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ELECTRIC RADIO

celebrating a bygone era

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Ben Booth, AG4I

ELECTRIC RADIO

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

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; John Staples, W6BM; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Jim Musgrove, K5BZH; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Dick Houston, WØPK; Andy Howard, WA4KCY; Skip Green, K7YOO; George Maier, KU1R; Albert Roehm, W2OBJ; Steve Thomason, WB4IJN; Don Meadows, N6DM; Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS

For the last couple of months in this space I've been bellyaching about the possibility of CW being deleted as a requirement for a license on the HF bands. I expect that the ARRL is still "studying the issue" so I'm not going to say much about it this month.

Some new vintage enthusiast oriented products have come our way for review. The first is a video by HI-RES Communications, Inc. Floyd Soo, KF8AT, the owner of HI-RES sent me his most recent video, "The Collins Amateur Radio Equipment Video Spotter's Guide" and after viewing it I can say that it's something useful and educational for us all; not just the Collins Collector purist. This video gives us all a chance to learn more about Collins equipment and get a good close up view of it. I was so impressed I've added it to the products at the ER Bookstore. The price is $24.95 plus $4.50 S&H. See page 56 for ordering information.

Jay Miller, KK5IM, author and publisher of "The Pocket Guide to Collins Amateur Radio Equipment 1946 to 1980" has produced a very nice B&W wall calendar featuring Collins Amateur Radio equipment. The photos in the calendar are of the same quality as those in his book. It will look nice on all our walls. It's available from the ER Bookstore for $9.95 plus $1.75 S&H. Another calendar I'd recommend is the new one from CQ Communications by well-known boatanchor photographer Joe Veras, N4QB. This one is in color and features all the old rigs from the golden years. It can be ordered from CQ Communications, Inc., 76 North Broadway, Hicksville, NY 11801. The price is $9.95.

One last thing for AM'ers out here in the west. Don't forget to check into the Third Annual AMI Thanksgiving Bash , November 28th on 3885. It will start early in the morning and end late in the afternoon. Net control is OJ, KØOJ. This is a major AM event, last year there were 63 checkins. N6CSW

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Cover: Ben Booth, AG4I, back in 1951 when he was WN3SFP. See the story about his callsign on page 2.

Late Bloomer

by Ben Booth, AG4I
604 Chaffee ST.
Talladega, AL 35160

It was 1951. WN3SFP had just upgraded from the newly introduced novice grade license to general class. The rig - months in the building - was a homebrew transmitter, a war surplus 4-65A plate modulated by a pair of 807's. The receiver was a Hallicrafters S-38A (which I still have) and a faithful war surplus Q5er.

Now, this is critical to my story. Although 17, I had not yet entered puberty. The strange interests that the onset of that hormonal episode normally produces, were not on my horizon - yet. My voice still had that British school boy's choir sound - a beautiful soprano. My mother called me a "late bloomer". I was a *very young* 17, a senior in high school. KDKA, "the pioneer broadcasting station" in Pittsburgh, had just gone on Channel 2! I had just gone on 10 meters! For those of you who don't keep up with the technical aspects of our hobby - that spelled big trouble, especially because we lived 30 hilly miles northeast of Pittsburgh - the fringe area for TV Channel 2. (The second harmonic of 10 meters falls on Channel 2.)

The plot thickens. I began using the phonetics W3 Susan Frank Peter. I think these phonetics were sort of in vogue for the day.

It was after school - I don't remember, a Saturday maybe - a sunny day. In any event, a boy my age walking past our house saw me on the front porch. "Bennie, you are a ham radio person, aren't you?" I nodded. I knew the chap, but he was definitely not a close friend. Besides he lived 4 or 5 blocks up the hill from us. "Did you know that there is a girl ham operator in town", he asked (Leechburg, Pennsylvania, was populated by no less than 2500 persons!) Maybe the hormones were stirring! I perked up. "Why no, I didn't. What's her name". He looked at me and just as serious as he could, thought a second and said - I think her name is Susan - Susan Frank Peter. We hear her on our TV set every night - she has a good sound -- you ought to look her up."

I don't recall my exact response. But I think I did a pretty good job of covering up the mixture of embarrassment and disappointment that surfaced very quickly! Embarrassment at hearing my soprano voice reflected through the puzzled disclosure of a boy I didn't particularly like and disappointment that if he heard this "good sounding" girl so well, how many others were likewise hearing "her".

Well, besides my voice having changed, not to mention other obvious changes, my *call* has changed several times as I have moved and upgraded licenses. *And* sharing married life with me for the past 23 years is a "good sounding girl" (and an extra class ham as well!). Her name - you guessed it - Susan (AG4H)! **ER**

Editor's Note: See the cover for a photo of "Susan Frank Peter".

AM International Update November

Discovery Weekend Results

AMI Headquarters received logs from 16 stations for the Sept. 6-8 AMI Discovery Weekend. Band conditions were not good, especially on the higher frequencies, but activity in some areas of the country was brisk. To stimulate activity AMI sponsors three levels of Discovery Weekend awards. The basic level recognizes standard AM operations on the 160, 75 and 40 meter bands. The second level encourages operation near 14.286 MHz to continue the decades of AM presence there. The third level was designed to motivate AM'ers to look for one another on 10 and 15 meters, hoping for a re-awakening of propagation with a renewed sunspot cycle. The awards are personalized multi-color 5x7 certificates. The overall aim of the weekend is for AM enthusiasts to discover each other, and for the rest of hamdom to discover AM operation, maybe for the first time. Logs were received from W1CKI, K1GUP, K1YJK, WA5UEK, KB5WWO, AC6GF, WA6IPD, NS6V, K6ZSR, N7SEP, KE7TV, W7US, W8SXX, KØEOO, WAØLEU/5 and NØTE.

Some highlights: Three Participant certificates (Level 1), seven Plus certificates (Level 2) and six Primus certificates (Level 3) were awarded. The three highest scoring stations were K1YJK with 57 contacts over six bands, WA6IPD with 54 contacts over five bands and KE7TV with 52 contacts over four bands. Art, WA6IPD, could not find anybody stateside on 15 meters, but worked several Latin American stations. He reported these stations were thrilled to make an AM contact. One station, XE1VV had not had an AM QSO since the 1960's. Brian, WA5UEK, thought the weekend was successful based on the number of heterodynes! Gerald, AC6GF, reported that QRN was fierce and the neighbors were worse. He suggested a new WANT award, "Worked All Neighborhood Telephones". You can't use an excuse of inefficient antenna for not participating. Jim, WAØLEU/5 used a Hustler antenna on his camper during the weekend. The activity on 20 meters was gratifying. Friday evening 14.286 MHz was positively busy. Participants reported a total of 75 20-meter contacts. Additional thanks to those participants who sent me a picture of their operating position.

Thanksgiving AM Jamboree

If you missed the Discovery Weekend fun you have another chance for AM operating fun Friday through Sunday, Nov. 29 - Dec.1 on the annual AM Jamboree. This operating event has normally been a 160-40 meter activity, but all bands will be included this year. To stimulate your participation, certificates will be awarded for logs sent in with more than 20 AM contacts over the weekend. Additionally, two endorsements will be available. Endorsement #1 will be added to your certificate if you make your contacts using five or more different transmitters from your station location. Endorsement #2 will be added to your certificate if you work stations who use ten or more different transmitters. Please log in the transmitters used and worked if you are applying for these endorsements. Log the final and modulator tubes of homebrew transmitters. Though this operating event is for any AM operator, I encourage you if you are a member of AMI to locate your AMI certificate number and to exchange it with your contacts during the weekend.

AMI Headquarters Update

As of the end of November AMI membership stands at approximately 950. The equipment used to create and print personalized AMI membership and award certificates was changed as part of an office move this month, delaying our correspondence. All membership

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A Few Miniature Tubes You Might Have Missed

by Walt Hutchens, KJ4KV
3123 N. Military Rd.,
Arlington, VA 22207

As Ray Osterwald observed in his fine article on 75A-4 modifications (The Collins 75A-4 Series Receivers: A Legacy of High Quality, Part 6: 75A-4 Modification Summary, ER, March 1993), the vacuum tube era ended just as the really "good" tubes were beginning to come on the market. As a result, many of the best of them were used only in the equipment for which they were designed, mostly TV sets. These tubes deserve to be more widely known, for some are much better performers than the popular types. This article will be a short tour of those I've noticed in wandering through the tube manuals on the way to a new homebrew rig. I've included only tubes listed in the RCA manuals and/or major tube catalogs; all are currently available for a few dollars.

It is true that (compared to the well-known types) fewer of these tubes were made, but at today's prices you can buy a lifetime supply before you solder the first wire. Moreover, in many cases there were so few applications that TV shops got stuck with 'just in case' tubes which were never needed; these will be percolating out from business closures and estate sales for decades to come. And -- realistically -- how many people will take my advice and build something with them? Yep, there's plenty of interesting tubes out there for "all three" of us!

The types mentioned here obviously reflect my interests; others will no doubt have other lists of overlooked wonders of the tube world.

Small Power Tubes For Series-Filament Operation

The constructor of a transmitter of under 50 watt output can at least consider series-string operation of the filaments: by using a silicon diode rectifier (or voltage multiplier) for the high voltage, a rig of this size can easily be built without a power transformer. Unfortunately nearly all the power tubes with heaters operating on more than 12 volts were designed for either audio or TV sweep operation: audio tubes have too little emission for the plate dissipation to make ideal class 'C' amplifiers and sweep tubes weren't made with 0.15 amp filaments, so you don't have as many options as you might wish. Nonetheless, there are better choices for that super-compact rig than the usual 50C5 or 50L6.

At the low-power end of the range, I like the 35GL6. This 7-pin miniature will do the work of a 50C5 but has a 35 volt, 0.15 amp filament. (The 35C5, by contrast, is a lower-power tube than a 50C5). With a plate dissipation rating of 5.5 watts, two 35GL6's in parallel with filaments in series should be a cinch to deliver 8 watts of RF from a 160 volt (half wave-rectifier) plate supply and the remaining 50 volts of filament power ought to be plenty for a driver, speech amp, and modulator. The maximum rated plate voltage for these tubes is 130, but they'll handle 320 (voltage doubler supply) which would get you to the 7 to 10 watt carrier class per tube. Yep, even in plate modulated AM operation -- but more on that in a later article!

A very interesting oddball is the 35DZ8. This 9-pin miniature 0.15 amp dual-section tube has a power pentode with specs a lot like the 50C5 plus a high-mu triode (equal to half of a 12AX7)

in the same envelope. The pentode plate structure is "awfully" small, but if the maker says it will handle 6.5 watts, I'm willing to give it a try.

A good bet for somewhat higher plate voltages would be one or two 19AQ5's. These are 6AQ5's with a 19 volt, 0.15 filament. Because the 6AQ5 was occasionally used (triode connected) as a vertical sweep tube, the maximum plate voltage rating is 275, with a peak-positive pulse rating of 1100.

These should be excellent for AM service at 320 or perhaps even 480 volts and a pair might give you around 20-30 watts carrier power. RCA evidently made only the 6- and 12AQ5 but others made the 19 volt version. This is, however, the hardest-to-find of the tubes mentioned in this article.

At still higher power levels, check out the 6/13/18/27GB5. This compact neonoval (large 9-pin) sweep tube has a 17 watt plate and its double-ended construction simplifies transmitter design. The higher voltage versions draw 0.6, 0.45, and 0.3 amps, respectively -- about as flexible as you get in sweep tubes. With a plate pulse rating of 7700 volts and fairly low drive requirements, you ought to be able to put out 30-40 watts of carrier from this one at something around 550 volts. The octal 6/12/25BQ6 has somewhat less favorable ratings.

Small Class 'B' Audio Tubes

This one has been mentioned here and there but deserves to be better known than it is. Although usually applied as a high gain class 'A' audio amp, the 12AX7 high-mu twin triode works well as a zero-bias class 'B' audio power tube at up to 320 VDC. Outputs of 7 watts per tube (15, with two tubes in push-pull parallel) can be obtained and resting current is only a few mA. For voltages above 250, check resting current -- you probably need three silicon diodes in the cathode circuit (-1.5 volts bias) to keep the plates to the rated 1.2 watts per section.

Drive requirements are surprisingly low. A single 12AX7 can be driven by half of a 12AU7; for two in push-pull parallel you need either both halves of the 12AU7 or a feedback loop around the driver to reduce the effective plate resistance. The driver transformer should have a step-down ratio of about 2:1 for each grid.

The 12AX7 seems to be a lot tougher than the handbooks say. Although rated plate dissipation is only 1.2 watts per section I have done sine-wave testing for periods of thirty seconds or so at full output!

A curiosity which I haven't explored yet is the existence of 'large' and 'small' 12AX7 plates. It appears that some have about 40% less plate structure area than others. In addition, there are two different basic designs of the 'small' plate. It is possible that some of these are better power tubes than others, but I haven't tested this.

A Better RF Amplifier Pentode

An ideal tube for a receiver RF or IF amplifier has high gain (thus low noise), and remains linear even for very large signals. There are a fair number of tubes that meet the first test -- the 6BA6 is pretty good, the 6BZ6 is better, and the 6GM6, better yet. However, if you have extremely strong unwanted signals reaching a stage, such as an RF stage with poor pre-selectivity using a large antenna in an area with strong broadcast signals, you will get severe cross-modulation with these tubes. The BC signals (I have one that measures one "volt" across 50 ohms!) drive the stage into non-linearity so the BC station modulation shows up as distortion on every other signal and its carrier beats against other strong signals to deliver combinations here and there throughout the 80 meter band.

The same problem comes up in the broadcast TV world, with signals from very strong adjacent channel stations only somewhat reduced by the receiver

continued next page

input and mixer circuits before they hit the first IF stage. And sure enough, when the engineers got really cranked up, better TV-IF tubes came along. One that I have tested is the 6EH7, a 9-pin miniature with a transconductance of 12,500 uMhos at the resting (no AVC) bias. That compares to the 6BZ6 at 8000 and the 6BA6 at 4400. However, the gain isn't the best thing about this tube. 6EH7 specs say something truly rare: at - 19.5 volts of bias (a transconductance of 125 uMhos) it will tolerate up to 0.45 volts of unwanted signal before reaching a crossmodulation factor of 1%! There are also specs for lower bias voltages.

Using a 6EH7 in an AVC-controlled receiver RF stage means that when you're listening to a solid signal, the amount of adjacent channel signal needed to cause crossmodulation is "greatly" increased. Sure enough, when I substituted a 6EH7 for the 6BZ6 RF amp in my Conset G-76, the combination of local BC stations that formerly occupied 3900 kcs at S9+20 during the daylight hours, dropped to S7 and the ham AM stations I often listen to on 3885, suddenly cleaned up their audio.

The 6EH7's sharp cutoff brother, the 6EJ7 has similar gain specs and might make a good choice if you're looking for a high-gain pentode mixer.

In applications requiring 0.15 amp filaments, I don't think you can do better than the 12BZ6 and/or the (sharp cutoff) 12DK6.

A tube pointed out to me by Editor Barry Wiseman is the 7788 -- a pentode with the amazing transconductance of 50,000 uMhos. Such high gain isn't ordinarily useful in an HF RF amplifier because atmospheric and external man-made noise controls receiver performance (large-signal linearity is more important and I don't have that info for the 7788) but it could be valuable on 20 meters and above.

Tube handbooks were published to sell tubes. The tubes RCA wanted to sell were those for which they owned the patents, so they're the ones for which you're most likely to see such 'new and improved' specs quoted. A tour through a GE, Sylvania, or other major maker handbook might turn up other types that are just as good.

Two 'Hot' Driver Tubes

The 12BY7 was designed as a TV video output tube but it went on to become almost the universal driver stage in moderate-power ham sets. With a transconductance (change of plate current/change of grid voltage) of around 11,000 uMhos it's a high gain tube. But the relentless push to do more with fewer sockets brought two more tubes which seem not to have been discovered by hams: the 12HG7/12GN7A at 21,000 uMhos and the 12HL7 with 32,000 uMhos. Basing of both is the same as the 12BY7; the 12HL7 has the same filament but the 12HG7/12GN7A draws a bit less.

With suitable shielding and bypassing in a new design, these should be great drivers, letting you run the earlier stages of a transmitter at a significantly lower power level. In the case of an existing rig with marginal drive, one of these tubes might be a drop-in fix. An example might be the SB-33, which, even with everything 'just so', has marginal or less drive on all bands except 40 meters.

Similarly, these tubes (rated plate dissipation 10 watts) ought to make great finals for a rig of 20-30 watts output. Careful shielding and neutralization "will" be needed!

A Great Mixer Tube

Because they have to be nonlinear to do their job, mixers are always a soft spot in receiver strong-signal performance. However, a tube with a wider linear range is a better strong signal performer, with the only price being a probable need for a bit more oscillator injection. The 6ES8 is a variable-mu tri-

ode -- as far as I can tell, the only such triode ever made.

Ray Osterwald used one as the first mixer in his 75A-4 mods and got spectacular results.

Another place this tube would shine is as a low-noise RF amplifier in a top-quality communications receiver design. The variable mu characteristic would let you use AVC (essential to avoiding distortion in later stages) with less chance of crossmodulation. The combination of a 6ES8 push-pull RF amp and a 6ES8 balanced mixer should be a real winner.

An Even Better Mixer Tube

Actually, I lied -- mixers "don't" have to be nonlinear on the signal path, only where they do the actual mixing. In "beam deflection" tubes a pair of deflecting electrodes control how the electron stream is shared between two plates. The total current is modulated by a control grid in the usual way. At each plate the output is a linear function of either the grid or deflecting electrode input. However, when both inputs are present, the output is the "product" of the two; this nonlinear process (multiplication) causes mixing.

Beam deflection mixers deliver high gain and exceptional signal handling ability -- 'exceptional' means up to a few "volts" at the signal grid!

The price is a very high oscillator drive requirement if you want full sensitivity. To make the most of these tubes you need to supply push-pull oscillator drive and take output from the plates in push-pull. A push-pull local oscillator delivering (say) 0.1 watts (and stable enough for a high performance receiver) is definitely a challenge.

I know of four beam deflection tubes: the 7360, 6AR8, 6JH8, and 6ME8. Connections and biasing vary. The last two are better tubes than the 7360; about the 6AR8 I know nothing. Note that to squeeze all the required connections onto a 9-pin base, all of these hook something else to one of the filament pins, meaning that one side of the filament must be grounded.

Specs for the 6ME8 claim it requires less oscillator drive but some rather sloppy testing I did, did not seem to bear this out. Further study would be necessary.

There were some "excellent" ham designs with these tubes. Check the Radio Amateur's Handbooks from 1965-1969 or so for simple 7360-based receivers.

These use single-ended oscillator injection at a fairly low power level and thus give up some sensitivity and large-signal performance but they do a lot with very little circuitry; the cheaper and better 6JH8 and 6ME8 should substitute with only minor changes. The only advanced beam deflection receiver design I know of is 'An Advanced Hybrid Receiver', described in the RSGB Handbook, Fifth Edition. This receiver uses a push-pull local oscillator which is phase-locked to a pre-mixed crystal plus stable (low power) tunable oscillator. With very careful work in the tunable oscillator department, this set should outperform any commercial ham receiver ever built.

Striking out on your own, the combination of a 6ES8 low gain RF amp (mainly to give you a place to apply AVC) with a beam tube mixer ought to really be dynamite.

Ten Pins In a Nine Pin Package?

You designed your set with a dual triode but, gosh, that oscillator really needs a buffer and there's no room for another socket. There are, however, some possibilities. Check the 6EZ8 first. With two high- and one medium- mu triode sections in a single 9-pin envelope, it might be the answer. The reason for the 'might' becomes obvious when you count the elements: to get everything onto just nine pins, the cathodes of two of the triodes are connected to one of the filament pins which must therefore be grounded.

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The Reference Shift Modulator

Are you looking for simple yet highly effective modulator for that surplus rig or your next home brew project? If so, this circuit may be for you!

by Dennis DuVall, WA3YXN
8011 Frontier Drive
Severn, MD 21144

As a young ham back in the 1950's, exotic and expensive components like modulation transformers were not items to be found around my shack. I was delighted, therefore, to come across a circuit for something called a "Reference Shift Modulator" which used a single 807, a filter choke and a few other parts and which would provide real, high level plate modulation for transmitters in the 60 - 80 watt class. The circuit was extremely simple and used only a handful of easy to get parts. All in all, seemed too good to be true.

