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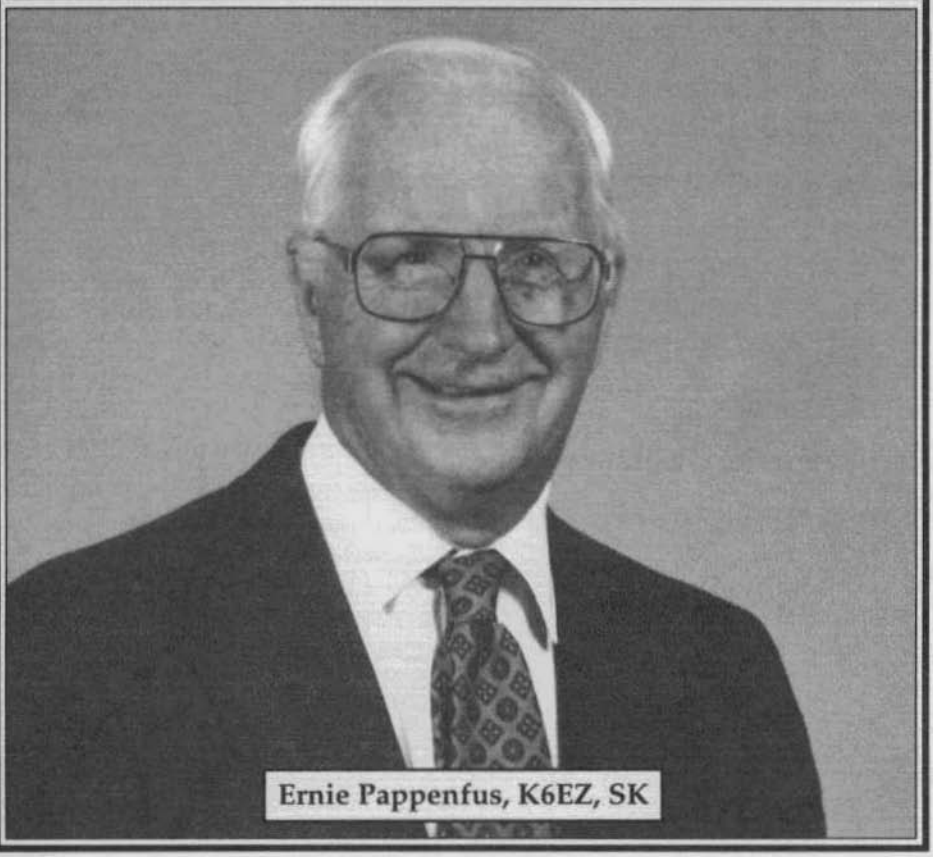
# ELECTRIC RADIO

celebrating a bygone era

Number 125 September 1999



Ernie Pappenfus, K6EZ, SK

# ELECTRIC RADIO

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

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

## Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK; Thomas Bonomo, K6AD and others.

# Editor's Comments

**Silent Keys**

In the September issue of CQ, Publisher Dick Ross, K2MGA, wrote an editorial about the passing of his friend and partner Editor Alan Dorhoffer, K2EEK. I think it is one of the most meaningful editorials I've read in a ham magazine in a long time. Dick chronicles Al's quick passing (from first symptoms to his death took only 9 weeks), describes his life-style, (he smoked, he didn't exercise, he didn't eat right) and tells us all that we have something to learn from Al's untimely death at the age of 61. I think the editorial was right on and I urge everyone to read it. Although I didn't know Allan Dorhoffer very well (I met him only once and talked with him on the phone just a couple of times) but I had a great appreciation for him as an editor and as a writer. His monthly editorial 'Zero Bias' was some of the best writing that ever appeared in the ham magazines. He's going to be missed. In this issue, in his Looking Back column, Lew McCoy also writes about K2EEK.

Ernie Pappenfus, K6EZ, has also become a Silent Key. Long-time subscribers will be very familiar with him through the many articles that we've printed about the Collins Radio Company where he was as an icon. Over the years I had the honor of having many telephone conversations with Ernie and always found him to be a very easy going, very down-to-earth individual who knew that despite his accomplishments he was just flesh and blood like the rest of us. I've often wondered how Collins would have fared without him. I think he made a tremendous contribution to that company's success. Fred Johnson, another Collins engineer, writes a tribute to Ernie in this issue (see page 18).

**Ten Meters**

Earlier today (September 6) as I was finishing up this issue, I experienced a brief opening on ten meters. I worked the following stations: Jeff, K4JAB; Rich, K1ETP and Norm, K2UST. Could this be the beginning of the band opening for the fall season? I hope so. N6CSW

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# Looking Back

**by Lew McCoy, W1ICP**
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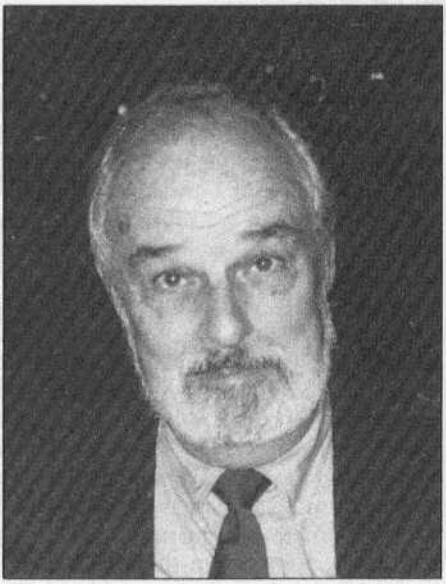
We all got a real bad shock when we heard that Al Dorhoffer, K2EEK passed away. He was only 61 and should have had many productive years ahead of him. In the event you don't know who Al was, he was the editor of CQ magazine for the last twenty or so years.

I had heard that he was ill so I called him on the phone. He complained that he had stomach pains and was feeling awful but he was going in to see a doctor the next day. They operated on him and found extensive cancer. Only two days later he passed away from kidney shutdown. Amateur Radio has lost a great deal with his passing.

Al, and Dick Ross, had purchased CQ many years ago from the Cowan Corporation. They took a magazine that was really not very well-known and made it very, very successful. I think that the only other ham magazine that is bigger in terms of subscribers is QST.

When I retired from ARRL, Al contacted me and asked if I would write for CQ. I had no commitment from ARRL so I accepted and have been on their staff for over 20 years. I had known Al and Dick for many years before I went to work for them. In fact, a couple of times I picked up dinner tabs for both of them when I was with the League. I recall Budlong calling me into his office one day (Budlong was General Manager of ARRL for many years.) Bud had my expense account forms and he asked me what I was doing taking our competitors (!) out to dinner. I simply explained that I did this so I could gather information. So much for that.



**Alan Dorhoffer, K2EEK, Silent Key**

What I find interesting these days is that back when I was at the League none of us were allowed to compete in CQ contests or affairs. There is no doubt in my mind that the CQ World Wide DX Contest is the biggest one around. I am very happy to see that ARRL dropped their narrow minded attitude and now recognize CQ activities.

Those of you that knew Al were aware that he had a marvelous sense of humor. He was a great guy to be around. All these years Al held a technician plus license and try as I might I could never convince him to upgrade. He always said 'Why?' and I could not answer him. He had nearly 300 countries confirmed and that is darn good for 10 meters. He spent his entire working career in ham radio so he knew what was going on. In his editorials he pushed for the good things in ham radio and while some of us may not realize the fact, he had a tremendous influence on our hobby.

K2EEK was one of the finest friends that I have ever had and I'm going to miss him. Shalom, Al. W1ICP

# AMI Update - September

**by Dale Gagnon, KW1I, President**

**AM in the Next Millennium**

What are the prospects for AM in the future? The trends in our hobby are important factors and can affect us. Some sort of license restructuring is looming. There are declining numbers of amateurs and an aging population. Activity is down on the bands. Propagation has been less than spectacular on this sunspot cycle. Technical developments in commercial communications reduce the attractiveness of amateur radio for long distance contacts. Technical developments in amateur radios provide undreamed of features, but also limit the average amateur's homebrew possibilities. Technical elitist activists are lobbying to make some communications modes obsolete.

In spite of these factors, over the past decade AM has enjoyed a renewal of interest as compared to declining general interest in amateur radio. What can we do to continue this positive trend? How can we enhance AM operations on the amateur bands?

I think the key to a healthy future for AM is plenty of visibility. We had practically no visibility in the late 1980's when I visited the FCC to talk to staffers about the AM power reduction issue. I was surprised to find that the people responsible for amateur regulations had no knowledge of the resurgent interest in AM or the then current level of AM interest. AM mentions in the major periodicals were minor if at all. A decade later we have AM operating windows listed in ARRL publications, articles with AM themes published and well received in QST, and influential comments to FCC rule making proposals from AM supporters. I recommend we continue to build AM visibility three ways: Hang out, spread out and reach out.

Hang out - AM'ers need to be heard more often on the bands. I am not saying we should spend more of our time with our radios, but I do think we should spend more of our radio time on the air. When there are few AM'ers in a geographical area and these AM'ers have different radio operating habits, they may frequently miss each other. Add the variable of band conditions and it is possible that most potential AM contacts never happen. One solution, AM nets, is already addressing this problem. Another solution we an learn from VHF operators. There are specific days, times and frequencies recommended for certain bands. This allows VHF operators to plan their week around these period and much larger concentrations of VHF operations are noted during these scheduled activity times. Ten and fifteen meters could benefit by setting up activity times.

Spread out - This boils down to rejecting the AM Window as the only place that an AM QSO should occur. The AM Window may be a good place to look for other stations, but we should not limit our frequency use to just these areas. Very large round tables are frequently better off splitting into several QSOs and moving the new QSOs off outside the AM Window. We need to use non-offensive ways of announcing an intention to start a new QSO from one that we are in that has become too large. We need to develop a concept of joint QSOs. You move among concurrent smaller round tables on multiple frequencies. This allows you to transmit more often, rather than sitting for 15-30 minutes or more between transmissions in a large roundtable.

We need to avoid calling CQ too close to other AM QSOs. This makes it look



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# The Collins CU-168/FRR Antenna Multicoupler

**by Jan Skirrow, VE7DJX**
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Radio collectors often want to connect a number of receivers to a single antenna. Switches provide one solution, but can become cumbersome as the numbers increase. More problematic, serious shortwave listeners often want to operate more than one radio simultaneously from a single antenna.

Passive signal splitters, such as those used to connect two or more televisions to the same cable connection, are not satisfactory due to the substantial losses involved. Also, receivers operating simultaneously can interfere with each other if there isn't adequate isolation between their antenna connections.

There has been growing interest recently in active multicouplers. These can provide good isolation between receivers and minimize signal loss. Unfortunately, these devices seem rare on the surplus market. Most are solid-state, but I recently bought what was advertised as a government rebuilt Collins CU-168/FRR vacuum-tube antenna multicoupler in its original packaging. It was built for the US Navy and able to connect up to five receivers to one antenna. The seller claimed that this unit was used with the R-390/URR and R-390A/URR receivers. Although skeptical of both claims, I had to have one, if only because it was a vacuum-tube boatanchor in the grand tradition! I was also curious to see how Collins had tackled the design problems unique to this kind of equipment, and interested in comparing its performance to a solid-state multicoupler of more recent vintage.

The CU-168/FRR turned out to be pretty much as advertised. It was a rebuild but, unfortunately, at some point early on holes had been made in the protective wrapping and some kind of oily grit had settled on what was probably only partially cured paint. The unit was packed with its front panel down, so this sticky stuff settled largely on the rear. Most of it cleaned off, but the power transformer and choke were left with a bad rash!

The multicoupler consists of a main chassis that fits flat against a detachable front panel. The power supply is mounted on a separate plug-in subchassis. Five individual amplifier subchassis also plug into the main chassis, which has a power connector and two N connectors. One connector is the antenna input and the other an output that can either be terminated with a 70 ohm termination, or connected to additional multicouplers. Each amplifier module has its own output N connector.

Photo 3 shows the underside of the main chassis with the front panel removed. The power supply plugs into the socket in the upper center of the chassis. The large box beside the fuses is the line filter. The horizontal Bakelite strip contains the signal and power distribution circuitry as well as sockets for the individual amplifier sub-chassis.

The unbalanced antenna input is applied to the balun transformer on the right side of the Bakelite strip to drive a balanced distribution line. This line is terminated at the other end by a match-

Photo 1 - Front view of the Collins CU-168/FRR antenna multicoupler

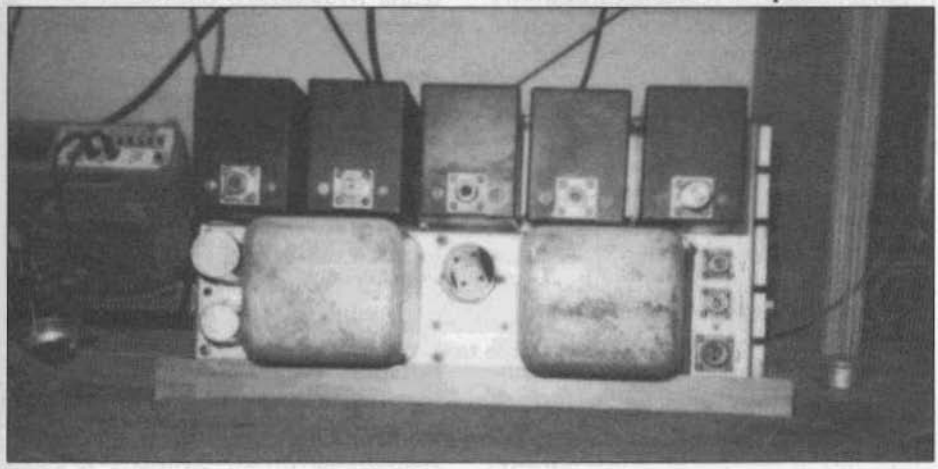

Photo 2 - Rear view of the CU-168/FRR

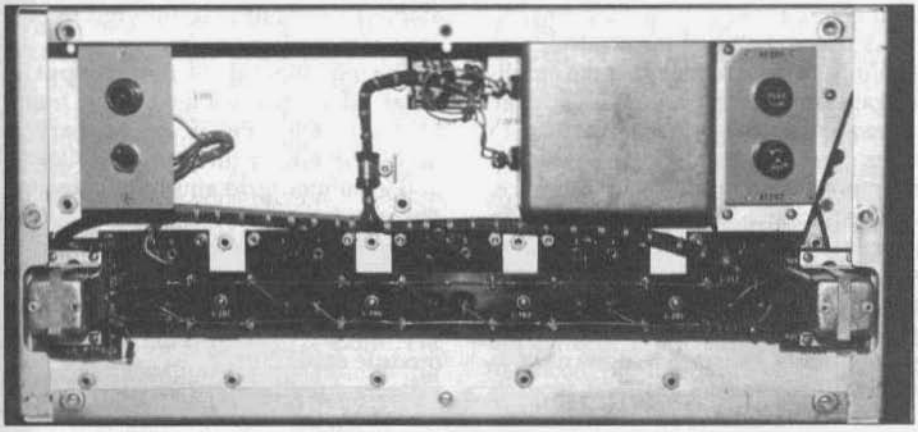

Photo 3 - The main chassis with the front cover removed

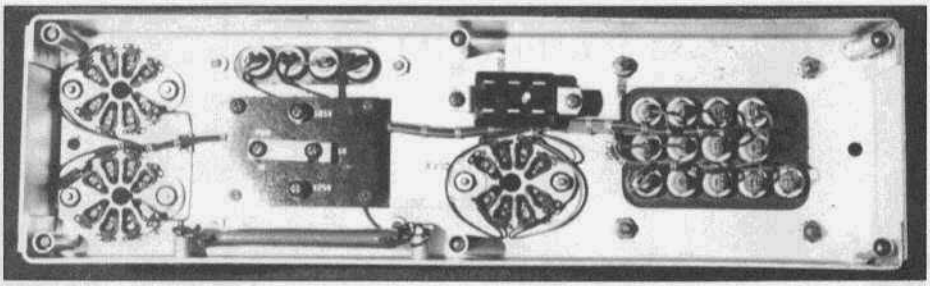

**Photo 4 - Underside of the power supply chassis**

ing balun that connects to the output connector.

Photo 4 shows the underside of the power supply chassis. It is a conventional two-section, choke-input filter design using a 5U4G rectifier. It shows the Collins touch, such as electrolytic capacitors that plug into very high quality ceramic sockets.

Each amplifier module draws about 80mA at 165vdc. The 5U4G thus operates somewhat beyond its maximum ratings for a choke input filter, making it an odd choice in an otherwise conservative design. Space is not an issue on this chassis, and a pair of 5U4GBs would seem to be a better choice.

Five identical amplifier modules plug into the main chassis. Each module contains two separate amplifiers, one for each side of the balanced input obtained from the main chassis. Each separate amplifier consists of two 12AU7 dual-triodes, a good choice for high frequency amplifiers. A major challenge for the designers would have been to maintain the amplifier gain-bandwidth product for the range of frequencies the multicoupler had to cover. The gain-bandwidth product is inversely related to plate load resistance, thus requiring a low load resistance to achieve the needed bandwidth. But a low load resistance, coupled with the need to operate the tube so that it can handle both large and small signals, results in large plate currents. I suspect that the need to balance these factors resulted in each 12AU7 having its two triode sections connected in parallel.

The first 12AU7 is a cathode follower connected to one side of the balanced input. This configuration provides high input impedance, thus allowing many such units to be connected to the antenna without substantial signal loss. The output is low impedance, which is advantageous in an amplifier that has to operate over a wide frequency range. However, the gain of a cathode follower cannot exceed unity. The cathode follower output is connected through a shunt-series compensating circuit (to broaden the frequency response) to the input of the second amplifier.

The second 12AU7 is a grounded grid amplifier, which is inherently stable at high frequencies and provides good isolation between input and output due to the grounded grid acting as a shield between plate and cathode. The input impedance is low, thus providing a good match to the preceding cathode follower stage. The circuit is configured to provide some voltage gain.

The unbalanced 70 ohm output is obtained from a center-tapped transformer. Each side of the primary is driven by one of the cathode-follower and grounded-grid amplifier pairs just described.

Photo 5 shows a typical amplifier module. The output balun is at the N connector end of the amplifier. Figure 6 shows the underside, with the slide-on module cover.

