) 583-8349

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

FOR SALE: Compactron adapters - set of (2) adapters which allow 9-pin & 12-pin compactron sweep tubes to be tested on TV-7 type tube testers. This lets popular tubes such as 6JB6, 6JE6, 6JF6, 6JM6, 6JS6, 6JU6, 6JZ6, 6KD6, 6KM6, 6KN6, 6LB6, 6LF6, 6LQ6, 6LR6, 6LX6, 6ME6, 6MJ6, 12BJ6, 20LF6, 21JS6, 23JS6, 24JE6, 27LF6, 30KD6, 40KD6, 8950, 7868 be tested on TV-7 testers which do not have compactron sockets. Tube test setup & test data are supplied for the TV-7 tester series only. This includes switch settings & bias values as well as minimum & 'as new' test values. (2) adapters as well as tube test info & pin-out conversion data are supplied. Please send $25 to: Daniel Nelson, 1025 E. Desert Ln., Phoenix, AZ 85040. (602) 243-7421 eves. E-mail: djn@indirect.com

FOR SALE: DX-100B w/mod. for sideband adapter, exc. condx., no visible wear - $275. Carlton T. Rand, W1PZL RR1 Box 209, Epsom, NH 03234. (603) 736-9695

FOR SALE: Heath SB-104A, CW filter & DC supply - $300, U-ship. Ken Kolthoff, K8AXH, 5753 David Place, Fairfield, OH 45014. (513) 858-2161

FOR SALE: Johnson Pacemaker - $300; RCA AVT112A, AVA126, AVA120 - $150; signal gens.: TS497B - $50; 1130 - $30. Mel, K2AOQ, 100 Stockton Lane, Rochester, NY 14625. (716) 671-0776

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: 6 & 2M converter supplied w/ Hallicrafter SX101A, takes pwr from set. John, W3WOD, 6605 Altamont Ave., Baltimore, MD 21228. (410) 747-2469

WANTED: Gonset G28 10M xcvr for cash or trade for some rig I have. Don, K5DT, TX, (903) 893-5357.

WANTED: Schematics Hickok 188X, RCA WR-49B, Heath HR-10 cal knob; VF-1 dial scale. Jack Bertholf, WA4CSM, 8109 NW 58 Ct., Tamarac, FL 33321. (305) 721-2337

WANTED: Coil "E" for the HRO-60. Will pay your price. Please help. Richard J. LaMark, N2TXL, 6822 Tuckahoe Rd., Williamson, NY 14589-9589. (315) 589-2552

WANTED: Unused 5907 & 7761 tubes for PRC-47 radio set. AA7W, 13428 29th Ave. SE, Bothell, WA 98012. (206) 261-7334

WANTED: Navy xmtrs: TBW, TCE & TCX; rcvrs: RBD & RAX or any accessories. Steve Finetti, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: Collins S-line filters F455FA-05 (part #546-9494-00) &/or F455FA-08 (part #546-9446-00). B. Lee Cornwell, KD3KD, HCR 1, Box 95, Mt. Pocono, PA 18344. (717) 839-2710

WANTED: Philmore AM/SW regen kit type radio 1957-62, Philmore catalog 1960s. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. MSG# (707) 523-9122

WANTED: Teletypes and any other teleprinter machines, parts, literature or information from the 1940's to the 70's. Gary Ashbaugh, POB 2008, Corvallis, OR 97339. (503) 758-8006

WANTED: National Co. catalogs, brochures, & manuals (military, government or consumer) from any era. Wayne Childress, KC7KUE, 1903 Jerome Pl. #3, Helena, MT 59601. (406) 443-7255

WANTED: Orig. working pwr xfmr for NC-183D; mic preamp subassembly for Harvey-Wells Bandmaster. Gary, WA5NCX, TX, (713) 787-0040.

WANTED: RAS/HRO spkr; S meter 19408 HRO; RAS coil #6 (7-14 Mc); Heathkit-SB-640 VFO/AR-3/HW-8; Johnson-Adventurer/122 VFO/Challenger; LS-3 spkr; BC-456/MD-7 modulator; FT-221/FT-154/FT-225 shockmount; Gonset-Monitone; SBE codapter/VOX/LA-1 AMP/SBE-34; Globe Scout 65/66; Chief-90; diagram ant tun. unit CG-CU-1208/URC-51. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. (707) 523-9122

WANTED: GE Tungar charger bulb #189048, Mogul base; GE K-82 chassis & spkr for a GE Georgian grandfather clock radio; AtwaterKent tapped variometer for AK breadboard radio. Ed Allison, 5525 20th Ave., Sacramento, CA 95820. (916) 454-1788

WANTED: BC-454/ARC rcvr, will accept modifications. B. Johnson, 195 Royal Ridge Way, Fayetteville, GA 30215.

WANTED: Schematic & any info on Claricon 15-500A handheld 27 MHz; Sams photofact CB 23 book or copy. Al, A4U, FL, (407) 298-3493 eves.

WANTED: Collins 75A-3 in good working condx; 350C-60 filter for my 75A-1. Call ACTY anytime - CT, (860) 675-5566.

WANTED: Chicago xfmr, CMS-3 mod. xfmr (500 watts as used in the Johnson Desk KW). Also looking for a parts SX-88 or its cabinet. Jay Spivack, 325 S. Washington Ave., Kent, WA 98032. (206) 859-2680

WANTED: Heath HRA-10-1 xtal calibrator for use w/ HR-10B rcvr. Ros, WB0GKL, 355 Animosa Dr., Durango, CO 81301. (970) 259-0785

WANTED: Orig. Collins 8R-1 calibrator. David Clark, K5PHF, 9225 Lait Dr., El Paso, TX 79925. (915) 591-4184

WANTED: Drake C-line, TR4CW/RIT, 2B, late production, very clean. KB0W, 11456 Fortyniner Cir, Gold River, CA 95670. (916) 635-4994

WANTED: Technical correspondence getting Collins URC-1 system running. Have 310V-1, 548L-4A, 490T-3, 914H-1 remote for trade; need 671B-1 rack, 618Z-4, 789X-1 units. Have many manuals. Byron, WA5THJ, 1215 Fresa, Pasadena, TX 77502. (713) 941-3631

FOR SALE: C-line/NB/filters/MN2000 - $675; T195 - $125; 75A-4 - $750; CE354 VLF - $325; R389 - BO; HT40/HG10B - $100; T-150 - $50. **WANTED:** Jones paddle, SX73, HRO-60. Ward Rehkopf, K8FD, 116 Fairway Dr., Belmond, IA 50421. (515) 444-4396

FOR SALE: Hallicrafters SX-100; Heath DX-100, exc. condx. - $250 for both. Don Dobbin, K8POU, 6233 E. T Ave., Vicksburg, MI 49097. (616) 649-4646

FOR SALE: Announcing "Radio by Hallicrafters", the definitive book on the Hallicrafters Company & it's products, by Chuck Dachis 'The Hallicrafer Collector'. More than 200 pgs, over 600 photos & 10 years in the making. Available late March 1996, at $29.95 + S&H from Schiffer Publishing Ltd, 77 Lower Valley Rd., Atglen, PA 19310.

