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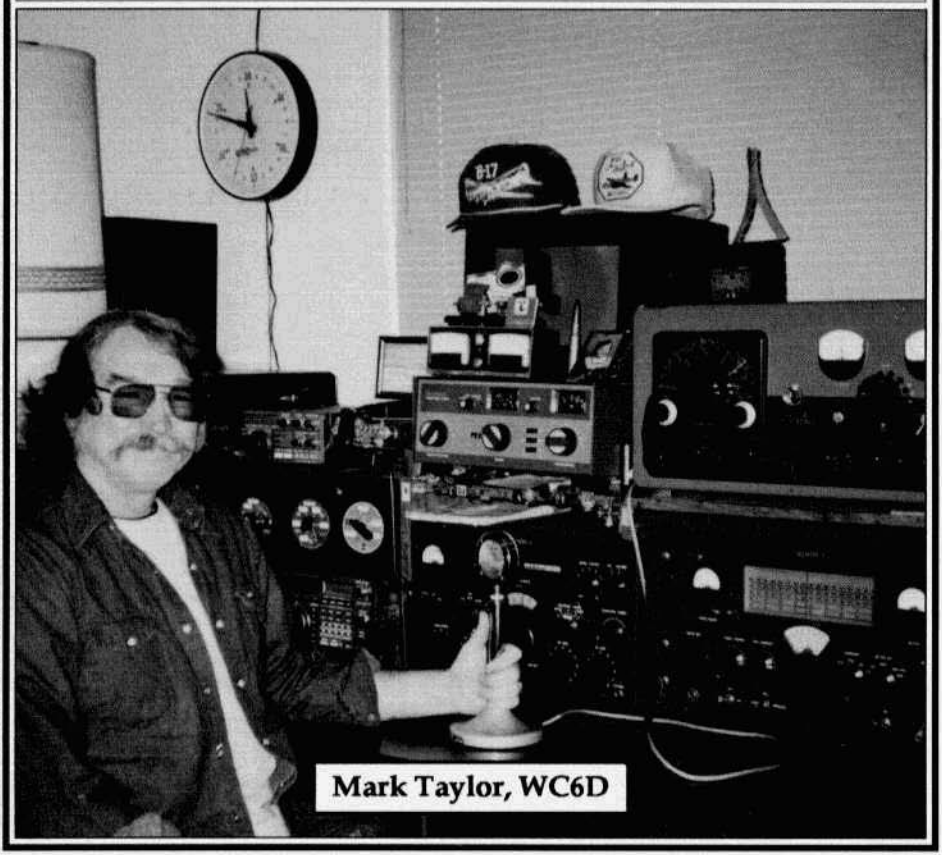
ELECTRIC RADIO

celebrating a bygone era

Number 77 September 1995



Mark Taylor, WC6D

ELECTRIC RADIO

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

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

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

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

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

Regular contributors include:

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

EDITOR'S COMMENTS

Good news: The response to last month's pitch for our first book publishing venture, Heath etc., has been beyond our expectations. There seems to be considerable interest among the ER readership in the Heath Company and their amateur products. We've decided to extend our prepublication offer - $23 postage paid - until October 15, which is a $5 saving. In this issue - on page 29 - Chuck Penson, WA7ZZE, tells us how he came to write the Heath book; it's an interesting story.

Lately we've been getting a lot of complaints regarding the Parts Unit Directory. The problem is that people put units on the list, then part them out entirely or sell them and fail to notify us so we can remove them from the list. It's very irritating to make expensive long distance calls only to find that the parts unit is no longer available. Please contact us if you have put a unit on the list that is no longer available. If this problem persists the Parts Unit Directory may cease to exist.

Les Lester, K6HQI, who along with Doug, VE4BX and Bill, W8VYZ, started the nightly 14.286 AM net has become a Silent Key - see our farewell to him on page 3. I think it's important that I remind everyone that without Les - who has led this net for some 20 odd years - there is a chance that the net will flounder and we sure don't want this to happen. Try to get on 14.286 as much as possible. The net starts at 5 PM Pacific, nightly.

The fall season is definitely here. Now is the time to build and refurbish antennas. After we get this issue to the printer Shirley and I are going to spend a couple of days away from the computers working on my antennas. There's a couple of antennas I can get higher and longer and there's a few more radials I want to add to my inverted L; maybe even a V-beam for 20. CU on the air. **N6CSW**

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Cover: Mark Taylor, WC6D. He is a long-time AM'er operating from Modesto, California. *Photo courtesy of K7POF.*

LETTERS

Dear ER

Sure do enjoy your magazine. In fact, you have gotten me on the air again. Just got my General 2 weeks ago, had my first contact in 33 years with KO6DT using my TCS-12 transmitter and SP-600 receiver. I've been collecting gear all that time, but let my novice expire in college and just never got around to getting the ticket.

I had forgotten the magic we get to participate in as radio operators. The thrill of hunting through the band for someone sending CQ and trying to get the rig tuned up and a response sent before another station gets there first. The magic of communication with someone a thousand miles away with half the power of a small light bulb, and that signal being sent out in all directions. Relearning the art of tuning the receiver to block other signals only 100 Hz away, compensating for the fading of the signal - just plain fun!

I guess I would have to add that if I can get the code back together (sort of) then anyone can do it. The result is worth the effort. Thanks for the inspiration of your magazine, keep up the good work.

Ron Hankins, KBØTME

Dear ER

Many pleasant evenings spent perusing the pages of Electric Radio finally inspired me to go forth and acquire my very own classic "glow in the dark" station. The first available swapmeet after this decision happened to be the Indianapolis Hamfest, held July 8/9 at the County (not State) Fairgrounds.

A friend and I arrived at the site about 10 AM on the second day, kind of late, I thought, for real bargains. The comments I had read about other recent hamfests had led me to believe that classic gear was scarce, but not here! Immediately I found and snapped up copies of the RCA transmitting and receiving tube manuals, then a couple dozen used tubes for a few bucks. There were at least four spaces offering large quantities of boxed tubes, $3 on average for miniatures.

I thought there was a really fine selection of classic radios, both commercial and military stuff. Maybe they just "popped out" at me, since before I had been editing out the boatanchors when scanning at swapmeets, and now I was actively looking for them. I ran out of room on my ticket stub writing down the models: HQ-160, Sky Champ S-20R ($50),S-38C ($30), Harvey Wells Bandmaster Sr, Gonset, ARC-2, ART-13, and many others. Prices varied a lot, but there were some bargains out there in the hot sun as the day progressed.

I ended up coming home with a 1947 HRO-7 with A-F coils and box, speaker, and doghouse supply for $120. It came out of an estate sale and was scratched up and covered with dirt, so I might have spent too much. But at home, after a cleanup, safety checks and a replacement line cord, I set coil D for bandspread, plugged it in to the front panel, turned on the power (good, no smoke), spun the smooth National dial to "383" for 3.885 MHz, touched the antenna terminal with a finger, and heard the AM voice of K4KYV blasting out of my speaker from Woodlawn, Tenn. Not bad for a beat-up 47 year old receiver --- that's 9 years older than me!

I was also looking for an (I can't believe I'm writting this) AM transmitter to get me back on low band. I finally decided on a very clean Heath/Daystrom DX-60 for $35. Now I need to get crystals for the AM windows, or find the VFO.

My friend was disappointed that he got to be my "helper" lugging my purchases back to the van. He may stay away, but I plan to be back in Indy next summer!

Kevin VanZuilen, KC9TZ

Vestal "Les" Lester, K6HQI, Silent Key

"Les was a fine gentleman", Sam, W6HDU.

"We'll sure miss that dominant voice on 14.286", Joe, KC4CFE.

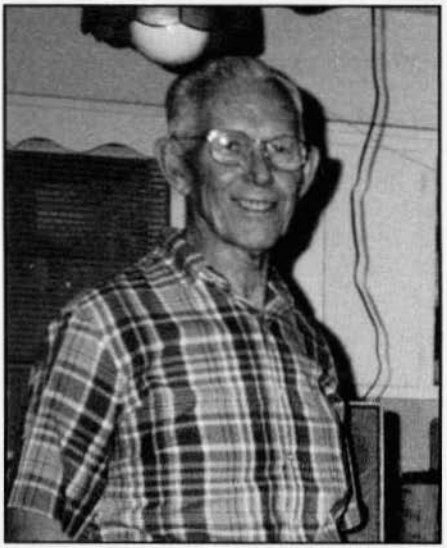
And from Dale, KW1I: "Les embodied the finest qualities of the pioneer hams. He was a leader, he designed and built his own equipment and he had a tremendous sounding signal. His great personality, his operating style and consistency over the years made him a landmark on 20 meters."

I called Doug, VE4BX up in Hamiota, Manitoba. "Les was a mighty fine guy. I talked to him regularly - almost every day except Sundays - for about 28 years. I remember that I ran into him and Ashtabula Bill, W8VYZ on 20 meters when I was tuning around one night. At that time I was about to quit ham radio altogether because sideband had taken over almost completely and I didn't want to operate SSB. Anyway, Les and I stayed on 20 and Bill started operating mostly on 40.

"Les and I became great friends. If I were off the air for more than a day or two he'd always call me up to make sure I was okay. He sent me a lot of parts and stuff over the years and would never let me pay him for it. He said, "Hams don't operate that way. "

Before I signed with Doug, his wife Viva came on the line and said that Les was Doug's very best friend and that although they had met only once (when Les and his wife Melba travelled up there about 13 years ago) they were very very close.

All of us who knew Les were shocked when we learned that he had passed away. I had talked to him on the landline - inquiring about his absence on 14.286 - about 2 weeks before he died. Everything was just going great for him. He seemed to be adjusting well to the death of his wife Melba a few months earlier



This photo of Les was taken by Joe, KC4CFE, during Les's last trip to Florida earlier this summer.

and he was moving ahead with his life. The only problem he had was with his transmitter; he couldn't get drive to the finals. He said that he was "temporarily stumped" but he would be back on the air in a day or two. I relayed that information to everyone on 14.286 and we were all anticipating his return.

On 20 meters Les was our leader. He was NET CONTROL. He was ALWAYS there. And he always had a BIG signal with his completely HB station; even his beam was HB. His transmitter, which ran 833A's modulated by 833A's, had a wonderful clear, crisp sound to it.

We were all very fond of Les. He was just the kind of man you'd want to talk to and spend time with. He was always upbeat and positive and an encouragement to everyone.

One of the things Les did to help us all sound better was to record some of our transmission and play it back to us. He also had an 'audio meter' and he

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The Central Electronics 600L
Technology Ahead Of Its Time

by Joseph J. Curry, KE6LFT (ex-K3ICO)
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As a young ham in the early '60s, I had a ringside seat at the battle of the decade: AM vs. SSB. As this battle for the airwaves raged, my student status relegated me to being a relative non-combatant. SSB gear was still very expensive and somewhat difficult to construct and tune without the proper test equipment. My budget pretty well left AM as the only viable mode for me... and homebrew AM at that. Perhaps that is why, even today, I still have a preference for Ancient Modulation. Yet, even then, when the new catalogs or the latest issue of one of the ham mags would appear, I would find myself mesmerized by the more exotic sideband equipment, particularly that manufactured by Collins or Central Electronics. To my mind, these were the "Cadillacs" of ham gear. While Collins equipment was clearly exotic (translation: expensive) and well advertised, Central Electronics gear seemed to me to be the true engineer's equipment. No-tune finals, all-mode operation (a la 1961), a built-in oscilloscope....these were the things of which dreams are made. The two pieces of equipment I remember most are the 200V transmitter and the 600L linear amplifier. These dreams however could only be had for $800 for a 200V and $500 for a 600L and therefore were beyond the grasp of most hams at the time and this one in particular. But as with most things, dreams are the basis for future sales and CE sure inspired a good many hams with their ads.

I dropped out of ham radio in the late '60s for all the usual reasons: school, marriage, family and career. The seventies and eighties passed without much thought on my part to ham radio. With the '90s came more time and one day I spotted a CQ on a newsstand and picked it up. The long and short of it was that I was hooked again. I spent a lot of time listening again to 75 and 40 meters. What really got me going though was that there seemed to be a good deal of interest (thanks to *Electric Radio*) in the restoration and preservation of vintage equipment for CW, AM and SSB. This was clearly for me; these were the dream toys of my youth. As an inveterate tinkerer and an old homebrewer, it just seemed to be a natural.

I had almost forgotten about Central Electronics until one day I ran across a posting on CompuServe offering for sale a CE600L in good condition. It met all of my requirements: 160-10 meter coverage, a no-tune final, 300-400 watts output, operated from a 117 volt line, and, best of all, it was made by CE. It looked as if dreams could come true and so, without further ado, I contacted the seller and bought the amplifier. How could I pass it by?

When UPS finally delivered the amplifier to me, the first impression I had was that this rig certainly had some serious iron in it. Weighing in at 110 pounds, this was truly equipment to be reckoned with. This amp was built like a battleship and everything worked. Considering that this amp had been made in 1956 (S/N 56313) made it seem all the more miraculous. The fellow from whom I had purchased the amp told me that it had been regularly used into the early 1980s. After a thorough cleaning and a repaint of the external cabinet, it looked as good as new and worked perfectly to specification. I was a tad

The CE 600L broadbanded linear.

disappointed; the cleaning was done and there was nothing to tinker with. Secondly, before it did arrive, I must admit that I was already considering an article in *ER* on its restoration. However, once it arrived and I got into the inner workings, it was clear that most of the restoration required was more like cleaning than anything else. I certainly didn't feel like writing an article about the great cleaning job I did. My disappointment however was short lived as I studied the schematic and read through the rather terse instructions. There was a good deal of engineering in this amp that was way ahead of its time in 1956. And how did those magic, no-tune couplers work anyhow? And why did this technology seem to die with Central Electronics? Now here were the makings of an ER article.

As I had mentioned earlier, as a young ham I had been fascinated by the engineering of CE equipment, and that was from reading their ads. It was even more impressive in the flesh. When you remove the outer cabinet, the first thing that hits you (hopefully only figuratively) is the power supply. As you can see from the internal photograph, the plate transformer, filter choke, and filter capacitor account for most of the internal volume (and mass as well). The plate power supply features step-start and is a brute force, full-wave, choke-input design originally using 816 mercury vapor tubes. My unit had been previously converted to a pair of 1N2637 solid state, plug-in devices. It seems that one of the previous owners had fried the bias-filament transformer (located on the underside of the chassis). This had been replaced with a Peter Dahl unit minus the rectifier filament winding necessitating the use of the solid state devices. The plate transformer is massive and looks as if it could run key down all day with a 600 watt load. The really impressive piece of iron is the swinging choke. It is a 65/5 Henry choke (that's right, 65 Henries) and is rated at 350 mA. This, too, looks

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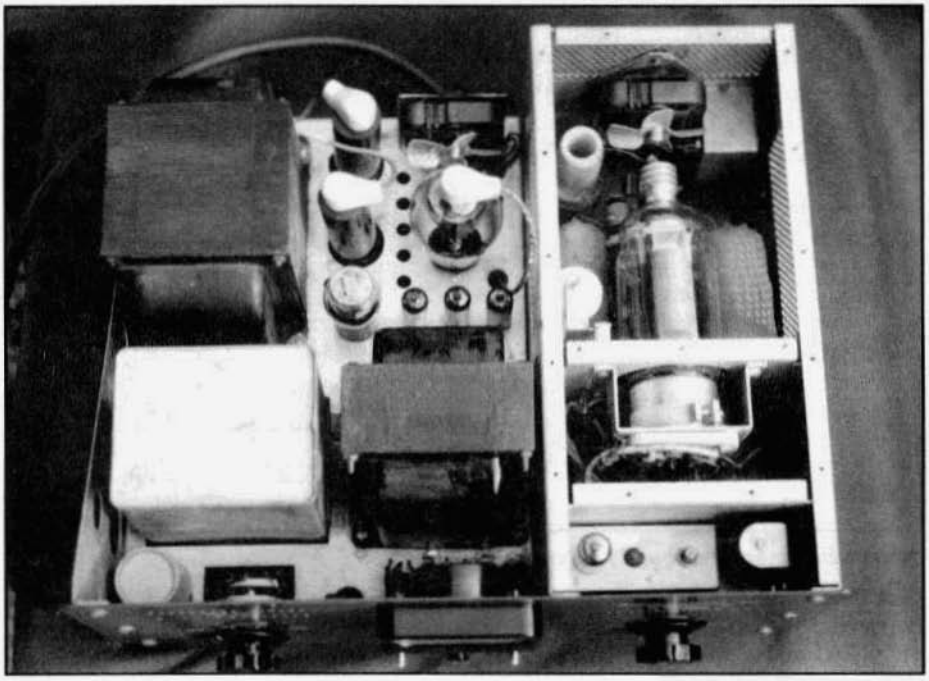
600L from previous page
as if it could run this all day long without breaking into a sweat. Legend has it (as related by Dennis, KØEOO) that Joe Batchelor, the father of most of the CE designs, had to "teach" the choke manufacturer how to build this monster. I hate to think what it would cost to have it rewound today. The filter capacitor is also a work of art. It is a 45 microfarad, oil and paper design that is also virtually irreplaceable. The plate supply runs at a stiff 1800 volts, made all the stiffer by all those joules stored in that big filter cap.

The 813 final amplifier is run in the AB2 mode, so a well regulated screen voltage is essential. This was accomplished by an early use of a circuit that was destined to become a standard for homebrew amplifiers. The regulator consists of an 812A triode whose grid to cathode voltage is supplied by a 6AQ5. The 6AQ5 regulator has its screen voltage set by 2 - OA2s at 300 volts. The control grid voltage of the 6AQ5 is adjustable with a potentiometer connected between the 812A filament center tap and ground. This puts the 812A in series between the plate supply and the screen of the 813 final amplifier. Varying the potentiometer adjusts the grid voltage of the 812A and provides a stiff 500-680 volt supply for the screen of the 813.

The 813 is run as a grid driven amplifier and therefore requires very little drive (on the order of 10-12 watts). This necessities the use of a -10 dB pad in order to use most "modern" exciters (1). CE recommends that the input not see more than 20 watts rms. Supplying 10-12 watts PEP (depending on band chosen) will drive the amp to maximum power (600 watts PEP input). CE claimed an efficiency of 60-65% which I can just make on 160-80-40-20 meters. Output is a little lower on 15 and 10. The 813 is a very economical tube to both run and replace. There are still a ton of US-made, surplus JAN 813s out there.

The most novel feature of the 600L (and the 100V/200V for that matter) is the no-tune feature. You merely select the band desired and, bingo, you're ready to go. The key to this no-tune feature is the use of the 'magic' couplers, two for each band (one on the grid input and the other in the plate circuit). What are these things? You can see the couplers in the internal photograph clustered around the bandswitch (just to the right of the 813). As I tried to research these little jewels, strangely enough there was little in the literature about them. QST never reviewed the 600L (although they did review the 200V)(2). The article mentions the couplers almost in passing, but it did give a US Patent Citation (US #2,864,060). I also checked out KØEOO's excellent article on the 100V which appeared in ER(3). This article provided some good insights into Joe Batchelor's designs. When I looked up the patent, sure enough it was issued to Batchelor in December 1958, having been filed in August 1955. For someone such as myself who has spent a good portion of his adult life in high technology and the patents that go along with it, this patent was both an interesting and enjoyable read. Batchelor's goal was to provide a device which would operate with high efficiency and linear response to transform between high impedance and low impedance and vice versa. It is in fact an ultra-efficient, passband, RF transformer. Furthermore it was to be "self protecting in that excessive currents, power losses, and heating cannot occur when the output is either short circuited or open circuited"... a pretty tall order. The basic circuit of the coupler is shown on page 8, courtesy of the patent drawing. It consist of two windings in series (L1 & L2). Normally L2 < L1. Another set of windings (L3 & L4) are also formed. L2 and L3 are bifilar wound. L3 and L4 are in series and L4 is wound over the top of the bifilar L2/L3 wind-



The 600L out of the cabinet, top view.

ing. There is a high stray capacitance (C_S) between L2 and L3. Z_H is the impedance of the coupler as viewed from the plate of the final amplifier; Z_L is the impedance of the coupler as viewed from the load.

I quote from the Patent: ". . . .Assuming the coupler is designed to give a uniform linear response over the 80 meter band between 3.2 Mc and 4.1 Mc, it is desirable to also attenuate frequencies outside of this band, for example, in order to prevent the passage of second harmonics which might have been generated in some of the preceding circuits. As the exciter signal increases in frequency from about 3.0 Mc to 4.3 Mc, the impedance Z_H presented to the tube plate circuit. . .together with the plate capacity C_P varies as shown (see accompanying diagram). The impedance Z_H at frequencies below the pass band drops sharply and has been found to be inductive, thus mismatching the dynamic plate impedance and causing attenuation. However, as the frequency increases beyond 3.2 Mc, the impedance Z_H levels out at approximately 3900 ohms. . .and has been found to be substantially resistive. This condition prevails until the frequency increases above 4.1 Mc, where the impedance Z_H again drops sharply and the reactance becomes capacitive to create a mismatch with the plate resistance".