I built two modulators using the circuit. The first was coupled to a BC-696 command transmitter and was constructed on a stripped down BC-456 chassis. (Wish I had that original screen modulator now.) At the time, the only test equipment I had was a VOM (borrowed) but the circuit worked first time! Other guys could understand what I was saying and gave me good reports. I used the circuit again with a surplus Bendix TA-12 and was able to fit the whole thing inside the cabinet by removing the band switch drive motor and the low frequency antenna tuning caps.

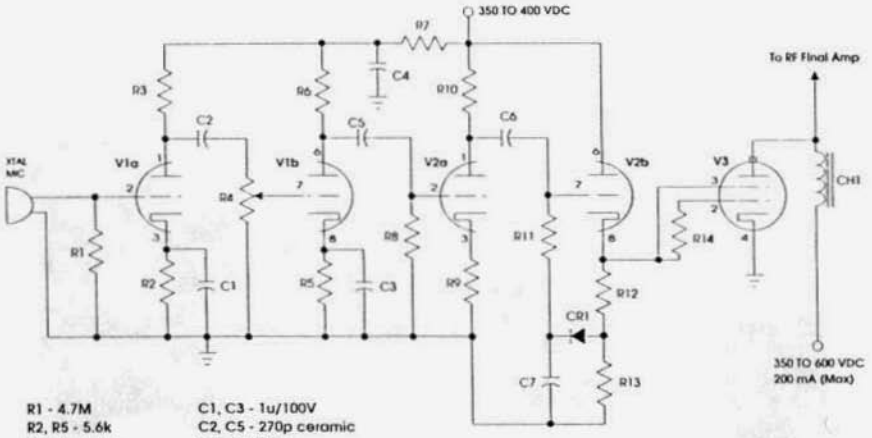
Over the years, I always remembered the basic circuit in its extreme simplicity even though I forgot where I had first seen it. I am now indebted to Bob Reardon, W8EPQ, for rediscovering the original article in the April 1955 issue of Radio and Television News and providing me with a copy.

The original circuit as described by the author, Dale Hileman, K6DDV, is shown in Fig. 1. What we see here, besides a straightforward speech amplifier, is basically a choke coupled (Heising) modulator but with a clever bias shifting mechanism which limits the plate current to the value required by the audio level. Thus, when no audio is present, the plate current and hence the plate dissipation of the modulator tube are both low.

As audio input is applied, the bias (positive in this case, see below) automatically increases to provide the proper level of plate current for linear operation. Other Heising circuits with dissipation control schemes can be found in the literature (see Notes 2 and 3).

With the classical Heising circuit the average plate current is constant and the efficiency at no input is zero. All the power going into the tube is converted into heat under these conditions and so the dissipation rating of the tube must be at least equal to this value. At maximum audio levels where the plate current swings from saturation to cutoff, the efficiency of the modulator would approach a theoretical maximum of 50%. This means that an 807 which has a 30 watt plate dissipation rating could produce something less than 15 watts of audio in the classical Heising circuit (30 watts in all the time, at maximum audio levels 30 W X 50% Eff. = 15W)

In the circuit shown in Fig. 1, however, with 600 volts on the plate the no-audio resting current is about 35 mA which gives a plate dissipation of 21 watts, well within the ratings of the tube. At maximum audio levels, an output approaching 30 W would be possible, for example, at an average plate current of 100 mA



R1 - 4.7M	C1, C3 - 1u/100V
R2, R5 - 5.6k	C2, C5 - 270p ceramic
R3, R6 - 470k	C4 - 8u/450V
R4 - 2.2M pot	C6 - 500p/600V
R7 - 100k	C7 - 0.003u/500V Mica or Ceramic
R8 - 2.2M	CH1 - 5 H, 200 mA
R9 - 10k	CR1 - 1N38
R10 - 220k	V1 - 12AX7
R11 - 1M	V2 - 12AU7
R12, R13 - 100k	V3 - 807
R14 - 22k/1W	All resistors 1/2 watt unless otherwise noted.

Fig. 1. The original circuit from Radio and Television News, April 1955.

(600V X 100mA = 60W input X 50% eff. = 30 W). This is a twofold improvement. It gets even better than this in practice. The 30W figure above was calculated assuming a steady tone condition. Voice, on the other hand, is a low duty cycle "burst" type signal and so 40 or even 50 peak watts of useful modulating audio can be achieved with this circuit without destroying the 807 (more on this later).

The circuit in Fig. 1 does all this beginning with an 807 connected up as a zero bias triode. In this configuration, the input to the screen grid must be driven up to about 250 volts positive with respect to the cathode to achieve maximum plate current. The clever part here is the cathode follower driver (V2b) and the associated circuit consisting of CR1, C7 and R11 fed off the center-tapped cathode resistor. This circuit "bootstraps" the bias level on the grid of the cathode follower V2b and hence the bias on the modulator tube as well to a positive DC value equal to half the peak-to-peak voltage of the input signal. Thus, with a 250 volt peak-to-peak signal input the bias level would self-adjust to +125 volts and the input to the modulator would swing between 0 and +250 volts. With a 100 volt input signal the bias would adjust to 50 volts, and the input would swing between 0 and +100 volts, etc.

Human speech, of course, varies widely in amplitude and frequency. Accordingly, the bias adjustment circuit must first ramp up quickly following the commencement of a speech utterance. (The "attack" time of this circuit was found to be approximately 20 ms.) Following this, the circuit must "hang" sufficiently so that the bias varies not at the audio rate of the input speech but follows the average audio level and varies at the syllabic rate. This is controlled by the time constant of C7 and Rx and .003 mFd and 10 meg respectively seem to be about right (see below). The "attack and hang" requirements here are very similar to those required by a carrier control modulation system such as found in a DX-60, or a receiver AGC system designed for SSB.

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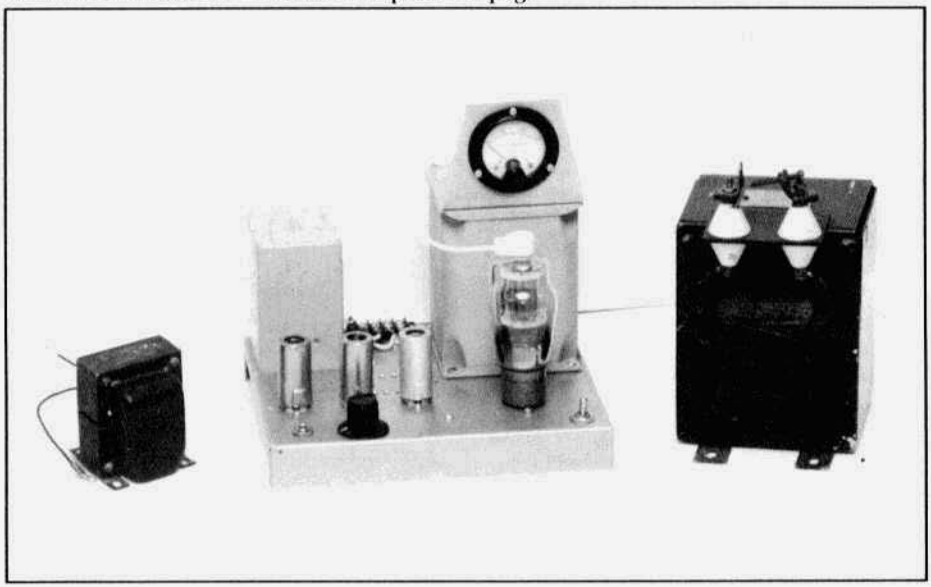


Fig. 2. Reference Shift Modulator as constructed for this article with a 10 Henry, 250 mA choke mounted on the chassis. Other chokes discussed in the text include the 4.5 Henry unit on the left and the 35 Henry monster on the right.

Construction and Testing

We began by duplicating the original circuit with the exception of larger coupling caps in the first two stages of the speech amplifier and the addition of a dedicated 12AU7 to perform the function of the cathode follower/driver V2b. A 10 henry, 250 mA filter choke was used for the modulation reactor. A power supply was included on the chassis which provided all internally required heater and B+ voltages. The finished unit is shown in Fig. 2. Initial testing was performed with a 500 volt supply and a dummy load consisting of a 5000 ohm, 100W resistor shunted by a .001 mFd capacitor to simulate a typical RF final.

The original circuit relied on the back resistance of CR1 to provide a discharge path for C7. It immediately became evident that the back resistance of the modern silicon diode used in the reconstruction was much higher than the original 1N38 - the bias (and modulator plate current) went up on cue but never came back down! A 10 megohm resistor (shown as Rx in Fig. 4) shunted across C6 corrected this and the circuit then performed exactly as advertised. Initial tests using both continuous tone and voice inputs indicated that at least 100% upward and 90% downward modulation should be easily achievable. Under conditions of maximum output with a continuous tone the 807 plate current can be pushed to 150 mA or more! With speech input the plate current jumps around just like a conventional class B modulator. As might be expected, some distortion of the output waveform was observed at maximum levels, particularly on negative peaks.

The overall frequency response of the system with a 10 Henry choke and with C6 at its original value (500 pF) is shown by the dashed curve in Fig. 3. The drop-off on the low end of the spectrum is primarily a consequence of the small value of C6.

According to the original author, C6 was kept small to minimize the effect of this component on the C7 discharge time constant.

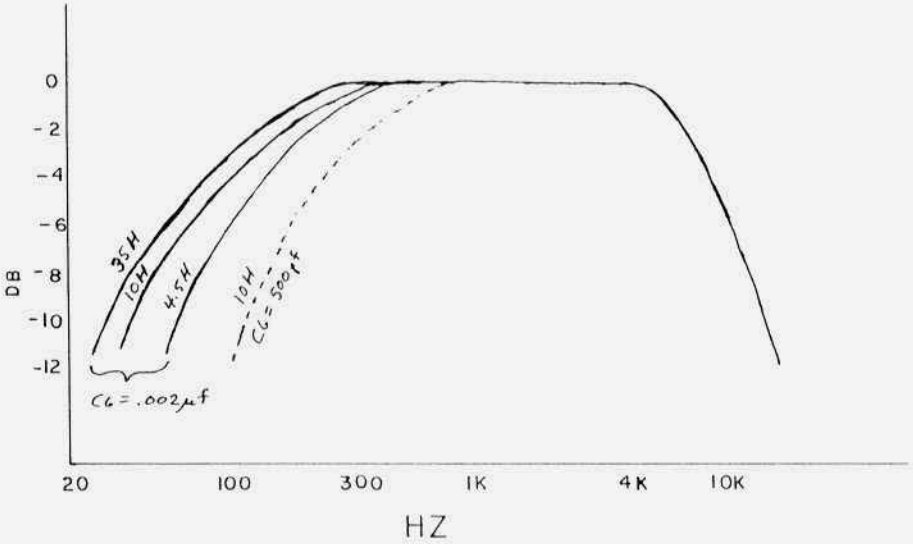


Fig. 3. Response curves for various system configurations as discussed in the text.

I found, however, that the size of C6 could be increased substantially with no apparent effect on the bias control characteristics of the circuit. Increasing C6 to .002 mFd improved the low end response significantly (and C6 could be increased even more). Response curves for three different chokes with this new value of C6 are also shown in Fig. 3. As can be expected, increased inductance improved low end response, but the difference between 10 Henries and 35 Henries is quite small.

Also, the performance of the 4.5 Henry choke would be completely acceptable for communications use. The drop-off on the high frequency end was almost identical for all chokes and is attributable at least in part to the shunt capacitance included in the dummy load.

On the Air With the Reference Shift Modulator

The system was tested using an ARC-5 T19 transmitter with an input of 66 watts (110 mA at 600 volts). (This was only partially a nostalgia trip, the command set was also the most convenient rig available for the test.) Modulation levels of 100% on positive peaks and 90% plus on the negative cycle were easily achieved. On-the-air reports were consistently excellent even though the modulation pattern on the scope didn't look as "clean" as with some of my other rigs. Tests with the 10 and 4.5 Henry chokes revealed very little difference in modulation quality between the two. (No comparisons were made with the 35 Henry unit.)

The most interesting finding during these tests was that the system could be driven into heavy clipping on both positive and negative peaks without producing any apparent splatter. This may be because the modulating waveform never goes all the way to zero and so the RF output of the transmitter is never abruptly cut off.

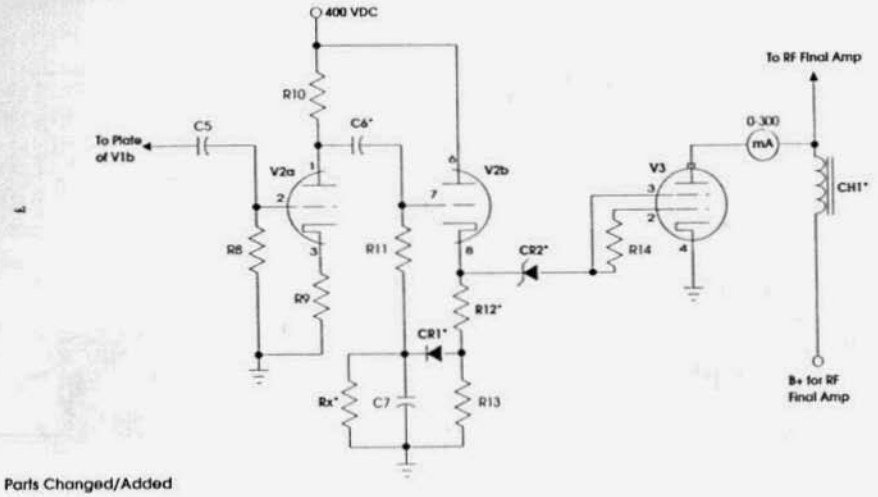
Modifications and Experiments

During on the air testing with the original circuit it appeared that the audio gain settings required to achieve 100% modulation in the positive direction resulted in excessive "bottoming" on negative peaks. Lowering the value of R12 to 82K and the adding CR2, as shown in Fig. 4 helped improve the symmetry.

Several other modulator tubes were

continued next page

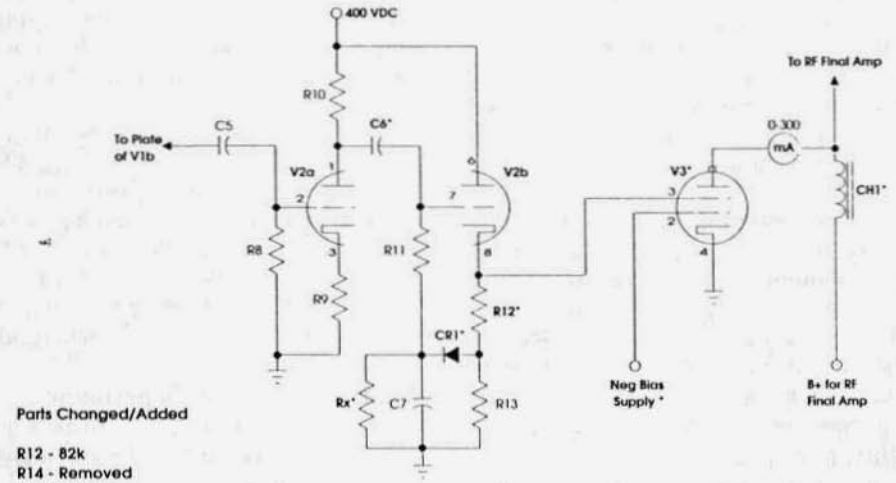
The Reference Shift Modulator from previous page



Parts Changed/Added

R12 - 82k
Rx - 10M
C6 - 0.002u/400V
CH1 - See Text
CR1 - 200V Silicon
CR2 - 15V/5W Zener

Fig. 4. Final circuit as used with an 807.



Parts Changed/Added

R12 - 82k
R14 - Removed
Rx - 10M
C6 - 0.002u/400V
CH1 - See Text
CR1 - 200V Silicon
V3 - 6DQ5, 6HF5, 6JS6C
Negative Bias Supply: -18 V for 6DQ5
-15V for 6HF5
-12V for 6JS6C

Fig. 5. Circuit changes required for sweep tubes.

successfully tested but required modifications to the circuit as shown in Fig. 5 including the addition of an adjustable bias supply to control the resting plate current. The 6DQ5, 6HF5 and 6JS6C sweep tubes gave excellent results. These required less input than the 807 and performed equally well in all other respects. Bias values in the range of -10 to -20 volts were required for 35 mA resting plate current with these tubes. The 6550 with it's 35 watts of plate dissipation was also an attractive candidate but seemed to take much more drive to produce the same modulation levels. The 6550 also requires much more screen current than an 807 and a dedicated 12AU7 with both halves in parallel was used for "V2b" in tests with this tube.

Final Comments

As noted above, an 807 can draw upwards of 150 mA in this circuit and under such maximum conditions the dissipation rating of the tube is far exceeded. Accordingly, care must be exercised to keep the duty cycle of the modulating waveform down at reasonable levels to prolong tube life. Whistling and rebel yells should therefore be avoided as should other forms of over-driving. During testing it was noted that the 807 plate readily showed color whenever I got too close to the microphone.

The +400 supply voltage specified by the author (Fig. 1) may seem high but is in fact required. Remember that V2a must produce signal levels of up to 250 volts peak-to-peak and V2b must pass these along, all with minimum distortion.

It should be possible to connect tubes in parallel for higher power levels but I didn't try this. (Bill Orr used a pair of 304TLs, see Note 3.)

Finally, for utter simplicity coupled with excellent performance this circuit is hard to beat. It was great fun to become reacquainted with my old friend during the preparation of this article. I thank Steve Ickes, WB3HUZ who prepared the schematic diagrams seen here and also the many hams who provided assistance and feedback during on the air tests. ER

Notes

1. Hileman, Dale: "A Reference Shift Modulator," Radio and Television News, April 1955
2. Hileman, Dale: "Class K Modulator," CQ, October 1953
3. Orr, William: "The Bias Shift Modulator," CQ, April 1953

Very Special Event Station Announcement

Greenwich, CT, celebrating 75th anniversary of the Transatlantic Tests. 1BCG was the first amateur station to send a complete message across the Atlantic to Europe using low power and short waves. W1BCG will be on the air from almost the same location from 2200Z on December 11 to 2400Z Dec. 15, 1996, 1815 kc CW only, using an exact replica of the original transmitter. Also, Dec. 13 through 15 on 80 to 10 meters, all modes.

QSL to SARA, PO Box 4225, Stamford, CT 06907-0225, USA. Send large or 9 X 12 SASE for certificate.

Sponsoring Organizations

Antique Wireless Association
Greater Norwalk Amateur Radio Club
Shoreline Amateur Radio Club
Stamford Amateur Radio Club

Contact Persons

Tim Walker, N2GIG, 19 Woodside Ave., Westport, CT 06889. (203) 454-4376
Bruce Kelly, W2ICE, Main St., Bloomfield, NY, 14469. (716) 657-7489

A Fleamarket Speech Amplifier/Driver

by Berk Berkemeyer, WØREP
402 Kingridge Dr.
Ballwin, MO 63011
worep@inlink.com

In the article on an affordable modulator (ER#90) I mentioned using a hi-fi or PA amplifier as a speech amplifier. Several readers have asked for more details.

You need to take more "dirty knees" visits to flea markets for the necessary parts. Here you don't have to limit yourself to hamfests. Offer to accompany your XYL on her next garage sale sojourn. You will not only surprise the heck out of her, but you may find the junk you're looking for. The last several garage sales I've checked have turned up usable items.

So what are you looking for? You will need two audio amplifiers. There are lots of tube type mono amplifiers lying around. One of the units will only be used to furnish the "driver" transformer. This should be a 20-50 watt TUBE TYPE amplifier using push-pull 6V6's, 6L6's or their more modern counterparts. It is imperative that the unit have push-pull output, since it will be connected 'backwards' to drive the modulator grids. The unit should pass the sniff test (has it been burned?). The other unit may be either hollow state or (heaven forbid) solid state. It should put out at least 20 watts and preferably more. It will probably have bass and treble tone controls and should have a high level mic input. If you find an otherwise usable unit with no mic amplifier, refer to back issues of ER or an older handbook and build the mic amp.