FOR SALE: Hallicrafters SX-101A, very nice, possible trade, mint HT-32A xmtr, orig. book, possible trade. Fred Clinger, WA8KJJ, OH, (419) 468-6117 after 6 PM EST.

FOR SALE: Mech filters: F455J-15 - $185; F455FA-21 - $55; LSB for PRC-47 - $50. **WANTED:** PP-1175/SR. Joseph Pinner, KC5IJD, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766

FOR SALE: Clegg Venus, near mint w/ps - $280. Cory, N2AQS/AFA4TZ, 1000 E., 14th St., Bldg 178, Plano, TX 75074-6249. (214) 751-7535 24 hrs. hinec88cgate.dl.nec.com

FOR SALE: New list - hundreds of manuals, schematics and service information. Send 2-stamp LSASE. David Crowell, KA1EDF, 40 Briarwood Rd., North Scituate, RI 02857-2805. (401) 934-1845

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

FOR SALE: Heathkit, RCA, Regency, parts, manuals, much more. SASE for list. John Hruza, KB0OKU, 2521 S. Holly St., Denver, CO 80222. (303) 758-4377

FOR SALE: NOS 2E24 tubes; Collins SSB manual. **WANTED:** Mobile rcvr, pre-1940 Q5'r's. Eddy Swynar, VE3CUI, 3773 Concession Rd. 3 RR#8, Newcastle, ONT L1B 1L9, Canada.

FOR SALE: General dynamics 1051B rcvr - $195; Sony 2010 rcvr - $195; Telefunken short wave radio - $50; WE 701A tubes w/socket - $20; 4CX250B pulls - $25; loads of old tubes, inquire. John Kalstys, 18 Hillcrest Terr., Linden, NJ 07036. (908) 486-6917

FOR SALE: R-390A/URR orig. Dec. 1961 maintance manual TM 11-5820-358-35, 189 pgs - $28 incl. priority mail. Aben, POB 4118, Jersey City, NJ 07304.

FOR SALE: Hammarlund HQ-129X, VGC - $125; Hallicrafters WR-1000 - $60. **WANTED:** Electro-Voice 664 mic w/stand. Herb Ellmers, 775 Howard St., Ft. Pierce, FL 34982. (407) 466-0926

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

WANTED: Old microphones, w/w-out stands, in any condx. Rick, KF5NU, 9031 Troulon Dr., Houston, TX 77036. (713) 774-5102

WANTED: E.F. Johnson 100D70, 100DD90 capacitors, UTC CG309 or LS185 plate xfmrs. Martin Piepenburg, W9OLD, RR 1 Box 56B, Monterey, IN 46960. (219) 542-2591

WANTED: Data sheet or info on how to use UTC CVM1 modulation xfmr. Bill, 119 Ivy Brook Ln., Chapel Hill, NC 27516. (919) 967-3576

Licensed at least 25 years ago ?
And licensed now ?
Then you should belong to the
Quarter Century Wireless Association
For information write :
159 E. 16th Ave
Eugene, OR 97401-4017

WANTED: Intelligence museum wants German, Japanese, Italian, Russian and Chinese communication equipment and any British or U.S. spy radios. LTC William Howard, 219 Harborview Lane, Largo, FL 34640. (813) 585-7756

WANTED: Interesting Navy stuff, xmtrs, rcvrs, radar, etc. Bigger is better! Surprise me! William Donzelli, 304 S. Chester, Park Ridge, IL 60068. (708) 825-2630 integrat@ustr.com

WANTED: Collins xmtr's KWS1, 32V2, 32V3, any Collins spkr's. Can arrange PU or will pay packing & shpg. Ron, W6HFZ, 13169 Briarwood St., Cerritos, CA 90703-7368. (310) 860-3623

WANTED: Pwr sply for the Heath single banders, either Heath's own (HP13 & HP23) or others (homebrew OK) capable of running them. Need both 12V & 120V supplies. Jeff Dantemann, KG7JF, 6840 E. Lowden, Cave Creek, AZ 85331. (602) 483-0192 x202

WANTED: Manual or schematic (copy OK) for RBA Navy rcvr. John Richardson, KB0UPL, 1163 Highland Pl., Dubuque, IA 52001. (319) 556-5504

WANTED: Mod. xfmr, Stancor 10P31, for Hallicrafters HT6 xmtr. Equivalent or parts unit considered. John Zitzelberger, WB6JJE, 1673 Devonshire Ct., Thousand Oaks, CA 91361. (805) 449-1036

WANTED: 4 kc AM filter for Drake R4C, trade CW filter or Collins F455-31. Paul, K5HMN, Box 101, Elephant Butte, NM 87935. (505) 744-5667 eves.

WANTED: Meters for RT67 & 68; handset for same, H-33F/PT. Bill, KA9CWK, 4146 S. Goff Rd., Hillsboro, IN 47949

WANTED: RT-136/GRC-12 military xcvr, made by RCA. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Information from the following WRL catalogs: 1950, 1963 & 1968. If you can help call - Leo Meyerson, WOGFQ, CA, (619) 321-1138.

WANTED: Hallicrafters S-40, 52, 77, SR30A, S-72L. Radio should be orig, & in exc. condx. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, Japan. FAX: 011-8145-301-8069

WANTED: Bandswitch knob for Hallicrafters SX-28. Karl Dasland, KA1RM, POB 3420, Westport, MA 02790. (508) 636-3281

WANTED: Millen 90801 exciter/xmtr; pwr splys; Bliley 100 kc xtal FM6-S; Hallicrafters SX-II dial plate; National SW-3 first model, 6 & 2 volt versions. Dean showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: For my ailing Heath HW-101: dial drive mechanism (Jackson Bros.); HP-23; SB-600. T. Zelasko, KA8GEF, 9401 Grand Division, Cleveland, OH 44125. (216) 883-5134

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: Data on Stancor 55C0328 mod xfmr, 2-STC-45 stamped on end bell, 300-400W. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

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

WANTED: MW/BCB rcvr mil R24/ARC-5 or equiv. Mike, AC5P, POB 33, Bartlesville, OK 74005. (918) 333-2795

WANTED: Manual/schematic Sonar SR-9 mobile rcvr (1951); 2, 6 & 10 meter models. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: GF-11 xmtr; BC-348-Q rcvr, in good condx. Mike, WØBVA, Box 121, Scammon, KS 66773. (316) 479-2756

WANTED: Hammarlund S200 spkr w/or without cabinet; spkr to match HQ-150. Bob, K8RNE, OH. (216) 322-8722

WANTED: HQ170A w/manual, very clean; Ranger I or II, very clean. Both working good. Eugene, W7MXM, ID. (208) 522-5854.

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: NC240D w/spkr, working but xmtr over heats - $25 + shpg. Dave, K2DK, 2526 Little River Rd., Haymarket, VA 22069. (703) 754-9376.

FOR SALE: Small collection of vintage radio gear & literature. Includes SX-71, R-46, GRC-109, home-brew linear, QST, CQ & much more. SASE for list. All for one price. PU only. Dave Mantor, W9OCM, POB 1, Fairmount, IN 46928-0001.