"The low impedance Z_L. . .varies as the mirror image of Z_H. As the frequency starts from a low value, the impedance Z_L is relatively high (and capacitive) but reaches a low. . .at 3.2 Mc. The impedance Z_L remains at this value over the entire passband but rises sharply at and beyond 4.1 Mc.

Well that pretty well describes what it does, but not how it does it. The "theory" as expounded by the patent is the most interesting part of all. It is fairly clear from the patent that, and I quote ". . .the theory of operation is not fully understood". What is given is a

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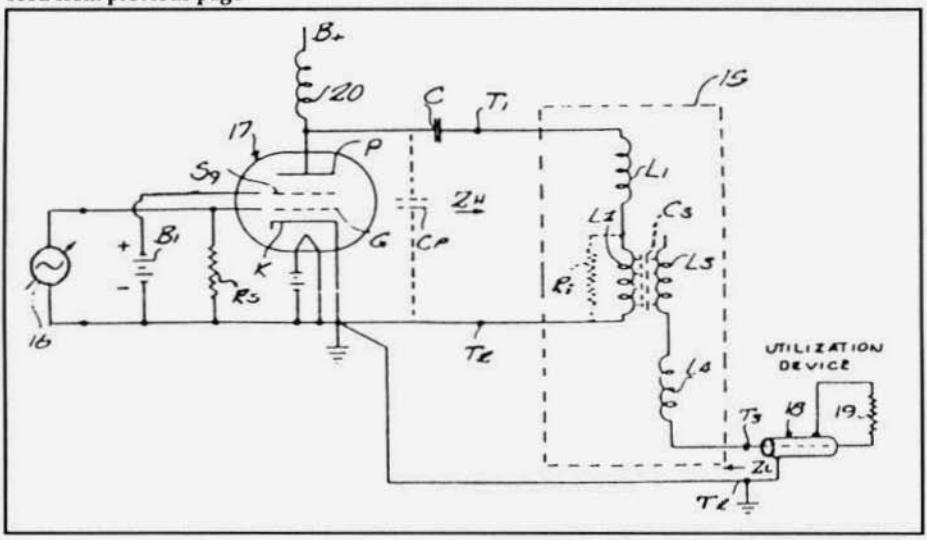

Schematic diagram of bandpass coupler.

plausible explanation, not particularly rigorous from an engineering point of view, but understandable. Terms such as "mutual inductace" and "coupling coefficient" do not appear anywhere in the text. The long and short of it is, in Batchelor's mind, that the couplers were built originally and optimized on a cut-and-try basis. The wire size, diameters of the coils, turns and spacings were all determined experimentally. This was way before simulation was even considered, let alone attempted even for a system of components as simple as this. I won't bore you with the details of the theory as presented, but will relate the high points insofar as they "explain" the bandpass nature of the coupler. The bandpass coupler has essentially three regions: upper cutoff, bandpass, and lower cutoff.

At the upper cutoff point, the cutoff is determined by the plate capacitance of the amplifier (C_p) together with L1 and L2. L1 and L2 in series are parallel resonant with C_p at the upper cutoff. At the lower cutoff, this frequency is determined by the stray capacitance, C_s, between L2 and L3 and the inductance L4. This forms a series resonant circuit. The bandpass portion of the coupler is determined by C_s which is proportional to the length of the L2/L3 winding.

Now here's where it gets a little tricky. At the lower cutoff, C_p has a relatively high reactance and L1 a relatively low reactance. The key word here is relatively. The impedance Z_H will be relatively high as well as the reactance of C_s. Under these conditions since the current is relatively low, the voltage induced in L2/L3 is small and therefore L1 does not efficiently couple into L2/L3. Since the impedance of the load is low (by design), the current in L1 is efficiently inductively coupled to L4. In the bandpass portion, the reactances of C_p and C_s are lower (because frequency is higher) as is the impedance of L1+L2 to ground. L1 thus couples "better" into L2/L3. The series circuit formed by L3, L4 and C_s is now above resonance. This produces a larger voltage drop across this circuit which partially offsets the voltage induced in L3 by L1. As the frequency increases across the bandpass the voltage induced in L3 by L1 increases but that is offset by the increasing voltage across the series circuit of L3, L4 and C_s. The net result is that the

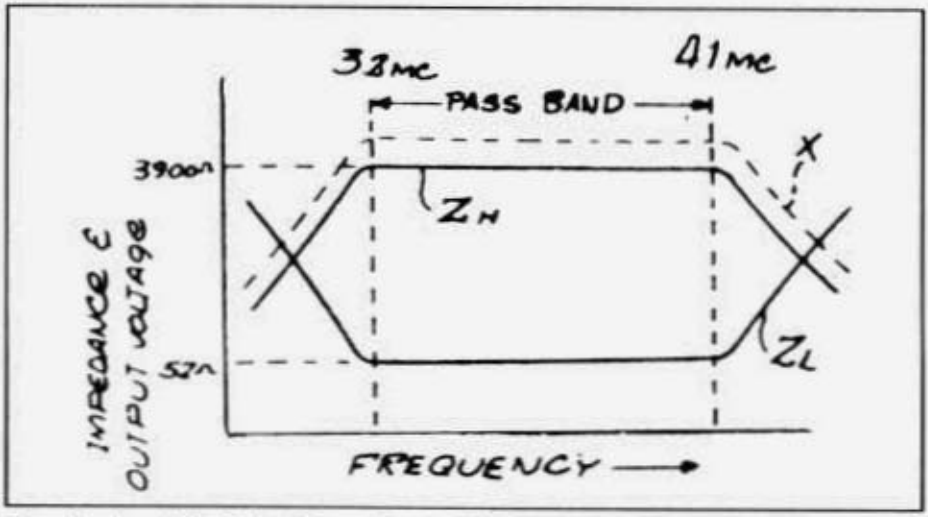

Plate circuit and load circuit impedances VS. frequency.

voltages and currents are essentially constant over the limits of the bandpass and the resulting impedance, Z_H, is constant.

At the high-frequency cutoff point, the reactance of C_p gets lower still as does the impedance of L1+L2 to ground. Power is therefore more easily transferred between L1 and L2 and therefore to L3 and L4. But because C_s and L3+L4 are in series and above resonance, the voltage and current are essentially constant as it the resulting impedance.

The impedance of the coupler is flat, at least to simple theory, over the bandpass, rolling off at the high end due to the parallel resonance of C_p and L1+L2 and rolling off at the low end by the series resonance of C_s and L4. . pretty neat stuff for 1955. The reality, as discussed in the patent, is that the bandpass has some humps and bumps caused by various parasitic capacitances. The explanation of how this is resolved gets to be a hand-waving exercise, but this is where Joe Batchelor's cut-and-try comes into play. The story ends happily with the humps and bumps being suppressed (but not totally eliminated) by "selected spacing of the windings". This is the art which makes the science work. For all of the above, I have focused on the transformation of the high plate impedance to the low load impedance. Needless to say, the device is bilateral and can transform low impedance to high impedance. And that is exactly what is done on the input circuit. The input couplers are just physically smaller since they only have to handle 10 watts or so, hence the caution about limiting drive power to 20 watts rms. While all of this is pretty neat unto itself, these devices had yet another nifty feature: they are "self shielding", that is, they have essentially zero external electromagnetic field. They can therefore be placed (and are placed) in both close proximity to each other and to metal chassis parts without spurious coupling. It wasn't until years later that toroids achieved the same noble status and only then in part. Batchelor's couplers are just wire and ceramic cores covered with what appears to be a blue-colored Sauereisen ceramic. This was a popular coating material of the period which could be painted or dipped on and hardened at low temperatures to a ceramic. The re-

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"Tiny Oskey" — A CW Monitor

by Rob Brownstein, NS6V
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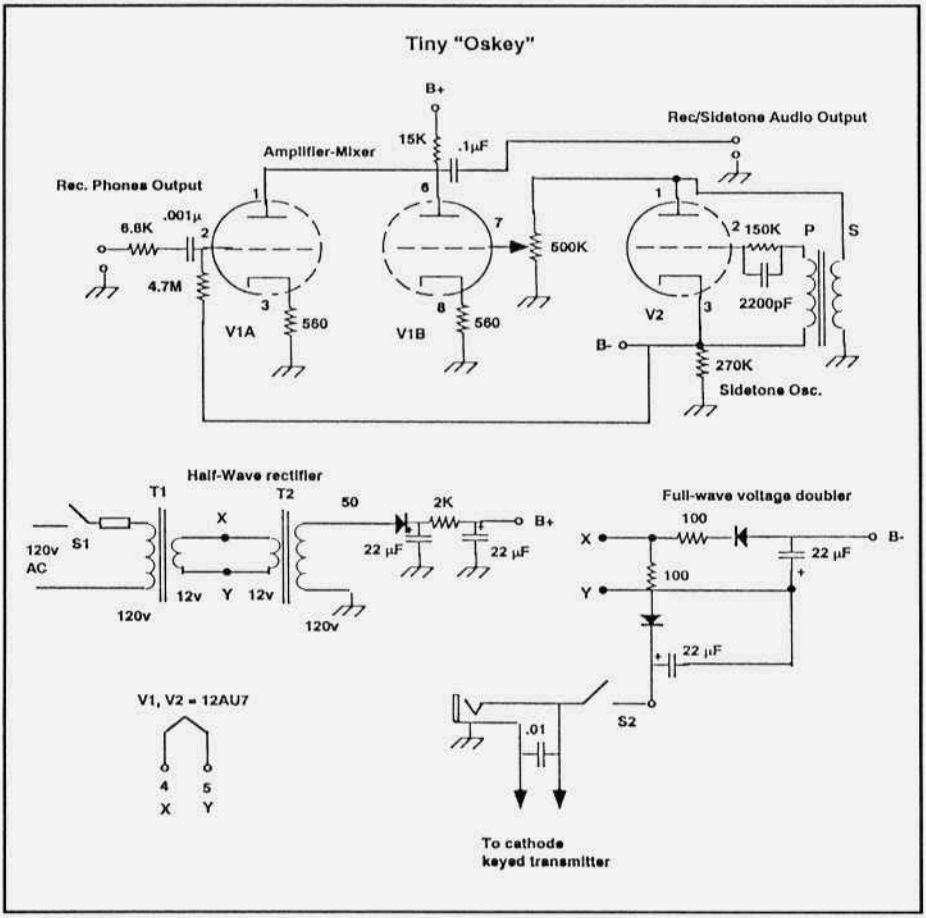
Santa Cruz, CA 95065

Need is often the mother of invention, or at least the inspiration to look for solutions. I recently restored the ultimate nostalgia station, a duplicate of my original station from 1958. It consists of a Viking Adventurer, homebrew modulator, VFO, and HQ-110 receiver. And it works just like my original station, too. When I operate CW, I have to throw the transmit/receive switch, turn the receiver gain down, then send while monitoring my signal. Frankly, I'm getting a little lazy in my old age, and this seems like too much work. I want to throw the transmit/receive switch, and start sending. Period. Of course, I have to monitor my sending, too. So, that was the need that mothered this invention.

Thus inspired, I turned to my usual source of ideas—old QSTs and the ARRL Handbook. And there, in my 1957 Handbook edition, in the section on keying, was the "Little Oskey." It was quite a clever little design, too. It used two 12AU7s, one as an amplifier/mixer, and the other as a rectifier/sidetone oscillator. When the key is up, the receiver's audio is gated through the first half of the first 12AU7, and when the key is down, the receiver audio is muted and the sidetone signal comes through. It sounded like just what I was looking for.

The original designer must have been an engineer because he really squeezed a lot of function out of those tubes, and used a clever power supply approach

"Tiny Oskey"



to keep things reasonably small. I liked that. The only changes I made to his original idea was to use two 12-volt transformers, back-to-back, instead of two 6.3 volt types. The reason was purely practical. Small 12-volt transformers are available off-the-shelf at Radio Shack, and they're cheap, too. Another change was using silicon solid-state diodes as rectifiers instead of using one half of a 12AU7 and a pair of germanium diodes. It seemed like a good idea to keep the 60 Hz AC out of proximity to the sidetone oscillator section, and silicon diodes are easily gotten, and they're cheap! And, finally, because I was using 12 volts instead of 6.3 volts, I built a voltage doubler instead of the voltage tripler used in the original.

Because I used back-to-back power and miniature audio transformers, "Little Oskey," which was reasonably small by 1957 standards, became "Tiny Oskey." I managed to squeeze it all onto a 5 x 7-inch Bud chassis with room to spare.

How It Works

"Tiny Oskey" is really quite simple. The receiver's headphone output is the input to the grid of the first half of V1. The sidetone oscillator's (V2) output is fed into the grid of the second half of V1, and the level is adjustable using the 500K potentiometer.

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The Camper's Companion - Model 2

A Complete Vacation Station

by Bob Dennison, W2HBE
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Westmont, NJ 08108

Part Two

Synopsis

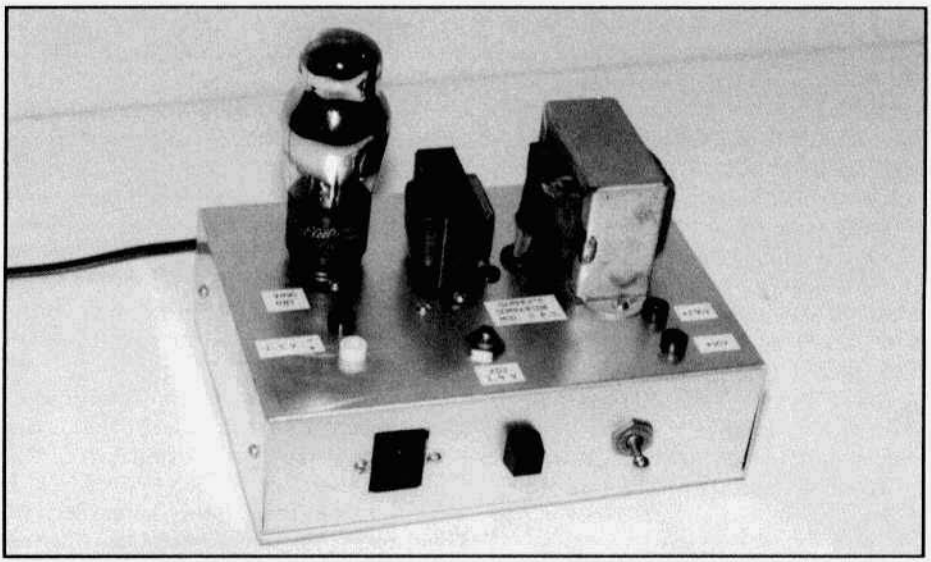
Part 1 described the Camper's Companion - a compact Vacation Station featuring a 3-tube TRF receiver and a QRP CW transmitter. The present article will cover the AC power supply, the power output meter and the tote-box used to carry everything when camping out.

AC Power Supply

Transformer T1 (see Fig.1) is common to both the A and B supplies. I used a transformer salvaged from an Eico signal generator. My guess is that either a Stancor PC8401 or PM8401 would do as well. You might have to make a slight adjustment in the value of R1. More on that later. Both the A and B supplies use solid-state rectifiers and this often leads to the generation of shock-excited RF oscillations which may then show up as tunable hum. The standard cure is judicious use of RF chokes and bypass condensers. They may not all be necessary but it was felt that it was easier to put them in now rather than try to find a place for them later.

A Supply

A full-wave bridge rectifier, BR1 (Radio Shack 276-1152), produces about 7.7 volts DC (in SEND mode) which is applied to a solid-state regulator, U1. The output voltage is perfectly regulated pure DC. Test points TP3 and TP4 are provided to permit checking the filament voltage, which can be set to 1.4 volts by means of R3.



Power supply used when AC power is available.

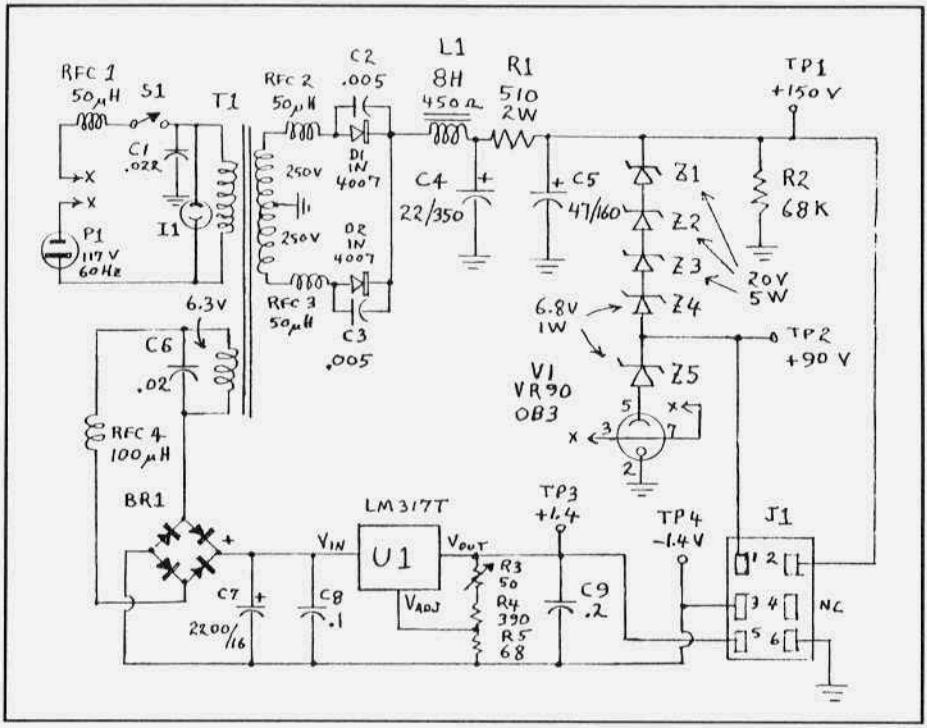


Figure 1. AC power supply for the Camper's Companion.

B Supply

A conventional full-wave rectifier using silicon diodes, D1 and D2, feeds a choke-input filter. The output voltages for the receiver and the transmitter are regulated by means of a voltage regulator tube, V1, and a string of silicon zener diodes. Resistor R1 was selected to produce a no-load current in the VR tube of 40 mA. My VR tube gives less than 90 volts so Z5 was added to bring the receiver voltage up to 90 volts. Three 20 volt zeners (Z1, Z2, Z3) should then give 150 volts at TP1. But again, the voltage was slightly low so Z4 was added.

The jumper in V1 (pins 3 and 7) is connected in series with the AC line. This protects against high voltages on C5 and the transceiver if V1 is removed. Bleeder R2 discharges C4 and C5 when the power supply is turned off.

Construction

The power supply is assembled on a 5 x 7 x 2 inch aluminum chassis. Most of the small components are mounted on phenolic boards - those for the A supply on one and those for the B supply on another. These boards are mounted on the end aprons of the chassis. Wire the boards before they are mounted. This greatly simplifies assembly and wiring. Test the power supply before you connect it to the Camper's Companion. Test for hum, proper voltages and proper no-load current in V1 (40 mA).

Power Output Meter

This device is a great help in tuning the transmitter. It also contains a dummy load so that you can test crystals and practice tuning without disturbing anyone on the air. The power output meter is simply an RF voltmeter connected across the antenna feedline.

continued next page

Tote-box loaded with accessories - ready to go camping.

If we assume a flat line (no standing waves) then we can calibrate the meter in terms of power instead of voltage. The circuit is shown in Figure 2. Plug P1 (input) connects to the RF output jack, J2, on the Camper's Companion. If the antenna is fed by a coaxial cable, it should be connected to jack J1 of the power output meter. If the antenna is fed by 75 ohm twin-lead, connect this to TB1 on the power output meter. Switch S1 selects either normal straight thru operation (ANT) or the dummy load. Switch S2 selects either the 50 or 75 ohm dummy load. It also selects the proper multiplier resistor for the meter. Switch S3 turns the meter on or off.

Calibration

As mentioned before, the power output meter is simply an RF voltmeter. The diode, D1, charges C1 to the peak value of the feedline voltage. The value of R2 (or R1) can then be easily calculated by Ohm's law. Thus if the feedline impedance is 75 ohms, and the full-scale meter reading is to represent 4 watts, the voltage across the line is

$V = \sqrt{PR} = \sqrt{4} \times 75 = 17.32$ volts rms or 24.49 peak.

If the meter has a 100 uA movement, $R2 = V/I = 24.49/100 \times 10^{-6} = 244{,}900$ ohms. This value includes the meter resistance. I used two 120K resistors in series that added up to the proper value. NOTE: The load on C1 is so low that it actually does charge up to the calculated peak voltage.