It seems unlikely that the CU-168/FRR was designed for use specifically with the R-390/URR. The use of type N con-

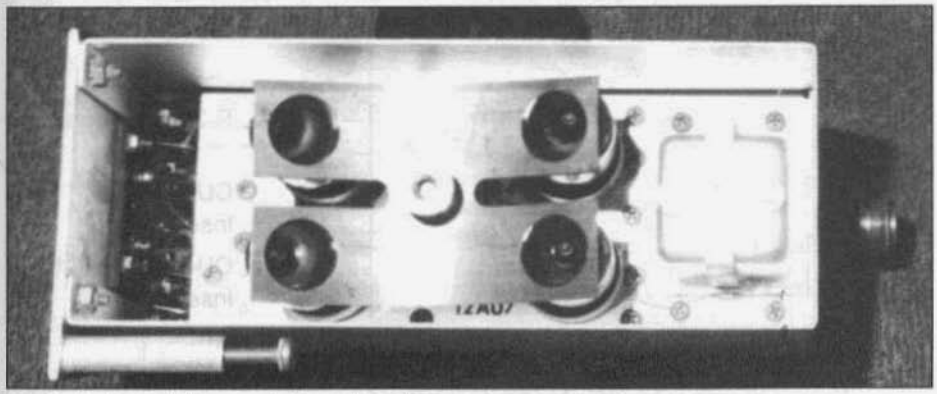

**Photo 5 - Amplifier module - tube side**

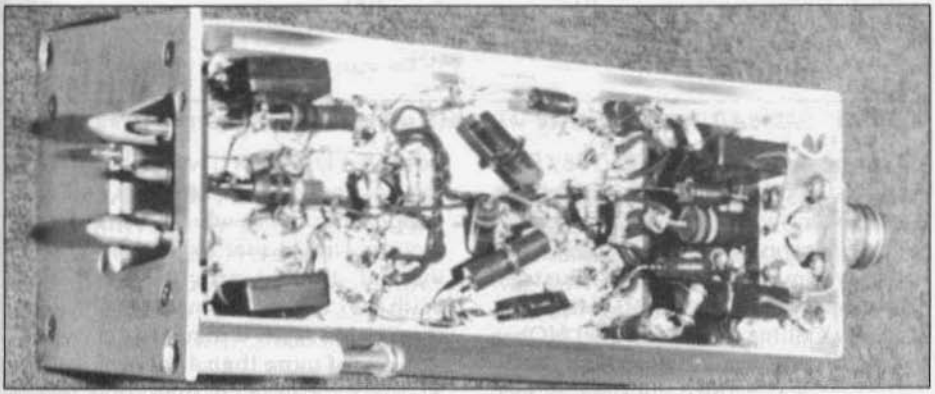

**Photo 6 - Amplifier module - component side and slide-on cover**

nectors throughout, and a completely different type of construction, suggests that it was designed for use with an earlier radio. Although the R-390/URR has an unbalanced input (with a type C connector) to allow use of a whip antenna, the balanced input seems to have been the primary intended configuration. It certainly provides enhanced performance, and adds considerable complexity to the radio's construction. The CU-168/FRR was clearly intended for use with unbalanced transmission lines.

I posted my puzzlement to the Internet's Milsurplus reflector. Wayne Hertel was kind enough to respond. He worked in a military installation in the mid-1960s that had several hundred R-390/URR and R-390A/URR radios. There were also a few SP-600 SuperPros and other assorted receivers in use. The CU-168/FRR was used to allow simultaneous use of a variety of antennas. The receiver inputs and the multicoupler outputs were connected to patch-panels that allowed the operator to connect a receiver to the antenna most appropriate for a given transmitter and direction. All of the R-390/R-390A receivers used the unbalanced connector input.

The CU-168/FRR was made for the Navy. Later versions of the R-390A/URR Navy technical manual provide a simple mod that allows the use of the unbalanced input connector with the balanced input circuitry, so that the advantages of that circuit are not lost. It seems likely that the receivers at Wayne's location had that mod.



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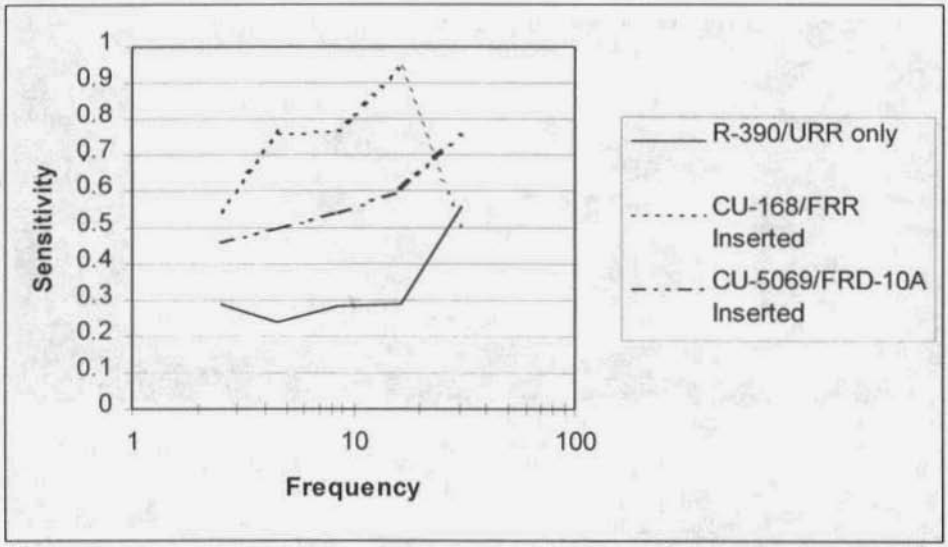



**Graph 1 - R-390A/URR sensitivity with and without the multicouplers inserted**

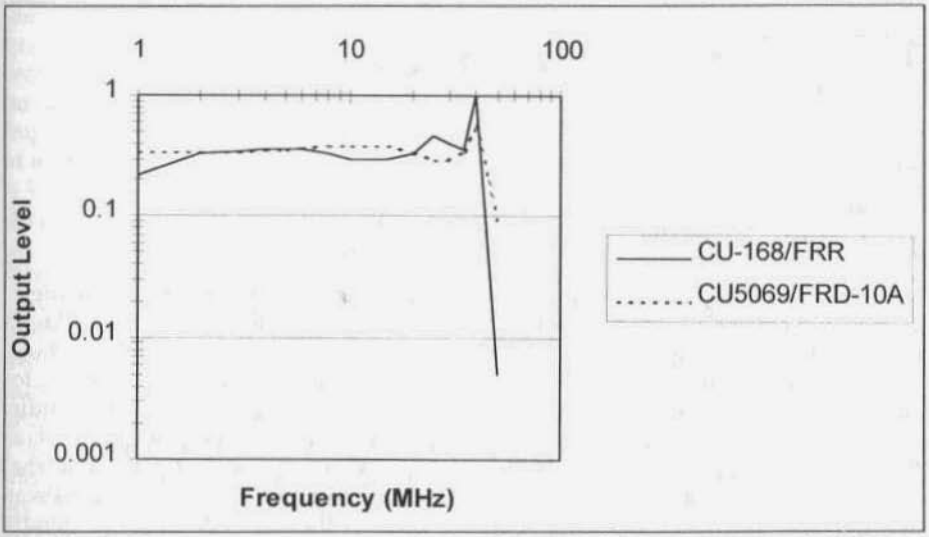
Wayne also has a CU-168/FRR manual dated 10 September 1952, which is consistent with the apparent age of my unit. However, the CU-168/FRR that he has was made by Telectro Industries under contract NObsr 75293. Mine was made by Collins under contract NObsr 49175. Wayne's manual also suggests that there was a third contract NObrs 52727, but I could find no further information on this.

A multicoupler is simple in concept but difficult in practice. It must minimize degradation of signal to noise ratio, sensitivity, and the overload and cross-modulation characteristics of the radio. It must not allow receivers to interact, and connecting or disconnecting one or more radios should not alter the performance of the rest. It must operate over a broad frequency range with a reasonably flat frequency response. With modern designs and miniaturized devices, this is a fairly straightforward exercise, but not so simple half a century ago!

I wanted a few "quick and dirty" performance measurements for the CU-168/FRR, and I wanted to compare these to a more modern multicoupler. First, however, I thought it would be interesting to know how well the unit was supposed to work when fresh from the factory. Unfortunately, Wayne Hertel's manual did not provide much help. With the output terminated by 70 ohms, the CU-168/FRR was not to give a voltage loss of more than 4 dB over the 2 to 32 MHz designated operating range, suggesting that the designers were prepared to accept some signal degradation in return for the broad operating range.

I also have an RCA CU-5069/FRD-10A multicoupler manufactured by Technical Materiel Corporation under contract to RCA. It allows up to 32 receivers to be connected to a single antenna. It is solid-state and covers the same frequency range as the CU-168/FRR. I repeated the tests on the RCA unit for comparison.

I did two tests. First, I measured the S/N ratio at several frequencies for an R-390A/URR connected directly to my signal generator, and then with each multicoupler connected between the signal generator and receiver. Second, I measured the gain of both multicouplers at several frequencies.




**Graph 2 - Frequency response of the CU-168/FRR and CU-5069/FRD-10A multicouplers**

Test 1: An HP8640B signal generator was connected to an R-390A/URR (8kHz filter setting and balanced input with the Navy mod) and the output measured across the receiver's line output, terminated with a 600 ohm resistor, using an HP3400A RMS voltmeter. The HP8640B used 50% modulation at 1 kHz. The tests were repeated with each of the multicouplers connected between the signal generator and receiver. The receiver's antenna trimmer was adjusted for maximum signal prior to each measurement. The results are shown in Graph 1. The figures given are in microvolts for a S+N rise of 10dB over N. No attempt was made to correct any of these figures to account for possible impedance mismatches. However, I believe that they are comparable for purposes of this article. Also, this is the way these units would probably be used in real life! Graph 1 shows the results.

It appears that both multicouplers degrade ultimate receiver sensitivity to some degree. Part of this may be due to insertion loss, and part may be due to noise added by the multicoupler. By the "ear" test, the older Collins unit definitely contributed more excess noise than did the solid-state RCA unit. The degradation due to the solid-state unit was fairly constant across the full frequency range, whereas the vacuum-tube design showed rapid fall-off at the top end.

Test 2: The HP8640B was used to provide a constant input to the two multicouplers at various frequencies and the output level measured to determine the frequency response characteristics of both units. The HP8640B output level is not flat enough across its range to assume that variations would be too small to matter. Thus various ways of measuring both input and output levels were tried. The method that seemed to give the most consistent and comparable results involved using a Tektronix 454A scope to simultaneously monitor both the HP8640B output and the multicoupler output. In each case the multicoupler was terminated with a resistive load. No attempt was made to correct the readings for impedance mismatches, or for the loading effect of the scope. This test was intended as a comparison, and the measurements for both



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# W2HBE Reminisces

## Part 2

**by Bob Dennison, W2HBE**
**82 Virginia Ave.**
**Westmount, NJ 08108**

I spent part of my time operating my station and the remainder was divided between experimenting and studying radio theory. I added an outboard chassis to the TRF set and converted it to a superhet with regenerative IF stage. Every time the humidity changed I had to open the IF transformer and re-adjust the position of the tickler. I soon abandoned this and went back to the trusty old TRF. I tried various transmitter circuits. The 2A5 gave way to a 59 tri-tet. Then came a 53 push-push doubler. For a considerable period I settled on the 2A5 osc, 46 Dblr, 10 final with 45 watts input. Like everyone else, I experimented with the 6L6-G when they were selling for 69¢. In 1938 I tried the 10 meter band and worked D4AFF in Germany at 11am—that was exciting—daytime DX.

Nathan DeYoung, W9AIJ, moved to Salina from Missouri and opened a small radio/electrical shop near Wesleyan Univ. I bought an 807 tube and a Jewell 100 mA meter from him. I rebuilt my rig to use these items and felt that now I had the ultimate.

From time to time various friends from school would come over to visit my ham shack which was now located in the kitchen so that the Zepp antenna feeders would be the correct length. Among my friends were Jack Hoefer and Ernie Hollis. The bug bit them and years later both became hams—Jack, WØIIJ and Ernie, W6ZGZ. Later Ernie's wife, Carol, also became a ham—K6OAO.

One winter several of the Salina hams built rigs for 160 meter phone operation. Everyone had a ball. On cold winter nights it was fun to make a big bowl of popcorn and then chew the rag for hours. Jim Forristal became the undisputed leader working as far east as Massachusetts using an antenna that was two blocks long—snaking its way through the yards of several friendly neighbors.

Earlier, Bernie and I had visited an unusual ham shack on Front street near the bend in the Smoky river. Jim Forristal, W9CQT, had a buddy—Francis 'Fritz' Miller, W9ZUC. The shack was at Fritz' uncle's place. It's possible that this shack may be the same one that Ralph and Jean had used. Jim showed us how they could install jumpers around the light meter when they were on the air. He was sure that it was Jean who had made the jumpers. I was impressed by the Allstar receiver which they used. It was sold in kit form and had a beautiful airplane dial and a 2A5 output tube.

After Jim left Carlisle Radio he started a small manufacturing operation making guitar amplifiers. Later he became a manufacturers representative and most recently was in computer software. His sons do all the work now and he is semiretired. These days Jim works 20 M phone—chasing DX.

Louie, Bernie and I would regularly visit all the stations that were active and some that weren't. We visited Doc Gemmill, W9STC, and Tom Bayne, W9SRS, fairly often. Mr. Gemmill had been a dentist but was now semiretired

and was well off financially. Fred's grandparents, the Quincys, were wealthy and lived in a large, expensive home on S. Santa Fe Ave. They had a huge lawn and Ralph Lewis had the job of mowing it.

While Mr. Gemmill could afford the very best, he was conservative. In the beginning he and Fred built a three-tube TRF receiver and the transmitter was a breadboard layout, beautifully built, and of modest power. In 1936 the TRF set was replaced by an RCA communications receiver and the rig was enclosed in a metal rack.

Mr. Gemmill's station was located in the basement which was large, clean and well-lighted. He had a commercial water softener in one corner of the basement. Salina had extremely hard water and this device fascinated me and Doc took pride in explaining how it worked. In the back yard he had a nice greenhouse where he raised many types of flowers.

In 1935 Fred Gemmill, Dick Porter and Bob Ganoung all won Summerfield scholarships—the highest academic honor KU bestows on undergraduates. Never before and never since has one department (EE) had three Summerfield scholars simultaneously from one town.

Doc had a sked every Saturday afternoon with Fred while he was away at the University. Doc would often tell us about some exciting new development that he had just heard from Fred. Once it was about a new UHF tube called the Rhumbatron in which the electrons oscillated as in a rhumba!

Doc bought a new callbook every year and he disposed of his old one for 25¢. I was the lucky recipient more than once. He also kept a good supply of radio parts on hand so he could try out the new circuits that appeared each month in QST. He sold me tubes, tuning condensers, etc. at giveaway prices because he liked to encourage young hams. He was exceptionally generous - but more on that later.

One evening we visited Tom Bayne and found him in the yard laughing and chuckling. He told us that a certain neighborhood dog always urinated on his bushes so he wired a Ford coil to the bush and waited for the dogs nightly visit. When Tom hit the switch, the dog yelped—ran ten feet—made a puddle—ran ten feet—made a puddle—ran ten feet—etc—etc—etc.

Glenn Webster moved to Salina from Tescott in 1922. A year later he became interested in radio after seeing a three-tube Grebe radio set in the high school physics lab. He began to read Radio News and other radio magazines. A short while later he helped Walt Allen build Salina's first radio broadcast station, WFAD, which was located in the Farmer's Marketing Bureau on 7th St. Walt Allen ran a motor/generator rewinding shop and he rewound an old generator to give 500 volts for the plate supply. Glenn scrounged up tubes and other parts for the transmitter. An old hand-cranked Edison phonograph was used to play musical selections. The carbon button mike was laid down inside the phonograph's horn.

Glenn had a buddy named Harold Flanders who lived a block away on W. South St. who had a station that used a chemical rectifier using Borax solution in old Mason jars. This station also featured a beautiful big Magnavox horn speaker. A few years later Harold had graduated to a big 100 watt bottle—possibly an 852 or 860.

Glenn graduated from SHS in 1925 and entered K-State where he worked his way through as chief engineer of the college radio station, KSAC. In 1926 he became 9DFK. After graduation he was chief engineer of WOC, WOS and installed several stations. From 1931 to 1945 he was in the NBC engineering department in Chicago and had a weekly sked with his father William, W9PMX, who lived on South St.

Bill Webster, W9PMX, was an optom-



continued next page

etrist and former telegrapher. His rig had a 47 crystal osc driving a 210 final and his receiver was a cute little SW-3. By this time Glenn's call had become W9JIR. I visited Bill Webster's station only once and it was apparent that he enjoyed ham radio as a means for friendly rag chews rather than as a technical toy to play with.

Dave Robb, W9YRN, received his license the same day I got mine. At that time he was living on a farm at Hedville, seven miles west of Salina. His receiver used a 30 detector and 30 audio amplifier. The transmitter employed a 6A6 twin-triode in a Jones push-pull xtal osc running about 10 watts input on 80 and 40 meters. A pair of 40 foot A-frame masts supported the antenna. The farm's 32 volt wind-charger system supplied power for the filaments and the receiver. Two extra wires were run to the barn for the 2V and 6V taps on the battery. Plate power for the rig came from a 300V genemotor loaned by Doc Gammill who used it at his summer cabin in Grand Lake, Colo.

In 1937 Dave moved to 804 W. South St.—just down the street from W9PMX. His shack was upstairs in a room with lots of windows. He progressed to the usual 58, 57, 56 TRF and later to a National FB-7 receiver. His transmitter there was a 6L6 xtal osc driving a UX-210 (later an HY-40) with about 60 watts input. For antennas he used an assortment of dipoles.

Dave graduated from SHS in 1939 and went to KU. After getting his BSEE degree he continued his education—receiving a Ph.D. Dave is now head of his own consulting engineering firm with offices in the United Life building in Salina.

Dave's father knew a ham back in the '20s who lived on S. 11th St. just south of South St. This fellow ran a fine wire out of an upstairs window, through the trees and wrapped it around the trolley car main feeder line. Thus he was able to steal 150 mA at 550 V DC to run a pair of 210s in his push-pull TNT xmtr. Naughty and dangerous, but cost effective!

DeWayne Woertendyke, W9YAH, lived in south Salina. His station was neat and businesslike. He was very active on the air and handled lots of traffic. Later he moved to Colby. He recently retired after years of sea duty as a maritime operator and now lives in Idaho.

Joe Addison, W9PKD, was wire supervisor at the Bell Telephone Co. and he knew his radio theory. His shack was in the basement and the transmitter was a rack and panel affair with a 59 xtal osc, 46 buffer, 10 final on 160 & 80, phone and CW. His receiver was a Breting 9. Joe is in his 80s now but is still active. He built a SSB rig back around 1960 with a pair of 811s in the final. He has worked 46 states on 6 & 2 meters—quite an achievement. Joe's first rig was a pair of 45s in a p-p TNT. The TNT is notorious for its vicious note and lousy stability and the FCC found Joe calling CQ on 3300 kc! That's when he switched to the 59 xtal!