FOR SALE: Valiant, needs work - $150; Navigator, exc. - $175; NC-300, good - $250; SB-610 scope, mint - $125; HM-102 SWR/Pwr, great - $50; Astatic D104 - $40. Clint, KB5ZHT, 107 Forest Oak Ln., Lake Jackson, TX 77566. (409) 297-3338.

FOR SALE: Military TS-148/UP spectrum display, untested - $39; SCR-274N FT-220A 3-rcvr command set rack (black), no shock, good - $90; #19 Mark II spare valve chest, missing 1 tube, nice - $49; Western Electric BC-AR-429 pre-command set aircraft TX w/C-376 coil, good - $69; Wireless Set #19 Mark II tank radios (2) untested - $70 ea. WW II Navy DAG HF direction finder, looks & works great - $215; BC-683A FM tank RX, looks great, electrical mods but no holes, working - $40; Boonton military TS-155C/UP UHF sig gen., brand new in orig. steel carry case, 1948, no accessories - $49. Don Metz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819.

FOR SALE: Collins KWM1 w/516F1 - $1050, US; Collins 312B5 - $525, US. Both VGC. Lorne, VE7BOX, Canada, (604) 675-3338, phone or fax.

FOR SALE: Johnson 6N2 xmtr - $40, 6N2 conv. - $25. As is, no manuals. Clem, W8VO, MI, (810) 795-4670.

FOR SALE: National NCX-1000, factory incomplete unit, w/meter, hardware, RF components, etc. - $75 shpd. George, K1ANX, MA, (413) 527-4304.

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

---

FOR SALE: Heath HW-16 novice band transceiver, good condx. w/manual copy & 10 xtal's - $75; Hammarlund HQ-125-X general coverage rcvr, VG w/orig. manual - $125; National NC-183 gen. coverage rcvr, VG w/ori. manual & lge matching spkr - $175; Knight TR-106 6-meter xcvr, VG w/ manual copy, hand mic & V-107 6 & 2-meter VFO - $115; Heath SB-610 monitor scope, VG w/manual copy - $115; Micromatch model 262 indicator unit, either wish to buy coupler or wish to sell indicator, exc. - $25. Clyde, N7IOK, AZ, (520) 323-1120.

FOR SALE: 575A tubes Sylvania, new; solid state 575A-S, new; solid state 866A-S, new; 4-400 pulls - $20; HP distortion analyzer - $75; 7/8 Andrew N (F) connector. Bob, K2LGO, NY, (516) 722-5737 until 8 PM EST.

FOR SALE: HP-536A wave meter - $110; Viking Valiant - $325. Fred, We9KM, 17890 Sharon Ct., Pine Grove, CA 95665.

FOR SALE: Autotransformer, 250 volt primary, 0-250 out, 1.5 KVA, 6 amps. Francis Waggoner, W2PTI, 268 Barben Ave., Watertown, NY 13601. (315) 788-1621

FOR SALE: HT-6 orig. man. - $150; Gonset G-50 - $125; HRO-60, A-F - $450. Bill Schmidt, 9925 S. Broadway, St. Louis, MO 63125. (314)-544-1515

FOR SALE: RCA/BTA1MX, 1 KW,AM xmtr - $1200; B&W5100 & Matchmaster - $300; DX100 & manual - $175; BC-939 ant. tuner - $225; have 4 home brew amps HF - $300/700; 1.2M - $200; Triex W7I twr - $300; Robin BX 52' - $250; Ham M rotor & control - $250; HQ-170C - $200. U-ship. Dan Arney, KN6DI, 18401 Chase St., Northridge, CA 91325-3610. (818) 886-2382

FOR SALE: National NC-183D - $300; Knightkit VFO - $50; Eico 720 - $60; National NCX-5 - $250. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

FOR SALE: Heath SB-220 manual - $15; Hammarlund HX-500 manual - $12; Heath AM-2 SWR, mint - $25; Heath VF-1 manual - $8; Heath GD-II mobile ps for Sixer & Twoer - $35; Signal Shifter - $55; DX-100 - $100; Johnson var. caps, NIB - $20 ea; Johnson Viking Ranger II manual - $15; Heath VX-1 VOX unit - $40. Marty Drift, WB2FOU, POB 21, Blawenburg, NJ 08504.

FOR SALE: McMurdo Silver 703 bandpass freq multiplier, 80-6 meters, w/homebrew heterodyning 80M VFO - $65; TCS-12 xmtr & rcvr; rcvr w/ps & spkr, both work - $125. Mike, WA7NI'A, WA (360) 837-3560

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: Used tube list, good selection and quality, SASE. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

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/TRADE: NC183; Drake T4XC/MS4 pwr sply; HW16/HG10; Collins parts new 70K-2 PTO; plastic dials; 30L1 xfmr, new Collins #662-0010-00, new wafer SW; SB-301/401 combo. Joe, K2QPR, FL, (407) 220-7362, anytime.

FOR SALE: Surveilance & specialized rcvrs, digital frequency & spectrum displays; Watkins Johnson, Astro, manuals. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

FOR SALE/TRADE: Hallicrafters HT-18 xmtr, nice; S-22 rcvr, good. Fred Clinger, OH, (419) 468-6117, after 6 PM Eastern Time.

FOR SALE: National R115 rcvr; Heath HX10 xmtr; BC375 xmtr; BC639 rcvr. PU only. Howard Hood, 5670 SW 44th St., Port Orchard, WA 98366. (360) 674-2179

FOR SALE: Manuals (copies): Ocean Hopper, WRL UM-1 - $7.50 ea; QF-1, BC-348, S-20R - $6 ea, DX-20, DX-40, HR-10B, FT101E - $10 ea; GR-54 - $13; LSASE (2 stamps) for complete list. David Crowell, KA1EDF, 40 Briarwood Rd., North Scituate, RI 02857-2805.

FOR SALE: Hallicrafters HT-33A linear amplifier, full output, exc + condx. - $500 PUonly; Eimac 4-1000PR, tested, full output - $125 shpd; Eimac 4-1000, tested, full output - $100 shpd. **WANTED:** 3-1000 tubes; BC-610 coils for 160 & 80; HR-8 plate cap (for 3-1000Z). Marc Chicoine, WC1X, 641 East Main Rd., Middletown, RI 02842. (401) 849-8531 eves. BRQ634888RAYTA1.DCRB.DLA.MIL

FOR SALE: The AWA Review, Vol. 9 (1995) - $12 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (847) 679-8641

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.

WANTED: Any condition, Hallicrafters S-35 panoramic adaptor and S-33 Sky Trainer as shown. Chuck Dachis, 'The Hallicrafter Collector', 4500 Russell Dr., Austin, Texas 78745. (512) 443-5027

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

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

FOR SALE: Tubes, capacitors, sockets, NOS and reproduction parts for antique radios and TV's. Large SASE for tube list or $2 for 20 page catalog refundable with 1st order. Vintage TV-Radio, 3498 West 105 St., Cleveland, OH 44111.