It is fairly easy to make a new scale for the microammeter - one that shows the power output in watts. Carefully remove the scale from the meter and tape it to a sheet of white paper. With pencil, trace the outline of the meter scale. Prick the paper at the exact location of the meter spindle. Draw an arc on the paper about an inch or two above the meter scale centered on the spindle axis. Project the 0 and 100 uA scale markings up to this arc. These will become the 0 and 4 watt readings when

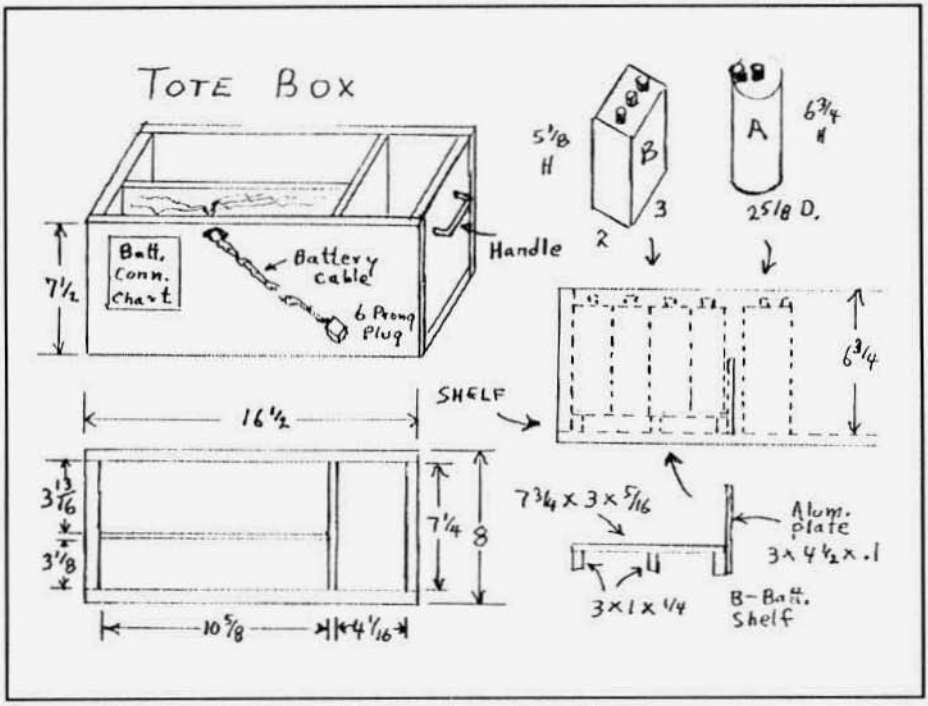


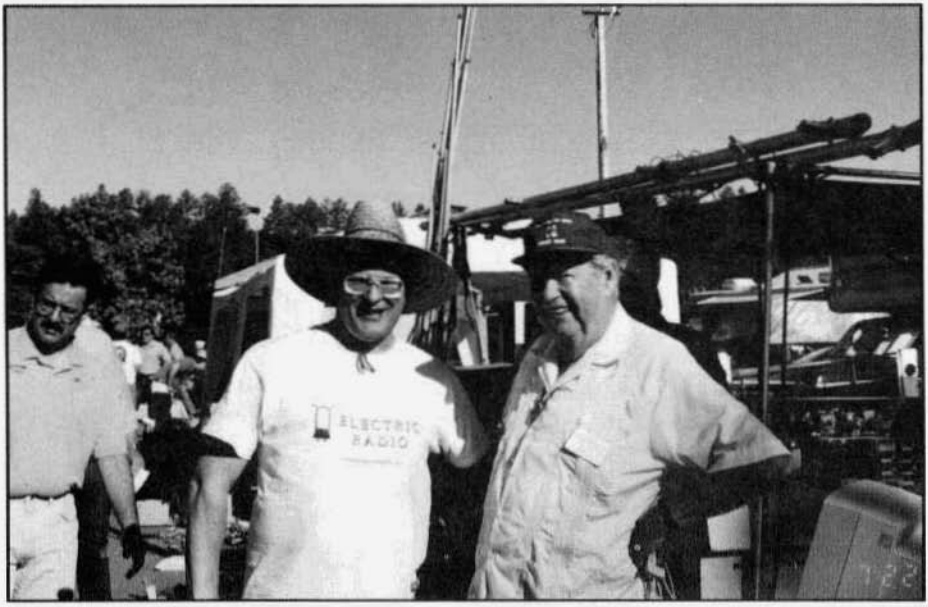
Figure 3. Tote-box for Camper's Companion accessories.

projected down to the new scale. Calculate the meter readings in uA that correspond to the desired power readings in watts. For a 100 uA meter and a full-scale reading of 4 watts, the formula is $I = 50 - \sqrt{P}$. I put the following points on my scale: 0, .1, .2, .4, .6, .8, 1, 1.5, 2, 3, and 4. I also put small unlabeled marks at .3 and 1.25. For example, consider the mark at .8 watt. $I = 50 - \sqrt{.8} = 44.72$ uA. Project a straight line from the spindle axis through 44.72 uA on the meter scale up to the new arc and mark this point .8. After all the points have been so marked, remove the meter scale from the bond paper. Now draw an arc of the came radius as the original meter scale. Project the wattage scale down to this arc. Draw it with black ink. You can add your call letters or logo if you wish. Cut the scale out with scissors and glue it to the original meter scale. Reassemble the meter taking care to not introduce any iron filings or dirt.

A Handy Tote-Box

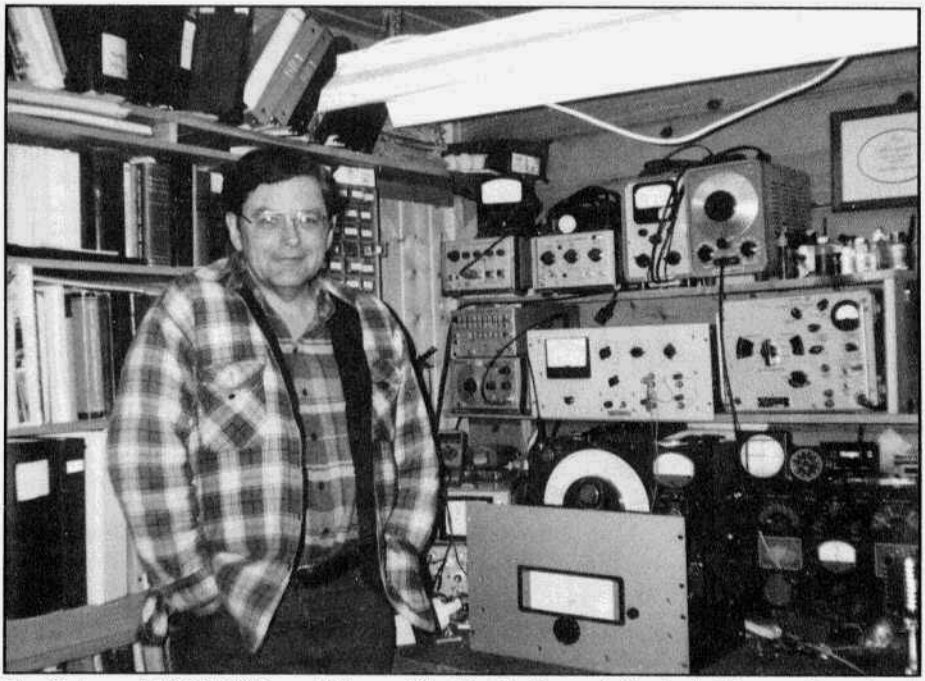
When you take your Camper's Companion to camp it's nice to have a tote-box to hold all the paraphernalia needed. Figure 3 shows a suggested design. The front compartment holds four Burgess Z30N 45-volt B batteries and one #6 dry cell. Since the B batteries aren't as tall as the A battery, a shelf is placed under the B batteries. A larger compartment at the rear holds the 40 meter dipole antenna with its 75-ohm twin-lead feeder and some rope for supporting it. Don't forget to include some fish line and lead weights to help get a line up over a convenient tree branch. You might also put in a sling-shot. The end compartment holds the key, headphones, power output meter, mini-log, paper and several crystals. Glue a battery connection chart on to the front of the tote-box to indicate which colored wire goes to B-, +90, A+, etc.

continued on page 18



Dave Ishmael, WA6VVL, (in his special one-of-a-kind hamfest hat) and the "living legend" Lew McCoy, W1ICP, at the Flagstaff, Ariz. hamfest. Dave was delighted to meet Lew who he says, "Started him down the long road of amateur radio."

Harold 'Dick' Callahan, W8GNV, at the mic in his hamshack. ***Photo courtesy of Hank Clark, W2IQ.***



Ray Osterwald, NØDMS, well-know Electric Radio contributor in his new hamshack high in the Colorado Rockies.

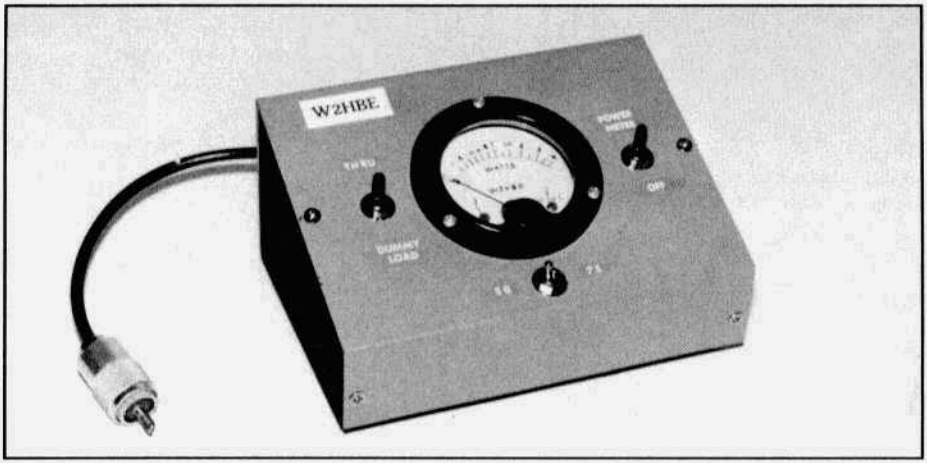
Joseph Curry, KE6LFT, in his vintage hamshack. He is the author of a very interesting article on the CE 600L amplifier in this issue.

Camper's Companion from page 15

Now you'll have something to do after the kids go to bed and your XYL is tried of playing scrabble. Hope your vacation is the best ever. ER

Reference:

"QRP Alive with Thrills and DX!" Dave Ingram, K4TWJ. CQ, Aug. 1995, pg, 68-71.



The power output meter and dummy load.

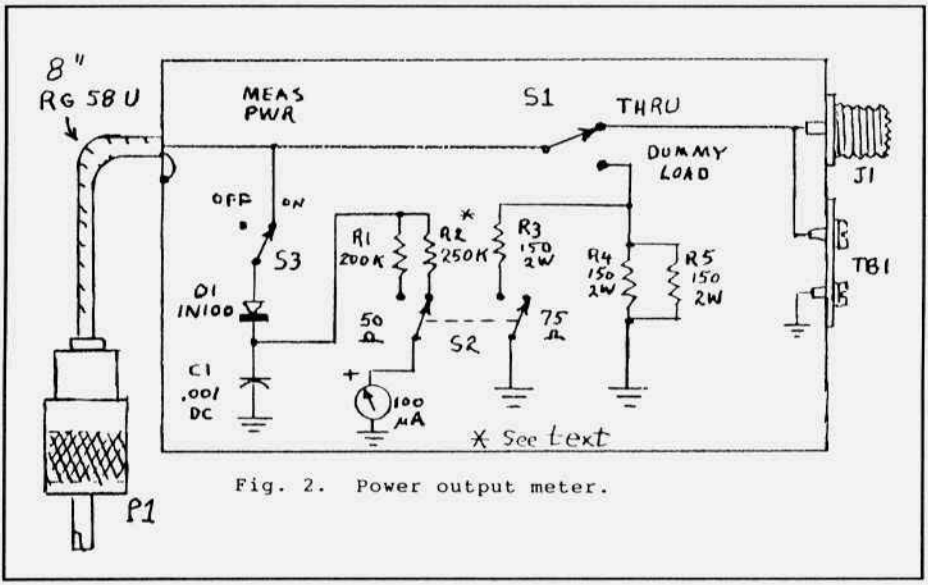


Fig. 2. Power output meter.

Figure 2. Power output meter.

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Wednesday nights at 8 PM PT on 3835.
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 4 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.
Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control is Les, K6HQL.
Arizona AM Net: Meets Sundays at 3 PM MT on 3860. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3808 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Westcoast Military Radio Collectors Net: Meets Fri. at 2200 local on 3990 and Sat. at 0800 local on 3990 + or - QRM. Net control is Tom, WA6OPE or Andy, KD6TKX.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
Vintage CW Net: For CW ops who enjoy using vintage equipment.This is not a traffic net; speed is not important. The net meets on 14.050, Saturdays at 1 PM PT. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Chuck, N5SWO. The group meets on 14.293 at 1 PM CT, Sunday afternoons.
Collins Users Net: The oldest of the 'users nets'. It meets on 14.263 Sunday afternoons at 2 PM CT. The net control revolves. This group also gets together for an informal ragchew on 3805 Tuesday evenings at 7 PM CT.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Heath Users Net: A new net started by Marty, WB2FOU/5. Net control is shared by Fred, AA5LW. It meets on 14.275 at 4 PM CT Sundays. Check in on either AM or SSB.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net has been meeting since 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Night 6 Meter AM Net: 8 PM Sundays on 50.4. Net controls are Dan, KV6I and Scott, K6PYP. Informal, supports restoring old gear and using it on the air. Loan gear available for those wanting to join in.

An Inexpensive AM Rig Using Clamp Modulation

by Berk Berkemyer, WØREP
402 Kingridge
Ballwin, MO 63011-2729

Several weeks ago, during a conversation with Editor Barry Wiseman, the 829B tube came up. He thought it might be a good tube for a low-power AM rig and I agreed to design and build a test unit. We agreed on 160 meters and AM. The unit in this article is the result of that conversation.

Over 50 years ago, I worked on the then new Navy VHF transmitter using several 829 tubes. The unit was an unqualified success, and was widely used during the latter portion of WW II. I was intrigued by the tube, but never had used it in amateur work. This project gave me the opportunity of revisiting an old friend.

The unit shown and described is not meant to be duplicated. All junk boxes differ, and I wanted to see what could be built out of my junk box. The only thing missing, other than a few resistors, was an 829B. But they are available at most hamfests at a reasonable price ($5-10). So, use this unit as a guide and modify it as dictated by what you have available. Incidentally, while the unit pictured is for 160, there is no reason it can't be built for any of the HF bands. A plus is that no modulation transformer is required.

The 829B is essentially two 807's squeezed into a small 7-pin all glass envelope. Total plate dissipation is rated at 40 watts per section. It can be operated on either 6.3 or 12.6 volts filament voltage. It has common cathodes and screens and separate control grids and plates, the common connections simplifying construction to some extent.

Reference to the schematic shows a simple MOPA (master oscillator power amplifier) RF unit using a modified Pierce crystal oscillator driving both sections of the 829B in parallel. The power supply delivers 775 VDC, 390 VDC, and filament voltage. No bias supply is needed. The 829B is clamp tube modulated (a form of screen modulation) using a 6L6G clamp and a 12AX7 speech amplifier, resulting in a carrier output of about 60 watts. On-the-air reports have been good and scope pictures indicate close to 100% modulation.

Circuit Description

The crystal oscillator is the classic modified Pierce oscillator, which utilizes the screen of a 6AG7 tube as the oscillator anode. This frees up the plate for a tuned circuit. The plate circuit does not affect the oscillation as much as in a grid plate or tritet, and the Pierce oscillator will work with almost any crystal, although the very small modern crystals should be avoided, as they are very crystal current sensitive. The oscillator is cathode keyed along with the amplifier. I found it unnecessary to bring the plate tuning control to the front panel, but there is no reason not to if your layout permits. This oscillator furnishes plenty of drive to the amplifier. Since I had to mount the crystals on the rear of the chassis, I used crystal switching. If your layout allows front panel crystal mounting, the switch can be omitted.

The power amplifier places both halves of the 829B in parallel. The grid has an RF choke in series with the grid bias resistor, and is capacative coupled to the oscillator. The cathode is bypassed for RF and is keyed by the transmit switch along with the 6AG7. The plates

A simple, monoband transmitter using a low-cost 829B final.

are tied together and fed through an RF choke and a small parasitic suppressor. You may not need the suppressor, but it can't hurt to install it. The plate tank is a pi network, using a combination of fixed and variable capacitors, and a coil wound on an old ceramic form from some long forgotten surplus unit. It could just as easily have been wound on a plastic form or made from commercial coil stock. The plate current is the only metered parameter. The screen is fed from the high voltage through a dropping resistor network which will be discussed in some detail as part of the clamp modulator description.

The speech amplifier uses both sections of a 12AX7 dual triode. The sections are resistance coupled and furnish plenty of gain. A non-amplified D-104 mic requires about a 50% setting of the gain control. The speech amplifier is resistance coupled to the grid of the clamp tube modulator.

The clamp tube modulator is deceptively simple. There are several parameters which have to be fixed and which interact. For the first parameter, we go back to the power amplifier screen supply. There must be two dropping resistors in series, the first to set the voltage for the clamp tube plate and the other to set the PA screen. The second resistor must be shunted with a l uF+ capacitor to allow the modulation to approach 100%. The 6L6G cathode needs to be at about 25 volts for the modulator to operate properly. In most cases, the two screen resistors will be within a 2-1 ratio. The easiest way to make the adjustment is to choose two resistors for the screen such that the modulator plate voltage is about 400 volts. Then adjust the 6L6G cathode resistor for the correct value (25V). Recheck the 6L6G plate voltage and the 829B screen voltage. If the 6L6G plate is about 400 volts and the 829B screen is about 200-220 volts stop! (If not, start juggling). Plug in the mic and talk. The gain can be set by listening to the signal in a receiver, with the transmitter running into a dummy load, although a better way is to use an

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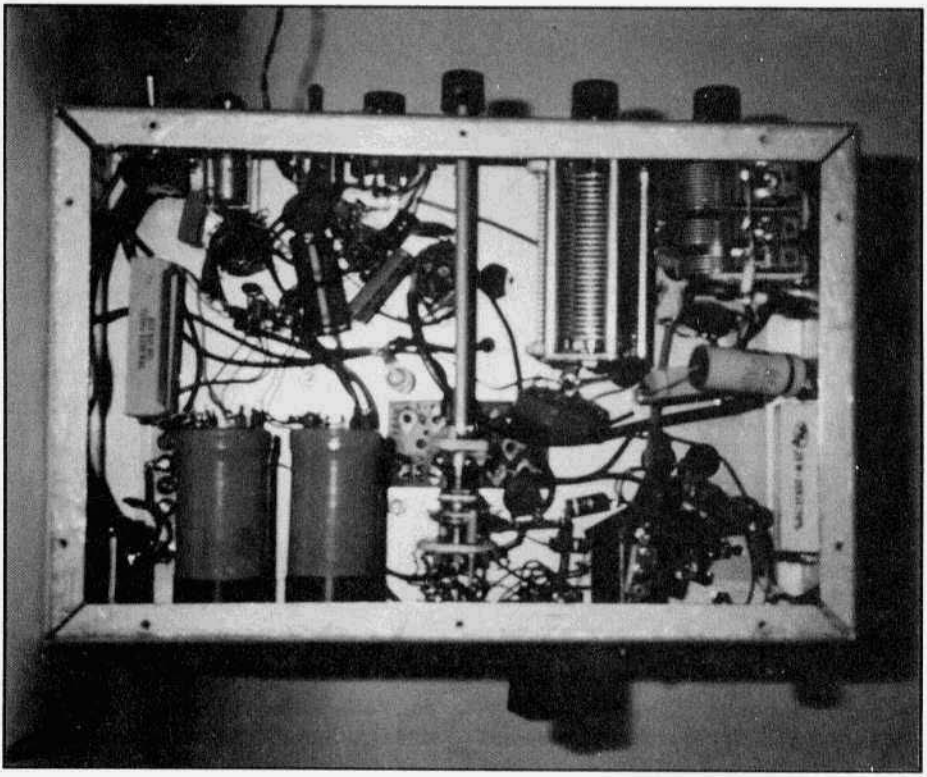


Under-chassis view of the 160M transmitter.

oscilloscope or modulation monitor.