Bernie's station also was in the basement—right in front of the furnace where it was real cozy on cold winter nights. His receiver started as a three-tube TRF similar to the handbook set except it had a National type B dial coupled to the tuning condenser via a piece of speedometer cable. Later the set was modified to a superhet. After Bernie started working for the Coca Cola bottling plant he bought a National NC-100.

I remember when Bernie bought his 1939 Chevy coupe. He discovered that if he let a little air out of the tires, the car would fit nicely on the train tracks. One Sunday afternoon we took a smooth, quiet ride on the tracks to Gypsum, Ks. We passed farm after farm, watched cows grazing, windmills turning and all the time praying that we wouldn't

see the plume of smoke of an approaching locomotive!

Bernie got very upset when young beginners visited his shack and started turning dials, so he got a large piece of cardboard and mounted a 4" dial on it. Then he added a sign that said "If you must twiddle the dials—Twiddle this one!"

Bernie's brother Paul had a photographic darkroom at the north end of the basement. One day Don, W9ZEU, innocently opened a box of sensitized printing paper thereby exposing it to light and ruining it. This touched off quite a ruckus between Paul and Bernie and from then on none of us ever went near the darkroom again.

George Lantz, W9ZVD, was a genius. Using only a few simple handtools he made a working copy of Bernie's NC-100. George had a bad heart which caused him to drop out of college in his Freshman term. Many years later he overcame this handicap and was frequently seen jogging around Salina. He is now retired in Arkansas.

Tom Bayne, W9SRS, worked 160 meter phone exclusively. His rig was so professional it looked like a broadcast transmitter. There was a 3" Triplett meter in every stage and his homemade neutralizing condensers looked just like Nationals. His antenna was supported by two fifty-foot A-frame masts—one located in a field across the street from his house. A counterpoise ran beneath the antenna—about 7' above ground. A Breting receiver completed the station.

Tom's wife was a pleasant woman who never seemed to mind our visits and always warmly welcomed us into the house. She seemed to enjoy Tom's hobby even to the point of practicing code with him.

Tom built a unique oscilloscope consisting of a 6" long neon tube and a motor driven mirror. All this was built into a wooden box with a 3-1/2" diameter peep hole. The neon glowed in proportion to the degree of modulation and the mirror effected scanning action to reveal the shape of the modulation envelope and percent modulation! Truly a first class station.

Tom also got involved in the then current 5 meter mobile craze. His basement workbench was littered with genemotors, carbon mikes, breadboard chassis of experimental super-regen detectors, oscillators, modulators, etc.

I saw Tom's transmitter a few days after his big antenna was hit by a bolt of lightning. It suffered incredible destruction—all the Triplett meters, paper condensers and many other components were blown apart or badly charred. It was a sobering experience.

One day Bernie and I were at Louie's shack on State St. Louie had a two tube set using a 57 detector and 56 audio like the one George Grammer built for QST. His transmitter on 7162 kc used a 47 osc and a 45 final. While tuning around we heard a strong signal calling CQ and signing W9YCL. We worked him and found that he lived only a few blocks away so we went over and met Scott Bloomfield. He was employed by a tombstone company and used sandblasting to engrave the stones. Later he engraved our call letters into pieces of opaque glass. Scotty had a $29 Sky Buddy receiver and a neatly wired breadboard rig. When he called CQ his hand would leave the key between dots and dashes—rising several inches in the air and he would assume a look of ecstasy! He had a wife and three little girls and they were poor as church mice with almost no furniture but ham radio kept him happy. His shack was heated by a kerosene stove and the fumes would almost kill me. But the love of ham radio overcometh much!

Don Johnson, W9YAK, lived on S. 9th St. His shack was upstairs and featured a Hallicrafters Skyrider receiver and a Gross CW-60 transmitter (47 xtal, 53 Buf, 35T). The Eimac tube ran a nice



continued next page

cherry-red when fully loaded. Once Don was zapped by the 1500 volt supply while tuning up and was knocked across the room. He worked 40 M CW mostly and occasionally snagged some DX which was always a big thrill. In Jr. HS Don chummed around with Dick Adams (later W9YAO) and they followed the usual course of building xtal sets then 1, 2 and 3 tube sets of the regen type.

Don was in an antiaircraft unit during the war and used his radio background dealing with radar and electronic fire directing equipment. After the war he became a patent attorney. He is now retired and enjoys his personal computer system. One of his sons was a ham in the 1960s and he sometimes thinks about returning to the air himself.

Daniel (Dinty) Moore, W9YFA, built a fine superhet like the one in the 1936 handbook. He also had a beautiful model T Ford and all the young hams in Salina admired it.

After school I often worked Gene Swafford, W9ZAW, of Fort Scott, KS. Later when I was a freshman at K-State I saw a model T Ford with the call letters W9ZAW on its rear end. I walked up, grinning like an idiot and said "73 Gene, QSL?" He was startled—then quickly said "You must be W9YRQ!" We were good friends in college and later when I became chief engineer of college radio station KSAC he worked for me. In 1943 when he left to join the service, he sold me his 1932 Chevie roadster for $35. Could any other hobby bring so many blessings and good friends? I am reminded of a QSL card I received from a Mexican station in 1933 (My mother always liked this card best) —it said "Querido Amigo: (Dear Friend) I like my radio very much because every day it brings me more and more friends." To which I say AMEN!

We had a radio club in Salina which usually met in the HS Physics class room at Washington HS although in summer when school was out it met in the park. One evening a man whom I had never seen before got up and said that current flows on the outside of a conductor. This led to a heated discussion so he got up and drew a picture of a conductor on the black board with little rings encircling the wire every inch or so. Everyone laughed as they recognized the familiar representation of magnetic flux. Then another man got up and went to the blackboard. This fellow played the piano on KSAL every day. He began to cover the blackboard with equations. Then he wrote an equation containing an integral sign:

$$\int H ds = 4\pi I$$

The room was very quiet. I don't think anyone there had a ghost of an idea of what it meant. I had seen that mathematical symbol in a few very advanced books and I realized my knowledge of radio left much to be desired. Later I found out that this man had taught electrical engineering at a large eastern university and had lost his job due to drunkenness.

At one of our radio club meetings in the park, Richard Porter, W9SS, who was home from college, gave a description of a radio controlled toy train that he and his friends had built. Dick was from the family that operated Porter's book store. After earning his doctor's degree he became a VP at General Electric and played an important role in the Nation's space program.

In my junior year, Midland Television school of Kansas City donated a partial set of their correspondence course booklets to the HS library. Unit 1 (30 booklets) covered basic radio theory, Unit 2 (14 lessons) covered radio servicing and unit 3 (10 lessons) covered broadcast transmitters antennas and licensing. These booklets were a Godsend to me. The course was well written and thorough. Later in life I met two of the men who wrote these books - Dr.

Karl Martin who taught television at KSC and Tom Gluyas who was head of the Broadcast Television Transmitter Design Dept at RCA in Camden, NJ. When I was half way through the course, Jim Forristal left his job at Carlisle Radio and I easily got the job. This gave me an opportunity to test my new knowledge. I discovered that when you know exactly how a radio works it is 'duck soup' to fix it! Imagine getting paid to have so much fun! In my senior year I had enough credits at SHS so that I could have the whole afternoon for work at Carlisle's.

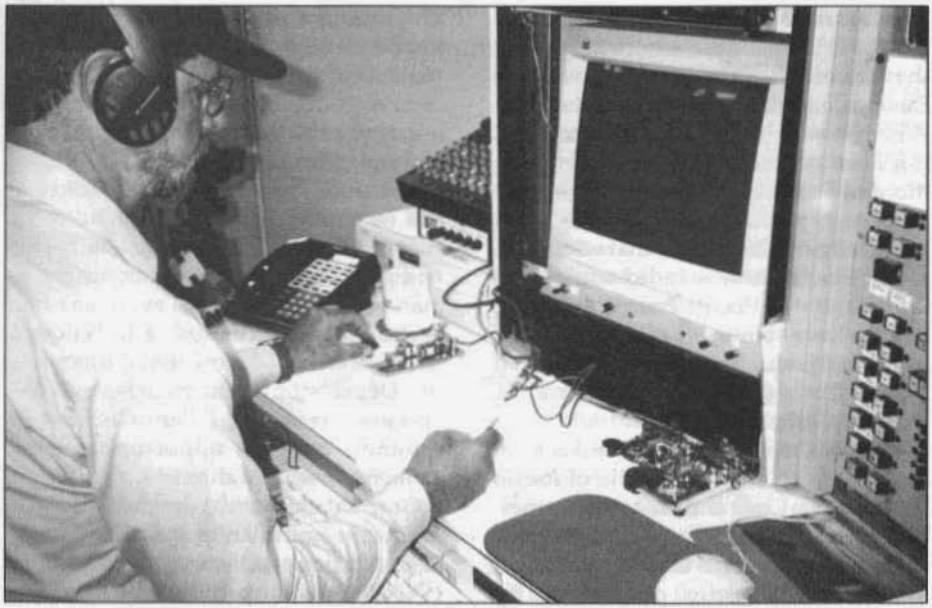
Ross Carlisle had a large bookcase in his shop with a complete file of Radio News, Radio Craft and other magazines. Whenever I caught up with my repair work I would read these. One day I discovered a series of articles by J.E.Smith—president of National Radio School. These covered math, algebra, trigonometry and elementary calculus. Soon I knew how calculus is used to prove the maximum power transfer theorem, how to find the average value of a rectified sinewave and several other wonderful things that calculus makes it easy to understand. This got me into trouble in my freshman year in college. Prof. Jorgenson accused me of copying a senior's report when I referred to derivatives of the B-H magnetization curve. Freshman weren't supposed to know calculus!

Radio station KFBI has a studio above the Carlisle Radio shop and Ralph Lewis played the violin on one of their programs. He often came down and we talked about our plans to get a Radiotelephone First Class license. Within a year we both had our license—he went to a radio station in Yuma, Arizona and I was a freshman at K-State working in the college radio station, KSAC.

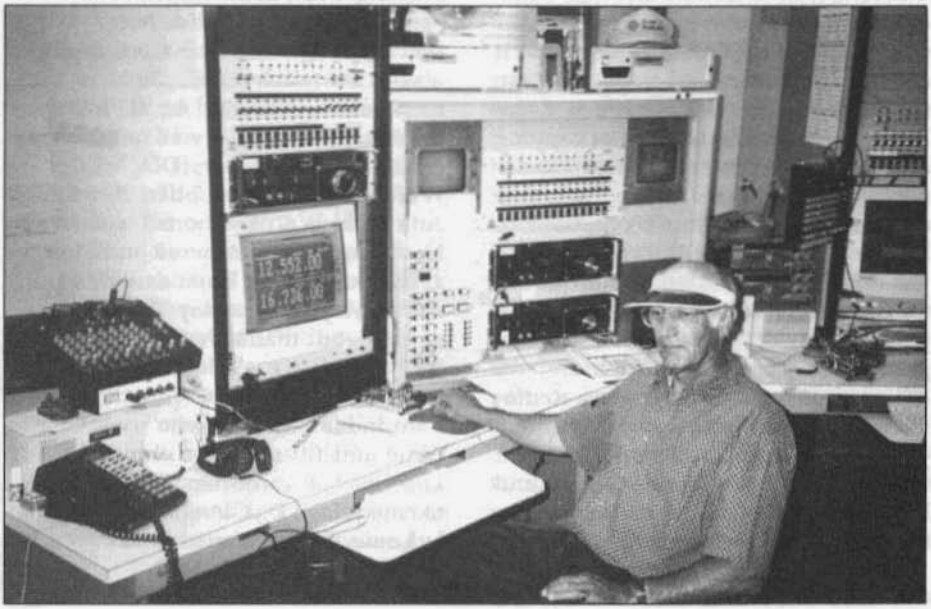
One day Mr. Gemmill came into Carlisle's shop and said "Bobby, it's about time you thought about college." I told him that I had visited Louie at Emporia State and Dr. Cram of the physics Dept. had offered me a job there. Well, Doc would have none of that—"you're going to be an engineer and you must go to K-State!" I protested that I had saved up a few hundred dollars but that wouldn't be enough. He told me not to worry. An hour later he came back with a check for $50 and said "This will get you started." During my freshman year he sent checks every so often—enough to keep me going and enough left over for a slide rule. Hard times like the Depression seem to bring out the best in some people. I thank God for Mr. Gemmill and the opportunities that came my way in Salina.

Graduation from high school today is big stuff—with all night parties in fancy halls or trips to Disney World - but in 1940 it was unpretentious. We assembled in Memorial Hall—students, teachers and proud parents. Professor Anderson was drunk as usual. We heard the usual speech, received our diploma and walked out into the warm June evening. Most of us wandered down to Santa Fe Avenue. I had a cherry-coke at Linck's drug store and went home. It wasn't so much graduation as commencement. It would be followed by college, a tour of duty as radar officer on a Navy destroyer (DD775) during WW II, marriage to Ellen Burskey, a cute little WAVE whom I met in the Navy, post graduate work and 31 years at RCA designing Broadcast TV equipment. Maybe someday I'll fill in the details—but that's another story. ER

PS.
I am indebted to all who took time to write and fill me in on things I never knew or had forgotten. Special thanks to Hoisy, Don D., Glenn, Dave, Joe, Don J., Louie, Ralph, Jean and Jack.



**Dick Dillman, W6AWO, sending farewell message from the Maritime Radio Historical Society over KFS/KPH on last day of North American commercial Morse, 12 July, 1999.** ***Photo by Tom Horsfall, WA6OPE.*** **[Ed. This photo and the one below did not arrive in time to be included with last month's article "The Last Day of Morse" by Dick Dillman, W6AWO.]**



**Paul Zell, Chief Morse operator at KFS/KPH on last day of North American commercial Morse, 12 July, 1999.** ***Photo by Dick Dillman, W6AWO.***

**Walter Schivo, WB6BKN, in his vintage hamshack. He's a very dedicated 10M operator.**

**Barry Sims, W7JKY, at his AM operating position. The transmitter is his latest homebrew project.**

# The glow lives on...

**by Fred Johnson**
**6202 Hilltop Trail**
**Sachse, TX 75048**

Ernie Pappenfus, K6EZ, 81, formerly of Cedar Rapids, IA , died August 14th of cancer in Temecula, Calif. Ernie is survived by his wife, a daughter, two sons, and two brothers.

Ernie was the power behind Collins Radio's amateur equipment development in the 40's, 50's and 60's. In addition, being division head of the engineering community he was responsible for many HF equipments from 50 KW transmitters to automatically tuned and loaded radios for all branches of the military. The S-Line equipments were developed under Ernie's direction as was special measurement equipment and stable oscillators.

Ernie had a warm yet sharp approach to getting things done. The short term high intensity development program which became known in the industry as the "Green Room" was originated and put into practice by Ernie. The first program of just a few days resulted in the product known as the Collins 30-L linear amplifier.

**Ernie Pappenfus, K6EZ, at Collins Radio back in the '60s.**

Always one to know the involved principles, Ernie founded a program of internal self schooling that became known as the Collins College of Radio knowledge. It was taught in rented halls or company property. New engineers were "encouraged" to attend and the courses were taught by individuals who had advanced skills. In teaching, these individuals learned more than the student. The result was a team of Collins development engineers that had broad capabilities.

Ernie worked closely with Arthur Collins in the amateur equipment developments. They were good friends. Ernie was well liked and had a great sense of humor. He was always available to engineers who needed to see him and took satisfaction in seeing the development of engineer capabilities.

Ernie was great with customers. He used his wit to great advantage. Examples of his humorous exchanges are still being shown about.

Ernie went on to a varied career beyond Collins Radio Company. He had responsible positions with major electronics manufacturers and ultimately retired, taking consulting positions in his areas of expertise. Restoring a Corvair to show condition, running a 30-acre avocado ranch and managing a concrete block manufacturing plant give a clue to Ernie's breadth.

Those fortunate enough to have worked with and for Ernie have a warm feeling for the man. He was a leading light, not a hard driver.

The glow lives on.... ER

# VINTAGE NETS

**Arizona 40M AM Group:** Meets on 7293 kHz at 10:00 AM MST (1700 UTC) on Sat. and Sun.
**Westcoast AM Net:** Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their informal AM net which includes a swap session. Net control rotates.
**California Early Bird Net:** Saturday mornings at 8 AM PST on 3870.
**California Vintage SSB Net:** Sunday mornings at 8 AM PST on 3835
**Southeast Swap Net:** Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
**Eastern AM Swap Net:** Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
**Northwest AM Net:** AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
**K6HQI Memorial Twenty Meter AM Net:** This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 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 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
**DX-60 Net:** This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
**Eastcoast Military Net:** It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0500 ET on 3885 + or - QRM.
**Westcoast Military Radio Collectors Net:** Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.
**Gray Hair Net:** The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html
**Vintage SSB Net:** Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
**Collins Collectors Association Nets:** Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
**Collins Swap and Shop Net:** Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
**Drake Users Net:** Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
**Swan Users Net:** This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
**Nostalgia/Hi-Fi Net:** Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
**K1JCL 6-Meter AM Repeater:** Located in Connecticut it operates on 50.4 in and 50.5 out.
**JA AM Net:** 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
**Fort Wayne Area 6-Meter AM Net:** Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
**Southern California Sunday Morning 6 Meter AM Net:** 10 AM Sundays on 50.4. Net control is Will, AA6DD.
**Old Buzzards Net:** Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
**Canadian Boatanchor Net:** Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating
**Midwest Classic Radio Net:** Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
**Boatanchors CW Group:** Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
**Wireless Set No. 19 Net:** Meets the first Sunday of every month on 7.175 +/- 5 kHz at 2000Z (3760 +/- 5 kHz alternate). Net control is Dave, VA3ORP.
**Beer Town Traders Net:** On 3885, 5:30 Central Daylight Time on Saturdays.

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

# Haunted Hammarlund Comet Pros

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

Getting a ham license 5 weeks before Pearl Harbor was not real smart. FCC order 87 on Monday December 8th 1941 said "no person shall engage in any amateur radio operation" and all amateur frequencies "ARE HERE-BY WITHDRAWN". Too young to enlist, the only thing I could do was finish high school, plan on the Army in 2 years, and wonder when I would be on the air again. There was talk about needing hams for civilian defense radio nets but it was only talk in early 1942. WERS, the War Emergency Radio Service 2-1/2 meter radio net authorizations didn't come through until late summer.