OK, you've found a couple of units. Take them home and clean the dirt, dust and spiderwebs out. Check the unit you plan to use as the amplifier, using a mic and speaker. Sounds good and loud and the tone controls work? Set it aside for now.

Strip the output transformer out of the other unit, being sure to mark the leads or terminals which lead to the tube plates and the speaker leads. Put it on the bench and connect the transformer speaker leads to the output of the amplifier. Connect a power resistor of suitable wattage (6K to 10K or so ohms) across the former plate leads. Do not operate the units without this resistor, you might ruin the transformer. Connect an AC voltmeter across this resistor and turn on the amplifier. Talking into the mic should result in meter indication. Obviously, a scope would be a better instrument if you have access to one. If using a scope, you can check out all the controls on the amplifier, marking the tone controls when set to give the desired audio response.

You are now ready to incorporate the transformer into your modulator. Connect the former plate leads to the modulator tubes grids and ground the center tap (see ER#90, p.29). If your modulator requires bias, connect the bias supply to the center tap and don't ground it. Fire up the rig (never operate the modulator unloaded) and speak into the mic. You should modulate the rig. While you may not have the optimum impedance match, it should work, it just may require more gain than if property matched. If the amplifier output and/or the new driver transformer has voice coil taps, a different combination of taps may improve the situation some. On-the-air contacts will aid in the proper setting of the gain and especially the tone controls for the best sounding signal, always keeping an ear out for overmodulation and splatter.

So off to the flea market, hamfest, garage or yard sale or junk shop. As I've said before, finding the components is half the fun. A final note: this same scheme is also adaptable as a modulator for a low-power rig. GOOD HUNTING AND HAVE FUN! ER

Drawing a Vacuum

Blueprint for a Tube Museum

by Paul Courson, WA3VJB
P.O. Box 73
West Friendship, MD 21794

John Walker knew he was hooked on hollow state years ago when his tube collection expanded from an initial 2-3 boxes. A longtime advertiser in ER, he's become one of the most authoritative sources of information on vacuum tubes of all types.

The soft-spoken, unassuming man swears his collection did not "officially" start until 1988, yet he acknowledges that he has a soft spot for tubes dating back some 30 years when he was licensed as WNØUVD.

That "soft spot" is the foundation for an eventual museum that Walker began thinking about as his collection approached 7,000 tubes.

These days, hams looking for the odd tube come to Walker for information and perhaps their first working example of a rare tube needed for a restoration project.

If a guy needs a tube real bad, and I've got a good one, I may take his dud - which is just as good for a display." Such a swap may not make sense to many of us, but Walker says he's not really in it for profit.

His easygoing style does not mean he's a pushover for speculators and shady dealers. Walker prefers to find out whether someone is a sincere collector, which for him makes doing business a pleasure.

Walker calls vacuum tubes "antiques", and disapproves of them going out of the country and to profiteers. Part of that philosophy comes from being loyal to the memory of a distant relative, W9JRV, who in the 1930s was a "junk collector" in the classic days of AM.

"What he threw out would make someone cry," Walker recalls, as he describes a farmhouse full of radio gear. The first big tube to catch his eye? "An 813, or maybe a 211" he answers, "that was just hot stuff!"

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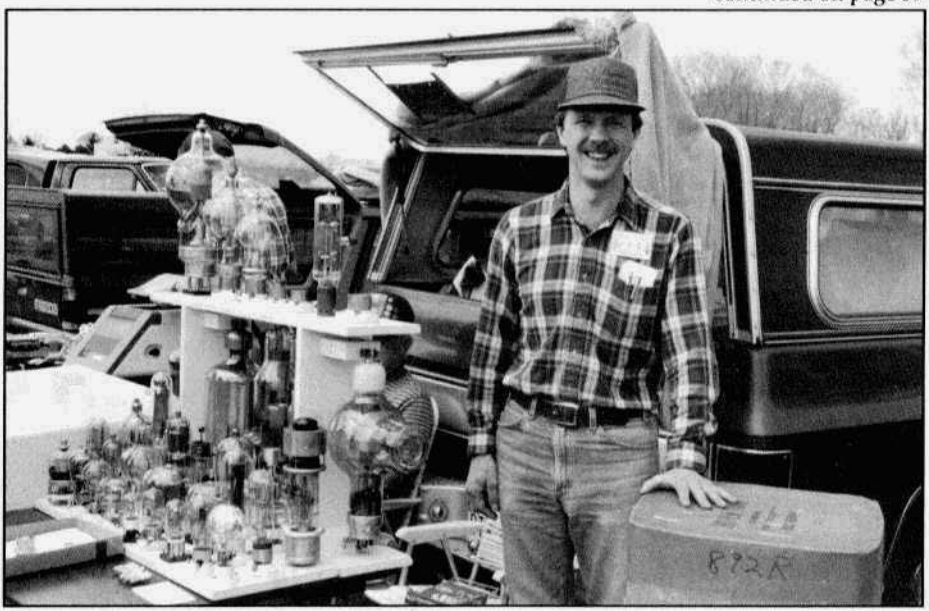
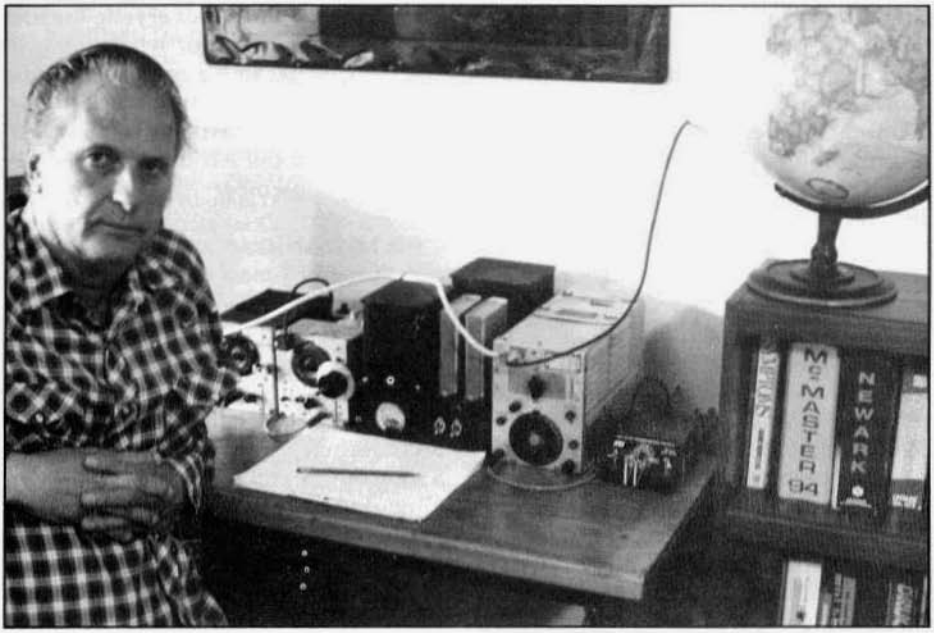


John Walker displays "Crown Jewels"

Bill Bowes, N7MOB, with some of his very pristine looking vintage equipment.

Eastcoast Military Net participants at the "Packrats" hamfest, Warrington, PA. Left to right: Ed Wambold, N3LHB; Ted Young, W3PWW; Steve Gajkowski, KD3HT; Steve Finelli, N3NNG; Mike Oxenreider, WB3CTC; Meir Ben Dror, WF2V; Pete Hamersma, WB2JWU. *Photo by Dennis DuVall, WA3YXN*

Pat Stewart, W7GVC, in his hamshack.



Tom Grove, K6LQI, with his simple 40-meter CW station.

How Come 3885?

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

When Sky King used his BC-611 WW II handitalkie to talk to Penny from his Cessna T-50 Bobcat, it must have been on 3885 kHz, all 611s seemed to be on 3885. In the 50's I was working on automated frequency selection equipment. I pulled the 1944 spurious output test reports of the BC-191, -375 and -610, and they were done on 3885. Guess what frequency had been used for spurious receiver response tests of the BC-312 and BC-342. When I got interested in 75 meter AM 2 years ago, there was 3885 again. I decided to find out where 3885 came from.

The primary frequency management agency in the federal government is the Interdepartmental Radio Advisory Committee (IRAC). When I went through old IRAC stuff, I found 3885 in an Army publication called Tactical Training Frequencies, dated 1945. It superseded a preliminary consolidated training frequency list dated 1943. I found training frequency lists for individual posts with dates going back to 1942. All listed 3885 kHz among others for training. All were listed as non interference basis, NIB, restricted to 25 watts, within 25 miles of the various posts, camps and stations.

3885 showed in a 1942 Signal Corps evaluation of Louisiana maneuvers. The report evaluated Link Radio Company 30-40 MHz FM umpire radios used to score Army maneuvers, but had an introduction which was interesting. The Army had observers in Spain in 1938. They saw that Franco's armies used direct communications between different branches to coordinate operations. To evaluate this the Army wanted Signal to net Infantry pack radio sets with Armored Cavalry vehicular radios. The pack sets had a low frequency limit of 3.8 MHz and the Cav sets had an upper limit of 4.5 MHz so frequencies between 3.8 and 4.5 MHz were needed for proposed 1941 maneuvers.

In 1941 3.8 to 3.9 was Amateur CW, 3.9 to 4.0 was class A phone and 4.0 to 4.5 was maritime and airline. Signal asked IRAC to pull back 3.8 to 3.9 from the FCC. The Air Corps also had designs on ham frequencies for pilot training and asked IRAC for 3.65 to 3.95 MHz. Since they couldn't get it right away, the Army Air Corps would temporarily take 3.8 to 3.9 MHz, effective 1 September 1941 and release it to the Army in January '42. Delays set the effective date back to 20 December 1941. December 7 changed everyone's plans considerably. Who got what amateur frequencies became a mute point, but 3.8-3.9 for Army training stuck, along with the 10 kHz channels, with 5 kHz guard bands, the Air Corps had instigated in September for 3650 to 3950 kHz.

3.8 MHz showed up in Signal documents many times. It appeared in an experimental version of Signal Corps Radio, SCR-67 in 1923. There was a close association between the Signal Corps and Amateur Radio in the years between the world wars. 80 meters was a revolutionary high frequency then, and a transmitter and receiver such as the -67 could be related to the experimental nature of hams working for the Signal Labs. The call 2CXL was used by Fort Monmouth. The relationship could be seen in the 30's when Signal used ham style modulated oscillator transmitters and superregen receivers on 5 meters,

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VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 4:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3808 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Westcoast Military Radio Collectors Net: Meets Fri. at 2200 local on 3990 and Sat. at 0800 local on 3990 + or - QRM. Net control is Tom, WA6OPE or Andy, KD6TKX.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:30 PM EST & EDST
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 7037, Sundays at 7 PM Mountain. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same frequency. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Night 6 Meter AM Net: 8 PM Sundays on 50.4. Net controls are Dan, KV6I and Scott, K6PYP. Informal, supports restoring old gear and using it on the air. Loan gear available for those wanting to join in.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Old Buzzards Net: Meets daily at 10 AM Local time on 1945. This is an informal net in the New England area.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating.

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

The Grandaddy Globe King

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

It was late June of 1981, and they were the words that every boatanchor collector longs to hear. "Jim, I have an old transmitter I haven't used in years. I think it's about time I got it out of my basement and gave it to you." So said my Columbus, Ohio friend, Bob Cartwright, W8FMN.

After making sure that I had brought my big old Pontiac Catalina to work that day and not the Datsun 210, Bob invited me to stop by his house to pick up the rig. I found out why he had asked about the car when I saw it. It was a genuine WRL Globe King 275, and we carried it out to the car trunk in FIVE pieces, RF deck (15 pounds), modulator (60 pounds, ufdah!), power supply (57 1/2 pounds, also ufdah!), rack cabinet (40 pounds), and a box of coils. I was so happy with my good fortune on the way home that I barely noticed the groaning rear shocks on the Catalina. What a wonderful find!

I knew, of course, about the Globe Kings. Since I'd started to read my Boy Scout Commissioner's QSTs back around 1950, Leo Meyerson had tantalized me with ads for Globe Trotters, Kings, Champions, Scouts and Chiefs (not to mention all the used gear that he recycled and passed on to a lot of the fledgling hams of my generation). But this was the first King I'd every really seen up close and personal. And it was the original, first production model from 1947/48, which made it even dearer to my collector's heart.

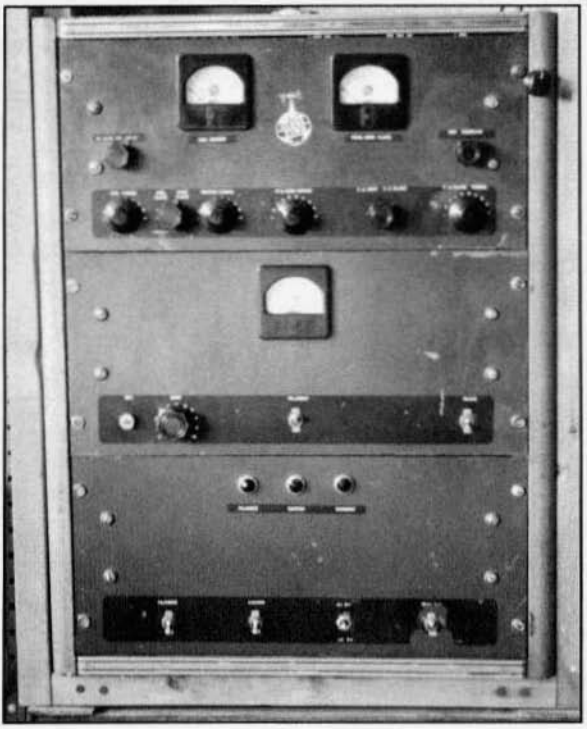
Bob had also given me an envelope containing several yellowed and frayed, hand typed, mimeographed instruction pages for a "Globe King WRL 400." The RF deck looked to be the same as his/now my rig, but the modulator was different, ending in 5514's in the "400" as opposed to 6L6's in the "275," so I wrote to Al McMillan at HI for the info on the WRL 275.

There was very little difference between the two manuals, even down to most of the wording. The WRL schematic was drawn by hand with the aid of a straight edge and a template, and Al included another schematic for the WRL 275 RF Section done on an engineering drawing bearing the logo of the "Chesapeake & Ohio Railway Co., Office Supt. Telegraph & Signals, Richmond, VA." Apparently hams were not the only ones who bought the original King.

Just this year I talked with Al and Leo about the Globe King. Al told me and Leo confirmed that WRL, then Wholesale Radio Labs, had custom built a 275 watt AM/CW rig in 1937 for W9YZX in Omaha. And Leo said that they had a 150 watt rig using push-pull triodes, perhaps 809's, 811's or 812's, and with 6L6's in the modulator, on the drawing board just before the war broke out and stopped everything. This 1941 rig "planted the seeds" for the 1947 Globe King 275 designed by Sam Fidone, W0QAB, which was the first production model to carry that famous name. Sadly, Sam died just last summer shortly after he was "rediscovered" by Jim Musgrove.[1]

Al also related that by the time the 400B King came along in 1953, Leo bid on an army contract for about a dozen transmitters.

"He didn't read the fine print and assumed he could just include the usual 6-page mimeo booklet for hams. When the government agent came to give acceptance approval, he asked, 'where is



The WRL 275 Globe King, serial number 1076. (The wooden frame is a rack that also holds an SP600, HT-20, and a VFO for the HT-20 "upstairs.")

the GOVERNMENT type manual you need!?' I (Al) was given the job of writing this book, which is in three parts.

"It took me 3 months to finish, as I first had to read a six foot high stack of manuals on HOW TO WRITE A GOVERNMENT MANUAL. It was still just a production King 400B, but, because of having this book with obvious quality, we were put on government bid lists. Next, on the 400C in 1954, we got a bid request for about six units from the Honolulu Sheriff's Department (on about 1780 kc as I recall) and it contained requirements of commercial level suppression of unwanteds.

"It was HELL meeting them -especially the -70 dB harmonic/spurious suppression, and we had to work hard to filter adequately -and had to bring in an outside engineer from Chicago to certify it. After two trips to Iowa, we finally made the engineer happy and just squeaked to -70 dB.

"But, again this got us on more bid lists, and special orders from foreign and domestic sources paid for the effort later."

Leo added in our conversation that he had seen a 400A Globe King in use as AM Broadcast Band transmitters in San Salvador, running continuously 14 hours a day with no back cabinet door and a fan blowing in to keep it cool, and that over all of the models, 28,000 Kings were sold.

I had also written in July, 1981 to Leo about my find. He replied then, "No question about it - you have in your possession one of the oldest Globe Kings by the tube lineup you sent me. This model unquestionably is the WRL-275 Globe King put out in 1948. I would like to find one myself - Hi.

"I am setting up a museum of the old gear and really all the equipment we ever manufactured. I never had the foresight to think that someday I might be interested in a museum - Hi.

"At any rate, I am glad to help you out and hope the rig is working - if not you should have little trouble in making it work as it is a straight forward rig. We were one of the first to have a set out right after the war."

Leo was quite right about the King 275 being a no trouble, straightforward rig. It is a real classic in the late 30's and 40's style. The final compartment is dominated by a pair of husky, tungsten filament, carbon anode V70D triodes in push pull, appropriately accompanied by split stator grid and plate condensers, plug-in

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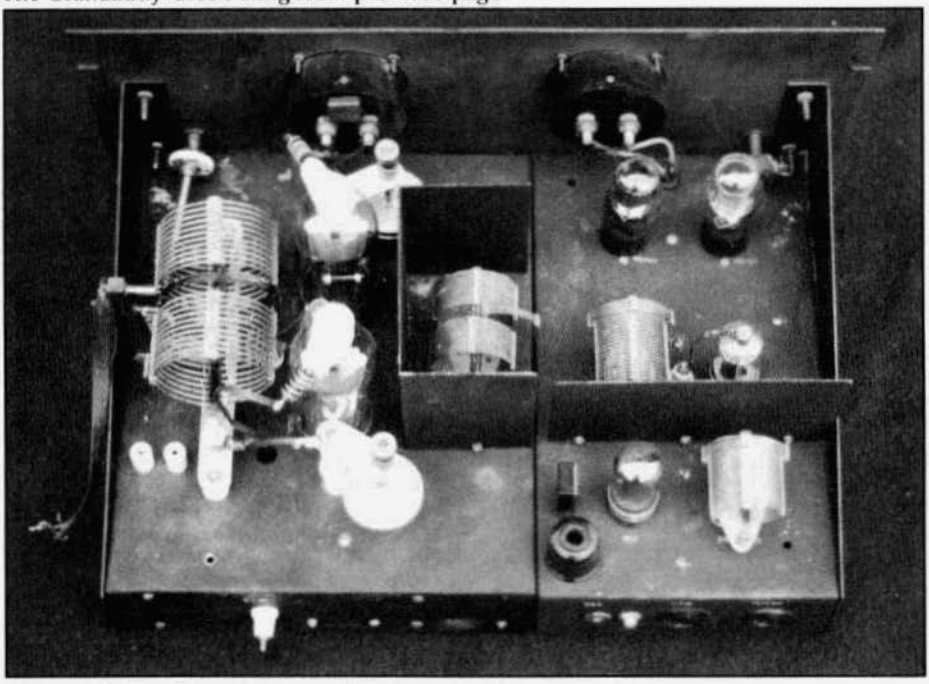
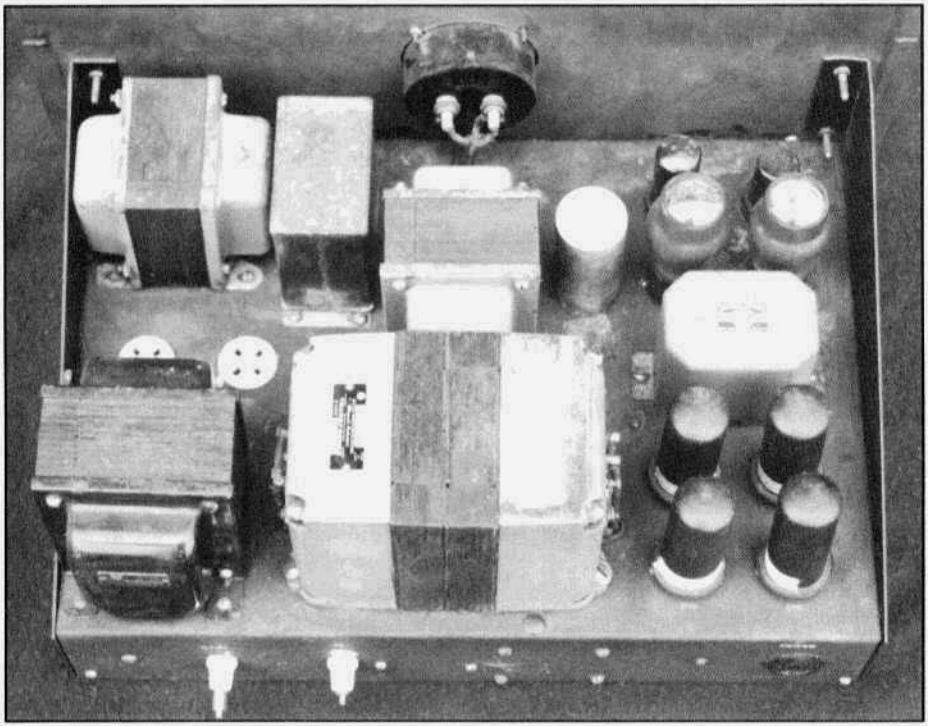


The RF deck with 40 meter coils in place. Crystal oscillator to the rear, buffer in front of it, V70D finals on the left.

coils, swinging links in the grid and plate coils, and disc plate neutralizing condensers. The RF deck gets the job done with a minimum of stages, starting with a 7C5 (loctal 6V6) hot cathode crystal oscillator that can go straight through or double, that driving a 2E26 buffer/doubler which loafs going straight through but has just about all it can do within its Class C ICAS ratings when doubling to pump 32 mA of grid drive into those mammoth V70D's. There are two meters on the RF deck, one 150 mA full scale that is switched between the oscillator plate (47 mA max) and the buffer plate (66 mA max), and the other 350 mA full scale that reads either final grid current (32 mA) or final plate current (250 mA full load). You need to keep your glasses handy and your wits about you when tuning up a Globe King.

