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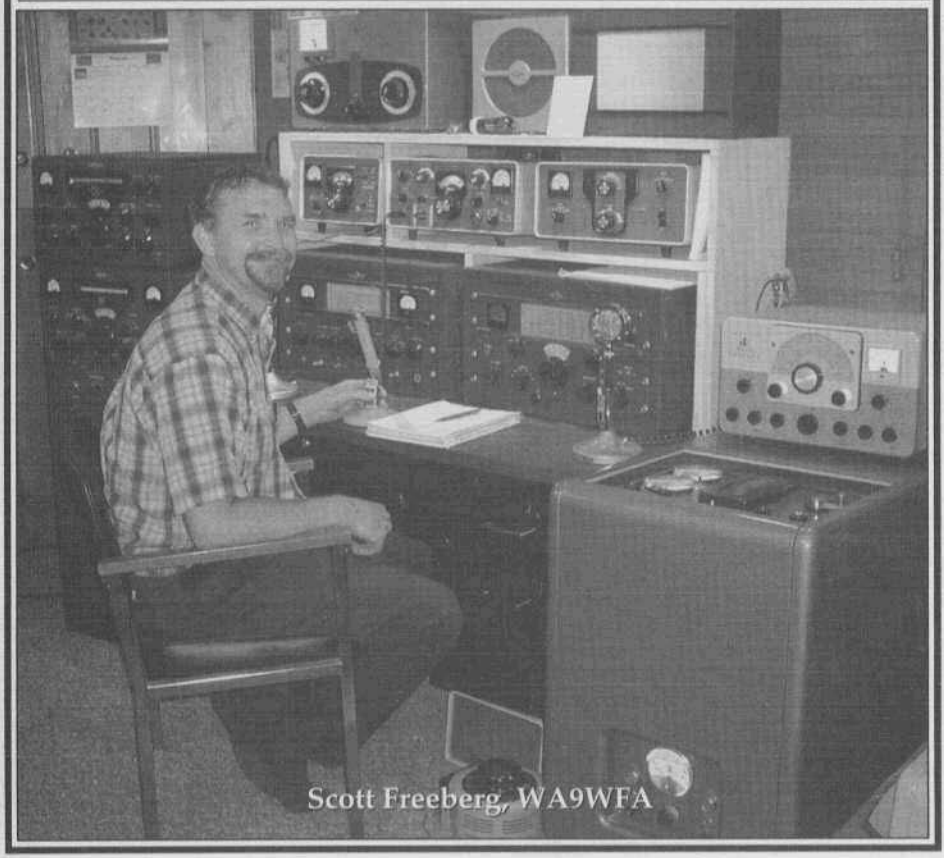
ELECTRIC RADIO

celebrating a bygone era

Number 146 July 2001



Scott Freeberg, WA9WFA

ELECTRIC RADIO

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

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

Regular contributors include:

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

Editor's Comments

Late Night 40M Activity

June 29 saw the beginning of what has become in just a very short time a very popular AM activity. Craig, KA1ZEQ started it all when he set up skeds with some westcoast stations to test the cross-country capabilities of 40 meters late at night. Starting around midnight eastcoast time the activity continued for about 4 hours. Very many stations on both coasts became aware of what was happening via the AM website run by WB3HUZ (address below) and got involved. Since the first night the interest in this late-night eastcoast to westcoast 40M activity has grown. Those stations who participated in the first night's activity are listed below.

Eastcoast stations: Mike, W2ZE; Tim, WA1HLR; Al, K1JCL; Dale, KW1I; Paul, WA3VJB; John, WN3V; Eric, N1WRG; Bud, WD8BIL; Dave, N1ZSP; Don, K4KYV; Tom, W2ILA and Tom, K1JJ.

Westcoast stations: Dennis, W7QHO; Bill, N6PY; Don, AE7H; Don, W6BCN; George, WB6YET, Joe, W1GFH/6 and Ken, WA6TJN.

On Monday about 11 PM local I fired up my GPT-750 and joined in the fun. Also on frequency that night was fellow-Coloradon, Bill Kleronomos, KDØHG with his homebrew 304TL rig. Bill's antenna was an extended Zepp at 140 feet and I have to report that he received much better signal reports than I did with my 160M dipole at about 40'.

As expected most of the talk centered around antennas. Many of those on frequency (including myself) were conjuring better antennas for this band. The loudest signal out here from the eastcoast was from Tom, K1JJ who was using stacked yagis at heights from 70 to 140 feet.

Most of the information here was gleaned from postings to the AM website operated by Steve Ickes, WB3HUZ, www.thebizlink.com/am/wwwboard/messages/527.html. N6CSW

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Cover: Scott Freeberg,WA9WFA in his vintage hamshack. The transmitter on the left is a Collins KWS-1 and on the right is a Johnson Desk KW with a Ranger II sitting on top of it. *Photo by Tom Moll, NØBS.*

Time Capsule Found at Fair Radio Sales

by Dale Gagnon, KW1I
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Bow, NH 03304
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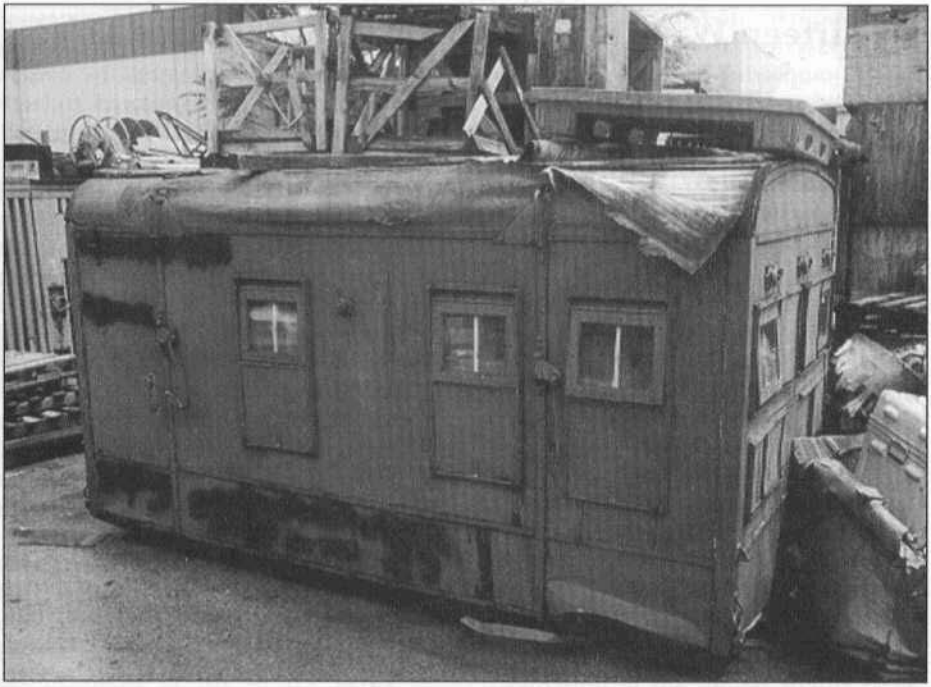
Fair Radio Sales in Lima, Ohio has been the first destination in Ohio for each of my Dayton Hamvention trips for most of the last twenty years. This year my brother Dean and I were treated to a special find. I have seen military enclosures many times over the years. Sometimes they were in scrap yards lying on their sides or upside down. I have pried a door or window open on some of these hulks, to find gutted insides or piles of garbage. I have seen some used for storage sheds. But, here at the Fair Radio yard was a communications shelter right side up with its door ajar. When I looked inside I was amazed to see just about everything was there the way it was when it was taken out of service maybe 40 years ago.

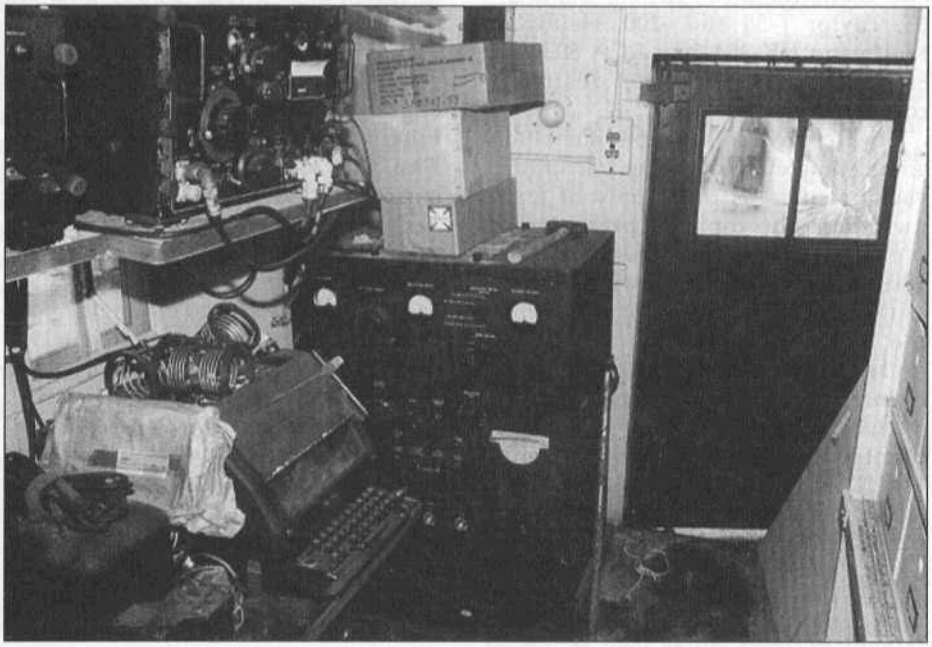
The shelter is a S69/GRC manufactured by York Hoover Corp under a 1950 contract. It was meant to be mounted on the back of a 2-1/2 ton, 6 x 6 cargo truck. A PE-95 generator would be towed behind the truck. It was used to provide facilities for transmitting and receiving radioteletype, AM and CW signals over the range of 2-18 MHz with an output power of approximately 400 watts.

The shelter is equipped with a BC-610H transmitter, which is on your right as you enter through the rear door. The BC-610 appears to be in very good condition. The BC-939 antenna tuner is included. The shelves and drawers on the left hand side of the shelter contain 41 tuning units, coils and all manner of spares in their original unopened packaging. In addition to the tubes in the BC-610 there is a spare 100TH and two 250THs. In the front of the shelter is the receiver rack with two R-388 Collins general coverage units. (They were temporarily out of the shelter when the picture was taken.) Just below the receivers is the CV-182 Frequency Shift Converter. Below that is a PP-712 power supply. Two LS-3 speakers are on the wall. The two teletypewriters nearest the receiver rack on the work surface are TT-55 teletypewriters. The unit nearest the BC-610 on the work surface is a TT-56 perforator-transmitter. On the shelf over the teletypewriters is an O-39/TRA7 Frequency Shift Exciter nearest to the BC-610. A C-808 Radio Teletypewriter Control is in between, and on the far end, near the receivers, is a BC-614 speech amp. There is a 15" stack of manuals, and a good quantity of TTY paper and perf tape.

I have known people to try to replicate these shelters looking for one piece at a time. It is just amazing that practically all the junction boxes, speakers, heaters, rectifier units, etc. are all here. The electronics are in pretty good shape, but the enclosure will need some TLC. Fair Radio found this on a farm in the south and is trying to sell it complete for a very reasonable price. I hope some ambitious military radio enthusiast, ideally one with a 6 x 6 truck will jump at this opportunity. ER



S69/GRC manufactured by York Hoover Corp under a 1950 contract



When I looked inside I was amazed to see just about everything was there the way it was when it was taken out of service maybe 40 years ago.

Thirteen Ways to ProlongTransmitter Tube Life: Heintz & Kaufman Engineers Revisited

by Robert E. Grinder, K7AK
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Amateurs engaged in AM operation are drawn inevitably into topics associated with transmitter vacuum tubes. The question of matching tube types to circuit requirements predominates in many discussions. Restoration of vintage commercial transmitters entails often an intense search for particular tubes. A sizeable proportion of amateurs are also either resurrecting prewar transmitters or seeking components for constructing replicas of them. Consequently, medium and high-power tubes, like the Amperex HF-200 and -300, Eimac 100th and 250th, Raytheon RK-36, -38, and -63, Taylor T-55 and -200, Heintz & Kaufmann HK-354, and RCA 803 and 805, etc., have become desirable commodities.

Given contemporary experimentation among amateurs involving transmitter vacuum tubes-as the supply of them dwindles—the topic of preservation seems especially noteworthy. To address the issue, the following thirteen "suggestions" or "rules" for prolonging the life of transmitter tubes are presented herein. The engineers of Heintz & Kaufman published them in the October 1942, issue of Radio. The country was deeply immersed then in WW II. An insatiable demand for transmitter tubes arose during wartime, and the H & K engineers believed, as they put it, "every transmitter engineer has a duty to nurse his tubes along, and obtain from them their maximum useful life."

Events during the past sixty years have altered circumstances markedly; a huge market for the tubes no longer exists, and the manufacture of most of them has ceased. Nonetheless, many vintage tubes are sought avidly today by members of the amateur community. The fact that they are scarce revives the exhortation to "nurse tubes along" and the wisdom of heeding suggestions for prolonging their effectiveness.

The special requirements of tubes constructed with thoriated tungsten filaments are described briefly below, as a preface to the H & K thirteen suggestions. Virtually all the tubes used in medium and high power amateur CW and AM transmitters following WW I have possessed thoriated tungsten filament structures. The H & K engineers, therefore, reference these tubes specifically in their suggestions.

The thoriated tungsten filament structure

The filaments or emitters of vacuum tubes fall basically into three categories: (1) Pure tungsten, which was first used as filament structure by the Englishman, John Fleming, when he invented in 1908 what is now identified as the "Fleming Valve." (2) Thoriated tungsten, which superseded pure tungsten as filament structure in the 1920s, when it was found to provide, relatively, much greater emission at significantly lower filament current. (3) Alkaline-earth oxide coating on nickel-alloy wire or ribbon, a filament structure that is now used extensively in receiver and other low-power applications (Tyne, 1977).

Dr. Irving Langmuir and his

colleagues at General Electric developed in 1921 the thoriated filament. The source of emission is a coating of thorium on a tungsten filament surface. The thorium functions as the emitting source and tungsten provides the heat. Langmuir discovered initially that even a mere trace of oxygen remaining inside the bulb after evacuation markedly compromised the emission of thoriated filaments. He solved the dilemma by inserting a small pellet of magnesium in the bulb, and as it vaporized during evacuation, it absorbed the remaining oxygen. The characteristic silvery appearance visible on many tubes results from condensation of the magnesium (Stokes, 1997).

The thorium coating on a tungsten filament is always in flux, perpetually losing and replenishing itself as emission ensues. In order to maintain a balance between the loss and the replacement of the active layer of thorium, emission must be held within a comparatively narrow temperature range. If operated too far below a designated filament rating, the tube will lose its emission rapidly and will deteriorate. If operated appreciably above its rating, the filament surface reduces to pure tungsten at accelerated speed, thereby, shortening the life of the tube. Maximum tube life, researchers have found empirically, occurs when filament voltage is between 95% and 100% of rated voltage.

Langmuir was unsuccessful, however, in predicting mathematically proper balance between rated filament voltage and filament temperature. For several years after his pioneering discoveries, as a consequence, the manufacture of tube types with thoriated tungsten filaments was labor-intensive, because the process of achieving the necessary balance had to be achieved from practical experience and observation. Eventually, in 1937, appropriate formulas and data were derived so that functional temperatures could be calculated precisely. The findings prompted subsequently the development of a host of new transmitting tubes (Dailey, 1943).