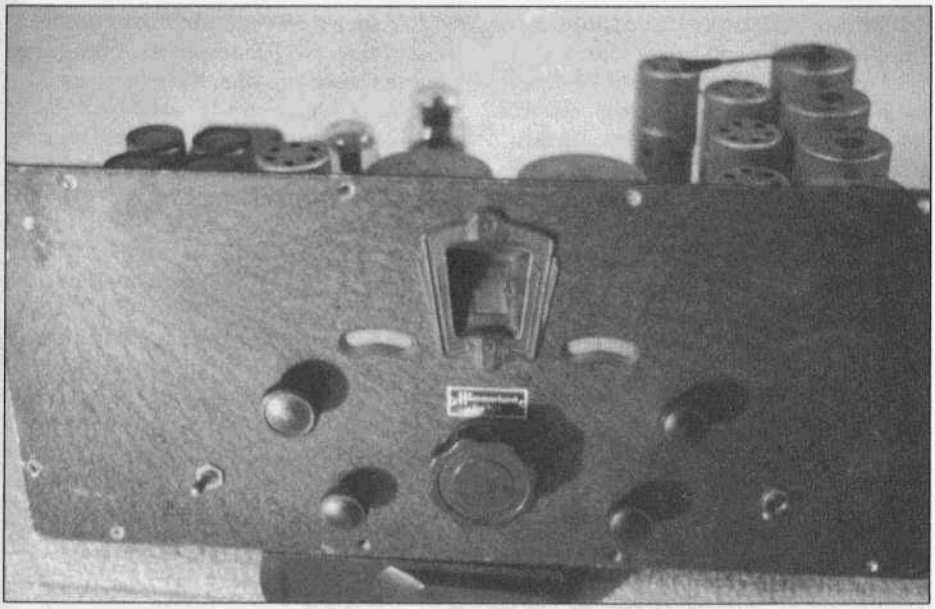
In the March 1942 QST Byron Goodman, W1JPE, described carrier current communications. Transmitting frequencies between 150 and 200 kHz over the 115 volt AC power lines, communications was possible for distances up to 10 or 15 miles. Goodman described a simple 6L6 Hartley oscillator/transmitter working on 175 kHz and a 1-tube receiving converter. Keeping the power down the signal would not radiate the power lines and violate FCC rules. It provided a way to do some local hamming and the ARRL pushed CC to keep up activity during the war. A carrier current column every month in QST published reports from active stations and how to build or modify equipment to work carrier current.

I decided to give it a try and headed to Genesse Radio to get parts, but lacking any war time priority I couldn't buy much. When I said I wanted low frequency coils, the counter man showed me a used 1933 Hammarlund Comet Pro receiver on consignment from a ham who had gone off to war. It had plug-in coils that I could rewind for low frequencies. Since it was used, and not on the Government communications receiver wanted list, I could buy it without a priority. So for $40 I brought the Comet Pro home on the trolley, bringing the total cost to $40.10.

Introduced in the spring of 1932 the Comet Pro was the first short wave superheterodyne or as Hammarlund called it a "double detection type receiver designed to meet the exacting demands of advanced amateurs interested in the reception of both code and voice radio signals in the frequency range of 20,000 kc to 1,200 kc". Hammarlund advertising addressed the controversy about AC operation versus battery. "Hammarlund engineers, after some experimental work, found it was perfectly possible to build an all AC receiver just as quiet in operation as the finest battery-operated receivers".

Advertising also addressed the question that superhets were considered too noisy for satisfactory weak signal reception. Hammarlund said "But experimental work also disproved this theory". They quoted an independent laboratory test of the Comet Pro as measuring the sensitivity as one quarter microvolt with a 4 to 1 signal to noise ratio. It is interesting that in only one advertisement did Hammarlund refer to the tuning range of the Comet Pro as 20,000 kc to 1200 kc. All other advertising I have calls it 15 to 250 meters, a much more common way of identifying tuning ranges in the early thirties. The plug-in coils and calibration charts were in meters.

Hammarlund being first with a ham communications receiver started the



**The Hammarlund Comet Pro was introduced in the spring of 1932.**

trend towards massive and black. Comet Pro makes the R-390A and SP-600 look small as it is bigger. None of the control knobs, switches, or terminal strips are marked as to function, a trend followed in 1934 by McMurdo Silver and RME, but then dropped by Hammarlund in 1936 with the bandswitching Comet "Super Pro". Despite its size and weight, I managed to lug the Comet Pro from Buffalo, NY to California, to Ohio before the war ended in August 1945.

Other than carrier current in Buffalo in 1942 and '43 I used the receiver only for SWLing. When we were allowed back on the air in late 1945 with the opening of the 10 and 2-1/2 meter bands I set the Comet Pro aside and used a Hallicrafters. I still have the Comet Pro manual, but what I did with the receiver I don't remembered. I might have sold it, gave it away, or loaned it out. Whatever, it just disappeared out of my shack and mind.

Perhaps my memory problems were aided by postwar FCC red tape. Since I had moved, I should have notified the FCC. Back then they changed your call sign if you moved to a different district, but during the war they asked all paper work be held until further notice. In June 1946 they requested forms from hams who were in areas where calls had to change due to realignment of call districts. I was licensed in Buffalo as a W8JWK and Western NY was changing from W8 to W2, so I submitted a modification.

I received W2QAO three months later, since my W8 suffix was assigned in the W2 area. I reapplied asking for W8JWK back as I was living in the eight district. Three months later I received W8QAO. This was spooky as the call on the front of my Comet Pro book was W8QAO. Dick Morrison, W8QAO, the previous owner, had lived near Buffalo and was killed in the Pacific. Was the Comet Pro trying to jinx my call?

I sent a letter asking again for W8JWK. Three months later I received a notice advising me it was in use. I tried telephoning the FCC in Washington. After



continued next page

45 minutes talking to 10 disinterested people, I finally got a nice woman who told me Charles Teeters held W8JWK. I told her I was Charles Teeters. She said no problem then, apply for a duplicate license stating how I "lost" the original. A $20 phone call (a lot of money then), and 14 months. The Call Book didn't get it straight for years, and I'm not too sure about the FCC. I blame it all on the Comet Pro. In 1946 they weren't worth much, so I didn't think much about losing track of it. I must have insulted the Comet Pro.

Several recent advertisements in ER caught my eye when they listed Comet Pros for sale and I gave them serious looks, but they were always in Colorado, California, or some other exotic place. But when one was listed in New Jersey my resistance broke down. A friend, Hank Yanel, W2SN, used a Comet Pro when I was at Fort Monmouth, NJ. Hank, who was the W2 QSL manager, took a lot of kidding about the old receiver but said it heard them in the thirties, so there was no reason it couldn't hear them in the fifties. With thoughts this might be Hank's old Comet Pro, I purchased the receiver.

I found my new Comet Pro came from the Mack Seybolt, W2RYI estate. Mack worked for RCA and wrote articles for QST and CQ about RCA test equipment and tubes. Then I found a picture and writeup about W2SN in QST with his Comet Pro. Hank had an extra switch on the panel exactly where the one I just bought does. The one hand-written page that came with my receiver says the extra switch is the filter in/out switch. The QST article about Hank said he had added an audio filter for CW. So is this Hanks Comet Pro? Mack out lived Hank by 10 years so maybe he ended up with it. They belonged to the same club and only lived 10 miles apart. I don't know, and the Comet Pro wasn't talking.

I went inside looking for answers. First I checked the tubes. The Comet PRO uses a 58 pentode mixer and a 57 oscillator. No RF amplifier. Both tubes were Cunninghams, the brand used by Hammarlund. The IF uses two 58s as 465 kc amplifiers. One was a Cunningham, the other a Western Auto Wizzard with a December 1934 guarantee sticker. Next was a Cunningham 57 plate detector. The audio was a 2A5 power pentode Cunningham, the rectifier a type 80 Cunningham. All in the green on the tube tester, except the 80 was in the yellow. All except one appeared to be original, and that one was almost as old. Either the receiver wasn't used very much, or Cunningham built a heck of a good tube. Hank used his receiver a lot, so despite the CW filter switch I don't see how this could be his with all the old tubes.

The 4 coil sets were in the original box but no writing there except what the factory put there. They are 5 prong Hammarlund Isolantite CF-5s, the extra prong used to connect in the proper section of the bandspread caps on the different tuning ranges. Next it was inside to check out the wiring. Everything agreed with the schematic, and matched the underside photos except for the detector-audio. There was a WW II LS-3 speaker output transformer connected to the grid of the 2A5. It could be switched in with the panel switch. Only the primary was used with 2 fixed caps across it. A check with the audio oscillator showed resonance at 600 Hz. A good frequency for a CW filter. The LS-3 transformer puts the CW filter modification after WW II, about the time the QST article said Hank did it.

I checked the B plus, no shorts. The line cord was the original cloth covered one with a few thin spots but was serviceable. I put the power to the Comet Pro. The dial lamp came on, the filaments lit, and B plus came up to 300 volts, exactly what the manual said it should be. I plugged in my Brandies, turned up the RF gain (Comet Pros don't

**A view of the top of the chassis from the rear.**

have audio gain controls) and there was noise and no hum. This thing works with 60 year old filter caps. They have to be oil filled.

I pulled the coil shields off and plugged in the two DD coils. Using the calibration charts I set the dials for 200 meters, 1500 kHz. No tracking problems with separate 0 to 100 dials for mixer and oscillator tuning. The bandspread is ganged however, tuning the osc and mixer, according to the chart, over about 16 meters on it's 0 to 100 illuminated dial, but it wouldn't turn. The cord on the right angle drive was broken. Reaching inside I turned the dial by hand. The first thing I heard was Kato and the Green Hornet on 196 meters, WSAI, 1530 kHz. They run old radio programs. Leave it to a spooky Comet PRO to come to life with a nineteen thirties radio program.

It was time to replace the dial cord and clean up the receiver. There was about 1 volt positive on the 2A5 grid. Leaky .02 bathtub. It looked like the first part ever replaced in this receiver. I removed the CW filter mod, it didn't seem effective. The IF alignment was right on the button. I checked the calibration charts, not much change from 1933. The BFO was intermittent, a broken wire in the can. The BFO pitch control is on the top of the BFO can inside the receiver. It's easy to bang it removing the receiver from the cabinet. Hammarlund didn't see any need for the operator to adjust the BFO of the Comet Pro. Even when he added AVC and a crystal filter to the later Comet Pros he left the BFO adjustment inside. He didn't change his mind until he built the Super Pro in 1936.

Now that the Comet Pro was working the way I thought it should, I decided to give it a workout in the shack. I pulled my SX-24 out and hooked up the Comet Pro. The speaker output is 4000 ohms so a matching transformer is a must if you want to hear anything. There are no connections to kill the Comet Pro on transmit, no standby switch either. I hooked my T/R relay up to short both the antenna and



**continued on page 41**

# Another Fleamarket Gallon

**by R.W. Berkemeyer, WØREP**
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**Ballwin, MO 63011**

Buggis hammus nuttis struck again, this time probably brought on by the unseemly hot weather this summer. When the temperature is in the upper 90s and the heat index is well over 100, there's nothing better (at least at my age) than to head for the basement shop and build something. Now, I need another gallon amplifier like a hole in the head, but the acquisition of a bunch of 304TL tubes begged that they be used for something. I decided to build another KW amplifier similar to the Flea Market Gallon described in ER #105, but using a 304TL. No schematic is included since your parts will differ from mine and the general circuit has been published many times.

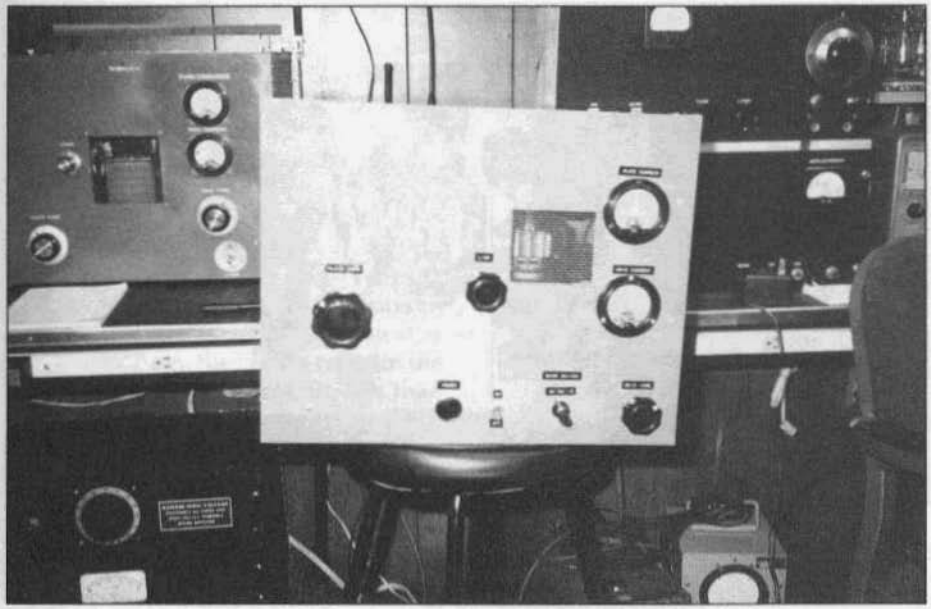
A check of the rafters disclosed another 12 x 17 x 3 chassis, again without too many holes from some previous incarnation. The 4" hole, originally designed for a 3-500Z socket could be covered by a piece of aluminum and the other holes could be either used or ignored. From previous articles, you probably know I don't buy anything if I can build it or modify something I already have. This latter idea was applied to the plate capacitor. I didn't have a 100-100 9000V cap, but I did find a 300-300 3000V unit This was disassembled and half the plates removed and the remaining plates reassembled using two spacers between plates. A little adjustment of the location of each plate set by moving the locking screws and adding washers and I had the plate cap I needed. It came out to 90-90 at about 9000 volt spacing and fitted on the chassis perfectly.

In the previous amplifier I mounted the plate capacitor directly on the chassis. Since I thought I might want to amplitude modulate the new unit, I knew I had to get the DC off the rotor so it wouldn't flash over on peaks. A couple of small blocks of bakelite did the trick. The rotor would have to be bypassed to ground, but there were several 5000V mica caps on hand. No problem.

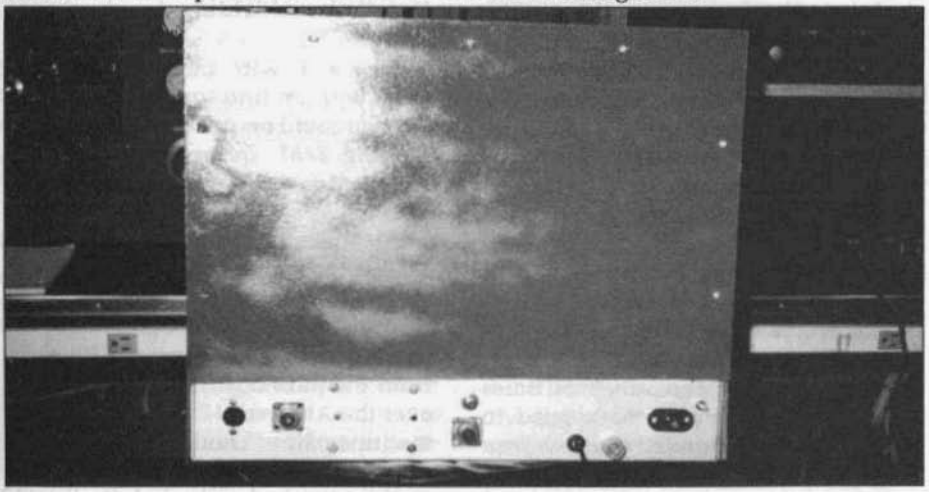
I had a complete set of KW swinging link coils on hand, but no swinging link assembly. A block of plastic was drilled near one end to pass a 1/4 inch shaft and a hole drilled and tapped for the setscrew. A surplus potentiometer with a locking screw was disassembled and the bearing assembly used to mount the plastic block to a small aluminum angle which would end up mounted an a plastic standoff. The locking nut allows the link to be tensioned so it can be adjusted from the front panel but won't move by itself. An old two turn link was fastened to the other end of the block and I now had my swinging link coil configuration.

The remaining problem was the neutralizing capacitor. The 304TL has high interelectrode capacity, being, as it is, four 75T tube assemblies paralleled in one envelope. That calls for a BIG capacitor. As I tried to figure the answer, I looked at a second 304TL and socket I had been using for testing. OK what can have the same interelectrode capacity as a 304TL? Another 304TL.

So now I had all the major parts needed (oh, yes, I did have the filament transformer, picked-up at some forgotten flea market). Some coil material, a variable cap and a ceramic band switch



**Front view with previous Fleamarket Gallon in background.**



**Rear view with SO-239 input and output connectors, high voltage connector, phone jack for send/receive from exciter and 110V power supply relay.**

for the grid circuit, and I was ready for the final design. There was just one more problem—the 304TL requires at least 250 volts bias for cutoff and more than 500 volts bias for efficiency. Well, there was room under the chassis for a small receiver type power transformer. Testing of one on hand indicated that it would put out over 250 volts at 50 mA. Now, a bias supply for a class C tube doesn't have to be well regulated, but there is one thing to be careful of. When the grid current flows through the bleeder which is part of the bias circuit, it can cause the voltage on the bias supply filter caps to be much higher



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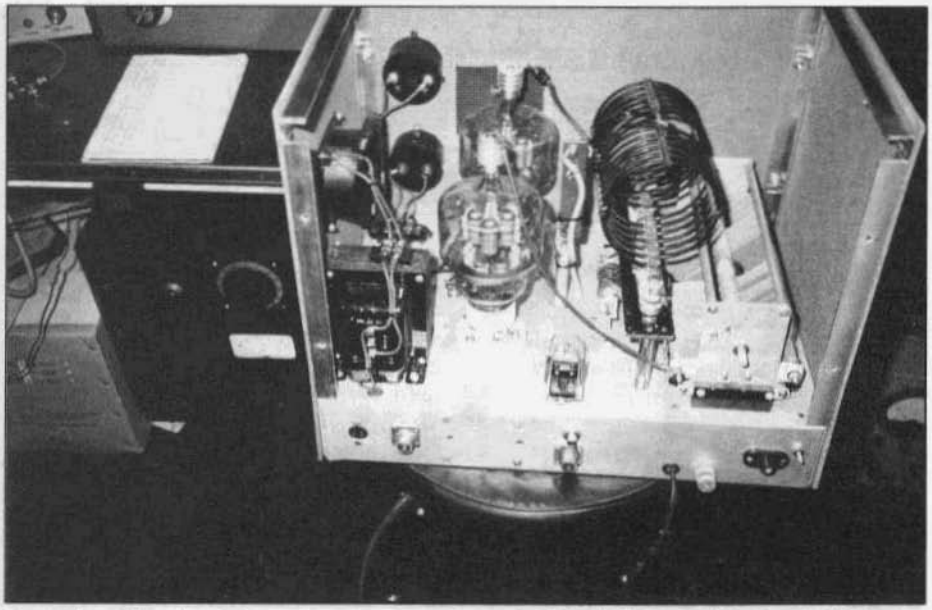


**Rear view showinginternal arrangement—swinging link assembly & small blower on left wall. Aluminum foil has not been installed as shielding.**

than that required by the supply itself. In this case, I figured that the output cap could see as much as 600 volts. That is the reason that there are two 400 volt caps in the bias supply. They are in series and a 100k resister across each. This value will help equalize the voltage across the caps, but will not affect the grid resistance of about 7000 ohms.