The modulator, on the other hand, uses ten tubes! It starts with a 6SJ7 preamp well matched to the popular high impedance crystal mikes of the day, like for example my D-104 and JT-30. Next comes a 6N7 dual triode amplifier/phase inverter, then push pull, triode connected 6F6 drivers, and finally a quadpack of triode connected, push-pull parallel, class B, zero bias 6L6's. This lineup cranks out at least 120 watts, and the on the air audio reports say that the King sounds better than my 32V-3. A pair of 5Z3's rounded out the ten tube roster on the original modulator deck. Bob had substituted a pair of mercury vapor, 866 Junior's for the hard to find 5Z3's. I ran them till one of them quit; it would ionize and glow blue, but it wouldn't conduct full current under load! I "temporarily" replaced the Juniors with sand-state diodes, which I have every good intention of removing in favor of a pair of 816's this winter.

The power supply deck is 57-1/2 pounds of copper, iron and steel and three tubes. A pair of 866A's crank out 1150 volts at 250 mA for the final and a



The 60 pound Modulator deck. Empty sockets will hold a pair of 816's.

5Z3 contributes 500 volts at 200 mA for the exciter. One nice feature of the final power supply is its "tune/transmit" switch. On "tune," a 100 ohm, 50 watt resistor is dumped in series with the primary of the high voltage transformer. With this resistor in the circuit, whenever the final is off resonance or otherwise drawing a lot of current, the voltage output of the supply drops way down, self limiting the amount of power dissipated in the V70D's. That's a trick that we home brewers used too, in those good old days, except I used a 50 watt light bulb instead of a power resistor. Not that the V70D's really need that much protection in the King 275. W ith their combined 170 watt plate dissipation capability, they wouldn't be terribly overloaded if they were called on to swallow the entire rated output of the power supply! As it is, something more than 200 of those 250 watts DC supplied to the final are converted to RF output, something you won't find happening in the later, less efficient, tapped-coil bandswitching pi-match rigs like the Viking Valiant. So the V70D's are barely breaking a sweat in the Globe King 275.

As both Leo and Bob Cartwright had predicted, the Globe King came to life immediately with very little other than cosmetic attention. I decided to match it up with my Meissner EX Signal Shifter as a VFO, also vintage 1948, and I found them to be a perfect pair. The King can be driven from a VFO one of two ways. Like other rigs, a VFO of for example the Heath VF-1 persuasion can be capacity coupled to the grid of the 7C5 crystal oscillator which, with its cathode switched to RF ground via the front panel control, will act as a stable buffer or multiplier stage. The King is also set up to link couple the low impedance output of a more powerful VFO like the Meissner directly into the crystal oscillator plate tank which is also the input circuit for the 2E26 buffer. There's a convenient plug on the rear of

continued next page

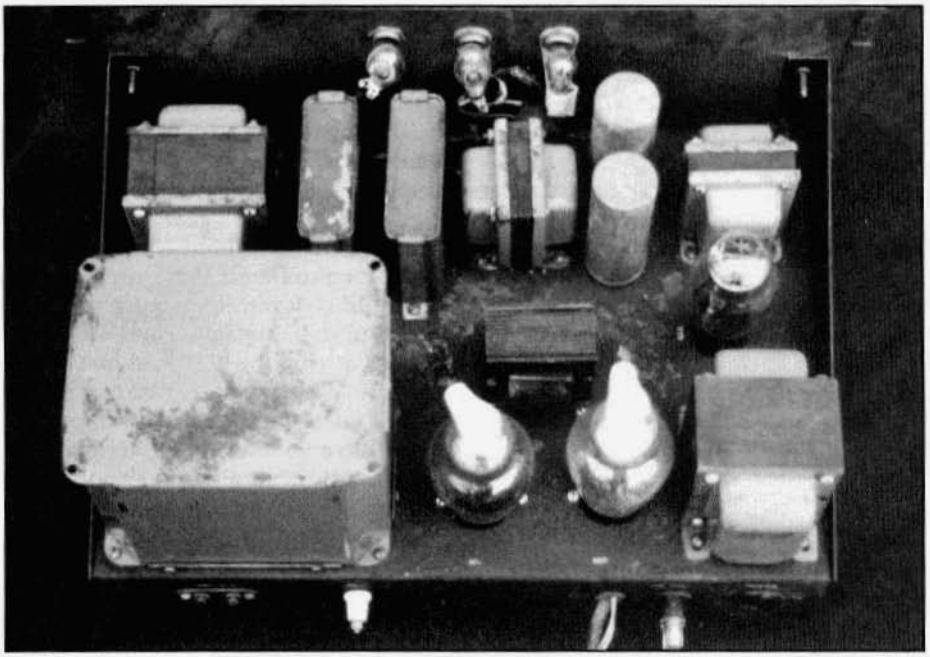
the RF chassis that gives access to the link on the oscillator plate tank and to a jumper feeding B+ to the oscillator. So all I did to use my Meissner was to disable the oscillator by opening its B+ feed, and to connect the output link from the Meissner to the input link on the oscillator plate/2E26 grid. Since the Meissner has output on 80, 40, 20, 15 and 10 (thanks in no small part to Hank Van Cleef who just recently supplied me with a long-missing 15-meter coil strip for its turret!), the Meissner/King combo is all ready to go on any of those bands.

For this article, I also tried out the crystal oscillator just to see how it would sound. It works well and keys nicely with its cathode grounded, working as a straight tetrode crystal oscillator with fundamental output. But in the "hot cathode" position, its oscillation frequency is determined by the plate tank tuning rather than by the crystal. Oops! Since I use the Meissner with the King all the time, I'll just put that down on the list of little things to be fixed one of these days when I get around to it.

In August of 1981, I received an OO report on my 7062 kc CW signal that said I had key clicks out 6 kc from my carrier. The stock King 275 keys only the cathode of the crystal oscillator and biases the buffer and final beyond cutoff with a selenium rectifier equipped negative bias supply. In my case, I'd been keying the Meissner and just letting the driver and final of the King follow along. An oscilloscope showed the final output wave envelope to be quite sharp on both leading and trailing edges. I finally cured the click by introducing what amounts to shaped, "grid block" keying to the 2E26 screen grid as shown in Figure 1. The 0.5 mFd capacitor "C" takes time to charge when it is switched from the -120 volts it is connected to at the output of the bias supply to the normal positive screen potential when the keying relay toggles, so it rounds off the leading edge of the keyed waveform. The 20K return resistor "R" pulls the 0.5 mFd capacitor back to the bias potential with a 5 millisecond time constant thus nicely rounding the trailing edge. The keying relay is a Western Electric type 337A mercury wetted relay, so it doesn't introduce any bounce or chatter into the waveform. The net result is that the drive to the final is shaped, and so is the final output. Bye, bye keyclicks. When I mentioned my clicks and their cure to Leo, he remembered that hams had given them some feedback about clicks on the King at the time, and that they had modified the circuit to key the buffer screen as well. Small world.

The last time I had the King on the air before I started on this article was 1989 in Ohio. Since then it has been packed and moved, and it sat out in my New Mexico garage for six and a half years. I cleaned the dust and some mouse debris out of it, and it came right back to life the first time I powered it up. But a quick check with the portable TV sitting about fifteen feet away and the King on 40 meters driving a Heath Cantenna showed objectionable TVI on Channels 2 and 4. This great old rig had been designed in 1947 when the "Tennessee Valley Indians" as we used to refer to them in the hopes that our neighborhood listener/watchers wouldn't catch on had just begun to arrive in force, and hams had yet to figure out how to live at peace with the new, one-eyed monster. Relatively speaking, the King is "wide open" as far as shielding is concerned with all sorts of escape holes for RF in the cabinet and out the power cables. But I remembered that back in Ohio I had been able to operate on 40 without bothering Channels 4, 6 or 10, so perhaps there was something short of major surgery that could be done.

The King does have a push pull triode final, and a properly balanced and adjusted push pull stage theoretically will cancel all even harmonics. Channel 2 is the 8th harmonic of 7 MHz, and



The 57 1/2 pound power supply deck.

Channel 4 is the 10th harmonic, so ideally they shouldn't be a problem. Perhaps the key was in the King's being "properly adjusted." Following Sam Fidone's directions, I started from scratch and re-neutralized the final. That involved opening the B+ line to the final, coupling a sensitive indicator to the plate tank (Sam suggested a link coupled #48 panel bulb, rated for 2 volts @ 60 ma, but I used a link coupled Tektronix 454 scope), and tuning the buffer, grid and plate for maximum output indication, all on 10 meters since the highest frequency band is the most sensitive for neutralization. Then, cranking the neutralizing capacitors first all the way closed and then five turns open - being careful to keep the same adjustment on each one so as not to disturb balance - and finally adjusting them in a little at a time, I tuned for zero output indicated on the scope. I was rewarded for my trouble with NO TVI, not only on 40 but also on 20 meters! The second harmonic of 10 meters still makes a definite impression on Channel 2, and I'm not one to adjust neutralization caps in real time with 1250 volts of DC and an equal amount of RF floating around on the other end of a short, plastic screwdriver. So I think I'll probably quit while I'm ahead and just not use the King on 10 meters. But it's nice to see that this almost 50 year old ham rig is still able to get in there and burn a decent hole in the CW and AM bands even today without bothering the neighbors' acquisition of culture.

My King is quite close to its original configuration yet today. Other than the sand state diodes in the modulator and the keying circuit, the only other non-original feature, added by Bob Cartwright, is a transmitting type variable capacitor around 300 pF in series with the final output link. A capacitor was often put in series with a link in the old days to help the transmitter load into a low impedance like the new fangled RG-8 and RG-11 coax that had just become available after World War

continued next page

Two. So even though it's non-original, it's both functional and vintage and it stays.

As you can see from its picture, the King 275 is "straightforward" and functional, but it has a few touches of glamor too. The famous WRL Radio Globe trademark is prominent on the front panel of the RF deck, so far as I can tell from Moore's Transmitter book the first of many times that emblem showed up on a WRL transmitter. A WRL emblem is found on each of the meter faces as well. As you can see from the pictures, my King also has black background stripes on the RF, Modulator, and Power Supply panels behind their rows of knobs and switches. That makes it a "275A" model according to Leo Meyerson biographer, Jim Musgrove, who assures me that the original King 275 has a plain panel as shown in the original, 1948 ARRL Handbook ad page.

All of my words so far describe the King 275, but they don't begin to convey the sensation of being one with it when it goes on the air. This is a radio that does more than just glow in the dark. The 24 watt, tungsten filaments inside that pair of V70D's illuminate the RF deck like a couple of light bulbs! And that friendly little blue glow that dances between the cherry red filament and the plate of those 866A's idling in the power supply seems almost to burst out of the tube envelopes when you hit the key. The one inch diameter red and green pilot lights on the power supply panel give you a continuous warning about which B+ supplies are active, at least as long as the 110 volt night-light bulbs in them don't burn out. The relay in series with the HV transformer primaries announces its closure with an authoritative "whack." The final power transformer hums in tune with your keying -who needs a monitor! This is a rig that truly conveys an experience in sight and sound that is lost in gear from our more modern era.

To really appreciate the Globe King 275, you have to understand it in the context of it's just postwar era. First off, up until the advent of SSB in the early to mid 50's when things got a bit too complicated, most hams either built their own transmitters or substantially modified "war surplus" gear. The average Joe Ham wasn't about to spend much more for a commercial transmitter than it would cost him to acquire the parts and build it himself. Ham radio, silenced during the war, had just gotten its bands back during 1946, and there was a lot of pent-up demand for new rigs with all of the marvelous advances in the radio art that our magazines had been hinting about throughout the duration. Yet at that point, the number of new commercial rigs were few, and most of them were relatively low power.

Hallicrafters still was offering its pre war HT-9, a rig the size of a small coffin that ran about 150 watts into a single 814. The Temco 75GA and Supreme AF100 look-alikes were available, but they cost $495 and $450 respectively and ran only 100 watts. They were rapidly loosing out to the newly introduced and much superior Collins 32V selling for $475. You could buy a half kilowatt Collins 30K if you were a millionaire, it's price tag with the 310A-1 exciter was $1450. The Temco 500GA ran 500 watts out and cost $1800!!! Those last two rigs cost about as much as a new Ford or Chevy! And there were a few 6L6 or 807 rigs like the Harvey-Wells Bandmaster, Meck T60, Millen 90800 and WRL Globe Trotter available, but they were low power, and some of them had neither modulator or power supply included.

The surplus market had yielded some BC-610's, ART-13's and Meissner 150B's in 1946, but they were far from cheap. Allied Radio, Van Sickle Radio Supply and WRL had BC-610's advertised for $535 used, $760 new in June, July and August of 1946, but not thereafter. Van

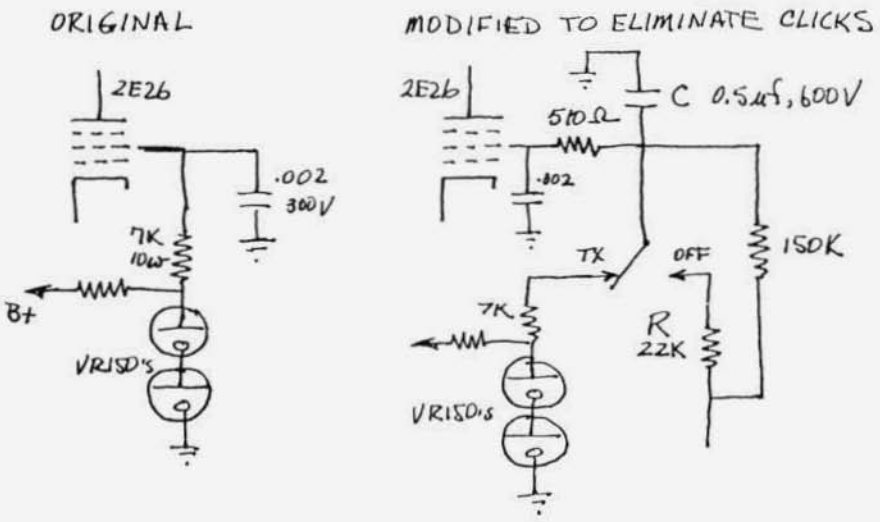


Figure 1 - "Grid Block" keying the 2E26 buffer screen eliminates key clicks.

Sickle and Sun Radio offered ART-13's as late as December 1946 in the $200 to $240 range. But by late 1947, all of the reasonably decent, medium to high-power rigs on the surplus market were long gone, and there was no reasonably priced, medium power, commercially manufactured transmitter on the market.

Into that void, Leo launched the 275-watt Globe King. At $351.45 for a kit and only $25 more for an assembled version, it was clearly the best watts per dollar value available in the medium powered field. It didn't have the sophisticated design, packaging, VFO and ease of tune-up of the Collins 32V, but it delivered more than twice the output power, its audio bandpass was wider so it sounded better on phone, it was twice as big and half again as heavy (which didn't hurt its image at all in 1947), and it was a hundred dollars less expensive. Not everybody was rushing to spend that amount of money, especially when Command transmitters were beginning to come on the market for peanuts, but the 275 King established a neat niche for itself in the ham radio market and was so successful that it was developed in turn into its direct descendents, the 400 and 500 series Globe Kings.

Here we are, almost five decades and, according to Leo, some twenty eight thousand Globe Kings later. Leo is still going strong, though he gave up wearing bow ties a few years ago, and he finally has his museum. World Radio Labs morphed into a 30-store chain of consumer electronics outlets when Leo retired, and finally disappeared altogether under pressure from still bigger competitors like Circuit City and Best Buy. But the great Globe Kings, and their little brother Champions, Scouts and Chiefs live on and continue to liven up our AM phone frequencies and CW bands with their solid signals. At 50, my WRL 275 Globe King is looking as though it may well live as long as Leo, himself. So to the '275 and to Leo, let's all lift an 807 and say, "Long Live the King!" **ER**

References

1) Jim Musgrove, "Farewell to Sam Fidone, WRL's Chief Engineer," ER #89, September 1996.

Have We Come a Long Way?

40 Years of Radio Evolution

Part 1

by Ed Fong, WB6IQN
2900 Semiconductor Dr.
Santa Clara, CA 95052-8090

Many older hams are saying, "Aren't the bands noisier now than they were 40 years ago? Whatever happened to those quite nights when I could hear the Congo as clear as KGO." Well, it's not your imagination. You are hearing more noise today, but it's not likely due to band conditions, although we are presently in a sun spot low. It's most likely your receiver. The receiver you're using now is not the same one you were using 40 years ago. You would think that with all this computer technology, all that 486, Pentium, K2 and that stuff, that HF receivers would have progressed to a point where the receivers of today would be vastly superior to receivers of made 40 years ago. Well, receivers have gotten worse, far worse. Skirt selectivity has gotten worse overall. Overload noise performance has gotten worse. Audio quality has gotten worse. So what do we get for our 1000-2000 dollars worth? Actually quite a bit in terms of features but at the expense of lost performance. These days a typical Icom or Kenwood gives you all kinds of features starting at about $1000. You get digital readout down to 10 Hz resolution. You get a very stable oscillator with less than 100 Hz drift. You get unlimited memories (typically 100), you get a computer interface control so you can control the radio from your computer. Unfortunately, you don't get the most important feature of all, a "high performance" receiver.

The modern day ham receivers (or transceivers as the case may be) are adequate for everyday consumer use. But make no mistake about it, these receivers will not perform at the quality of an old Collins R-390A, 75A-4 or Collins S -line. Even an old Kenwood 520 will outperform many of the radios available today. So it's just not the manufacturers, it's in the design philosophy of transceivers.

Receiver design of forty years ago was quite different than that of today. Primarily, designers did not have the availability of inexpensive microprocessors, software, memories, etc. From that point of view, much had to be brute forced. Things had to be done in the most basic form. Although quite often very elegant, the design engineer had to stick to the basics. Basic LC (inductor and capacitance) circuits, no CAD (computer aided design), no varactor diodes, no PIN diode switches, no hot carrier diodes, no digital logic gates, no gate arrays, and no fancy microcontrollers.