Thirteen ways to prolong transmitter tube life[1]

ONE

The life of a tube in normal service depends upon the number of watts it is required to dissipate on the plate. If the plate loss in watts is reduced, the life goes up proportionately. In other words, tube life may be expressed as "watt-hours of plate dissipation," and any reduction in watts results in a gain in hours. Therefore, it is advisable to adjust every circuit so that the highest efficiency is obtained.

TWO

Keep circuits properly tuned. A small amount of detuning in the plate circuit causes a rapid increase in the plate dissipation of the tube. Circuits often detune as the transmitter heats up, and readjustment is then necessary.

THREE

In Class B audio amplifiers, the "no-signal" plate current can often be reduced without resulting in harmful distortion. This reduction saves precious "watt-hours."

FOUR

Minimize stray circuit losses in Class C r.f. stages, and make sure that the loading on the tube is useful loading. To test for this, disconnect the useful load and check the unloaded plate current.

Because the grid current will rise under the unloaded condition, it is advisable to lower the excitation to get normal or less-than-normal grid current during this test. The unloaded plate current should fall to such a point that the remaining d.c. plate input power is only enough to supply the tank circuit losses, as well as the small incidental plate dissipation at the time of the test.

continued on next page

FIVE

If the unloaded plate current seems unreasonably high, it is advisable to vary the physical arrangement of the coil, shielding, L/C ratio, design of choke coils, amount of tube bias, etc., until the unloaded plate current is brought to a reasonable value. In many cases this value can be made to approach one-tenth the loaded plate current.

SIX

The grid current of a triode is a good indicator of the amount of r.f. grid driving voltage required. In ordinary Class C r.f. amplifiers the grid current should be roughly one-quarter to one-sixth the d.c. plate current of the tube . For doubler or tripler service, where large grid leaks on the order of 50,000 ohms are employed, the ratio of grid to plate current may fall off to nearer one-tenth.

A good experimental way to adjust to the proper amount of grid drive, is to reduce the drive until the efficiency of the tube starts to fall off. This will be indicated by a visible increase in plate heating. The grid drive should then be restored somewhat above this fall-off point.

SEVEN

When the tube is idle the filament should be turned off. When both the plate and filament voltage can be turned on simultaneously, the filament may be turned off in stand-by service also, since a thoriated tungsten filament is ready to operate in less than one second after the voltage is applied.

EIGHT

In these days no one can afford the luxury of an experimental set-up or a slightly "hay-wire" condition in the circuits and power supplies of a vacuum tube transmitter. Accidental circuit failures and accidental failures of component parts, will often destroy the tube.

Don't take the chance of not having circuit connections solid, and all parts in top mechanical shape. Don't cut corners on the factors of safety in any electrical parts, including tubes. Circuit protective devices are always wise.

NINE

Avoid excessive grid drive. Excess grid drive (grid current) wastes driving power, and shortens the life of the driver tube by making it do extra work. Excess grid current also overheats the grid of the tube, and shortens its life either by damaging the grid permanently, or by increasing the number of watts the tube must dissipate.

TEN

It is essential that the rated filament voltage be maintained at the tube. This voltage should be measured at the socket, and should not deviate more than plus or minus 5% from the rated value.

The life of a thoriated tungsten filament will be reduced to two-thirds of normal if the filament voltage is permitted to run 10% above its rated value. At 10% below rated value, the emission from the filament may fall off due to failure to diffuse enough thorium to the surface of the filament to maintain emission. A drop in emission may cause severe overheating of the plate, with a consequent reduction in the life of the tube, or even complete failure.

ELEVEN

Make good electrical connections to the tube. At ordinary frequencies, the standard connector clips are satisfactory. At ultra-high frequencies the charging currents into the inter-electrode capacities become large enough so that special care must be taken; A split connector of aluminum or plated brass, with the two halves held together by a silver or similarly plated external spring, which will remain good at 200 to 300 degrees C., will prove most satisfactory.

TWELVE

The efficiency of a Class C r.f. amplifier is largely dependent upon the

conditions in the grid circuit. The d.c. bias voltage is the total of the voltages developed in the grid-leak resistor, the cathode resistor and the voltage supplied by the fixed bias source.

The grid bias voltage should be considerably greater than that required for cut-off. The exact value of total bias voltage is not critical so long as it is ample. A good value to approximate is that listed on the data sheets for the particular type of tube and type of service.

In ordinary Class C amplifier service, a very desirable arrangement of d.c. grid bias voltage is one consisting of enough fixed bias to prevent the flow of plate current when all r.f. excitation voltage is removed—with the balance of the bias supplied by the IR drop in the resistor.

Such an arrangement provides adequate protection, and at the same time gives the highly desirable automatic action of a grid-leak resistor.

THIRTEEN

The electrical instability of r.f. circuits increases the probability of damage and overload to a tube. Parasitic oscillations can also cause damaging overloads, as well as inconvenience. Nearly any parasitic oscillation can be prevented. A good way to isolate and cure parasitics in an amplifier is to:

a—Remove the normal excitation

b—Remove all fixed bias

c—Lower the plate voltage until the plate loss due to the static plate current flowing does not exceed the rated tube dissipation.

Under these conditions there should be no parasitic oscillation at any position of the tuning dials. A parasitic oscillation will be readily indicated by the presence of grid current. If such oscillations occur, then:

a—Find the frequency of the parasitic

b—Determine the parasitic circuit superimposed on the normal r.f. circuits.

c—Adjust the parasitic circuit, decreasing its excitation voltage until the oscillation ceases. Such changes need not seriously affect normal circuits.

References

Dailey; H. J. (1948, January). Designing Thoriated Tungsten Filaments. Electronics, 21, 107-109.

Stokes, J. W. (1997). 70 Years of Radio Tubes and Valves. (2nd ed.). Chandler, Az: Sonoran Publishing, LLC.

Tyne, G. F. J. (1977). Saga of the Vacuum Tube. Indianapolis: Howard Sams & Co.

Footnote

[1]Reprinted verbatim from Radio, (October, 1942), #273, pp. 15-16.

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

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

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

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

Or contact :

Pete Hamersma, WB2JWU

PO Box 467

Holderness,NH 03245

E mail : pehamers@worldpath.net

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

The 6U8 Receiver

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

In the early 1950's, I had been working at RCA in Camden, NJ just a short time when I saw an announcement in *Tele-Tech* magazine announcing the 6U8 tube. My boss had an aversion against 7 and 9-pin miniature tubes. He thought they were too fragile to be used in broadcast quality equipment. But I argued that the 6U8 would revolutionize the design of sync generators, stabilizing amplifiers, special-effects equipment, etc—all devices that employ large numbers of tubes. Finally, he gave in and we began to use the 6U8 and other miniature tubes. So the 6U8 has had a warm place in my heart for many years and I think you will like it too! Some of my friends insist that solid-state is the only way to go but I like tubes that light up. So here is my latest receiver and it uses two 6U8 tubes.

The Goal

The goal was to build a simple regenerative receiver that incorporates the following features:

1. Set must use only two tubes and they must be 6U8's.
2. Input stage to be a cathode-follower thus isolating the detector from the antenna so that antenna resonances do not affect regeneration.
3. The set should cover the broadcast band, the 80, 40 and 20 meter ham bands and all frequencies inbetween.
4. Set to employ plug-in coils which are shielded to prevent noise pickup from house wiring and overload from a local BC station.
5. Dial to be calibrated to facilitate finding and logging stations. Must have a comfortable tuning rate on all bands.
6. Must have a built-in loudspeaker and a headphone jack.
7. Must have built-in power supply, yet be hum free.

When you draw up a set of specifications to be met, you can be sure that you will encounter a few problems. And, often they will be of a totally unexpected nature. I thought that the cathode-follower input stage would be the easiest part of the design. Not so. Initially, the set displayed an overwhelming hum. At the grid of V1A I had called for a 390K resistor. It took a while to discover that this was a mistake. Replacing that resistor with an RF choke cured that problem. Cathode-followers often show a tendency toward parasitic oscillations so a ferrite bead is used at the grid.

Initially, C20 was 22uF. It seemed reasonable based on my experiences with previous sets. So if it seems strange to call for 100uF at C20, it was necessary to cure a low frequency motor-boating that occurred when the volume control was turned up more than half way. I have friends who are computer experts and they probably could put this circuit into one of their programs and quickly find the optimum values for all components. But I'm old-fashioned and enjoy doing it the old-time way. Makes me wonder what the HRO would look like if National had used a computer.

The Dial

At first, I thought it would be nice to employ a Millen dial like the one I used on my last receiver. But after a fruitless search, it became apparent that dials are a very scarce commodity. In my stock of tuning condensers was a 3-gang unit with features that inspired a solution to the problem.

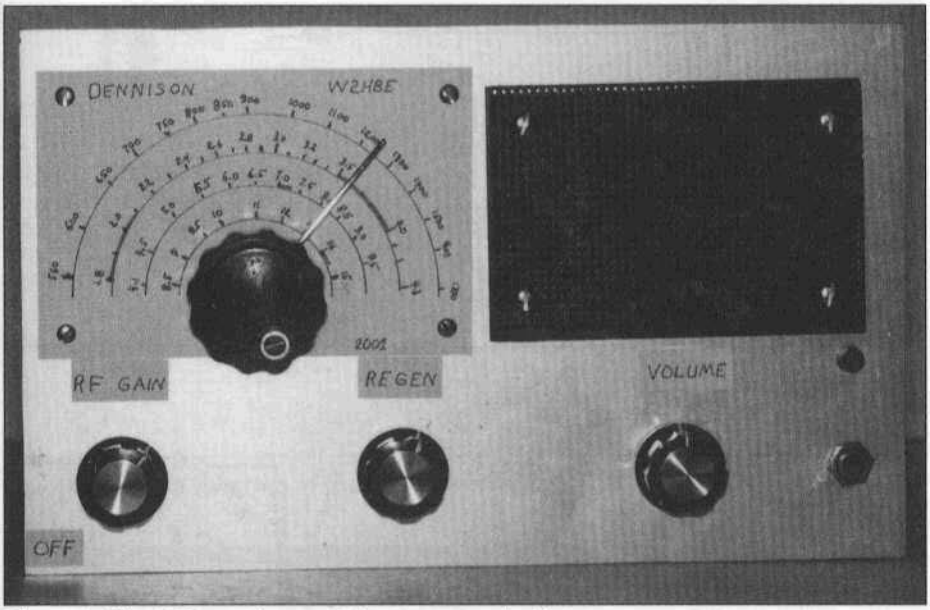

Photo 1. The 6U8 receiver and its homemade dial

This condenser had two concentric shafts. The inner shaft was a normal inch shaft. Surrounding this shaft was a 3/8 inch shaft. There was a 6 to 1 turning ratio between them. Thus a knob on the 1/4 inch shaft would have to be turned three complete turns to cover the band in use. On the 1/4 inch shaft, I installed a 1/2 inch knob. This knob had a one inch crank or "spinner" to facilitate rapid excursions to another part of the band.

It was necessary to fashion a pointer to be attached to the 3/8 inch shaft. I started with a 9/16 inch hex nut and enlarged the threaded hole so it would slip onto the 3/8 inch shaft. I made the pointer (two inches long) from the smallest section of a cell phone whip antenna (Radio Shack No. 270-1414). I drilled a small hole in one side of the nut and forced the pointer into this hole. On an adjacent flat of the nut, I drilled and tapped a hole for a 4-40 set screw. If desired, you can paint the pointer but I left mine chrome plated. The dial scales were drawn on white Bristol board and held in place by four 4-40 BH screws.

The end result is a personalized dial that turns more freely than any commercial dial and one which you will be proud to display. My set of dri-transfer letters didn't provide the words I needed so I typed the control labels on heavy white paper and glued them in place.

The Detector

The pentode section of V1 is used as a grid-leak regenerative detector. Feedback is by means of a tickler coil, L2, and controlled by variable capacitor C7. A strange oscillation occurred when C7 was set at minimum capacitance and this was cured by adding C21. Immunity to line voltage variations is provided by zener diode Z1. Ferrite bead FB2 is used to forestall any tendency toward parasitic oscillations.

The 6U8 pentode is a very sensitive detector and it may be necessary to select one that is non-microphonic. Another source of trouble is vibration of the tuning condenser. In the all-wave radios popular in the 1930's, many

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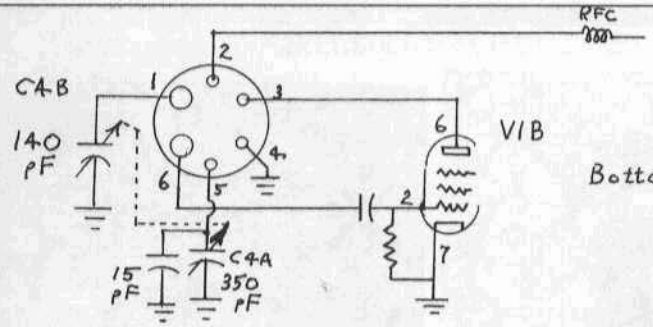
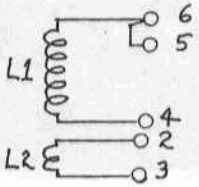
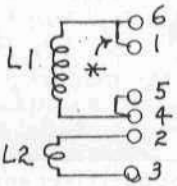


Bottom view of coil.



Broadcast coil



Short Wave Coils

* On coil 4, this jumper is replaced with 130pF capacitor

COIL	BAND	L1	L2	
1	.55-1.7	99 turns, No. 28E, CW, #	11 turns, No. 28E	# = ferrit core
2	1.8-4.2	45 turns, No 28E #	5 turns, No. 28E	
3	4.1-9.8	21 turns, No. 24E #	3 turns, No. 28E	
4	8.5-15.3	16 turns, No. 18E	2 turns, No. 28E	

NOTES: All coils wound on 1¼ inch diameter forms provided by Antique Radio Laboratories, 5355 S. 275 West, Cutler, IN. 46 920. # Ferrite cove – see text.

Fig. 2. Winding and connection data for coils.

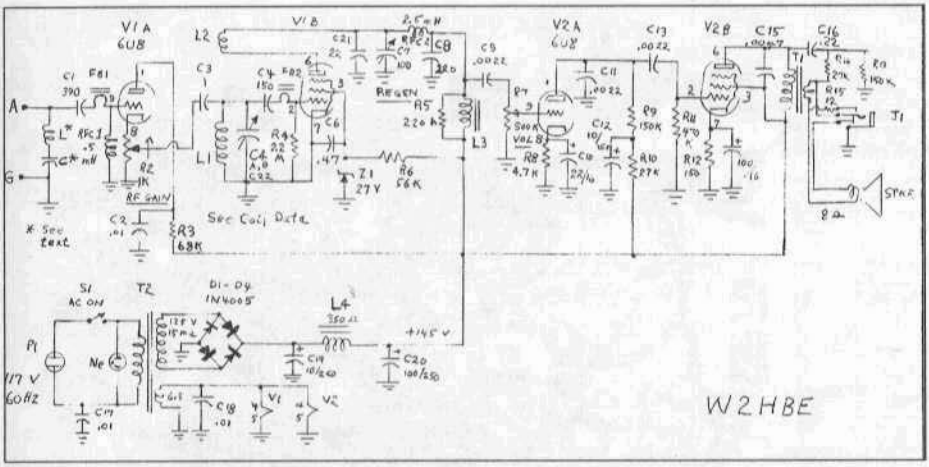


Figure 1. Wiring diagram of the 6U8 receiver. L*C* is a wave trap tuned to a local radio station.