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: Collins 351D-1 mobile mount for KWM-1 - $85; HP 410B VTVM - $70. Jerry, KB7M, 519 E. Flint St., Laramie, WY 82070. (307) 742-4033.

FOR SALE: NC101X, spkr - $275; HRO 60, spkr, needs work - $375; Eico 723 - $50; SX101 MK III - $225; B&W 5100B - $375; Realistic DX 150 - $65; NYE Viking tuner MB II - $325; Globe Scout 680A - $75; Argonaut 509 - $265; Hallicrafters HT-18 - $60; Heath AM-2 - $25; Heath SB300/SB401 - $275; Hunter Bandit 1000A - $400; MFJ 949B Versa tuner II Deluxe - $75; Harrison KW dry dummy load, meter - $95; military handset H-350/U - $10; Bird coax switch model 74 - $75. Many others, free list, call/write. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454.

FOR SALE: Green plastic dial for Hallicrafters S-40, good condx - $6 ppd. Frank Hill, WA6SYI, 1313 Milton Ave., Walnut Creek, CA 94596. (510) 939-2940.

FOR SALE: R1051 rcvrs, exc. condx, cleaned, completely checked, various models to choose from. Shawn Daniels, (314) 343-5263.

FOR SALE: Radio tubes; repair and restoration of all vintage amateur and commercial radios, 25 years experience. Herbert Stark, 321 N. Thompson St., Hemet, CA 92543. (909) 658-3444.

FOR SALE: Collins CC-2 (RE) carrying cases for KWM-2/30L-1, NIB - $73; KWM-2 meters, NIB - $30 factory sealed 4D32 finals - $39 shpd; reconditioned CU-168 rcvr multicouplers - $35; Collins 416W-1 dynamotor/pwr splys - $35. **WANTED:** SCR-32 info. Lowell Thomas, AA6ZD, POB 15026, Fresno, CA 93702. (209) 227-1605.

FOR SALE: Genrad 1330A bridge oscillator, 5 kHz-50 MHz - $169; 1650A RLCDQ bridge - $185; more, list- LSASE. Kirk Ellis, KK4YP, 203 Edgebrook Dr., Pikeville, NC 27863. (919) 242-6000 eves.

FOR SALE: URM-25 - $140; URM-90/ZM-30 - $135; 2 synchros w/new MN-50E bearing indicator/cable - $75 + shpg. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (520) 624-8029.

FOR SALE: Manuals professionally reproduced for SP-600-JX-17 - $22; SX-28 - $19; AR-88D/F - $28; RCH - $21; TV-7 - $15; TS-323 - $17. Call for shpg. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (520) 624-8029.

FOR SALE/TRADE: 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 wrk.

FOR SALE: Collins CP-1 - $140; KWM/325 xtals - $8 ea; 312B-4 (R) - $225; PM-2 - $85; Heath 2140 wattmeter - $55; Swan-210 VFO - $150. Bill, WA1APX/8, MI, (810) 781-9717.

FOR SALE: HP-606A RF signal gen., 0.05 thru 65 MHz, calibrated output attenuator 3 volts to 1 millivolt, meters for output level vernier & percent modulation, CW & AM at 400/1000 Hz, xtal calibrator at 100 kHz & 1 MHz, 17 tubes, push-pull VFO & buffer, regulated supplies, very stable, table top case, good running order - $130; HP-606B, newer model, same specs plus added fine freq. vernier, freq. counter output, solid state regulation, very nice condx. - $145; AN/URM-25D military RF signal gen., 0.01 through 50 MHz, metered, freq. counter output, compact & rugged, CW & AM at 400/1000 Hz, good running order - $85; Logimetrics RF signal gen., 0.05 to 80 MHz, regular bells & whistles, solid state, digital freq. readout, new old stock - $175; military rack mount HRO items: rcvr - $70; pwr sply - $55; coil box w/ 7 coil set - $75. The case exteriors for HRO items have some weathering, were painted gray, as is, preference single buyer; TEK 7000 series scope plug-in extenders: rigid unit - $140; flexible cable unit - $150, very good physical & operating condx; TEK 6013 high voltage scope probe/case, 1000X, 12 kv, approx 80 MHz - $70; Interstate Lin/Log (1000:1) sweep function generator, solid state, 3 MHz - $100; TEK TM503 3 bay cabinet, hold 3 each 500 series plug-ins - $60; TEK FG501 function generator - $85; Bird 300 watt 50 ohm coaxial dummy load - $45. Parts sets, as is: S38 rcvr - $15; Hickok Cardmatic 118B (tester only) - $50; HP-606A - $50; HP-412A - $15; Heath HR-10 rcvr - $15; HP-200 CD - $20; HP-3400A rms voltmeter - $35; Shugart 800 8" drive - $15. + UPS for all items. **WANTED:** HP-4800 vector impedance meter; extender/calibration cable set (Service kit HP-11592A) for HP 1415/855X/8552B spectrum analyzer, TEK P6009 or P6007 100X scope probe; also tubes: 75TH & 6000. Will buy or trade. Stan Krumane, KO6YB, 16432 Lakemont Lane, Huntington Beach, CA 92647. (714) 841-5866

FREE: Need antique radio/transmitter parts, tubes, schematics, repairs? For flyer send 2-stamp LSASE to Olde Tyme Radio Co., 2445 Lyttonsville Rd., Ste 317, Silver Springs, MD 20910. Phone/Fax (301) 587-5280

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

FOR SALE: Rare Collins prototype 30S-1 amp. - offers, cash or trade. **WANTED:** WW II Japanese radios, German HROs & Squires-Sanders equip. John Orahood, N5SPQ, 5819 Miller Valley Dr., Houston, TX 77066. (713) 440-5998

FOR SALE: Rare Collins 30K-1 AM xmtr, complete w/all coils, tubes, instruction manual & matching 310A-3 exciter, cabinets are in exc. condx. I have many spare tubes including 4-125A finals. Must be seen; Collins 51J-4 rcvr w/1.4, 3.1 & 6 kc filters, cabinet, orig. instruction manual & matching 270C-3 spkr, cabinet is exc. - serious offers on the above please. Local PU only; Electronic Measurments Corp. model 206 tube tester in wood case - $125; RME speech clipper - $35; Echophone EC-1 rcvr - $40; Turner 33X microphone - $45; Astatic T-3 microphone - $45; rare Astatic model 1296 circa 1931 - offers; National spkr, black crinkle cabinet, red enamel emblem, some rust - $50; homebrew rotor control w/lge compass dial, black crinkle case, matches older Collins - $50; pair of Eimac 304-TL/VT-129 tubes, new - $65; pair of 100TH tubes, new - $90; RCA 4-1000A - $85; Raytheon 4D32 tubes, NIB - $50; Eimac 4-400A, NIB - $50; Eimac 4CX-1000A tested full output - $95. Will consider clean, late model S-line in partial trade on 30K-1/310A-3. Steve, NI2C, NY, (914) 693-3669, after 8 PM EST.