What these classic receivers lacked in electronic technology, they made up for in mechanical ingenuity.

Historical Review

Let's begin by reviewing the sections of a basic superheterodyne shown in Fig. 1. Virtually all HF receivers are based on this fundamental design. Some are dual conversion, some are single conversion, but the principles are the same. This holds true regardless of whether it is a $5000 Collins or a Radio Shack DX-330. They all have RF front ends, local oscillators (LO), mixers, IF amplifiers, detectors, and an audio stage. It is the differences in these stages that make a good receiver and a super receiver.

If you were to buy a Collins KWM-380 at $5000 today, one quickly notices that the receiver's noise floor cannot match that of an old Collins R-390A made back in 1960 (originally designed in 1954 un-

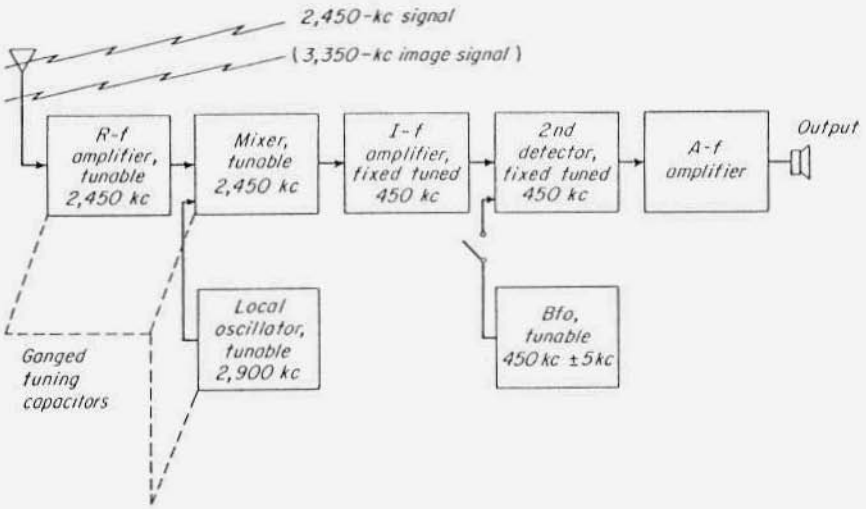


Figure 1. Block diagram of a superheterodyne receiver. Virtually all receivers are based on this design.

der US contract 14214-PH-51). I have personally measured noise floors of R-390A's at -143 dBs. This is a good 3-6 dBs better than any other radio I have tested, old and new. A typical Collins KWM-380 is only about -135 dBs. So what makes this 40-year old boatanchor tic?

The reasons are probably not that simple. If it were, the problems could be easily incorporated into today's receivers. Obviously, the major problem confronting manufacturers today is cost. Manufacturers would like to deliver the best value to the customer. $1000 today is the equivalent of $150 thirty years ago. So what could one pick up 30 years ago for $150? Not much. Maybe an Eico 753, or Heathkit DX-60 transmitter with a HR-10B receiver. Certainly in terms of value, we get quite a bit these days. We just don't get top performance unless we are willing to pay for a Harris 3200 or Ten Tec Omni VI. These "professional" receivers (transceivers) all go for about $5000 and up. This is not to mention the Collins HF-80 series where if you had to ask, you can't afford it.

RF Front End

The RF front end is probably responsible for a good portion of the receiver's performance. If the front end is overloaded, there is nothing in the following stages, short of artificial intelligence or an act of God, which can fix the signal. To preserve the integrity of the signal, an ideal front end desires to have the following characteristics.

1. Handle the weakest signals and yet will not overload with strong signals.

2. The front-end should hold its own. AGC (automatic gain control) is not a substitute for a high dynamic range front end.

3. The front end should be as linear as possible and not introduce distortion to the modulated incoming waveform.

4. If any AGC is to be used in the front-end, it should not affect the biasing of the front-end amplifier or mixer otherwise distortion products result. The AGC signal should be used to control a programmable signal attenuator.

Let's look at the first issue. Certainly one can build a front end with plenty of

continued next page

Have We Really Come a Long Way? from previous page
gain. With today's low-noise transistors, the front end sensitivity can easily match up to the old tube stuff such as the 6DC6 used throughout the R-390A by Collins. Contrary to popular belief, sensitivity is usually not the problem. The challenge is being able to handle the weakest signals and simultaneously handle the 2 KW down the street on the same band. This is a problem that all military radiomen can relate to. On board a military ship, there are literally tens of kilowatts of RF energy ranging from DC to daylight.

So what do the professionals do? Fig. 2 shows the front end of a Collins S-line receiver. This is also similar to the same front end of the R-390A. It uses a 6DC6 in a pentode configuration. This configuration virtually has endless dynamic range since the tube plate voltage sits at +140 volts. This circuit is almost impossible to overload and yet delivers sensitivity to 0.3 uv or better. With some careful tuning, my R-390A measures to 0.1 uv on selected bands. With minimum AGC, this circuit has a dynamic range exceeding 140dBs. Because AGC is kept to a minimum, SSB signals experience less distortion due to the high linearity of the front end. This also accounts for why many tube rigs often have better audio quality. It's simply not all in the detector and audio circuit. In modern rigs, part of the poor performance is due to the front-end contributing distortion due to the AGC and the non-linearity of the RF section.

Let's compare the Collins front-end with the front-end of, let's say an Icom 735. The good news regarding the Icom is that it does use FET's as opposed to bipolar transistors which are much more nonlinear. The Icom circuit is in a common gate configuration. To match the impedance and provide for more gain, Icom has paralleled two devices. The circuit uses NO AGC at all in the front end. Thus, it is prone to overload. The drain is biased at approximately 8 volts. This gives rather poor front-end overload performance as reported by many IC-735 owners. However, this front-end is probably adequate for residential and mobile operation. I just won't use it at ARRL headquarters or aboard the USS Enterprise.

In general, FETs are better than bipolars at the front end but they are no match to tube front ends which offer lower noise and lower distortion products. Tubes are superior in terms of dynamic range due to the high bias voltages and are virtually impossible to overload if designed properly.

On another note on front ends, the Icom and for that matter, all cheaper radios (Kenwood, Yaesu, etc.) use standard switching diodes for switching in the various front end bandpass filters. As mentioned in the Mar 95 issue of QST by Ulrich Rhode, conventional switching diodes (such as 1SS53's) are notorious for distortion and cause Inter-modulation (IM) products. The bandpass filters are typically not tunable in the cheaper radios and thus do not reject in-band signals. Even if the bandpass filters were tunable, the linearity is usually inferior due to the use of nonlinear varactor diodes.

On the contrary, the Collins R-390A has no PIN diodes for switching. It uses real down to earth wafer switches. No measurable distortion in these devices!! Expensive? Yes, but it is the best way to get the job done. Not only that, the Collins R-390A goes one step further which is only found in the most expensive receivers made. It uses CAM gears for TRACK TUNING. This technique was and still is the ultimate in receiver design. As one tunes the main tuning knob, the front end, the mixer, the local oscillator, the second mixer and all associated circuitry are mechanically tracked. As you tune the main knob, all the other tuned circuits in the radio are mechanically retuned for optimum performance. If one looks into an R-390A, it is more complex that a Swiss watch.

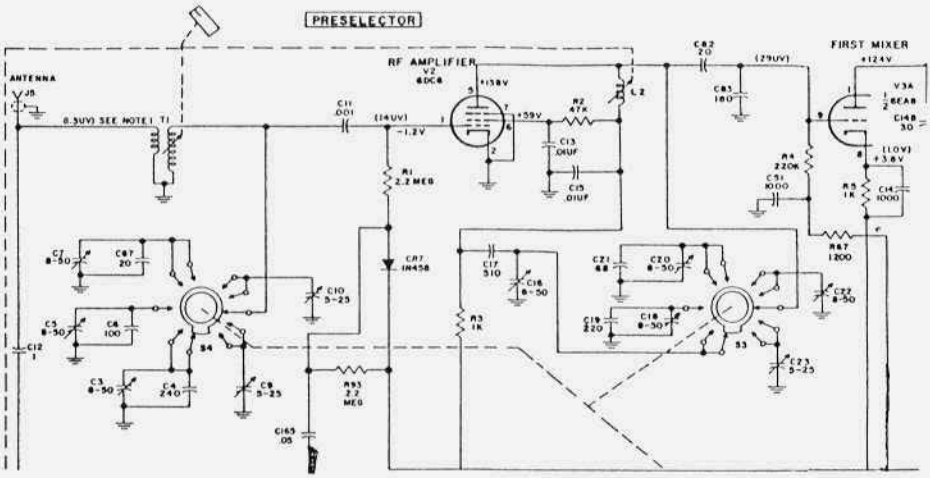


Figure 2. Schematic diagram of the front end of a Collins 75S3.

There is a funny story that goes along with that. I heard that when the Soviets seized an R-390A in the mid 1960's, they were elated until they looked inside. Upon looking at the overwhelmingly complex cams and gears, they decided their time and efforts could be spent elsewhere. The Soviets copied many U.S. products for their military but you will never find a copy of a R-390A.

The purpose of the CAM gear is to transfer the linear motion of the main tuning knob to a NONLINEAR relationship to match the tuning of a particular inductor or capacitor. This technique maintains peak performance regardless of where one is on the band. CAMs take odd shapes and sizes and were empirically derived at Collins. This was a mechanical engineer's nightmare. The engineers at Collins changed the course of history. It was the receivers that were developed under their direction that managed to intercept virtually every Soviet and Chinese message transmitted across the HF band.

Does the CAM tuning system work? You bet it does, but at a high cost. But cost was never an object during the cold war. There were about 100,000 of these receivers made between 1954 with the last batch delivered to the U.S. government in 1984. Yes, they are not only being used in military ships today for reconnaissance but they are still being installed in newly christened ships. Why? Because they WORK, even under the most adverse conditions. These receivers have skirt selectivity that is absolutely unheard of in today's consumer type receivers. With 5 mechanical filters for various bandwidths and one crystal filter for narrowband CW work, there has never been and perhaps never will be another receiver as superb as the R-390A. The U.S. government had 10 (as far as I know) contractors work on these to meet demand, although Collins was the original designer.

The first attribute that a user notices about this receiver is the way signals just pop in and out when tuning a segment. The primary reason for this is the superb mechanical filters which were designed by William Sabin. Mr. Sabin is still consulting today for Rockwell Collins. The subject of mechanical filters will be further discussed in the section on the IF stage. **ER**

Part two will be in next month's issue.

More on the AWA 1929 QSO Party

by Phil Kor, VE4KOR
P.O. Box 264
East-Selkirk, MB R0E 0M0
Canada

Up here in the backwoods of central Canada few know of the existence of AWA. Even fewer are aware that they introduce intriguing contests, such as the current 1929 QSO Party. It sure got my attention and soon after the receipt of ER's Feb. & Mar. '96 issues, containing Bob Dennison's interesting articles on the subject, I decided to dive into my extensive junkbox and create a Hartley oscillator myself!

The initial version was very similar to Bob's (see schematic Figure 1). I used a 45 triode instead of his 27 and parallel HV feed. The combination of L1 (8 uH) and C1, C2 & C3, with values shown, makes it possible to set the center frequency exactly at 3589 kHz with C1 providing the right amount of bandspread. Location of the components is not critical; just keep the leads as short as possible.

The unit produced about 5 Watts output into a 52 Ohm dummyload. Unshielded, it emitted enough harmonics to create beautiful fishbone patterns on our TV in the living room and probably on my two neighbors sets as well! Encasing the unit and grounding same reduced the TVI virtually to zero.

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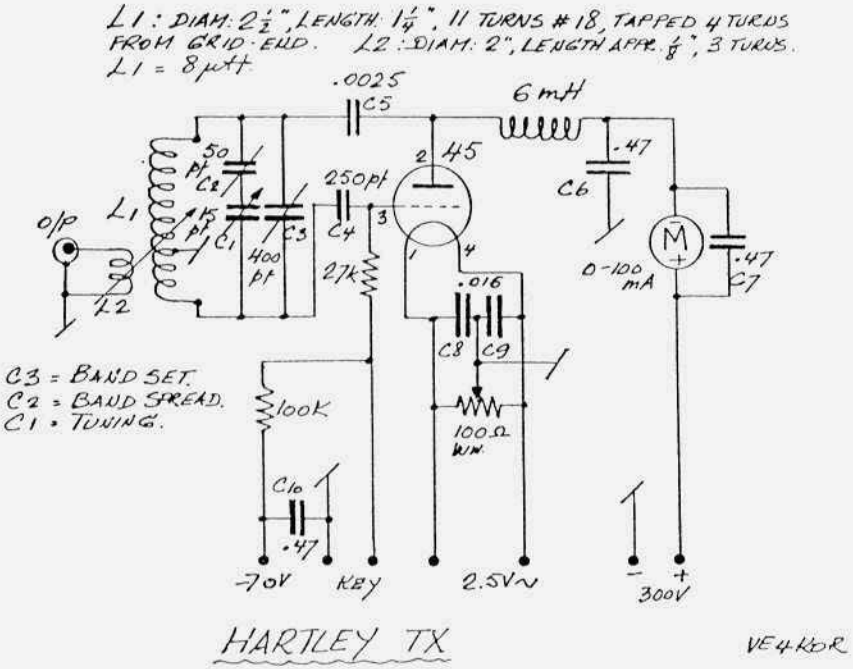
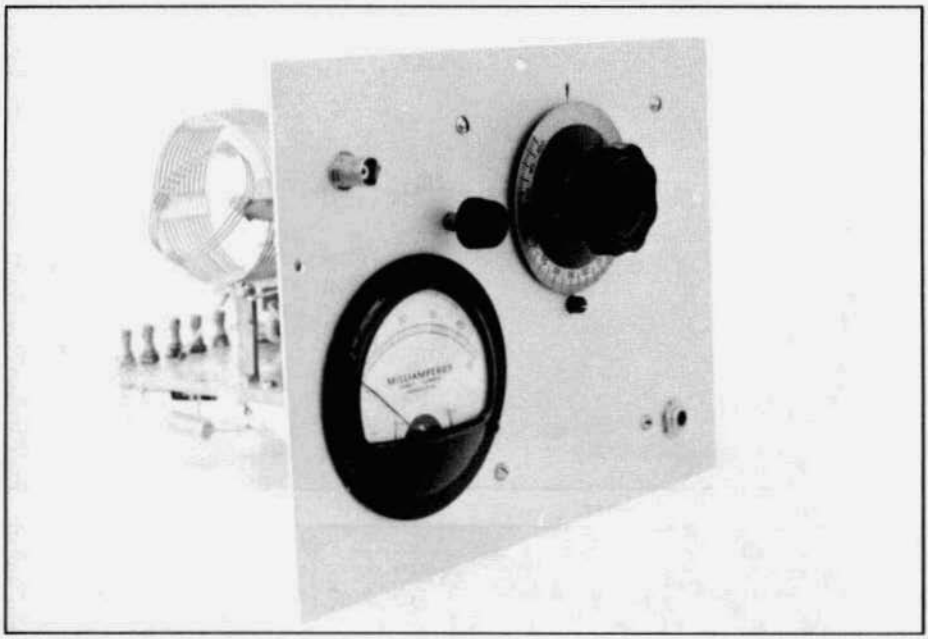
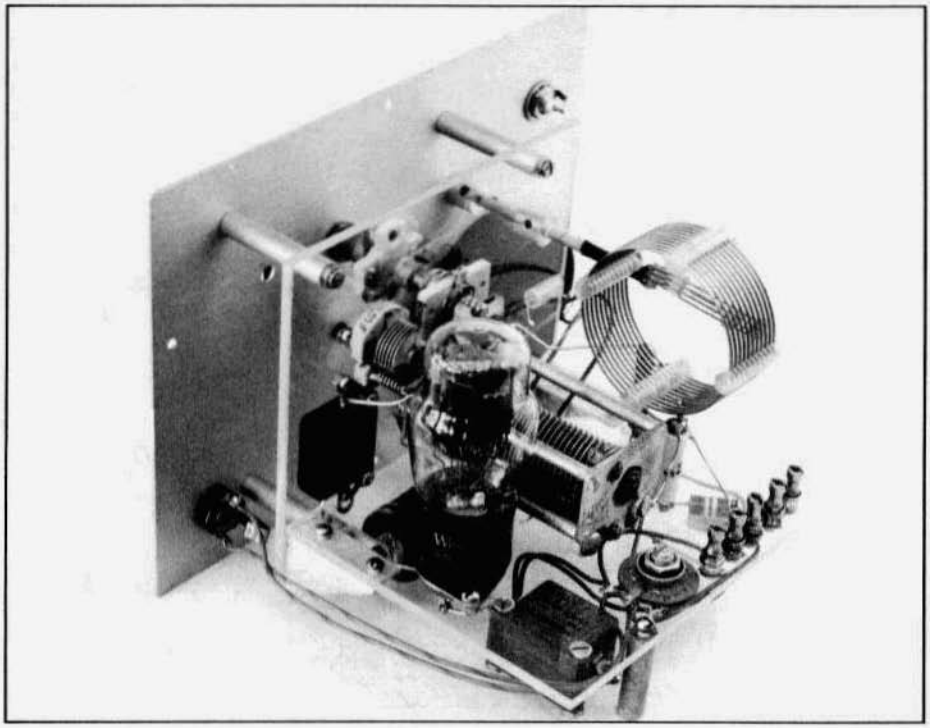


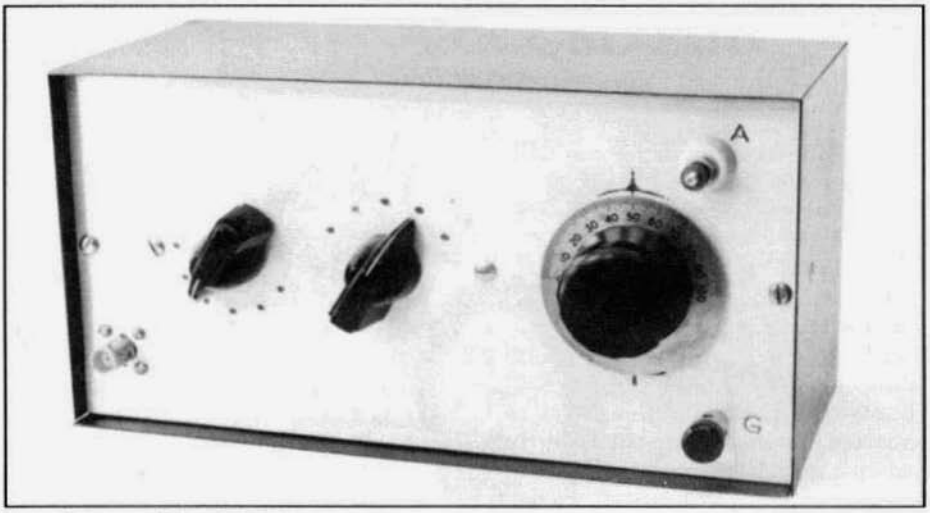
Figure 1.



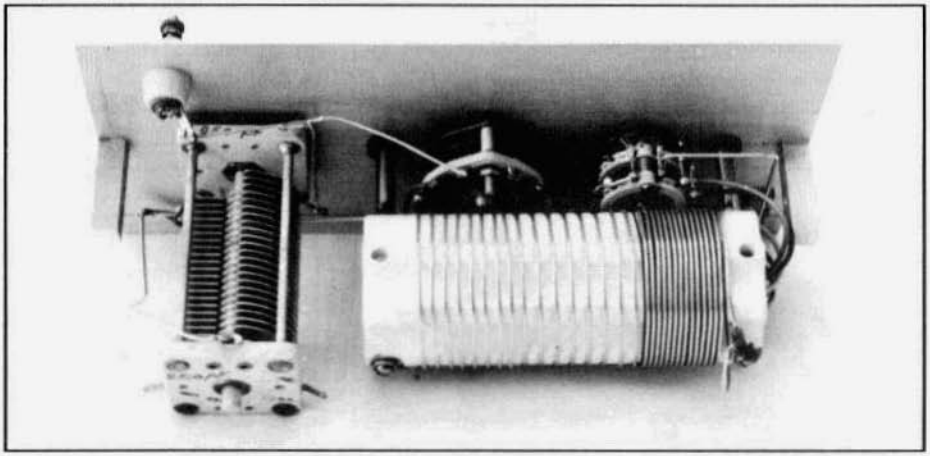
Front view of the 45 Hartley.