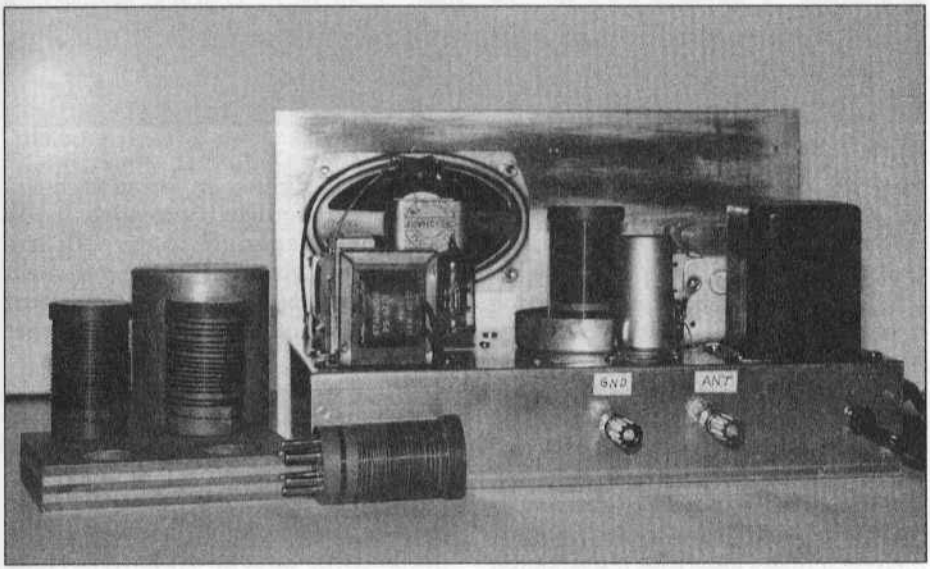


Photo 2. Rear view of the 6U8 receiver. Coil shield removed to show broadcast coil

manufactures mounted the tuning condenser on rubber "shock absorbers". I found it helpful to wedge a toothpick between the frame of the tuning condenser and the choke L3.

One reader of ER asked me where he could find a high-inductance detector plate choke like the one used at L3. In the prewar days, these were made by several companies but now they are scarce. Before these chokes became available, it was common practice to use the secondary winding of an audio transformer. Some builders connected the primary and secondary in series to get even higher inductance, being careful to observe proper polarity of the windings. But today even audio transformers are scarce. Check your friends to see if they can help or run an

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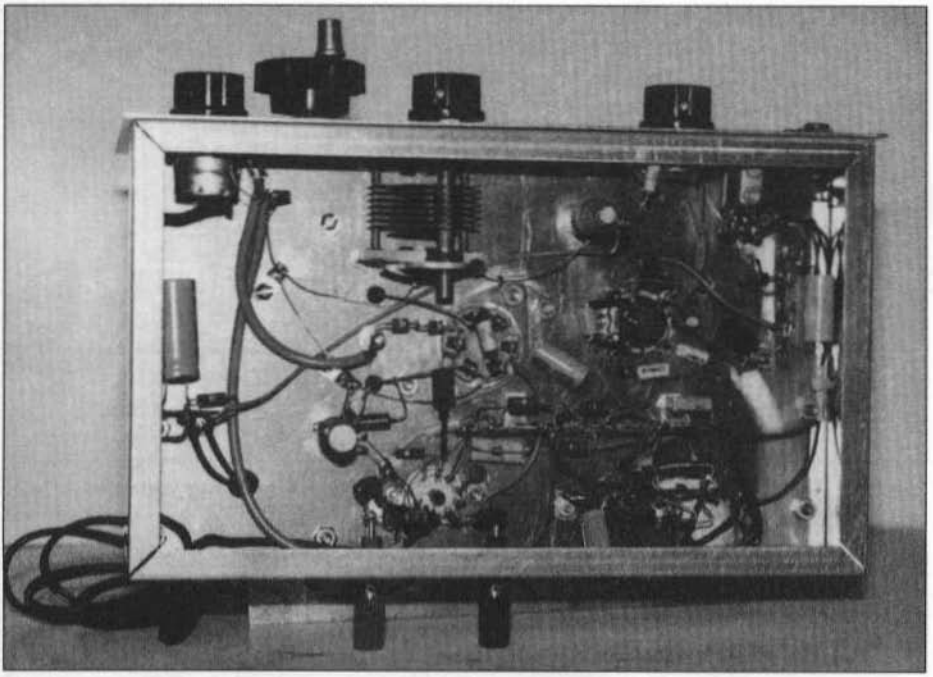

Photo 3. Bottom view. Note uncrowded layout.

ad in ER. As a last resort, substitute a 47K resistor for L3-R5. You will sacrifice volume but get better fidelity.

Coil Data

Refer to Fig. 2. Four coils provide coverage of the broadcast band and the 80, 40 and 20 meter ham bands. A jumper inside the coil form selects either the 350 pF capacitor section or the 140 pF section. In addition, coil No. 4 inserts a 130 pF capacitor in series with the 140 pF tuning condenser in order to give a more reasonable tuning rate on this band.

I live close to a broadcast radio station so it was necessary to shield the coils. The coil shield lowers the inductance of the coil so final adjustment of tuning range must be made with the shield in place. I set the receiver on its side and placed pieces of ferrite inside the coil form then replaced the shield. This was repeated using differing amounts of ferrite until the desired tuning range was obtained. Finally, the ferrite was locked in place using a coating of epoxy. A label was glued on top of each coil showing the range it provides. If you are lucky enough to live in the wilderness, you can skip the coil shield and the ferrite. You may have to adjust the number of turns to get the proper coverage.

When all the coils are finished, add coil dope or Duco cement to hold the turns in place. Make a label to glue on top of each coil to show its tuning range. Then make a holder for the coils. Mine measures 3.75 by 4.25 inches and is made of five-layer birch plywood. Holes for the coils were bored with a 7/8 inch power wood bit and cut down through the top four layers of wood. Finally, I added a coat of cherry stain.

Audio

A second 6U8 serves as a two stage audio amplifier. The output transformer is a low cost item available from Radio Shack—see Bruce Stock's article in the December 2000 ER. The headphone jack, J1, is arranged so as to provide a proper

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Vintage Field Day, 2001

by Barry Wiseman, N6CSW, ER Editor

I think that this year's VFD was more successful than any other. There were more participants actually in the field and there were more people operating from their home stations. I think that as the years go by there will be more and more interest in VFD and it will become a fixed annual event just as the normal ARRL Field Day has become.

In this issue I'm going to present some of the photos and one of the reports I've received so far and in future issues throughout the next year I'll print some of the logs, reports and comments so as to keep the idea of VFD before everyone.

From Al Tipsword, W6GER

Well VFD was a real hoot for me. I got to the site, about 30 miles from my home, at 7400 feet in the Sierras at about 08:30. The site is on a ridge overlooking the Sierra Mountains, about 20 miles southwest of Lake Tahoe. Beautiful location. Weather was perfect, clear sky and warm. It took about 45 - 50 minutes to unload, erect the vertical antenna and hook up. The antenna is the 30 foot vertical with 24' radials. Took a few pulls on the Genset to realize I was giving it too much choke for that high altitude. I was on the air by 09:30. Started on 7290 and called CQ. After a few calls, my first contact was Dennis, W7QHO, he was at home. His van broke down on the way to his field day site. Worked a number of the 40 meter guys then migrated to 14.286 only to run into "Kids Day". Spent most of the afternoon/ evening on 20M. I managed to get into a 20M AM roundtable that had about 15 stations. The bad news was that most of the guys were operating from home, and some of the old guys were very long-winded. I needed to shut down and refuel about every 45 - 50 minutes and some of the old timer held the mike for 5 - 10 minutes each go-round. I managed to get in about one transmission per tank full.

Back to 20M in the afternoon and early evening. Worked into New Hampshire, Connecticut, Minnesota, and Canada among other mid-west states. After hearing Barry, N6CSW from Electric Radio all day, conditions finally changed around 19:45 and I actually made contact with him about S8 from Monument Valley. I moved down to 75 M around 20:00 and was unable to raise anyone. I stayed around til 21:00 for the MRCG Net, but heard no one. I worked a station in Ft. Bragg at 21:15 and secured. Packed everything up and headed home and a nightcap, arriving around 22:15.

All in all, VFD went very good for me. The GRC-19 performed excellently, both the T195 and R392 ran all day long without a hitch. The T195 does not load up well on 75M on the vertical but all the other bands are great. The Genset ran all day long with no problems, I did readjust the carb once midday. No sunburn and a minimum of insect bites. Very nice weather all day. Sunday Morning I was burned out on radio stuff and monitored a little and then did Fathers Day. W6GER

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You Can Go Back - At Least To Visit

by John MacAulay, WQ8U
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Regular readers of ER are probably aware of St. Xavier High School in Cincinnati and its radio club- the alma mater of Jim Hanlon W8KGI (see ER # 66,115,133 and others). I also had the good fortune to attend St. X; Jim was my Elmer there and still is. At the Cincinnati Winter Hamfest in February, I saw a young ham, Justin Rigling KC8OIO, wearing the St. X logo on the seat of his camouflage pants. (In my day the only folks with a school logo on their clothing were the jocks with their letter sweaters.) I introduced myself and asked about the old radio club and station, W8GYH. I was the station's first trustee in 1955. He told me the club was alive and well. That's not bad for an organization that is well over 50 years old and has a 100% membership turnover every four years. In true ham fashion, he invited me to a club meeting so I could tell them how things were "back then."

I visited them and was impressed with what had changed and what had not changed. In the '50s, the club station was tucked in a cubbyhole on the fourth floor in the "new", only 90 year old, part of the building with a drafty window to an iron fire escape where the antenna's open feed lines were anchored. Today's club is in a well-finished air-conditioned laboratory room on the first floor of a modern building with a conduit to the roof for the coax and rotor controls. What a difference! They have modern Kenwood and Icom tranceivers with satellite and multi-element HF beams on towers on the roof and work SSB, satellite and digital modes. We had a Command Set VFO, Millen 90800 exciter/driver, home brew push-pull 812A amplifier and home brew 211 modulators with 866 & 816 Mercury vapor rectifiers (which were real crowd pleasers). Our only antenna was a 134 ft. center fed Zepp strung between the old church next door and the school roof. Our only modes were CW and AM which we monitored on a 5" Dumont scope we borrowed from the Physics lab. What a difference! For more information on the old station and antenna you should read Jim's article in ER #66, "The Hammarlund HQ-129-X...or, how I almost slid off the church roof." I told them about learning code on the surplus TG-34 code tape machine at the school and facing the traveling FCC testing officer; some of them have no code licenses. Big difference! Some of the gear in today's W8GYH was not working properly and they were planning to send it out to be repaired. What a difference! Our moderator was the Physics teacher who was neither a ham nor active with the club. Their moderator, Greg Lamping WX8N, is the head of the language arts department and is very active with the club. What a great difference! Our phonetics for W8GYH was "Willie 8 Green 'n Yellow Hamburgers"; theirs now includes "Willie 8 Geeky Young Hams". Maybe not so much of a difference.

The photos show W8GYH in the early 50's (that's Jim Hanlon, then W4VIV at the mike) and now (that's Justin, KC8OIO next to the gear). What a difference!

What has not changed is the enthusiasm to learn about and through

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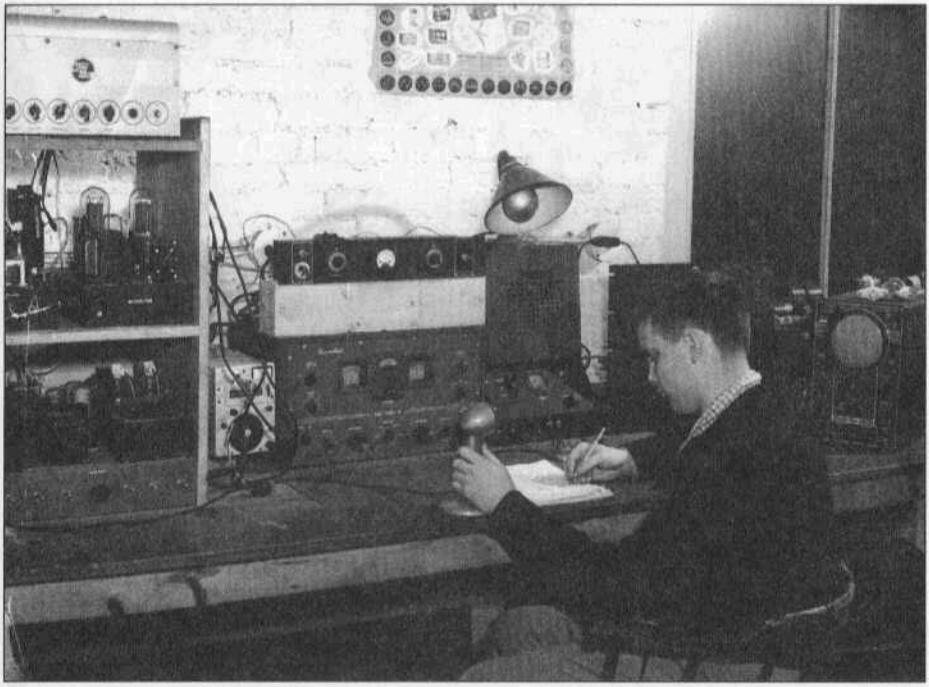

W8GYH in 1955 with Jim Hanlon, W4VIV (now W8KGI) at the mike.

W8GYH in 2001 with Justin Rigling, KC8OIO next to rigs.

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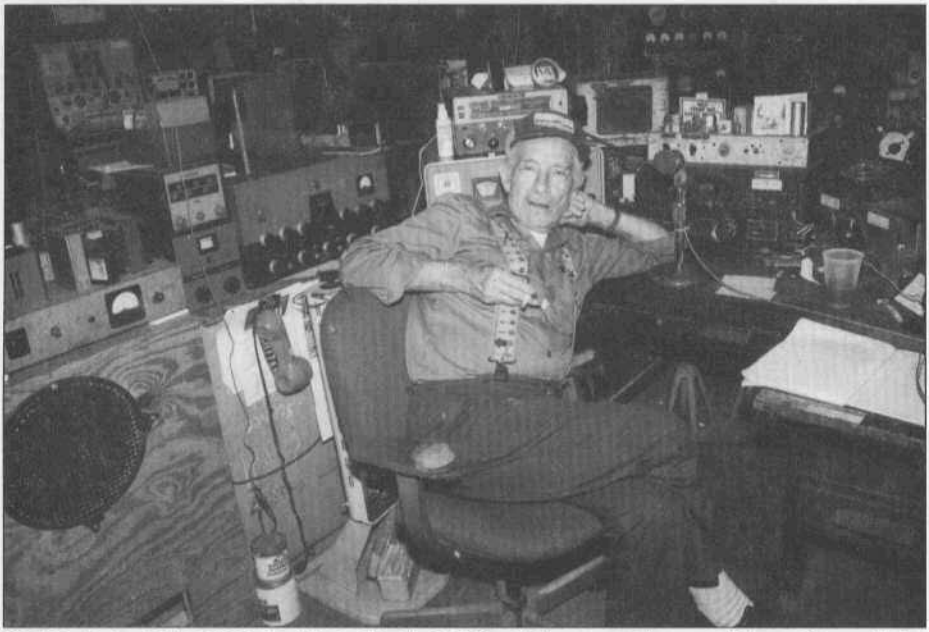

Bill Dolvin, W8VYZ (aka 'Ashtibula Bill') at his operating position. One of the most active of AM'ers he can be found daily on almost any band. *Photo by John Dolvin. KC8LII.*

Andy Kaufmanis, WAØGAG and XYL Sandra, KØGAG in their shared hamshack. Andy purchased the S-line shown back in 1963 fromHenry Radio.