This is not a step-by-step procedure for building a big amplifier. The circuit has been in print thousands of times over the years. What I have tried to show is that you use what you have, can beg, borrow or steal and if none of that works modify and adapt. If you don't have the right meters, you shunt what you have to the correct value. If you don't have the right neutralizing cap, use another identical tube (which doesn't have to be good, just not shorted or broken and doesn't need a good filament). Wind transmitting coils from house wire, 1/8" copper tubing or even 1/4" tubing. Build the cabinet from 1/8" pressedwood and aluminum angle, and paint it with the cheapest spray paint you can find (or don't paint it at all) You could omit the cabinet and cage it using 1/8" square hardware cloth. The main thing is BUILD SOMETHING!!!

Does the finished unit work? With 2750 volts on the plate at 400 mA and about 70 mA drive from my Drake 2-C, the input is 1100 watts and about 850 watts out. Not bad for an amplifier built from the junk box. It should run well over the AM limit—I plan to modulate it with a pair of triode connected 813s. I'm still thinking about that 304TL linear for 160 which will work fine on AM using controlled modulation in the driver.

Just remember, the voltages involved are lethal. **BE CAREFUL** but HAVE FUN!!! **ER**

# BOOK REVIEW

***On The Short Waves, 1923-1945** by Jerome S. Berg, Publisher: McFarland & Company, Box 611, Jefferson, N.C. 28640. 272 pages, hard cover, 7 X 10 in. Illustrations B & W.*

Reviewed by Bruce Vaughan, NR5Q

This well illustrated book will bring back many memories to those who remember the thrill of tuning in a foreign station on a detector-one step in an attic hideaway, or on the family radio in the living room. Many hams are less than enthusiastic when answering SWL cards. This book reminds us that SWing is a hobby within itself and not necessarily a step toward becoming a ham. As I read the book I became aware that we, the ham fraternity, were all SWL's before we were hams.

Mr. Berg's book is illustrated with literally hundreds of interesting pictures. Relive the days of Gernsback Publications such as Short Wave Craft, (my favorite magazine of the thirties) Radio News, and Radio Craft.

This carefully researched and well documented volume covers the emergence of radio from the time of spark and Alexanderson generators up through the post war Voice of America stations.

Illustrations alone are worth the price of the book. Here you will find pictures of rare QSL cards and verification letters, early advertising, men and women who played a part in early radio, radio equipment, antennas, broadcasting stations, magazine covers, and diagrams of radio installations.

For many the most appealing part of the book is the excellent index, making any aspect of early radio quickly available.

One can only hope that more radio books from Mr. Berg are forthcoming. I assure you my copy of 'On The Short Waves, 1923-1945' will soon show signs of wear as I constantly refer back to it for needed information.


**PRODUCT ANNOUNCEMENT**
**NEW SVETLANA Y644**

**Svetlana Introduces the Y644 Tetrode to the World Market**

The Y644 is a version of the venerable 4CX250B. It is identical mechanically. It is substantially different electrically because the Cossor CGR1020 VHF/UHF ground/air communications system was originally developed to use the Y644 by ECI in the United States. The Cossor system is used by the British Military and by military organizations throughout the world. The Svetlana Y644 is fully qualified by the British Ministry of Defense for the CGR1020 ground/air communications system. The Svetlana tube is now being used extensively by the British MoD and is exactly plug-compatible with the Y644 manufactured in the United States. The Y644 is currently available from Svetlana distributors throughout the world.

For more information contact:
Headquarters
8200 South Memorial Parkway
Huntsville, AL 35802
Tel: 256-882-1344 Fax: 256-880-8077
Marketing & Engineering
3000 Alpine Road
Portola Valley, CA 94028
Tel: 650-233-0429 Fax: 650-233-0439

# Triple X 813 Homebrew Transmitter

by Sam Champie, W7XXX
105 W. McKenzie
Hermiston, OR 97838

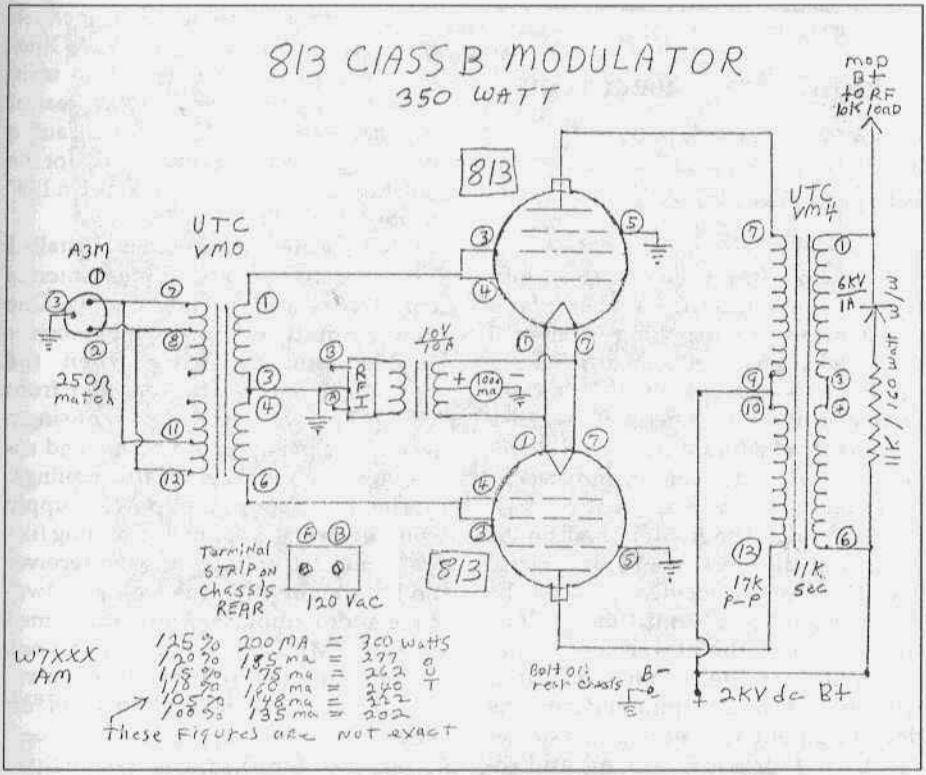
## Part Two, The Modulator

I am discussing the modulator in depth in this article because the most frequent asked question is how did I do it. A few hams on the air have figured it out when I told them I used 2 813s in class B and was modulating 125% on the positive peaks and 100% on negative. A quick check of my sidebands and audio quality gave it away. It's too simple to be true.

The first thought I had was I wanted to use the same power supply for both the RF and mod decks and my supply was 2 KV at 500 mA, so the choice was easy. A pair of 813s triode connected was the answer, and I began my research. Old articles in Electric Radio were helpful, but not detailed enough to custom engineer what I wanted to do with the transformers I had. The first debate was should the suppressor grid be grounded or hooked to the other two grids. I didn't get the answer I wanted until I, by luck, bought a copy of the 1959 Radio Handbook. To avoid RF problems in the modulator deck ground the grids. Some hams claim they can get another 50 watts by hooking all the grids together, but if you are out in the street duking it out with your unhappy neighbor or destroying your wives phone call, weigh the facts. Is it worth it? No, and I feel it's poor design unless you are building a neighborhood entertainment station. This brings up another big debate which has a simple explanation. How about those swamping resistors you hear about? You can see them in my photos in article #1. I took them out pronto. They made it hard to get a correct idle current and hard to get a match on the audio drive to grid impedance. They may help if you are using long lines from your audio driver and using its output transformer directly into the grids of the 813s. The secret of getting proper idle current is to get the right driver to grid match, which wasn't easy, but I was lucky to have a UTC VMO multimatch transformer which when I found the right match put my idle current at 50 mA. I'm was happy instantly. My old Masco PA has adjustable output impedance so it made the process less painless.

Alrighty then, what about the use of overmodulation in order to put more audio out on my signal. A negative cycle unloading circuit proved to be the answer and gave that hard to find old UTC VM4 modulation transformer the protection it deserves. I used the same circuit I had tried on a 15 watt homebrew with success. I only wanted to put out 300 watts audio to my 300 watt carrier, so no need for complicated hard to adjust circuitry. One big wirewound resistor and one high voltage diode was the plain simple answer. How do you know how to pick the value of the resistor. This plagued me as I'm not one to use the smoke tests and waste these rare old resistors that are disappearing rapidly.

After coming up with a logical solution which was that the resistance should match the load of the final RF amplifier, I then proved it with the scope. If you want to modulate over 125% your resistor should be variable so you can lower the resistance until you achieve your desired positive and




not exceed 100% on the negative. If you go for the big audio, I would advise using the three-diode circuit which keeps a fixed load on your transformer and allows you to adjust for lower resistance and more positive modulation while leaving your protective load unaffected. I like the sound of the audio at 110% to 130% as it is almost broadcast quality when tailored properly. In excess of 150% sounds boomy and is perfectly good communications audio, but I go for a little more fidelity over loudness. I must be getting old. This modulator is so simple it still amazes me why I ever built anything else. Zero bias. To this date all 40 on air reports have confirmed that my audio is high quality and the listener has their choice of audio, due to the Hi-Fi PA and my microphone collection that host such classics as the Gates 700, Turner U9S, 33X, 22D, 22X, Shure 55, Turner 9D, 44D and many others. If you are limited by one microphone, tailor your audio to match. It makes a difference. Do lots of reading in the old handbooks and don't forget your math. It's a must. **ER**

PS: Yes, I forgot the power rating on the resistor should be half the output (modulator) power to be safe. I over build as I like to get on to new projects, not repair old ones.

# One Tube Homebrew Receiver

**by George Carroll, N2GBY**
**301 New Jersey Ave.**
**National Park, NJ 08063**

After building my one-tube transmitter featured in Electric Radio #75, I decided to build a matching receiver. I found what I needed in an article written by Penn Clower, W1BG, that appeared in the December 1992 issue of '*73 Magazine*' which described the construction of a one-tube regen receiver. Early on in the project, I realized that there would not be enough room on the chassis for the receiver and power supply. Therefore, I decided to build the receiver and then a third unit, which would contain the power supply and an audio amplifier. Both the chassis were made from 3/4" pine and from the door of an old automotive parts cabinet. Except for a few resistors and capacitors, all components came from my junk boxes.

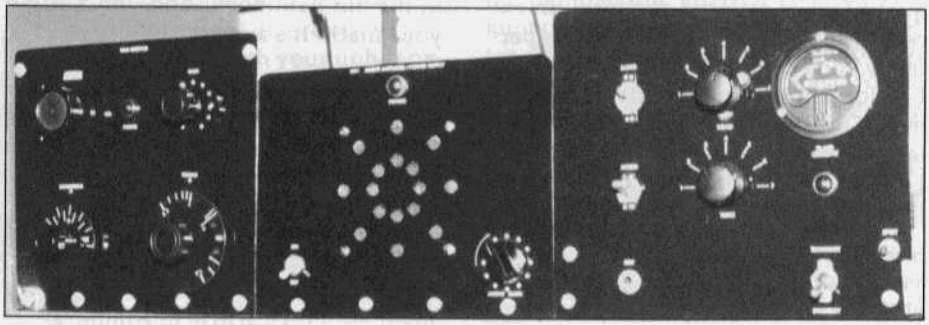
The receiver uses a tube 6SN7, 1/2 detector, and 1/2 audio amplifier to drive a set of high impedance headphones. The plug-in band coils are wound on the glass envelopes of old octal tubes. I made 4 coils covering 40, 75, 80,160 meters and the AM broadcast band. The antenna is coupled to the coil with a swinging link which is operated from a control on the front panel. Other panel controls include regen gain, main tuning and bandspread. At the rear of the chassis are jacks for power in, audio out, muting, and a terminal strip for the antenna connection. On the side is a 1/4" headphone jack.

A 4-pole double throw relay installed in the transmitter provides antenna changeover and receiver muting. One inherent problem with this type receiver is frequency shifting when the operator's hands are near the front panel. This was eliminated by using a steel front panel for shielding, and using Johnson insulated shaft couplings.

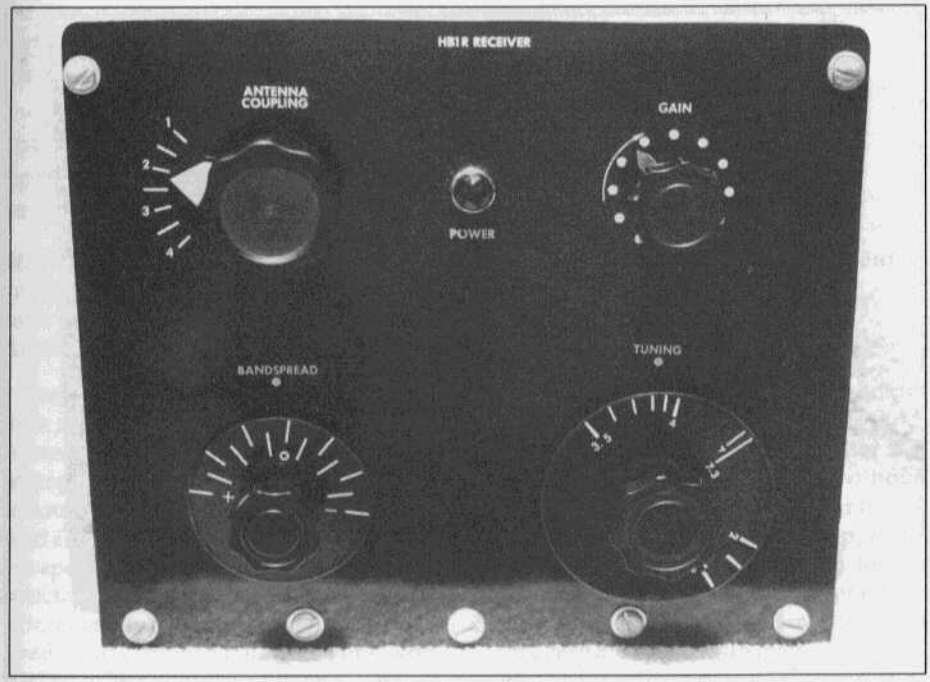
The audio amplifier/power supply contains power supplies providing filament and B+ voltages for the receiver and audio amplifier as well as a two-tube audio amplifier (circuit designed by K4CWM), using 6V6 and 6SN7 tubes. Mounted on the front panel are an audio gain control speaker and an on/off switch.

I painted the front panels of all three units a "Johnsonish" maroon color. Lettering was done using dry transfers then the panels were painted with two coats of clear.

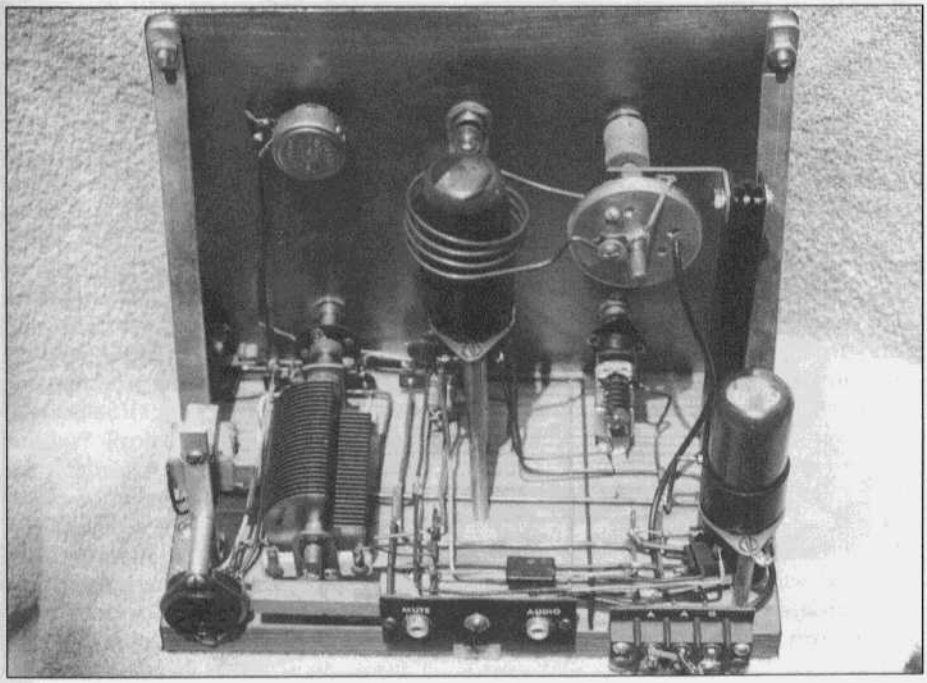
The performance of this little station has been pretty impressive. So far I have worked 22 states on 75 meters AM and have made it as far west as Kansas when I worked Mike, WØBVA early one morning. ER