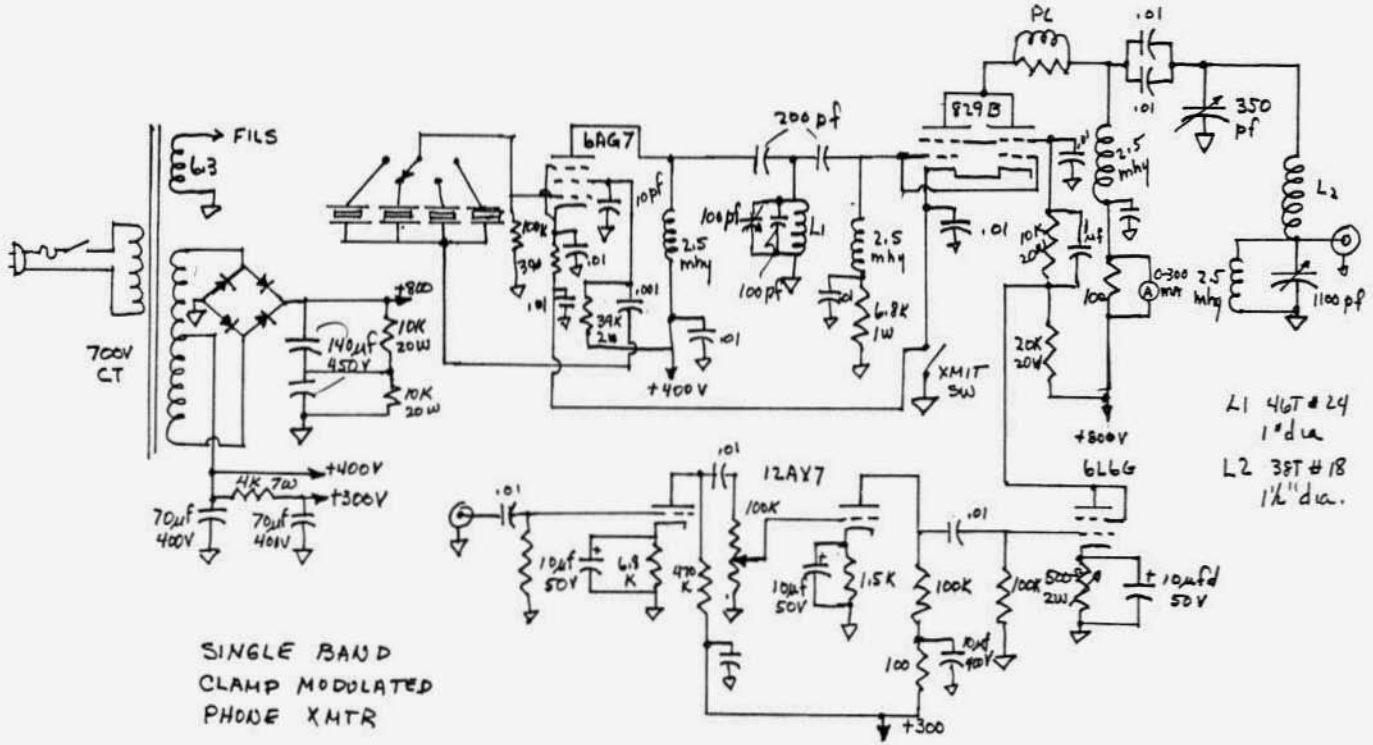
Modifications

The send/receive switch is a toggle on the panel. If addicted to push-to-talk, a small relay powered from the filament winding can be paralleled with the switch contacts. Tubes other than the 829B can be used - a pair of 807s or 1625s, or possibly a pair of 6146Bs.

In any case, the resistance values in the screen circuit would need to be changed. If the screen current required is less than the 32 MA of the 829B the resistance values would be increased, and if the screen current is higher, the reverse is true. Power supply voltages can be different. I would not recommend any higher voltages than those shown but anything down to about 600 volts should work after properly modifying the PA screen resistors. And of course, the power supply could just as well be separate, making possible a very small footprint on the operating table. I also plan to try Heising modulation of the screen, using the low voltage supply, thus eliminating the need for the heat dissipating screen dropping resistors.

Conclusions

This is a neat and compact single band AM transmitter, which can be built cheaply and from readily available parts. It is adaptable to any of the HF bands if crystal oscillator output is available, and gives almost anyone the capacity to try AM without a large outlay of funds. Build, modify and enjoy! See you on AM! ER


FILS
6.3
7000V CT
140μf 450V
10K 20W
10K 20W
+800
+400V
+300V
4K 7w
70μf 400V
70μf 400V
6AG7
10pf
.01
100K 3W
.001
39K 2W
2.5 mhy
+400V
200 pf
104pf
100pf
L1
2.5 mhy
6.8K 1W
XMIT SW
829B
PL
.01
.01
350 pf
2.5 mhy
L2
10K 20W
1μf
0-300 mA
100
2.5 mhy
1100 pf
20K 20W
+800V
6L6G
12AY7
.01
.01
100K
10μf 50V
6.8 K
470 K
10μf 50V
1.5K
100K
100K
500K 2W
10μfd 50V
100
10μf 400V
+300
L1 46T #24 1" dia
L2 38T #18 1½" dia.
SINGLE BAND
CLAMP MODULATED
PHONE XMTR

The Johnson Viking VFO Model 122. . . . and its little secret

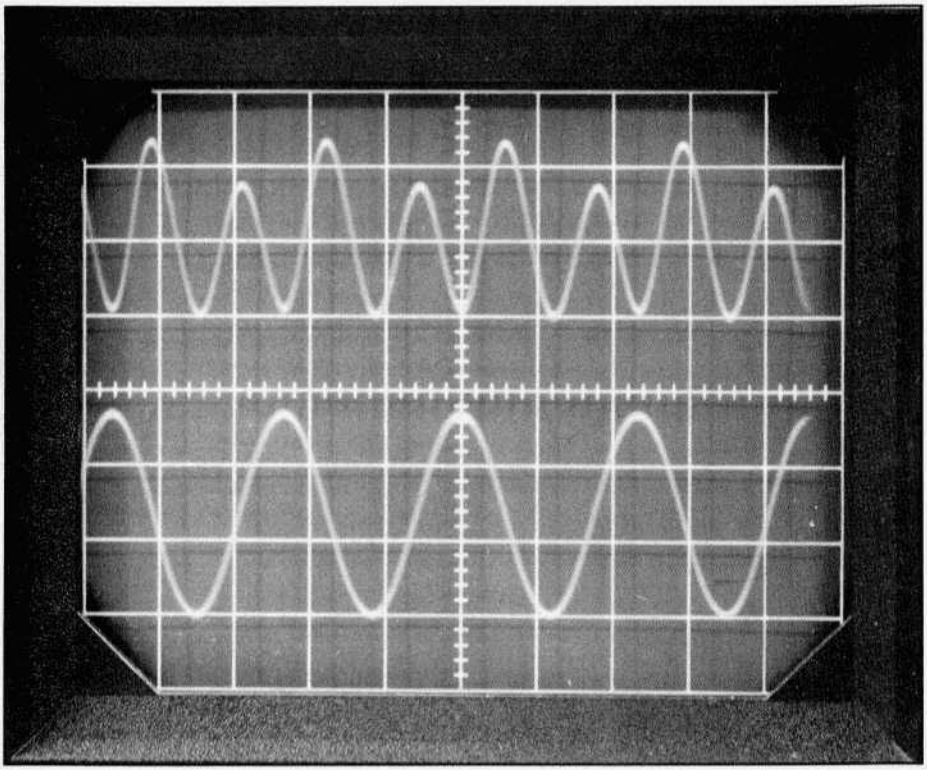
by Bob Thomas, W3QZO
216 Sunrise Ln.
Philadelphia, PA 19118

Like many ER readers, my long-repressed fascination with tube-based equipment and the desire to recapture early ham radio days surfaced recently, calling me back to those halcyon times of Electric Radio. I had built a Johnson Viking II and 122 VFO when they first became available as kits, so it seemed natural to acquire them once again, setting into motion what has since become an absorbing journey deep into the field of vintage radio restoration. A Viking transmitter and VFO in decent condition were purchased and several enjoyable hours spent cleaning inside and out, replacing condensers and various suspicious looking components, and removing numerous "unauthorized" modifications.

Proper operation of the rig was verified on a dummy antenna then, in preparation for calibrating the VFO, a frequency counter was connected to the VFO output with a coax "T" at the transmitter input. Calibration of the 40-10 meter range (7.00 to 7.425 MHz) proceeded without difficulty. However, when I switched the VFO to its 160/80/40 meter range (specified only as 1.75 to 2.00 MHz throughout the Johnson instruction manual) the counter indicated 3.8 MHz with the VFO dial set to 1.9 MHz. "Strange," I thought, for I had naturally expected output in the 160 meter band. I reduced the counter sensitivity to avoid possible generation of second harmonic distortion within the counter, but that did not help; 3.8 MHz continued to be indicated even with the input level reduced to where reliable counting ceased entirely.

So out came the oscilloscope. At first, the VFO output frequency appeared to be solely 3.8 MHz - on a range that is supposed to provide drive at 160 meters! But then, with careful readjustment of the scope Trigger Sensitivity for more stable sweep synchronization, it became apparent that the VFO output had two frequency components: The principal component was a 14-volt (p-p) 3.8 MHz sine wave, but a second one of much lower amplitude (3-volts p-p), was superimposed on alternate positive peaks of the main signal. That smaller, half-frequency component was the "missing" 1.9 MHz 160 meter VFO output, the only one mentioned in the instruction manual. Further investigation revealed the oscillator control grid waveform to be a pure 1.9 MHz sine wave, implying substantial doubling in the plate tank circuit. Related waveforms are illustrated in the accompanying oscillogram.

Incredulous, and believing there was something wrong with my VFO, I calculated the inductance of the plate tank coil as 14.3 microhenries on the basis of its physical dimensions. This inductance resonates with the 110 pF VFO output load capacitance at 4.0 MHz, accounting for doubling to 80 meters in the oscillator plate circuit as actually observed on the so-called "160 meter" VFO range. For resonance to occur in the 160 meter band, the plate tank coil would require a capacitance of over 500 pF- far more than the existing capacity. To verify this, I paralleled the existing 110 pF load capacitance with an additional 390 pF and sure enough, the VFO out-



Voltage waveforms obtained with 10:1 scope probes and 122 VFO tuned to 1.9 MHz. Upper trace: VFO Output. Lower trace: 6AU6 control grid. Vertical Sensitivity: 5 volts/division. Sweep Rate: 250 nanoseconds/division.

put became a pure, high amplitude 1.9 MHz sine wave without a trace of 3.8 MHz!

At last the mystery was solved: Johnson apparently intended the 122 VFO and Viking II transmitter to operate together as a clever system, in which meager 160 meter VFO output would be just adequate for operation of the Viking II on that band, but with plenty of 80 meter output for driving the transmitter on 80 or doubling to 40. The VFO and transmitter were, literally, "made for each other." While this unique approach is cute, it is also quite obscure, and it would seem to have warranted a hint, if not a full explanation, somewhere in the VFO or transmitter manuals for the enlightenment of users of the system, and especially for those who might want to utilize the VFO with other transmitters. Similar results with measurements made on a second 122 VFO at W3VVS confirmed operation as described here. Furthermore, a Heathkit VF-1 VFO, which is little more than a "reverse-engineered," 122 VFO, was also found to have weak 160 meter output superimposed on a dominant 80 meter component, but again there is no mention of this arcane situation in the Heath manual.

Out of all this there are some practical considerations for hams intending to use 122 or VF-1 VFOs with transmitters other than those intended by the manufacturers. Specifically, if either VFO is to be used with a 160 meter transmitter, a substantial increase in drive can be realized by retuning the low frequency plate coil of the VFO to

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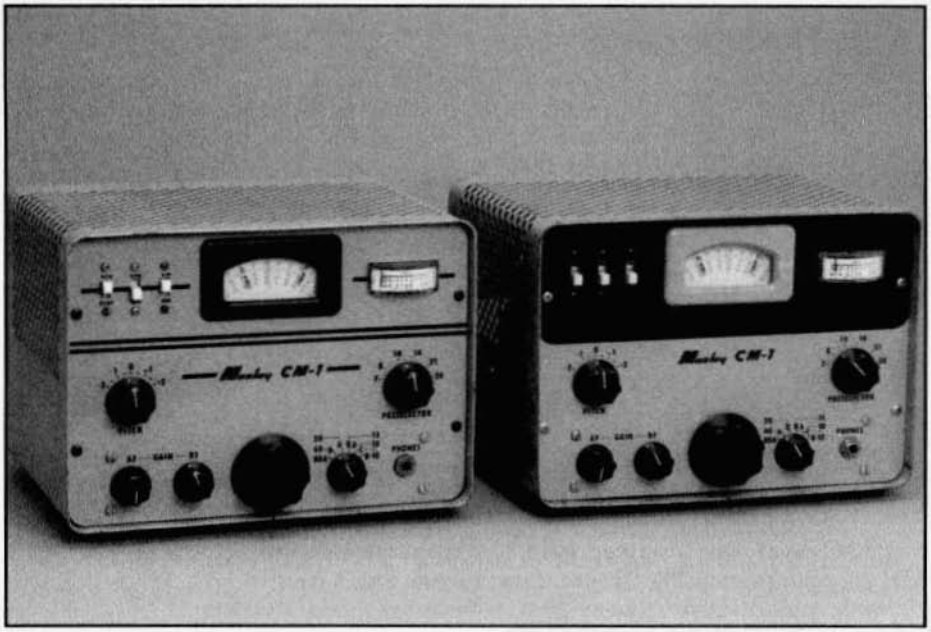
The Mosley CM-1 Receiver

by Herman Cone III, WB4DBB
305 Foxwood Dr.
Goode, VA 24556

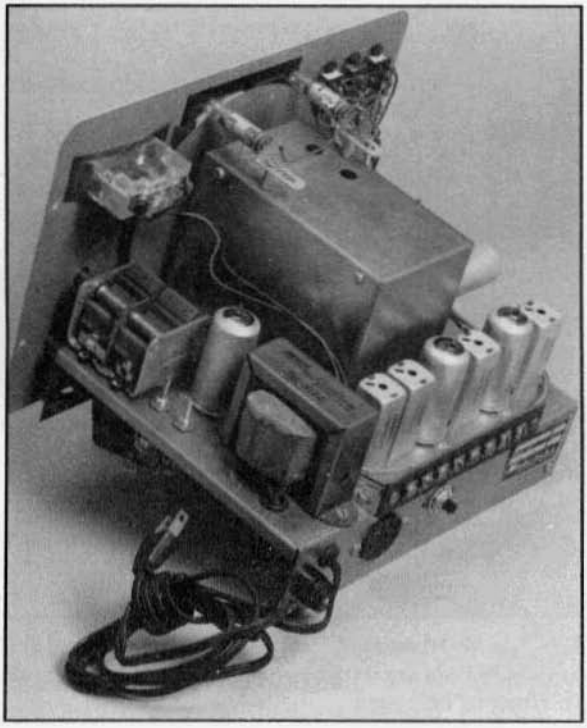


Front view, 2 versions of the Mosley CM-1 receiver. The one on the right appears in Mosley's manual and brochure, and is the more common style.

The Mosley CM-1 receiver, which was made during 1961 and 1962, is a relatively unknown product from a well-known manufacturer. Although Mosley Electronics was and continues to be a leader in antennas, the CM-1, which never caught on, was their first (and last) receiver.

This is a small radio, only 10-1/2" wide, 7-1/2" high and 8" deep. Volume wise, this is not much different from the Hallicrafters S-38 series receivers. The colors are black and gray; the gray shade being almost identical to that used on the Collins KWM-1. There were two versions of front panels that were shipped, although there appear to be no other obvious differences. The list price of the CM-1 was $169.95. The matching CMS-1 speaker (which I am still looking for) was $16.95. The manual also lists a 160 meter converter, model CV-160, as an option, but no price is mentioned. It is quite possible that this item was never actually sold; it is not included in their 4-page brochure.

The CM-1 is a ham-band only receiver, covering 80, 40, 20, 15 and 10 meters in 7 ranges; 10 meters is covered in 3 segments. WWV (15 MHz) can be received



Top of chassis, Mosley CM-1. The 40-10 meter converter is located between the power transformer and the front panel. The VFO and 2nd converter are in the large enclosure.

by selecting 40 meters with the bandswitch, and tuning the preselector to near the 14 MHz marking. There is no crystal calibrator, or any provisions for "zero-setting" the dial, however. There is no crystal filter, and the bandwidth is 2.5 kHz at the -6 dB points. For CW and SSB reception, there is a product detector and an adjustable BFO ("pitch") control. A simple diode ANL circuit is also included. All of the connections to the radio (mute, antenna, speaker, etc.) are done via a terminal strip on the back. Additionally, the meter "zero" control and an octal socket (for running the receiver from a battery source) are located on the rear apron.

Probably the most striking characteristic of the CM-1 is that it uses only one type of tube. 5 6AW8A's are used. These are dual-purpose tubes, containing a triode and a pentode for "10 tube performance." Additionally, there are 4 diodes; one is a half-wave rectifier, one is the AM detector, and two are in the noise limiter.

On 80 meters, the radio is single conversion, using 455 kHz as the IF frequency. 4 double-tuned IF transformers are used, and selectivity is adequate for AM and casual SSB and CW reception. The VFO tunes from 3.955 to 4.555 MHz (high-side injection) to allow reception of 3.500 to 4.100 MHz. A 2 pole filter, which tunes the 80 meter band, tracks with the VFO. Only 4 of the 6AW8A tubes are used when operating on this band.

On the other bands, the remaining tube is switched in, to convert these higher frequencies down to 3.5-4.1 MHz, which is now a variable first intermediate frequency. The pentode section is a crystal controlled oscillator, and the triode section is the mixer. The converter circuitry is extremely simple. A double-tuned preselector tunes (barely) 7.0 to 30.0 MHz in one sweep, without bandswitching. The band select control is very small; all the functions are on one wafer. It turns the converter off and on, selects the appropriate crystal, and switches the antenna between the converter's input and output, depending on the band selected. I found this converter's input circuitry to be less than ideal; it seems impossible to have the filter work well both at 7.0 and 30.0 MHz. The two coils are mutually inductively coupled, and they appear under-coupled on 40 meters, and over-coupled

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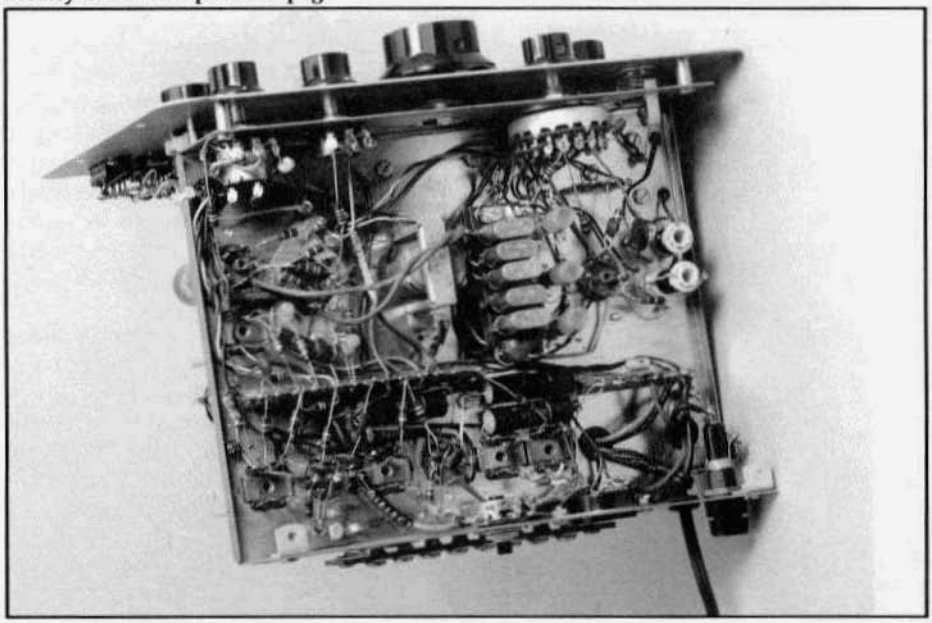
Mosley CM-1 from previous page



Bottom of chassis, Mosley CM-1. The 40-10 meter input coils are on the bottom. The three plastic coil forms near the crystals are in the converter oscillator circuit. Note the simple bandswitch, in front of this area.

on 10. This probably helps explain why the image rejection is 64 dB on 40 meters, and only 35 dB on 10 meters. Making the coils capacitively coupled, and optimizing the capacitors for all 4 of the "converter" bands would be an improvement, but would have added more compexity (and cost). On 40-10 meters, the receiver is dual conversion, and the tuning rate remains the same as on 80; the dial is calibrated in 5 kHz increments. Although there is no RF stage on any band, the mixer stages, along with 2 IF stages produce adequate gain, and sensitivity is more than sufficient. The product detector does a fair job on SSB and CW; about par with what would be expected in a receiver of this price. The audio output is a little low, rated at 1/2 watt at 6% distortion. I did not measure the stability of the VFO, but it seemed quite good after a 15 minute warm-up. The VFO and BFO are both voltage-regulated with NE-2H neon lamp bulbs.

Although the CM-1 does not have all the performance and "bells and whistles" of other receivers of its time, it does a respectable job, especially on AM. Considering its small size and reasonable stability, it is a good choice if you want something to operate portable. Only needing to have one tube as a spare is also a plus.

These receivers do show up from time to time at hamfests, and should be considered by anyone looking for the more rare and unusual pieces. If anyone has any questions or would like a schematic, just send a large SASE to the above address. ER

Writing the Heath Book

Or How "Heathkit, A Guide to the Amateur Radio Products" came about.

by Chuck Penson, WA7ZZE
Box 2414
St. Paul MN 55102

I didn't mean to do it. I didn't mean to write a book. It just kind of worked out that way.