David Dunkelberger, W6MKA, in his vintage hamshack.

When Bob Sitterley, K7POF, stopped by on his way to Dayton one of the things I had to show him was a very odd looking antenna that I've had in my shed for years. Although Bob is somewhat of an antenna expert he had never seen anything like this. The antenna was manufactured by the Little Giant Antenna Lab in Vaughnsville, OH and appears to have been designed for 40 meters. I'd like to hear from anyone who could provide us with more information on this antenna. *Photo by N6CSW*

Review

The CD "Heathkit: The Early Years" by Terry Perdue, K8TP, 18617 - 65th Court NE, Kenmore, WA 98028-7920, terryp@halcyon.com
Self-Published, ISBN: 0-9637627-1-0
$29.95 plus $4.50 S&H from the Electric Radio Store.
Review by Chuck Penson, WA7ZZE
wa7zze@juno.com

The writable CD ROM has been a kind of quiet revolution. I can't tell you precisely when writable CDs became commonly available (though I'm sure lots of people know exactly), but there they are—on virtually every computer sold today. The significance of these now-ubiquitous devices (beyond being able to download music from the net) is that they permit the wholesale archiving of literally tons of data on a few small, shiny disks. Consider an entire set of QST magazines—a stack more than 20 feet high weighing better than 500 pounds. Presto chango. They now occupy just a handful of CDs, fully indexed and searchable. What once consumed whole rows of shelves can now be reduced to something that fits in your pocket. And it's easy. Anyone can do it. Moreover, it can be done for pennies per megabyte.

The ease and low cost with which data can be stored in digital form has made it possible to begin archiving information previously thought to be either too voluminous and/or not of sufficient significance to be practical. This, in turn, has begun to encourage people to preserve every kind of data imaginable from newspaper clippings to old family photos.

This is exactly what Terry Perdue has done for the Heathkit family. On his remarkable CD entitled Heathkit: The Early Years, Perdue has collected, scanned, and recorded some 1000 mostly never-before-seen photos and other documents generated by the Heath company, mostly during the 50s.

His efforts provide nothing less than a window in time through which one can look inside the Heath company almost as though it was 1950 again. There are pictures of engineers engineering, designers designing, fabricators fabricating, testers testing, packers packing and shippers shipping. There are scans of early product fliers and catalog covers. There are copies of in-house newsletters. There are product shots, newspaper articles and more—even an astonishing thirty minute WAV file featuring an interview with the late Gene Fiebich, Heath's director of engineering for over two decades.

While there is no index per se, and the files are not searchable, finding what you want is made simple because all of the photos and documents have been cataloged into logical folders. For example, "Ed Heath", "Howard and Helen", and "Catalogs and Flyers" make it clear what kind of information various folders contain.

Perdue admits there is no interpretation or explanation accompanying the photos. And so, we do not know (in many cases) who the people are that are pictured, where the picture was taken, when it was taken, or why. This is not a shortcoming of Perdue's effort. The photos were taken years before he joined the company and were literally rescued from the dumpster by himself and others when Heath got out of the kit business. This isn't a problem for me—it's a puzzle to be solved!

In recent years, Heathkits have achieved near cult status and for devotees of Heathkit (and vintage radio in general) this CD will be a wonderful treat to be browsed and savored. But there is so much more to it. For the historian, this CD is a gold field of data to be sifted carefully for clues and

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VINTAGE NETS

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

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

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

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

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

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

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

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

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

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

Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 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. http://www.crompton.com/grayhair

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 on Tues nights on 3805 at 2100 Eastern and on Thur nights on 3875. West Coast 75M net that takes place on 3895 at 2000 Pacific

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

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

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

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

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

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

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

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

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

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

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

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

Midwest Classic Radio Net: Sat. mornings on 3885 at 7:30AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.

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

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

Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22.00 UTC on 7220. Net control is Dennis, VE7DH.

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

The RME VHF 2-11 Receiver

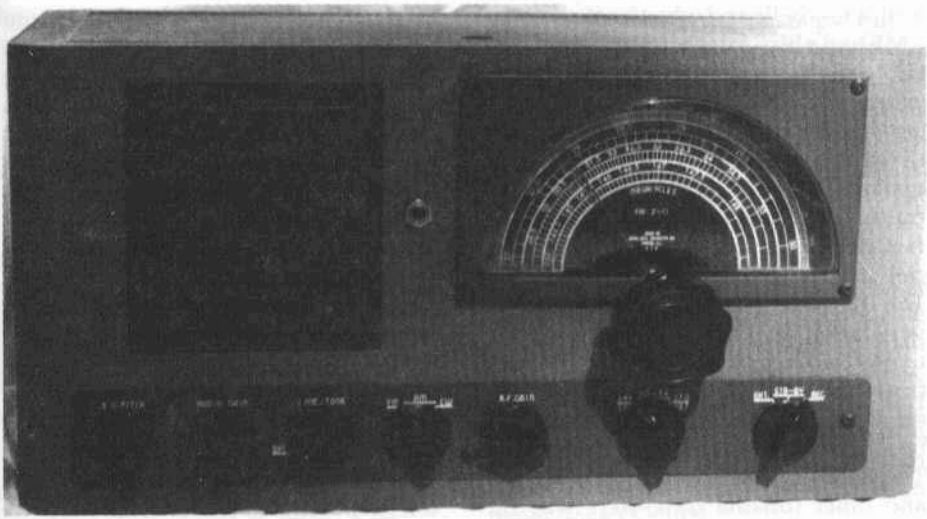
by Chuck Teeters, W4MEW
841 Wimbledon Dr.
Augusta, GA 30909

I saw the RME sitting in Rick's "I don't know why I bought it" stack of radios and thought it was an RME-84. A closer inspection confirmed Rick's comment that it was an RME VHF 2-11. They look so much alike that unless you get close enough to read the lettering on the controls and dial you can't tell them apart. It was the first 2-11 I had ever seen in person. I had stopped in with my wife to see Rick Sitz in Bradenton, Florida because of his gracious invitation to see his receiver collection and go through his "excess". Our winter home is about 50 miles south so we drove up on a Sunday afternoon. His collection is impressive, everything looks showroom new, and everything is connected up and working. I took great delight in being able to tune around on the receivers without having to lift, move, or connect any wires, not like my shack to say the very least.

My wife, planning ahead, had brought a book along to read, so I had time to browse through Rick's collection. Being a receiver fanatic myself, I found his side porch collection the most interesting. It had receivers waiting work, excess, or bought simply because he couldn't pass them up. That's where I spotted the VHF 2-11 that I had mistaken for the 84. I had an RME-84 in grad school in '48 that I got in a trade for an SX-43. I had installed a 10 watt 6V6 40 meter crystal oscillator inside under the lid and stole power from the receiver. I carried the RME around to rooming houses and apartments and worked 40 CW with aluminum clotheslines, rain gutters, and porch railing antennas. The 84 always worked and I can't ever remember being under the chassis. When Rick offered me the RME VHF 2-11, complete with manual I couldn't resist.

A check of the manual showed the 2-11 to be RME's VHF 152 converter inside an RME-84 cabinet with IF, audio, power supply, and AM and FM detectors. The RME-84 was a 1947 effort by the company to broaden their HF receiver line. Hallicrafters always followed the Sears and Roebuck lead with good, better, and best receivers. National and Hammarlund had better and best lines, but RME had only one receiver in their line since their start in 1933. After WW II they came out with the RME-45 as their standard receiver, but they followed up a year later with the $98 RME-84 as their first low priced receiver. The best way to describe the 84 would be to say it was a Hallicrafters S-40 with loctal tubes and mechanical bandspread. One RF amplifier, and two IF amplifiers, with a converter in between was followed by a detector and two audio stages. A noise limiter and BFO completed the signal line up. An internal 5" speaker and power supply completed the receiver. There were sockets on the back for battery operation and an external S-meter. The 84 must not have been a roaring success as it was not only RME's first low priced stable mate to their top line receiver, it was also their last. The 84 was in production for slightly over two years.

While RME normally built only one HF receiver model, they were heavily into receiver accessories. Starting back in the thirties they built pre-selectors and converters. The pre-selector provided some gain and greatly improved the image rejection of the receiver it was connected to. RME converters, or band extenders as they



The RME VHF 2-11 receiver

called them, extended the tuning range of a receiver, usually up into the top of the HF band and the lower part of the VHF band, but they also built low frequency converters to extend receiver tuning down into the LF band. They also built crystal oscillator units to provide fixed frequency operation of their own receivers and competitor's.

One RME accessory that came just at the right time was the VHF-152. The 152 was a two-tube tunable VHF converter that covered 10, 6, and 2 meters, with a 7 MHz output. The 152 hit the market in late 1945 just as the FCC opened the new 6 meter band to replace the prewar 5 meter band, and the new 2 meter band to replace the prewar 2-1/2 meter band. Also the War Assets Administration started releasing thousands of military surplus receivers like the BC-342 and 348 that only tuned up to 18 MHz. The RME-152 was an immediate solution to coverage of the new bands and receiving 10 meters on the military surplus receivers.

The popularity of the VHF-152 continued into 1947, '48, and '49 even though surplus VHF receivers were available. The popular SCR-522 and VHF ARC-5 sets T-23 and R-28 were helping to populate the VHF ham bands. The surplus aircraft sets covered 100 to 156 MHz with crystal controlled transmitters and receivers. The crystal controlled transmitter was fine as that was the norm for operation back then. The rock bound receiver however presented problems. You normally had to tune the band to find a contact. The locals each had their favorite crystal frequency and you had to go looking for them. Operating procedure was to tune the band and if no one was heard, you called CQ and then tuned the band. Converting the surplus crystal receivers to tunable was not easy if you wanted a stable receiver with decent band spread and good dial calibration. The 152 offered the easy way out. It had an excellent dial with good band spread and calibration, and its 6AK5 RF stage with a noise figure around 12 dB was as good as or better than any of the surplus VHF receivers.

RME apparently interpreted the sales of the VHF-152 as a ready market for complete VHF receivers. The VHF 2-11 was the result, the VHF-152 combined with the guts of the RME-84 receiver

continued next page

with a few bells and whistles thrown in. RME had a history of putting their more successful accessories into the same cabinet with their receivers. They had started by putting the DB-20 preselector in with the RME-69 receiver. Sales were apparently poor as the combination was pulled off the market after 1 year. In fact none of their combinations were sales leaders, and the 2-11 followed suit. The RME 2-11 sales must have been very poor as it was pulled from the market after one year. The one I got from Rick is the only one I have ever seen, and I could only find one that had been advertised in ER in the last 5 years. The death knell for the 2-11, VHF-152 and other tunable converters was Ed Tilton's, W1HDQ, simple crystal controlled converters described in *QST*. These allowed VHF reception with all the stability and calibration of your regular HF receiver. The HF receiver, functioning as a tunable IF following the xtal controlled VHF converter was the only way to go by 1950.

When I got the 2-11 receiver home I replaced a bad AC line cord, 3 filter caps, and one screen bypass. I cleaned the switches and controls and it came to life, but with lousy performance. It took a complete alignment to get it receiving anything on 10, 6, and 2. The instruction book described the alignment procedure with several precautionary remarks about the accuracy of the signal generator. Nothing was said about warm up drift of the receiver however. A quick check over the first 15 minutes from a cold start on 2 meters looked like an upward drift of 300 kHz. After that it seemed to settle down a bit. Another odd alignment precaution is that the 2 meter oscillator pad is in series with the 6 and10 meter pads, so you set 2 first and then do 6 and 10. However for the RF alignment they say to do 10 first and then 6 and 2 last. Strange but it seems to work OK.

The 2-11 uses a 6AK5 tuned RF amplifier feeding a 12AT7 oscillator mixer which is the same as the 152 converter. In the 2-11 the 7 MHz output from the mixer half of the 12AT7 feeds into a 6BE6 2nd mixer with 455 kHz output. The 6BE6 oscillator section is a self controlled Hartley. With the 12AT7 VHF oscillator front end, any drift in the second oscillator is insignificant. Two 6BJ6s function as IF amps and are followed by a 6AL5 diode detector and noise limiter. A 6AJ6 is the first audio feeding a 6G6 power amp. Later models used a 6AK6 in place of the 6G6. The 6G6 was tight against the audio output transformer mounted on the speaker frame and apparently could cook the transformer. The miniature 6AK6 cured the problem. A 6BJ6 is the BFO for CW reception and a meter amplifier for an external S-meter when receiving voice. The 2nd IF in addition to feeding the diode AM detector, also feeds a 455 kHz 6BJ6 limiter and 6AL5 discriminator for FM reception. A VR150 regulates the plate voltage of both oscillators. High voltage is provided by a 5Y3. While the 2-11 wasn't much of a success it did provide RME with manufacturing and design experience with the new miniature 7 pin tubes and an FM detector. They used this experience the following year to upgrade their top line receiver from the loctal tubed RME-45 to the miniature tubed RME-50 with a built in FM adapter.

Performancewise the 2-11 tunes 27 to 30 MHz on ten, 49.5 to 55 MHz on six, and 144 to 148.3 on two. The dial has calibration marks every 100 kHz on all three bands. Separate 300 ohm balanced antenna connections are provided for each band. A front panel switch will disconnect the front end and allow the receiver to be used as a 7 MHz IF channel for separate converters. The noise limiter is switched out by pulling out on the audio gain control just like the RME-45. Like a lot of low end receivers, there is a front panel standby switch,

but there are no provisions for remote switching. Also there is no provision for battery operation. With a VHF receiver and the possibility of a mountain top expedition, you would think battery operation would have been a useful option.

The 2-11 could hear the leakage on 10 meters from my signal generator, which is probably well under 2 uv. On 6 meters it took about 2 uv. On 2 meters I had to crank up the output to over 4 uv. Connected to my 2 element vertical on 10 meters the 2-11 heard everything on AM that my 51J3 could. However on 2 meters the 2-11 could hear more than a Gonset Communicator, but far less than an Icom 229A when connected to a 4 element vertical. I didn't try it on 6 meters. The AM performance of the 2-11 is outstanding, and on 2 meter FM it hears the local FM repeaters better with slope detection than it does using the FM detector. The FM detector is OK but is set up for wide band FM. An extra stage of audio after the discriminator would help, but then so would squelch. It is a nice clean receiver as I couldn't find any images or birdies on any band. The selectivity is wider than you would expect for two 455 kHz IFs, about 18 kHz wide 6 dB down. Makes it a fine monitor for 10 meter AM as the drift is less than 10 kHz after a 30 minute warm up. With the limited 10 AM activity these days it is just right. On 2 meters it drifts more than 30 kHz in the second 30 minutes of operation and never really settles down to where a signal will stay in the pass band for more than 10 or 15 minutes. The 2-11 is not a receiver to use to monitor a 2 meter local net or repeater. For just looking over the 2 meter band for activity it is fine.

The bottom line on the RME VHF 2-11 is that it has replaced the Hallicrafters S-21 Skyrider 5-10 in my shack. It looks better, works better, covers 2 meters, and most of all reminds me of my RME-84 and my days at Northwestern University. So leaving nostalgia out, if you can find an RME VHF 2-11 it is a fine 10 meter AM receiver that will allow you to listen to 6 and 2 meters, and like most RME products, is well built and a good looking and working addition to your shack. ER

The 6U8 Receiver from page 12

load on T1 whether phones or speaker are used. The 6U8 does a commendable job of driving the loud speaker—a small oval job measuring 2.75 by 4.25 inches. The speaker grill is made from perf board (Radio Shack 276-1394) and painted black. Put a piece of black cloth behind the grill so that the aluminum panel doesn't show.