**The complete station, left to right: receiver,power supply/audio amp and transmitter.**




**Front view of receiver.**




**Rear view of receiver.**



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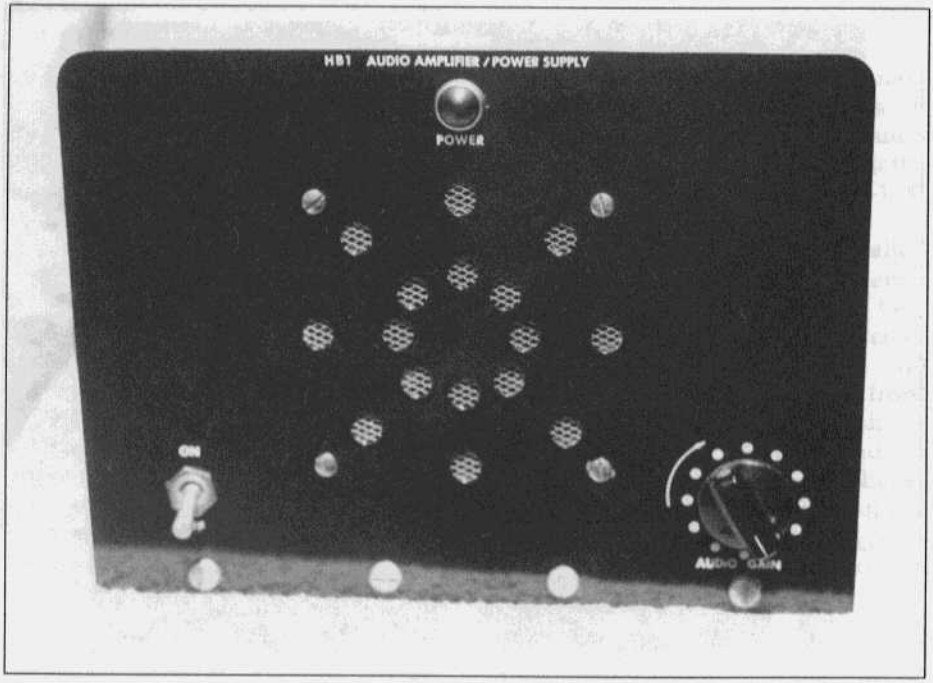
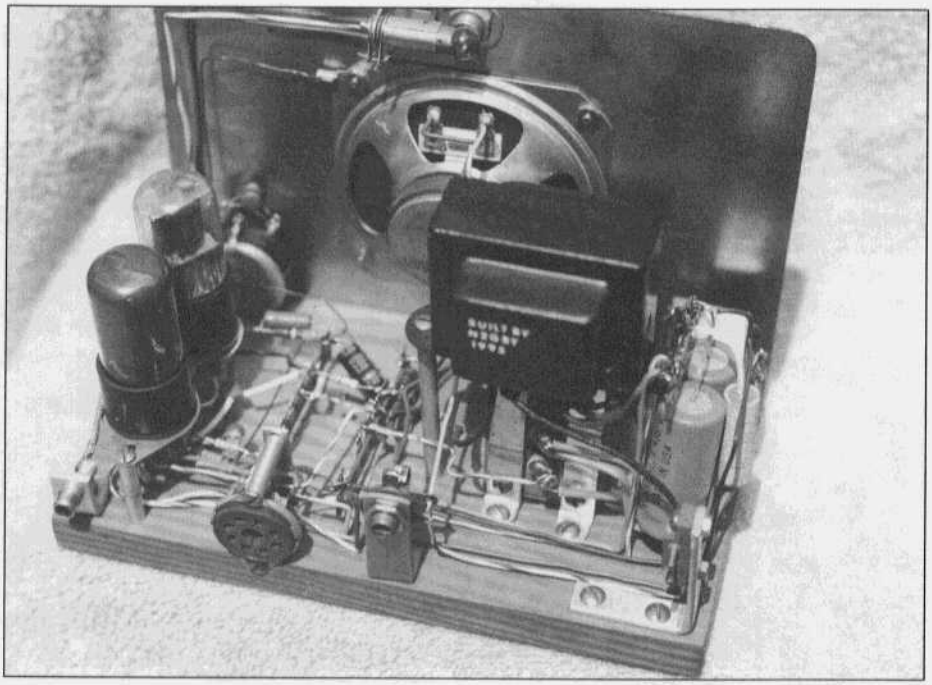



Front view of the audio amp/power supply



Rear view of the audio amp/power supply

# The Builders

**by Bruce Vaughan, NR5Q**
**504 Maple Dr.**
**Springdale, AR 72764**
**nr5q@aol.com**

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

Perhaps the primary reason there is so little radio construction by present day Amateurs is that they simply do not know where to begin. I offer this observation seriously. When was the last time you read anything in a radio publication written specifically for beginning radio constructors. My article in the July issue, "Clarence" was a true story. Clarence lived. And Clarence taught anyone who wished to learn how to build radio gear—and he taught them how to build from whatever parts were available. Necessity made him an expert in the art of 'making-do.' In the next few pages I will pass on a few things he taught me. If some of my directions seem obvious, forgive me, it is better to cover material not needed than to omit something that is not well understood.

*Your first step before starting a building venture is to choose a viable project.* Is the item something you would like to have? Does it look simple enough for a first attempt? Can you find all the required parts and components? Is the item you selected suitable for the average home builder? Projects requiring extensive metal fabrication, for example, are best left to someone with a suitable shop. Perhaps your goal is quite simple—to build something that works —proof positive that *you can actually build a working radio.* If so, let me suggest you start with a simple receiver.

When you build a receiver, it is easy to evaluate your success. Within minutes after completing your project you should know whether or not it is working—and how well. With a small transmitter it's possible to call CQ a dozen times without getting a reply—even though your transmitter is working perfectly. The opposite is also true. Your rig could have a 'lousy' sounding, weak, wavering note, and you might receive a RST-599 on your first call. Not every amateur radio operator is candid with you about the sound of your rig. Furthermore, if you choose a receiver as your first project, you are going to be surprised how much enjoyment you derive from it.

I recently completed my fifteenth receiver. Within four hours after soldering my last connection, I had all of the 'bugs' worked out. Together, at the end of this chapter, we will walk through my debugging process. Of course your project will not have the same bugs—but don't despair—you will get your radio going if you stay with it.

Building from scratch, gratifying though it is, may be impractical for some. Those with limited work space, a nonexistent 'junk-box,' and only a few hand tools, might do well to consider building a kit. A look through current ham publications will bring you up to date on kits available today. The experience will be fun but the end product may be disappointing. I feel I must emphasize once again that you enter such a project with realistic expectations. Results obtained from most, if not all, solid state regenera-


**continued next page**

tive radio kits will be far short of the capabilities of even the most basic, well constructed, 'hollow-state' receiver.

I recently purchased a kit from a well-known manufacturer of ham equipment. I wanted to see how their newly introduced kit compared with my home built receivers. I was especially careful during construction. Every capacitor and every resistor was checked before installing in the circuit board. The set worked immediately ... no problems at all. If I was rating operation of the set on a scale of 1 to 10, I would give it a zero minus. Times are rare when, with great patience, I manage to coax one or two warbling bird like signals from the receiver on the forty meter band. After doing so, I can step across the room, switch on a home-built regen, and tune in from 25 to 40 stations between 7000 and 7060. Furthermore, I know approximately the frequency of the station I'm receiving, and drift, after a modest warm-up time, is not noticeable. While there is no way the kit receiver could be used in a QSO, the home-builts are in daily use here at NR5Q.

The kit has erratic regeneration, inadequate audio, difficult tuning, terrible audio quality, plus poor sensitivity and selectivity, and an unacceptable level of instability. In a nutshell the radio is unbelievably bad. In reality, the kit radio is an expensive, poorly designed toy. I have about $75 in the receiver—including the eight 'C' cells required to power the thing. So much for progress. How much is it worth to prove a point?

Stage two in constructing gear from scratch is accumulating the parts needed for your chosen project. Concentrate on finding the most difficult parts first—components like power transformers, chokes, variable capacitors, vernier tuning dials, and audio output transformers are not in abundant supply. Cost of new parts, when available, may be staggering. Such things as filter capacitors, resistors, tube sockets, tubes, and 600 volt disc and tubular capacitors, should not present a problem.

Expect to pay from $12 to $20 for a chassis. Don't start with a dinky little chassis that is going to jam your parts and wiring together in an impossible jumble. I would recommend a chassis about 10 x 14 x 3 inches--certainly no smaller than 9 x 12 x 2. I think you will be more comfortable working with a chassis 3 inches deep. This is more than you need but sometimes the 2 inch chassis is pretty tight. There is a place for compact construction—your first home-built receiver is not it.

Panels may be fashioned from plywood, hardboard, sheet aluminum, or one of the imitation 'Bakelites.' Most home supply stores carry lightweight sheet aluminum. It is heavy enough for such things as shielding between stages, and as a backing for nonmetallic panels. If you choose to use a nonmetallic panel, attach a sheet of very lightweight aluminum to the back of the panel. Use double-sided tape, contact cement, or even a few 6/32 x 3/4 inch machine screws around the perimeter of the panel. Whatever you use is fine—but you must use a shield between your body and the tuning capacitors if you are to avoid the old bugaboo of 'hand capacity.'

I strongly suggest that you do not attempt to use a direct drive dial for your 'bandspread.' In actual use this will be your main tuning dial, while the so-called 'main tuning' dial is in reality the 'band-set' control. Do I have you properly confused? Well, let me explain more fully, Here is a good place for old-timers to grab a cup of coffee. Rejoin us six paragraphs down the page.

Forget Mmf., and picafarad, and inductance, and capacity, and all that other stuff that makes you shy away from building anything. Think like the old timers thought. If your main tuning capacitor has a total of 20 plates, for example, and you find tuning in CW signals a critical proposition, you probably need to s - p - r - e - a - d out the band—so that it covers

more divisions on your tuning dial. By doing so, where the band formerly covered three or four divisions on your tuning dial, it may now cover 25 divisions. I am sure you can see the advantage. All this talk of divisions is, quite naturally, an estimate. Your receiver may cover a little more or less—depending upon many factors.

A two to five plate tuning capacitor, in parallel with the main tuning capacitor, has long been referred to as the 'bandspread' capacitor. I prefer a two plate, close spaced, or a three plate, wide spaced capacitor. When rotated from minimum to maximum capacity, the two plate capacitor will cover 100 kHz or so. Now don't get technical on me ... of course this is a guess. I'm betting it's rather close. And just think—we are avoiding all that technical junk. On my latest receiver, the coverage obtained with 180 degree rotation of a three plate, wide spaced capacitor, is actually 126 kHz.

So... with a nice vernier dial on the two plate, or 'bandspread,' capacitor our budding builder is going to find it very easy to tune in 30 stations or more as he tunes across the CW bands—probably a lot more on 80 meters. This being the case, it's easy to see where the 'bandspread' capacitor is going to become the primary control for tuning in stations on the 20 and 40 meter bands. On the 80 meter band, you may find it more convenient to use the band-set capacitor for tuning as the band is rather wide.

What then is the 'main-tuning' capacitor used for? It becomes your 'band-set' control. As each coil is wound, and found to operate to your satisfaction it should be 'calibrated'. Here is an easy way to know where the bands are, and approximately where you are on the bands.

When Howard Armstrong invented the regenerative receiver, he also invented the CW transmitter. When your radio detector goes into regeneration (oscillation) it puts out a signal on whatever frequency it is tuned to. If you have a shop with a frequency counter or other frequency measuring equipment—fine. If you don't, do not despair. All you need to find the bands on your regen is any modern day transceiver with an accurate readout; if it's digital, that's even better. Set your 'bandspread' capacitor with the dial at 'zero,' and the two plates fully meshed. (Maximum capacity) Set the digital readout on your receiver to the low end of the CW band. (7000 kHz for 40 meters—14,000 kHz for 20 meters, etc.) Now advance your regeneration control until you hear the 'plop,' or 'rush,' indicating oscillation. Slowly tune the main tuning control on your homebrew receiver until you hear its signal in the transceiver. Note the setting of your 'main tuning' (band-set) dial. By setting the dial to this number you can return to the band after changing coils.

While we are at it we may as well calibrate the tuning (bandspread) dial. Move the transceiver up 25 kHz. Now, tune the 'bandspread' dial until you hear its signal in the transceiver. This will tell you how many divisions on the 'bandspread' dial it requires to cover 25 kHz. Now calibrate at 50 kHz, 75 kHz, and 100 kHz up. With these four marks on your dial you should be able to read frequency within 5 kHz—probably closer. Certainly not a precision method of frequency measurement, but close enough.

I hope you now understand why the 'main-tuning' dial is not your MAIN tuning dial, and why the 'band spread' is in reality your main tuning dial. Ain't this fun?

With all major components on hand you are ready for the most difficult part of building; mounting parts on the chassis and panel. Experience helps, but even those who have been building for years make a few mistakes at this point. Here is the way I go about it. First the panel. If it is highly polished—be sure to work on a soft towel or other material to protect the panel from scratches. Lay it flat on the


continued next page

table. Arrange the actual knobs, dials, switches and controls for a pleasing appearance. Chances are, the most pleasing appearance will not be the most practical—but it is a starting place. Now, once everything is in place, take a few minutes and **THINK** before drilling holes. What about clearance for your components? If you are using a 2 inch deep chassis, such items as the regeneration capacitor may be a problem... Plan the layout with wire length in mind.

Place the detector tube socket, coil socket, and the regeneration and tuning capacitors relatively close to each other. The output transformer should mount near the audio output tube, etc. Please remember, no matter how hard you try, as you progress you will see places where the component placement could be improved. I find it better to go ahead with my construction and build receiver number one. Then with the knowledge gained, build receiver number two. Here is a good rule-of-thumb. *When aesthetics conflict with practicality, choose the most practical layout.* You can eventually learn to live with a panel where all controls are not in perfect balance. You will never like a receiver if it exhibits poor, erratic operation.

**Do not demand perfection from yourself.** James Millen, the driving force behind the design team of the National Radio Company in the thirties, later founded the James Millen Company. While with National, the company built some of the world's finest radio equipment and components, James Millen was largely responsible for the design of an entire line of receivers starting with the National 'Thrill Boxes' and the SW-3. In rapid order the Company followed with the FB-7, National AGS, and the classic HRO. Many hams consider the National HRO the finest radio built during the period from 1935 to 1955. Take a look at a history of the National Company and the HRO. The HRO went through many variations and models—while keeping the same basic appearance, and design. Millen would see where the receiver could be slightly improved, and quickly incorporate those changes. Often, one might see several design changes within one year. **My point is this—If James Millen's first efforts did not result in an ultimate design, why demand more from yourself.** Profit from your mistakes, and build another 'variation.'

Keep in mind while working on your layout that the antenna capacitor must be above ground. Tuning capacitors, and the regeneration capacitor may be mounted directly to the chassis. To keep my capacitors above ground I mount the capacitor on a piece of Plexiglas or other insulating material. I then mount the insulated capacitor to the chassis using a short piece of aluminum angle stock for a mounting bracket.

If you do not plan on using the receiver for communications, omit the standby switch. Do not discount the possibility of using such a simple receiver on the air. They work well enough for reliable communications.

Once you think the panel is arranged OK, attach the panel to the chassis. Tighten nuts, hand tight—you will remove it and reattach it a number of times before you are finished. By the way, I use 8/32 hardware for attaching panels to the chassis. I find 6/32 somewhat light for this job.

When laying out top chassis components such as tube sockets, coil socket, output transformer, (if mounting above chassis—under chassis may prove more practical) tuning capacitors, etc, leave some room on each side of the chassis for a panel to chassis brace. A firmly braced front panel is imperative if you would avoid wavering signals.

Take a look at the rear of the chassis. Here you will mount such things as a speaker plug, antenna input, power supply connections, and ground connection. I like to use a SO-239 co-ax connector for the antenna connection.

This is convenient as every antenna I own will then quickly attach to the radio. I long ago standardized my speaker plugs. I always use a RCA phono plug for speakers. My power supply connections are made through a barrier strip. The ground connection is an 8/32 x 2 inch machine screw. Install a spider washer. Pass the screw through a hole in the rear of the chassis. Add another spider washer, the nut and tighten well. Two flat washers and a wing nut will complete the ground connection.

For your first effort, I suggest you use an external power supply and speaker. Regenerative detectors are exceptionally sensitive. It is not unusual to pick up a lot of hum if you mount a power supply near the detector circuit. Oh yes, it's done all the time. I seldom have a problem with it... **NOW**. However, I can practically assure you that your first efforts with a built-in power supply will result in hum—especially on the twenty meter band. After you have built a set or two, go ahead and try one with a self contained power supply. By careful placement of parts, good filtering, and perhaps some needed shielding, it is possible to have a quiet receiver, even though the power supply is within inches of the detector.

**I DO NOT** recommend a built in speaker—EVER. Regenerative radios are very sensitive to vibrations. The detector tube can, indeed, become a 'microphone'—amplifying everything from the human voice, to a gentle tap on the table near the radio. A self contained speaker will almost assuredly cause 'howling' and feedback. I have experimented with rubber mounted detector tubes with some success. I have tried rubber pads between the panel and the speaker. All this works—to some degree—but if you turn the volume UP high enough, it is a safe bet the detector will pick up the sound, amplify it, and the end result will be a feedback howl.

After mounting parts, look around under the chassis. Install ground lugs at random—wherever you have a machine screw coming through the chassis. If you install a few you don't use that's preferred to needing a ground lug nearby, and not having one. Likewise, install terminal strips here and there. I promise you will need at least four or five, four to six lug terminal strips. If some lugs are unused, so what? That's far better than having six or eight wires soldered to one lug—with a glob of solder only slightly smaller than a golf ball.

When building your first receiver it is a good idea to stick to the schematic you have chosen. Unless you are an engineer I would postpone any modifications and 'improvements' until you have built a few receivers that worked properly. With this idea in mind, take your schematic to a copy shop and have five or six enlarged copies made.

As you add a wire or component, take a 'Highlighter' and mark off the completed part on your schematic. NEVER GET IN A HURRY. Look at the schematic—let's say you are installing a 240K resistor. Pick up the part—look at the color code—Red, Yellow, Yellow. If you have an Ohmmeter—check it out. Now look at the schematic again. Install the part. Recheck the schematic. Are you sure you have the resistor going to the proper tube socket connection—or whatever. When you are positive you have it in the correct place, solder the connection. When completed, visually check the value of the component installed, and its proper installation. If it still seems OK, mark it off on the schematic.

Speaking of soldering. **Never use acid-core solder in a radio. Use rosin-core solder only.** Those dainty little 30 watt soldering irons used for printed circuit boards are all but useless for tube type gear. Either use a soldering gun with a small tip or a good 40 to 50 watt iron. A lot of components are heat damaged, and cold solder joints made,


continued next page

because of inadequate heat from the soldering iron. A hot iron will do less heat damage to a component than a iron without enough heat to melt the solder quickly. If you must keep the iron on the connection for a long time, you heat the component. Whereas, if you heat the connection quickly, it is possible to solder the component in place without undue hating of the component itself.

When using new components, it is very likely the leads and tabs to be soldered will be tinned. Unfortunately many of the components you will be using, if you construct the receiver suggested, will be many years old. Before any connection can be soldered it must be clean. In addition—the connections should be 'tinned' before soldering. To clean a connection, scrape it with a knife, the edge of a screwdriver, an old razor blade, or whatever is handy. Better still, if there is room, polish the wire or lug with a small piece of sandpaper or steel wool. When the ends are clean, place your soldering iron **under** the wire end or lug—heat it as quickly as possible, and apply a small amount of solder... **Not to the iron tip, but to the wire or lug.** The result should be a very thin coating of solder on the parts to be joined. Now, make enough of a mechanical connection to hold the parts in place for soldering. Whenever possible, place the iron under the joint to be soldered. Heat quickly, and apply solder to the joint until it flows smoothly over the connection. Remove the iron and **do not** disturb the joint while the solder is cooling. Remember the parts being connected should melt the solder—not the soldering iron tip. It is important to keep the soldering iron tip clean and tinned at all times.