Originally what I wanted to do was gather enough details about my collection of Heathkits to lend some additional meaning and context to the pieces I own. For me just having a piece isn't enough. I need to know something about it. When was it made? How much did it cost? Who designed it? What is its relationship to the other pieces in my collection? It must be my museum background.

I decided that a good start would be to make a list of every ham radio product Heath ever made. Such a list would give me some clue about the completeness of my collection. This seemed like it would be an easy task.

Since I didn't have many Heath catalogs I reasoned that Heath's advertising in *QST* would give me most of the information I needed. As luck would have it the Minneapolis Public Library had a nearly complete set of QSTs (I had not yet discovered the Pavek Museum of Broadcasting in nearby St. Louis Park). So after work one cold October night in 1991, I set off for the library, notebook in hand.

"Hi", I beamed. "I would like to see all of the issues of QST from 1950 to 1960." A stunned librarian indicated that my request may take a few minutes and motioned for me to have a seat. A decade shouldn't take long to go through, I thought - this ought to be a breeze. About 15 minutes later a librarian arrived with an entire cart full of books. Twenty-two volumes, hard bound. Each year had been bound in two, six-month books. Man! This looked like a lot of material. What had I been thinking?

As I worked my way through each of these ponderous tomes, I kept getting distracted by the articles. Hey, here's a great transmitter project. I should make a Xerox of this. And here is a great story on long-delay echoes. And look at all these wonderful pictures. Get a load of those hair cuts. It didn't occur to me until I was into the 1957 volume that as long as I was doing this I should take the time to catalog all of Heath's test equipment too. It wouldn't take much time to start over again.

This time I got as far as December 1955 when I stumbled across the review of Heath's DX-100 transmitter. You know, as long as I'm doing this, I should take the time to list all the reviews of Heath products. Better still, I should list all references to Heath products.

I started over for the third time.

"Your attention please, it is now 9:45 and the library will be closing in 15 minutes."

Huh?!

The next night I made it a bit further - all the way up to 1957. As the days turned first to weeks, then to months, I plowed my way through issue after issue of QST. I was, by that time, putting data directly into a small portable computer purchased specifically for the task. As I began to work my way into the '60s, certain issues began to look familiar. 1966 was when I was first licensed. Progress slowed to a crawl as memories flooded over me with almost every turn of the page.

A sobering dose of reality kicked in some time later when I realized that if I wanted to be complete I would have to repeat this entire process with CQ magazine. Ham Radio, too? Oh. . . maybe.

continued next page

Upon completion of this research - more than a year later - I realized that there were a lot of holes in my data. What I really needed was access to a complete set of catalogs. The factory would still have a set, wouldn't they? "Hello, I'd like to speak to someone about coming to the Heath Company to do some research." I was transferred several times, eventually to Chas Gilmore, Vice President of Operations. He wasn't in. He wasn't in the next day either. Or the next. The following day he was in a meeting. I decided to write. A short time later I was reading his response. Yes, he wrote, we have a complete set of catalogs and you are welcome to come and browse through them.

The catalogs were in a single, large four-drawer file cabinet near the copy machine. I worked all day Friday and most of Saturday. As I worked my way from the simple flyers of 1947 to the full-blown catalogs that followed, a most remarkable picture began to emerge. Before my eyes a stream of products appeared, evolved, faded away and were replaced by new ones. Black and white gave way to color. Marketing became more sophisticated. Here, stuffed away and forgotten in a four-drawer file, was a complete outline of the history of the company. I cataloged reams of information but I still needed more detail.

I had come prepared with a camera and a tape recorder and talked at length with Mr. Gilmore, and several engineers whose desks were near the file cabinet with the catalogs. Tons of material, I was told, had been dumpstered only months before this. The company, I realized, was throwing away its past. Suddenly, there was an imperative. A voice in my head said "Write this down. Save this stuff. This is the only written record of the company." I was now writing a book.

I left Heath having filled my disk drives and tape cassettes with tons of data and conversation. Yet large chunks of Heath's history were gone. Trashed. Filed somewhere in a landfill. To reconstruct the missing pieces would mean having to talk with as many former employees as I could. I had gotten some good leads on people to talk with, but - at the risk of sounding indelicate - these guys were getting old. It was now late in '92 and somehow I felt that time was of the essence.

I fired off several letters to former engineers. Several wrote back and invited me to call. Most were retired and still living in the Benton Harbor area. Over a period of months I talked with many former Heath engineers. At first they were a bit hesitant but as we chatted about their years and accomplishments at Heath, and as I gained their trust, they began to open up. We chatted for hours about the products and the people, the good times and the bad, the great products and the not-so-great products. They spoke with great pride about the gear they designed and built.

It was some time during the interviews that two remarkable windfalls came to me. The first was from a long time friend who worked for the Heath store in the Twin Cities. He was aware that I was working on a book and called me one day to tell me that the Heath store was closing and that he had retrieved a bunch of stuff from the dumpster - did I want it? It was like in a cartoon. . . I was at his place before he hung up the phone. The "stuff" to which he referred included a complete set of catalogs from 1965 to the present, several cases of assembly and service manuals, and a fiche machine with a set of fiches containing Heath's complete parts list.

The second windfall happened at one of the local hamfests. Before the doors opened I noticed a guy hauling a huge load of what appeared from a distance to be books. As I got closer I noticed that the books had that distinctive Heath-assembly-manual-yellow color. Sure

enough. And if he had one manual he must have had a thousand. To make a long story short I bought the whole load for $75. More than 800 books. About a third related to ham products.

During this same time I began the process of taking photographs for the book. It was winter and although the basement was cold, the photographic lights would keep it nice and toasty. I used twin 500 watt halogen work lights and large pieces of foam-core as reflectors. Finding a place to shoot pictures in my basement (where most of the collection is stored) wasn't easy. It required the complete disassembly of my primary SB series HF station so I could use the bench to shoot on. I shot the big stuff first - just to get it over with. The TX-1, RX-1, HX-10, and HA-10 were no picnic. Three exposures each of three angles. Nine frames per piece. There would be about 160 products in the book. I owned about 120 of them. Do the math. I was soon swimming in prints. I guess if I knew anything about photography I could have done it in fewer frames.

I had already started writing the descriptions of each piece. The writing seemed to go quickly and before I knew it, it was summer 1993. Summer in Minnesota is short and is not to be squandered hunched over a computer and a pile of catalogs. Work on the book ceased for 6 months.

Early in 1994 work resumed and the various pieces of the book started to come together. The introduction proved to be the most difficult part. It was to be a brief history of product development at Heath and I found I could only write a few paragraphs at a time. Writing this chronology required frequent trips to the basement to consult my manuals, catalogs, and other reference material. It also required numerous additional phone calls to the engineers to clarify some of the finer points.

Since I had written a few articles for Electric Radio, editor Barry Wiseman expressed an interest in the book and asked if he could see the manuscript. Since we were both going to Dayton in April I brought a copy for him to look at. A month later we were talking details. Before I knew it, we had agreed on a completion date. Now the pressure was on - actual production of the book went into high gear.

A graphic artist friend of mine started the layout while I began scanning photographs. Several friends took on the daunting task of proof reading. I couldn't believe how many goofy typos I had made. There were some real howlers hidden away in the text but the best one has to be this; "Be careful of high voltage when working in this area - always use an "insulted" screwdriver." Yeow! This is the kind of stuff your spelling checker can't find.

In a couple of months we had the first working draft of the book. It was rough but enabled us to see where the photos would be, and roughly how many pages we were talking about - around 250. A month later we had a version with most of the photos in place. Two weeks later we had a version that looked a lot like a finished product. Now we were proofing for all the fine details. The GR-54 and 64 were in reverse order. The SB-110 was missing! The SS-9000 page had the wrong photo. The DX-60 page referred to six bands instead of five. There should be a comma here and a semicolon there. I realized that I wasn't going to find all errors. We printed one last copy, looked it over as best we could, and sent it off to the publisher.

Four years after it began, the job was complete.

I didn't mean to do it. I didn't mean to write a book. It just kind of worked out that way. **ER**

Editor's Comment: To order Chuck's book (at the pre-publication price) send $23 (includes S&H) to ER, Box 57, Hesperus, CO 81326. Offer good until October 15; then price will be $24.95 plus $3 S&H.

Gonset + Ford = Fun

by Bill Kleronomos, KDØHG
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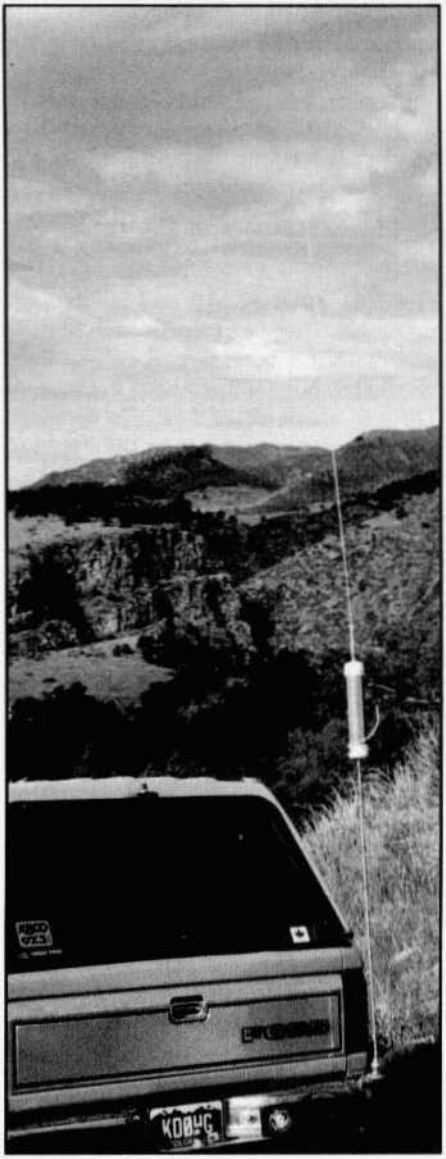
Lyons, CO 80540

Over the last few months, I've had several conversations with N6CSW that have gone something like this - "... C'mon, Barry, there's been a zillion articles written on HF mobile operation... does the world really need another?" Well, given the increasing popularity of taking boat anchors on the road, perhaps it's time for *ER* to jump on the bandwagon! There are a number of tangible benefits to taking the show on the road, and there's some 1990's products available that make goin' mobile easier and more effective then ever.

One of the major motivational forces behind my purchasing my Gonset G-76 AM transceiver for mobile use was the ridiculous amount of time spent in my truck driving to my former place of employment. For most of the last thirty years I've had a two meter rig in my vehicles: first a Lunchbox on AM, then a Sidewinder for SSB, and a succession of FM rigs. Unfortunately, the last few years have wrought major changes to two meter FM: discussions that formerly kept my attention have been replaced by seemingly endless autopatch calls to spouses and other by the new ".34/ ten-four" crowd. I was beginning to wonder if I needed a "handle" instead of a call sign; the FM rig went into the closet and the Gonset was installed in its place.

Getting Started

Of course, the obvious place to start is deciding which rig to use in the old buggy, and where you're going to put it. No matter which vintage rig is chosen, it's probably going to take up front passenger seating or floor space, so construction of an easily removable mount or carrier should be considered. My first



"Boulder Bill" operating mobile in "Colorful Colorado".

AM mobile rig was an Elmac A-54 and PRM-7 combination built into a small plywood chest that also contained the power supplies and a shelf for mic, key and a few crystals. This home-brew carrying case normally sat on the passenger's seat and could be strapped in place with the seat belt. The use of quick-connect power jacks made installation and removal quick and easy. When not in use, the whole chest could be kept in the trunk of a car, or in my case, the back of a pickup truck.

Running AM mobile is, as a baseball club's manager once put it, "Deja Vu-all over again". We face the same rig selection decisions today in the 90's as hams of the 50's did, and the solutions are pretty much the same. There are a few commercially manufactured AM rigs suitable for use; those most commonly available are the compact receivers and transmitters made by Multi-Elmac and Gonset. Other usable options include the use of military surplus such as the ARC-5 Command Sets. This is one area to be creative and have a ball - there are a number of military rigs that could be run from a modern alternator-equipped vehicle with the use of today's inexpensive inverters - see past issues of this magazine for ideas. And, of course, there's always 100% homebrew. On AM, most of them run something like 100 watts PEP with a 25 watt carrier, while real vintage iron like the G-76 will make 70 watts of 100% modulated carrier or darn near 300 watts PEP. Someday I'd like to install a high-powered ART-13 in the rear of my vehicle with only the pilot's remote control box and a portable short-wave receiver up front. Was that a Zero in my mirror? Naah, only a Mazda...

There are considerably more options available when running vintage sideband mobile and few reasons not to. Not only are the innumerable rigs by Drake, Collins, Heath and Swan relatively inexpensive, but mobile power supplies are fairly common. As a bonus, many of these rigs run several times the power input of your garden variety 100-watt Japanese and a few can even run AM. Check it out!

Antennas and Etcetera

In the past, perhaps the #1 impediment to radiating a respectable signal from a vehicle was an often inadequate antenna system. The specifications list for a short radiator to be an efficient one is short, but often ignored by the manufacturers of stylish, visually pleasing mobile whips.

1. The antenna should be as long as practical.

When properly mounted and supported, a 12' mast/whip is an eminently practical proposition. Such a structure is fully 50% longer in terms of wavelength than the 8' whips commonly sold more on the basis of aesthetics and convenience than performance.

2. The loading coil must be efficient and have high Q.

This rule is also commonly violated by manufacturers of those 'pretty' antennas. Most of us know what a high-Q quality inductor ought to look like: Preferably air-wound without the use of a lossy coil form and with a large diameter-to-length ratio. Again, the antennas many amateurs have used incorporate long, skinny, low-Q loading inductances wound on a moisture-absorbing coil form and coated with a thick layer of plastic insulation.

These crucial points and a number of others have been adequately covered in past amateur antenna literature, so they won't be detailed here. Those contemplating the purchase of a new mobile antenna would do well to review the article "California Mobile Antennas and the Moment of Truth" published in the September, 1995 *QST*. This article presents the results of field strength tests of a number of mobile antennas; over 10 dB of difference exists between various commercially manufactured mobile

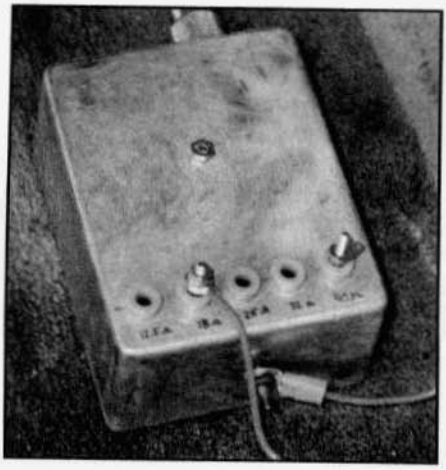


Figure 2. Exterior view of the author's broadband impedance matching autotransformer. At one end is the coax connector to the rig and the other end has multiple taps from 12.5 ohms to 40 ohms to match a 50 ohm line to the antenna.

antennas! Lastly, one should remember that the signal radiated by an infinitely small isotropic antenna is only 2 dB down from that radiated by a full-sized dipole. Small antennas can, and will work well, but only if properly designed.

If one consults literature on electrically short antennas it becomes obvious that the resistive component of the feedpoint impedance will be significantly below 50 ohms. The losses inherent in the antenna and its environment appear as a resistance in series with this low impedance; an inefficient antenna, when resonated, will have a much higher feedpoint impedance than calculated. Because of this, many antennas such as the Hustler offer a good match to a 50 ohm line. By the same token, an efficient antenna such as one of the brands of Bugcatchers will exhibit a feedpoint impedance significantly less than the 50 ohms most rigs are designed to load into. This would mandate the use of some sort of impedance matching device between radio and antenna.

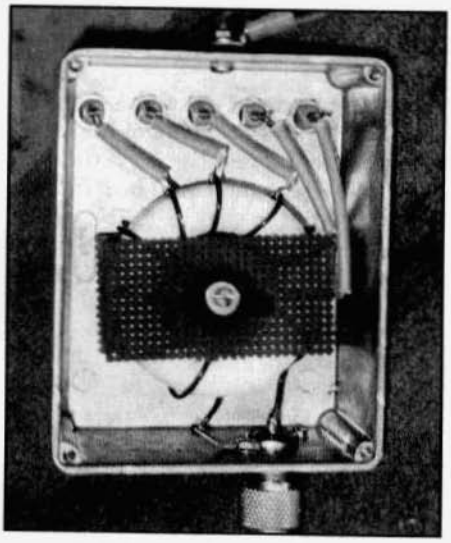
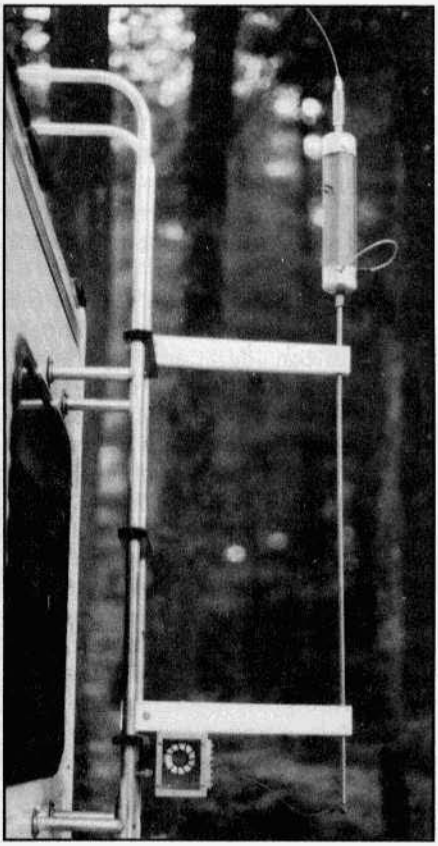


Figure 3. Interior view of the autotransformer.

A boatanchor radio has more than enough knobs to twist and I didn't want to add the complexity of an adjustable tuner to my installation. Figure 2 and 3 are photos of a broadband impedance-matching autotransformer I designed for use in lieu of a tuner. The matching transformer consists of a single twelve-turn winding of #14 enamelled wire wound on an Amidon FT-240-61 ferrite toroid core. The core and wire are sold together as part of Amidon's 1 KW balun kit. They offer two balun kits; one has an iron-powder core included and the other provides a ferrite core of much higher permiability. I recommend the use of the latter kit. Cover the core with a layer or two of a fabric-based insulating tape; 3M glass-cloth tape is ideal. Wind a dozen evenly-spaced turns of the wire provided in the balun kit on the core and mount it into an enclosure suspended between a couple of chunks of perf or PC board material. One end of the winding is grounded; the other 'hot' end is connected to an SO-239 coax connector that is the 50-ohm feed to the mobile rig. The winding is tapped once per turn beginning one turn from the



Dale Gagnon's, KW1I, installation on his motorhome. He consulted KDØHG and the installation is almost identical. However, Dale used standoffs made of a plastic bar stock to keep the antenna away from the body of the motorhome. ***Editor's Note: Dale visited us in July and I was very impressed with the way his mobile station performed. When he got into Colorado we operated on 75 meters and at no time did we lose contact. Distances varied from 4 or 5 hundred miles down to just a few miles.***

hot end; going towards the grounded end the taps are labeled 40, 32, 25, 18 and 12.5 ohms, respectively. One of these taps will allow a 50-ohm line to be matched to the low impedance exhibited by an efficient short antenna. In the case of my own installation of the Texas Radio Products BG-1000A Bugcatcher which is about 130" long, I found the 18-ohm tap to be optimum on 75/80 meters and the 25-ohm tap ideal when operating on 40.

Lastly, no article on mobile operation would be complete without a mention of RFI. While the open road may offer freedom from power line and light-dimmer interference as well as those dreaded "I'm getting you on my TV and phone. . .*&%%$. . ." calls, there are time-worn procedures that need to be followed in precluding interference problems to or from a vehicle's electrical control systems. Probably most important is to ensure the electrical integrity of the vehicle/ground plane. Bond everything together - and to the frame - with copper braid or strap. This includes items such as the hood and trunk lids as well as the outlet end of the typical rubber-isolated tailpipe. Securely ground the transmitter with a short length of braid run to the nearest substantial ground. Spending an afternoon on this detail will go a long way towards preventing problems 'down the road'. In spite of being equipped with three computer-controlled systems, my vehicle has only displayed one minor problem when the Gonset is transmitting: the tachometer wiggles about 1000 RPM in response to modulation. This is not entirely unwelcome - having a combined tach and modulation meter.