The power supply delivers 145 volts at a load of 19 mA which is a bit over the 15 mA rating of the transformer. The transformer runs only slightly warm. The filter choke was found at a hamfest and measures about 5H.

Conclusion

I agree with Bruce Vaughan (ER No. 138) that building regenerative receivers is still as big a thrill today as it was back in the 1930's. You can have your solid-state, triple-conversion, made in Japan superhet but I'll continue to build and enjoy those old-time regens. ER

Happy Birthday Bob!

Our good friend W2HBE turns 80 at the end of this month and I'd like to wish him a very happy birthday on behalf of myself, Shirley and all of the ER readers.

Over the years Bob has produced dozens of excellent articles that have contributed mightily to ER's success. We appreciate him very much. N6CSW

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

The Echophone EC-1

by Jim Hanlon, W8KGI
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Raymond Moore gives the following background information about Echophone in his wonderful reference, Communications Receivers, The Vacuum Tube Era: 1932 -1981. "The Echophone Radio Company started in the early 1920's in Southern California where they owned radio stations and manufactured home broadcast receivers. In 1930 they moved to Waukegan, Illinois, where the company turned out 1000 sets per day. They changed management in 1931 and later moved to 2611 Indiana Avenue in Chicago. The depression and financial difficulties hit Echophone in the mid 1930's and they finally suspended business in 1936.

"Ray Durst, an Echophone executive (customer credit manager per Chuck Dachis), got together with Bill Halligan, president of Hallicrafters, and they worked out a deal where Hallicrafters acquired the Indiana Avenue plant and Echophone's RCA manufacturing licenses. Hallicrafters moved their entire operation into the plant on August 15, 1936. Ray Durst became Hallicrafters vice president.

"The Echophone name went into limbo until 1940 (actually February 1941) when Hallicrafters wanted to come out with a line of very low priced communications receivers. Rather than tarnish the Hallicrafters and Skyrider images they put the new sets out under the Echophone name. The sets were designed and produced in the Hallicrafters facility by Hallicrafters personnel."

Bill Halligan apparently went to some trouble to dissociate Echophone from Hallicrafters. The Echophone ads in QST listed their company address as 201 East 26th Street, Chicago, Illinois, which appears to have been the side door to the Hallicrafters plant on Indiana Avenue. The Echophone Commercial radios, EC-1, 2 and 3, did not look like Hallicrafters products from the outside. They are considerably smaller and lighter than their Hallicrafters cousins, thanks in part to their being AC/DC sets with no power transformer. Their gray crackle paint has a brownish shade. They have rectangular tuning dials in the center of the cabinet rather than the round dials at the left-hand side that the S19R, S20R, SX-24 and SX25 were sporting. They use black plastic knobs typical of the broadcast receivers of their day. And they use slide switches with plastic handles rather than the metal toggle switches of the Hallicrafters line. They also cover the 545 kc. to 30.5 mc. range in only three tuning bands, 545 to 2100 kc., 1.2 to 8.1 mc., and 7.9 to 30.5 mc. But their Hallicrafters origin must have been apparent, as Chuck Dachis reports that they "became affectionately known as 'the poor man's Hallicrafters.'"

Chuck Teeters has already described his EC-3 in Electric Radio, July 1999. It is pretty close to the SX-24 with 1 RF, 2 IF's, a crystal filter, a noise limiter, and calibrated bandspread on 80, 40, 20 and 10 meters. Chuck also includes a good story about the Echophone days as told by one of the Hallicrafters employees of the era. The EC-2, a step down from the EC-3, is comparable to the S-20R except it has only 1 IF stage instead of two and it does have calibrated ham-band bandspread.

This is the best of the two EC-1s that I restored. It was minus its top cover when I got it.

The EC-1, known originally just as the EC or "Echophone Commercial," is the subject of this tale. It is somewhat comparable to the S-19R electrically, though physically it is much smaller with its 10 3/4 x 7 1/2 x 7 1/2 inch cabinet. It evolved into the EC-1A and B in 1945, which in turn became the Hallicrafters S-41 G/W in 1946. It is the first of the Hallicrafters AC/DC sets that eventually became the famous S-38 line from 1946 through 1961.

In early 1941, World War Two was going hot and heavy in Europe. The famous Battle of Britain between the RAF and the Luftwaffe had just been won months earlier, and American manufacturers were gearing up to support the war effort. The EC-1 had been designed specifically to use parts and materials that were not on the National Defense Production Board's critical list. But the general American ham public, judging from the pages of QST, was not expecting the US to be drawn into the war. American hams had been prohibited from working any foreign stations by FCC order 72, June 4, 1940, and they would shortly be put on notice to vacate portions of 80 meters to make way for army training exercises. But there is no hint that anyone anticipated the events of December 7th that were to launch us into the thick of things.

The Echophone line first appeared in the February 1941 QST. The EC-1 was announced in a full-page ad as "The Greatest Value Ever Offered in a Communications Receiver," and its price was only $19.95, two-thirds the price of an S-19R. The next month another full-page ad featured the EC-2 and 3. The following months saw all of the EC line featured in full page ads, but in September the EC-1 appeared alone at a new price of $24.95. In October the EC-3 was advertised by itself; after

continued on next page

that the Echophone ads showed only the EC-1. By the spring of 1943 according to Chuck Teeters, parts had dried up and the EC-2 and 3 went out of production. The EC-1 continued to be advertised in QST up until October 1945, but it may not have been readily available. My EC-1 manual has a government stamp on it saying "SOLD ON PRIORITY ORDERS ONLY, AA-3 or higher priorities, $28.50 complete."

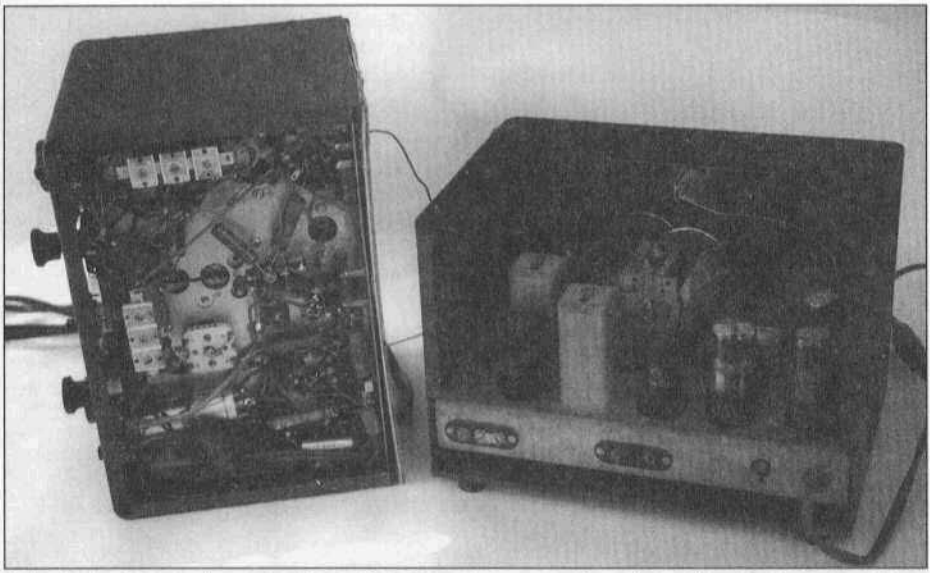
The QST ads touted the EC-1 as the radio for the service man to take along with him to keep in touch with home and the world. From February 1942 onward, Hogarth started showing up in the ads. He was what we would call a Nerd, a short guy with glasses. But because he had an EC-1, the admiral would scrub the decks for him to listen to his radio, the MP's hauled him away so that the general could listen to his radio, and girls all over the world from North Africa to the Pacific Islands "admired" him for his EC-1. Some of the ads would be decidedly politically incorrect today, but during the war I'm sure a lot of weary hams got a good laugh from them.

Although I've never owned any of the Hallicrafters AC/DC receivers, I've had a soft spot in my heart for the S-41-G ever since 1950 when my brother, Bob, and I were saving our grass cutting money to buy a used one from WRL. Fortunately, Dad bought us an HRO-50 instead and I got a very different introduction to ham radio. But all these years I've had a suppressed desire for that S-41. So when a friend at work asked if I wanted an "Echophone Commercial," I said sure. What I got was an almost fully intact EC-1. The plastic dial cover was broken away except for the black outer rim that once framed it. I was thinking of ways to simulate the original dial cover when another EC-1 showed up on e-Bay. It was in worse shape than the one I had with no top cover and speaker and no cardboard back, but it did have an original dial glass. So I decided to get it and to make one whole EC-1 from the parts of two.

Two things happened to dissuade me. The paint on the two cabinets was sufficiently different so that the top panel from the first would have been an obvious color mismatch to the cabinet of the second. And something told me that neither one of these little critters would be "happy" if it were cannibalized to fix the other - so I wound up fixing both of them. I don't know whether I've optimized their net value, but I feel better to see both of them restored and working rather than to see one of them turned into trash.

What's inside of an EC-1?

Electrically the EC-1 is a lot like it's younger, better-known S-38 cousin. It is a six tube superhet with a 12K8 local oscillator/mixer, a single 12SK7 455 kc. IF stage, a 12SQ7 detector, AVC and first audio, a 35L6 audio output, a 35Z5 half wave rectifier, and a 12J5 bfo. The 1945 EC-1A and B and S-41G/W all had the same tube lineup except the 12K8 was replaced by a less noisy 12SA7. Like the EC-2 and 3, the EC-1 covers 545 kc. to 30.5 mc. in just three bands, and it provides electrical bandspread on all ranges via a single rotor plate bandspread capacitor built into the main tuning capacitor. This same capacitor idea was used earlier on the S-19R and followed on into the S-38 series. The chassis is directly connected to one side of the AC power line, and it is isolated from the cabinet by four rubber grommet mountings that are still intact and pliable in both of my receivers. The chassis is connected to the outer cabinet through a 0.25 mFd paper capacitor, so I decided to use a polarized line cord (one lug larger than the other and connected to the ground side of the AC line) so that my chassis would always be at AC ground potential. I also installed a DPDT switch in the line cord



A look inside and under the EC-1. Headphones plug into the pin jacks and are isolated from lethal voltages by the output transformer secondary winding.

outside of the receiver and I shorted the original switch on the volume control so that there would be no possibility of the chassis being hot to ground through the low resistance, unheated filament chain when the set was off. I don't like the possibility of being tingled by a few milliamps of AC from these little guys under any circumstances. One should also be sure that the knobs are plastic and that they have well-recessed setscrews, as Hallicrafters did for the original knobs they installed on the EC series.

Mechanically there are features about the EC-1 that are down right cheap and others that are remarkably high quality. On the cheap side, the three local oscillator coils are all wound side-by-side on a single, heavy cardboard coil form, as are the three mixer coils, a design feature that carried over into the S-38. This probably saved a few pennies and quite a bit of space under that little EC-1 chassis. The bfo coil is wound on its own cardboard form, considerably thinner than the ones supporting the other coils. The back cover of the EC is solid cardboard about 1/8th inch thick, the kind used on most AC/DC broadcast sets in 1941. On the quality side, The EC-1 cabinet, including the clamshell main section, and the top and bottom plates, is made from the same heavy steel as is used in its SX-28 big brother. The tube sockets are the same molded plastic ones with their tube type numbers molded into them and painted white as are used in the SX-28. The resistors and capacitors under the chassis are the same types used in the SX-28, there are just not as many of them. As a testimony to their quality, in my two receivers I had to replace only the power supply, filter capacitors and one paper capacitor to make both of them play again. All of the other original parts are still air worthy after nearly 60 years. The two padder capacitors serving the broadcast band and mid-frequency ranges share a single, heavy ceramic frame that is solidly bolted to the underside of the chassis. And there is a compression trimmer capacitor with

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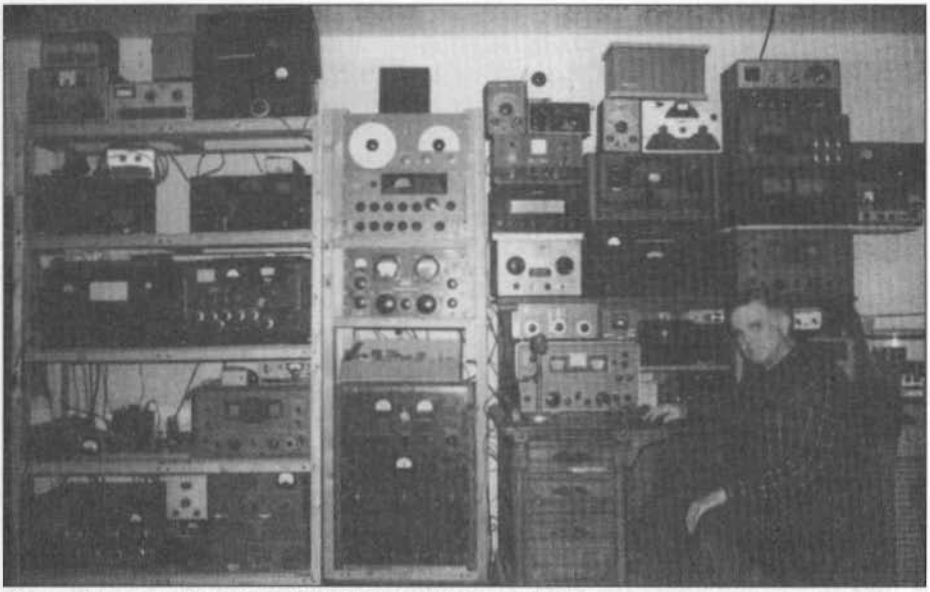

The author, Jim Hanlon, W8KGI, in his hamshack.

a solid, steel frame on the back of the chassis for adjusting the bfo frequency.

Repair work on the two was not terribly difficult considering the condition they were in when they arrived. Both needed new dial cords for the Bandspread control. Fortunately the bandspread dial pointers, a little piece of bent sheet metal that clips to the dial cord, were still there in both receivers. On the first set, when I removed the chassis from the cabinet to restring the bandspread dial cord, I didn't pay attention to the wiring that went to the slide switches on the front panel. Two of the switches broke apart when I pulled the wiring too tight! Fortunately AES has slide switches almost exactly the same size, so I drilled out the back of the rivets holding the original switches to the panel and installed the new ones right over the old rivets using a dab of epoxy to hold both switches and rivets in place. On the second set I unsoldered the wires to the switches so that I wouldn't repeat my earlier mistake.

The first receiver was the one without a dial cover. I made a replacement for it out of Plexiglas sheet, the same size and shape as on the other receiver. I painted a black frame onto the reverse side to make it a better match to the original. I mounted it with small screws in the original rivet holes. I still need to paint those screw heads black for a little better appearance. The cardboard back was falling apart in several places, so I glued it to a sheet of stiff, file-folder paper and cut out the vent slots into this new, laminated backing.

The second receiver needed a new metal top plate and speaker. I started with a piece of galvanized flashing stock from the hardware store, straightened its built-in bend over my leg, and cut it to the required shape with tin snips. I made the necessary bends with the aid of a couple of Jorgensen woodworking clamps. After looking unsuccessfully at the local surplus shop for a speaker grill, I broke down and punched and drilled a hole pattern in the top that doesn't look too bad as long as you don't look across it from the side of the receiver. I did find a 4 inch, 3.2 ohm

speaker at the shop to mount under the hole. I sprayed the new top with gray wrinkle paint from AES. Its wrinkles set up nicely under the heat of a 60 watt bulb mounted in a 9 inch aluminum reflector that I moved to several spots in turn across the surface. Its color doesn't match but does blend with the rest of the cabinet, and its texture is quite similar.