FOR SALE: TU-6-B w/CS-48 - $25; other military equip., tech manuals, 1945 Handbook, CQ, QST, 73, old callbooks & other radio books. LSASE list. Patrick Marineau, K9HF, 5055 -1/2 Lakewood Ave, St. Louis, MO 63123. (314) 752-3611

FOR SALE: Heathkit lives on in historical anecdotes by employees. Quality 124-page illustrated book. $9.95 postpaid. Heath Nostalgia, 4320 196th S.W., Suite B-111, Lynnwood, WA 98036-6754

FOR SALE: Fan bracket for KWM-2/32S-? lowers the internal temp 20° C using two 60mm micro-bower fans (ER#71). Drop-in, no mods - $15; replica Ocean Hopper front panel - $20. All ppd. DWI Engineering, POB 3611, Costa Mesa, CA 92628-3611.

FOR SALE: Ham Price Guide, introductory price - $9.95. Over 3000 items of ham gear identified & described from model names & /or number. Over 6000 real & dated prices. Prices for over 2500 different items. Boatanchors through HT's, linears, tuners, mics, pwr splys, antennas & more. Use also to decipher those cryptic ad descriptions. $9.95 includes US postage, $11.50 Canada, $14.95 other countries. Californians add tax. Tube Type Transmitter Guide, still available, $17.95 US, $19.95 Canada (21 ounces). Please mention ER. Sound Values, POB 9, Auburn, CA 95604.

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

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

FOR SALE: National FB-7 no sply - $295; Heath DX-100 - $195; Hallicrafter TW-1000 - $125; Sky Champ - $50; SX-99 - $50; S-38, very nice - $65; ARC-5 xmtr, new - $45; CE 100V xmtr - $295; Fisher tube amp model X-100B - $75; Drake 2B/2BQ/calib. exc. - $150; TR4C/AC4/MS4 - $275; R4B/T4XB/AC4/MS4 - $300; collector quality Globe Chief Deluxe - $95; Collins 3253 - $395; 75A4 gear reduction assy. - $100; 18081 coupler, new - $295; Collins parts. Ron Follmar, K5GIT, 332 Camino Real, Kerrville, TX 78028. (210) 896-8830.

FOR SALE: SX-62 - $95; R-42 spkr - $80; HA-1 keyer - $50; Sprague TO-4 - $35; ARC-5 RX dynamotor - $12; Master Mobile Matcher, as is - $10; Morrow Falcon rcvr - $60. Joe Sloss, K7MKS, WA, (206) 747-5349.

FOR SALE: Copy of National factory SW-3 manual - $5 + $2 shpg; SW-3 plug-in replacement coil forms - $7.50 ea + $3 shpg; 4, 5, & 6-pin plug-in coil forms - $6 ea + shpg. James Fred, R1 Box 41, Cutler, IN 46920. (317) 268-2214.

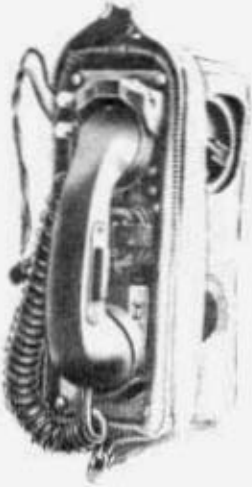
FOR SALE: Collins embroidered grey baseball caps, winged or meatball - $15 ea or both for $27. Mail check to Ridinger's Enterprise, 3487 Bayberry Dr., Chino Hills, CA 91709-2817.

Jim Williams & Sons Surplus

Rear 330 Main Street - Dickson City, PA 18519
Warehouse: (717) 383-1295 - Fax: (717) 341-0953

TELEPHONE TA-43

These rugged light weight fieldphones are made to go the distance. All you need is wire and two 'D' cell batteries for tens of miles of secure communications. You get two TA-43 phones and two canvas carrying cases w/straps. These government-reconditioned '43's won't last long at this price!!!! With partial, repro manual.



BLOWOUT PRICE - $54.99/SET

We even pay the shipping.

We specialize in miliary radios and related communication equipment, both used and government reconditioned. We have in stock GRC-106 & 109, T195, R-392, PRR-15 RX, PRC-25 & 77s, RT-524, KWM-2A and various types of military vehicle shelters.

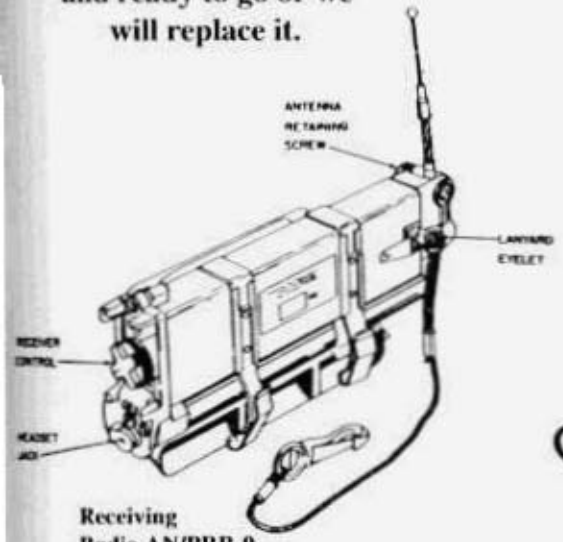
FAX YOUR WANT LIST 24 HOURS A DAY.

And always at Jim Williams & Sons - THE BEST PRICE!!

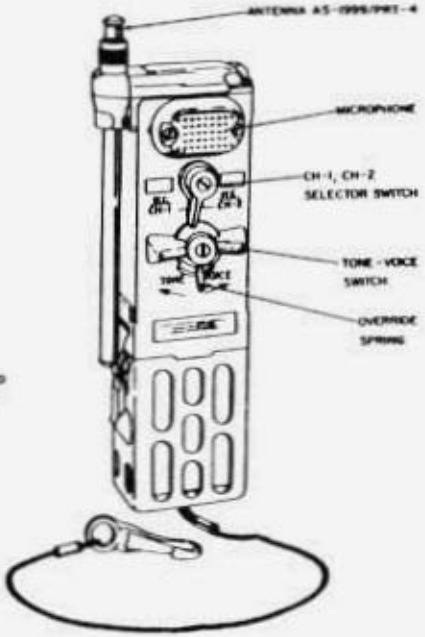
Sorry no C.O.D. or credit card orders.

RECEIVING SET, RADIO AN/PRR-9
AND
TRANSMITTING SET, RADIO AN/PRT-4A

Every set tested and ready to go or we will replace it.



Receiving
Radio AN/PRR-9



Transmitting
Radio AN/PRT-4A

PRT/4-A Transmitter - PRR-9 Receiver are crystal operated on 47 to 57 MHz. Both units are shipped on 51MHz. PRT/4A transmits voice and tone to PRR-9 at 450 mW and will also work with PRC-25, PRC-70 &77, etc.
The PRR-9s are government-reconditioned. The PRT/4As are used but not abused. Both are OD green and shipped to you with antennas, lanyard, harness slide, receiver headset and original manual.
Batteries are also included in the "DEAL".

Spare Battery Deal
$1 each
at time of order only

BLOWOUT PRICE - $42.99/SET

We pay the shipping.