In my book, HF mobiling has been a heck of a lot of fun. Over the last year or so I've managed to work about 20 states on 75-meter AM without really working at it. Using the Gonset, I've received reports of better than Q5 S-9 from as far east as upstate New York, once receiving a +20 over S-9 report from W8VYZ in NE Ohio while I was driving through Boulder. Many times I've been told something to the effect of, "You can't possibly be mobile with that signal. . ." (Smile, stick mic out window; honk horn.)

continued next page

Gonset + Ford = Fun from previous page

ER welcomes your story on mobiling with the old iron - and remember - watch those fast food drive-throughs, garages and low flying pigeons. ER

References

Tall 'Bugcatcher' style antenna without capacity hat:
Texas Radio Products
5 E. Upshaw
Temple, TX 76501
(817) 771-1188

Bugcatcher style antenna with capacity hat:
GLA System
P.O. Box 17377
Hattiesburg, MS 39404
(601) 261-2601

Ferrite toroidal coil forms and balun kits:
Amidon Associates
P.O. Box 956
Torrance, CA 90508

Gateway Electronics, Outlets in St. Louis MO and Denver, CO also stocks Amidon products.

GEE, I'M SORRY -- I'M SO USED TO THEM, I FORGET THEY'RE THERE

122 VFO from page 25

1.9 MHz and operating the transmitter input/oscillator stage straight-through on 160 or doubling on 80 (which is exactly the scheme everyone I have spoken with assumed that Johnson and Heath were using all along). If you do not intend to operate on 160 meters, use the VFO as is, benefitting from the high-level 80 meter output on its "160"/80/40 range.

While discussing these VFOs, a few mechanical improvements might be worthy of consideration. Anyone who has used them will have encountered their tendency to skid around the operating desk because of their light weight and comparatively hard rubber bumper feet. I eliminated the problem with a piece of 1/4-inch steel plate fastened to the inside of the bottom plate, and replacing the bumper feet with wide strips of self-stick foam urethane tape sold in tool and sports shops as "Comfort Tape." Start-up frequency drift can be reduced by relocating the OA2 regulator tube and B+ dropping resistor to a small minibox which can be plugged directly into the transmitter VFO power socket. Finally, to separate the VFO from the transmitter by a distance greater than the limit imposed by the standard 3-foot length of RG-59 VFO output cable, the coax can be changed to 5 feet of RG-62 without upsetting VFO output circuit tuning.

The old adage that, "What you don't know won't hurt you," does not apply to ham radio, where adaptation of commercial equipment to unique circumstances demands knowedge of how things really work. In fact, we become inquisitive when it appears that "Things are not always what they seem to be." Taken together, these two adages characterize the peculiar "160 meter" output from the 122 and VF-1. Hopefully, the account related here will create a better understanding of these VFOs and facilitate their adaptation to a variety of transmitters. ER

CE 600L from page 9

sult was inexpensive, light weight, and broadbanded. . .what more could you want?

One unanswered question is why this design wasn't copied more. One thing is for sure, the average homebrewer would have a devil of a time trying to make these things work. And maybe that was the problem Central Electronics had as well. . . too much fiddling to get the right values. Or was it just the acquisition of CE by Zenith which ultimately brought about the demise of both CE and this technology? One of these days I would like to talk with Batchelor about it. I understand from Dennis, KØEOO, that Joe is alive and well and still designing circuits in his eighties! One thing is for sure, he did a great job on the 600L.

There are a couple of other features which are worthy of note. These, too, were ahead of their time, but went on to become widely adopted in the industry:

- meter that reads power directly (not a great engineering feat, but handy nonetheless)
- protection circuit for the 813 from high SWR
- built-in SWR circuit and direct reading RF ammeter without the use of a thermocouple ammeter
- plate current protection circuitry
- ability to source blocking bias either internally or externally.

I only made one minor modification to the 600L and that is easily reversed for the purists. CE provided a two-prong AC socket on the back that was wired in series with the plate supply primary. Normally, a shorting plug or shorting contacts were connected across this point. I don't like using AC plugs for anything but AC power. Besides, running 10-12 amperes through this little plug seemed odd. I connected the two leads together permanently and rewired the socket so that 117 VAC appears across the contacts when the plate circuit is energized. This was used to power a bypass relay that could be keyed from a transceiver. Thus if the plate supply is off, the bypass TR switch goes straight through to the antenna. When the plate switch is on, and the transceiver is keyed, the bypass relay runs the output of the transceiver through the amplifier. . .works like a charm.

The amplifier, as previously discussed, works extremely well up to 20 meters and then falls off a bit on 15 and 10. I have even run the 600L as a linear on AM although the efficiency is necessarily low (a little less than 40%). I have operated it on 75 meters with about 250 watts in (limited by the plate dissipation of the 813) and about 100 watts out. I got some great reports. If you put good audio in, good audio will come out.

The bottom line is, that if you see one of these at a swapmeet, or in an ER classified, pick it up without hesitation. At the very least you will get to enjoy some classic equipment that can more than hold its own with the present day amplifiers. As their ads used to say, "at 400 watts out there is less than 1 S-unit difference compared to a 2 kW PEP input amplifier" (<1500 watts out). I guarantee you won't be disappointed. This amp was built to last a lifetime and given the fact that it is coming up on 40 years old, I would have to say they did a great job. Now if I could just find a nice 100V or 200V to go with it. . .hmmm, let me check those ER for-sale ads again. **ER**

Footnotes:

1. Steve Thomason, "RF Attenuators", Electric Radio, #70, Feb. 1995, pg. 28.
2. "Recent Equipment: 200V Transmitter", QST Aug. 1961, pp. 46-50.
3. Dennis Petrich, "Restoration of Central Electronics 100V", Electric Radio, #30, Oct. 1991, pp. 20-25.

Tiny Oskey from page 11

When the key is up, there is no ground reference to the voltage doubler's negative supply, so the sidetone oscillator is off and only the receiver's audio is gated through to the headphone output jack. When the key is down, the cathode keyed transmitter is keyed, and the voltage doubler gets a ground reference. This turns off the first 12AU7 stage while turning on the sidetone oscillator. As a result, only the sidetone signal appears at the headphones output.

The switch S2 puts "Tiny Oskey" in or out of the line. With S2 open, the sidetone is silenced and the receiver audio comes through, even with the key down. That allows you to monitor your actual signal when desired. With S2 closed, "Tiny Oskey" is operational and works as described above.

The transformer used for oscillation feedback in the sidetone oscillator is specified as an audio interstage transformer of 3:1 ratio. I used a 2:1 miniature transformer I got new for about $2 from Mouser Electronics (part number 42TM027) And it works. But don't try to use Tiny Oskey with a modern 8-ohm headphone. In 1957, headphones were high impedance, and so is the output of the 12AU7 amplifier/mixer, as designed. With my high impedance headphones in the socket, it worked just great. With an 8-ohm Kenwood HS-5 plugged in, forget it. There was insufficient audio from the HQ-110, and the audio gain on the 75A-4 had to be pushed up past 5.

Weekend Homebrew Project

For you CW men out there, with cathode keyed transmitters (I have two), "Tiny Oskey" might be just the thing to streamline your operating procedures. It is easily built in a couple of hours, and requires virtually no scrounging around for parts.

Keep in mind, though, that neither "Little Oskey" nor "Tiny Oskey" is muting the receiver's front end — just its audio. So, if you are using it for full break-in operation, make sure your receiver's front end can handle whatever RF signal is getting into it, and that your AVC can recover sufficiently between code characters.

Since I don't operate my vintage equipment in full break-in mode, my receivers are muted when I throw the transmit/receive switch. "Tiny Oskey" lets me monitor my sending without having to first lower the receiver's gain. And that's just what I was looking for. **ER**

Les, K6HQI, Silent Key from page 3

used to tell us when our audio was low.

Les was also good at gently admonishing anyone who made an "old Buzzard transmission" when there were a lot of stations on frequency.

One of my best memories of Les was when I sponsored what I called a "Twenty Meter Allnighter" on 14.286 about 4 years ago. He was there the entire night. I gave up about 5 in the morning.

Two years ago Shirley and I were travelling back from Dayton with Bill, AD6A and his wife Pam, WA6SJL. They had a Kenwood TS-50 mobile setup that put out about 20 watts on AM. I gave Les a call and we talked all through Oklahoma. It was the first time Bill and Pam had heard Les and they thought he was just great and they couldn't believe his signal. He was a great ambassador for all us AM'ers.

I should mention that Les was a combat veteran of WW II. He was severely wounded and lost a leg.

Les will be missed by us all but he will live on in our memories.

I invite other friends of Les's to send in their reminiscences. We'll print them next issue. **N6CSW**

CLASSIFIEDS

Advertising Information

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

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

VINTAGE EQUIPMENT ONLY

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

DEADLINE for the OCT. Issue: OCT. 3

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

FOR SALE: HS-30 headsets, Cl dated 1944, brand new, in sealed, waxed, protective cartons. Extra earpieces, dessicant, instructions, cord, included. Used with virtually all WW II and many later combat and clandestine radios - $20. Gene, KD4YIZ, (800) 619-0900.

FOR SALE: New book on tube type xmtrs, xcvrs, linears & more. 1922 through 1970. 550 pictures, 105 manufacturers, 550 models of xmtrs/xcvrs & more - $17.95 including postage. Add $2 for Canada. Calif. add appropriate sales tax. Ready for delivery. Sound Values, POB 9, Auburn, CA 95604.

FOR SALE: SX-43, restored, no spkr - $170; Heath ID-22 - $20; salvaged trans, chokes, switches, relays, etc. call for info, u-pay UPS. **WANTED:** Zenith 85359 pb osc module. Ted Stewart, W6NPB, 2157 Braemar Rd., Oakland, CA 94602. (510) 531-7042, FAX 531-7072.

FOR SALE: 2 Zenith black dial consoles, 1056/99 - $150, 105567 - $225; (Bunis-2) Philco 39-45 console - $150. All consoles restored & working. Request pick-up only; **WANTED:** Orig. knobs for function switch & meter switch on the Globe King 500A; final tank coil for the 500A. John Packer, W3QCL, 318 School St., Springdale, PA 15144. (412) 274-4734

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

FOR SALE: Collins KWS-1 #1460 w/spinner knob, antenna relay, spare finals, manual & 75A-4 #5017 w/spinner knob, 3 filters, 312A-1 spkr, manual, both exc - $3850; Johnson Viking 500 - BO; T-368-F, very clean w/manual - $950; late EAC-built R-390-A, overhauled by Rick Mish - $600; Ranger, very nice - $300; B & W 5100-S - $350; HT-37 - $200; Hammarlund SP-600 - $400; Central 100-V, exc - $500; round KWM-2A/PM2 w/winged 312B-5 - $1800; HT-32A - $250. **WANTED:** HQ-180A. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/FX (313) 454-1890

FOR SALE: Receiving tubes, new and used; multi-section twistlock electrolytic caps to 500-VDC; SAMS photofacts. Send stamp for lists. Turner Electronics, 16701 Main St., Ste. 121, Hesperia, CA 92345.

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

FOR SALE: Viking II CD w/122 VFO, works fine, cosmetically rough, w/manuals - $150; SB-300 - $30; or TRADE for military gear.. Mike Heltborg, WA7NPA, 191 Tote Rd., Washougal, WA 98671. (360) 837-3560

WANTED: Collins pre-WW II xmtr models 30W, 32A, 32B, 32G, 30FX & 40B, desperately needed to finish my station. Paul Christensen, N9AZ, 11142 Raley Creek S., Jacksonville, FL 32225. (904) 646-0129

WANTED: National/RCA/Hammarlund. National AGS w/coils for 5 bands; National SW-3 w/588-AB ps; RCA RAL; HRO-60 (rack mount type). Taka, CA, (415) 697-6719.

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

WANTED: HRO plug-in xtal for HRO variation two (only xtal). Tajima, JA1DNQ, c/o The Nakagawa's, 22942 Cedarspring, Lake Forest, CA 92630.

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

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

WANTED: SX-42, SP-400 only in very good condx. Jose Cangas, EA4JL. Contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: B & W HDVL coils; 500 watt multi-match mod. xfmr. Martin Peipenburg, W9OLD, RR1, Box 56B, Monterey, IN 46960. (219) 542-2591

WANTED: Collins 62S-1, 30K, 353A-60 & 353B-60 (mech filters adaptors for HRO-60 & SP-600). Butch, KØBS, MN, (507) 288-0044

WANTED: Clegg Zeus & Interceptor in good condx. Harold Deppe, NY7Y, POB 31656, Tucson, AZ 85751.

WANTED: Knight T-60; J-38 key & Blue Racer bug. Bob Braeger, WA6KER, 6634 Navel Ct., Riverside, CA 92506. (909) 682-5084

WANTED: PRC-47, nice condx. Tom, N5OFF, LA, (318) 989-3430, n5off@w5ddl.aara.org@usl.edu

WANTED: Alignment instruction for Clegg Intercepter. Harold Deppe, NY7Y, POB 31656, Tucson, AZ 85751

WANTED: Hallicrafters SX-122A VGC to mint. James B. Geer, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: National HRO RX's w/coils; CQ 1976-1989. Dong-Hyun Cho, Biology Dept., Kang Won Natl. Univ., Chun Chon 200-701, South Korea.

WANTED: Schematic service manual Allied SX-190; Squires Sanders SS1 BS. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: National HRO w/ps & coils. Can pick up in Calif. or pay for shpg. Joe Lavery, 744 E. Clara St., Port Hueneme, CA 93041-2816. (805) 488-8753

Vintage Manuals Available
for amateur, audio, and radio-related equipment. Quality is always our number one customer priority. Catalog, two $.32 stamps. Pete Markavage, **Manual Man**, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

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

WANTED: KWS-1; HF-380; 62S1; R-389 and SP-600JX. Need exc. condx. Mitsugu Shigaki, JA6IBX, 2825 -2. Jozan Kamidai Machi. Kumamoto. 860 Japan. FAX Japan-96-329-4601

WANTED: Squire Sanders SS1BS, SS1RS, SS1V, SS1S. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252

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

WANTED: HI-FI spkr's & enclosure by Altec, Electrovoice, Jensen, JBL; tube components. Tim Phelan, 845 Lilybud, Ballwin, MO 63011. (314) 227-9264.

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

WANTED: Schematic Precision E200C (6U8, 6AU6, 5Y3); one small green knob for Heathkit HR-10. Jack Berthoff, WA4CSM, 8109 NW 58 Ct., Tamarac, FL 33321. (305) 721-2317

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

WANTED: National NC183D rcvr, any condx, reasonable. Hoover, SC, (803) 726-5762.

WANTED: TBY-7, BC-222, WW II Japanese military radios of any kind. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, Japan. FAX 011-8145-301-8069

WANTED: Manual or schematic for Olson RA570, 6 meter xcvr. Will pay. Fred Hooter, WØBMT, 205 E. 4th St., Neligh, NE 68756. (402) 887-5201

WANTED: Heath SB310 rcvr; Collins 62S-1 transverter; CP-1 crystal pack; noise blanker for KWM-2A. Don, N6IDY, CA, (818) 368-7374, callbook adrs.

WANTED: Help! What type bulb is used to indicate Shorts in Hickok 533 tube tester? Jim Hanlon, W8KGI, POB 581, Sandia Park, NM 87047. (505) 281-0814

FOR SALE: New Collins PJ-068 mic plugs for S-line/KWM-2 - $8 each. Clint Hancock, KM6UJ, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: National NC-183 w/large matching spkr & orig manual, electrical condx, exc, appearance VG - $275; Hammarlund HQ-145 exc condx w/manual copy - $195; Wollensak Portable 7" reel-to-reel tape recorder, VGC w/spare tapes & manual - $50; Heath RLC bridge model IB-5281, NIB never assembled, complete - $95; General Radio audio freq mtr model 434A, good condx - $35; Tektronics scope plug-ins type 1A1, 53C, 53/54B, G, N, 3T2, & 3S2, phone for details; Micromatch model 262 power indicator w/manual copy but no pickup coupler, as new - $20. Clyde Sakir, N7IOK, 4243 E. 1st St., Tucson, AZ 85711. (602) 323-1120.

FOR SALE: HP 410-B selector switch assy. NOS complete switch & components - $15 + shpg. John, Box 905, Grover Beach, CA 93433. (805) 473-3235.

FOR SALE: National NC-183 w/spkr & manual, VG - $140; National spkr for NC-125 - $30; Howard 440 - $80; Hallicrafters SX-73 R-274/FRR manuals 100 pgs NOS - $10. All + shpg. Dan Mason, R Rt.1 Box 204F, Santa Fe, NM 87501. (505) 455-3416.

NOTICE: Ham Auction, October 28, Lexington, Neb., at K/C Hall, 9 AM check-in, 11 AM sale starts. Contact WA0JRM, Gary Reiss, Rt1, Box 141, Wilcox, NE 68982. (308) 995-5541.

FOR SALE/TRADE: Hammarlund Super Pro SP210X, BC779A, w/ps, works, cosmed fair - $150; Bogen MT330A PA amp - $20; S38E - $20; EC-1 - $45. **WANTED:** Johnson Valiant meter, parts rig, Johnson 500; NC173R; NC183 DR; NC183T dark, 183 table or rack spkrs; Select-O-Jeck; unmodified orig Valiant. Sam Champie, KD7XX, 105 W. Mckenzie, Hermiston, OR 97838. (503) 567-2879.

FOR SALE: Radio Marine Corp Shipboard AM radio station, includes: radio console CRM-8B, less rcvr; MF xmtr, ET-8051C; HI freq. xmtr, CRM-TIC-1000; rectifier, modulator, RM-147B; manuals, exc condx - $1550. Bob, WB6EZK, POB 1081, Sausalito, CA 94966. (415) 332-3905, FAX 332-1305.

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

FOR SALE: Navy TBS xmtr w/manual, pick-up only. Ted Bracco, Quincy Univ. 1800 College Ave., Quincy, IL 62301. (217) 228-5213.

FOR SALE: Sig gens., substitution boxes, too numerous to list. SASE or FAX for list. John, WB8IPG, MI, (810) 362-2656, FAX 362-2706.

TRADE: 40-70's QST, CQ's, 60's Ham Radio for QST's CQ's, other mags, sales lit, etc. Newell, VE7AEC, Canada, (604) 943-6033.

FOR SALE: Johnson Valliant - $325; JMbox 275W - $90; JMB 275 W w/SWR mtr - $120; DX100 - $150; Heath HW-22A working w/sply - $75; Yaesu YP150 dummy load watt mtr - $125; ARRL Handbooks, many AM rigs. LSASE for list. WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149.

FOR SALE: Eico 460 scopes, good crts, manuals, repairable - $20 ea. Louie, NY, (718) 748-9612 after 6 PM local only.

FOR SALE: Hammarlund HQ-180C & spkr, near mint - $325. Dan Merz, 312 Sierra, Richland, WA 99352. (509) 375-1334.

FOR SALE: AM fone patch US army #1200 GRC NOS - $20. Joe, CA, (916) 731-8261.

FOR SALE: DY-17A/ART-13, complete in following condx's: NOS - $55; good - $40; parts unit - $25. UPS about $20. Robert W. Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043. (713) 467-5614.

FOR SALE: BC-348R w/dyn - $250; ARC-5 xmtr & rcvr. Ken Kolthoff, K8AXH, 5753 David Pl., Fairfield, OH 45014-3507. (513) 858-2161.

FOR SALE: Clegg 99er VG condx, working, manual; Gonset III 6 mtr, fair. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373. (513) 339-1546

FOR SALE: KWM-2A, 516F-2, 30L-1 round, exc, no shpg. Jon, KØDTA, 8311 5th Ave., S, Bloomington, MN 55420-2329. (612) 881-9037

FOR SALE: HP volt mtrs 400H (RM), 400L, 403B, new batteries; Heath AV3 audio voltmeter. Don, W7KCK, OR, (503) 289-2326.

FOR SALE: SC101 lamp hoods & slug rack covers for 75A-4. Butch, KØBS, MN, (507) 288-0044.

FOR SALE: Swan 240, GC, manual copy, no PS - $75, includes shpg. Patrick Marineau, K9HF, 5055-1/2 Lakewood Ave., St. Louis, MO 63123. (314) 752-3611

FOR SALE: National NC-100 w/matching spkr, exc. electrically good cosmetically - $175, prefer local PU. Michael, KH6KD, MA, (617) 581-5479.

FOR SALE: Heath SB200 cabinet, VGC. John, WAØJYJ, CO, (303) 249-2751.

FOR SALE: Half-spool of Belden # 8235 heavy-duty, transmission-quality 300Ω twin-lead - $25. John, WB8IPG, MI, (810)362-2656, FAX 362-2706.

FOR SALE: Hallicrafters S-108 rcvr - $85; Tempo 2020 xcvr - $200; R-388 rcvr - $250. All exc w/ manuals. Burt, MI, (517) 736-8020.

FOR SALE: Heath VF-1 VFO, exc condx - $100. Craig, WA9HRN, IL, (708) 367-1599.