OK—let's assume you have, after many hours, connected the last wire in the set. What now? Here is where you get out one of those big, fresh, extra copies of your schematic and pull up a nice easy chair. Start at the antenna and recheck every bit of wiring in the radio. As you check each resistor, capacitor, switch, control, and tube socket connection, mark them off with your highlighter. It should take no longer than one hour to do this. It is surprising how much time this step will save in the long run.

If you are one of those rare individuals lucky enough to complete your first receiver without a single error, congratulations. Now comes the moment of truth. Before connecting the high voltage supply to the receiver, be sure and check the power supply. If it runs for several minutes, with no load attached, and you notice no heating of parts, then the power supply is probably OK. Check the HV output. I would hesitate to apply over 300 volts to one of these little receivers. A high voltage supply of 175 to 250 volts is desired.

Hook up filament supply first. Turn on your receiver. Do all the tubes light up? Oh, you are using metal tubes because of the shielding. Fine—just let 'em stay on for five minutes or so and feel each tube. They should be moderately warm.

Now, make sure the receiver is well grounded, attach the antenna co-ax, plug in a speaker, and apply both filament and B-plus voltages. Let tubes warm up 30 seconds or so. Advance the volume control to half scale. You should at least hear a slight hum. Now, advance the regeneration control. Do you hear a hiss—like wind blowing? Or perhaps you hear a 'Plop' or even a '**PLOP.**' Heaven forbid—you may even hear a god-awful screech. Good! The set is working.

If you get a slight 'plop,' or a gentle 'hiss,' your regeneration is working properly, and the set probably needs no debugging.

Let's take a took at some situations where the set does not operate.

Your receiver tubes are warm to touch, but the regeneration has no effect at all. The receiver is completely dead. OK... since this receiver is a simple detector, three step audio, it is easy to isolate the stage giving trouble. The vol-

ume control works by adjusting the input to the first audio stage.

**CAREFUL NOW !!** Remember these little radios pack a terrific wallop if you get across the high voltage. Turn the radio upside down, giving you access to all the gizmos under the chassis. Turn the radio on. With an insulated handle screwdriver, touch the metal blade to the center tap of the volume control. If you get a loud hum you have determined the three audio stages are working. You have a detector problem.

Measure the plate voltage on the detector. It should be somewhere between 75 and 175 volts depending upon your supply voltage. If very low, or no voltage present, your problem is easy to locate. Start at the plate and work back towards the supply to see where you have lost voltage.

Now we will assume you have a voltage of 125 volts—plus or minus. Still the receiver is dead. Try another tube. If the set remains inoperative, check your coil windings. Are they connected properly? Are both windings wound in the same direction? Check the wiring a second time. This detector circuit is so simple the trouble should be relatively easy to spot. Perhaps the tap on your coil is placed too near the bottom of the winding. (Does not include enough turns to get the stage to 'feedback.') If you suspect your winding is low, a simple and quick check may be made by jumping your regeneration capacitor with a small fixed capacitor, say 10 to 20 picafarad. This will increase the capacity of your regeneration capacitor. If the set goes into regeneration, either move the tap up, or leave the fixed capacitor in place. Assuming plate voltage is at least 80 volts, the proper thing to do is move up the tap.

We will look at another scenario. Your receiver lets out a terrible screech when the regeneration control is advanced. I would immediately suspect your plate voltage is far too high... **OR** ... the tap on your coil is too high. (Too many turns between the tap and the low end) The coil should be tapped just high enough to permit the detector stage to go into oscillation. Somewhere between 1-1/2, and 2-1/2 turns works well for me on 20 and 40 meters. The 80 meter band may require a turn or two more. **PLEASE**, don't let stuff like this bug you. It really is not all that critical. I feel that it is necessary we discuss it here because I want to cover all bases in case you encounter a problem.

**Here is a problem you may very likely encounter.** Your receiver operates but the regeneration control is 'rough.' The set goes into regeneration with a loud noise, or whistle. Increase the resistance of one of the resistors in the plate supply line to bring the voltage somewhere near 85 volts. The 75 tube seems to love this plate voltage.

OK, your receiver seems to be working fine, however when you advance the volume control you encounter a problem such as distortion, screeching, howling, etc. Check the plate voltage. I see little need for over 150 volts on the plates of the first and second audio tubes. Naturally this lowers the overall volume, but that is a big advantage of having an audio surplus—you will still have more than needed.

If you encounter hum, especially on the 20 meter band, it is a good indication that a shield should be placed around your coil. Shielding works wonders with regenerative receivers.

I hope your home-built receivers give you a lot of pleasure. Don't give up. If your first effort is less than ideal—try again. The rewards of building are well worth the effort.

I promised earlier in this chapter that I would walk you through the debugging of my latest receiver. Here goes...

My receiver did not want to go into oscillation (regeneration) when I first hooked it up. I was using an old two section broadcast capacitor from an early Heathkit receiver. Though it has



continued next page

two sections, several plates had been removed by an earlier home-brewer. I bought the capacitor at a local hamfest for 75 cents. Upon inspection I found the plates of the capacitor were rubbing. I unhooked the capacitor and removed it from the circuit. Using an ohmmeter to test my progress, I straightened out the plates until they were no longer rubbing. The capacitor was reinstalled. The set still did not regenerate. Did I need more capacity? I soldered a 1 inch wire from section to section, more or less doubling the capacity. Now the set went into regeneration with a loud 'plop.'

I would normally have used a nice Johnson, Hammarlund, or National 140 Mmf capacitor, but they have disappeared from hamfests in this area.

I like smooth regeneration. I checked the plate voltage on the 75 tube. My trusty Simpson meter read 128 volts. Far too high. I changed resistors a few times until I had exactly 82 volts on the plate. Now the regeneration was smooth as silk.

However, all was not well. The receiver exhibited loud pops and crackles when the table was jarred, even the slightest bit, and sometimes for no reason at all. In addition, when I turned the 'bandspread' dial the signals jumped in and out and there was a loud scratching noise. I tried tapping the tubes with a pencil eraser—gently. I could not tap gently enough to keep the pops from occurring. I tried a complete new set of tubes. The problem persisted. One would normally think of a cold solder connection—or even an unsoldered connection. I doubted this was the culprit. I have built too many receivers to make a cold solder joint—and I had followed the advice in this chapter and traced every wire and connection before applying power.

I pushed the receiver aside and decided to try another time. After thinking about it for two days I returned to the receiver and disconnected the detector from the grid of the first audio. I turned the receiver on, advanced the volume control, and let it cook for hours. Not one snap, crackle, or pop came from the speaker. Now I literally hammered on table near my receiver. Still dead silence. The trouble had to be in the detector circuit. I checked every resistor, and even replaced the RF choke. My trouble was still there.

My next thought was bad contacts in either the coil or tube socket. I cleaned the socket contacts and tube and coil prongs with a cotton swab dipped in Deoxit. For a few minutes I thought I had solved my problem—then the popping and snapping started all over again. I started probing around above the chassis. My 'main tuning' capacitor was an old antique brass plate capacitor I picked up at a hamfest for display. I found when I touched the stator of this antique capacitor with a pencil eraser, the noise stopped. Upon further testing, I found the stator plates were corroded and not making a good clean connection. A general dose of Deoxit, plus tightening all nuts on the capacitor, stopped the noise for good.

My set was working pretty good now, but I still had the rasping noise when I tuned the 'bandspread' capacitor. I inspected the brass rotor shaft very closely. It appeared corroded also. I dipped a cotton swab in Deoxit and applied one drop to the front and rear bearings on the rotor shaft. Suddenly, tuning became smooth as silk.

I am still not pleased with the regeneration capacitor, and it will be replaced if, when, I find a better one. But for the present time the receiver is working perfectly. I am constantly amazed at how a receiver made from a few inexpensive parts can work so well.

Debugging is really more difficult than building, but it is what makes a mediocre receiver into one you will be proud of. Out damned bugs! ER

**Hammarlund Comet Pros from page 23**
speaker. Finding a place for the coils and calibration charts was fun. My shack is full of plug-in coils, I use them in my AM and SSB transmitters. The lack of calibrated dials doesn't turn out to be much of a problem when you work spot AM frequencies like we do with these boat anchors. The plug-in coils are another story though. Changing bands to check who is on is really bothersome when you have to change coils to do it.

The Comet Pro comes to life quickly when you turn on the power. The 2.5 volt tubes heat up fast. Once having the oscillator and mixer tuning set, all tuning is done with the large bandspread knob. With no AVC, you keep one hand on the gain control while tuning. Other than these two controls all you have to play with is a tone control and the BFO on/off switch. The receiver is quiet and remarkable nice operating. The bandspread tuning is smooth and has no backlash. Selectivity is not a high point however, it's 9 kHz wide 6 dB down and 15 kHz wide 20 dB down. Sounds great on AM signals, but when there is QRM you have to live with it. Operating AM on 75 there is no noticeable drift. On 40 there is a bit at first but not enough to correct for. Besides somebody is usually off frequency anyway so retuning is normally required in our roundtables.

Running the Comet Pro on CW showed me why Hank, W2SN, used his for so many years. It is a great CW receiver, with the ear making up for the lack of receiver selectivity. The tuning rate is just right on 80 and 40 and rock stable after a few minutes warm up. Line voltage changes don't bother it much and you can beat it with a baseball bat and the note doesn't change. Without a noise limiter it's a bit testy when there is a thunderstorm around. Needless to say it is as good on sideband as CW except for the selectivity. During the day when there is not much activity, it hears them right up there with the Kenwoods. Again you keep a hand on the gain knob. Sure makes you appreciate AGC.

Overall I think I could I live with the Comet Pro on 160, 80, and 40. As for anything higher, I haven't given it a try yet. Those 57s and 58s don't look too appealing for 20 meters. If I was going to continue using it I would add audio AGC, and wire in connections to open up the mixer B plus for send receive switching. But then it wouldn't be a 1933 receiver, so I'll just keep one hand on the gain control.

A final note, after using the receiver for a few weeks, I put it on the bench to plug the extra hole in the front panel. I removed the panel from the chassis. The panel is held by spacers about a sixteenth from the chassis. Stuck between the chassis and panel was a newspaper clipping dated March 8th with no year identification. It was about Lieut. David Woodcock of 20 Cazenovia St. Buffalo NY who was one of fifty Navy fliers who took part in the first raid on the Jap base at Truk. Lieut. Woodcock's group was commanded by Lieut. Commander Edward 'Butch' O'Hare who was lost in action at Makin. The clipping had to be 1942 or '43.

The article gave Woodcock's schooling, South Park High School, State Teachers College, and the University of Buffalo. He was commissioned in August '41 and assigned as an instructor pilot at Jacksonville until January 1942. But the most interesting part was the last line. "A brother, Richard C. Woodcock is a radarman in the USN". Only top electronics people were put in radar during WW II. Was this the connection to the Comet Pro? So far I have not been able to make a connection. A search of old call books has not produced a ham by that name from Buffalo, but I'm still looking. I'm not going to let a Comet Pro get the best of me, but it sure is trying, and it's got me back where I started, in Buffalo! ER

**Collins Multicoupler from page 9**
multicouplers were made in the same way. Because of the method used, the input signal level used was much higher than a typical received signal. But both multicouplers would have been intended to operate in both strong and weak signal environments. The results are shown in Graph 2.

The CU-5069/FRD-10A was remarkably flat across its operating range. The low frequency response of this unit is better than that of the CU-168/FRR. According to the information I have found on the CU-5069/FRD-10A, it was apparently intended to work down to VLF frequencies.

However, the CU-168/FRR was also surprisingly flat within its 2 to 32 MHz design range. This is a considerable achievement, given the inherent difficulties of broadband designs using vacuum tubes, and the complexity of its multiple baluns and the internal RF distribution line.

Both multicouplers are quite old. A random check of component values in both revealed the kind of drift in value expected with age, and in the case of the CU-5069/FRD-10A, with 7-24 operation for many years. Thus it is possible that simple aging effects would adversely affect performance over time.

These tests were not done with great precision, but hopefully do give a sense of the capability of the Collins CU-168/FRR in comparison to a later solid-state design. What I find most interesting is just how good the vacuum-tube design is, even though later technology may have made the task simpler. Still, the inevitable reality is that to duplicate the capability of the 32-output CU-5069/FRD-10A using the earlier technology would require about five feet of rack space, compared to the actual 3.5".

It was also interesting to conclude that the performance of a receiver connected through either multicoupler was degraded somewhat. So the bad news for my SWL friends, straining to hear the unhearable—stick with one receiver and a good antenna! The good news for everyone else—a multicoupler is a great addition to the well-equipped collector's shack! **ER**

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**AMI Update from page 3**
like we are confined to one area on the band and it can cause hard feelings between AM ops.

The current lack of activity on the amateur bands is a golden opportunity to stake out new frequency claims for AM nets or AM activity periods.

Reach out - The last phase is a combination of promotion and public relations. We AM'ers know how much fun we have. We need the general amateur population to appreciate AM's qualities. We should take every opportunity to bring AM activity, personnel and operations to the attention of FCC and ARRL officials. The authors among us should be encouraged to send more AM friendly manuscripts to the major radio magazines. More AM groups should be sponsoring special event stations at hamfests. Participation in AMI and ER sponsored operating events will also be an important demonstration to the wider amateur population.

In short, the future for AM depends on AM being identified as a main stream amateur radio activity. The way to accomplish this is to demonstrate the vitality of AM at the same time that other branches of amateur radio are losing their vital signs! **ER**

*To Join AMI send $2 to:*
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**INFORMATION:** Available on classic communications gear. Just look at: http://www.geocities.com/SiliconValley/6992/index.htm. Thanks for your visit!. Jose, EB5AGV, eb5agv@amsat.org

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

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

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**FOR SALE:** Brand new Jackson Brothers reduction drives 6.5:1 for standard 1/4 shafts. Standard small brass planetary drive used in many rigs. Mount w/two screws - $9 each or two for $17, four for $30, (Ten or more $7.00 each); New Bourns 10-turn Vernier knob for precision potentiometers. Turns counter and flip-lock. Approx 7/8" diameter. $9 each or two for $17, four for $30. Also, transformers, tubes, electrolytics etc -55c SASE for list of homebrew parts. Brian Carling, 488 Sun Lake Circle #314, Lake Mary, FL 32746 or see: http://come.to/af4k/ (Click the main banner)

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**FOR TRADE:** BC-973-A, BC-1003-A DF rcvrs. Extra loop. Looking for pre-1939 military radio stuff. William Donzelli, 15 Gen. MacArthur Dr., Carmel, NY 10512. (914) 225-2547, aw288@osfn.org

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**FOR SALE:** Ameco TX-62 w/VFO, 6-meter AM/CW xmtr, very clean - $150 shpd. Jeff, WA8SAJ, 5368 Melody Ln, Willoughby, OH 44094. (440)951-6406, wa8saj@ncweb.com

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**FOR SALE:** Hardline, approx. 125', 1/2" OD, N-connectors - $115, includes shpg; Hickok 800A tube tester w/manual - BO plus shpg. N4GL, (352) 637-1755, boomer1@hitter.net

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**FOR SALE:** Send SASE or email for list, ham, military, books, tubes. Wayne Letourneau WBØCTE, Box 62 Wannaska, MN 56761. wb0cte@arrl.net

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**FOR SALE/TRADE:** Transmitting/rcvg tubes, new & used. 55¢ LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & lge tubes from the old Eimac line; 152T thu 2000T for display. John H. Walker Jr., 11015 W 126th Terr., Overland Park, KS 66213. (913) 782-6455, johnh.walker@alliedsignal.com

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

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

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

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

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

**WANTED:** ITT Mackey marine 3010-C w/manual & Johnson AN/FRT-505. Ric, C6ANI, POB N4106, Massau NP, Bahamas.

**WANTED:** For purchase. Equipment & technical information related to AN/ARN-6 Radio Compass. Jim Cavan, 6 Timberline, Norfolk, MA 02056. (508) 528-0908,jcavan56@aol.com

**WANTED:** Gearshift for Teletype Model 28, or complete machine with one. Ivan, WA6SWA, POB 248, Reno, NV 89504. (775) 329-7738, idh@cs.unr.edu

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

**WANTED:** 1920-30s Army and Navy equipment, any condx, any size; also, some VT-5s. William Donzelli, 15 General MacArthur Dr., Carmel, NY 10512, aw288@osfn.org

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

**WANTED:** 1930s military electronics: BC-114, BC-115, GP-1, RAG, TAV, etc.. Some boatanchor trades available. William Donzelli, 15 General MacArthur Dr., Carmel, NY 10512. (914) 225-2547, aw288@osfn.org

**WANTED:** Long wire ants AT101, AT102, GRC-9; DY88/105; PP327GRC9; counterpoise CP12 & 13 GRC9; BC348 pwr conn PLQ102/103. KA1ZQR, 348 N. Main St., Stonington, CT 06378.

**WANTED:** Coils, circuit, manual for Canadian Marconi Marine rcvr 3V-SW8/93930. David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4, Canada. (418) 877-1316. davidboardman@sprint.ca

**WANTED:** WW-2 Japanese military radio of any kind, Hammarlund PRO-310. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan Fax 011-8145-301-8069, takadoi@carrot.ocn.ne.jp

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

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

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

**WANTED:** Anyone having info on the Deltronic Corporation of Los Angeles, CA, please drop an email, letter or call. The company was in operation in the early 1950's. Thanks, George Maier, K1GXT, 64 Shadow Oak Dr., Sudbury, MA 01776. (978) 443-9659, gmaier@ultranet.com

**WANTED:** SW-3 coils any band; any early ham, spark or wireless equipment; early ARRL Handbooks. Mike Bald, WD5GLW, (918) 492-7361, radiomb@aol.com

**WANTED:** Aircraft radios, xmtrs and airport ground sets prior to WW II. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272, treherne@erols.com

**WANTED:** National HRO-5 coil box, E & F coil sets with metal dial /frequency plates (1940's vintage), also junkers for parts. Don, (616) 451-9874.

**WANTED:** British, Commonwealth W.S. 62, W.S. 22, W.S. 18, W.S. 48, W.S. 46. George Rancourt, K1ANX, MA, (413) 527-4304

**WANTED:** Knight-kits; Ocean Hopper, Star Roamer II, T-150A, and others. Also Allied/Knight catalogs, especially 1959-1962, 1965, 1969-1972. Steve Donahue, 1773 Sterling Pointe, Cleveland, TN 37312.