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

WANTED: SX-42; SP400; EH Scott rcvr; only in very good condx. Jose Cangas, EA4JL. Contact in States Kurt Keller, CT, (203) 431-6850.

WANTED: Schematic & info on the 'Tone Modulator for Millen grid-dip meter, type #90754' like: 'What type battery'? Wes, W5DPM, 1950 Chevelle Dr., Baton Rouge, LA 70806.

WANTED: Pwr xfmr for the Heath HO-10 or HO-13 monitor scope; manual for HO-10 (copy OK). John Keil, 4618 Norwalk St., Union City, CA 94587. (51)) 471-4838

WANTED: Collins 30L1 parts, diode board cover for tube compartment w/30L1 script. Bill Smitherman, 9401 Hwy 67, East Bend, NC 27018. (910) 699-8699

WANTED: Copy of the tube data chart for Precision Tube Tester model 612 (or 614). Tom Taylor, AA6BR, 3405 Walton Way, San Jose, CA 95117. (408) 247-9055

WANTED: Ham gear made by American manufacturers from 1930 to 1980. I will travel to your location to photograph equip. for CQs Radio Classics calendars and a book on the American ham industry. Would also like to interview anyone connected with the ham industry during those years. Joe Veras, N4QB, POB 1041, Birmingham, AL 35201. (205) 328-2661 d, 967-0639 eves/wkends.

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

WANTED: Benton Harbor lunch boxes & related items. I'll pay shpg. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752. (717) 547-2674

WANTED: Vintage tube CB's, ps/modulator for Johnson 500. Send card or call w/models you may have. Steve White, WB5UGT, Box 1086, Clute, TX 77531. (800) 374-6477-9008 leave message

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

WANTED: ARC-5 equipment, R24, R25 rcvrs; T17, T18 xmtrs; RE2 ant. relay. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Electric Radio issues 1 thru 76. John Casale, WA2FHL, 3 Pickering Lane, Troy, NY 12180. (518) 272-3631

WANTED: For restoration: early HRO, NC-100XA, RAO, TCS, RCA 816K, Zenith 829, 835 or similar radios, non-working, rough, chassis only, parts units OK, prefer inexpensive units. Jon Chamberlin, 1458 Wilderness Dr., Maumee, OH 43537. (419) 893-1737

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

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: Heathkits: Audio signal generator, SB-600 spkr, HDP-444 mic, exc. condx. only. Dennis Heikura, 3941 Lakeview Dr., Shingle Springs, CA 95682. (916) 677-4117

WANTED: Globe King, Globe King, Globe King; WRL or Globe Electronics 500 or A, B or C preferred, for my shack, not for export, resale or speculation. Are you hoarding a Globe King 500 you can't fix or will never use? Do you know where I can find a lonesome Globe King 500? I will give you free, an excellent Johnson Adventurer for a referal to a Globe King I make a deal on. I can pay between $850 & 350 depending on condx. & model. Will PU in western US or send crates east. All photos returned promptly. Radio must be serviceable, not working OK. Have mercy on a poor boy! Please leave weekend or evening phone number. Capt. Larry Rau, KF6WV, Box 1139, Occidental, CA 95465. (707) 874-1000

WANTED

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

FOR SALE: Thousands of tested tubes w/ warranty! Send for new list w/improved discounts & monthly specials. Both xmtr & rcvr tubes. I have acquired many common tubes recently. Buy those spare tubes for your tube radio, audio, ham & electronics. Most tubes are used at about 33% of new, many are about $1. I have bunches of octal, older, 7 & 9 pin tubes. All tubes are tested on TV-7D tester & then boxed. I give a 30 day warranty. Send wants or SASE with 2 stamps for list. Daniel Nelson, 1025 E. Desert Ln., Phoenix, AZ 85040. (602) 243-7421 eves. dpn@indirect.com

FOR SALE: Swan 500C, 117XC AC sply/spkr, 14C DC sply, manual. Looks almost new, rcvr OK, transmit problem - $150. K4OCC, GA, (770) 396-1312.

FOR SALE: BC-348 manual: orig. USAF T.O. for operation, installation, troubleshooting, maintenance, brand new (collector's item itself) - $32 ppd, bookrate. Military Marketing, Inc., Box 741, Norcross, GA 30091-0741.

FOR SALE: Collins S-line 75S3B (WE), CW filter, 32S3 (WE), 516F2 (RE), 312B-4 (WE), mint condx., mike, manuals, cables - $1200. Bob Needleman, KD4ZN, 395 Meadowbrook Rd., North Wales, PA 19454. (215) 661-9283.

COLORFUL
QSL PRINTING

"Colorful QSL's" are now available by a new owner. Letterpress as done by C. Fritz and Jack Reed.

The printing includes specially mixed inks for a brilliant "Rainbow" effect. Ours are the "Ultimate QSL". Samples $1.

Colorful QSL Printing
P.O. Box 4027, Dept. E
Lafayette, IN 47903-4027

NEW TUBES 1/2 PRICE

SEND SASE FOR LIST
TUBES
555 SEMINOLE WOODS BLVD.
GENEVA, FL 32732

FOR SALE/TRADE: R390A EAC w/manual exc - $395; Zenith R7000 - $160; Crosley Ace 5 - $165; GPR-90 heavily modified - $175; HW12 & DCPS - $75; HW12A & HP23 - $85. **WANTED:** SP600; Squire-Sanders AEC's, radios, spkrs, accessories, dead or alive, especially black wrinkle finish. Will PU reasonable distance, 200 mi? Fred Watson, KB8NRF, 581 W. Summit St., McClure, OH 43534. (419) 748-8798.

FOR SALE: Prewar Meissner Signal Shifter coils, 3190-3760 kc set plus 8 forms - $10. Jim Maccolis, N2EY, 12b Summit Ave., Upper Darby, PA 19082. (610) 352-5247.

FOR SALE: SX16 - $125; SX25 - $85; Heath #1G-02 (sig gen.) "unbroken seal" - $75. Shure mic #330 ribbon - $100. Pat, K7YIR, WA, (206) 487-1230.

FOR SALE: Drake 2C & 2NT in GC - $200; Heath HW-101, w/ps, spkr & mic - $200; BC-221 freq. meter w/AC sply - $20; BC-348R, unmodified, w/dynamotor, no shockmount - $175; CAY 46077 HF rcvr - $100; pwr sply for previous rcvr - $80; Heath GR-81 regen. rcvr - $38; Heath EK-2 SW rcvr - $38; Hallicrafters S-41C - $50; Heath HW-7 - $75; Heath DX-60B/HG-10B, untested - $150; Harvey-Wells TBS-50D, w/manual - $50; Heath Sixer, modified w/mic & xtal - $50; ART-13, fair condx - $150 OBO; ARN-1 AM VHF rcvr, VGC - $65. John Devon, KI6DQ, 1653 Amberwood Dr., Apt. #27, S. Pasadena, CA 91030. (818) 799-0527.

FOR SALE: BC-779 (SP-200) w/pwr sply & orig. manual - $150; HQ-170A, exc w/orig. manual - $250; Heath HW-101, ps, manual - $195; Heath RX-1 Mohawk & HX-10 Marauder, exc. condx. - $400, will consider split. All + UPS. Joe, NY5Z, UT, (801) 393-6840.