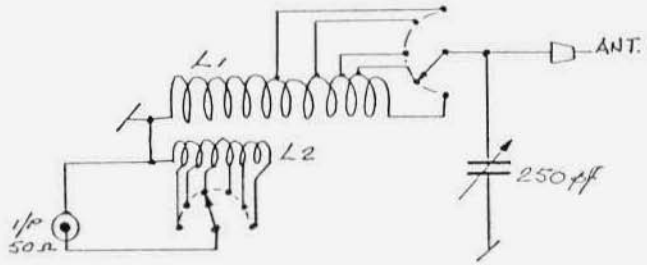
Rear view of 45 Hartley.



Front view of the Hi-Z tuner.

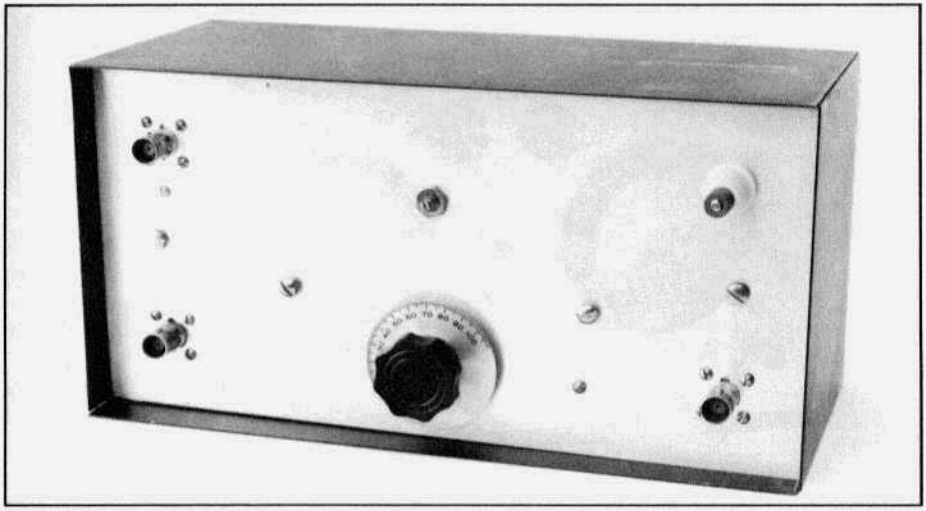


Interior view of the Hi-Z tuner.

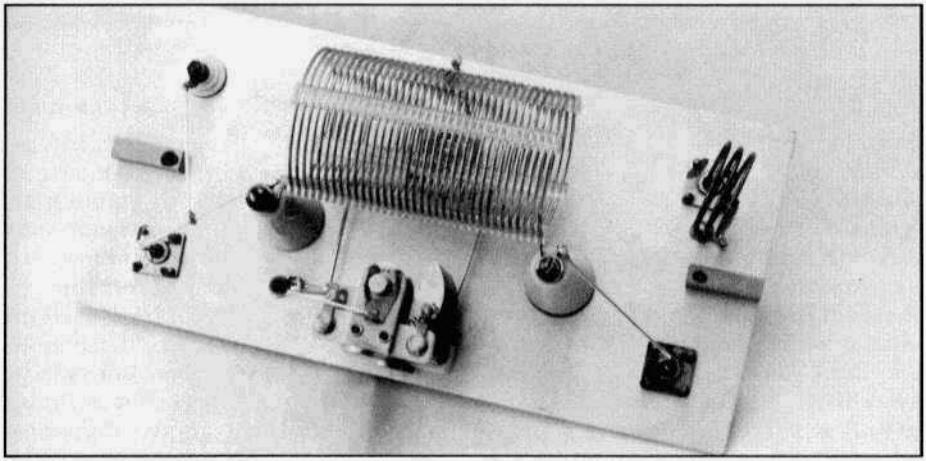


3.5Mc. ANTENNA CPLR FROM HARTLEY TX TO END-FED MARCONI

Figure 2.



Front view of the T-tuner.



Interior view of the T-tuner.

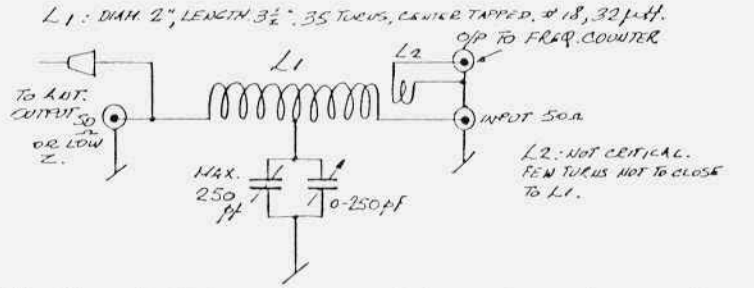
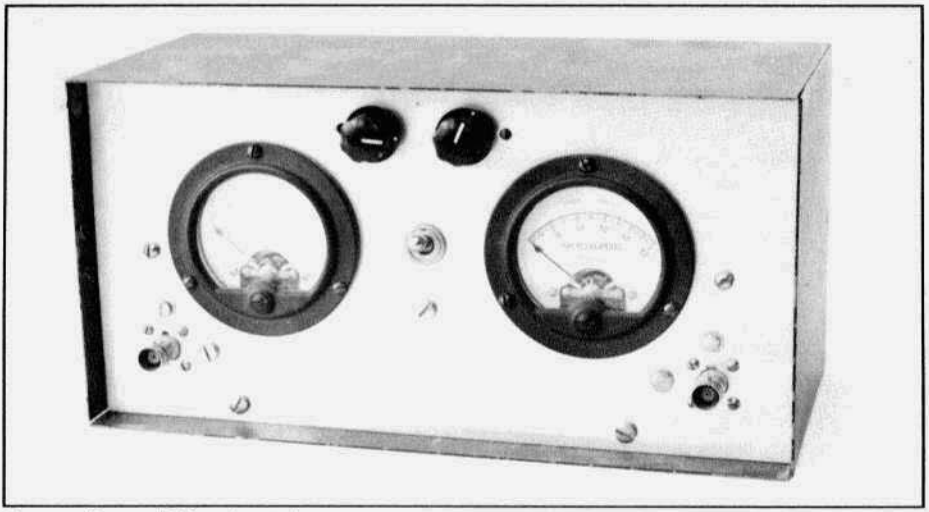
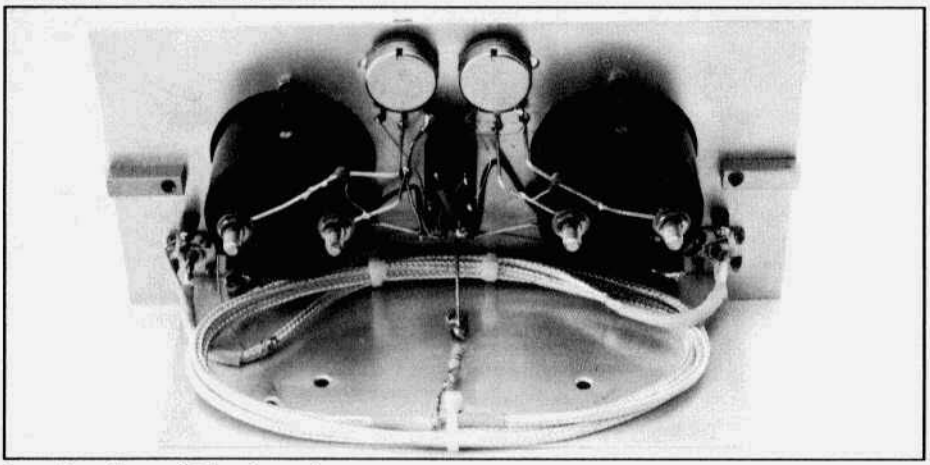


Figure 3



Front view of Monimatch.



Interior view of Monimatch.

Two 3.5 MHz antennas are available in my hamshack; a half-wave end-fed longwire (Marconi) and a half-wave dipole with an input impedance of about 70 Ohms. To match the output of the Hartley to the Hi-Z Marconi a tuning unit along conventional lines was assembled. (Fig.2).

L1 has 30 turns of #18 tinned copper wire wound on the ceramic form out of a BC-375 tuning drawer, tapped every three turns from the top, 4 times, and connected to S2 for course tuning while the variable capacitor provides the fine tuning. The tapped coupling coil inside the ceramic form was retained and connected to a 6-position switch S1, so the coupling can be varied.

To couple the Hartley to the dipole I built a T-configuration tuner as shown schematically in Fig. 3. With the values shown it's possible to match the 50-Ohm output of the transmitter to any antenna with an impedance between approx. 5 and 100 Ohms. L2 in this unit was added to feed my frequency counter, providing me with accurate tuning and frequency drift information.

A 3.5 MHz low-pass filter was

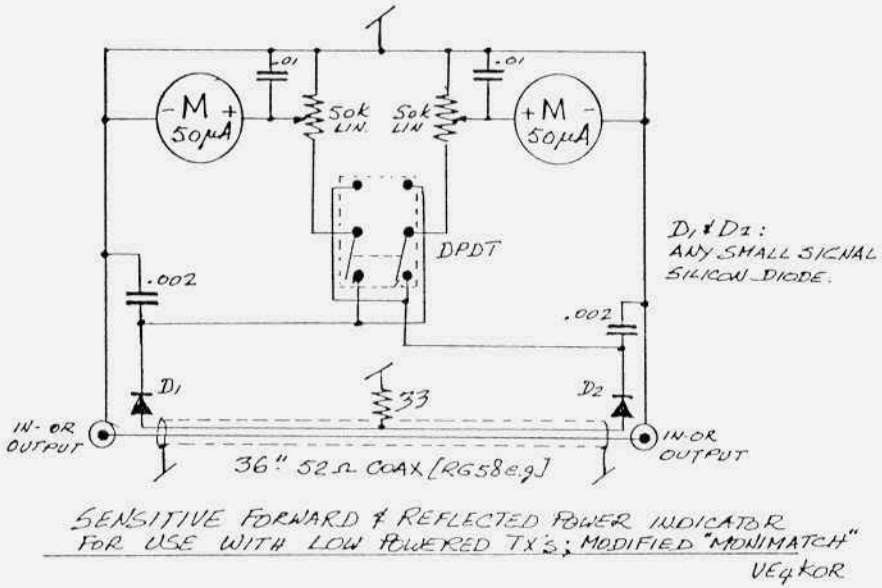


Figure 4.

planned as another accessory. However, the proper shielding of all units and the sharp tuning characteristics of the antenna tuners were deemed more than sufficient to prevent TVI.

In order to facilitate the tuning procedures, a version of the venerable "Monimatch" of the early 50's was put together and modified to ensure proper operation at flea-power in the 3.5 MHz band. Accordingly, sensitive (50 uA) meters were used and the length of the pickup wire (inside the 52 Ohm coax cable) was extended to 36 inches. Full scale readings can be obtained with power as low as 3W. DPDT switch S1 enables both meters to be balanced, if so desired, to show the actual ratio of forward and reflected power. In practice, this is not really required and the LH meter (Reflected) can be set at a much higher sensitivity than the RH (Forward) meter.

To set the output coupling coil (loading), connect the output of the transmitter to the "Monimatch" input and its output to a 52 Ohm dummyload. Tune the transmitter to the desired frequency and adjust the output coupling coil for the highest Forward reading concurrent with the lowest Reflected reading. This adjustment will affect the frequency and this should be corrected. Any change in the position of the loading coil will affect the frequency, however a change of frequency from one end of the band to the other will have barely any influence on the setting of the output coil.

Remove the dummyload and connect the antenna and tuner to the "Monimatch". Proceed to tune the antenna (and where applicable, the coupling coil in the antenna-tuner) again for the highest Forward reading concurrent with the lowest Reflected reading.

Three copperclad steel boxes (ex relay covers) were available from my junkbox. The two tuners and the "Monimatch" were constructed to fit these boxes exactly, providing ultimate shielding and a very neat appearance.

Any power supply capable of deliv-

continued on page 39

Book Review

The Cathode Ray Tube: Technology, History, and Applications by Peter A. Keller, 320 pp., hardbound, 317 illus., 7-1/2 x 9-3/4 format, published by Palisades Press. $29.95 plus $3 S&H from the ER Bookstore. See page 56 for ordering information.

Reviewed by Chuck Penson, WA7ZZE
penson@sci.mus.mn.us

To see the unseeable. To visualize and quantify even the most ethereal and elusive forces of nature. This is why the CRT was such an important contribution to science and technology, and it is difficult to comprehend the effects this unassuming device has had on history and society. The same device can fill our heads with mindless drivel in black and white or stunning visual images in full color. The CRT can, with equal facility, paint a picture of the target of an atom smasher or the target of a stealth bomber. It brought you both Neil Armstrong and Bart Simpson. It can not distinguish between the political right and the political left.

I'll cut right to the chase. This is a wonderful book. It is intelligently written, skillfully crafted, and profusely illustrated and annotated. And what's more, it's fun to read.

While the author does not muse much at all about the sociological impacts of the technology, the reader can not help but ponder the subject a little. But this is not a book about sociology, this is a book about technology. And what a book it is!

Peter Keller has successfully turned what had the potential to be a deadly dull lecture into a delightful journey through the history and application of what is arguably one of the most important, and certainly one of the most pervasive, technologies of the twentieth century. No matter where you are odds are that there is a CRT within 15 feet of you.

This hard cover book's 317 pages are well organized and divided into ten chapters covering CRT fundamentals, history, use in radar, oscilloscopes, television, data, avionics, and a variety of special purpose applications. There is also an extensive reference section and a very thorough index.

The book is loaded with razor sharp black and white photos. You will recognize many old friends; the classic RCA 5BP4, the rectangular Waterman 3SP1, and one of my favorites, the venerable Du Mont 3RP1. Many of these are from the author's collection. Photos of others were contributed by friends and associates of the author, and a number were provided by various manufacturers. In addition to these, many more photos came from the collections of the National Museum of American History and made me want to hop on a plane and head for the Smithsonian.

Keller has not attempted to record and reference every CRT ever made, there are just too many. Instead, he has chosen to discuss only those tubes that are in some way significant, i.e.. those that represent advances in the technology, or those that achieved widespread acceptance. Nevertheless, this really does qualify as a "collector's guide."

Keller's discussions range from the oldest and simplest to the most advanced high performance tubes and are not limited to simple facts and figures. They include in-depth explanations of even the most subtle and complex inner workings of various tubes. Yet amazingly, he always remains on a level clear enough that even a dunderhead like me can understand what he is talking about. This man not only knows his subject, he

Book Review from page 14
knows how to explain it. A rare quality indeed.

Of particular interest to me was Keller's chronological recap of the history of the CRT, from Vincenzio Cascariolo's observations of inorganic luminescence in 1603 to Karl Ferdinand Braun's fully functional tube in 1897, with no fewer than 19 others in between.

As a result of his clear understandable style and the book's organization, this is a book you can open to any page and begin reading.

I find myself picking it up often, just to browse through it for a while.

Keller has had a long relationship with CRTs. He built the first of many homebrew scopes at the age of 12. He has since held positions at Stanford University, General Precision Laboratories, and the Associated Universities for Astronomy, all before joining Tektronics in 1963. He is a member of several prestigious organizations and appears to be a very busy man. One wonders how he found the time to pen such a superb work as this.

Peter Keller will make a splendid addition to your reference library and will sit very nicely next to Chuck Dachas, Ray Moore, Jay Miller, and all the rest. **ER**

AWA 1929 QSO Party from page 37
ering the required voltages and currents can be used, preferably regulated, as HV variations do cause some change in frequency in this type of oscillator. The 45 draws transmitter about 40 mA.

No attempts at a QSO have been made yet as conditions at 3.5 MHz are still not very good (QRN). As soon as they improve I'll be on the air with the Hartley. Appropriately an antique 1910 straight key, similar to the one used on the ill-fated Titanic will be used to get the CW going! **ER**

Drawing a Vacuum from page 15
Regarding today's market, Walker says he is really irritated by mainstream, non-radio antique dealers scouring yard sales and estates "buying up any and all tubes" without real knowledge. He resents that those tubes are then sold at top dollar, distorting the market for end users.

At least a third of Walker's collection duplicates or is a slight variant of the same type of tube. He will use some as barter, to acquire other types that are not represented in his collection. Others will illustrate differences, such as his four kinds of TZ-40.

So what happened to his original 2-3 boxes? He still has them - intact and carefully stored for likely display. His sources for tubes started out being relatives "dumping table radios and TVs" on him.

He also came into some old TV transmitting tubes from what's now the DeVry Institute. Those big bottles are Walker's "Crown Jewels" for display.

Word has spread that he's a good home for tubes of all types - including 833s, 450TH and the Western Electric series like the highly-prized 212. Walker counts at least a thousand contacts here and overseas.

But he laments how even the most common receiver and transmitter tubes are being snapped up by Asian and European buyers. And Walker says he's "just not finding audio triodes up to about 50 watts."

Nonetheless, Walker counts many friends among those who have come to him looking for the right tube or offering collections that he won't exploit for maximum profit.

Walker has become a name brand since he first started picking up cast-off tubes, pausing once some years ago when he "took a break for cars and girls," only to come back to find a collectors market waiting for him. **ER**

John H. Walker, Jr.,16112 W. 125th St., Olathe, KS 66062

How Come 3885? from page 18

such as the SCR-195. However the oldest reference to 3885 was the September 1941 Air Corps document.

The Army maneuvers were conducted in January 42 using 3.8 to 3.9 MHz. The evaluation praised the intercommunications and plans were underway to provide the necessary integration. But the evaluation emphasized that the Link police VHF FM radios used by the umpires worked better than the HF-AM Army radios. This changed the direction of Fort Monmouth development towards VHF FM for Armor, Artillery, and Infantry radios. The SCR-293, -298, -300, -508, and -608 were products of this effort.

By accident I found a production record with a reference to 3885. A copy of a 1943 letter to Belmont Radio Corporation, attention J.F. Houdek, was attached to a WPB "E" confirmation of production of BC-221 frequency meters and T-17 carbon microphones. The letter authorized Belmont Radio and Seeburg Music Company to use 3885 kc for testing, limited to 1 watt, at 3633 South Racine Avenue, Chicago, Ill. I wonder how you hook a T-17 to a BC-221 and get 1 watt on 3885? Mr. Houdek must have been some super engineer.

This confirmed suspicions that Monmouth Signal Labs were using the 3885 training frequency for contractor testing. It is logical as Fort Monmouth was a primary Signal training base and 3885 was theirs to use. The Fort was also designated by IRAC as a government test facility, and, as such, was authorized to use any frequency necessary for research, development, and test. It appears the prominence of 3885 kHz in WW II equipment was the result of the Army Air Corps channel assignment process, and the Army Signal Corps Labs interpretation of frequency authorizations to expedite production without red tape. **ER**

Miniature Tubes from page 7

If you can't get by with two grounded cathodes, there's still a chance. In between the 9-pin tubes and the Compactron's 12-pin base, were a handful of '10-pin 9-pin' tubes -- that is, tubes with the envelope of a 9-pin miniature, but 10 pins on the base. The 6J9 is a triple triode, essentially 1.5 12AT7's in one envelope. Two cathodes are connected together but not to the filament. There are also several other 10-pin types.

There are two different 10 pin base designs: one has an extra pin in place of the shield in the center so the socket probably could be hand made. The other has ten pins in slightly more than the space taken by the usual nine -- wow, *tough* to make that one! And good luck finding either at a fleamarket or dealer. See why I say 'possibilities'?

Of course the 'big gun' if you run out of holes in the chassis before you run out of jobs, is a 12-pin base. Everything you can imagine was made, and probably a few more; because the tube era ended soon after these tubes came on the market, there are plenty of them out there. And the sockets are easy to find.

Finally ...

The sensible designer starts with the common tube types. But when you're trying to get top performance sometimes a tour of the tube manual can pay off. Gentlemen, start your soldering irons ... **ER**

AMI Update from page 3

certificates will be mailed out in advance of the AM Jamboree to insure your full and official participation! Apologies to many of you who have wondered if we were ever going to cash your membership checks. Warren, NY2H our treasurer, relocated from upstate New York to Eastern Massachusetts and was finally able to find a bank with no service charges for a small account like ours. **ER**

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FOR SALE: Johnson KW Matchbox w/meter, coupler & manual - $275; Drake 2C rcvr, exc condx - $125; unbuilt Heathkit IT-3121 curve tracer - $50; Millen grid dip meter, no G coil - $35. All + UPS. Ron, KC6WTC, POB 783, Santa Rosa, CA 95402. (707) 539-8319.

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Lee, W9VTC, (847) 439-4700 (d), 726-1660 (n)

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FOR SALE: RCA WV-87B w/manual, 6-1/2 x 4-1/2" meter, exc condx - $60, free shpg. Joseph Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003. (304) 277-3154. schematic1@aol.com

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3TF7/RT510 Ballast tube, unused - $17.50

Shipping charges additional! Ask for our 1996 catalog!

FOR SALE: 75A-4 MHz drum decals, 20.5 or 20.8 MHz (you specify), buff color, install instructions - $8.50 ppd. W3HM, Rt 3 Box 712, Harpers ferry, WV 25425

FOR SALE: Negative cycle loading circuit, instructions - $2; Protect modulation transformer, extend positive peaks. WB8BEM, 410 Robinhood Dr., Florence, AI 35630.

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

FOR SALE: (2) Heath GW II tube scvr's - $30 ea. Hoover, SC, (803) 726-5762.

FOR SALE: Motorola GP-300 UHF HT, new - $200; Heath AKS, spkr - $75; Heath DX-40 manual - $10; Heath HD-10 keyer - $45; Heath T-shirts - $15 + $1.50 shpg; Hallicrafter SR-2000 parts rig - $45. Marty Drift, POB 21, Blawenburg, NJ 08504. (609) 466-4519

FOR SALE: GF-12 aircraft xmtr; tech manuals; dynamotors; ARRL Handbooks; early 73; CQ Surplus Conversion Handbook; other equip., parts, books. LSASE list. Patrick Marineau, 6300 Kingsway Dr., St. Louis, MO 63123

FOR SALE: Hallicrafters SX-117, exc. condx. - $275; SX-99, near mint - $125; Hickok 534 tube tester w/multimeter - $125; TMC GPT-750 orig. manual - $40. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

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

FOR SALE: Misc. military equipment & accessories; ham/military manuals. List available. Henry, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

FOR SALE: Vintage tubes, (833A, VT4C, etc.); assorted radio/wireless telegraph books & magzines, 1880-1935. SASE list. Jan Perkins, 524 Bonita Canyon Way, Brea, CA 92621.

FOR SALE: Coming soon, another run of quality reproduction manuals for R390A, SP600-JX17, R648, SX28A & more. Bob Bakinowski, 1524 St. Tropaz, Tucson, AZ 85713. (520) 624-8029

FOR SALE: Yaesu FT101EE scvr good condx., built in pwr sply w/12V hook up cords & manuals - $250 + shpg. Douglas Dein, N6RQL, 5226 Squire Ln., Paradise, CA 95969. (916) 872-3472

FOR SALE: HQ-150 w/manual, good condx. - $150 + shpg; TA-33JR, NOS in box - $125, PU only. Bob, K8RNE, OH, (216) 322-8722.

FOR SALE: Fil trans (new) NOS 2-5 volt, 12A, CT windings for 872s, etc 120V prim - $22.50. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: Communication tubes: GL5720, 8013A, 5840, RCA5893, IN21B, RCA 1960, 813A, etc. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

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

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

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

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

WANTED: HF-380, 451S1, AC-3814. Koji Mitoshi, Japan TEL/FAX 011-81475-24-9115, e-mail ;byj01726@niftyserve.or.jp

WANTED: Mics by Altec, Neumann, AKG, WE, Sony, any vintage; tube compressors/limiters; will trade my rare NOS tubes for mics. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fx

WANTED: ARC51, ARC164, ARC83, ARN118, ARN-127, SST181X, KY28, Wilcox 807, cables, radios, mounts, manuals. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272

WANTED: Collins R389, 30K-, 310-, 399C-1, 851S-1, KW-1, HF8000 series, Hallicrafters SX-115. Richard, NE, (402) 464-8682.

WANTED: Globe Scout Deluxe in good condx, Knight T-60, VFO; Swan WM-2000 SWR/watt meter. Ron, KS, (913) 268-5973 d, Fax 268-0461.

WANTED: Model BC-148-1935 vintage BC-148 w/diamond loop antenna, sentimental as I operated this unit in US Army 1938. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699

WANTED: (2) National NC-150 or NC-500 or equiv neutralizing condensers. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 748-5968

WANTED: Collins cabinets for 75S3 rcvr & KWM2. Fred Honnold, W6YEM, 17890 Sharon Ct., Pine Grove, CA 95665.

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

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

WANTED: GPR 90, 91, 92; Hallicrafters SX-88; Eddystone rcvr's. James B. Geer, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Henry 2K-Ultra. Takashi Nakamura, JR7TEQ, 20-2 Midorigaoka Shiroishi, Miyagi 989-02 Japan. FAX: +81-224-26-1424

WANTED: Mics-Astatic T-3; Shure 707A, 705, 545, 54D/PE, 533VC; Turner BX/CX, VT-73; EV 605, 638, 619/719, Hi-Z only. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225, Fax 328-4217. 74053.3164.compuserve.com

WANTED: Scott rcvr SLR-F, RCH or other SLR configuration, any condx. Ken Kinderman, WB9OZR, 50 E. 79th St., New York, NY 10021. (212) 288-1310, fax 288-3070

WANTED: Original manual for Swan 250C, 700CX, Johnson Valiant, Drake TR-3; others you no longer need. Craig Pitcher, WA9HRN, 1308 Kristin Dr., Libertyville, IL 60048. (847) 367-1599

WANTED: Very Good to exc condx Knight-Kit V-44 VFO; Collins S-Line 75S3-B, 3253, 312B-4, 516F-2. Reid Simmons, NZ8K, OR, (503) 690-8024

WANTED: Good gray or black front panel for HT-9 xmtr, need coils for HT-9. John Packer, W3QC1, 318-1/2 School St. Springdale, PA 15144. (412) 274-4734.

WANTED: Manuals or copies for the Simpson Model 383A Capacohmeter, N.R.I. model 33 Signal Tracer. Richard J. LaMark, N2TXL, 6822 Tuckahoe Rd., Williamson, NY 14589-9589. (315) 589-2552.

WANTED: For HRO-5T, coil sets D, E, F & filter xtal; for HRO-50T, coil sets A, D, E, F and #XCU xtal calibrator. Jack Ellis, 7607 Ensley Dr., Huntsville, AL, 35802. (205) 881-6646.

WANTED: Collins 75A-4, state price, condx. **FOR SALE:** Drake T4XB - $85; Century 21 digital - $135. All as is. Mike, WA6NGF, CA, (209) 568-0345.

WANTED: Any APS-4 radar parts; PPN-2 items; S5TR-1 items; S5R5A items. Steve Bartkowski, 4923 W. 28th, Cicero, IL 60650.

WANTED: Globe Scout Deluxe; NC-300/303 calibrator, cosmetically nice; tube rcvr's & xmtr's that deserve a second chance at life. Ron, KS, (913) 268-5973 d, Fax 268-0461, 24 hrs.

WANTED: Military radios: Canadian WS #29 (CDN) A set; eastern European RM-31 set. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

FOR SALE: Hallicrafters SX-28, matching spkr, manual, reversable internal modifications w/ documentation, no panel holes - $245. U-ship. WA7HDL, ID, (208) 756-4147 after 0030Z.

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: Clegg 22er - $75 shp'd; Globe 6+2 VFO - $25 shp'd; National NCL 2000 ruff but works & spare pair tubes - $200 PU only. Mike, WB3CTC, PA, (717) 656-8746

FOR SALE: Drake TR-4C - $185; T-4XB - $150; AC-4 - $90; Collins CP-1 - $115; 312B-4 (W) - $165; Hygain collectable rotor repeater - $65 + UPS. WA1APX/8, MI, (810) 781-9717.

FOR SALE: Army helmet antenna, one piece resiliant monopole & groundplane w/SMA connector, like new - $10 + shpg. Mike Bittner, 27215 Sunnyridge Rd., Palos Verdes, CA 90274. (310) 377-4797

FOR SALE: National CRO (1930s station monitoring scope) - $125; NC-100, uncommon swTing version w/art deco front panel, matching spkr - $350; National AC-200 xcvr pwr sply - $60; 1-10 - $45; SW-54 - $50; Heath HW-16 - $55; 1930s homebrew (kit?), three tube regen w/plug-in coils, black wrinkle Bud cabinet, airplane dial, red knobs, very nice & very cute - $75; 1946 CQ limited edition hardbound volume - $40; Sam's communication rcvrs vols. CR-1 & CR-2 - $40; QST 1931-33 & 1938-44 - $15/yr; Radio World Weekly, 145 issues (1929-1935) - $125; Antique Radio Classified, Vol.1, #1 thru 1995 - $100; 250+ new & NOS capacitors - $50; 4000+ tubes (local PU only) - $1000 (obo). All + shpg. Wayne Childress, KC7KUE, Rt.1 Box 200A, Altavista, VA 24517. (804) 369-4072.

FOR SALE: Items from estate. The following equipment is mostly complete but has moderate surface rust on cabinets and chassis. Sold as-is & + shpg. Central Electronics 20A - $10; Sideband Slicer - $10; Heath HP23 sply - $30; HT1 - $15; DX40 - $20; Dyna PAS2 - $25; Instructograph, rough - $3. Don Knotts, W7HJS, 3158 NE Azalea, Hillsboro, OR 97124 (503) 648-1738

FOR SALE: SC101/312A-1 chrome lamp hoods & grills; kHz dials for all Collins St. James gray equip. **WANTED:** 310A-3 exciter & 302C-1 wattmeter. Butch, KØBS, 5361 St. Mary Dr., Rochester, MN 55901. (507) 288-0044

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

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

WANTED: Copy of schematic, operation & circuit description, Heath CR-1 xtal rcvr. N6CC, 2608 Campeche Ct., San Ramon, CA 94583

WANTED: Heath HP23 pwr sply. **FOR SALE:** Knight R100A rcvr - $65;1625 tubes, WW II dated NOS - 3/$10. Dave, W1DWZ, MA, (508) 378-3619.

WANTED: Manual schematic Squires-Sanders SS1BS. H. Weber, 4845 W. 107th, Oak Lawn, IL 60453-5252.

WANTED: Manuals for BC-348C, APA-38, SCR-612, SCR-613, SCR-587. Gary Cain, POB 521, Shakopee, MN 55379. (612) 496-3794

WANTED: Pwr xfmr for Heath monitor scope SB614 or junker monitor. **FOR SALE:** DX60B - $65. Norm Roscoe, W1CIX, POB 402, W. Bridgewater, MA 02379. (508) 583-8349

WANTED: Collins 30L-1. Fenton Wood, 109 Shoreline Dr, Star Harbor, Malakoff, TX 75148. (903) 489-0204

WANTED: My first rcvr, Hammarlund HQ180/A/C, S-200. John, AK, (907) 337-9157 Alaska time.

WANTED: GPR-92, SP-600JX-21A & HQ-170ACX-VHF w/orig. manuals. C6ANI, POB N4106, Nassau NP, Bahamas.

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

WANTED: TMC GPR-92, Hallicrafters SX28, SX42 rcvrs, collector quality, complete. John, NE6G, 7495 Gunter Rd., Pensacola, FL 32526. (904) 944-6563

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

WANTED: Hallicrafters HT-1, HT-9, HT-4; National SW-3, model 1, 6 & 12V versions; other pre-1950 ham gear. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

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

WANTED: Reward paid for National SW-4, has 4 tubes but only one set of coils. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (617) 934-5043

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

WANTED: Will pay premium prices for unassembled Heathkit rigs; HW-99, HW-5400, HW-9, etc. Gary Debock, N7EKX, WA, (206) 848-4748.

WANTED: In pristine condx.: Collins 51J4, 32V3, 75A1, 3051, 4-1 knob, KWM1, 75A4 filters, 3253A (RE), 31083, 30K1, mech filter adapers, 55G1, SP-600X, cabinet, & Hammarlund spkr. Lee, W9VTC, IL, (847) 439-4700 d, 726-1660 eves.

WANTED: Swan pwr sply type 117-XC, working. W7SBG, Box 355, Nucla, CO 81424. (970) 864-2228

WANTED: Replacement meter for Drake WV-4; R390A meters; National spkr for NC100. Fred Watson, KB8NRF, 581 W. Summit St., McClure, OH 43534. (419) 748-8798

WANTED: 7-pin socket savers by Pomona; 1G4G & 864 tubes; octal, molded amphenol, black tube sockets; 7-pin headers by Keystone; Knapp toy electric motors; AC Gilbert radio info & catalogs. James Fred, 53555-275W, Cutler, IN 46920.

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

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

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

WANTED: 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: Orig. tube-type CB radio operating/owners manuals; also tube-type CB radios. Walter Ryan, 7114 Geyser Ave., Reseda, CA 91335. (818) 344-8735.

WANTED: Johnson Ranger, Johnson Desk KW. Willing to pay top $ for pristine condx. Lee, W9VTC, IL, (847) 439-4700 (d), 726-1660 (n).

WANTED: Main tuning capacitor for Heath HW-16 xcvr; 26-113. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 PM.

WANTED: PM2 (KWM2) pwr sply resistor strip; two 8-32 Bristo key set screws. VK3BFB, 38A Parkers Rd., Parkdale, Victoria, Australia.

WANTED: ARC xmtr 7-9.1 MHz ATA 52211 (has red instruction plate). Ken Kolthoff, 5753 David Pl., Fairfield, OH 45014. (513) 858-2161.

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

WANTED: Manuals for TS-179/CRN-10; Scott SLR-12A; antenna coupler CU-1388; test unit 1-176-A copies OK. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179.

WANTED: R390A in exc condx. Prefer PU 200 mile radius MD/WV. Will consider all. Dave Humbertson, W3NF, HC 86, Box 123A, Fort Ashby, WV 26719. (304) 298-4596.

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

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

WANTED: WW II Japanese military radio of any kind; pre-war Japanese QSL cards. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, Japan. FAX: 011-8145-301-8069.

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug-in coils) for restoration & ER articles. Ken Lakin, KD6B, 63140 Britta St., Ste. C106, Bend, OR 97701. (503) 923-1013. klakin@aol.com.

WANTED: Hammarlund Comet Pro, AVC model; Comet Pro coils, parts & parts sets; Hallicrafters SX-11 dial plate; Millen 90801 exciter. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370.

WANTED: Collins KW-1, 30S-1, KWS-1. WA0AKG, NE, (402) 464-8682.

WANTED: Johnson Challenger, Adventurer, Navigator, good cosmetic condx. Doug Knoll, KA9IQA, 1400 4th Circle NE, Waseca, MN 56093. (507) 835-8821.

WANTED: Hallicrafter model's; S-40B, S85, S108, or SX110 in working condx., advise price + shpg. Benigno Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: R47 spkr for SX101 MK3 rcvr; Johnson 122 VFO. Doug Knoll, KA9IQA, 1400 4th Cir. NE, Waseca, MN 56093. (507) 835-8821.

WANTED: HQ-110 in good working condx; xtal's for the CW portion of 80 & 40 meters novice bands. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677.

WANTED: Collins KWS-1 or complete KWS-1 / 75A-4 station. Will consider all units available. Gary, K8BKB, MI, (616) 685-5792, Compuserve 103273,1070.

WANTED: On-Off/Tone rotary switch for Hallicrafters SX-99 or SX-110. W2JBI, NJ, (908) 842-6606, skrevsky@ix.netcom.com.

Dovetron NB-1 Noise Blanker

Back by popular demand!

The Dovetron NB-1 Noise Blanker is a small solid-state devise that plugs directly into J22, J23 and J24, which are located on the top of a Collins KWM-2/2A HF transceiver. The NB-1 may also be installed in all versions of the Collins 75S(*) receiver.

In addition to noise pulse blanking and random noise suppression, the level of the received signal may be amplified 15 dB or attenuated more than 20 dB. Specs upon request.

P.O. Box 6160
Nogales, AZ 85628-6160
Telephone 520-281-1681
FAX 520-281-1684

FOR SALE: Thousands of tested tubes w/ warranty! Both xmit & rec tubes. Buy those spare tubes for your tube radio, audio, ham and electronics. Most tubes are used at about 1/3 of new, many are around $1. I have bunches of octal, 7 & 9-pin tubes. All tubes are tested on TV-7D/U tester and then boxed. I give a 30 day warrenty. Send wants or SASE with two stamps for list. Daniel Nelson, 1025 E. Desert Lane, Phoenix, Ariz. 85040. (602) 243-7421 eves. djn@indirect.com

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FOR SALE: Just released: Send 2-stamp LSASE for latest Olde Tyme Radio Co. Flyer 196A. Olde Tyme Radio Company, 2445 Lyttonsville Rd., Ste 317, Silver Spring, MD 20910.

FOR SALE: Collins 32V-2 for tix up or parts; 1930s parts amp; Macay 401-A xmtr, used on USNS Phoenix; HW-32A, pwr sply; Globe Chief 90-A; HP-UHF sig. gens.; Rycom selective voltmeters; Heath audio gen. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: 19" rack cabinets: 10-1/2 x 14 w/ blower; 26-1/2 x 18; 21 x 14; 9 x 15; 14 x 12; blank rack panels: 4", 7, 8-3/4, 10-1/2, etc. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: Gonset Comm III - $75; RME VHF-152A 10, 6, 2M converter - $75; Tecraft VHF TX - $75. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

FOR SALE: Knight Star Roamer S-118 - $50 ea; Heath DX-60B - $50; 3 Drake set ups complete. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758.

FOR SALE/TRADE: NIB 4-G.E., 211's & 3-2A3's. Trade for NIB 210's, 10S, 6550/A's or B.O. Art Plummer, K1WKT, POB 640493, San Francisco, CA 94164. (415) 359-1858

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

FOR SALE: R-390A/URR orig. 1961 maintenance manual TM11-5820-35, 189 pgs - $28 incl priority mail. Aben, POB 4118, Jersey City, NJ 07304. avidov@juno.com

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FOR SALE: Johnson Mobile xmtr - $130; Gonset G-76 - $175; Yaesu FR-101 digital rcvr w/filters, FM board, 6 & 2 meter converter boards, matching spkr - $260; Collins 325-3 (wing) - $280; R-4A, T-4X, AC-4 - $250 or will separate. **WANTED:** Coils or info to make coils for the Hallicrafters HT-6; cabinets for 75A-3 & 32V-2; small panel spkr/grill for Racal RA-17; good panel for SX-88 or parts radio; manuals or info for Wells Gardner 250-GSC xmtr or Browning Drake "National" rcvr. Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (630) 852-4704.

FOR SALE: Clough-Brengle type OM-A sweep gen. & type CRA scope circa 1935, orig. manuals - $100/the pair. Don, OR, (503) 289-2326.

FOR SALE: Scopes, Supreme model 650, Precision ES-500 - $24 ea + shpg. Henry Mohr, W3NCX, 1085 W. Wyoming St. W, Allentown, PA 18103.

FOR SALE: Vibroplex WW II Deluxe - $150 firm. **WANTED:** EV664 mic. Chuck, W7EGO, WA, (206) 833-3313.

FOR SALE/TRADE: Collins 75A-1, HQ-110, S-38, Viking II, VFO 122, S120, S36A, Match box 250-23. Ray, MO, (314) 428-1963.

FOR SALE: WACO-SNWX telephone interference filters - 1/$12.95, 2/$24.00, 3/$33.00. Add $1 S&H. If these don't work then none will. Just plug in. Cecil Palmer, 4500 Timbercrest Ln., Waco, TX 76705. (817) 799-5931 or W5NWX@juno.com

FOR SALE: Vintage equipment manuals starting at - $5; Hallicrafters, Johnson, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: B&W 6100 - $295; Hammarlund HQ200 - $195; Collins 30L-1 w/o tubes - $395; Tektronix 555, ps, cart - $99. K1BW, MA, (413) 538-7861.

FOR SALE: Mohawk, mint, used 1 yr - $300; Legato spkr's - $800. WA1PGB, ME, (207) 567-3219.

FOR SALE: ART-13 - $125; RAX; Manuals: ARC-2 - $19; AN/PRC-515; Collins HF-2050. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051.

TRADE: Drake T4XB, looking for Johnson Navigator, Heath SB400 or SB401. Charlie, W6HYK, POB 684, Lompoc, CA 93438. (805) 735-3568.

FOR SALE: Millen grid dip - $45; Millen absorption meter set - $60; National NCX-1000 - $500; NC-242 Doghouse - $100; BC778E Gibson Girl - $100; Heath SB-634 station control, mint - $100; Heath VTVM mod-IM-28 - $25; DX-35 front panel, new - $15; Browning Eagle CB R-27, S-27 operates tranceive, mint - $250; + additional tube type CB gear. Bob Napoli, K2LGO, Box 158, Riverhead, NY 11901. (516) 722-5737, 5-8 PM EST.

FOR SALE: Heathkits: DX-40 - $60; VF-1 - $40; HW-101, PS - $110; SSB, CW filters - $40; Crystals (100) NIB, 80M, 40M - $5 ea.; National XCU-50 xtal calibrator - $95. Trade: HRO-7 AA coil for HRO-50, 60 A thru F coil; Collins WE 30L-1 - $500. All with manual plus shpg. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881.

FOR SALE: Heath SB-300 - $125; SB-303 - $200; HR 1680 - $140; DX-60B - $85; AM-2 - $25; QF-1 - $20; UT-1 - $65; HP-23 - $65; SB-600 & HP-23A - $85; SB-614 - $125; VF-1 - $60; EK-1 - $25; IT-121 - $35; HD-1250 - $45; Johnson 6N2 VFO - $70; Ranger - $265; Signal Sentry - $35; National XCU-27 calibrator - $40; Multi Elmac AF-68, PMR-8, AC/DC sply - $250. Free lists, manuals/equip. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454.

FOR TRADE: Two good RCA 833A's for one Taylor 833A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com.

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

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

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

FOR SALE: KWM-2 fan bracket - $15 ppd. Dave Ishmael, WA6VVL, 2222 Sycamore Ave., Tustin, CA 92780. (714) 573-0901.

FOR SALE: Knight nostalgia! 100-in-1 Electronic Lab Kit. Sorry no manual - $15. Robert, CO, (303) 988-2089 eves.

FOR SALE: NIB Bud No. CK-916 LO-coil kit, 4, 5-pin wound coils, 2 sets to sell - $20 ea; NIB Bud No. CK-917 det. LO-coil kit, 4, 5-pin wound coils, 2 sets to sell - $20 ea; NIB Bud No. CK-17 RF LO-coil kit, 4, 4-pin wound coils - $20; NIB Bud No. CK-918 LO-coil kit 4, 6-pin wound coils; Heath HD-1426 Relative Field Strength meter, seems to be unused, no papers - $10. All above + shpg. ARL-USA, James Fred, 5355 S. 275 W, Cutler, IN 46920. (317) 268-2214.

FOR SALE: All ppd: BC-457, good - $20; Eico 324 sig. gen. - $25; S-37 UHF RX, good, not tested - $85; NOS RT-7 system, no sel. sw, has ants & ind. - $55; Heath VTVM's: V-7A & IM-10 - $15 ea; T-416 VHF TX, no large tubes, untested - $25; handsets: H-33, 90, 189, 250 - $15 ea; headphones: Trimm K, Everette E-2, H-251 - $10 ea; mics: M-80C, RS-38A, T-17 - $12 ea; B & K & Heath IT-11 cap. checkers, untested - $22 ea; Heath HW-7, VG w/manual - $75; Royal 18" carriage manual typewriter, fair - $30, + shpg. RT-68, VG - $75; PP-112, 24V, exc - $20. **WANTED:** PE-103 or h.b. p/s for BC-654A; 6M FM rig such as KDK, Regency HR-6, etc.; MAB ant. & vibrapak; legs & cranks for GN-58, or similar GN w; RTs such as BC-474, 1306, 441, etc. Eric Jones, N4TGC, 6537 Cnty 61, Florence, AL 35630. (205) 764-0675. djones@funamow.una.edu.

FOR SALE: Technical Materials Corp. (TMC) GPT-750 xmtr w/SBE-2 exciter mounted in a GPR-90 cabinet. FSK, SSB, CW & AM (AM modulator not included). No mods, all manuals, exc condx, will deliver western states area. Asking $850. Willie, NV, (702) 564-2507, eves.

FOR SALE: Drake: TR7A QC, w/mic, manual - $475; MN2700 - $225; MN4C - $125. All in exc condx. Ken, WB9YCJ, CA, (714) 564-9010, lve msge.

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

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

FOR SALE: All electronic repairs welcomed. Specializing in ham gear, qualified. Stocking Collins, Heath, etc. Tiki Electronics, 1564-62 Front St., Cuyahoga Falls, OH 44221. (330) 922-8454.

FOR SALE: HQ110 sell? or exchange for mil. rcvr or Silver 801 or HQ100; GSC IT WW II code training set w/4 keys, swell looking set for key collection, CW enthusiast? - $115; BC451 two styles + one connector - $20; APX2 w/control box - $50; ID1189 test set for PRR9 PRT4 - $25. **WANTED:** WW II enemy radio equip., buy or trade my Martin Autoplex; German 1918 portable spark xmtr; pre 1946 US military & Forest Service radio espec.; ARC2 ARQ1 ARQ8 ARR16 BC310, BC224/324 suffix A-C, DAG RAX; boat radio before 1950 or later SSB types; manuals adverts, brochures on any of above. Hue Miller #220, 476 E. S. Temple, Salt Lake City, UT 84111. (801) 237-4903, Ive message. hue@sisna.com

FOR SALE: (2) Hallicrafters panel meters, 3-1/2" round, 0-200 ma DC - $5 ea + shpg. Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

FOR SALE: Heathkit SB300 rcvr - exc., working great and w/manual copy! Eico 753 xcvr with AC and DC pwr sply - exc., working great w/ orig. manual! Chuck, NZ5M, 8705 Toledo Ave., Lubbock, Texas 79424. (806) 798-1452.

FOR SALE: KWM-2A, winged, by Collins Radio Co. Ltd. Japan, good condx - $875 OBO. Phil, AB5TH, TX, (281) 992-5762 days. pmilb@a.crl.com

FOR SALE or TRADE: Hallicrafters SX-62 rcvr, nice; also S-20R rcvr, good condx. Fred Clinger, OH, (419) 468-6117 after 6 p.m. ET

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FOR SALE: Fiberglass rods, 5/8" dia., 13' long, UV resistant, good standoff insulators, twinlead spreaders, ten ppd - $10. Ron, K5YNR, NM, (505) 327-5646.

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

FOR SALE: Radio & electronics related books, 160 titles, call or write for list. Paul Washa, WØTOK, 4916 Three Points Blvd., Mound, MN 55364-1245. (612) 472-3389

FOR SALE: Collins repair. I specialize in S-line equipment. Reasonable, & work guaranteed. Steve, N6HK, Box 1136, Goleta, CA 93116. (805) 967-7466

FOR SALE: Heath, 1 ea. unassembled "troubleshooter" $25. 1ea assembled IM13 bench VTVM $40 w/book. U ship. Don, CA, (408) 378-3275, wa6gyd@aol.com

FOR SALE: Two Ranger meters, Ampex VU meter - $50 each; other Ranger parts. Steve, KA9QLF, (IL), (217) 243-3920

FOR SALE: Heathkit Lunchboxes - $40 ea; DX35 - $65; Riders Manuals, 1-12 - $225; SCR522 - $75. Pat, K7YIR, WA, (206) 487-1230, yir@scn.org

FOR SALE: URM-25D - $65 plus shpg; HP-614/616 generators - $25 for both; USM-28 - $20 pickup only. Sandy, W5TVW, LA, (504) 836-2134, ebjr@worldnet.att.net

FOR SALE: Heathkit Technical Bulletins--Heath's own private "Hints and Kinks" publications distributed for use by Heath technicians around the country. Compiled from notes by factory techs as well as techs in Heathkit stores nationwide. Contain thousands of fixes, modifications, and hints for kits spanning Heath's entire product line. Everything from TV and stereo to ham gear and general products. Covers complete years 1966 to 1979 (1977 missing). About 1000 pages on standard 4 x 6 microfiche $20 plus $3 shipping. Satisfaction guaranteed. Chuck Penson, WA7ZZE, Box 2414, St. Paul MN, 55102

FOR SALE: Heath SA2040 2KW tuner, VGC. John WAØJYJ, CO, (970) 249-2751 (evenings)

FOR SALE: 1935 E.H. Scott Allwave Imperial rcvr and spkr, nice conds, working - $150; Rick KD6ZR, Fremont, CA, (510) 657-8341, rickh@lathropeng.com

FOR SALE: Tubes, NIB 866A - $10; NIB 811 - $25; NIB 807 - $8; 3B28 - $15; 4E27A - $15; 814 - $10. Dan Merz, 312 Sierra St, Richland WA 99352. (509) 375-1334

FOR SALE: Kenwood TS-530S - $375; ART-13 w/28V & 1150V ps - $250; LM-15 frequency meter w/AC ps - $40; (2) Gonset Comm. IV xcvr's, one w/VFO - $75 for all. PU only. Jim DiMauro, NJ, (201) 764-5203

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FOR SALE: R-390A components: RF & xtal deck - $75; audio - $90; IF - $65; pwr sply - $20; PTO - $45; complete knob sets - $10. All decks in good condx, but minis some tubes. George Rancourt, K1ANX, 82 White Loaf Rd., Southampton, MA 01073. (413) 527-4304

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FOR SALE: Tubes, NIB 8005 - $25 ea. **WANTED:** Viking I or II parts unit. Collin Collier, N4TUA, GA, (912) 988-1276.

FOR SALE: RCA Radiola, 1924, exc condx. - $125; xmt'g tuning; unit TU-5-B, very good - $75. Bill, KB8IJC, WV, (304) 842-4635.

TRADE: My HRO-50 G coil for your HRO-5 (or earlier) G coil or will buy. Dale, K5AIZ, 7217 E. 65th St., Tulsa, OK 74133. (918) 496-7752.

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

FOR SALE: 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: HRO-60, ABCD coils, needs work - $125; HRO-7-ABCD, ps & spkr - $350; Heath SB-610 - $85; SB-620 - $85; SB-630 - $85; SB-640 - $85; new in crate, GRC-109, special forces radio, all acc. + handcrank gen - $500; Heath Cheyenne xmt, pwr sply & mic; Commanche rcvr & spkr & mobile mount - $225; Heath Commanche rcvr - $40; HX-20 & HR-20 w/pwr sply - $95. George Rancourt, K1ANX, MA, (413) 527-4304

FOR SALE: Several old Hallicrafter SW radio's & matching spkr's, silver dial to S-120 models. Tom Lucht, 9317 Jaynes, Omaha, NE 68134. (402) 342-5630 d, 571-0688 eves.

FOR SALE/TRADE: Zenith Oceanic good operational. **WANTED:** 2 ea. 811A (American) lea. 813 (carbon plate). WØBVA, KS, (316) 479-2756.

FOR SALE: Tubes, new, 1 or 3000, 40% + off. SASE or e-mail for list. Jim Dillon, WL7CMQ, 201 Seward, Juneau, AK 99801. (907) 586-3223, beadgal@ptialaska.net

FOR SALE: Heath HD15 phone patch exc, w/ manual - $19; two unused RCA 12JB6A's - $9 ea. Bill, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

FOR SALE: Collins mech. filter F250A85 - $45. **WANTED:** Hi-Fi & guitar amp lifiers (tube type). Rob Rodriguez, CA, (510) 845-2625

FOR SALE/TRADE: Xmt'g/rcv'g tubes, new & used. 52¢ LSASE for list. Many thousands added lately. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR SALE: Heath HW-12 80 meter xcvr, HP-23A sply - $80; HW-100 xcvr, 80-10 meters, HP-23, handmic - $125; Drake R4-B - $125; T-4XB for parts - $75; AC-4 for parts - $30; Swan model 22 adapter - $15; Swan Desk mic, rough - $10. U-ship all items. Dan Langston, KO4RA, GA, (912) 452-1015.

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FOR SALE: Hallicrafters FPM300 - $350; HB ps for Swan - $75; LS166 spkr - $15; AT895 antennas - $12. **WANTED:** Harvey-Wells APS90 ps; manuals for: KARADIO model 80 & ps; Morrow FTR; Gelosо G207DR rcvr. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

FOR SALE: Rider Book "How to Use Meters" - $10 ppd. RJ Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: Exc RME69 cabinet - $50; beautiful orig. KWM2 w/factory SO239, collector quality - $500; R48A, nice - $45. K5YY, AR (501) 756-5010

FOR SALE: Johnson Valiant xmtr, good condx, works fine, manual copy - $200 + shpg. Jeff, K2EWM, 58 Saddle Shop Rd., Ringoes, NJ 09551. (908) 782-2346

FOR SALE: RME VHF-152A radio frequency converter - $50; Knight tube tester, mint - $50. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

FOR SALE: Orig. manual for S-20R Hallicrafters - $25; Hammarlund HC-10 converter w/orig. manual - $100. Arnie Depascale, K1NFE, POB M, Plainville, CT 06062. (860) 675-3333

Please remember that ER will only accept ads for vintage radio related gear.

WANTED

Vintage AM equipment for personal use. Must be collector quality or mint. Prefer Collins, will consider others. Bob Tapper, K1YJK, Box 61538, Denver, CO 80206. (303) 740-2272, FAX (303) 777-6491

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

FOR SALE: K7FF mailorder list of parts/equip., two first-class stamps/mailing label. Lots of new small parts, (military surplus etc), antenna insulators, tubes, 19" rack panels, wire, snap-on ferrite cores, etc; coaxial cable mostly mil spec, mostly new (some w/slight use, but VGC), RG-58, RG-59, RG-213, RG-214, RG-223, etc at great prices. Special: 100' ($60) & 200' ($120) lengths of slightly used RG-214 w/male N connectors (misc. lengths also available.) Derek, K7FF, 5191 Rimwood Dr., Fair Oaks, CA 95628. (916) 965-4904

FOR SALE: 500 KHz Collins filters for the filter modifications described in the March & June '96 issues of ER. They are 3.5 kHz wide, centered at 501.5 kHz - $50 ea + $3 for priority mail. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150. rh8421@usa.net

FOR SALE: Radiotron Designers Handbook, 3rd edition, 1941, mint condx - $50 ppd. R.J. Moraine, N5UX, 3700 Cliffwood Dr., Bedford, TX 76021. (817) 281-1128

FOR SALE: Orig. manuals: Collins 30S-1 - $36.50; 18S-4 - $33; R-390 (operator's) - $8; SCR-274N (operator's) $10; WS No. 19 Mk III - $22; Eico 460 - $10. Above PPD CONUS. DM-42A 12V dynamotor (SCR-506A), NOS, - $60; other items, LSASE for list. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942.

WANTED: National AGS. Have 1924 WE 3-A 50 watt AM xmtr to trade. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272.

WANTED: DM-24 dynamotor; R25/ARC-5, 1.5-3.0 mc rcvr. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Roller inductor parts for Viking II. Mike, N1HXA, MA, (508) 386-7966

WANTED: Manual for Collins 651S-1 rcvr, copy OK, + small control knob for same. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838.

WANTED: Military radio's. Canadian or British WS-38 & WS-48. Ron Germain, 717 Waterloo St., St. Clair, MI 48079.

WANTED: Navy xmtr's: TCA, TCE, TLX, TBW 800 cycle pwr sply; TBM modulator CAY-50065. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: Broadcast mics, manuals R-390A, Knight Star Roamer. Ken Poling, N8EIJ, 4707 Martin, N. Olmsted, OH 44070. (216) 777-8785

WANTED: L-26 out of the Collins 75A-4 rejection tuning filter. John Casale, WA2FHL, 3 Pickering Ln., Troy, NY 12180. (518) 272-3631

WANTED: National NC-80 dial bezel or junker w/good one; FB-7 coils. Robert Enemark, W1EC, Box 1607, Duxbury, MA 02331.

WANTED: Heath gear, unassembled kits, catalogs and manuals. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI 49002. (616) 375-7978. billrobb@net-link.net

WANTED: Original knobset and S-meter for Hammarlund HQ129X. Bob, K6GKU, AZ, (602) 816-0660

WANTED: Manual and/or 80 meter phone BC-746 tuning unit for the BC-745/SCR-511. Nicl Wiegand, WA5VLZ, 12105 Mustang Chase, Austin, TX. 78727. (512) 219-8548.

WANTED: One and two tube receivers (regenerative), kits or homemade. Bob Mattson, KC2LK. 10 Jane Wood Road, Highland, NY. 12528-2607. (914) 691-6247, rmattson@freemark.com

WANTED: Collins mech. filters 1.5 and 6.0 for 75S3-C and 32S-3A RE w/ 516F2 RE. Must be mint. I0LBE, FAX +39-6-3071079 or liber.fab@iol.it

WANTED: Like new front panel for Viking Ranger or someone who silk screens them. Ron Weaver, N6VO, 13691 Solitaire, Irvine, CA 92720. n6vo@earthlink.net.

WANTED: Millen gear – 90801 exciter, ps; 90881 amplifier, ps; 90902/3/5 scopes. Will pay cash and/or have other ham gear to trade. James Olson, N6IFO, 3442 North Cook Road, Powder Springs, GA, 30073. (770) 429-8189

WANTED: RT9000,HF380,SSB wide filter AC-3814 Koji Mitoshi,Japan. TEL/FAX:011-81475-24-9115, BYJ01726@niftyserve.or.jp

WANTED: Collins SM-3 mic and 51J4 w/cabinet. Frank Scutch, WB4AYJ, 11780 N.W. 24th St., Plantation, FL 33323 (954) 472-9474

WANTED: German WW II radios and clandestine sets any period. Will pay freight. Offering cash / swap. Rag Otterstad, OZ8RO, Hesterkobvej 10, DK 3460 Birkerod Ph: +45-4281 5205, Otterstad@mec.dk

WANTED: Legible copy of schematic only for Clegg Interceptor rcvr. All duplicating costs reimbursed. Thanks. Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660. (773) 262-5360

WANTED: National NC-120 rcvr; Bendix ATD xmtr & dynamotor; BC-348 rcvr; Eico model 753 Tri-band xcvr & pwr sply's; Temple (brand) luggage type portable radio; 1930-1950 Popular Mechanics magazines. Harry L. McCall, KB4CSY, 9135 Glade Valley Rd., Ennice, NC 28623. (910) 657-8248

WANTED: Yaesu (Spectronics) spkr SP-400. John, (907) 337-9157 Alaska Time.

WANTED: J. Miller Co., broadcast band AM tuner 565; Heath DF-2 Navigator rcvr. Al Kaiser, W3LEQ, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: USM-3A tester, need not be complete; BC-312, BC-342 for parts. David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4. (418) 877-1316. Canada

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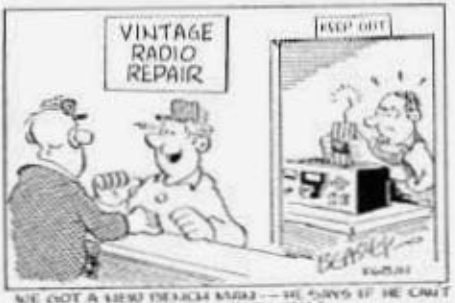
WANTED: 1937 Frank Jones Radio Handbook. Lynn Stolz, N8AJ, 2461 Bean Oller Rd, Delaware, OH 43015. (614) 369-9777



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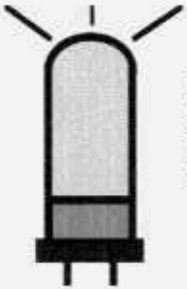

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