The second receiver also needed a new back cover. I couldn't locate a reasonable match to 1941 solid cardboard that I could easily cut slots into, so I just used some modern cardboard from an empty box of dog biscuits. That did not make the receiver any more of a dog than it already was. This set had another problem that showed up as I was tuning it across the broadcast band. It worked fine on the high end, but about half way down the band it stopped abruptly. The culprit was one of the tracking adjustment tabs on the local oscillator section of the tuning capacitor that was shorting to the adjacent stator plate. A very slight bend outward and things worked fine over the entire tuning range.

Both receivers aligned without trouble. Someone had tightened down all of the IF transformer capacitor screws on the first set, so it initially had several IF responses, none at 455 kc. I wound up tuning all of the capacitors to one of the responses that I could hear and then walking the signal generator up to 455 kc, readjusting the capacitors along the way. The local oscillator and mixer adjustments were simple once I figured out which capacitor went with which band. The local oscillator even had padder capacitor adjustments on the two lower bands so that I could set the calibration on both ends of those bands until it was more or less correct. My manual copy has a drawing listing which adjustments are which, but it is so tiny and has been recopied so many times that it is no longer legible. The manual also has a schematic and a list of part numbers with their values. Unfortunately the part numbers are not shown on the schematic, so it requires a certain amount of psychic power - or simple observation of the actual components - on the part of the serviceman. I wound up writing the part values onto a copy of the schematic and sending it back to Peter, the Manual Man, so that the next guy who gets an EC-1 manual from him won't have to guess.

On the air both little EC-1's work remarkably well for what they are. I listened to 40 CW on the night of the Sweepstakes and I think I heard at least half of the stations working the SS, all at the same time! They all sounded T-7 too. I'm using one of the EC-1's right now as a short wave broadcast receiver in my great room. With an antenna about 20 feet long strung up to a second floor deck it does a great job of pulling in the BBC, Holland, the Vatican and Germany just to name a few on the 6 mc band at night. It also hears the local CB good buddies on 11 meters and the early morning AM guys on 75 just fine. I think it's doing just what Bill Halligan intended for it to do when he brought it out in 1941, and that makes me feel good. It is indeed the first of "the radios that amazed the experts."

One EC-1 is fun, but two is one too many. Does anyone out there have a spare S-41 to trade for a good EC-1? Maybe I'll get my S-41 after all. ER

Editor's Note: Next month Jim will start his series on the repair and restoration of transmitters.

Radio Service in the Golden Age
1930's through the 50's

by Bruce Vaughan, NR5Q
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Episode 2

Bruce's Radio Shop

Strange thing about dreams; if and when a dream becomes a reality, it is almost sure to fall short of your expectations. I first noticed this at a very young age. After looking forward to Christmas for weeks in advance when the big night finally arrived I always had a feeling of disappointment. Please understand—it was not about presents. My parents were always poor; whatever gift I received I understood that money spent for the gift, however modest, was badly needed somewhere else. Gifts aside, my feeling of happiness and excitement was less than expected.

As I stepped from the 5:00 AM train that beautiful August morning in 1945 I had that same feeling. I had not been home for more than two years. Here at last was that wonderful moment I had been dreaming of for months. Somehow it was not what I imagined while standing guard on cold winter nights in France, working on radios in our planes, or enduring long uncomfortable hours in the air.

In retrospect, I suppose the shock of going from a Staff Sergeant in the Air Corps to a BMOC* in 16 days was more than I anticipated. On August 18, 1945 I fully expected to be in Europe until at least the spring of 1946. Then at 4:00 PM Captain Quigley called me into his office. The Captain informed me to get my gear ready for a 6:00 am take off the following morning. Less than three weeks later I was walking across the U of A campus with my arms full of books, ready to take up where I left off three years before. Yeah, sure—everything was just as it was back in 1941, or was it?

I felt out of place in civilian clothes. My fellow classmates, (the large influx of veterans did not occur until the following semester) seemed young and immature. One Professor gave me a pain in the posterior, and I assured myself a 'F' in his course, French, when I had all of the pompous gentleman I could take. I said to him during class, "If you spoke French in France the way speak it in the classroom, you couldn't order a beer." The class found my remarks amusing, the Professor did not.

It was about this time that I slowly started realizing the truth—something many other people knew all along; dreams are perfect, reality is not. What I really wanted from life was the opportunity to work at my own pace in comfortable surroundings, answer to no one, and have access to equipment and parts to build whatever piece of radio gear that interested me at the time. I realized this was a rather selfish goal, and certainly not a lofty one. What I wanted was my own business, perhaps a radio repair shop. However, I weighed my options; I was not far from graduating, and the G.I. Bill was footing my college expenses.

I knew nothing about bookkeeping or merchandising. My lack of experience was rivaled only by my lack of business

acumen. Even more discouraging was my financial situation—my bank account was now slightly less than $700.00.

My only skill seemed to be electronics, and 90 % of that knowledge was with two-way communications equipment; ham radio and aircraft radio—not the kind I would likely encounter if I opened a radio repair shop.

As I pondered my problem, I could not help but smile. "Of what value?" I asked myself, "Would experience with the radio equipment found in C-47's be to me if I opened up a radio repair shop." All our planes were equipped with SCR-274N command sets, a radio compass, a BC-375 transmitter, the famous BC-348 receiver, and a host of associated radio gear. However, my area of expertise was not so much in doing the actual repair of these units as in lugging intermittent SCR-522's back and forth between the Signal Depot and grounded C-47's parked on a remote corner of the air base.

I might mention that working on radios in the 98th Squadron, 440th Troop Carrier Group consisted mostly of changing out the entire radio. Most of the equipment was rugged and well built, though units like the BC-375 was badly outdated, even by 1940 standards. Most of our radio repair crew spent their time changing antennas on the planes, or tuning up the four mechanically tuned channels on the SCR-522. If we had a problem involving trouble- shooting, it was S.O.P. to take the radio to the Signal Depot for exchange.

One recurring problem was the trailing wire antenna on the C-47's. Located in the belly of the ship, the trailing wire antenna was controlled by a reversible motor driving a reel about six inches in diameter. The wire passed off the reel thru a metal tube in the floor of the plane. The 'fish,' a teardrop shaped lead weight, was attached to the end of the wire. I don't remember it's exact weight, but it was heavy—about 4 to 6 pounds I would guess. The problem was that radio operators often forgot to reel in the weight before landing. There was a lot of lead scattered in the fields a mile or so from each end of the runway. The trailing wire antenna was seldom used. This seemed to be the primary reason radio operators forgot to reel in the trailing wire before landing.

During briefing, Radio Operators normally received orders to maintain radio silence. Well, it doesn't take a great amount of radio knowledge or operating ability to maintain radio silence. It was common practice in our Squadron for ground personnel to trade places with a radio operator for a mission or two so they could get a glimpse of Germany and things close to the front. During the spring or 1945 we were literally flying our tails off trying to keep General Patton in fuel for his tanks. We hauled it in 5 gallon 'Jerry Cans' stacked wall to wall in the cargo area of our C-47's. It was quite a load for the twin-engine plane. The only means of getting from the door in the rear of the ship up to the radio room and cockpit was to walk on top of the 'Jerry Cans.' It was a hectic time for both those on the ground as well as aircrews as our Squadron often flew three missions a day.

I knew General Patton was up near Worms, Germany and decided I would like to see first hand what was happening at the front. You know, a nice place to visit, but not a place I wanted to remain at any longer than necessary. One afternoon things were slow in the repair shack I asked Captain Quigley, the Communications Officer, if it was OK if I grabbed a mission to Germany. I received his permission and headed for the runway where the planes were preparing for takeoff. I did not have to ask twice to find a Radio Op who was delighted to 'duck' a mission.

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I was on flying status all time I was in the ETO, and required to log at least four hours a month, so it was more or less a legitimate flight for me.

I signed the log, telling the Pilot I was a 'replacement' for the regular Op who was not feeling well. I was sure it would be a fun trip. Boy, was I ever wrong!

As we were approaching our ETA** the sky became heavily overcast. Then the rain and lightning began. It was like flying under water. The air became very rough and we lost all visual contact with the ground. Our ETA passed. Suddenly my headset came alive. "Pilot to radio, Pilot to radio," Yelled the Pilot.

"Yes Sir," I replied, "This is Radio."

"Shoot me a QDM," said the anxious voice, "and be damn quick about it. We may be over enemy territory."

Now, I could build a transmitter out of a stack of spare parts, and I could copy CW at a solid 25 WPM, but I did not have the remotest idea of how to shoot a QDM. I did know that it involved contacting two stations, getting a bearing from each, and figuring out by triangulation just where we were. At least that is how I thought it went. However, I had no idea what frequency the stations were on or how to proceed once contact was established. My stupidity could cost us a ship and four lives. I was literally numb with fear.

"Radio to Pilot," I spoke into the mike. "Sir, the static is so bad I cannot establish contact with either station."

With a resigned voice he replied, "OK, You strap on your side arms and make sure the Crew Chief has his on. We are letting down and hopefully break out of this stuff. If we are over Germany, get ready for a rough ride."

We broke through the overcast at less than 1000 feet. You cannot imagine how good we felt when we spotted a small grassy landing strip with a Squadron of P-51's parked along the perimeter.

Even though we missed our designated landing strip the Pilot decided it was time to land and unload our Jerry Cans of gasoline.

I was very nervous for the next few days thinking that there might be repercussions from the mission. Nothing about it was ever mentioned. Apparently it was not uncommon for things to go wrong on missions.

I had forgotten the incident until the day I received my discharge in Jefferson Barracks, Missouri. A WAC 2nd Lt. was typing out my discharge papers. "Well," she said, "I see where you received the Air Medal with one Oak Leaf Cluster. You must have been doing some combat flying."

"No Mam," I replied, "You have my records mixed up with someone else. I did receive a Bronze Star, but never the Air Medal."

She looked at the papers closely, checked my name and serial number. "No, there is no mistake. You have it right here on your record. Did you never do combat flying? She asked.

I thought of the times I had hitchhiked rides and thought of the day over Germany. "Well, yes, I guess you might say I was on combat missions—but if you don't mind I'd rather not talk about it."

"I understand," replied the WAC.

"Oh no you don't," I thought, "and thank God for that."

So, legal or not she typed out my discharge with an Air Medal and one OLC. One thing for sure, I'll never write the War Department and ask about it.

With confidence born of both ignorance and youth I quit college. I remember a phrase I once read, "If you don't enjoy what you are doing, you are paying too big a price." I determined to spend the rest of my life doing something that I enjoyed. I would open a radio business in my hometown.

I had a lot of luck or I might never have made a go of my new enterprise. The week I quit college, I dropped by our Chevrolet dealership where my Dad

was Shop Foreman. This was before the days of auto dealerships that covered ten acres and stocked hundreds of cars. Late Chevrolet was located on our lone main street, Emma Avenue, in downtown Springdale. The dealership had a showroom large enough to display three new cars or small trucks. The remaining stock of new cars, eight to ten in number, was parked on the unpaved dirt road alongside the corner building.

Mr. Late was sitting behind his old oak office desk in one corner of the showroom. He had his 'bad' leg propped up on the desk, and his floppy straw hat thrown on top of a bunch of papers on a corner of the littered desktop.

"Yer Dad says you up and quit school," he said. "What'cha plannin' on doing now?"

"Well, I don't really know just yet," I replied. "I'm thinking about putting in a radio repair shop. I'm a pretty fair repairman—and I can improve."

"Yep, I remember you workin' for Coy Cantrell down the street before you went off to the war. I think you could do right good if you put your head to it and got in there and worked." answered Mr. Late. "I'm gonna' make you a proposition—you can have the building next door, rent free, the building between here and the Ritz Café. All you've got to do is install radios in my new cars as they come in from the factory. There won't be many for a good many months, we only get a load now and then. When we start getting a bunch of 'em, we will work out other arrangements that will be fair to both of us."

"Let me think it over," I replied. "I'll give you my answer in a day or so. By the way, I really appreciate your offer."

The old man never answered. Without smiling, he lifted his walking stick and waved me aside.

My affirmative answer to Mr. Late was delivered the following morning. The building, once designed, as a display room for Case tractors and parts, for reasons known only to Mr. Late, had never been used. The pale green walls were freshly painted, and the concrete floor was nice and smooth. There was even a glassed in office in the rear of the showroom. Behind the showroom was a garage or workshop area ideal for doing auto radio work. I would have been hard pressed to find a more suitable building.

In 1946, by most standards, I made a very poor choice. I exchanged a college education for the life of a tradesman. After all, radio repairmen were more or less on the bottom of the social and economic ladder. We were ranked with shoe repairmen, auto mechanics, plumbers, carpenters, painters, and others who earn their living by producing and maintaining consumer products. I did not mind what others thought. I have always believed there is dignity in creating and producing useful goods and services, though the wages may be modest.

Though I did not realize it at the time, I was among the fortunate few who would witness, at very close range, the death of radio's golden age, the coming of television, and the invention of the transistor. In 1946, tape recorders, LP records, pocket radios, stereo, video recorders, and computers were only dreams in the minds of a limited number of inventors and scientists. Few today realize the social and economic changes wrought by the explosion of technology in the field of electronics. A ringside seat where one could not only observe but also participate in all this emerging technology was worth more than gold—in retrospect, a lot more. ER

*BMOC—'Big Man on Campus'
**ETA—Estimated Time of Arrival

Antenna Tuner for the SP-600 Receiver

by Harry A. Weber
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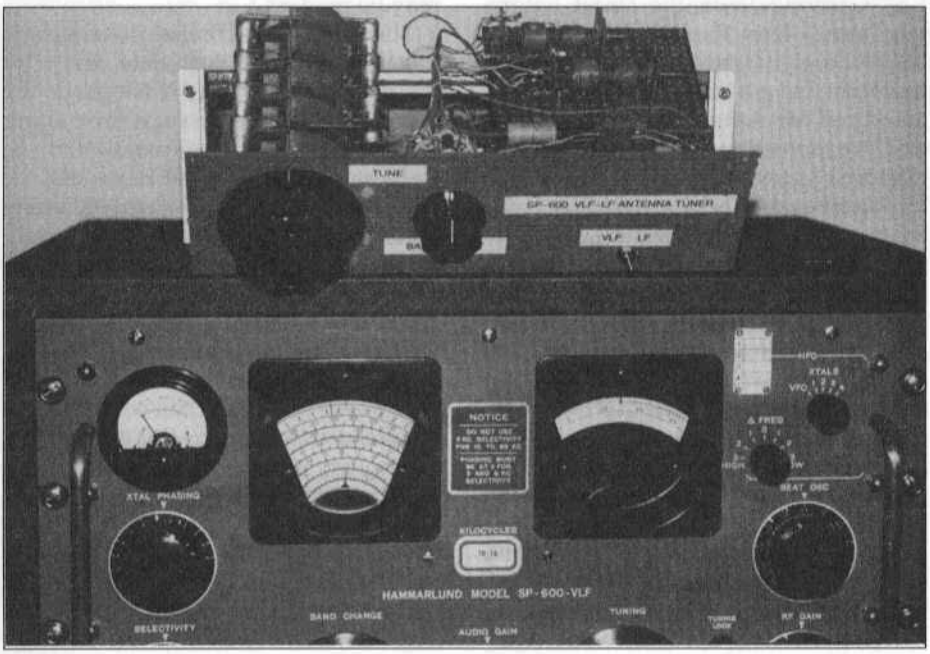
Oak Lawn, IL 60453-5252

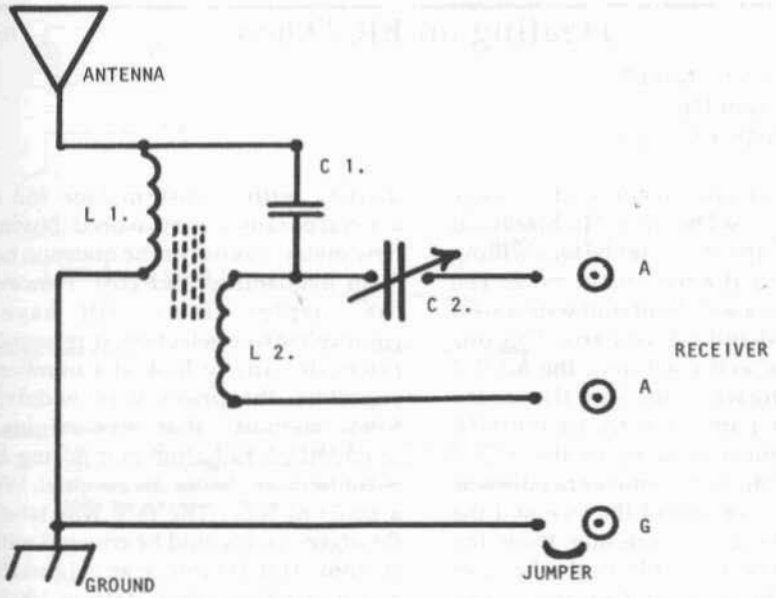
Having a problem of operating that old Hammarlund SP-600 VLF receiver to full specs, not enough room for a dipole cut to farms length? Well here is a simple and easy to construct matchbox that should ignite your VLF listening pleasure. Whether DXing such far out places like Vishakapatnam, Sadona, or the moons of Jupiter, this little wonder will tune your bedspring just like that doublewide up at Clam Lake.