**WANTED:** Service manual or copy for R1051B receiver. Carl Banfield, W2YH, (973) 827-7441, cbanfield@juno.com

**WANTED:** HRO-5A coils E & F. Will trade 2 HRO coils for each one, or buy for cash. Don, (616) 451-9874

**WANTED:** Swan 330 converter for Swan 600 rcvr and a Dow-key 10VAC DPDT antenna relay. Jim Brown, KØYLW, Box 56, Holton, KS 66436-8106

**WANTED:** Hand crank generator GN-37, antenna base insulator IN-85, radio chest CH-39, legs LG-8. Need for restoration of SCR-178. Paul Thekan, N6FEG, 335 Rutherford Ave., Redwood City, CA 94061-3514, paul.thekan@eimac.cpii.com

**WANTED:** For Valiant, drive cam for VFO shaft under chassis. Tom, WB3HLH, 409 Anderson Ave., Rockville, MD 20850.

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

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

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

**FOR SALE:** Tube type kits for CW/AM. Vintage Radio Kit Co, 427 North Main St., Sharon, MA 02067. email us at CPCW-5 @aol.com or visit our web site at: http://www.mnsinc.com/bry/vintage.htm

**FOR SALE:** Vintage radios on display, bought, sold, traded and repaired. Webpage - http://www.tiac.net/users/hobfact. Rick Galardi, W1DEJ, Boston, MA, (781) 485-1414, Fax 289-1717, hobfact@tiac.net

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

**FOR SALE:** Heath HD1410 keyer - $35; Yaesu ant tuner 250W, FC107 - $85; Astatic 10M5A carbon mic in box - $25; Nat NCX3 w/ps - $125; MFJ versa tuner II - $55; Lay PF30 30-50 FM rcvr - $20; Heath 10-102 RF gen - $20; Heath SG-8 RF gen - $20; Heath Twoer 2MT xcvr - $50; General Radio type 1210C audio gen 20 cy to 500 kc - $75; Heath HX-30 SSB 6mt TX - $95; EICO 377 audio gen - $20; GE Delta S on 6 FM now.70W 16 chs all cables, head, spkr, ctess - $125. All + shpg. Randy, K4RHH, 1019 Woodhaven Dr., Lynchburg, VA 24502. (804) 239-6127

**FOR SALE:** LSASE for list of old parts, many V caps, Hphones, mics, accessories, rigs. Carl, WA7LUY, 644 Pineview Pl, Casper, WY 82609.

**FOR SALE:** Hallicrafters HA-2 & HA-6 xverters w/pwr sply & manuals - $425. Robert Braza, W1RMB, RI (401) 434-1629.

**FOR SALE:** Complete set (7) HRO coils for Navy RAS rcvr 175 kc IF - offers/trades. Jim, K7BTB, AZ, (520) 635-2117.

**FOR SALE:** ARC-5 T-21 5.2-7 mHz, orig - $50 U shp. Ken Koltoff, 8967 Scott Dr., Desoto, KS 66018. (913) 585-1196

**FOR SALE:** Two Knight T-150s both - $120; Heath TM1626 mic mixer - $25. **WANTED:** RME spkrs. Bill, KE7KK, ND, (701) 772-6531.

**FOR SALE:** Hallicrafters SX-101A & S-38. Les Mathews, WB2DQU, 2405 Thistledown Ct., Sewell, NJ 08080. (609) 218-8838

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

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

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

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

**FOR SALE:** Microphones: RCA 74B Junior ribbon broadcast mic, chrome case, stored, untested; Turner U9S multi Z (like baby 618A) lge nice floor stand, desk stand parts, all - $475; 300 watt modulator parts - UTC commercial grade, plate & modulation xfrmrs, these are heavy. Prefer PU, also 400 mil, 5-25 hy choke & 2 Taylor 203Z zero bias modulators. All unused - $225. Paul C. Crum, 6272 N. Cicero Ave, Chicago, IL 60646. (773) 282-3033

**FOR SALE:** Books, 5840 tubes, send SASE. **WANTED:** Stancor PCO/PSO200, PCO/PSO150, RC8150; Altec T1401. Richard Robinson, POB 1425 Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

**FOR SALE:** Drake 2-NT - $115; Clegg Venus - $375; Heath Ten'er - $60; Altas RX110 rcvr - $315; Collins 75A2 - $425; Gonset IV, 6 meters - $115; Lafayette HA-410 - $150; new list - free. Richard Prester, 131 Ridge Rd., W Milford, NJ 07480. (973) 728-2454, rprester@warwick.net

**FOR SALE:** Johnson Valiant; National NC-300; Hammarlund Super Pro? PU only. Louis L. D'Antuono, 8802 Ridge Blvd, Brooklyn, NY 11209. (718) 748-9612 after 6 PM

**FOR SALE:** Heath 2M Lunchbox - $35; AM-1 - $20; Master mobile SlimJim - $75; Z-match - $40; SW antenna control box - $20. N6DBH, CA, (559) 454-1311

**FOR SALE/TRADE:** Manuals for Johnson, Elmac, Gonset, RME, Harvey-Wells, Morrow, Drake, Clegg, Swan. NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 352-5536, ni4q@juno.com

**FOR SALE:** NOS TCS baseplates, most still in factory paper - 2/$15 + shpg; **WANTED:** Source for band drum dial cord for NC-300. Carl, KN6AL, POB 3531, Laramie, WY 82071. (307) 742-0711, kn6al@uwyo.edu

**FOR SALE:** 3'x5' reprint of the factory diagram of the Collins KW-1 - $30 ppd. Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660.

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

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

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

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

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

**FOR SALE:** Send 2-stamp SASE for new list of books & mags. Thousands of mags, many complete runs, many types besides electronics; also parts for big HF amps & projects; some surplus & xcvrs including BC610-I & acc. Vic Edmondson, W4MYF, Rt 1 Box 2599, Lee, FL 32059. (850) 971-5580

**FOR SALE:** Books, Submini tubes, send SASE. **WANTED:** Stancor PCO/PSO200, PCO/PSO150, RC8150; Altec T1401. Richard Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

**FOR SALE:** High voltage pwr xfrms: (1) UTC type S-44, 115V primary, 1150V & 1050V CT secondaries, new - $35; (1) Pacific type 448A, 115V primary, 1875V & 1550V CT secondaries, exc - $50. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405-2375. (541) 345-2169

**FOR SALE:** Collins S-line; Ranger II; R-390A; (2) HQ-129X; TS-520; CE-20A w/VFO; Clegg 99'er; HT-18; BK-35M scope model 1535; Heath SA-2060A tuner; CP-1 xtal pack; GFII; BC-348Q; unused tubes: 4CX1000A, 6146A, 7027A, 6JS6, 6GF5, 6JE6, HW-12, no/ps; pwr readout panel to 500 MHz; (2) 7' rack cabinets w/rear doors unused RF connectors; coaxial relays, unused 26 & 28 volts, BNC & UHF; meters; GRC-109 sets; Ameco VFO midel 621; Precision DC volt meter mod DC-100A. Mike McDermott, WØBVA, 305 N. Keith St., Scammon, KS 66773. (316) 479-2756

**FOR TRADE:** Two good RCA 833A's for one Taylor 833A; also looking for Taylor 204A, 813, 875A. John H. Walker Jr., 11015 W. 126th Terr., Overland Park, KS 66213. (913) 782-6455, johnh.walker@alliedsignal.com

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

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

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

**FOR SALE:** Copies: Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip. ham gear. Contact me for prices, availability. Duane Ballew, KB7QZK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

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

**FOR SALE:** 'The Gonset Guy', basement full of Communicators, 10 meters thru 144 MHz, including CD aircraft versions; many mobile converters & VFOs, phone patches etc - Ask. Steve Gross, N4PZ, IL, (815) 734-4255.

**FOR SALE:** Tubes galore. Send SASE for new list AA; also test equip (list); tube sockets & extenders; Amphenol plugs & sockets; 4 thru 12 pins, ditto; Cinch Jones, Ballast tubes, time delays, HV caps; teletype repair parts, Typetronics, Fred Schmidt, N4TT, POB 8873, Ft. Lauderdale, FL, 33310-8873. (954) 583-1340, fx 583-0777

**FOR SALE:** I have a nice B&W pwr output/SWR meter used w/a T-368 600 watt TX - $100, U shp. **WANTED:** Low freq coil sets, xtal calib for a National HRO-60 rcvr. Will pay premium price for same. Joe Davis, WE5I, POB 388, Cherokee Vlg, AR 72525. (870) 257-2839

**FOR SALE:** Hallicrafters S-20R Sky Champion, Ultra-Skyrider, Drake TR-3. Chris, KC4CMR, chris.cmr@juno.com

**FOR SALE:** Johnson Viking Thunderbolt HF linear in exc condx - $800, PU only. K7BDY, AZ, (520) 537-2450.

**FOR SALE:** Hammarlund HQ-110, looks & works good - $100 + shpg. Ken, TX, (254) 772-7307.

**FOR SALE:** BC-610-I pwr sply PU; DX-40 & VFO; HW-100; HW-101 pwr sply; BC-348Q; BC-375E PU. W7RBF, AZ, (602) 864-9987.

**FOR SALE:** National NC300 w/manual, good condx, complete, unmodified, works - $150. Jim, W8HPL, OH, (740) 927-2592.

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

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

**WANTED:** Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 399C-1; 62S-1; KWM-1; 302C-3; 51S-1; 75S-3C; 32S-3A. I buy any Collins equip. Leo, KJ6HI, CA, Ph/Fx (310) 670-6969. radioleo@earthlink.net

**WANTED:** Collins 310B3 w/ant tuner, 70EBA oscillator assembly, & Chicago 500W CMS-2, high level modulation xfmr. Jerry, W8EGD, CO, (303) 979-2323.

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

**WANTED:** Tube-type Hi-Fi & guitar amplifiers by ACRO, EICO, Fender, Marantz, McIntosh, Pilot, Triad, UTC. Rob, CA, (510) 845-2625.

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

**WANTED:** Hallicrafters S-39 rcvr Skyranger. Bob, K1YJK, CO, (303) 768-9200, k1yjk@arrl.net

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

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

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

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

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

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

**WANTED:** QSL collectors: Want W2KQZ card (wife's grandfather). Will trade other cards or pay Carl, WA1KPD cnord@snet.net 860-663-3676

**WANTED:** Radio collection under $10,000 within 250 miles of Cedar Rapids, IA. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

**WANTED:** McMurdo Silver 802 HF ham radio rcvr. Jim Miller, WA2UMP, 32 Garretson Rd., White Plains, NY 10604. (914) 644-2603, jmiller@basit.com

**WANTED:** Two large black tuning knobs for NC-183D; Heath SBA401-1 crystal kit. W3WKP, (703) 768-0257, dreese@mindspring.com

**WANTED:** Scott SLR-M osc./mix coil shield cover. Paul Thompson. WØOD, (303) 973-8483, snowshoe@dimensional.com

**WANTED:** Pre 1940s QSLs from Iowa when Iowa was 9 district and any 1950s KNØCER or KØCER. w5usm@aol.com

**WANTED:** Operators instructions for the Heath model HM-2140 watt meter, willing to pay. WH6CZD, 80 Lehua St., Kahului, HI 96732. **WANTED:** Schematic type 503 Tektronix oscilloscope. Bob Lackey, W4QBE, 1252 Worley Creek Rd., Lakemont, GA 30552. (706) 782-3670

**WANTED:** Gonset G-76 accessories: 3349 pwr sply; 3269 100KHz calibrator; 3240 mobile mic; 6M band xtal. VE4UD, Winnipeg, Manitoba, (204) 489-7434, bevans@ebsys.mb.ca

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

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

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

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

**WANTED:** Any type or make of an AM xmtr that was used in police cars & taxis. Ted Bracco, WØNZW, 203 Main St., Teutopolis, IL 62467. (217) 857-3351 ext 306

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

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

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

**WANTED:** Collins KWS-1, 270G-3 spkr, KWM-1 spkr. **TRADE:** HF-380, 51J4 w/cabinet, S-line, 30L1, KWM2/2A, mechanical filters, military gear & lots more. Steve Darveniza, 20 Scott Rd., Herston, Brisbane, Australia. PH/FX: 61-7-3856-2543

**WANTED:** National NC44 & 45, any condx. **FOR SALE:** Heath CPOs & Q multipliers - $19 ea + shpg. H. Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103-3131.

**WANTED:** Swan 600-R Custom or Custom SS rcvr. W8JKS, 1344 McDonald Hill Rd., Frankfort, OH 45628. (740) 998-4518



**WANTED:** Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135

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

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

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

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

**WANTED:** Collecting military electronics including radio, radar, RDF and test, manuals & literature. William Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6031

**WANTED:** Early 2 & 3 digit tubes. E-mail fathauer@home.com for bid list. George H. Fathauer, 688 W. First St. Ste. 4, Tempe, AZ 85281. (480) 921-9961, Fax 921-9957.

**WANTED:** Surplus goodies: control panels for RT-1209/PRC-104; R-1218 rcvr; PRC-38; RF amp & antenna tuner for GRC-193; GRC-109 parts or complete; war vetran Collins KWM-2A. All can be working or not, raunchy or basket cases OK. Bruce Gentry, KA2IVY, 622 Plymouth Ave., Mattydale, NY 13211.

**WANTED:** Radio collection under $10,000 within 250 miles of Cedar Rapids, IA. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

**WANTED:** Pierce Simpson, Gladding 25 amateur 2 meter FM, xcvr w/pwr sply. Bob Milligan, KI4MB, 6608 N.18th St., Arlington, VA 22205-1802. (703) 533-0650

**WANTED:** Service manuals for RCA Radiomarine Direction Finder model AR8712, RCA receiver model 18T; Hallicrafters HT-18 VFO. Al Kaiser, W3LEQ, 713 Marlowe Rd, Cherry Hill, NJ 08003-1551. (609) 424-5387

**WANTED:** Instruction manual for EICO 710 grid dip meter. Robert Harding, KC5LHR, 1321 Monte Largo Dr. NE, Albuquerque, NM 87112. (505) 291-0950, harding632@email.msn.com

**WANTED:** Heath SB200; Dentron MLA 2500; Dentron 2000 antenna tuner. Richard Cohen, FL, (813) 962-2460.

**WANTED:** Scott Special communication rcvr. EA4JL, contact in the States, Kurt Keller, CT, (203) 431-6850.

**WANTED:** A metal enclosure (cabinet) for the WRL Globe Chief #90 xmtr. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 7485968, imq@bellsouth.net

**WANTED:** Hammarlund noise immunizer (silencer) for HQ170/180; manual for CV591A and manual for Knight Star Roamer. Ed, (817) 337-4464.

**WANTED:** For Hallicrafters SX-111; notch freq & tuning knobs, manual (13 tube version). John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

**WANTED:** Bendix RA-1B aircraft rcvr; Soviet aircraft radio sets. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123, leroysparks@earthlink.net

**WANTED:** CNA-46161 Navy low freq rcvr manual (National RBL-2 1942). George Marts, WØTDH, 5022 Pennsylvania, St. Louis, MO 63111-2041. (314) 353-7669

**WANTED:** Power xfmr for Heath SB650 digital display. Cliff, WA9SUE, WI, (608) 625-4527 after 6 pm

**WANTED:** Vibroplex Zephyr bug, 3" wide base; schematic/info on Collins PM-2 pwr sply. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688

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**FOR SALE:** SASE for list of reconditioned gear. Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670

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

**FOR SALE:** Collins S-line cabinet top lid support supports - $12 a pair shpd. Butch Scahrtau, KØBS, 5361 St Mary Dr., Rochester, MN 55901. (507) 282-2141

**FOR SALE:** R1655/URR navy sub rcvr 1-15 kc, 10-150 kc, AM, LSB, USB, CW ac contained exc condx - $275; Atlas 210, 215 - $325 ea; AC console - $100; digital readout - $125; Swan VHF150 100 watt 2 meter station amp - $200; Swan 408 VFOs, w/ switch - $200. Harry, W6ATC, Fax (310) 273-1995, w6atc@aol.com

FOR SALE: Heath set of 7 plug in PC boards for SB-104, VFO, plus other parts. Marvin, 2957 Gaffney Rd., Richmond, VA 23237. (804) 275-1252, wa4toj@juno.com

**FOR SALE:** Estate collection. Very large quantity of mostly test equipment and parts. PU only in Sacramento, Calif. Craig, CA, ckpinsacto@aol.com

**FOR SALE:** "Complete Guide To WWII Military Communications Equipment", 117 pg info on almost all WWII equip. - $15 + $2 domestic mail. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

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

**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.

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

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**The Collins 75A-4 Video** 4 hours - $89.95

This video is four hours of information on how to repair, maintain and restore this classic receiver. Butch Schartau, KØBS, guides you through all aspects of keeping your own 75A-4 running like a top.

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***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***

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

**WANTED:** Soviet military aircraft radio equip; US AN/ARC-19; R550/ARR-40. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123, leroysparks@earthlink.net

**WANTED:** New or used unmodified BC459A, BC696, T18/ARC/5, T19/ARC/5, CBY52232. Louis Lytch, K2DET, 117-33 230th St., Cambria Heights, Jamaica, NY 11411-1806. (718) 528-5065

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

**WANTED:** Rhode & Schwarz EK07 rcvr. Harry Weber, 4845 W 107th St., Oak Lawn, IL 60453-5252.

**WANTED:** Manual or at least alignment data for Collins 51J3 rcvr. Will pay copying or other reasonable costs. Harry, NC, (828) 693-7519, millsjr@bigfoot.com

**WANTED:** Hallicrafters SX-88 in good working order, will pay top price for clean radio. John Evans, N3HBX, MD, (301) 253-1847

**WANTED:** National pwr sply 697 for HRO & coils J & H. Walt, W7MN, OR, (503) 397-1046.

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**WANTED:** Galaxy LA-550 amplifer, any condx; any paperwork for Harvey-Wells SM-1 station monitor. Kelley, W8GFC, IN, (219) 365-4730.

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

**WANTED:** National SW-3, model 1 version 3 (uses 32-32-30 tubes). Dean Showalter, W5PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

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

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

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

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

**NEW:** Flyer 199. For details send 2-stamp LSASE to: Olde Tyme Radio Company, 2445 Lyttonsville Road, Suite 317, Silver Spring, MD. 20910. Ph/FX (301) 587-5280, oldetymeradio@juno.com

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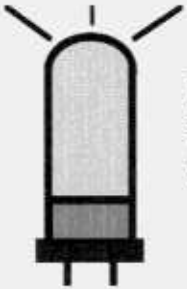

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