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

FOR SALE: SW-3 replacement plug-in coil forms - $7.50 ea; short wave coil book - $4; SW-3 story - $5; WD-11 plug-in replacements - $20 ea.; WD-11 adaptors - $5 ea. All the above less shpg, add $2 shpg. James Fred, R1 Box 41, Cutler, IN 46920. (317) 268-2214

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

FOR SALE: Very nice Viking Ranger - $275; exc SX43 - $175. Buyer pays packing, shpg. Merle Cox, W7YOZ, 12411 86th Pl., NE, Kirkland, WA 98034.

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

FOR SALE: Collins 300J broadcast xmtr, tuned for 80 &160 meters - $1950; pair Eimac 3-1000Z's, 1 new, 1 as new - $800 pair; chimneys - $100 ea. Gary, KE6MS, CA, (310) 696-0177.

FOR SALE: Hallicrafters Cyclone (SR400) front panel (NOS), might be last one that exists. (Not Cyclone II or III) - $200 or trade. Craig, WA9HRN, IL, (708) 367-1599.

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Western Heritage will be closed for renovations from January 1 to approximately May 1.

Equipment donations can still be shipped to a temporary location. Please contact Leo for instructions.

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Remember Western Heritage (with the new facilities) will be one of the few museums anywhere open six days a week with 14 people to serve you.

For more information contact Leo Meyerson, WØGFQ at (402) 392-1708, May-Nov.; 619) 321-1138, Nov.-May.

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

WANTED: 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: AL4 rotating loop antenna for the Drake SPR4 radio. Clyde Hixson, 3907 Columbia St., Des Moines, IA 50313. (515) 243-7930

WANTED: Repairing an Eico model 425 5" oscilloscope. I have the manual w/schematic but no component values or system voltages are shown. Can anyone help? Vince, WA2QAP, 402 VMI Parade, Lexington, VA 24450.

WANTED: Help! Need PE-104 vibrapack & technical manual for BC-654A. Norm Hall, W6JOD, 6506 Jetta, Bakersfield, CA 93308. (805) 399-4101

WANTED: Silver 802 & Silver 701 by McMurdo Silver Co. Larry Flegle, N4TMW, 210 Wylie Ln., Woodstock, GA 30188. (800) 298-0765

WANTED: National NTX30; Hallicrafters HT6 or RCA ACT 20 xmtr; type 1CP1 CRT. John Zitzelberger, WB6JJE, 1673 Devonshire Ct., Thousand Oaks, CA 91361. (805) 449-1036

WANTED: Heath SB-313; Gonset G-28; Swan 140, 350A, MB-80/A. Herman Cone, WB4DBB, 305 Foxwood Dr., Goode, VA 24556. (540) 586-5643

WANTED: SRR-11-12-13 or FRR 21-22-23 rcvrs, manuals or schematics. Ray Blackford, WA1ZYE, Box 6591, Edison, NJ 08818. (908) 892-6537, 9-10 PM

WANTED: Collecting early Heath gear 1940's - 1950's; early Heath catalogs and literature; Heath mics, spkrs, supplies, access., any parts units. Byron, WA5THJ, 1215 Fresa Rd., Pasadena, TX 77502-5017. (713) 941-3631

WANTED: Collins 75A1, A2's, A3's, 75A4's; coil set for the 310B1 exciter. Bob Kemp, POB 470, Lake City, MN 55041. (612) 345-5345 (d)

WANTED: RAL & AN/BRR rcvr's. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051.

WANTED: Clean or mint spkrs for NC-300 & NC-183. Clint, KB5ZHT, 107 Forest Oaks Ln., Lake Jackson, TX 77566. (409) 297-3338

WANTED: Hallicrafters HT-9 xmtr & spare parts, info etc. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

WANTED: Eldico TR-75 xmtr. Don Temple, AF0C, 5405 S. Florence Ct., Englewood, CO 80111. (303) 779-0923

WANTED: Ameco TX-86 & KNWD T599 xmtr's. Paul Vaughn, 2317 Williamson Rd., Williamson, GA 30292.

WANTED: Touch-up paint for Johnson Valiant II, Ranger II, etc. Gary, AA5QT, 18615 Big Cypress Dr., Spring, TX 77388. (713) 355-6153

WANTED: Hammarlund HC-10 SSB converter; Heath SB-620 Spectrum analyzer for 500 kHz IF from Collins R-388. Al Kaiser, W2ZVR, 713 Marlow Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: Hallicrafters HT-40 Mk1 &/or HA5 VFO; clock cover for HQ-100AC. Jim Berry, WA3JAT, 2512 16th St., Cuyahoga Falls, OH 44223-2048. (216) 922-0158

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

FOR SALE: Heath HR-1 rcvr, HX-1 VFO & DX60B, very nice - $300; Measurements model 59, UHF head - $125; Heath HD-1250 GDO - $35; Eico GDO model 710 - $35; ARC-4 control head & connector - $35; used 3-500Z - $35; mod xfrms - Thordarson T-11M 98 - $100; Thordarson T-45916, primary 8000 ohms - $100. George, K1ANX, MA, (413) 527-4304.

FOR SALE: 30L-1 xfmr, new - $100; SBE-34, SB2-LA amp - $250; SB-104A, spkr/sply/VFO, mint - $375; Drake SSR-1 - $110; Swan 350, spkr/sply - $175; Drake TR-4, MS-4, AC-4 - $225; Heath HR-1680 rcvr - $45. +shpg. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

FOR SALE: Heath IM-11 - $20; IT-27 - $10; IT-28 - $30; IM-5210 - $15; SB-101 & B&K scope model 1460 - $75. Frank, W8SET, WV, (304) 343-0415.

FOR SALE: Heath HW16 CW xcvr; Heath H6108 VFO. Will TRADE for AT-1. KD4FZK, don.patton@cornucopia.digital.net

FOR SALE: Hallicrafters S95 rcvr, exc. cosmetic condx, rcvr not tested - $75 includes shpg. Olde Tyme Radio Co., 2445 Lyttonsville Rd., Ste 317, Silver Spring, MD 20910. Phone/FAX (301) 587-5280

FOR SALE: Radio parts, tubes, meters, Galena crystals, at very low prices. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150.

FOR SALE: BC-610E HV xmfr - $60; 27V, 300 amp 310 lbs - $60; RME 45 repairable - $45; complete working R-174 w/pwr - $125; 12-4500 mFd 200 VDC computor grade caps - $2 ea; 4-2x15 amps line filter - $4 ea; 4 20 amp switch breakers - $1.50 ea; 12 VCT 24 VCT 20 amp xmfr - $10; 1000 VCT 150 mils xfmr - $3; 60 VCT 10 VCT 6 amp xmfr - $3; 8-2800 mfd 55 VDC caps - $.50 ea. U-ship. Mike Nichols, 10010 W. 59th Pl., #4, Arvada, CO 80004. (303) 431-7298

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

TRADE: Collins KWM2-A, RE, w/pwr sply for linear amp, 160-10. Bob, K4CSV, 821 S. 14th St., Fernandina Beach, FL 32034. (904) 277-7061

TRADE: BC-654A w/PE-103-A pwr unit, cables, for BC-610 or what have you? Alan Barlow, WA6FMZ, 8838 W. Hill Dr., Piñon Hills, CA 92372. (619) 868-6383

FOR SALE: TR-3 - $200; Hallicrafters control box - $100; BC-610 speech amp - $60; Swan 350C AC/DC - $225. Andrew, PA, (717) 749-3631.

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

FOR SALE: WW II connectors, PL153A, mint - $5 for one, $3 ea for 3 or more + shpg. Jeary Vogt, 3 Brampton Rd., Malvern, PA 19355. (610) 296-2162

FOR SALE: Globe Chief 90 - $75; National NC66 - $75, UPS paid. **WANTED:** 7HTF3 ballast tube. Howard Hood, WA7QQL 5670 SW 44th St., Port Orchard, WA 98366. (360) 674-2179

FOR SALE: Collins R-648/ARR-41 Handbook. You get a copy of all 4 military technical manuals, sprial bound in a huge 362 page handbook - $45. Bob Bakinowski, AZ, (520) 624-8029.

FOR SALE: Hammarlund SP-600-JX-17 Handbook. You get a copy of the factory manual plus 5 Military technical manuals, spiral bound in a huge 332 page handbook - $55; factory manual sold separately - $25. Bob Bakinowski, AZ, (520) 624-8029.

FOR SALE: R-390A Handbook. You get a copy of all 6 Military technical manuals, spiral bound in a huge 400 page handbook - $58. Bob Bakinowski, AZ, (520) 624-8029.

FOR SALE: New Amperite time-delay relays for the 30S-1 amplifier, Part No. 115NO120 - $20; Collins Red Label plug-in mech filter, F-455-Q-6 - $50; KWM-2A, 516F-2 - $595. Steve, WB4IJN, SC, (803) 873-2499 x 200 (d), 821-7749 (eves).

FOR SALE: KWM-2(w), 516F-2 - $500; Drake MN-2700 - $265; Conar 400/500 station - $150; Swan 117XC partial, 14A DC converter, VFO 210 - $150. Bill, WA1APX/8, MI, (810) 781-9717.

FOR SALE: Elmac A-54H w/PSA-500 AC sply, decent, working - $69; Gonset Communicator IV, 220 MHz, fair, works - $70; Lafayette KT-200 (HE-10) rcvr, nice but 3 knobs wrong - $70; Hallicrafters SX-43 w/R-44 spkr, VG - $169; Lysco Dipmaster GDO, like new in box - $45; Heath DX-100, some knobs wrong, untested - $75. Don Merz, N3RHT, 47 Hazel Dr., Pittsburg, PA 15228. (412) 234-8819 EST weekdays

FOR SALE: Holtzer-Cabot box-phone, 6" wooden cube, canvas strap, nice - $69; Wireless set #19 Mark II, untested, unmodified - $85; WS#19 dyn. sply, untested - $44; DAG WW II direction finder w/manual & loop, working - $235; PE-120B sply for BC-620/659, fair - $45; 2-position "ATR" rack (fits ARR-15, etc.) no connectors - $35; CY-1218 equiv. to JB-70 from SCR-399 truck, Hallicrafters tag, nice - $125. Don Merz, N3RHT, 47 Hazel Dr., Pittsburg, PA 15228. (412) 234-8819 EST wkdys

FOR SALE: SX-117 - $155; 75A-4 - $495; Eico 720 - $85; Heath TC2 - $25. Ed Sauer, KC9SP, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483

WANTED

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

WANTED: McIntosh and Thordarson amplifiers any condx. Marcus Frisch, WA9DXP, Box 28803, Greenfield, WI 53228-0803. (414) 297-9310

WANTED: Radar equipment, the bigger the better! Also early TV cameras. Allan H. Weiner, 507 Violet Ave., Hyde Park, NY 12538. (914) 471-9500

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

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

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

WANTED: Old tube amps & xfmrs by Western Electric, UTC, Acro, Peerless, Thordarson; Jensen, JBL, EV, ALTEC, WE spkrs. Mike Somers, 2432 W. Fargo, Chicago, IL 60645. (312) 338-0153

WANTED: Kleinschmidt "Teletype" equipment, literature, 7/8" paper tape, Hallicrafters elevating base for SX-42. Tom Kleinschmidt, 506 N. Maple St., Prospect Heights, IL 60070. (708) 255-8128

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

WANTED: T22/ARC5 xmtr; RE2/ARC5 antenna relay box. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Military radios RT-136/GRC-13, Soviet xcvr R-112, rcvr R-323. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

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

WANTED: Military radios. Any manpack, walkie-talkie, survival. Prefer working/cosmetically clean, premium for NIB. Particulary PRC-17, 21, 28, 63, 64A, 93, 103, 126; CRC/7; URC-64 pwr sply AM-65; RT-66-67-68/GRC; crank generators including G8/GRC & G-76G; test sets URM-30, AN/PRM-32, TS 2530/UR, URM-172; TRC-77 battery box, 12V pwr cable & TM. Harness for PRC-75. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Msg (310) 398-3840, FAX 398-7159

WANTED: Manual for Collins 476J-1 selective volt meter. Dave, NY, (315) 446-1258.

WANTED: TCS dynamotor type COL-211330, any condx considered, though good pretered. Carl Gottsmann, KN6AL, POB 971, Durham, CA 95938. (916) 899-8675, kn6al@ecst.csuchico.edu

WANTED: FM detector adapter to use w/455 kc IF rcvr. Gene, K5NYT, callbk adrs or genetulsa@aol.com

WANTED: Hallicrafters HT32 or HT37 pwr xfmr. Will buy entire rig. Jeff, near Detroit, WB8KZW, (810) 661-0202.

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

WANTED: 4 VT4C/211's, 1 VT25, TU5B, plate current meter, PE73C for BC375. Steve Gajkowski, KD3HT, RR2, Box 2712, Saylorsburg, PA 18353. (717) 992-6768

WANTED: Viking II spinner knob; LV choke (L2); Valiant II manual. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

WANTED: Collins AM/CW filters for 75A-4 & 75S-3B/C. Dean, KO6IJ, CA, (714) 643-7930. deanbers@ix.netcom

WANTED: Manuals or copies for WRL Globe Scout 65A, RME-4301, Heath Twoer. Bill Mayes, N6LKA, 873 S. 10th St., San Jose, CA 95112. (408) 280-7172

WANTED: TR relay for NCX5; crystals for VX-501 VFO console. N8RFD, OH, (614) 679-2164, call collect.

WANTED: Red anodized knobs for SP600-JX17; Hammarlund XC-100 calibrator. Grant, NQ5T, TX, (817) 491-2393, eves- collect.

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

WANTED: Military radios, any URC/PRC, manpack, walkie-talkie, survival, particularly URC-4, 64, 68; PRC-63, 93, 68, 47; RT-10, 20, 60. Pref. working/repairable. Additional contacts appreciated. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Msg/FAX (310) 398-7159

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

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

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

WANTED: Uniden CR-2021; Kenwood T-599 xmtr; Radio Shack DX-400; SB-610 scope. **FOR SALE:** 300W multi-match mod. xfmr, Stancor A-3898 - $125. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

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

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

WANTED: Best price or TRADE for your National SW-4 or Hallicrafter Sky Buddy S19 (not S19R). Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (617) 934-5043

WANTED: PE-110 pwr sply for SCR-543 (BC-669), Wireless Set #19 Mark II remote cable (12 pin connectors). Don Merz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST wkdys

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

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

WANTED: Manual, tech data, tubes & connecters for WW II German military rcvr "EK". Don Merz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819. EST wkdys

WANTED: Schematic or manual for Hewlett-Packard HP-606A sig. gen. Richard Pann, 2447 Yates Dr., Augusta, GA 30906.

WANTED: Cabinet HQ-145, 170, 180; mod. xfmr for Ranger II; Harvey-Wells Aps-90. Sam, N4VIB, 207 Middleton Rd., Chatsworth, GA 30705. (706) 695-5658

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

FOR SALE: Military ZB pilot's control box CZR-23214 - $16; ABA/BC-645 remote control box - $22; RBZ orig. manual - $40; TM-11-467 Radar System Fundamentals - $22; TM 11-296 PRC-6 Oper manual - $12; TM 11-4096 PRC-6 Field Maintenance Manual - $16; RCA Radiotron Designers Handbook, 3rd edition, 1941 - $26; CQ Mobile handbook, 1962 - $9; Sams "Post War Communications Receiver Manual CR-1", nice - $29; ARRL Antenna Book, 7th edition, 1955 - $11; orig. manuals: Globe 755A VFO - $10; Hallicrafters HA-6 - $14; Hallicrafters SX-24 (cover dirty) - $12; Hallicrafters SR40 - $10; Heath HWA-2036-3 pwr sply - $4; Heathkit SB-104 Transciever Assembly Manual - $17. Don Merz, N3RHT, 47 Hazel Dr., Pittsburg, PA 15228. (412) 234-8819 EST wkdys.

FOR SALE: TCS-13 rcvr, xmtr, cables, control box, vertical mount w/base, Navy AC sply, manual copy - $325; ART-13 - $115; 400 watt modulation xfmr, 1.33/1.37:1 ratios - $55; 37H, 275 mA modulation choke - $20; canabalizing: TCS rec/xmtr. TRADEs? Offers? U-ship. George, WA7HDL, ID, (208) 756-4147 after 1730 MDT.

FOR SALE: Ten Tec Century 21 w/manual - $125; GE tuning unit TU6B - $25. Collin Collier, N4TUA, GA, (912) 988-1276 (d).

FOR SALE: Hallicrafters SX-42 - $250; Hammarlund model SP-600 - $275. Above working, clean. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015.

FOR SALE: Gates BC-1T #68949, orig. condx, manual, spares, dolly. B/O or TRADE. Lloyd, AA6T, CA, (408) 722-4349 eves.

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

FOR SALE: Drake TR4C, MS-4, AC-4 - $350; MN4C - $150; 2B calibrator - $25; Collins 75A-4 - $595; Hammarlund HQ-170C - $195. Ron, K1BW, MA, (413) 538-7861.

FOR SALE: WW I British aircraft set unused in orig crate, "Telephone Wireless Aircraft MK II xmtr, model A" complete w/xmtr pilot's control box, all plugs & interconnecting cables, checkout sheet dated April 11, 1919 - BO over $2000; WW II Japanese army aircraft xmtr model 99-4, dated 1944 w/aircraft mount, 4-6 mc, 10 watts, w/schematic & history - BO over $1200; see me after Henry Ford auction, 2-1/2 hours away. Sam Hevener, W8KBF, The Signal Corps, 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244, 11 AM-6 PM Eastern.

FOR SALE: Military radio equipment, accessories, etc. Manuals, military/ham. Lists available. Henry, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179.

FOR SALE: Mint Heath Sixers & Twoers - $45; photo copies of Heath catalogs, 50's, 60's, 70's & 80's. Copy all or part. Call for prices. Marty, NJ. (609) 466-4519.

FOR SALE/TRADE: NC-183 exc; AF67/pwr sply; rare Mica Mold TX 6AG7/6L6; HW 16; 2-ARC 5 TX; 3-6Mc ,6-9Mc; 1 unmodified 6-9 RX BC-455; (2)-312B4,WE; CP1; Waters fone patch. **WANTED:** KWM2/2A, need not be in exc condx. Joe, K2QPR, FL, (407) 220-7362, any time.

FOR SALE/TRADE: TMC GPR-90 & GSB-1 w/ spkr & manuals - $625 + UPS. Dan Mason, RRt 1, Box 204F, Santa Fe, NM 87501. (505) 455-3416

FOR SALE: Johnson Challenger, cabinet scuffed, all there, untested so only - $45; HG-10 VFO, dial has cracks - $25; antique GR-224L wavemeter kit, nice - $95. Mack Lester, POB 149, Lewisville, AR 71845. (501) 921-5874

FOR SALE: R390A, EAC, no meters - $175; R390A, Capehart, complete - $250; R390A, Teledyne, complete - $250. All three for - $625; T-368 pick-up - call; HP 5245L w/500 MHz plug-in - $200; HP 5245L - $150; HP 310A 0-1.5 MHz wave meter - $100; HP 3400A true rms meter - $175; SX-28, exc front panel & knobs, orig. cabinet, orig. spkr, chassis needs cleaning, working - $250; rcvr, FM military, R442, like new w/used base - $250; R1051B - $325; R1051 - $250; TCS-14 TX/RX matching serial numbers, extra rcvr, stock pwr sply, antenna tuner, remote spkr, pwr cables - $300 for the pile, pick-up only. Bob Miller, KE6F, 9655 Appalachian Dr., Sacramento, CA 95827. (916) 362-5481. internet rmmiller@netcom.com

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

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

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

FOR SALE: Level meters for Collins R-392/URR rcvrs, new - $35, UPS prepaid. Dennis, WA0WAB, (316) 225-3737 (d), 225-2961 (n)

FOR SALE: Rare Heath XC-2 two meter converter for Mohawk RX-1 rcvr - $75 or BO. Marty, NJ, (609)466-4519.

FOR SALE: GPM-55 test set for PRC-25 modules go no-go - $40; I-177B tube tester - $45; I-222A sig.gen. - $35; Fluke 803 diff. voltmeter, pts units - $15; URM-25D scratch/dent - $25; HP-608C, storage worn - $50; ARC-27 - $50, accessories avail - call; PP-894/GRC-32, ARC-27 ground pwr sply 115/230 input, 28V 20A out unreg, no cabinet - $45; transit/cabinet chest add - $25; xfmr from PP-894 w/input volt change switches, 37V 22A - $30; 8.6 mH choke 22ADC sealed - $12; RT-671/PRC-47 chassis w/PA tube, no modules - $30; RT-77/GRC-9 - $95; MD-129A pwr sply/mod for T-217 - $85; C-806 remote radio cont, for R-278/T217 - $15; RT-554/ARC-38A - $175; GF-11/CW-52063A xmtr w/CW-47141 coil, some mods, no tubes - $35; GF-12/CW-47141 coil set w/CW47192 container - $12; RT-34/APS-13, no tubes, fair - $10; BC-733 w/DM-53A, no xtals - $35; manual copies: URT-7, -7A, -7B, URT-7C, -7D; TED-9; RDR - $25 ea + shpg. Tartan Electronics, Inc., POB 36841, Tucson, AZ 85740-6841. (520) 577-1022

FOR SALE/TRADE: Stoddard AN/PRM-1 EMI rcvr, remote indicator, ACPS, trunk, manual - $300. **WANTED:** Mint SX-100. Sandy, W5TVW, 417 Ridgewood Dr., Metairie, LA 70001. (504) 836-2134

FOR SALE: National NCL-2000 linear amp, very nice - $500 + UPS. Bill Gross, WB6WCW, CA, (805) 968-4227.