Considering the well received comments from my last article, see ER # 139, on my version of a very low frequency regenerative preselector; some of our readers had a problem of securing those all elusive multilayer honeycomb coils. With this in mind I thought to simplify things by designing a passive tuner, having a minimum amount of parts, while at the same time provide for that all important impedance transformation.

Looking at the schematic the concept is quite basic, whereas L1 is the high impedance antenna input inductance element, coupled via C1 and the ferrite rod towards L2. Completing the downward transformation is L2 connected in series with the high capacity variable air condenser, and the receivers floating (ungrounded) antenna input coil. Coil structure can be of any type such as scramble wound, multilayer, or honeycomb; here the only criteria being that both must be mutu-



The tuner sitting on top of an SP-600 VLF receiver.



Component Specification List

TUNING RANGE	ANTENNA COIL L1	COUPLING CAP. C1	OUTPUT COIL L2
16-30 kHz	15.4 mH	none	41.7 mH
30-80 kHz	31.5 mH	none	31.7 mH
80-150 kHz	2.7 mH	12. nF	3.8 mH

Measurements made with a TENMA Model 72-960 LCR Meter with an operating frequency of 1.0 kHz.

Component Selection

For frequency range of 16 to 50 kHz use J.W. Miller type 6330 coil.
For frequency range of 50 -150 kHz use J.W. Miller type 6315 coil.
C1 coupling capacitor 1.0 nF.
C2 variable capacitor mult-section type 1.5 to 2.0 nF.
NOTE GROUND RECEIVER AND TUNER AT ALL TIMES !!!

ally coupled via the ferrite rod; this also establishes the low frequency set point of operation for each band. For this project I chose coils as manufactured by J.W. Miller, here horizontal oscillator and width inductors worked quite well. The variable capacitor should not be grounded, and must be operated with an insulated knob. Tuning in a range of 16 to 150 kHz with three sets of coils makes the effort of bandswitching not too difficult; although an alternate arrangement of plug-in coils can be used, just like the ones as used in the National HRO series of receivers.

When connected, one is immediately struck by its outstanding performance, looking at the signal strength meter you

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Healing an EICO 666

by Art Hogrefe, N3FEB
3140 Sheffield Dr.
State College, PA 16801

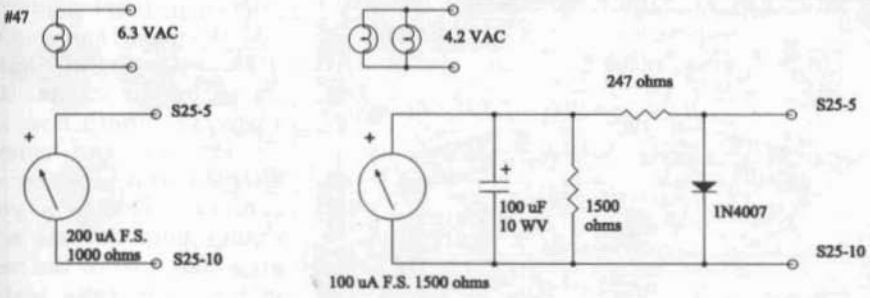
Fellow electronicker and vintage radio buff Ray Thompson in Maryland had a backup tube tester he was willing to part with at a reasonable price. The EICO 666 is a well built unit with a steel box and lid and robust parts. This one was also a well used unit, the *MERIT* lever having worn significantly into the aluminum panel, mostly in the *OFF* position but also some in the *READ* direction. Most of the meter needle was laying loose on top of the face and the return spring was missing from the *MERIT* lever, probably in the hope of stopping the wear on the panel. A less than perfect idea which may have jinxed the meter. The operating manual warns against making a merit measurement unless all short checks were satisfactory, the missing return spring was a hint that *MERIT* may have been in the *READ* position at the beginning of a test and tried to send the meter needle into the next county. It was a good project for overhaul since the meter worked and one could check tubes by looking where the little stub pointer was aimed.

Checking out the internal components revealed only a bad rectifier diode for the semiconductor test circuit. The critical resistors were wire wound and still accurate. Cleaning out a couple of spider webs, contact cleaner on all the multi switches, and a little oil on bearings made a fair improvement on the interior. The power cord was looking pretty tired but its replacement could wait for the final cleanup. A new spring was found for the *MERIT* lever.

Current meters were the heart of most classic test equipment. They become analog computers when calibrated in other than the actual microamperes. The 666 meter is 4-5/8 x 4-1/8 inches, a big display with a custom face for the several parameters measured. Buying a new meter was out of the question both from availability and cost. However, the surplus flyers still have a comprehensive selection at reasonable prices (be sure to look at a number of suppliers, the prices vary widely). I found a meter that was originally intended for radiation monitoring and was the same size as the original. What a piece of luck. The face was labeled *Roentgens* and would be covered with a custom print. It came in an original box and had a fabrication date of 1992. It was probably surplus to an equipment build or maintenance stock.

This new meter is a Simpson with a full scale rating of 100 uA. Any meter that is more sensitive than the original can be modified to the same sensitivity and probably the same impedance. In this case it was very simple, the meter resistance measured 1500 ohms and it was twice as sensitive as the original. Bridging it with a 1500 ohm resistor changes full scale to 200 uA and adding 250 ohms in series with the pair raises the circuit resistance to the 1000 ohms of the original meter. Fig. I shows the circuit for the new meter which also includes a time constant to slow down the response and a diode current limiter.

We have an advantage over the original designers, large value low voltage capacitors are available that make it easy to add a significant time constant to the metering circuit and keep the needle from picking up so much velocity it becomes self destructive. The 100 uFd with the 750 ohms of parallel resistance creates a 750 millisecond time constant if the driving circuit is a current source. This provides plenty of time to



A: Original meter wiring

B: Replacement meter wiring.

Notes: Resistors are required to obtain original sensitivity and impedance.
Capacitor limits needle velocity and damps mechanical response.
Diode limits overcurrent drive due to operator error.
Pilot lamps are inside meter and driven from filament tap as shown.
Meter face is photo reproduction of original.

Fig. 1

Replacement meter wiring for EICO 666 Tube Tester.

change your mind about the measurement. Further, the 1N4007 bypass diode limits the maximum current in the meter to roughly 300 microamperes. The capacitor also provides dynamic damping of movement from external vibrations.

The new meter has the same mounting screw positions as the original. It also had a red alarm lamp added to its backside, that was removed by carefully drilling out the mounting rivet. This was done with the meter face cover removed, I used a drill press at the lowest speed and was careful to keep chips from the movement. The new face covers up the lamp viewing and mounting holes. There are also a pair of 6 volt lamps, these are now connected to the tester's 4.2V filament winding to maximize the life of the bulbs. There is plenty of illumination. Fig. 2 is a photograph of the meter with its cover removed and the replacement face.

Most meters have plastic covers that pop off for access. The surplus unit used here is higher quality, it has a glass cover in a Bakelite bezel, two good sized screws secure it. Most meter faces are mounted to the movement with two small screws, this particular unit has four. One must be very careful working with screws near the meter motor, do not let them fall into the movement. I tilted the meter away from the movement so that the screws would fall away from the axis and wedged a bit of wax on the screwdriver tip to make them stick. Be very careful working near the movement, the magnet is quite strong and can easily jerk a steel screwdriver, usually into the coil spring which permanently wrecks the meter. So be cautious and if possible use a nonmagnetic screwdriver.

Once the mounting screws are removed the face is very gently slid away from the movement being careful not to let it touch the needle. Whew!

It's easy to reproduce an original meter face if a digital camera with macro focus or a color copier is available. The

continued next page

Figure 2 is a photograph of the meter with its cover removed and the replacement face.

resulting digital file has several advantages, a good color printer makes a fine looking face on glossy photo quality paper, you can work with a single photograph (no 36 exposure roll to use up) and erase it if the result is less than satisfactory. Lighting is the most important accessory when photographing, shoot outdoors if necessary although many of the digital cameras can match the white balance of any indoor source. Don't let any shadows fall across the old face and shoot so it nearly fills the camera frame. Also use maximum resolution for the storage medium. All this is easy for the 2 MegaPixel and up consumer cameras with macro capability. They are getting common, you can probably find a friend with appropriate equipment or a camera shop that will do the job for a couple of dollars. The camera should be positioned at the center line of the face with its back perfectly parallel to the old face. Then the illumination must be positioned so no glare reflections are present. Using a color copier is even simpler.

Once the face is captured you can scale it and modify it as desired with digital darkroom or digital art software. Photoshop LT works well and comes bundled with a number of cameras. This lets you change both the size and aspect ratio to fit the new meter. This tube tester application was easier than most, the meters were nearly identical, only the bottom of the face needed trimming to fit. I did add a couple of comments to the face and brighten the colors.

In addition to overall fit, the face scale lines should converge exactly at the axis of the meter movement. The Fig. 2 closeup of the refaced meter shows I didn't quite get there, the *Inter-element Leakage* scale doesn't quite line up with the *Percent Dynamic Conductance* scale. Next time!

3M Photo Mount Spray Adhesive is a good choice for attaching the new face. Follow the directions carefully. I used a couple of sheets of wax paper to keep the over-spray off of things and another one between the face and mount as it was aligned. Once attached, roll the face to insure no bubbles remain. Then let it cure over night to keep from introducing organics into the meter motor movement. If one goofs and needs to clean up adhesive or remove the new face, naphtha (lighter fluid) works well. The result looks original and of high quality.

It's nice to add one's initials and the date of replacement to the new face as well as the manufacturer and sensitivity. This gives future owners a fighting chance even if they have no schematic.

The last photo Fig. 3 shows the completed test set, nice for an old and well used piece of gear. EICO didn't skimp on the mechanicals, the

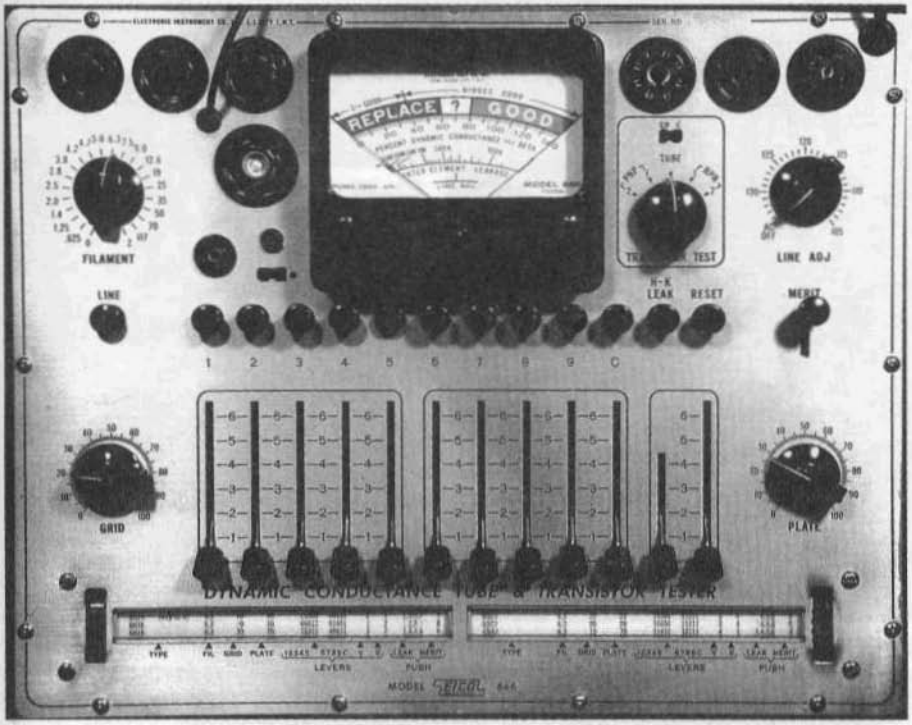


Figure 3 shows the completed test set, nice for an old and well used piece of gear.

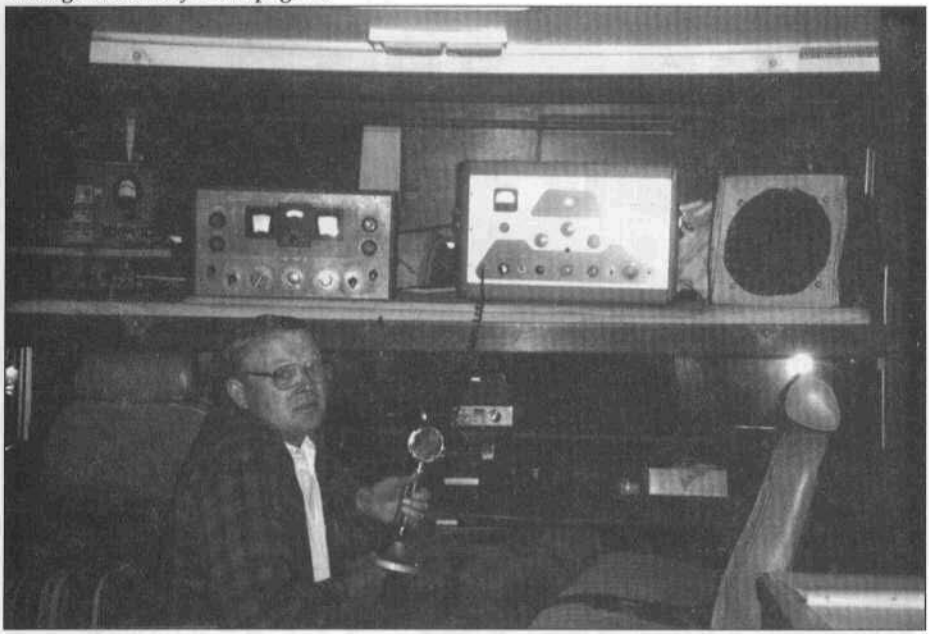
engraving is all good, switches and pots working. The metal case is painted with grey crackle enamel and I did the usual cleanup with a couple of rubs using turpentine followed by a light wipe with an oiled rag.