WACO 5NWX FILTERS

Eliminates RF Interference
In Telephones - Just Plug In
1/$12.95, 2/$24.00, 3/$33.00
Add $1.00 S&H
"IF THESE DON'T WORK, THEN NONE WILL"

Cecil A. Palmer, W5NWX
4500 Timbercrest Ln.
Waco, TX 76705
(817) 799-5931 or
w5nwx@aol.com

FOR SALE: Tube checkers: Heath TC-2 w/all papers, one knob wrong, water-spotted case, otherwise VG - $25; Sencore TC-114, fair w/chart - $15; NRI (Triplett) 67, w/home-done chart & schematic, good - $20; Sig-gens: Heath SG-6, good, just needs cleaning - $15; SG-8, 2 knobs wrong, 2 xtra holes in front, otherwise looks good - $10; Eico 320, VG - $30; RCA WR-64B bar/dot/x-hatch color, works, VG - $45; Eico 147A sig. tracer, VG - $20; Heath V7A VTVM, needs cleaning & cal., just good - $15; Bogen C-35 S-S PA, works, looks good - $35; Zenith 5L41 black bakelite portable batt/AC, works & looks VG - $35; Knight R-100 RX, looks good but needs serious TLC (broken band sw, bad joints), missing one knob & spkr/S-meter - $45; Conar 400/500 pair, xlnt w/orig. manuals - $100; Heath HW-7, VG w/manual - $120. All ppd, tubes checked good, spares available. Not ppd: HQ-129-X w/matching spkr - $150; Collins 32RA, missing some plug-in stuff & 2 knobs, otherwise looks good - make offer; AN/USM-140C scope, known good - offers. (Make an offer on anything). **WANTED:** Buy or trade for mil. surp. RT's such as: BC-441, 474, 654, 745, 669, 1306; GRC-9 & 109; RT-12/TRC-2; RS-6; PRC-10; BC-728 RX; 2-3 Mc Marine mobile; SSTR; Drake 1525 EM mic; schematic/conversion for T-416/GR; info manuals for 2-3 Mc Marine, esp. Aerosonic Marine's Porta Marine IV; MAB, DAV; tube checkers Simpson 335 (need manuals, charts); Weston 798 (repair info); Eico 667, adapter 615 or info on it. Eric, N4TGC, AL, (205) 764-0675, best before 9 AM or after 6 PM & weekends.

FOR SALE: Book-Reference Data For Radio Engineers, 5th edition - $32 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: R-442 used - $175, w/mount & cable - $195; RT-505/PRC-25 used - $200; RT-77/GRC-9 - $95; PSM-13 batt. tester NOS - $25; VRM-1, RT-524 module tester - $50; GPM-55, PRC-25 module tester - $40; GRA-6 PRC/GRC remote cont. (C-433 & C-434) w/bag - $35; AM-1565 cabinet - $35; EE-89A phone repeater - $25; F-237/GRC-10 band pass filter NOS - $40; Sig. Gen. parts units, URM-25D - $25; URM-26A - $25; HP-608C - $35; HP-618B - $50; GPM-15 - $15; HP-340B - $25; PP-894/ARC-27 pwr sply 115V in-28V 20A out open frame - $45; URM-120 wattmeter set - $120; PRC-47 set - $150; HyGain LP-1402AB (AS-2851) 30-76 MHz log periodic used - $95. Add shpg. Tartan Electronics, Inc., POB 36841, Tucson, AZ 85740-6841 (520) 577-1022

FOR SALE: QST 30's to 60's - $1, singles; $6 for complete year, $5 for incomplete year. Some Allied catalogs & Magnatone PA; new RF tested tubes: 811A's - $8; 572B's - $40; Collins 51J4, 3 filters w/covers - $310; Hallicrafters working units: SR-150 - $250; SR-160 - $185; SR-500 - $225; S-25 - $185; Ranger I, HT32, HQ170 parts units. All + shpg. Joe, WSØE, MO, (417) 882-3197 eves

---

FOR SALE: TS-509/UR field strength meter - $10. **WANTED:** Johnson VFO 122. Collin Collier, N4TUA, GA, (912) 988-1276.

FOR SALE: Ham Radio magazines: 1980 thru June 1990, complete - $5 per year. Francis Waggoner, W2PTL, 268 Barben Ave., Watertown, NY 13601. (315) 788-1621

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

FOR SALE: Collins PM-2 and MP-1 pwr splies (for KWM-2) average condx, all complete, call for info - single for $50, ten for $400; NIB dial assemblies for KWM-2/S-line - $50; used 4D32 tubes - $25; new Sierra dummy loads, models 160B-300, 50 ohms, 160W, female 'N' connector, oil filled - $95; new Struthers HF slugs for Sierra wattmeters - $25; NIB RCA 807s - $7; rare Heath SB1000 HF amp kit in unopened box - $800; NIB J-45 knee keys - $20; Collins directional coupler w/3" sq. RF wattmeter meter, same as in SC101 console and earlier Collins wattmeters, used coupler/new meter - $50. Three 1st class stamps w/label for long list parts/equipment. Derek, KI6O, 5191 Rimwood Dr., Fair Oaks, CA 95628. (916) 965-4904

FOR SALE: Tubes (all NIB) 6AV6, 6AK6, 6AL5, 6AS6, 6AG5, 6AH6, 6BA6, 6AX5, 6BH6, 6CB6, 6SJ7, 6Y6G's, 6X4W, 12K8, any 10 for - $15; Eimac 3ST (6) @ $25 ea; 3C24/24G (10) @ $10 ea. All + UPS. Ron, KC6WTG, POB 783, Santa Rosa, CA 95403. (707) 539-8319

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. Make check payable to: Harvey Laidman, N6HL, 4923 Encino Terrace, Encino, CA 91316.

FOR SALE: Heavy items including no charge delivery along US 95 (FLAME): Johnson Desk KW Pedastal, missing modulation - 80; Navy TDE xmtr including P/S - $500; beautifully made H/B AM xmtr; PP 100TH's modulated by PP 811A's B/O over - $1000; Collins 30S-1 WE - $1400; military aircraft xmtr model ATD 200 kcs to 15,800 kcs (Bendix), over 50 years old, but unused & orig., including manual, dynamotor assembly, remote control & indicator units, VLF ant. tuning unit, sealed orig. box of spare parts & cable connectors - $375. Parker Heinemann, W1YG, 87 Cove Rd., Lyme, CT 06371. (203) 434-7783 or (813) 262-2568

FOR SALE: Collins 30K-1 w/310A exciter, extremely nice condx, complete w/manual, coils, orig. wattmeters - $6000 firm. 1 crate, U ship from Italy. Alberto Sannazzaro, IK1CXJ, Str. Pontecurone 9, 15042 Bassignana, Italy or Kurt, CT, (203) 431-6850