FOR SALE: ARRL Handbooks 44, 54, 56, 63, 67, 68, 69, 71, 73 - $9 ea + shpg. Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103.

FOR SALE: Rcvr's, xmtr's, access's, manual, parts - LSASE brings list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (201) 728-2454

FOR SALE: GSB-100 - $125; Viking-1 - $150; Viking-II - $200; 75S-3 - $450; 304TL (new) - $60; 4-65A (new) - $40 + shpg. Details SASE. N4GL, Box 1658, Hernando, FL 34442.

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

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

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

FOR SALE/TRADE: Make reasonable offer. Military ARC4 w/dyn.; ARC1; MT230; BC229, uncommon black; AB15; ARR1; Beacon rcvrs BC1206 LN, BC341; PE55 w/plug, shockmount; Collins watzits: RE, panel mount VHF xmtr 242 F2, 135 MHz, 4CX150, no mod/pwr; 55A2 HF rcvr front end?? **WANTED:** German, Italian, Japanese military radio items from WW II, any condx; other retired comm. equip; US military mobile & Forest Service, both before 1950; Civilian Aircraft LF/HF; fishing vessel radios, DFs, old or recent, especially obscure extinct manufacturers; comm. equip. manuals, advertising leaflets, etc, big or little, old or recent. Thank you! Hue Miller, 250 S., 900 E., #4C, Salt Lake City, UT 84102-2341.

FOR SALE: Service extension cables for R-1051 rcvr audio/IF & T-827 xmtr mode selector modules, new - $12.95 ea. ppd (USA); BC-639A rcvr w/RA-42B - $85. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

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

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

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

FOR SALE: Homemade galena crystal radios and parts. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

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

FOR SALE: Heath SB-101 xcvr, HP-23A pwr sply, SB-600 spkr & all manuals - $225 + UPS. **WANTED:** "Command Sets", printed by Cowan late '50's or early '60's. Wayne Letourneau, WBØCTE, POB 62, Wannaska, MN 56761. (218) 425-7826

FOR SALE: RCA AVT 112A / AVT 126A / AVA120 - $150; TS497 sig. gen. - $50; Swan 120/ps - $150; Heath SA2060 tuner - $250. Mel, K2AOQ, NY, (716) 671-0776.

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

FOR SALE: Collins KWM-2 w/2A conversion installed, 11000 s/n, cabinet & trim ring in exc shape, chassis very clean, no dust or dirt, just aligned, works well, w/copy of latest manual & PM-2 p/s - $550 + shpg; 30L-1 linear, very nice shape inside & out, w/copy of latest military manual & cables - $600 + some help w/shpg. Neither of the rigs were military units. These were orig. owned by individuals. Drake TR4CW w/ MS-4 & AC-4, orig. manual, 43000 s/n chassis clean, no corrosion, pwr sply recapped, new transmit relay. Works well on the air & good signal reports, orig. manual - $375 shpd. Kim Herron, 16141 24th Ave., Coopersville, MI 49404. (616) 677-3706

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

FOR SALE: Hallicrafters SX-140 - $65; SX-110 - $95; SX-122 - $150; Nat. NC-270 + spkr - $175; Buckmaster Q5T microfiche, includes Micron 780 reader, pick-up only - $350; HA-1 - $45. Dave Ishmael, WA6VVL, 1118 Paularino Ave., Costa Mesa, CA 92626. (714) 979-5858

FOR SALE: HP606A RF sig. gen. - $135; HP200CD audio gen. - $40; Hickock Cardmatic 118B tube tester w/lge test card set - $200; Heath HR-10 rcvr - $40; EH Scott Allwave-15 rcvr chassis, ps, spkr - $340; Tek 7A19 vert. amp - $100. All items + shpg. Stan Krumme, KO6YB, 16432 Lakemont Ln., Huntington Beach, CA 92647. (714) 841-5866

FOR SALE: Heath AC1 antenna coupler (early version, see ER #72) - $100; S108 w/orig. box & manual - $225; Atlas mod. 206 aux. VFO, mates w/ 210X or 215X, rare, only a couple of hundred made - $225. All EC or LN. Jim Weil, KB8SZ, MI, (810) 391-7687.

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

FOR SALE: R-390 power input cables - $25 shpd. Rick, OH, (419) 255-6220.

FOR SALE: Johnson front panels refinished and silk screened. Viking I - $75, 122 VFO - $40. Exchange prices. Turner Enterprises, POB 451, Cal-Nev-Ari, NV 89039-0402

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

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FOR SALE: Ameco TX62 w/VFO 621 - $75 + shpg, or will trade. John, WB9OVV, IL. (708) 964-3020.

FOR SALE: R390 collectors: 11 rare, full size shop drawings detailing all aspects of R390 design - $95 ppd. N1FRX, ME, (207) 834-6273 eves/wknds

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FOR SALE: Four-stamp LSASE for long list; new, Wiremold 115 VAC, 60" standard 3-prong outlet strips, 10 outlets/strip, grey, instructions, two or more together for longer strips, ship UPS in PVC pipe containers - $15 ea; Heath SB1000 linear, new, kit in unopened box, - $800; J-45 knee keys, NIB - $20 ea; vol. 1, Kl6O PVC antenna manual, complete instructions & diagrams for a number of orig. HF-VHF PVC antennas, includes the PVC Six-4, a 6-meter, four-element linear loaded portable/contest rover beam, sloper tower insulator, & more. Unique designs, innovative feed systems & creative use of PVC pipe. Available October - $7.50 ea, $2.50 shpg/ handling (CA add $. 58 sales tax). Derek, Kl6O, callbook address. (916) 965-4904.

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

FOR SALE: TM 11-486 electrical communication systems engineering manual April, 1945. **WANTED:** TBK, TBM, TBN, TCE, TDE Navy xmtrs & access's. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

FOR SALE: Heath green machine panel & cabinet refinishing. Production runs late this fall or early winter on the Apache, Mohawk, Marauder, SB220 & SB10. Complete panel/cabinet/knob refurbishing. Also doing the Hallicrafters S-76 panel/cabinet. SASE for info pack. Ron, AB5WG, 115 1st St., Sugar Land, TX 77478. (713) 491-7823 after 6 PM CST

FOR SALE: Hallicrafters S-37 UHF rcvr, very good; S-38 black wrinkle, very good condx.; orig. manual for S-37. Fred Clinger, WA8KJJ, OH, (419) 468-6117 after 6 PM EST.

FOR SALE: Heathkit ham radio collectors guide, pictures, specs. List of all ham gear ever made - $22, includes S & H. Marty Drift, POB 21, Blawenburg, NJ 08504.

FOR SALE/TRADE: Transmitting/Receiving tubes, new and used. 1 SASE for list. I collect old and unique tubes of any type. **WANTED:** Taylor and Heintz-Kaufman types and large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE: Collins: PM-2 supplies - $75, have twenty more, call for package deal; KWM-2/S-line freq. dials, NIB - $50 ea; MP-1 mobile supplies - $50 ea; directional coupler/wattmeters (look identical to 312-B4 couplers), 100/1000 watt scales - $40 ea; couplers only - $30 ea; NOS, main tuning knobs, appear to be 75A series w/white 1/4" indice line - $5 ea; used 4D32 tubes - $25 ea. Derek, KI6O, callbook address. (916) 965-4904.

FOR SALE: HRO-5 RA-1 version 6, spc, ac, spkr, mil gray - $675 OHC; HQ-140X - $375 OHC; SX-42A - $475 OHC; Bass spkr - $100. Overhauls guaranteed 3 years. Nice trades OK. 50% deposit, bal. + UPS 30 days. Large SASE for brochure, list. Photos $2 ea. Capt. Larry Rau's, Occidental Radio Workshop, Box 1139, Occidental, CA 95465. (707) 874-1000

FOR SALE: Parting HT32-A, no pwr xfmr. Fred, W7RBF, AZ, (602) 864-9987.

WANTED: Military sets, US RT-136/GRC-13; ABK, APX-1 & other I.F.F. sets; British W.S. No.21. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

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

WANTED: Hammarlund series 200 Super Pro rcvr, circa 1940. Bob, K6GKU, AZ, (602) 816-0660.

WANTED: Set of knobs or knob skirts for Hallicrafters HT-32B, need operation, function & 2 of the 0-10 calibrated knobs; HT-32B parts set; Drake C-line station; Hammarlund Pro-310. John, KG7RS, AZ, (602) 464-5870.

FOR SALE: HP 3580A spectrum analyzer - offer;Daven VH7951H attenuator, 75 ohm, 0-111 dB, binding post in/out. **WANTED:** Gates SA 39A/B, Sta-Level-Devil, etc Langevin Progar, any Langevin gear, any condx OK. Richard P. Robinson, POB 5055, Woodbridge, CT 06525. (203) 397-5420 FAX 294-1745

WANTED: Hallicrafters SP-44 panoramic display. Rick, N6NVG, CA, (510) 687-2719.

WANTED: First annual Wireless Blue Book published by the Wireless Association of America, dated May 10, 1909; Citizens Radio Callbook magazine for 1920, '21, '22; Citizens Radio Amateur Callbook magazine with flying horse cover for 1924, '25, '26; 1913 Dept. of Commerce "Radio Stations of the US", same as for 1915. Bob Arrowsmith, W4JNN, POB 166, Annandale, VA 22003. (703) 560-7161, collect.

WANTED: Manuals for the following NEMS-Clark's: DCA-5100A-1; R-1071-1; RFT-109A; RFT-101D; FSD-104E; FSD-105E; 1673; SSM-101-11-157. Edward J. White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121. (302) 322-1313

WANTED: Hallicrafters SR-46A; Ameco TX-86; manual for Heath EK-2 AM/SW radio. Al Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Collins 75S2, KWM1, 32V3 (no cabinet needed); Transco 141000 series, 4 position N connectors; 28 VDC, ant. relays. Ron Steinberg, K9IKZ, IL, (708) 773-3583 (h), FAX (708) 773-0822, (800) 279-8324 (w), rhstein@interaccess.com

WANTED: Need to locate a PTO for an R389, to be used for restoration and ER historical article. Will purchase entire parts unit. Ray, N0DMS, Box 582, Pine, CO 80470. (303) 838-3665. Please call collect.

WANTED: Swan WM-200A VHF PEP wattmeter; WM-3000. Craig, WA9HRN, IL, (708) 367-1599.

WANTED: Manual copies: SCR-197, BC-325, BC-342N, TM-11-850, Jefferson Travis 350A, Gonset Communicator IV 6 meters & same for 220 MHz. Don Merz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST wkdys

WANTED: 500 watt mod. xfmr UTC CMS-3 or same as in Johnson Desk Kilowatt; NC183D or NC303 in very good condx. Jay Spivack, N7JDT, 325 S. Washington Ave. #244, Kent, WA 98031. (206) 859-2680

WANTED: Schematic Knight communications rcvr, model R-195. KD4FZK, (FL) don.patton@cornucopia.digital.net

WANTED: Nice Johnson Viking Pacemaker & Ranger xmtr and exc. to mint; National NC-183D & NC-303 rcvr. Bill Gross, WB6WCW, CA, (805) 968-4227.

WANTED: Collins 75A1, any condx as long as its all there. Mike, W1JZ, MA, (508) 529-4427

WANTED: "S" meter for Hammarlund HQ-140XA, need exc condx or NOS. Bud, N8CMC, POB 71, Howell, MI 48844. (517) 546-6249

WANTED: Manual for Heath AR2 RX; vry gud ceramic base T210 tube for use in 29 TNT xmtr. Larry Meyers, W3MNE, 1598 Brimfield Cir., Eldersburg, MD 21784.

WANTED: Collins radios, access's; coil cover & calibrator for 75A-2/75A-3; Hallicrafters HT-46. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

FOR SALE: Collins 75A4/KWS1/270G-3 - $1250; 1940-1980 QST - $95. George, AAØWP, MN, (507) 288-0242.

FOR SALE: National HRO right angle drive w/2 skirts & knobs - $80; diodes, 1200 volt 1.5A, .15; 3A, .25; 6A, .50. Joe, WSØE, MO, (417) 882-3197.

FOR SALE: Book "Electrical Engineering", by Steinmetz. Autographed by Mr. Steinmetz - $20 + $4 UPS. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: T-605/ARC-58 xmtr - $125 + UPS. Alan Dale, W9ZPP, 2824 Forest Ave., Evansville, IN 47712. (812) 424-5208

FOR SALE: "The Vail Correspondent", key collector's quarterly journal. Free ads - $10/yr USA; sample $2. TVC, Box 88-E, Maynard, MA 01754

FOR SALE: Johnson Ranger - $175; Johnson Adventurer - $75; Heath DX-60 - $75. All working. Pat, K7YIR,WA, Phone/FAX (206) 487-1230.

FOR SALE/TRADE: 75S3B WE, mint condx for 32S3 WE same quality or towards KWM2A. Al Shurko, RR 57A C13, Peachland, BC V0H 1X0. Canada. (604) 767-6447

FOR SALE: Palomar VLF-A - $50; P-310-X reselector - $90; Heath V-7A VTVM - $20; Systron-Donner 114 counter - $40; old Vibroplex (1945) bug - $125; Drake W-4 wattmeter - $75. **TRADE** for National items. Jim, K7BTB, AZ, (520) 635-2117.

FOR SALE: Heath HW16 xcvr w/HG10B, manuals, exc - $130, U ship. Rick, KF5NU, 9031 Troulon Dr., Houston, TX 77036. (713) 774-5102

FOR SALE: HQ-170C - $110; Hallicrafters R-44 - $45. **WANTED:** R-47 spkr; HT-32B; Viking 500. Bert, N8NN, 2150 Silentree Dr., Vienna, VA 22182. (703) 448-8016

FOR SALE: Gonset mobile set; SX71; Valiant; 32S1; 75S1; S/S pwr sply. Mike, WØBVA, KS, (316) 479-2756.

FOR SALE: HQ-140X, VGC - $150; NC-173 w/matching spkr, VGC - $200; 2-A, fair - $70; 2-AQ, VGC - $55. All w/manuals (copies). All + shpg. Al Culbert, KØAL, 328 Norman Dr., Cedar Rapids, IA 52402. (319) 377-4367

FOR TRADE: Two good RCA 833As for one Taylor 833A. John H. Walker, Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: Collins RE KWM2A; antique Collins gear; dial point for Collins 310B exciter. **FOR SALE:** Filters for 75A-3. Stu, K2OA, NY, (914) 691-7957.

WANTED: BS8 module for SM220 scope. Harry Blesy, N9CQX, 95740 Clarendon Hills Rd., Hinsdale, IL 60521. (708) 789-1793

WANTED: National HRO & Hallicrafters S-38, -A, -C. Dung-Hyun Cho, Biology Dept., Kang Won National Univ., Chun Chon 200-701, South Korea.

WANTED: Schematic/manual for Halcyon 500B universal tester. Leonard Meek, 2265 Komo Mai Dr., Pearl City, HI 96782.

WANTED: Copy of manual for Heath HW29A 6 meter xcvr. Will pay costs. Harry Davey, VE7AIJ, 847 Glencoe Dr., Port Moody, BC V3H 1G7 Canada.

WANTED: Book "Fessenden, Builder of Tommorrows" by his wife, doing research, writting article. John Dilks, K2TQN, 125 Warf Rd., Egg Harbor Twp., NJ 08234-8501. (609) 927-3873

WANTED: CQ's Command Sets booklet published in 50's or books relating to their history. Dan Benecchi, K1DC, MA, (508) 587-7045.

WANTED: Hammarlund MLW-125 variable condenser (see June '95 ER ads for picture); SX24/25 S-meter; Cosmophone &/or info; B & W plug-in coils 2175 thru 2179; Drake 1A vernier knob; 4-pin coil forms by Shortwave & Television Laboratory of Boston; Viking 500 sply/mod. Brian, WA5UEK, (800) 399-2914.

WANTED: 10-80 final amp tank coils for Globe King 500 radio. Jim Wilhite, W5RXC, 2404 S. Hughes, Amarillo, TX 79109. (806) 371-7233

WANTED: Photographer is looking for collections of American ham gear made between 1930 & 1980 to illustrate book. I will travel to your location. Joe Veras, N4QB, POB 1041, Birmingham, AL 35201. (205) 328-2661 (d), 967-0639 eves & wknds

WANTED: B-26 radio operators or crew - your stories & experiences w/SCR-274N radio system. I am building a B-26 radio operator's display. Any assistance appreciated. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. (707) 523-9122 lve msg

WANTED: Mars, Babcock, Palco, Pierson, Lysco, Subrace, Gonset Commander, other AM mobile xmtr's, rcvr's, pwr sply's. Dead OK. Capt. Larry Rau, KF6WV, Box 1139, Occidental, CA 95465. (707) 874-1000

FOR SALE: Manuals, (copies): Ocean Hopper - $7.50; DX20, DX40, HR10B, HW29 - $10 ea. LSASE (2-stamps) for complete list. David Crowell, KA1EDP, 40 Briarwood Rd., N. Scituate, RI 02857-2805.

FOR SALE: Fan bracket for KWM-2/325-? lowers the internal temp 20 deg.C using two 60MM micro-boxer fans (ER #71). Drop-in, no mods - $15; replica Ocean Hopper front panels - $20. All $ ppd. DWI Engineering, POB 3611, Costa Mesa, CA 92628-3611.

FOR SALE: Good used 810s - $55 ea. Don Gies, K4GIT, Box 2790, Rt.2, Melrose, FL 32666. (904) 475-3306

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

FOR SALE: GPR-90 w/manual, exc. condx - $350; CE 20A w/BC-458 VFO (CE rework, front panel, etc), good condx, works, w/manuals - $125; DX-20 w/manual, exc. condx - $50. Plus UPS. Bill, AD6A, NM, (505) 883-4998.

FOR SALE: Bound magazines w/covers, exc condx: QST '23 thru '48. CQ '59 thru '84, 73 '60 thru '82. Larry Wright, N9HRQ, 131 Hilltop Dr., Lake in The Hills, IL 60102. (708) 658-7328

FOR SALE: Nice front panel Central Electronics 20A - $20; Drake high-patch model 584, nice - $20. Larry, W5VHP, 4212 Beacon Ct., Bartlesville, OK 74006. (918) 333-2891

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

WANTED: Sources for Heath replacement parts, paint & cabinet work. David Varn, KM6RI, 2445 Boxwood Dr., San Jose, CA 95128. (408) 243-9326 varn@alagroup.com

WANTED: Spkr cabinet for NC-183. **FOR SALE:** Elmac AF-67; Heath HW-7 or trade for S-40. Dave, K4IST, FL, (904) 479-1684

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

WANTED: Manual/schematic for Collins T-730/TRC-75 xmtr (amp?). John Bipes, KØYQX, 906 Adams St., Mankato, MN 56001. (507) 345-7169 (w), 387-3840 (H)

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

WANTED: Gonset G-66 rcvr &/or 3069 universal pwr sply (110/6/12), misc cables. Tom Koch, W4UOC, 8170 Habersham Waters Rd., Dunwoody, GA 30350. (770) 391-0914, FAX 391-0918

WANTED: 8116 or 8117 tube. Dale Gagnon, KW1I, 9 Dean Ave., Bow, NH 03304. (603) 228-8721

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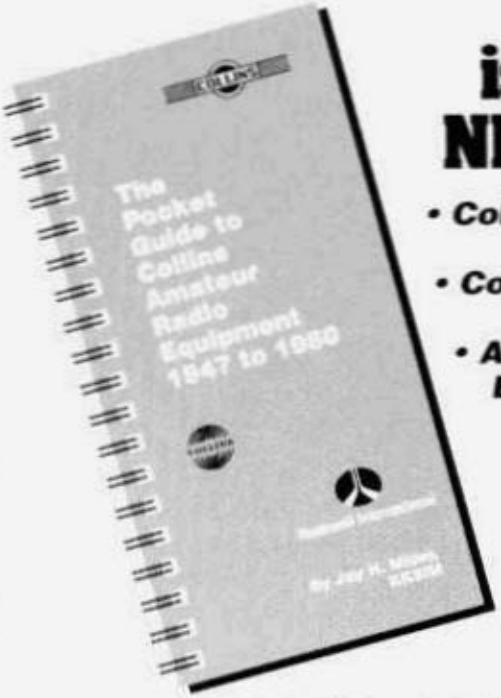

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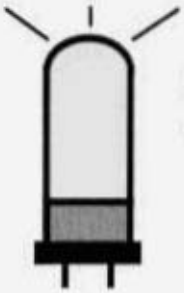

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