Computer drafting programs provide another option, a meter face can be exactly tailored to a given unit. I used Auto Cad LT to draw a custom face for a HeathKit Q meter when calibration showed the original scale didn't quite track. That and the addition of an oscillator frequency monitor BNC has at least halved the error uncertainty for that unit.

These old test sets are a lot of fun and provide good insight on the older design techniques and fabrication methods as well as supporting AM operations. A classic radio enthusiast should probably acquire a Digital Multimeter and Solid State Frequency Counter, the improved accuracy vs cost is too great to ignore. Most calibrations and repair measurements can use classic test sets, for tubes checks there is little alternative. The 666 overhaul shows an originally decent design can be restored and brought back to working condition for a few dollars and a bit of patience.

As always, be a little suspicious when checking tubes. No verification of capacitance and high frequency operation is possible and when nothing else corrects a problem be sure to substitute a new tube prior to pitching the gear in the river or selling it cheap. Once everything is back to normal there should be at least a couple of warm glows in the house. ER

Vintage Field Day from page 13



John Movius, WA6JUS, operated VFD from his Winnebago motorhome.

Herb Hildebrand, K9GTB with friend K9MDQ operating a set of Drake Twins. Herb says that next year he'll have his Valiant up and running for VFD which he thinks will be much better than the Drake gear.

Tom Anderson, K5HPF operated 2M only during VFD this year using a Gonset Communicator II which was solar powered. His most interesting contact was with KB5AK who came back to his CQ from his 2M AM mobile.

A snapshot of VFD N6CSW station while I was in the process of packing up Sunday afternoon.

Antenna Tuner from page 35

begin to wonder where the preamplifier is. Although intended for use with the Hammarlund SP-600 very low frequency receiver; this antenna tuner can be used on such newer receivers such as the Harris R-2368B version, or the Rohde & Schwarz Model EK 896 series of wideband receivers.

The accompanying table of coil values and capacitor levels are to be used as a guide in establishing your set point of operation. Due to variation in antenna design, or other receiver input characteristics, a certain level of experimentation is needed in order to fulfill ones objective. ER

You Can Go Back from page 14

ham radio. I brought photos and lots of war stories about the old rigs and my current boat anchors. We talked about what hams did then and now - hamfests, field day, rag chewing, DXing, etc. Not much of a difference! They were very interested in what rigs we had, how the old gear really worked, how we scrounged and converted surplus and, of course, how things were then. Sitting in the corner of today's clubroom was an NC-270 and a Heathkit Apache that had been donated by the family of a silent key. It is not part of their operating station. Which brings me to why I am telling you all this.

If you were a member of a high school radio club and you can arrange a visit - do it! Or, consider finding and visiting you local high school radio club. The students are still the same as we were - curious and energetic and they are interested in learning about their club and ham radio in the "good old days." It is a chance to introduce them to the joys of boat anchors, a facet of our hobby they may have not experienced. Consider donating a boat anchor, before you are a silent key, along with your assistance. They will find the same fun we do and you will get the satisfaction of helping young hams more fully enjoy our hobby. ER

Review from page 18

information not previously revealed in company catalogs or other previously unearthed documents. The real value of any data lies in the subtle details and the details in these photos speak volumes about how the company worked, what is was thinking, and where it was going. This CD is unquestionably the single most comprehensive archive of Heath photos and documents ever assembled—or ever likely to be assembled, as these documents may well represent literally all that remains—the entire volume of surviving works outside of the catalogs and manuals.

This is a first rate effort from start to finish. The vast majority of the JPG images are very clear and sharp (as one might expect since the source documents are originals, not copies) and Perdue has done a superb job in scanning them. For images containing very small text it is possible (with the correct viewer) to zoom in for a better look.

Perdue's CD is a welcome and important addition to the growing archive of CDs on which the rich history of electronics in general, and ham radio in particular, is being protected from oblivion.

Terry Perdue has just saved a huge chunk of the 20th century. What are the rest of you waiting for? Fire up that scanner now! ER

Ed. Chuck Penson, WA7ZZE, is an industrial archeologist, free-lance writer, and a recognized authority on the Heath Company and its products. He is the author of the book "Heathkit A Guide to the Amateur Radio Products" that was published by Electric Radio.

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

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

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

FOR SALE: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig. - $17.50 ppd. Bruce Kryder, W9LWW, 336 Sliders Knob Ave., Franklin, TN 37067

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

FOR SALE: Hammarlund HQ100 - $100; Heath SB-110 w/ps in spkr - $300. Bob Blaney, W9FRU, 127 Westlawn Dr., Decatur, IN 46733. (219) 724-4575

FOR SALE: Signal Corps rack FT-244A type 500GA equip; gold mine of beautiful parts & tubes - $30 + shpg. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405.

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

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

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

FOR TRADE: Have Collins 51J-3 rcvr, great shape, want WW II PPN-1 set. Steve Bartkowski, 4923 W. 28 St., Cicero, IL 60804. (708) 863-3090

FOR SALE: New Andrew 1-1/4" 110', 2 connector N; also Rohn parts, 74' 7/8 used. Dave, WØBEI, (800) 500-8055

FOR SALE: 6 & 12 volt 7/9-pin tubes, tested good - 25¢ ea. or 5/$1. Len Gardner, 458 Two Mile Creek Rd., Tanawanda, NY 14150. radiolen@aol.com

FOR SALE: Collins 30K4, KWS1; 75A4. Bruce Manser, N9KGR, WI, (920) 693-3247

FOR SALE: War surplus headphones w/foam ear protectors - $10 ea + $4 shpg. James Fred, 5355S 275W, Cutler, IN 46920.

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

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

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

FOR SALE: 2001 COLLINS CALENDAR now shipping. 15-months, all color! $14.95 postpaid USA and Canada. Trinity Graphics, 5402 1/2 Morningside, Dallas, TX 75206. www.kk5im.com

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

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

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

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

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

FOR SALE: Rider manuals; military whip antennas; 24V dynamotors; all NOS. Bruce Beckeney, 5472 Timberway Dr., Presque Isle, MI 49777. (989) 595-6483

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

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

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

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

FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W90JI / N4PZ, IL, (815) 734-4255 or N4PZ@aol.com

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FOR SALE/TRADE: R390A. Interested in HQ170 AC; SX101A (the one w/spinner knob); or NC303. Sam, k4ndy@alltel.net.

FOR SALE: Tempo 2020 & parts unit, needs work - $175; Viking II, (2) 122 VFO, needs work - $200. U shp. W7RBF, AZ, (602) 864-9987.

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

WANTED: Millen 90280 or 90281 exciter in working order. Ronnie Hull, W5SUM, 1855 Shady Lane Dr., Shreveport, LA 71118. (318) 688-1389, w5sum@glowbugs.com

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

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

WANTED: 75AA-4 4-1 knob & assembly. Bob, AK, (907) 455-4559

WANTED: EICO 722 VFO. Must be in top condition. Will pay premium for high quality. R. Lucas, K4JEJ, (561) 626-0136, k4jej@adelphia.net

WANTED: Good case Hallicrafters SX-25, Good meter for SX 24 or 25. Stewart-Warner chassis 01-6A? John Phillips, 3645 Old Uniontown Rd., Van Buren, AR 72956, johnph36@juno.com

WANTED: WW-2 Japanese military radio and radar. Yokohama WW-2 Japanese Military Radio Museum, Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama 246 Japan. Fax 011-8145-301-8069, takadoi@carrot.ocn.ne.jp

WANTED: Information on CIR (Swan) Astro 200 series of transceivers and accessories. KA4GAV, (360) 825-1167, Turini@hamanuals.com

WANTED: RBM rcvr pwr sply and cable, orig. condx; PRC-66 nicad battery and antenna. Steve K7MBK, (480) 962-0220, milspec22@aol.com

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FOR SALE: Moving sale: Ecophone EC-1A commercial, good, works - $59; Bretting Model 14 (famous mirror dial set) 5 slide-rule bands, works, nice - $495; orig Super Wasp 2 foot black print of layout/schematic - $50 ppd; Radio Shack TR-800 8 track player/recorder, good w/42 tape cassets - $295; Collins 32RS1 rack pwr sply for 125 watt rig - $; Galaxy HD pwr sply for 200 watt rig w/choke & instr - $75; pwr amp stiffener 25 uf@4kv - $15; VTC CVM-2 multi-match modulaton xfmr HD commercial 60 watts - $50; National MB-40SL multi-band tuner for exciters - $18; parting out 520, 520R chassis - ask; National MB-29 TRF broadcast tuner - $125; Tecktronix 1A1 dual trace plug-in - $28; nice RAK-7 VLF rcvr/ps, PU only - $175. **WANTED:** Old &/or lge hand keys. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (781) 934-5043

FOR SALE: Send SASE for large list of excess parts, publications, ham & test gear. K4AFW, 104 Glenwood Dr., Williamsburg, VA 23185

FOR SALE: UTC type CG-1S modulation reactor. DC coil resistance 40 ohms, 40 lbs, 5"x6"x10". John, WA6JUS, CA, (858) 565-0613

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

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

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

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

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

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

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

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

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

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

WANTED: Radio CB614C-2; ps 416 W-1 for Collins 618S-1. Orecchia Gianluigi, IW1PHD, Corso Galliera 14/26, 16142 Genova, Italy

WANTED: National AR2, AR5, XR50, XR60, XR70 coil forms. K1MBI, 21 Freestone Ave., Portland, CT 06480

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

WANTED: Any info on the Eldico company and the Eldico S5B Twins for future article. Joel Thurtell, finder@radiofinder.com

WANTED: 1930s Army Navy control boxes, pwr splies, dynamotors - any wierd types. William Donzelli, 15 MacArthur Dr., Carmel, NY, 10512. (845) 225-2547, aw288@osfn.org

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

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

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

WANTED: Manuals, signal generators: General Radio 1021A, 50-250 MC, 250-900 MC. HP Glideslope 232A, Boontown 202M. Allan Lurie, W9KCB, 605 E. Armstrong, Peoria, IL 61603. (309) 682-1674

WANTED: WW II Military Television

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

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

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

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

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

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

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

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

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

FOR SALE: Meissner Sig Shifter 9-1090 - $30; TBX8 xcvr w/accr'y box, see ER May 1993 issue - $100. Prefer local area PU or make arrangements. Lawrence Gross, 11040 70th St S, Cottage Grove, MN 55016. (651) 459-3233

FOR SALE: Crystal calibrator model 111B by Measurements Corp - $25; Heath capaci-tester model CT-1 - $10 + shpg. J. Micsak, 1549 Shoecraft Rd., Penfield, NY 14526. jandjm130@juno.com

FOR SALE: HT-9 tuning coils - $25; tank coils - $50. **WANTED:** Yaesu FL2100B; Drake L-4 pwr sply. Bob Braza, W1RMB, MA, (508) 261-8231

FOR SALE: Hallicrafters SX43, S40B, SX140, S108; Collins 75S1, 75A4, 30L1; Heathkit SB303, SB100. John Thuren, AA5T, (281) 530-6130, jbthuren@hal-pc.org

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

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

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

FOR SALE: I am making aluminum plate and grid connectors for T series tubes. If interested contact Alan Price at fixr752r6@cs.com

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

FOR SALE/TRADE: Numerous EICO, Conar, B&K, Knight, Heath, RCA, Paco, Superior, Precision test equipment manuals. Bernard, NI4Q, FL, (407) 351-5536, ni4q@juno.com

FOR SALE: (2) RCA military rcvrs: (1) RBB-1, 840 kHz to 4 MHz, works OK on all bands; (1) RBC-1, bandswitch is broken, is on the 6.450-10.300 MHz band, also selectivity SW is bad & wired to the medium POS, rcvr still works fine, comes w/ps that works both rcvrs & cables - $450 all; have the RB VLF rcvr w/ps 17 kHz to 600 kHz, works OK - $275; (1) R-375, same as R-390 but has tuned selectivity not mec filters, works OK, meters OK - $350. These radios are very heavy, would prefer PU but could drive 150 miles to meet with you. National NCX-500 xcvr w/ps, works OK - $150 + shpg; Abbott MO TR-4 ultra SW TX-RX, untested, looks good inside & out - $60 + shpg. Randy Cunningham, K4RHH, 411 Woodhaven Dr., Lynchburg, VA 24502. (434) 239-6127, kevinc@nesbeconline.com

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

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

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

WANTED: Stancor 10P schematic &/or manual. George Marts, W9TDH, 5022 Pennsylvania, St Louis, MO 63111. (314) 353-7669

WANTED: Orig Heath manuals for ham & test equip. Please state condx & price. Warren, K1BOX, POB 1051, Spruce Pine, NC 28777. (828) 688-1922

WANTED: Lysco 600S. Jeff Bray, W1GRS, POB 2031, Cupertino, CA 95015, w1grs@arrl.net

WANTED: Amplifier AM3007 for T-827F, R-1051B AN/WRC-1 Set. Don, WA2ELD, KY, (859) 254 1886, wa2eld@myexcel.com

WANTED: Hammarlund crystal holder/switch for HQ180(X). Ed, N5BFW, (817) 222-5355, ecuevas@juno.com

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

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

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

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

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

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

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

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

WANTED: Info on the history & developement of the BC-342 rcvr & conversion articles. Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612

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

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. 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: RCA 140, 141, AVR5A. GE K80, K80X, K85. Any condx. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. treherne@erols.com

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

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

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

WANTED: Clean Mackay 3010C & Kenwood R599D w/all filters & manual. Ric, C6ANL POB N4106, Nassau NP, Bahamas.

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

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

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

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

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

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

WANTED: Top perforated shield and covers for terminals on rear of Collins 32V3 xmtr. Carl Monin, W4WML, 206 Greenfield Ave., Tullahoma, TN 37388. (931) 455-0351

CDs From the ER Bookstore

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

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

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

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

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

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

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug-in coils) for restoration & ER articles. Ken Lakin, KD6B, 63140 Britta St., Ste. C106, Bend, OR 97701. (541) 923-1013. klakin@aol.com

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

WANTED: Tube tester, military TV2/A types, consider Hickok models, military or commercial. eojohnsonww2@home.com, (509) 838-2161

WANTED: Knob and friction drive for the Heath SB series dial calibration. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688. k9vky@stargate.net

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

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

WANTED: WW II military remote control rcvrs #ARW/CRW, xmtrs, dynamotors PE186 PE126, joy sticks, Gyroscopes for the GB, Azon glide bombs. Maurice Schechter, NY, (516) 294-4416 or mauricsch@cs.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: QSL cards from old/pre WW II Ham DX countries; old regen kits. Hajime Suzuki, Nishikuniyoshi 1644-24, Ichihara-Shi, Chiba-Ken, 290-0231 Japan

WANTED: Hallicrafters SX-23 parts radio, any condition. Buy and or trade. Robert Hall, FL, rboyceh@gte.net

WANTED: Tube and chimney holding clips for 4-1000A. Andy Howard, WA4KCY, 133 Cartbody Rd., Carrollton, GA 30116. (770) 832-0202, andy@wa4kcy.com

WANTED: Abbott TR 3 or TR 4 or Meisner 21/2 meter tranciever. Rich Wurtzinger, 1140 S. Taylor Ave., Oak Park, IL 60304. (708) 383 4579 richwurtz@juno.com

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