FOR SALE: TBS 50 w/pwr sply - $160; Heath AT-1, VF-1 - $185; National HFS w/complete coils set - $185; national CRM scope - $125; Millen 90501 frequency standard - $85; Millen 90700 vari-arm VFO - $185; ARRL Handbooks SASE; Stancor SRT 120 xmtr - $150; Stancor ST-202A xmtr - $165; Johnson VFO-122 - $45; Knight T-50 xmtr - $85; Knight T-60 xmtr - $85; Conair 400 xmtr - $75; Bretting 9 rcvr B/O over - $400; Military Spy Radio set 2-22 MHz, RR-2B, RT-3, RP-1, RP-2, nice - $295. Packing, shpg, insurance & satisfaction included. Parker Heinemann, W1YG, 87 Cove Rd., Lyme, CT 06371. (203) 434-7783 or (813)-262-2568

FOR SALE: Two 2C39s NOS - BO. **WANTED:** Repairable Johnson, Hammarlund gear. Larry, N4QY, 170 Heritage Lane, Salisbury, NC 28147. (704) 633-3881

FOR SALE: Manuals orig., prefer swap for non-ham radio manuals, military, Forest Service, boat/ship radio, aviation radio or magazines, Bendix Radio Engineer, Electronic Industries, KAAR Communicator, USN Electron, Digest of Airborne Electronics, etc., or sell ppd; Hammarlund HK1B - $4; Heath HD10 - $5; HN31 - $5; HDP21 - $2; XC6 - $3; Eldico EE3 - $5; Hallicrafter HT31M1 - $10; HT33B - $10; HT33M1 - $10; Globe FCL1 - $4; 500C - $10; 350 - $10; LA1 - $7; VHF62 - $6; VFO6N2 - $6; Swan Mark 2 - $7; 1200X - $7; Johnson Viking 2 - $7; Ranger I - $10; Navigator - $10; VFO122 - $7; catalog 975 - $5; military RT666768 - $7; SCR522, new - $6; prewar police car xmtrs, rcvrs. **WANTED:** WW II radio equip., especially German, Italian, Japanese, any condx; US Military ARC2, ARQ1, ARB, ARQ8, ARR15, ARR16, BC310, BC1209, RAX, TRC10, TCH, what have you? Hue Miller, KA7LXY, 250 S. 900 E #4C, SLC, UT 84102.

FOR SALE: National Co. 1-10 - $175; NC-98 - $100; NC-125 - $150; Hammarlund HQ-140X - $200; S-200 spkr - $100; Hallicrafters SX-25 - $200; S-19R - $100; R-47 spkr - $50; early Heath AR-3 - $100; DX-60B - $100; Lafayette Explor-Aire - $40. Greg Gore, 11528 Watermoss Ln., Charlotte, NC 28262. (704) 549-4719

FOR SALE: Collins mech filters: 2.1 kHz, 3.1 kHz - $20 ea; Drake 2B w/calib & 2BS spkr - $135; Drake 2AQ Q-mult - $35; Hallicrafters SX-11 - $125; Hammarlund HQ-170C in orig. box - $215; Heath tunable audio filter (HD-1418) unopened kit - $45; Heath SB-400 - $75; Mosley CM-1 spkr - $30; National NC-5SW shortwave converter (1934) - $385; National NC-109 & spkr - $100; National NC-183 - $95; Signal One CX7A w/B upgrades - $750; Vibroplex Deluxe vibrokeyer - $50. All FOB Los Gatos, CA. Peter Brickey, KD6KDR, CA, (408) 353-1925.

FOR SALE: Hallicrafters HA5 VFO - $50; Galaxy SSB pack set - offer; Ranger II - $250. All + shpg. Berk Berkemeyer, MO, (314) 394-0441

WANTED: On HP 606 B generator. What do freq control input and freq analog output indicate? Its use? K6UU, POB 905, Grover Beach, CA 93483.

WANTED: WW II navy shipboard xmtrs & accessories, any condx. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: Hammarlund HQ-180A. Will pay fair price for exc. condx. James B. Geer, WB5LXZ, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Millen 2 KW matchbox switch, part #51001; also to hear from Supreme xmtr owners. Harry Blesy, N9CQX, 95740 Clarendon Hills Rd., Hinsdale, IL 60521. (708) 789-1793

WANTED: Motorola Vibrasender PL reed, PL172, 103.5 Hz, large gold unit. Will buy, trade. Jack Alley, 2100 Miscindy Pl., Orlando, FL 32806. (407) 851-6258

WANTED: Fifth Edition or earlier of RSGB Handbook. Joseph Falcone, AA8HV, 3000 Town Center, Ste 2370, Southfield, MI 48075. (810) 357-6610

WANTED: Vintage AM equipment for personal use, must be collector quality or mint. Prefer Collins, will consider others. Bob Tapper, N0IMH, Box 61538, Denver, CO 80206. (303) 740-2272, FAX 777-6491

WANTED: Two 813 tubes, two 813 sockets and two 813 plate caps. Pete Cullum, N9GED, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

WANTED: Have 1926 Atwater Kent model L horn, need driver for same. Charlie Solie, 1409 Jeanie Ct., Las Cruces, NM 88005.

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

ELECTRIC RADIO STORE

BACK ISSUES

All back issues are available at $34 per year or $3.25 for individual copies. Buy the entire first 6 years (#1- 72) for $175 and save. This price includes delivery in the U.S. Foreign orders please inquire.

COMPENDIUMS

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

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

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

HATS

Finest quality, U.S. made, tan in color, embroidered ER logo -$15 delivered.

T-SHIRTS

The front displays the logo from the cover of ER (the tube outline, Electric Radio, and 'celebrating a bygone era'). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio). The T-shirts are U.S. made by Haynes and come in S-M-L-XL and XXL($1 extra).

The color is just a little lighter than the cover of ER - $15 delivered.

BOOKS

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

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

Fixing Up Nice Old Radios by Ed Romney.....$19.95

Communications Receivers, The Vacuum Tube Era: 1932-1981 by Raymond S. Moore.....3rd Edition $19.95

Don C. Wallace, W6AM, Amateur Radio's Pioneer by Jan D. Perkins....$25.95

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

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

Lew McCoy on Antennas by Lew McCoy, W1ICP.....$15.95

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

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

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

ER Parts Unit Directory

If you need a part for a vintage restoration send $2 and an LSASE (.32 postage) for a list of parts units. If you have a parts unit, consider putting it on the list. Your dead unit can help bring others to life!

ER, Box 57, Hesperus, CO 81326. (970) 247-4935

Subscription Information

Rates within the U.S.
$28 per year 2nd class
$38 per year 1st class

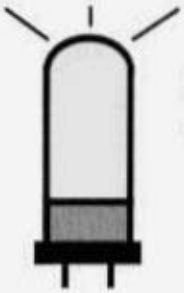
Canada by Air (only).....U.S. $39

Other Foreign Countries by Air (only).... U.S. $70

Guaranteed Refund at any time for issues remaining on subscription

subscribe by mail or phone

ER
P.O. Box 57
Hesperus, CO 81326 **Phone/FAX (303) 247-4935**



SECOND
CLASS

ELECTRIC RADIO
145 CR 123
Hesperus, CO 81326

TO: