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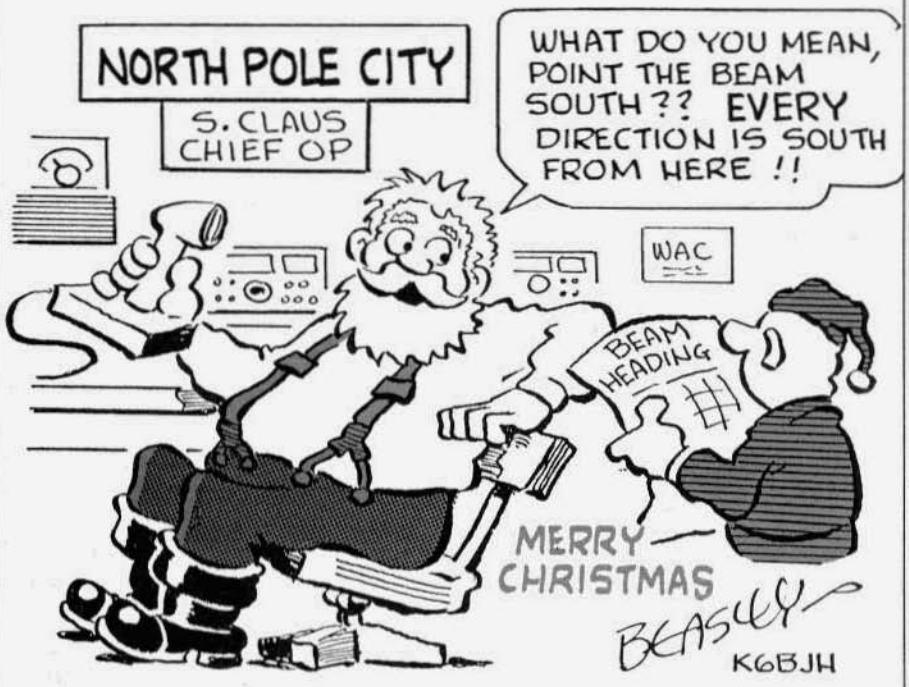
# ELECTRIC RADIO

**celebrating a bygone era**

Number 92 December 1996



# ELECTRIC RADIO

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

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

## Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; 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

The first order of business is to announce the ER Seventh Annual 160-Meter Jamboree/Contest, December 26, 12:01AM to 11:59 PM, Pacific Time. This year the rules remain the same - one point for each contact and one point for each AMI member worked. Logs must be received here by January 15th with as much of the following information as possible: name of operator worked (first name OK) callsign, city, state, equipment being used, antenna and time of contact. I'd like to announce the results in the February issue so please get the logs in to me as soon as possible. The prizes this year will be award certificates (suitable for framing) plus a Pocket Guide to Collins Amateur Radio Equipment 1997 Calendar for 1st, 2nd and 3rd place winners.

A while back we announced our AM-WAS program and the response has not been spectacular. So far, only 3 individuals have sent in QSL cards for the award and of these three none has worked all states. Paul Maikranz, KB2MUQ, sent in 30 cards; Wayne Steiner, NØTE, 22 and John Vercellino, WB9OVV, 22. I'm going to prepare the awards with appropriate endorsements and send them out in the near future. Hopefully it won't be too long (maybe when we get deeper into sunspot cycle 23) when someone will work all states on AM. I wonder how long it's been since that's been done? If there are any other AM'ers working towards AM-WAS and have worked over 20 stations I invite you to send in the cards for an endorsed award. When (not if) you collect cards from all states I'll make out another award.

Shirley and I hope all our readers have had a good 1996 and that 1997 is even better. We send everyone our very best holiday greetings. Have a Merry Christmas and a very Happy New Year. N6CSW

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**Cover:** Another fine Christmas cover from Bob Beasley, K6BJH. Thanks Bob.

## Dr. William E. Neeley, K7INK, Silent Key

**December 24, 1943 to November 9, 1996**

Bill Neeley, K7INK, died early November after a valiant fight with lymphoma. He is survived by his mother Upha, his wife Linda, WA7SUM, and his children Laura and Will.

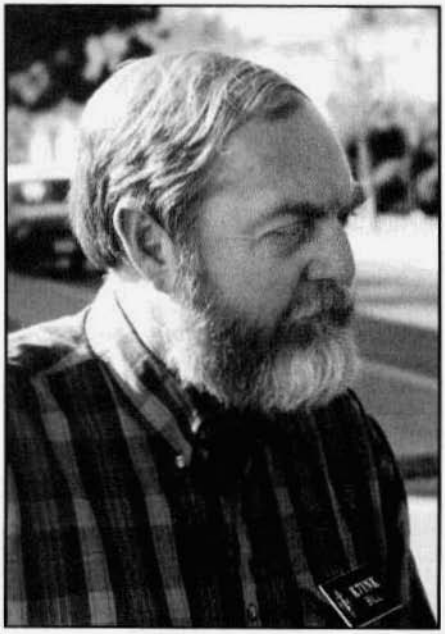
Bill was one of those rare individuals to whom the description "gentleman" truly applies. He was universally loved and admired both in his profession of university professor and in his hobby of amateur radio.

At the time of his death, Bill was a professor in the Department of Politics and Public Administration at the California State University Stanislaus, in California's Central Valley. He completed his bachelor's and master's degrees at the University of Washington and his Ph.D. at the University of Nevada at Reno. Joining the CSUS faculty in 1976, he was instrumental in founding the Master's in Public Administration program. In 1990-92 Bill was appointed by the California state legislature to serve on a state wage commission. He served in several public service positions and was a member of many professional societies.

Bill's intelligence and people skills carried over to his favorite hobby, ham radio. Licensed in high school, he returned to AM operation in the late 80's, accumulating many artifacts from the Golden Age of ham radio. He was proud of his Tec-Rad T-350XM transmitter, covering 160 as well as 75, and his Johnson Desk Kilowatt and Globe King 500 carried his warm voice to us on 75 meters.

Bill held AMI number 13 and was Director of the Southwest Region of AMI.

He frequently took charge of the legendary Wednesday night West Coast swap net, and often broadcast the taped



Ham Radio Newsline as well. Dale Gagnon, KW1I, AMI President, noted that the AMI Southwest Region was one of the most active and best organized areas of AM activity in the country.

Bill was the coverboy of the September 1993 issue of Electric Radio.

He held an Alaskan call when he and his wife Linda taught elementary school in Yakutat in 1968-9, and in the Eskimo village of Akhiok, on Kodiak Island, the following year, where they were the only non-natives.

Fifteen years later, he held an Irish call during a year's sabbatical leave to Cork, Ireland, the country of his roots.

Bill's enthusiasm and warmth set a high standard for the rest of us. He was indeed a unique individual that all of us who knew him will surely miss.

**John Staples,W6BM**

# An Historic Moment!

**Art Collins' callsign, WØCXX, assigned to Collins Amateur Radio Club in Cedar Rapids.**

**by Floyd Soo, W8RO**
**8232 Woodview Dr.**
**Clarkston, MI 48348**

Sunday, 24 November 1996, will go into the books as a historic moment for fans of Collins Radio Company and family of Art Collins. As of the 18th of November 1996, the Collins Amateur Radio Club in Cedar Rapids was assigned WØCXX! This, of course, was Art Collins' callsign. Through the work of people like Rod Blocksome (KØDAS), Tom Vinson (NYØV), Warren Bruene (W5OLY) and Mary Collins; Art's old callsign is back on the air after being silent for a decade or so.

The Collins Collectors Association was asked by the Collins ARC to participate in the inauguration of the club's new callsign. The CCA was honored to be a part of history, so on Sunday, 24 November 1996; Butch (KØBS) called the net up on 20 meters with a new twist. He turned the net over to Tom (NYØV), and he began by reading the famous quote that Art wrote when he was 16, and then a 15 second period of silence was observed to pay tribute to the great man whose callsign was about to be resurrected.

Then the fun began. Tom and Rod

**continued on page 40**

**Warren Bruene, W5OLY, makes the first contact with the Rockwell-Collins Employee's Amateur Radio Club during the club's first day of operation at WØCXX. The Cedar Rapids, Iowa club bestowed the honor on Warren who joined the Collins Radio Company in 1936 and was one of the principal engineers in the design of modern single sideband technology. The Collins Collectors Association hosted the first day of operation for WØCXX, callsign of company founder Arthur J. Collins, during its weekly 20-meter net on November 26. At left is Jay Miller, KK5IM, from whose Dallas, Texas station the first call was made.** ***Photo by Glen Kitto, KC5WBQ***

# CPCW-5 Transmitter

## (Cake Pan, CW, 5-Watt)

**by Carl Gelormini, WB1EYE**
**427 N. Main St.**
**Sharon, MA 02067**

**Introduction**

The CPCW-5 is a 5 watt transmitter, designed for 80 meter, or 40 meter CW, keeping with the idea for a basic clean sounding CW transmitter, using *vintage* design and components. The idea for using a cake pan for the foundation for this project, came from Rich Leverone, K1ETP, another fellow vintage enthusiast. Rich built a plate modulated transmitter on a WalMart cake pan. Following in Rich's footsteps is Pete Whelpley, W1VZR, a master technician and vintage enthusiast who also built an AM transmitter. I could not resist the temptation after seeing their cake pan transmitters. I just had to have one of my own so I built one using an octal tube lineup, a single 6L6 modulated by a pair of 5881's. The plans for this came from a previous article in ER called "Long Live the 6L6" by Jack C. Schutt, N9GT. Thanks Jack. I now use this transmitter as my main rig.

Something was missing. Being also an avid CW enthusiast, I came up with the CPCW-5 "cake pan" CW 5-watt transmitter. This rig consisted of the same cake pan foundation, only it was more compact, using a 6C4 triode as an untuned Pierce oscillater. The signal is fed to the grid of the 6AQ5 power amp where it is increased to operational level. A pi network is used to match any 30 to 75-ohm load. Keying is accomplished by breaking the cathode leads of the 6C4 and the 6AQ5 at the key jack. To prevent clicks, and to shape the CW note, a .47 mFd mylar capacitor with a 100-ohm resistor are series connected from J1.

I have used this little PW (peanut whistle) on 80 meter CW and have been amazed at the S9+ reports. This little rig is a winner indeed. That's when I got the idea to produce a vintage kit that I could share with everyone who might be missing the old days of building a transmitter and being proud of putting it on the air. Ah yes!!! We are now going into the 21st century and we can still have the warm glow of "hollow state" instead of the plastic silicon jungle that sits on the desks of most Amateur Radio shacks. At the very least you will build a conversation piece that will have your friends looking away from your newly acquired Kenwood 950, and asking about your cake pan. So dig in. Keep the iron hot and the leads short. Put one hand in your pocket and follow the "Yellow Brick Road" to your first "home brew" project since who knows when!

I want to thank Rich Leverone, K1ETP, Pete Whelpley, W1VZR, and Lou Savoie, K1RAK, for the inspiration to design and build this exciting little "glow in the dark" transmitter.

**Now on to the "yellow brick road"**

The first prototype was not without flaws. After putting it together using a 5763 for a final, I noticed the price of that particular tube is in the vicinity of $15. Thinking of cost effectiveness, I redesigned the prototype using a 6AQ5 at a price of about $4. Big savings here and very little loss in performance.

Next fly in the ointment - where to find iron for this project? I took a look around the shack, found a pile of "dead soldiers," you know, previously scrapped projects! I came across a nice



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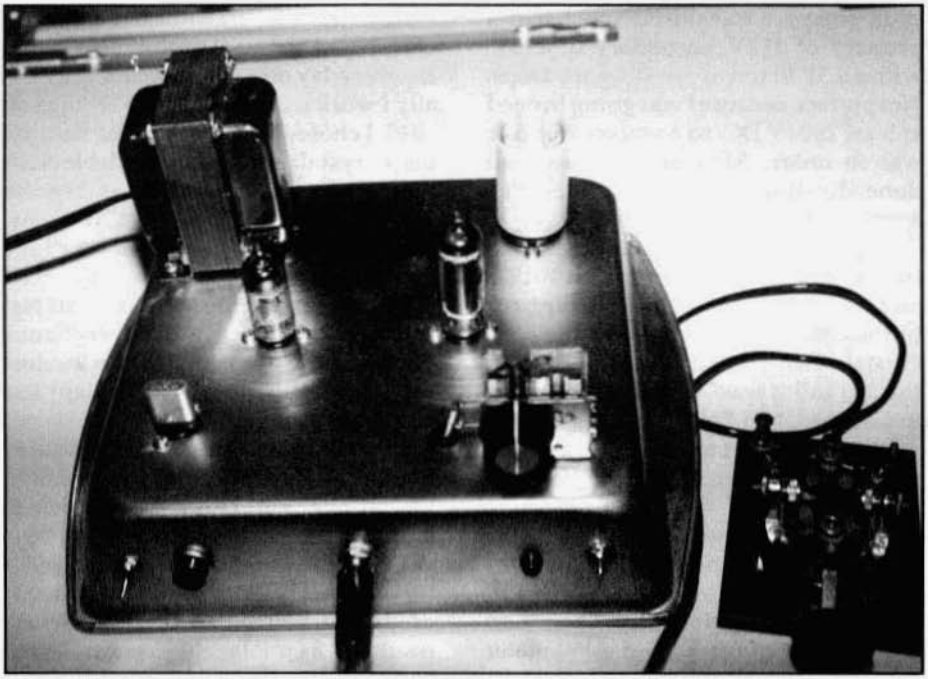
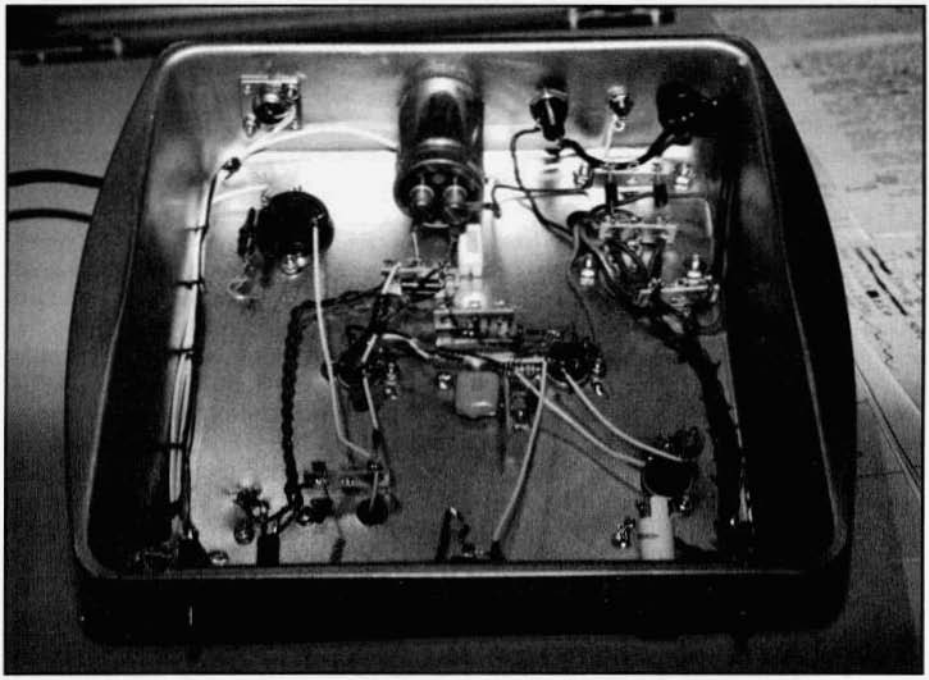


**Topside of the CPCW-5**



**Underchassis view.**

**CPCW-5 Transmitter from previous page**
little compact transformer that had a primary of 117V, secondary of 125V, with a 6.3V filament winding at 2 amps. Not perfect, because I was going to need at least 200+V DC, so a voltage doubler was in order. After all was said and done, down went the key and up came a real nice sounding CW note.

Now the real test! After setting up the transmitter on top of my Yaesu 101ZD and hooking up the antenna to the back of the cake pan, I plugged in the 3535 crystal, then started to call CQ. After the 3rd call it was "DE N1JH RST 599+ in Concord, NH." Not real DX but the 5 watts did okay at around 130 miles on August 12th in the middle of the afternoon.

At this point it was time to make the final adjustment and test to make sure I was within operating parameters of all the components. Now will it work on 160 or 40? I plugged in the 160-meter coil and oh yes forgot to tell you, the coil that the circuit uses is a "plug-in" wound on a plastic coil form cemented to a octal base. Nothing new here! So I can go 160 thru 40 meters with this little peanut whistle. No problem on 160. No problem on 80. BUT!! Some trouble on 40 meters. The signal was a little chirpy. So back to the drawing board.

Testing the power supply under load, I found a large drop in voltage from 240V to 180V - no good at these higher frequencies. So I knew that if I wanted to make this a 3-bander, I would need a stiff power supply using full-wave rectifier and cap input filter. That meant finding a transformer that would handle around 50 mils at 250V each side of center. Well I want to tell you I called around and the average price for this little bugger was in the vicinity of about $40. This was now blowing the kit idea right out of the water. However I found a local company that would custom-wind a transformer to my specs, if I ordered a minimum of 25. Now this looked a lot better.

Now that the transformer dilemma was solved, the final prototype is on the air everyday on 3700 or 3640. Occasionally I work some DX in the evenings on 7040. I chose these frequencies because these crystals are readily available clock osc. types. The cake pan has become very popular on the local CW scene. They can be heard from time to time anywhere in New England, in fact I have created a informal Cake Pan Net that meets at 11:00 AM EST every Saturday morning on 3640. So tune in, dust off the old Blue Racer, or straight key and join in the fun.

If you are from the New England area listen in and you will hear the all new "3 Layer Cake Pan." This is the new deluxe model which has been modified by Pete, W1VZR. He uses a few dropping resistors off the B+ to a rotary switch that drops the voltage to the final which results in 3 QRP levels - 5 watts, 1 watt or 100 MW.

Also I have added a VXO to move the crystal frequency a bit if the going gets tough. So many options here! How about screen modulation? Oh yes, now in the works. As we speak, Mark, N2ZAB, from Poughkeepsie, NY, has designed a prototype direct conversion receiver for the Cake Pan. Watch for that one next!

In closing, we hope the Cake Pan will give you many hours of enjoyment, not to mention having a piece of radio history in your shack. We sometimes forget our roots but this radio will remind us of what radio used to be like. In the old days of the homebrewer we used everything from shoe boxes to rack and panels to design our transmitters. That's why, unlike the kits of today, we left part of the design to the individual. So hopefully just as we each are individuals, our transmitters will be individualized. We also chose two operating frequencies. One in the novice band and one in the general portion. So we can all meet each other from time to time and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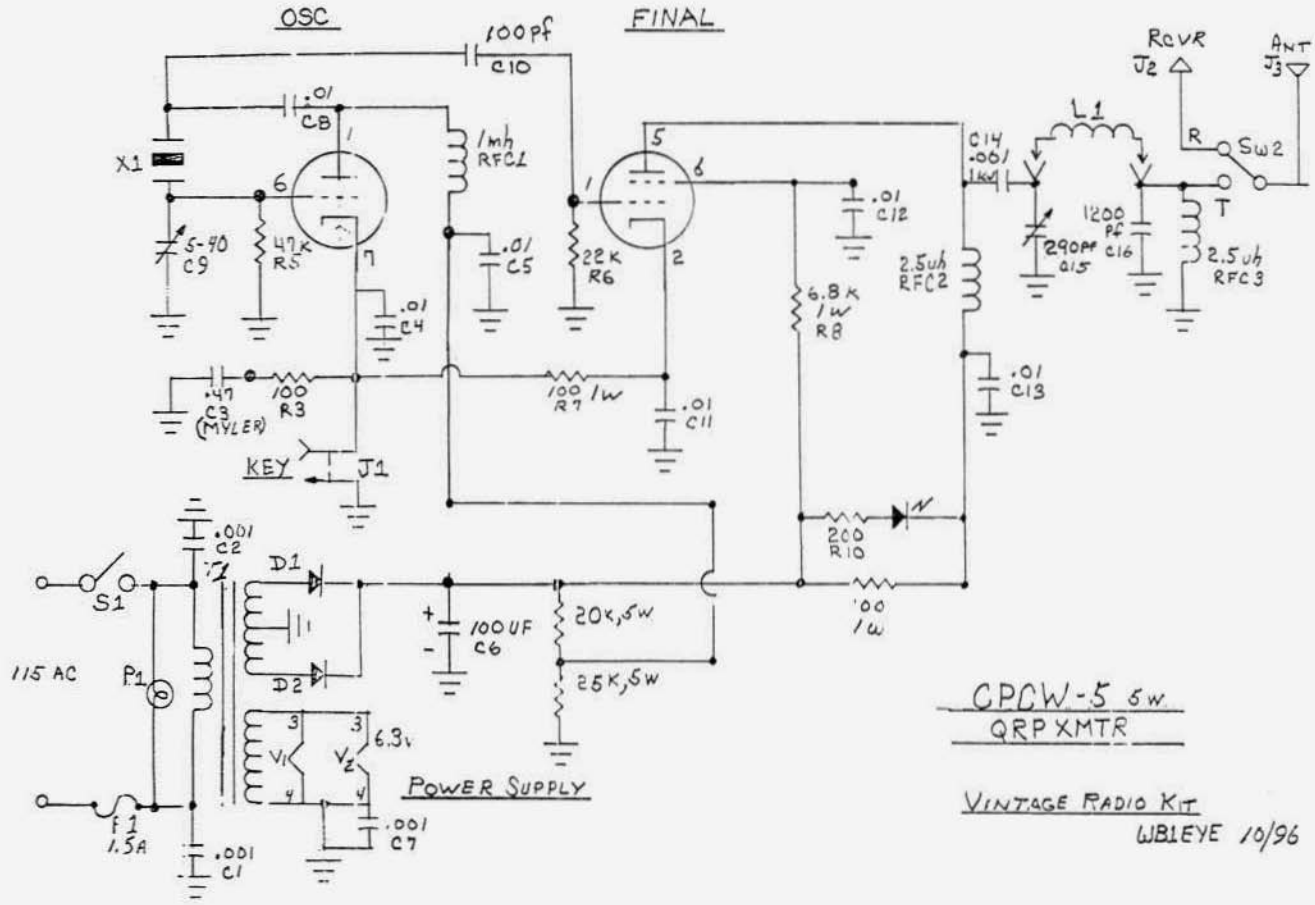
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FINAL
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C9
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C5
22K
R6
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C12
6.8K
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R8
C14
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C1
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C6
20K,5W
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200
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1w
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V1
V2
.001
C7
POWER SUPPLY
CPCW-5 5w
QRP XMTR
VINTAGE RADIO KIT
WB1EYE 10/96

# AM Receiver Selectivity: How Much? What Kind?

**by John Sehring, WB2EQG**
**PO Box 373**
**Baker, MT 59313**

We've been talking (and disagreeing) about how much selectivity to use when receiving amplitude modulated (AM) signals for many years (at least 50 of them!). On one side there's always been the 'hi-fi' crowd - it wants faithful, distortionless, wide frequency range reproduction of AM signals. This requires a receiver with relatively wide bandwidth (but less selectivity) when using traditional AM receiving techniques. It's fine when signals are strong and QRM is minimal.

Driving the other side of the argument are the facts of life on our bands: Signals are not always strong and there's usually lots of QRM. This situation requires receivers having less bandwidth (more selectivity) and that usually means a compromise in fidelity. Specifically, you usually get less of the higher audio frequencies.

Let's put some numbers on this. I'll use an example from the MF AM broadcast band where channel spacing in North America is 10 kHz. That means there's 5 kHz of space on either side of where the carrier sits for a total of 10 kHz.

An AM signal modulated with a 5 kHz sine wave tone produces one sideband 5 kHz higher in frequency (the upper sideband) than the carrier and another sideband 5 kHz lower in frequency (the lower sideband) than the carrier, thus spanning the full width of the inter-channel space.

Channel spacing sets the upper frequency modulating limit before QRM with adjacent channels occurs. Higher modulating frequencies would produce sidebands that reached into the sideband space of adjacent channels. This would cause severe QRM ('monkey chatter').

A conventional AM receiver suitable for this channel-frequency spacing would need to have a bandwidth of twice the highest modulating frequency (2 x 5 kHz = 10 kHz) if you wanted it to reproduce the highest modulating frequency without attenuation, in this case 5 kHz. This is because both sidebands, upper and lower, are needed by usual AM receivers along with the carrier for successful demodulation (detection) of the signal. You'd tune such a radio to put the carrier exactly in the middle of the bandpass curve to pass both upper and lower sidebands equally.

Now this nice arrangement of signals on fixed channels makes for a pretty picture. But it's not at all the case on the MF and HF ham bands where operation isn't channelized. AM, SSB and other signals of all sorts are jammed together elbow to elbow. This produces fierce, rotten QRM --just listen for yourself!

Now we know that for transmitting just speech, bandwidth can be reduced quite a bit, down to a frequency of about 3 kHz, while still maintaining good intelligibility. So our AM receivers could have a tighter bandwidth, ±3 kHz, for a total of 6 kHz and still pass both sidebands.

Sometimes, the treble cut caused by tight selectivity like this makes speech sound unnatural. One cure is to crank in a bit of complementary bass cut. As long as the product of the low and high frequency -3 dB cutoffs (in kHz) equals approximately 0.5, you'll maintain a fairly balanced sound quality even though the overall bandwidth is restricted.

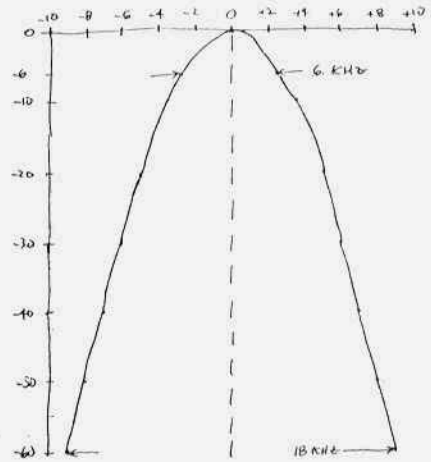


**Figure 1A. Selectivity curve of a typical communication receiver with 455 kHz IF frequency.**

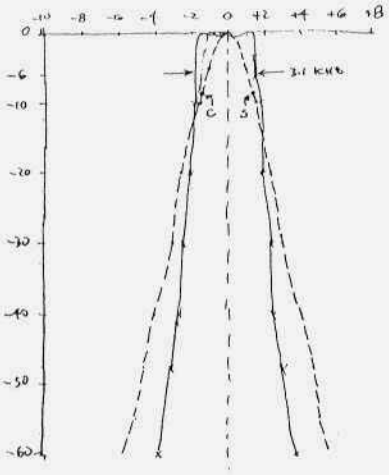


**Figure 1B. Selectivity curves. Solid curve: Collins 3.1 mechanical filter. Dashed curve: 455 kHz IF frequency, nine tuned circuits.**

See Figure 1A for a typical AM receiver's selectivity curve. Note the rounded shape of the nose of the curve. This is usual for radios with ordinary L-C tuned circuits. The carrier would of course be placed in the center of the curve. This tighter, 6 kHz bandwidth is a distinct improvement but sometimes even this doesn't provide enough selectivity for crowded band conditions.

So let's crank in some more selectivity, bringing the total bandwidth down to about 3 kHz as shown in Figure 1B (dashed curve). We won't touch the tuning knob so the carrier will stay put at the center of the curve. Yes, your selectivity will be better, but an AM signal will then sound very muffled, perhaps even unintelligible. Who turned the treble down?!

This happens because 3 kHz of bandwidth will pass only ±1.5 kHz of sidebands thus limiting the highest modulating frequency that is detected to 1.5 kHz. This limitation is too severe for speech. It shows that you can carry conventional selectivity only so far.

Let's look at things another way. The fact is that both sidebands (upper and lower) of an AM signal carry exactly the same information (the modulation). This makes them redundant. So why do we have to pass both of them? Why not dispense with one of the sidebands and work with just the carrier and the remaining sideband? If we could do this, we'd have a receiver that could be twice as selective yet still have a frequency response sufficient for good sounding speech.

To try it, let's leave our receiver's bandpass 3 kHz wide. But we'll retune slightly, moving the carrier down one side of the curve, to 1.5 kHz away from the peak. Let's say we put the carrier on the low frequency side, shown as point C of Fig. 1B. This would place the upper sideband over the peak of the curve and down the other slope, on the high frequency side, at point S of Fig. 1B. The carrier and the 3 kHz upper sideband would then be symmetrically placed on the curve.

If you try this yourself with the usual



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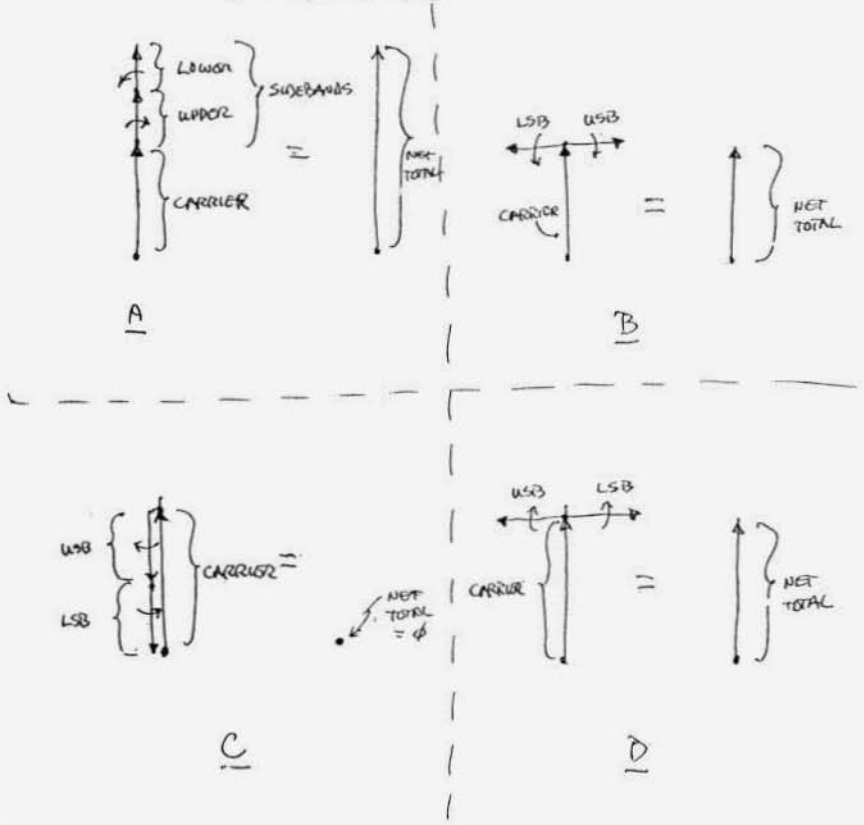


**Figure 2. Double-sideband AM**

receiver you'll immediately notice one big problem: Lots of distortion, which gets worse as the amount of modulation on a signal goes up. This is because the carrier as received at the detector is 5 to 10 dB below most of the sidebands due to the rounded shape of the usual receiver's selectivity curve. This makes the signal at the detector act as if it was severely over-modulated.

The same-sounding kind of distortion, although due to entirely different causes, can be heard on most ionospherically-propagated MF or HF AM signals as they fade up and down. It is often called 'selective fading' or 'selective distortion'. It happens when different (even closely-spaced) frequencies don't fade at the same time. So, if for example the carrier alone fades it leaves too much sideband energy relative to the amount of carrier being received. The result mimics over-modulation.

A solution to the problem appeared just before World War II, in 1941. The FCC and the OSS (one of the forerunners of the CIA) needed receivers of the highest possible selectivity to monitor enemy radio activity. But along with high selectivity to fight QRM, they needed a receiver that would still pass the higher speech frequencies accurately as the Japanese language in particular contains a lot of sibilant ('s') sounds.

Such a receiver was produced and successfully used during the war. Its solution was to use a differently-shaped selectivity curve. It used a bandpass shape that was flat (or nearly so) on top instead of round-nosed, but with half

the bandwidth (3 kHz) of an ordinary AM receiver, see Fig.1B (solid line).

If we tune a radio with this kind of selectivity to place the carrier at one edge of the flat bandpass, even the farthest sideband (3 kHz away in our case) will be passed without attenuation and in correct proportion to the carrier. As a result there won't be the severe distortion we heard before yet we'll have tight, QRM-fighting selectivity.

There must be some kind of hitch to all this, you might be thinking! Well, the story isn't complete yet. After all, if receiving the carrier and just one sideband is so great, how come it isn't THE way all AM receivers are designed?

The answer has two parts. First, it's much tougher (and was even more so in the past) to design and build an IF strip with flat-topped bandwidth characteristics and, at the same time, sides sufficiently steep to give good off-frequency selectivity (good filter shape factor). And all of this needs to be affordable.

The shape factor is usually defined as the bandwidth of a filter at its -60 dB response points divided by the bandwidth at its -6 dB points. A lower number means better skirt selectivity. An ideal filter with a perfectly flat top and vertical (infinitely steep) sides would have a shape factor of 1.

Second, you can't get perfectly distortion-free demodulation when using the carrier and only one sideband with an ordinary (envelope) AM detector. Let's see why this is so. Figure 2A shows how an AM signal looks on what's called a *phasor* diagram. The carrier and the two sidebands are each represented by phasors (lines with arrow).

A phasor is similar to a vector and then some. Like a vector, its length in this case shows amplitude and the arrow tells you which way it's going. A phasor represents a signal by spinning around its tail at a rate equal to the signal's frequency.

To give ourselves a better vantage point, we're going to climb on board the carrier phasor as it spins, say clockwise, at a rate equal to the carrier frequency. Since we're riding on the carrier phasor, we won't notice its spin at all - it's not germane to our discussion.

The amplitude of the carrier is steady so the carrier phasor's length will stay the same. After all, the final amplifier average plate current in a properly operating plate-modulated AM transmitter is steady even during modulation and our receiver's S-meter tells us the same story.

What we'll see from our viewpoint riding on the carrier phasor are the two sideband phasors. They are added to the carrier by the process of amplitude modulation. For 100% modulation, the length (amplitude) of each sideband phasor is exactly one-half that of the carrier.

The sideband phasors each rotate around the tip of the carrier phasor at a rate equal to the modulating frequency. However, one sideband phasor spins clockwise and the other counter-clockwise, see Fig. 2.

For the sideband phasor that is spinning clockwise, its motion adds to the clockwise spinning of the carrier phasor. So its net total spin (frequency) as seen by the world is higher than the carrier's - this is the upper sideband.

The other sideband phasor spins opposite (counter-clockwise) to the spin direction of the carrier phasor and so its net frequency (as seen by the world) is subtracted from that of the carrier - this is the lower sideband.

Let's take the carrier and two sidebands through one entire cycle of modulation, shown in Figs. 2A through 2D. At the start of a modulation cycle (time A), both sideband phasors are in phase both with each other and with the carrier so they all add up together in the same direction to a maximum amplitude. This gives the peak of the modulation cycle (100% modulation in this



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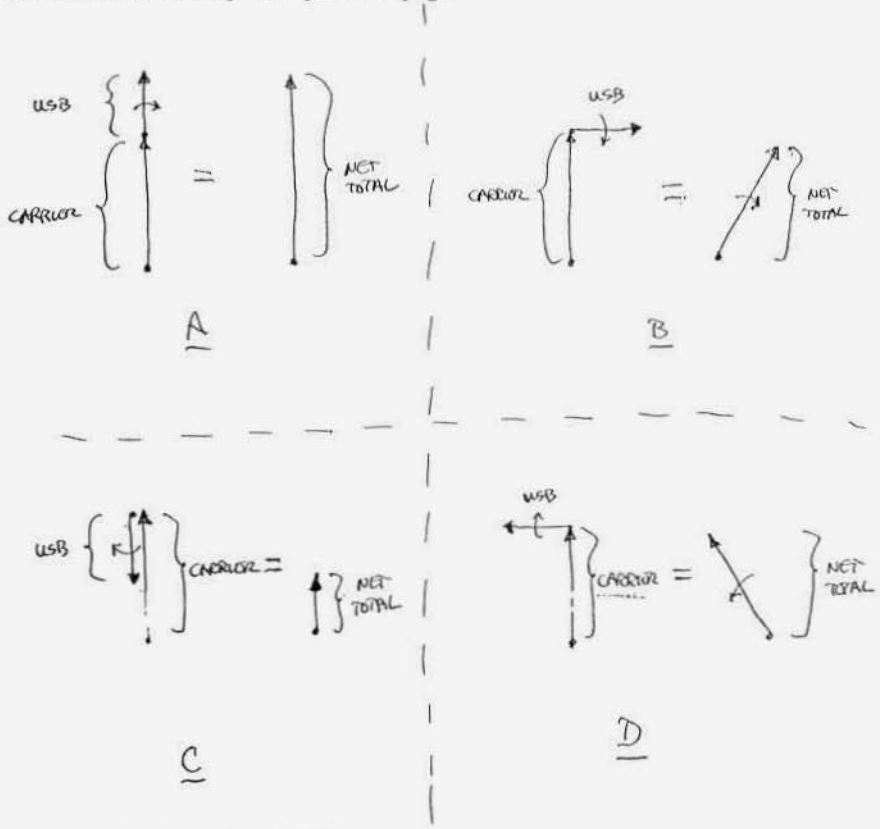



**Figure 3. Single-Sideband AM**

case) where the peak RF voltage output of the modulated transmitter is twice its unmodulated output.

At time B, the sidebands are 180° out of phase with one another and thus cancel out. Here the net amplitude is just that of the carrier alone.

At time C, the sidebands are in phase with each once again but are now 180° out of phase with the carrier. The sum total is now zero. This is the bottom of the modulation cycle. Time D shows a mirror image of time B. Continuing the cycle brings us back to time A again.

Essential point: The frequency of the net result of the carrier and the two sidebands is absolutely steady, i.e. the net phasor always points straight up. Only its amplitude (length) is changing, hence amplitude modulation. That's exactly what's needed for distortionless demodulation by the usual AM detector: pure amplitude variations with no frequency changes.

Let's do exactly the same exercise but this time using the carrier and only one, say the upper, sideband. We'd get this kind of signal when using our flat-topped selectivity curve with the carrier tuned to one edge (lower in this case) of the bandpass as in Fig. 1B (solid curve); the upper sidebands would then fill the bandpass.

At time A (Fig. 3A), the carrier and the one sideband are in phase but the net total amplitude isn't quite as high as it was in Fig. 2A because now there's only one sideband to add up with the carrier. So we won't ever get to full 100% modulation.

At time B, the carrier and single sideband give a net result that swings off to the left. At time C, we can't quite reach the bottom of the modulation cycle - there isn't enough amplitude in one sideband to cancel the carrier completely to zero as in Fig. 2C.

Time D is a mirror image of B except the net phasor swings to the right. Continuing brings us back to the beginning again at A.

So what does all this mean? After the AM signal passes through a filter that allows the carrier and only one sideband through, (1) our detector will not a see a signal with full 100% modulation and (2) there will be some frequency modulation on the signal along with the amplitude modulation.

You saw the latter occur at times B and D when the net result swung to the right (higher in frequency during this time) and to the left (lower in frequency), respectively, which means the net frequency was not constant. In other words, we now have simultaneous amplitude and frequency modulation of the original AM signal at the detector due to action of the filter.

Now what will the effects of this be on reception? Point 1 means less than 100% maximum modulation at the detector which will decrease the amount of signal. This will only be noticeable though with weak signals on a quiet band. This does not describe 75M but is more like the 10M band where a lot of selectivity is usually not needed. However the effect of a smaller noise-bandwidth product from using a narrower receiver bandwidth partially offsets this effect - less noise will get through.(1)

Point 2 will produce only a small amount of distortion as the amount of frequency modulation is relatively minor at average modulation levels. This distortion is mild and becomes only somewhat more with higher modulating frequencies and modulation levels. You can see this in Fig. 3B and D: if the sideband is smaller (lower modulation levels) the net phasor will swing sideways by less. This kind of distortion is somewhat noticeable on loud music but hardly on speech. The treble roll-off action of most communication receivers IF and audio stages will mask this to a large extent.

If the carrier is purposely made much larger than the sidebands, you get the same effect. This can be done in two ways: 1) Peak up the carrier or, 2) substitute for the carrier with a strong BFO. This is called 'exalted carrier' reception.

I'll bet most operators will never notice either of these effects. What they will notice is much better selectivity. Besides this there is another advantage as well. With this kind of passband shape, you can take advantage of being able to choose which sideband you want to listen to.

We saw in Fig. 1B (solid curve) that by placing the carrier at the lower edge of the bandwidth window for example, only the upper sidebands were passed. Or, by retuning to place the carrier at the upper edge of the passband, only the lower sidebands would be passed. This is very useful if interference exists on one side of the carrier but not the other. You can listen to the side that has the least interference. Any remaining heterodyne(s) can be eliminated by IF and/or AF notch filters.

It takes a bit of practice to get used to this. I think it's because we're all so used to tuning for a peak. An excellent way to demonstrate single sideband AM reception is to use the time signals from Canadian station CHU on 3330, 7335 and 14670 kHz.

Tune in CHU on an SSB receiver by zero-beating the carrier. Then switch between upper and lower sidebands. You'll be surprised at what you hear because it transmits an AM signal using a carrier and only one sideband! Repeat this using the single sideband AM re-

**AM Receiver Selectivity from previous page**
ceiving technique described above.

Single sideband AM reception is also useful in reducing (but does not eliminate) the effects of selective fading caused by propagation as mentioned before. This is because the radio doesn't then care whether the other (rejected) sideband has faded relative to the carrier.

Statistically, you may get about a third less time and/or severity of selective fading. This is because we now need only two spectral components (the carrier and one sideband) instead of three (the carrier and two sidebands) to be present.

What kind of radio can provide this type of flat-top selectivity characteristic? Well, probably the most well-known are receivers using the famous Collins mechanical filter. These filters are quite flat on top (with only about ±1 dB or less of ripple) and have steep sides (excellent shape factor), see Fig. 1B (solid curve). I think they are the best there is in vintage equipment.

A lot of the AM crowd gripes about the 3 kHz wide mechanical filter found in, for example, the Collins 75A-3 receiver. Of course, if you tune a receiver in the usual way to place the carrier of an AM signal right at the center of the filter's passband, as we saw before, you're stuck with an upper frequency response of one-half the filter's bandwidth, which is 1.5 kHz in this case, and that sounds terrible.

We saw that the right way to tune an AM signal with a flat top filter is to put the carrier at either edge of its flat passband. Then you'll get audio frequency response to 3 kHz.

Ceramic filters are often used these days to achieve some of this kind of performance at a much lower cost. Crystal-lattice filters are excellent too (but costly) and are rarely found in receivers appropriate for AM reception.

All of the Hallicrafters double-conversion receivers using a 50 kHz second IF have a quite flat passband. This includes the model S-76, SX-88, -96, -100, -101, -101A and -115 receivers. They get this kind of passband using lumped L-C circuit elements at 50 kHz. The very low second IF frequency makes it possible.

Due to production tolerances and/or aging of components, some samples of these radios do not display a flat top but rather a rounded filter shape. I'm planing a forthcoming article which shows how to easily change the flatness and/or bandwidth of the passband of these radios.

The nice thing with these radios is that the bandwidth is easily varied from the front panel, in five steps from 0.5 to 5 kHz. With the carrier positioned at one edge of the passband, audio response out to about 5 kHz is possible when using the widest bandwidth. The 5, 3 and 2 kHz bandwidths on the radio are useful on AM when used this way.

The Hallicrafters side skirts are not as steep as with a mechanical filter but are certainly quite good. These radios also have a selectable sideband feature - the flip of a switch selects the carrier and either the upper or lower sideband.

The Drake R-4, -4A and -4B receivers use a similar kind of 50 kHz second IF arrangement as the Hallicrafters. Four steps of bandwidth from 0.4 to 4.8 kHz are available. The 4.8 kHz and 2.4 kHz bandwidths are useful for single sideband AM reception.

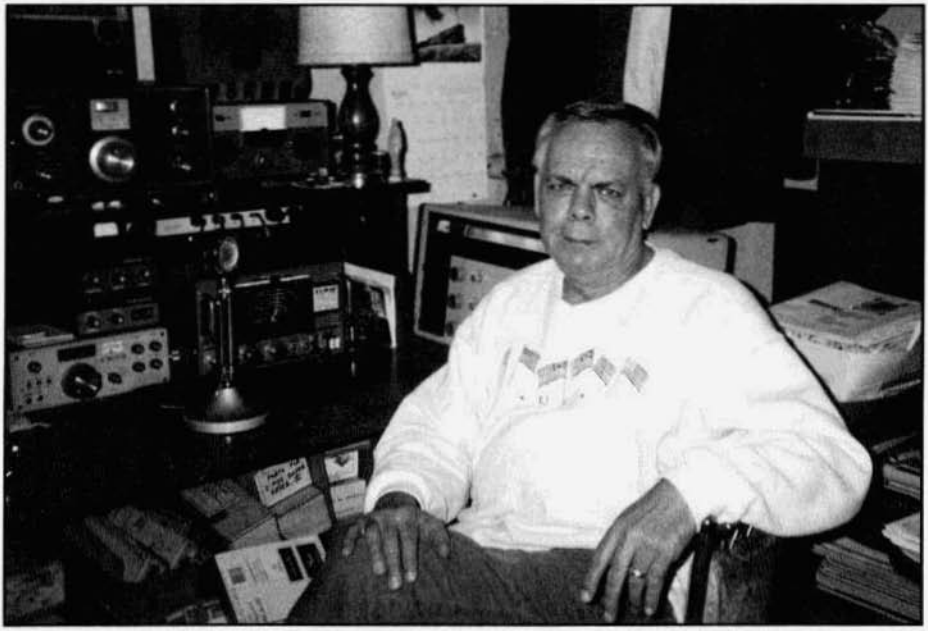
These radios have a continuous passband tuning feature that allows selection of upper or lower sideband and carrier, double sideband with carrier in the center of the passband, or anything in between, without touching the tuning knob. I've found the audio quality on AM to be particularly good with these receivers.

Some of the 'Super Pro' versions (e.g. SP-600JX-17) have fairly flat-topped passbands but are tough to align perfectly without a sweep generator.



**continued on page 31**

Les Locklear (L) and Wally Chambers K5OP. This photo was taken after the Biloxi, Miss. hamfest. Les is holding a speaker in a Bud cabinet that he purchased at the hamfest for $10.

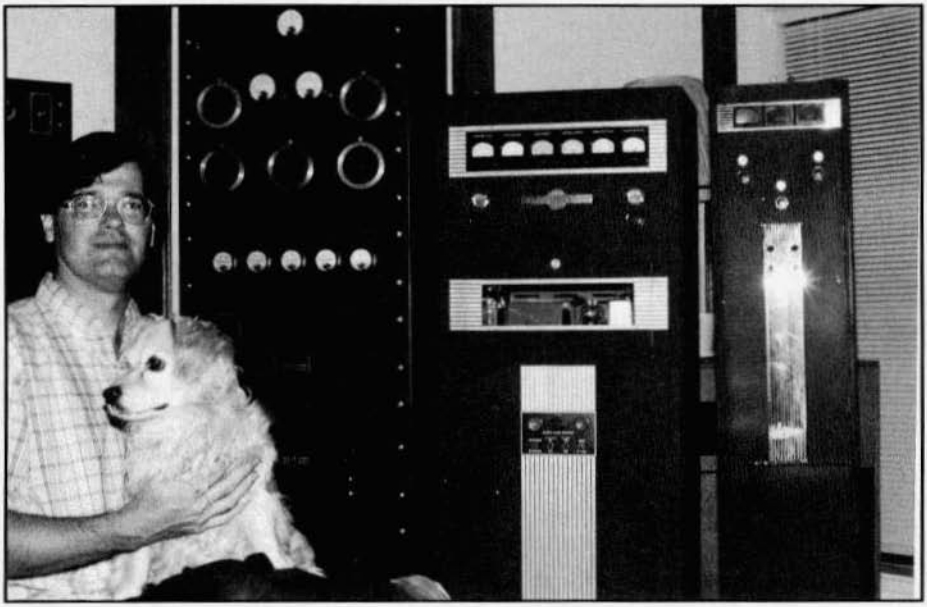


Ron Mayer, W8KYD, in his hamshack. His main AM station consists of an AF-67 transmitter and a NC-303 receiver.



more photos next page

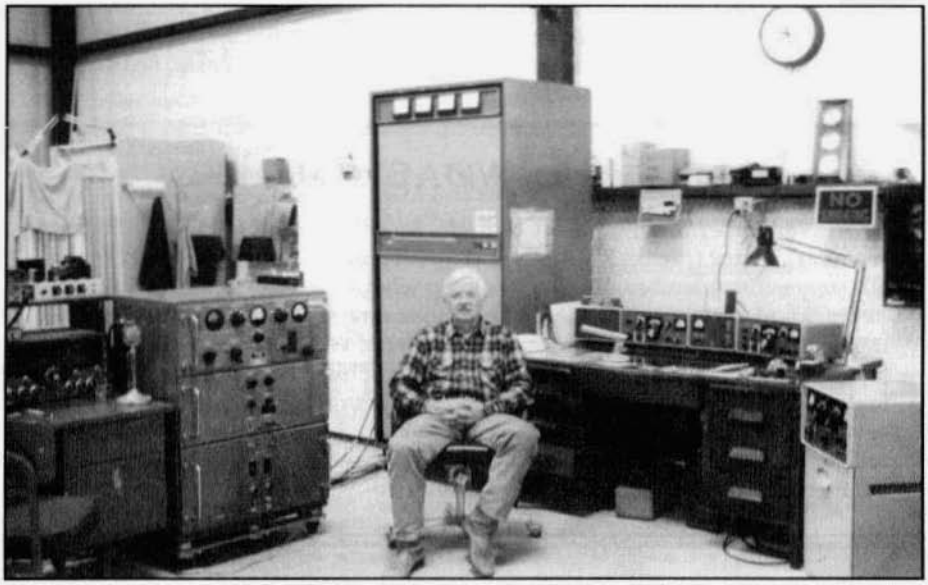
Jim James, W4IVB, with his vintage treasures. The receiver in front of him is an SX-17. Next to it is a rare WRL Globe Trotter transmitter.



John Firey, W5ZG (ex WB5HRI) with some very rare Collins transmitters. From John's letter: "At left is a Collins 150c (1935 vintage), 203 final, P-P 203 modulators. At center is a 1939 Collins 30J, with P-P 813s in the final and P-P ZB-120s as modulators. The transmitter at right is most likely a one of a kind. It is a 2-1/2 meter transmitter built to look like a miniature Collins 30J, built with many of the same components as is used in the 30J. It was built as a W.E.R.S. (War Emergency Radio Service) transmitter. I acquired this piece in Cedar Rapids, Iowa. It was likely used there, probably built by a Collins employee to match their flagship transmitter at the time, the 30J. It uses an 815 in the final, modulated by P-P 6L6s. Presently it can be run on 2 meters AM as a modulated final (driven by an external exciter)."

John is the AMI South Central Regional Director.

George Folse, KB5WWO, at his operating position. Some of the gear in the photo includes a TX-1 (on the desk, on the left) and a Ranger (same desk, upper right). The amplier in front of the Ranger is a Gonset GSB-201.



Wes Minear, W7UO (ex W9UO) in his hamshack. The transmitter on the left is a T-368. The unit against the wall is a Gates BC1G that Wes uses on 160. A complete S-line station sits on the desk with a 30S-1 amplifier next to it on the floor.

### 54 Checkins to Third Annual AMI Thanksgiving Day Bash

KØOJ, "OJ", conducted another great AM special event. Starting early and ending late he managed to check 54 AM'ers and "potential AM'ers" into the AMI Thanksgiving Day Bash.

Listening to the net from my QTH 350 miles southwest of OJ, I was impressed with the camaraderie that was present. I don't think there's a group more close-knit than the AM'ers out here in Colorado and neighboring states. I think a good time was had by all. Kudos to OJ.

Another benefit from events like this one is the exposure that AM and AM'ers get. Many hams get their first taste of AM operation during events like these. This is usually when they try out the AM position on their Japanese rigs for the first time. Credit goes to OJ and others like him who encourage the hams that are new to AM to get on and enjoy the fun.

I hope that other groups around the country will consider sponsoring similar events. More on page 38.

### Dummy Load Society's Second Annual New Year's Day AM Bash

Tradition is an important part of our hobby. Thus, the Dummy Load Society - a group of avid non-joiner Colorado hams - will host the Second Annual New Year's Day AM Bash. We'll hold forth on 3885 MHz, plus or minus, and hope to exceed last year's total of 35 participants. Based on band conditions, we'll start long-range check-ins at 6:30 am MST and begin to add the local/regional crowd at 7 am MST. Net control will be shared by several DLS member stations along the Colorado Front Range, starting with Ed, NØAUB.

Check-ins are encouraged to share appropriate AM limericks, talk about their vintage gear, compete for dubious awards, propose preposterous resolutions, tell tall ham tales, and generally ring in the New Year with hollow-state friends. So, avoid the ridiculous parades and enjoy some serious AM-ing on January 1. Join the Dummy Loaders in the Second Annual New Year's Day AM Bash! NØAUB

## Hank Adams, WØAEE, Silent Key

On November 3, 1996, the Colorado Morning AM Net lost a charter member, Henry (Hank) M. Adams, WØAEE, and the ham fraternity lost a 50+ year active member. Hank operated packet and SSB activity up through 70 cm. Hank passed away at his home in Aurora, Colorado, due to hardening of the arteries and a pulmonary embolism. While serving his country, Hank was severely injured in World War II. This injury later would ultimately lead to many of his physical problems. Survivors include a niece and several cousins. Grave-side services were at Ft. Logan National Cemetery on November 7th. We'll miss you Hank, 73!

**George W. Watson, WØLOB**

# 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 3537, Sundays at 7 PM Mountain. Net control is Tracy, WB6TMY.
**Vintage SSB Net:** Net control is Andy, WB0SNF. 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.**

# Mystery Rig

## Does anybody recognize this piece of equipment?

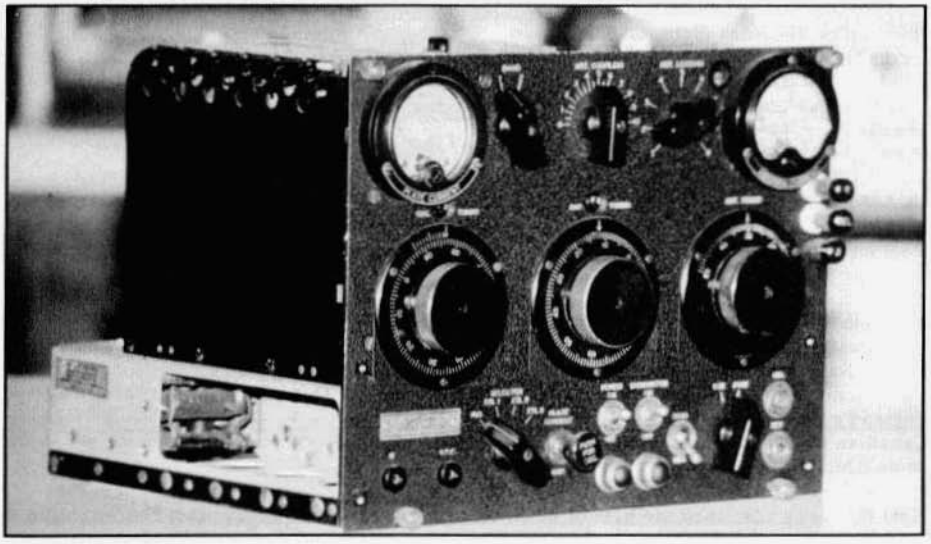
**by Dennis L. DuVall, WA3YXN**
**8011 Frontier Dr.**
**Severn, MD 21144**
**(410) 551-8311, wa3yxn@aol.com**

The unit shown is a two-band transmitter estimated to operate in the 2 - 5 MHz range and uses four 307A pentodes, one each for the MO and suppressor grid modulator and two in parallel for the PA. The MO may be either self excited or crystal controlled and uses the large, three-prong holders the same as found in the TCS. Tuning in both the oscillator and PA circuits is done by roller inductors and fixed capacitors. The integral antenna tuner is a "T" network using a variable capacitor and a tapped coil.

The MO tuning control is the large dial on the left side of the panel. The PA control is in the middle and the antenna tuning dial is on the far right. The meter in the upper left hand corner measures either oscillator or PA plate current and the meter on the other side reads antenna current. The three knobs arranged across the top are labeled (L to R) "BAND," "ANT COUPLING" and "ANT LOADING." The bottom left rotary switch selects "MO" or one of three crystal choices. The rotary switch bottom right selects "CW or PHONE". The three toggle switches are for "POWER", "DYNAMOTOR" AND "SEND/RECEIVE" and meter selection (Osc or PA) is controlled by a push-pull switch to the right of the oscillator mode switch.

The only label on the chassis reads: "PATENT NOTICE, LICENSED FOR AVIATION USES UNDER PATENTS OF THE AMERICAN TELEPHONE AND TELEGRAPH CO., BENDIX NO. A7146-2". The design and components used would indicate mid to late '30s construction.

Can anyone help? ER



# Production at C-W Crystals Ends - Sadly

**This letter was received by Vern Van Valkenburg, WØVV.**

August 9, 1996

Dear Valued Customer:

Production at C-W Crystals has ended with the sudden death of my wife Ruth, a vital part of the C-W Crystal team of Bob & Ruth.

I began C-W Crystals in 1933 as a one person operation supplying crystals to amateur operators thru clubs and advertising in *QST* classified and other magazines for Amateurs. I went to school and obtained First Class Telephone and Second Class Telegraph commercial licenses and automatically qualified me for the Amateur license which I operated under with the call letters of W6KEG. These were the days of Hitler during the 1930's as Europe was slowly edging toward war and C-W Crystals was growing in size as crystals were needed for war, also the domestic needs continued on. As time went on the USA became a direct participant in WW II and in the month of April, 1941, I married Ruth who I took into the C-W Crystal operation where she was put in charge of quality control. I got acquainted with Ruth when I was working part time at a 24 hour AM broadcast station and on the night program, call-in show, she was a caller and from this call came 55 years of crystal finishing and as time went on after the war was over C-W Crystals reduced operations and resumed producing amateur crystals, as the war had shut down all amateur operating. Eventually as time went on we became a team of two as I tried or wanted to retire from commercial crystal production. C-W Crystals had operated before and after the war producing for such as John Galvin's enterprise, known then as Motorola, as it is today and other crystal users such as city, county, police, fire and ambulance mobile needs. So we now became a team of two, Ruth & Bob Woods, as I retired from the problems of commercial crystal production. The two of us were trying our best to be a service for the older equipment that is still out in use as well as experimenters. The idea of ham radio is not just operating, as that is part of amateur radio, but to build something as I put in the classified ads in QST, Amateur Radio is more than CB.

Ruth is gone from this team of two. She did all of the finishing from the raw blanks which I supplied to her, as well as all the bookkeeping, tax preparation as well and taking care of this now 83 year old ham.

Ruth was with me for the past 55 years making crystals and it is with a heavy heart that I will have to close down C-W Crystals, this Ruth & Bob operation. I offer my thanks to the many hams that have sent their orders and letters of appreciation for the service we offered.

Enclosed is your order and remittance for information or order with the hope it's return has not inconvenienced you greatly.

**Bob Woods, WØLPS**

# More on the VT Fuze

**by Al Brogdon, K3KMO**
**114 Lyons St.**
**New Britain, CT 06052**

This is with regard to Bob Dennison, W2HBE's, article, "The Radio VT Fuze," which was published in the September 1996 issue of Electric Radio.

My first thought was, "Hot dog! It's going to be nice to see the developer of the fuze get some well-deserved attention!" Then I read the article and, to my dismay, saw that the company that developed the fuze was not even mentioned by name. Here's some more information, to supplement the excellent information in Bob's article.

I worked at the Applied Physics Laboratory (APL) of The Johns Hopkins University (JHU) for 23 years before retiring a few years ago. Although I was there too late to be in on the VT fuze development program there, I knew many of the engineers and scientists who did the fuze work during the WW II years, and that's where I got what Paul Harvey calls "the rest of the story."

APL was formed as a division of JHU (which it still is) in 1942, at the request of the War Department, as one of the several means of putting the scientific community to work on the war effort. Although it is a Division of JHU, APL is a quite separate operation that does a lot of Navy and other government contract work. It was formed under the auspices of the National Defense Council (later the Office of Scientific Research and Development) - the organization that focused the scientific community's war efforts in developing devices such as radar, the atomic bomb, and the VT fuze.

By the way, the "VT fuze" name was a security cover. Variable time (VT) fuzes had been in use for many years, where the time delay is set manually before the shell is loaded, to explode the round at a corresponding preset distance from the gun. In order to keep up the cover story that the new "proximity fuze" (its more accurate name) was nothing unusual, it was called a "VT fuze" during the war years. The name stuck.

After much developmental work, the Lab put the VT fuze into production in their facility in downtown Silver Spring, Maryland. The fuze was developed just in time to meet the new kamikaze threat in the Pacific, and the Navy put the fuze to good use.

An interesting touch of irony came into play with the very first successful downing of a Japanese aircraft with a VT fuze. In that first success, a Betty light bomber was brought down by a shell fired from the cruiser USS Helena. The Helena had been present at Pearl Harbor on December 7, 1941!

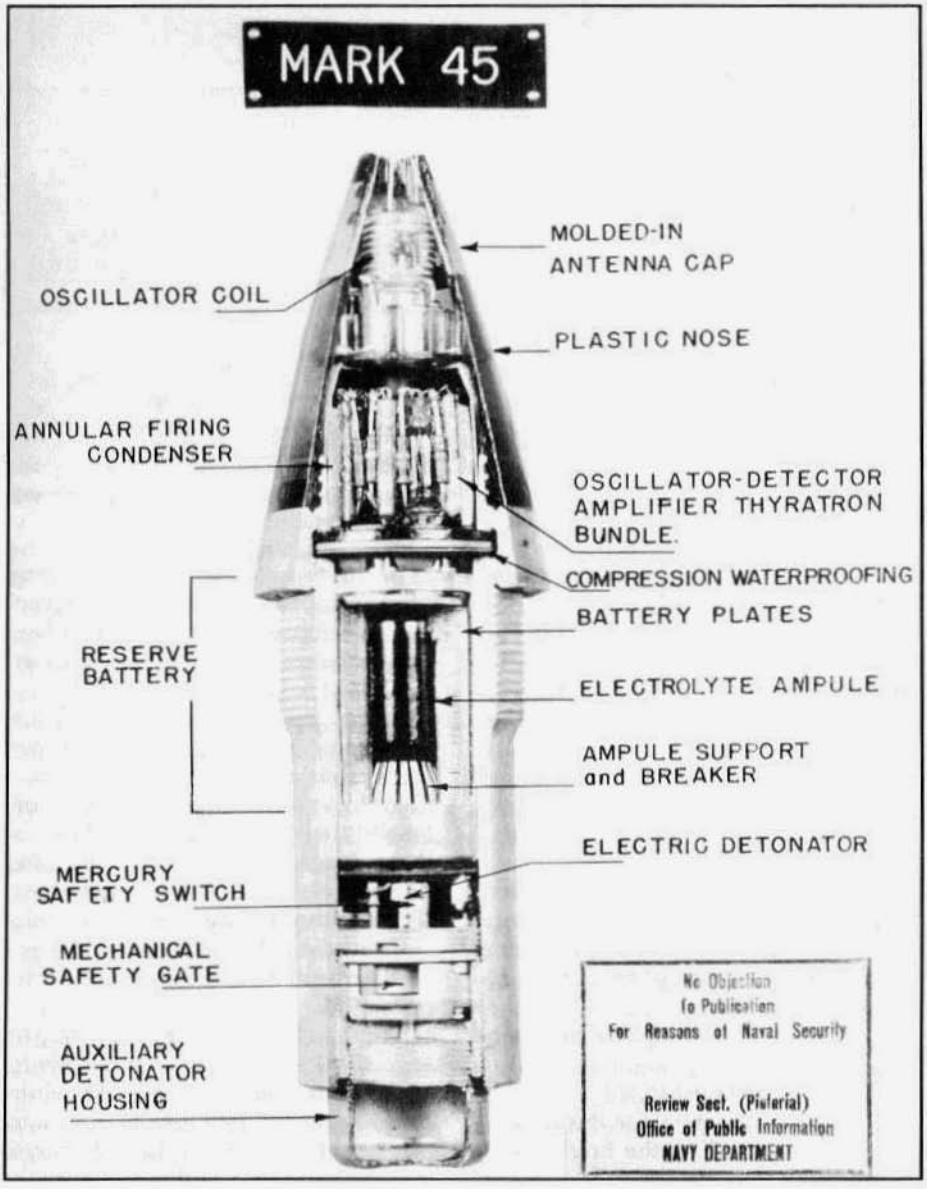
The Navy's use of the fuze in five-inch guns was the top priority, but when production reached a level that was in excess of the Navy's needs, proximity fuzes were also furnished to the Army for use in the European Theater of Operations, where their low-level air bursts proved quite deadly to enemy troops in trenches and foxholes.

The enclosed photo is one that I rescued from the trash can at APL when some files were being cleaned out, back about 1980 or so. It is a cutaway view of a Mk 45 fuze, with callouts showing the various component parts of the assembly.

I went through the Signal School's Electronic Warfare Office course at Fort Monmouth in 1958 and first learned about proximity fuzes. After that course I was assigned to the Army Security Agency's 319th USASA Battalion in Germany. My first duty, as a green 2LT, was as the platoon leader of an operations platoon at Staberhuk, on the west-



**continued on page 39**


MARK 45
MOLDED-IN ANTENNA CAP
OSCILLATOR COIL
PLASTIC NOSE
ANNULAR FIRING CONDENSER
OSCILLATOR-DETECTOR AMPLIFIER THYRATRON BUNDLE.
COMPRESSION WATERPROOFING
BATTERY PLATES
RESERVE BATTERY
ELECTROLYTE AMPULE
AMPULE SUPPORT and BREAKER
ELECTRIC DETONATOR
MERCURY SAFETY SWITCH
MECHANICAL SAFETY GATE
AUXILIARY DETONATOR HOUSING
No Objection to Publication For Reasons of Naval Security
Review Sect. (Pictorial) Office of Public Information NAVY DEPARTMENT

# Mystery Radio Station

*Previously published in* ***The Montana Journal***

**by Alice Clink Schumacher**
**115 17th St., N**
**Great Falls, MT 59401**

**Dooley in 1932 when it was "on the air" with radio station DHS. This photo was taken from "school house hill."**

In 1932, a Dooley high school student initiated an unusual and, as it turned out, illegal science project.

The young man's father owned the local electric light plant, operated only at night and on Monday mornings. He was knowledgeable about electricity and showed his son how to build a radio transmitter. This expanded into a small broadcasting station. Since station DHS (Dooley High School) was located over 100 miles in any direction from regulation stations and was only battery-operated and non-profit, no one even thought about applying for a license.

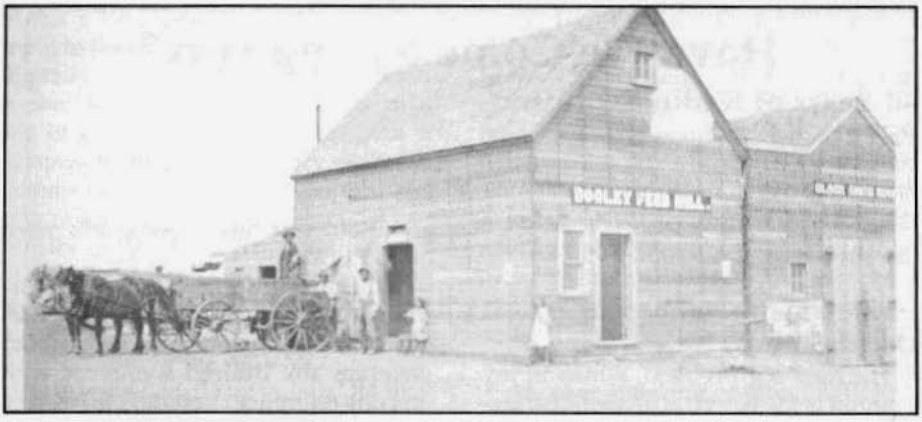
The signal was clear, with no interferences.

The young scientist took his apparatus to school and set it up in the library. There it was used by the English department to put on plays and present dramatic readings. The pupils found this so enjoyable that they extended into music groups and solos, both vocal and instrumental. More ingenuity led to drilling a hole in the floor and dropping a cord and microphone down into the gym to broadcast the school band and various dance groups and ensembles.

Soon word came in that the programs were being picked up, not just in town, but at outlaying farms and even in Plentywood, the county seat. Someone loaned the school a "pick up" head, so that records could be played on a small portable phonograph and sent out over the air without being heard in the makeshift studio. This was really big-time and permitted smooth, uninterrupted operation.

Requests began coming in, asking for special selections and dedications for birthdays and anniversaries. The entire community got involved. During summer vacation, the studio was moved into the local feed mill. Neighborhood comedians dropped by and performed. Dooley was definitely "on the air."

Since this was the depth of the Great Depression, drought and the economy



**The summer location of radio station DHS was in the local feed mill.**

were prime worries. People soon figured out that the way to maintain morale, and even enjoyment, was to present fictitious market reports and weather predictions. These were creative and fantastic. Well-known radio programs were parodied, and brand names and products offered extensive material for an exciting group of innovative writers.

The position of DHS on the dial was just above Bismarck, North Dakota, chosen because that city was so far away no one could foresee any possible interference. But one night, Dooley people listening to the Bismarck radio station heard ominous references to an unlawful DX station coming in on their frequency. They ascertained it was using the call letters, DHS. The authorities were asking that anyone with information about this mysterious encroachment report their findings so that immediate government action could be taken.

Fearfully and hastily, the Dooley broadcasters dismantled their station and banished the parts. Inquiries continued to come in out of Bismarck for several weeks, but since no information was forthcoming, the whole affair was eventually forgotten. Maybe listeners began doubting their ears or suspected dreams or aliens. An exciting chapter of Northeast Montana history was unceremoniously concluded. Since ignorance of the law is no excuse and this happened sixty-three years ago, those involved hope that the statute of limitations protects them!

After the loss of their radio station, the high school students undertook a new adventure, the production of a bimonthly newspaper. "The Dooley Do." This was entirely student-written and student-produced, from typing, advertising and mimeographing to distribution. This was a great springboard for grammar and literary assignments and typing practice. There were special editors for sports, society and features. Family names included Wankel, Bye, Eaton, Larson, Goss, Domonoske, Dahl and Engdahl. The dissection of a cat in the science lab created the headline, "Nine Lives Lost." The district track meet in Culbertson listed DHS participants in the mile run, dashes and broad and high jump events.

Thus, in the early 1930s the little town of Dooley, population about 140, had great media involvement. Dooley High School produced and inspired some unique communication experiences. ER

**Editor:** Alice Schumacher is the author of the book "Hiram Percy Maxim" that will be reprinted in an expanded form some time in 1997 by Electric Radio Press.

# Have We Come a Long Way?

## 40 Years of Radio Evolution

### Part 2

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

### Phase Noise and the Local Oscillator (LO)

The next big problem, which in my opinion is the worst, is phase noise created by the local oscillator. Let's first review the origins of phase noise and then perhaps we will get a better understanding of what it does to receiver performance.

Phase noise, as the name implies, comes from Phase Locked Loops (PLL). This term was unheard of in the old days because PLLs were not used in HF amateur type equipment until the Drake TR7 introduced in 1979. Prior to that, PLLs were only used in expensive military equipment before the introduction of inexpensive integrated circuits (IC's). A programmable PLL uses intensive logic and will contain thousands of transistors. Probably more like tens of thousands of transistors. In the old vacuum tube days, the cost would have been prohibitive for the average ham.

It is interesting to note that fully synthesized HF radios were used by the military starting in about 1957 with the B-52 bombers using the now famous ARC-58. This radio had less than 10 Hz drift and provided excellent HF SSB and CW performance. It was the predecessor to the Collins 618T series of HF radios still being used in commercial aircraft. These include Boeing 707's 747's, 727's, etc. For you bargain hunters, some of these radios have found their way into the local flea markets. I saw a Collins 618T at a swap for $400. So they are within reach of the budget-minded radio amateur. But enough about old war time stories, let's move on to PLLs.

To begin with, what is the major purpose of the PLLs in radio communications? Its primary attribute is that it can generate any desired frequency with just one reference crystal. This is a very powerful tool in radio communications because it can generate any frequency all electronically without moving parts. Storing channels in memory becomes straightforward. This will become clearer in the following paragraphs.

I will not attempt to write a dissertation on PLL but I will basically give you a qualitative explanation on how they work. Perhaps one could then appreciate how difficult it is to get one to work properly. The VCO is the heart of the PLL and is basically a voltage to frequency converter. For low voltages, the output frequency is low and for high voltages, the output frequency is high. The programmable divider divides the output of the VCO down to the frequency of the reference oscillator. The reference frequency and the divided output are then fed to the phase comparator. If the output frequency of the divider is greater than the reference frequency, the output voltage of the comparator goes down. This forces the VCO to slow down. If the frequency of the programmable divider is lower than the reference, the output voltage of the comparator goes up which forces the VCO to go up. The VCO output will eventually lock on to a multiple of the reference oscillator. As one changes the programmable divider, the output of the VCO changes accordingly to a multiple of the reference frequency.

It is not difficult to see that this be-

comes a very powerful tool since the input to the divider chain can be stored digitally in memory, allowing a return to the exact operating frequency at a flip of a switch or better yet, with a computer, where the memory channels become infinite, limited only by the hard disk capacity.

In the old days of permeability tuned oscillators (PTOs) such as in the Collins R-390s and S-lines, there was no memory. The memory was usually the operator tuning the dial. Memory was simply just a pencil and paper. Old timers will remember the US government having racks and racks of R-390's and 51S-1's at our monitoring stations in Guam, Anchorage, and Osaka (Japan). Each was tuned to a predefined frequency during the Cold War to listen in on enemy communications. I guess that's one way to solve the memory problem, each receiver is set to a single frequency. Only problem is that you needed 1000 receivers for 1000 memory channels. With the advent of PLL's and PC computers, all that is needed to scan 1000 channels is a Kenwood TS-440 (or the equivalent), a serial interface, and a personal computer.

This all sounds fine and dandy in the ideal world, but in reality the system of PLL doesn't work as well as one would like. The problems of jitter, lock time, lock range, capture range and phase noise cannot be ignored. These problems are nonexistent in the older PTO radios. Unfortunately, older radios such as the S- line used crystals for the first LO. To obtain general coverage, one needed 114 crystals for the S-line. At $15 apiece, that's $1710 just in crystals. The jitter was more in you pocketbook than in your receiver. Jitter is the most annoying of problems in VCOs. This is because the VCO is not as stable as a crystal. Jitter is primarily caused by the low pass filter having a time constant which is much less than the VCOs oscillating frequency. Typically, low pass filters (LPF) are set to several KHz on PLL's. The VCO may be operating at 50 MHz in a modern radio but the frequency correction rate may only be a few KHz. The result is that the VCO drifts at the rate of the low pass filter. This is extremely annoying because it causes a hissing wobbling sound at the speaker which is apparent on almost all synthesized radios with the exception of perhaps the most expensive ones such as the Harris 3200 or the more familiar Icom 781.

Another apparent problem with PLL radios is the "divider noise". As you tuned across the band on a synthesized radio, the frequency divider on the PLL is constantly changing. This causes the LPF to inject sudden jumps in voltage to the VCO. Even with a good LPF, chirping is heard at the speaker when one tunes through the band. This is particularly noticeable when one tunes across a carrier on the SSB/CW mode. With an analog PTO, the carrier appears as a smooth tone coming in and out. With a PLL radio, a changing chirping tone is heard.

The internal CPU and PLL divider clocks also contribute to front end noise since clocks take the form of square waves and are rich in harmonics. This again reduces the noise performance of the receiver.

Are there any solutions on the horizons? Manufacturers are now beginning to use higher and higher frequency VCOs. This was not possible previously due to the high cost. With the advent of cellular technology, using a VCO in the 1 GHz range is not fantasy. The National LMX2320 is a 2.5 GHz PLL and sells for only a few bucks. The approach with these high frequency VCOs is to develop the LO signal at a frequency many times higher than desired. The signal is then divided down through a frequency divider chain. The jitter is also divided down resulting in lower phase noise.



continued next page

## IF Filter Performance

A lot has been said regarding IF signal processing and filtering. Some truth, some myth. In the old days, one really didn't have that many options. If you wanted the best, the Collins mechanical filters did the trick. These were the best on the market. A good Collins filter had skirts of 1.8. Mechanical filters are spec'd to what is known as a 6-60 ratio. The response is measured at the -6 dB point and then again at the -60dB point away from center. The ratio of theses two frequencies from center is the skirt selectivity. As an example, a filter with a skirt selectivity of 2.0 will have a -60dB response at 4 kHz away from center and the -6dB point would be 2 kHz from center. They usually consist of 6-10 sections depending on the desired response. Some of these filters would roll off by as much as 90dB.. Consumer receivers today usually use ceramic filters, which although low cost, have poor performance. An Icom IC-730 has a 2.5 skirt selectivity and a maximum attenuation of about -60dBs.

I have certainly noticed that many modern-day receivers are awfully "hissy". I can't say that it all comes from the noisy IF amplifiers combined with poor mechanical or crystal filtering but certainly bad IF filtering contributes to noise. In combination with the noisy LO and diode switching, it is not difficult to see why an old boat anchor like the R-390A wins hands down.

In the old Collins receivers, everything was wafer switched. These direct mechanical switches would give virtually near perfect linearity and lossless switching. With the advent of switching diodes; the non-linearity of the diodes and "on resistance" became a factor in determining the noise floor. To be fair, the electronic switching does offer an economical means of computer control which is not practical in the mechanical approach. Also, with the electronic approach, one need not ever clean contact switches every two years. However, modern radios are not optimized for performance. Again, it probably just comes down to cost. In one of my old AES catalogs, my Collins CW filter went for $406.92 (See Figure 1, facing page). This is the 1979 AES catalog. Remember that this was in 1979 dollars. So today that would be about $1000. Many of these high-priced items were designed for the US Government during the cold war so money was no object.

Today, there is just not a demand for such items. Rather, value is emphasized, not just brute performance at any cost. Filtering is often done by digital signal processing (DSP). The actual function of these filters perhaps will be covered in another presentation. Are these new digital filters any good? Well, as usual, yes and no. Are they low cost? Definitely, yes. Do they present a good value to the user? I would say "yes". Are they what I would call "high performance". Probably not. They are however, very versatile, fully programmable for various bandwidths, various skirts, even built-in gain. But I find them a bit on the noisy side, especially when used in the IF stage such as the Watkins Johnson HF1000. I don't know the exact processor they are using but typical DSP engines that can perform at 455 kHz usually do not exceed 10 bits. This translates to a noise floor of only 60dB. Far cry from the Collins filter with a noise floor of about 90 dB. Because the rest of the radio is so quiet in the R-390A, it is usually the audio amplifier which limits the noise floor on many older tube type receivers. Modern receivers are usually limited by the noisy LO. My 75S-1 has an audio noise floor of about -65 dB. My "modern" Drake TR7A has a audio noise floor of about -55 dB. I really can't say where all the noise is coming from in modern receivers, but it is probably a combination of the LO in combination with the PLL, IF filtering, the switching diodes, and perhaps from some noisy bipolar transistors.



text continued on page 30

# COLLINS

| | | |
|---|---|---|
| 75S-3C Receiver | | 3390.00 |
| X-455KQ-200 200 Hz filter | | 406.92 |
| F-455FA-05 500 Hz filter | | 154.00 |
| F-455FA-08 800 Hz filter | | 212.00 |
| F-455FA-15 1.5 KHz filter | | 137.00 |
| F-455FA-31 3.1 KHz filter | | 120.00 |
| F-455FA-40 4 KHz filter | | 120.00 |
| F-455FA-60 6 KHz filter | | 120.00 |
| AM filter socket wired in by AES | | 32.00 |
| 32S-3A Transmitter | | 3673.00 |
| 399B-4 Xtal control adaptor | | 199.00 |
| 516F-2 AC supply for 32S-3A/KWM-2A | | 467.00 |
| KWM-2A Transceiver | | 3992.00 |
| KWM-2A/136B-2 Xcvr w/blanker installed | | 5008.00 |
| 136B-2 Noise blanker | | 554.00 |
| 312B-5 Ext VFO/wattmeter/spkr/patch | | 1826.00 |
| 399B-5 Xtal control adaptor | | 260.00 |
| 351D-2 Mobile mount w/cable | | 826.00 |
| MP-1 DC supply | D | 680.00 |
| 440E-1 Cable from MP-1 to KWM-2A | | 139.00 |
| PM-2 Portable AC supply | | 768.00 |
| **SPEAKER CONSOLES** | | |
| 312B-3 Speaker | | $107.00 |
| 312B-4 Speaker/wattmeter/patch | | 732.00 |
| **MICROPHONES** | | |
| MM-1 Mobile microphone | | $ 73.45 |
| MM-2 Mobile boom mic w/earphone | D | 240.00 |
| SM-3 Desk top microphone | | 189.00 |
| **CARRYING CASES** | | |
| CC-2 Suitcase for KWM-2A & PM-2 or 30L-1 | | $297.00 |
| CC-3 Suitcase for 312B-4, 312B-5, or MP-1 | | 297.00 |
| CP-1 Crystal pack | | 826.00 |
| DL-1 Dummy load, 100w | | 305.00 |
| 180S-1 Antenna tuner | | 1774.00 |
| 637T-2 Dipole antenna | | 896.00 |
| 302C-3 Directional wattmeter, 2000w | | 557.00 |
| 440F-1 5' ext cable for 516F-2/PM-2 | | 62.15 |
| Crystals for S/Line, KWM-2A | each | 9.00 |

**Figure 1. Prices of Collins equipment from a 1979 AES catalog.**

Have We Really Come a Long Way? from page 28

## Product Detector

I find little information in the literature in regards to the effects of product detectors on audio quality. Personally, I think the product detector is one of the most important stages of the receiver in terms of audio distortion. Often what is misunderstood for audio cross-over distortion is really poor matching on the product detector mixer. Shown in Fig. 2 is a typical product detector which is used in most (if not all) HF SSB receivers. For minimum distortion, the four diodes must be perfectly matched. This is not always the case. I have been told that replacing conventional diode detectors with well matched Schottky diodes will improve the audio quality dramatically. At least that is what Dennis, AE6C tells me. I have not personally performed this modification. However, it is not difficult to see that the Schottky diodes provide far less conversion loss than conventional diodes since their turnon point is closer to 300mV as compared to conventional silicon diodes which have a turn on of about 600mV. Nevertheless, even with Schottky diodes, the ring diode configuration still experiences a conversion loss of 6-10 dB's.

The product detector on the Collins 75S3C consists of 1/2 of a 6EA8 triode. These tubes are very linear and thus produce very low distortion. The configuration is single-ended and thus no critical matching components are needed. This is probably the major reason for why people say that their Collins receivers sound so rich. The other major reason is that tubes will handle transients far better than solid state components. Tubes will have soft clipping so even if you do overload, they do not sound all that bad. Most people will tell you that they can instantly tell a tube radio compared to a transistorized radio. There may be truth to that statement, although with some of the new radios (such as the SGC, Harris, and Icom, and JRC radios), it is getting more and more difficult.

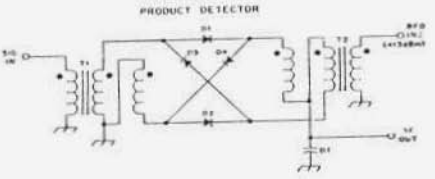



**Figure 2. Schematic of a double-balanced product detector.**

## Audio Stage

So what about audio quality? I personally have found that most radios have good audio quality. Most modern rigs have 1-5 watts of audio and in general the quality is very good. The audio amplifiers today are far more efficient than those produced 30 years ago due to IC technology. In the old days, we would use 6AQ5's or 6BF5's in the audio running in class A. The class A configuration would only give 25% efficiency and the rest was lost in heat. Maybe OK for a fixed station at home but certainly not very practical for mobile or portable operation.

There may be a difference in quality from the audio of a 75S1 and that of an Icom 735 when put through the same speaker, but it is not dramatic. The most noticeable difference is during large pops and cracks that come across the air. The Collins really wins out as with most tube audio output stages. The reason is really quite simple. The pops and cracks are transients. The transistor output stage tends to clip. The tube amp will also clip but with a smoother transfer function which is quite apparent to the human ear. The Icom will sound raspy while the Collins sounds softer. But I must stress that this is not significant and I would not advise one to spend much time investing in this issue. The difference in tubes versus transistors is probably only relevant to the audiophile.

However, if you have one of the earlier solid-state radios, such as the Heathkit SB-104, you may want to look twice. It had cross-over distortion that even my 7 year old niece noticed. The problem can

be remedied with modern IC's. I personally have modified many rigs which lack audio power and had experienced crossover distortion by replacing the entire audio section with an LM383 available from National Semiconductor. This is a 7 watt audio amplifier in a TO220 package about 1/2 inch square. It has basically 5 pins: ground, power, output, input inverting, and input non-inverting. One can mount it anywhere since it typically replaces an entire audio board if the rig is from the 70's or 80's. Space is almost never a problem. Distortion is less than 0.1% and quiescent current is typically 45 mA. The audio difference is night and day. Before all you guys run out and make this mod, check out the specs on your present rig. If it is spec'd at 1-2 watts and is constructed from discrete components, then there would be a noticeable improvement. If the audio is already spec'd at 5 watts or more and consists of a single chip, then you would probably not hear any improvements.

## Conclusions

What I have attempted to discuss here is not that one radio is bad and the other is good, but rather the trade-offs that have been made throughout the years. Absolute performance of radios has no doubt degraded. But value has improved. This is mainly due to the transformation of tubes being the primary technology 30 years ago compared to the all-solid-state radios of today. However, modern day radios offer endless features including but not limited to: general coverage transmit and receive, small compact size, energy efficient circuits, infinite memories when interfaced to a computer, and low cost. The value we get today compared to 30 years ago is improved by at least tenfold. We will see modern day radios make incremental improvements and perhaps in my lifetime, I may see an all-solid-state radio match an R-390A. ER

**AM Receiver Selectivity from page 14**

Surprisingly, some receivers that use a crystal filter (not the lattice type) can be used for single-sideband AM reception. Judicious use of the crystal bandwidth and phasing controls can give some semblance of the necessary kind of passband shape. See References 7 and 8 for more on this.

There are I'm sure other radios out there with flatish top bandpass characteristics. They are all candidates for single sideband AM reception. My list of radios is by no means exhaustive and represents only those that I've had experience with.

I too love the sound of wide-band high fidelity AM on the ham bands. But when the going gets rough (not all of us have high power and the best antennas), having the extra selectivity available may mean the difference between having a QSO and having to QRT. ER

1. The loss in recovered audio is 6 dB but we accept 3 dB less noise, so the signal to noise ratio suffers by only 3 dB. See: Grammer, G. (W1DF), "The AM Equivalent of Single Sideband", QST, January 1954, P. 22.

**For further reading:**

2. McLaughlin, J. L. A., "The Selectable Single-Sideband Receiving System", QST, June 1941

3. Goodman, B. (W1DX), Technical Topics--"Why Don't They Build Better Receivers?", QST, June 1947

4. McLaughlin, J. L. A., "Exit Heterodyne QRM", QST, October 1947

5. McLaughlin, J. L. A., "Selectable Single-Sideband Reception Simplified", QST, April 1948

6. Goodman, B., "A Sharp Amplifier for 'Phone or CW", QST, December 1950

7. Goodman, B. "Selectivity and 'Phone Reception", QST, March 1954

8. Grammer, G., "How to Tune in AM 'Phone", QST, December 1955

9. Roberts, B. (WØIEU), "Mechanical Bandpass Filters for IF Ranges", QST, February 1953

## Collecting Military Communications ... Museums and Such...

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### A War Story

I can remember two notable events from 1952:

(1) The Korean war was "on". My math teacher was getting drafted (no more math! ... I thought ... WRONG!!)

(2) A fellow classmate dragged a Wireless Set No. 19 to school to interest us all in the science class.

That W.S. No. 19 was about to change the way I thought, acted and talked for the rest of my life.

My classmate Paul's father was a radio amateur. During WW II he had been an "OWL" (Operator Wireless and Line) and had done a tour of duty in the Western Desert, operating tank radios.

Paul's father had removed the 'B' set (a little, low powered 230 MHz Tx-Rx used for local intra-tank communications) and built in a small AC power supply and an output stage to handle a loudspeaker. The front panel was pretty. The light green background with multicolored labels on it in English and Cyrillic (Russian) caught my eye. I WANTED ONE OF THESE!

Mr. Mann (our science teacher) plugged in the radio, set up the speaker, attached a wire to the modified antenna post and, while the December heavy wet snow piled up on the window frames of the classroom, we kids hugged in close around the radio. As the tubes sprang to life, the BBC Overseas service bought us a cricket match from South Africa... England was playing in Pretoria!. I REALLY WANT ONE OF THESE RADIOS!

That event took place 43 years ago. As I write these words I can remember with the same enthusiasm the mystery and delight when I finally was able to rake up the $3 to make the purchase from Field's Radio in Birmingham, England. As I handled this radio, with its olive-green wrinkle paint, looking almost new, (it had only been built 8 years-then) I tried to imagine how many different radio stations I would hear. Could I, dare I, make the transmitter work so I could talk back?

Y'know, it took me many years to realize that my initial interest must have been sparked by this radio's appearance.

Today, several models of the Wireless Set No. 19 are in the South Carolina Signal Corps museum. YEAH..I got one of those sets!

### Collecting For Fun

Well, one thing led to another and another and I was beginning to find out that "you just can't collect one!" Remember that the late '50s, '60s were all about "surplus conversion" i.e. hacking up front panels, chopping down vanes in a variable cap, repainting the cabinet so it blended in with the "S-line" or (for the Brits) the new Geloso or KW Vanguard.

I belonged to the CADBURY (chocolate) Ham Club (G6BY) and the members had totally rebuilt a BC-348 into a "hammertone" finish new front panel. Disgustingly, they had thrown away the legend (name) plate so it "appeared" to be commercial equipment!

I think that it was about 1965 and onwards when a "preservation light" went on in a few people heads, the need to save some of this representative samples of war technology was seen as necessary by the few. At the same time, some non-preservation types who were in to emerging military technolo-

gies were seeking out the latest and greatest of the time i.e. AN/ PRC-25's. '74's etc. Additionally, mostly due to the encouragement of preservationists" the military vehicle collector groups have, through their stated desire to equip their vehicles with the correct radio's, all of the above have stirred the collecting pot significantly, the desire to seek and collect military radios is with us for ever?

Collectors are by-and-large packrats I think. I believe this primeval instinct is in everyone more or less. I notice that "real" collectors:

-collect to satisfy the insatiable appetite for military history. They are never satisfied.

-collect as a techno-history buff trying to discover every technology that has ever been stuffed into a military radio, much of which doesn't work.

-have a fetish for the old rubbery smell of aging wire covering, combined with the pungent 'air' of flux and leaky capacitors.

To discover if you have the basic collector requirements (and be honest) answer the following questions:

I have or desire to:

-collect odd lengths of wire?

-save(d) all nuts and bolts I find?

-remove(d) all usable components from chassis?

-save(d) all data plates from scrapped out gear?

-save(d) other peoples' (or yours) cigar boxes to put 'something' in later?

Two or more qualifies you!

## Collecting - getting started and buyers beware!

Ten to fifteen years ago, I would not have given anyone more than 5 years max, till all that there is to collect-has been collected. I am still finding many interesting pieces new in the box. There was just so much stuff made in WW II by the U.S., (principally). It still shows up in some old warehouse somewhere in the world.

Now that there is with some people a profit motive in dealing with military radios, more of it is being found.

The best place for finding what you want has to be the ham flea market or hamfest. My greatest discoveries were made there. Greatest, because I paid the least, met some great people who were interested in doing what I was doing. There are also dealers who put out lists. Take your time going through the little stuff on the table tops, don't be afraid to haggle and (a lesson learned from a friend, Tom, here in Greenville. S.C.) look under the tables, as this is where the bargain stuff will be found.

A few years ago, I purchased a T89/ ARC-5 tx (100 Mcs to 125 Mcs) at a hamfest for $1! It was found under a table, sitting in the dewy grass, complete. This is an unusual find. Yes, you can do it too.

Do not forget that one of the best resources for what you want is this magazine you are reading. It provides an excellent vehicle for "For sale" and "Wanted" as it is focussed on period technology.

There are many reputable people who deal in these military radios. I think that some of the prices are a little ridiculous at times. However, these folks are causing some interesting items to be re-discovered, and the collector who does not have every-breathing-minute to devote to his cause can save a lot of time and some money by finding such a person and telling him what you want and how much you are willing to pay.

Do not be afraid to deal with collectors just because they live in a foreign country. They can be just as honest as anybody else. Often you will find that they are just as enthusiastic about what you do, if not more so. You will find many are very aggressive (zealous).

Dealing in a foreign country opens up a brand-new horizon of import restrictions, freight charges (astronomically), special packing to ensure that



continued next page

the goods get there OK, excise taxes etc. I maintain one particular Dutch contact who works as hard for me as I do for him.

Sometimes you will hear of those globetrotters who are turning what should be a fun-pastime into serious profit. I caution you of two things. (1) these globetrotters" who usually want the very exotic stuff e.g. German WW II or some unusual British items and indicate that they are destined for a foreign museum, usually are not. These items will be resold overseas for big bucks and will not be seen here in the U.S. again!

(2) Sometimes you will receive items less than the quality you expected. Was it a language difficulty? Who knows? This same situation has happened to me in dealing with people here in the U.S. Remember CAVEAT EMPTOR.

I encourage the use of terms i.e.:

NOS - New-Old stock

GUC - Good Used Condition

UU - Used Unmodified

UM - Used Modified.... or?

These terms, used by many vehicle collectors to describe the condition of parts or accessories seem to fit well to radio equipment too, and it is understood well overseas (particularly Europe). A condition abbreviation is easy to understand and does not dramatically increase the cost of advertising. I would encourage ER advertisers to consider such abbreviations.

If there is anyone left who has never heard of FAIR RADIO SALES, LIMA, OHIO? My association with them since the 1950's is proof to me that you can spend a little money with these guys, sometimes find some neat stuff and make good friends too. Oh, they have a great FREE catalog too. Makes good reference material.

## So now I know where to find stuff...what should I collect?

Pick a theme. Here a few suggestions:

-U.S. Tactical radios (1917 to present)

-German Army WW II communications. (all)

-British/ Commonwealth tactical radios (1936-1946)

-German Luftwaffe communications (1938-1945)

-Anybody's WW II aircraft radar

-Clandestine radios (anybody's)

-U.S. military aircraft communications (1936-1945)

-U.S. fixed communications equipment (1938-1950)

-French communications WW II (any ...good luck!)

-Japanese WWII communications. (any)

Consider the vast amounts of cold war gear that is now lying around. There is a broader span of interesting technologies and equipment between 1945 and 1970 than at any other time. I find this equipment to be much more economical to collect than WW II or before. Recently, I saw the small compact AN/ARC-51BX at a hamfest, CW control unit and cables for $50 a pop! Not too shabby. This little UHF Tx/Rx covering 225 to 399.95 MHz, is a finely made unit with at least a Vietnam era history.

For those who would who like to take up a challenge, how about some of the lesser known war related communications equipment, e.g:

-Forest Service. A vital, necessary part of our defense industry support; used many small contract built portable HF units and field telephones very similar to military units of the period. Not much has been collected. Very little has been written.

-Civilian Conservation Corps. Did they build small radios for use on their military civil construction projects? The U.S. Park Service has an interesting, photo-filled history book that shows at least one shot of a 'CCC' repair shop with radios on the bench. Not much is known and little has been written.

-Civil Defense. We know at least about

the Abbott TR4 VHF 112 MHz 2-way radio. Were there others commercially built? How about those that were privately built? Again not much written and little has been recorded.

Consider, as you collect, to add a few personal touches to your collection so that when you display your prized possessions, it does not appear as a bunch of boxes on a shelf gathering dust. I have, over the years, sought out military uniform items, personal papers, i.e. 'V' mail from home, 'K' ration boxes, photos, period radio magazines and mannequins etc. to bring life and interest to those, who are not so history oriented. It makes a big difference.

There appears to be more specialization in collecting today than before. Try to collect contiguous pieces that at least interact in their meaning or history. I believe that most people wish to spend their time wisely and are proud to show off what they have. There is not an awful lot of continuity between an AN/TCM-3 (Tactical Cocktail Mixer) and a roll of TT-1 field wire. (Yes, the 'TCM-3 is a rare item).

**Don't overlook cannibalized equipment that can be rebuilt**

It is just not practical that everything that was built during WWII is to be found in new-boxed state or even pristine. You will find, however, that many collectors demand this. Most serious collectors are satisfied with something 'good-used' and above. I can imagine a situation where the OIC of a signals unit tells his men during the heat of battle to "be careful not to get too much mud oh the gear, you will lower its collector value!"

As I am personally interested in the historical aspect of military communications equipment, a few 'mars' only add to the mystery of an equipments life.

You will find that some collectors will refuse an otherwise interesting piece of gear because:

-the paint has been touched up

or

- the unit has post-WW II MWO (Modification Work Order) stamps on it. Maybe it really wasn't used during the war.

Of course paint will get touched up! Paint is to protect the metal surface.

Consider rebuilding a piece of equipment back to its original condition.

I have seen modified ARC-5 Tx's (no extra holes drilled in obvious places of course) lovingly restored back to original state by people, who enjoyed getting their soldering irons 'wet'. I have also seen the end product(s), some look really original.

A few years ago, a collector friend in northern Illinois, after purchasing a few SCR-300 WW II backpack radios, decided that they needed refinishing. He took the initiative to get a batch of the original paint mixed by the original manufacturer. Additionally, he had legend plates and name transfers made that were no different from the original. The end result was great. He refinished those radios so they looked like new. At the same time he garnered a wealth of knowledge on the construction of these sets.

I am very pleased with one that I have from him. It always gets good reviews from people who visit the museum.

In summation, remember that if careful refinishing is not for you that's fine. Please remember the world's most famous painting, the Mona Lisa, has been touched up many times in its life, it is not appreciated any less nor worth any less either.

Displays, shows, museums. Why Collect?

A few years roll by after you have started collecting. You notice that what you have is pretty unique e.g. you have acquired a complete set of SCR 274N and AN /ARC-5 WW II aircraft communica-

tions equipment, that includes all the low band ARC-5 Tx's, (300 kcs thru 2100 kcs) etc,etc. Furthermore this is not an inert display, you have carefully restored the dynamotors, lubed up the flexible drives, restored the HV capacitors, burnished the relay contacts on the antenna relay boxes etc. and the stuff works. You have even found the 3885 kHz crowd and are having a great AM time.

This is the time to consider showing off what you have to others. A great 'tonic' to reward your efforts of arduous collecting over the years, is to share what you have with others.

As a MARS member for many years and an ardent collector for even more, I got the urge to take a display of some pieces to my annual MARS meeting at Ft. Jackson, SC. It was received with great enthusiasm. Members asked me what I would bring next year? For many years I took a different theme e.g. WW II walkie talkies of the Allied and Axis forces. The next year it was clandestine radios. It gave me a great boost in my collecting 'spirits', encouraged me to refine my efforts and encouraged a couple of people to start themselves.

A Canadian friend some years ago got interested in preserving Canadian built WW II radios. He commenced with the W.S.19 (hmmmm- sounds familiar) and has ended up with a mighty fine collection of British, Canadian and U.S. built sets. Yes! This truly is the first international military radio venture - designed and built by PYE in Cambridge England to be a radio that any part for it would not cost more than (approx.) $6 or 5 minutes to make. Soon the radio was being built in the U.S., most of the production going to the lend-lease vehicles being shipped to Russia (hence the English and Russian writing on them). Also in Canada, the companies of Canadian Marconi, Northern Electric and RCA Victor were producing (and refining) the W.S.19 Mk III for Commonwealth use.

My friend did not hesitate to show his friends, become involved with the local military museum, wrote several articles on this radio and has had several articles written about him and his dedication to preservation. He truly deserves the credit. His rewards are the pleasure he brings others.

About 25 years ago I made a serious decision to try to "preserve forever" some radios that I considered had contributed much to the Allied war successes. To assist this effort, I decided to attract the general public by:

(1) becoming a non-profit museum, where the contents ceased to become private. Rather, at the direction of the Board of Trustees, the contents could become (eventually) part of a larger state or national collection where they will be in-trust for all times.

2. adding an incentive for donors, by allowing them to donate their pieces, in-trust, in exchange for a Federal and State tax break.

Generally this has worked well for me. For others considering this approach, a lot has changed in the nearly twenty years since this happened, it is TOUGH and (personally) expensive to do this. You will be monitored by the IRS who can deny you, up to certain number of years, your (eventual) non-profit status.

I do not regret taking this approach. A good friend recently commented that "Uncle Sam could simply one day gain all this stuff and it would be never seen again." He has a point. I knew this when I started. I am reminded about a old-time, well-known radio dealer who died in the New York area, a few years ago. He had "saved back" some "one only" pieces for preservation upon his death, it all went into the trash!

If you wonder where this all leads to ... a local university now requires "Engineering History" as a required Engineering course!

What I have felt and shared with oth-

ers for a long time is that unless we preserve some of the past, with sufficient qualified knowledge of its 'purpose' and 'means' we are as a Great Nation, doomed to either repeat what we have done (and forgotten ) or worse, have no example of achievement that we can share with our sons and daughters to guide them in what is "our future".

If that is "flag waving" I have no apology.

**Final thoughts**

If you collect, share your interests with other people. It helps create a supportive atmosphere for what you do.

If you are the "dealer type", let people know what you do. It is very upsetting to some to find that their former prized possessions are "on a slow boat to China". If you are the exchanger/seller and you wish for your goods to be retained in a collection, try to reach an accord with the potential new owner, or find a well known museum or collector who has a good reputation.

Network amongst other collectors.

If you can, share a few page copies of a technical manual with a fellow collector. As long as it is not an "ever-recurring event", it sure helps a person getting started.

When seeking help from a fellow collector, avoid tying his time up on the phone. Consider writing the individual and send a return SAE. I know of at least one gentleman who, if you do not respond by when he thinks you should, will place your name on his "hit list" and tell the world.

**Personal note from me.....**

Hey world! Quit throwing all the racks, connectors, cables and control heads away. They need to be saved and recirculated. The same also applies to canvas items e.g. bags or covers with 'SG-nn' or 'CW-nn' or straps with 'ST-nn' on them. To a serious collector, these items help complete a collection. (I have a AN/GRC-14..a.k.a. AN/ MRC-50 that is missing most of the cables and rack .... HELP! )

The South Carolina Signal Corp Museum (SCSCM) has been lucky enough to acquire a good set of reference documentation over the years. For that period of 1936 thru 1955'ish, principally for U.S. equipments, (at this time) I am putting together a list of 'smaller' accessory items i.e. cables, bags, straps,covers, boxes etc. This list has been compiled from individual tech manuals, training notes and the last version of SIG-5. SIG-5 contains a complete description of every (?) ARMY/ ARMY AIR FORCE equipment group and its individual (group) contents.

This list will be available soon. If you would like to have a copy (free) send a medium-size envelope, self-addressed, with sufficient postage to: South Carolina Signal Corp Museum Inc., Attn: Curator (ER), c/o, Rollingwood Dr., Taylors, SC 29687. SIG-5 is about 2000 pages of 'toilet paper' weight paper. Please do not ask me for copies of this manual (at least-not at this time)! Good Luck ... Good Hunting! ER

HE FOUND AN OLD VINTAGE RADIO AT THE DUMP AND FELL IN A CULVERT ON THE WAY BACK TO THE CAR.

**AMI Thanksgiving Day Bash from page 18**

I've printed OJ's log from the event. He listed the checkins by State, Call, First Name, AMI Number and equipment. N6CSW

CO, KØOJ, OJ, 155, 32V-3, 75A-2
CO, WØAS, Musser, 931, Ranger II, NC-183D
CO, WØFD, Mike, 229, Globe King 400, 51J4
CO, WAØNUH, Horst, 863, H/B TXRX
CO, KBØODM, Greg, ( ), Viking II, HQ-140X
CO, WØLOB, George, ( ), ( ), ( )
CO, KGØMR, Scott, 780, 32V-1, 75A-1
AZ, W1NML, Lock, 639, T-368, HRO-60
MN, KAØCHZ, AB, 417, BC-610E, HQ-170
AZ, KD7RYU, Joel, 773, Valiant, Drake 2A
NE, WAØJRD, Dan, ( ), Apache, HQ-170
CO, K1YJK, Bob, 886, ( ), ( )
CO, NØAUB, ED, ( ), Valiant, R-390
CO, KBØQAK, Jim, ( ), IC-738, ( )
NM, K5HMN, Paul, 926, H/B, R4C, AF-67
CO, WØGM, Bill, 788, Valiant, HQ-170
CO, WA2KEC, Wayne, 934, Globe King 500C, 51S1
CO, NØGIL, John, ( ), 32V-2, 75A-3
CO, K8MLV, Rick, 175, DX-100, ( )
WY, KK7CM, Ken, 873, FL101, FR101, R-388
WA, WØLU, ( ), ( ), ( ), ( )
CO, WB9NJB, Hunter, ( ), TS-50S
CO, KGØHS, Carl, ( ), TS-50S
CO, KUØE, Bill, ( ), C-Line, L-4B
CO, KEØXL, Neil, ( ), FT-757GX
CO, KBØNQE, Bob, ( ), TS-430S, ML A2500B
SD, KØAS, Arne, 681, Globe King 500B, Mohawk
AZ, NØBD, Dave, ( ), H/B 813, SC-88
MT, K7TNJ, Bob, 423, DX-100, NC-300
SD, KØHP, Don, 828, DX-100B, SX-101A
CO, WØAH, Doug, ( ), AF-67, NC-101X
CO, KCØHH, Rich, ( ), IC-706
CO, KØWIQ, Dave, ( ), IC-70
TX, W5RXC, Jim, ( ), Apache, NC-300
CO, KFØOW, Fred, 835, Globe King 400, NC-183
AZ, KE7TV, Randy, 767, Johnson Desk KW, ( )
( ), WBØLRO, Phil, ( ), IC-725
( ), WA9TCD, Geo, ( ), RF-3200
( ), KAØVOY, Roger, ( ), IC-735
( ), KØRZ, Bill, 803, Ranger, SX-100
( ), NØRUR, Darrell, ( ), TS-850
( ), KØCTM, Tom, ( ), HT-32, 75A-2
( ), NØSXI, Ron, ( ), TS-440
( ), N3IYR, Glen, ( ), TS-850
( ), W1OP'H, John, ( ), TS-440
WY, N7SPH, Jim, ( ), FT-840
( ), NØBLU, Jim, ( ), TS-680
( ), N7MR, Mike, ( ), FT-890
( ), KBØTJ, Bruce, ( ), IC-765
( ), N6CSW, Barry, 4, Viking II, CR-88
( ), KØMB, Martin, ( ), TS-940
( ), KEØCO, Brian, ( ), Viking II, SX-101MK3
( ), KØOL, Butch, ( ), FT-900
( ), WØAGU, Gene, 390, HT-18, S-38

**More on the VT Fuze from page 22**

ern tip of Fehmarn Island, in the Baltic Sea. We were listening for, among the things, proximity-fuze signals from East Germany's Wustrow firing range - right across the water from us. Then, in 1970, I went to work for APL and finally learned where the proximity fuze had originated!

Ralph Robinson, W5FDF, was a young Navy officer who designed the reactance oscillator for the VT fuze, and shepherded the fuze through its development and testing phases into full operational status. Ralph then completed a long civilian career at APL before retiring to Texas, where he lives near Bill Tynan, W3XO, another APL alumnus. Ralph is just now finishing a book on the subject of the fuse and is hunting for a publisher. I would recommend this book to your reading, once it appears.

It was a pleasure to learn, through Bob's article, that he was a wartime user of APL's fuzes. I was still in grade school during the war years, and I'm happy to salute Bob and the other veterans of WW II (and our country's other wars) for their services! ER

Editor: Al Brogdan, K3KMO, is Managing Editor at QST Magazine.

**CPCW-5 Transmitter from page 6**

compare notes. So as a good friend always tells me after a fine QSO, "see you when the wind shifts." ER

**Note:**

The kit sells for $99.95 or fully assembled it is $149.95. The Econo Kit (for you "frugal" homebrewers out there who might have most of the components laying around your shack) sells for $49.95. The Econo kit includes punched & drilled cake pan with transformer, crystals and complete instruction which includes pictorials. You can also buy individual parts from us for this project. We call our company Vintage Radio Kit & Components. We can be reached at 617-784-0847

**WARNING: High voltage is deadly. Keep this in mind.**

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**An Historic Moment from page 2**
began operating their special event station, going across the country from east to west. What ensued was unexpected by the folks in Cedar Rapids. After close to 5 nonstop hours of check ins, Rod and Tom finally secured the Collins ARC station just before 8 PM EST! They had logged 176 contacts with 3 countries, almost every state and province in the USA and Canada! The boys in Cedar Rapids did not expect this sort of response to their special event station! It certainly was an exciting and emotional time for many! Warren Bruene (W5OLY) checked in from the QTH of Jay Miller (KK5IM). Other ex-employees of Collins Radio Company also checked into this historic net. All that checked in were proud to have been able to make contact with WØCXX. Some had stories of making contact with Art himself!

There are two different Collins ARC operating locations. The first one is at the main plant, where the main HF rigs are KWM/HF-380s. Unfortunately, this station was not on the air due to maintenance so Rod and Tom had to run the special event station from the so-called "North Campus", Building 112. Operating from this particular location caused a couple of red faces when a check in station asked what kind of Collins equipment they were running. At that location, the HF gear consisted of an Icom IC-765 with an IC-4KL linear running 1.5 kW out to a TH-7 at 70 feet!

Here are some of Rod and Tom's comments:

"We started the event by first reading a quotation by Arthur Collins, then stood by for 15 seconds of silence in memory of Art Collins. The frequency was really quiet during that period too! Next Tom came on the air and called Warren Bruene (W5OLY) for the honor of the first contact since he had done a lot to help make it all happen.

"This was the most gentlemanly, professional group of people in the pile-ups. Everyone needs to take pride in this observation. I know there must have been many that we missed due to a variety of reasons, and we apologize. But we experienced only the highest standard of operating courtesy among the crowd.

"We are also putting together a special event station operation from the Collins exhibit at The History Center in Cedar Rapids for Feb 1, 1996. Operation all day on 14.270 and 7.270."

Rod and Tom also put WØCXX on the air again during the CCA 75-meter net on Tuesday evening, 26 November 1996. I was honored to be the NCO coordinating the check-ins for contact with WØCXX. They operated from the main plant a majority of the time on the KWM-380, Alpha 77DX and a broadband dipole. Problems between the linear and the antenna forced them off the air after an hour of operation. In that hour, WØCXX was in contact with approximately 42 stations from coast to coast! Jay (KK5IM) even checked in on a 32V-3 that at one time belonged to Art Collins himself!

There will be a special QSL card for the new Collins ARC callsign. For those that wish to send QSL cards to the club station, please do so via Tom Vinson (NYØV) at 10211 Hall Rd., Cedar Rapids, IA 52401. We are all reminded that this call is brand new and that no QSL cards have been printed yet. Those that are expecting QSL cards will receive them after the 1st of the year.

The board of directors and members of the Collins Collectors Association want to thank everyone for their efforts in reviving Arthur Collins' callsign. It is being used where it all began for Collins Radio Company, and rightly so! ER

# CLASSIFIEDS

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**FOR SALE:** "AM FOREVER" quality Haynes T-shirts, grey, blue, green & red. Sizes M, L, XL - $15 shpd. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

**FOR SALE:** 3' x 5' reprint of factory schematic for Collins KW-1 - $25 ppd US. Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660. (312) 262-5360

**FOR SALE:** Hallicrafters rcvr, S-41G - $75; Hallicrafter sig. gen. HG-1 - $75; CV89-A/URA-8A - $90. All + shpg. Steve, KB4IRB, 1024 Crtstal Bowl Cir., Casselberry, Fl 32707. (407) 699-9433

**FOR SALE/TRADE:** Hallicrafters S-37 UHF military rcvr, w/manual, VGC. Fred Clinger, OH, (419) 468-6117, after 6 PM EST.

**FOR SALE/TRADE:** R-390A - $350; DX-60B - $150; Johnson Adventurer - $100; KW Matchbox - $200; HW-16 - $175. LSASE list. Sam Timberlake, POB 161, Dadeville, AL 36853. (205) 825-7305.

**FOR SALE:** Drake: TR-4 w/NB - $225; RV-4/MS-4 - $135; MN-4 Match - $125. U-shp. Lee Bird, N7YXW, 625 Concord Cir., Fernley, NV 89408. (702) 575-6705

**FOR SALE:** Heath, SB-401 - $150; SB-303, w/2&6 meter xvrt's. - $150. U-shp. Lee Bird, N7YXW, 625 Concord Cir., Fernley, NV 89408. (702) 575-6705

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

**FOR SALE:** Drake 1A - $300; Johnson 500 - $1000; Collins 310B - $275; Collins 32V2 - $500. PU only. Steve, K6PFW, CA, (909) 985-1062

**FOR TRADE:** Collins 312A-1, S/N222. Trade for early HRO, unmodified & complete. Art Plummer, W6LR, POB640493, San Francisco, CA 94164. (415) 359-1858

**FOR SALE:** HS-30 Headsets, WWII dated, new, in export packaging w/extra earpieces, dessicant & instructions - $30 + UPS; $100/4. **WANTED:** Military radio manuals, WWII preferred, but anything considered (other subjects too). Gene Kaplan, KD4YIZ, Box 741, Norcross, GA 30091-0741. (770) 729-9315

**FOR SALE:** Heath HM2141 SWR/wattmeter .50-174 MHz, exc - $100. Al, K2SSE, Orlando, FL (407) 222-0007 dys, 298-3493 eves.

**FOR SALE:** Globe Electronics Citizens Broadcaster Tube xcvr w/mics - $35 ea. H. Noonan, SC, (803) 726-5762.

**FOR SALE:** Johnson Pacemaker - $250; Viking SSB adapter - $225; Collins 32S-3 WE - $400; 516F-2 WE - $150; Hallicrafters SX-101 w/160 - $225. **WANTED:** Cabinet or parts rig for Globe Champion 300. John, AE4EN, NC, (910) 686-4236.

**WANTED:**

In pristine condition: Collins 32V3, 75A1, 30S1, 270G1, 3253A (RE), 310B3, 30K1, mech filter adapters, 55G1, SP-600X, cabinet, TV-7 tube checker, 75A-4 mech. filters.

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

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

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

**WANTED:** Collins 302C-3, DL-1, 625-1, 515-1, 55G-1, 312B-5, 399C-1, KWM-1, SM-1/2/3, 32V2, any Collins spkrs. Leo. KJ6HI, CA, (310) 670-6969.

**WANTED:** QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

**WANTED:** Good R-389, R-390A and SP600JX. Mitsugu Shigaki/ 2825-2, Jozan Kamidai Machi.Kumamoto.860, Japan. FAX JAPAN (0)96-329-4601, fle8316368pcvan.or.jp

**WANTED:** Info on military entertainment radios, photographs, manuals, personal histories on use, or any set you may have to sell. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

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

**WANTED:** Hallicrafters R-274 (SX-73) parts rcvr. **FOR SALE:** New 4-125A's, 811, 4CX250B & 250TL's. Frank, W8SET, 1 Wildacre Rd, Charleston, WV 25314. (304) 343-0415

**WANTED:** Marantz, McIntosh, or similar tube audio amplifier in any condition; Heath catalogs. Mike Nowlen, WB4UKB, POB 1941, Herndon, VA 20172

**WANTED:** Manual for VHF xcvr type TRV-6 made for Federal Aviation Agency contract FA-WA4340 by Aeronautical Electronics, Raleigh NC. Robert D. Milligan, KI4MB, 6608 N. 18th St., Arlington, VA. 22205-1802

**WANTED:** Mics. EV605, 638, 641; Astatic T-3; Shure 707A, 520, 545, 533VC; Turner CX/BX, CD/BD, VT-73. Will buy not working. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. Fax 328-4217. 74053.3164@Compuserve.com

**WANTED:** Heath RX-1 Mohawk & TX-1 Apache. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

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Step way up to the finest replicated and original vintage manuals available. Get new Catalog 7, three $.32 stamps. Pete Markavage, **The Manual Man**, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

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

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

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

**WANTED:** Heath xtal sets; early ham & shortwave equip., literature, accessories, broken or parts units; any Heath amateur gear. WA5THJ, Rt 9 Box 163, Alvin, TX 77511. (713) 331-2956

**WANTED:** Pre 1980 microcomputers for historical museum collection; early magazines & sales literature. Dave, KK4WW, POB 341, Floyd, VA 24091. (540) 231-6478/ 763-2321

**WANTED:** Fair to good condx. E.F. Johnson Valiant I or II. Will pay above average price. J. Costello, WA5HSI, LA (504) 889-2424.

**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 777-6491

**WANTED:** BC-611 &/or spare parts. Andy, WA4KCY, 1055 Sweet Bay Ln., Carrollton, GA 30116. (770) 832-0202. wa4kcy@usa.net

**WANTED:** To buy a copy of Datong RF Clipper, model RFC 362, volumn compressor. John, K6UU, POB 905, Grover Beach, CA 93483.

**WANTED:** Manual, info for TNH-11 recorder; need pwr & remote ART-13 cable connectors; ART-13 pwr sply. Jim Cavan, 6 Timberline Dr., Norfolk, MA 02056. (508) 528-0908

**WANTED:** SP400, RME, EH Scott rcvrs, only in very good condition. EA4JL, contact in the States, Kurt Keller, CT (203) 431-6850

**WANTED:** Manual or schematic (copy OK) for Rutherford Electronics B16 Pulse Generator. Geoff Fors, WB6NVH, POB 342, Monterey CA 93942. (408) 373-7636, Fax, 373-2345.

**WANTED:** J. W. M AM rcvr Model 585. McDonald, W6SDM, 24 Glenbrook, Camarillo, CA 93010. (805) 484-1307

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

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

**FOR SALE:** Repair/restoration of vintage Drake EFJ, Collins & others. Please call for info. Dee, W4PNT, (540) 949-8300

**FOR SALE:** B&W 5100/5100B VFO dial overlays, super quality - $10 postpaid. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803.

**FOR SALE:** RME-VHF-152 radio frequency converter - $40; Knight tube tester, mint - $40. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

**FOR SALE:** Johnson Desk KW - $300; B&W 5100B & 51SB - $400; SX-28 - $225; DX-40 - $75; Heath SB-10 - $80; Johnson Pacemaker - $350; Valiant - $275; Gonset Monitone - $50. John, W7KPA, 2445 S. Hillside Dr., Springfield, MO 65804. (417) 889-0233

**FOR SALE:** R-388 - $400; Hallicrafters SX-117 - $240; Hallicrafters SR-34AC - $200; BC-348R - $200; LS-3 spkr - $30; RME 6900 - $250; RME VHF152A - $60; Hallicrafters S-53 - $75; S-38E - $40; QF-1 - $25; Heath VFO - $45; Drake 2B & 2BQ - $225; TV-2 tube tester - $200; Dow Key 115V ant relay - $35; Johnson TR switch - $45. John, W7KPA, 2445 S. Hillside Dr., Springfield, MO 65804. (417) 889-0233

**FOR SALE:** Collins 75A-1 - $300; Hallicrafters SX-24 - (make offer); National NC-98 - $150; Central Electronics Q-mult - $35; Johnson SWR meter & coupler - $40; Collins SM-1 mic & DL-1 dummy load - (make offers); Gonset G-66B, G-77 & ps - $200; Harvey-Wells T-90 - $125; Elmac AF-67 & PRM-8 - $150; R-390 - $150; Central Electronics 20A, VFO & HB 200W linear - $175. John, W7KPA, 2445 S. Hillside Dr., Springfield, MO 65804. (417) 889-0233

**FOR SALE:** Collins 75A-4, 3 filters - $450; Collins KW-1 - (make offer); National NC-183 - $125; National NC-173 - $200; HT-37 - $125; Brown Brothers straight key - $100; Drake & Collins xtals - $5 ea; Heath phone patch - $25; Heath Marauder - $125; huge antenna rotor w/control head (weighs 400 lbs), used to rotate the biggest military LP's - $1000; NOS 4-1000A & socket - $125. John, W7KPA, 2445 S. Hillside Dr., Springfield, MO 65804. (417) 889-0233

**FOR SALE:** USN URR35 200-400 MHz, wrkg - $100; Hallicrafters S20R, wrkg - $90; Rider TV manuals Vol. 2 thru 17 - $35. W2OQI, 17 Inwood Rd., Center Moriches, NY 11934.

**FOR SALE:** KWM2/PM2/CC-2 W/E, exc GRC 109 special forces CW rig. **WANTED:** ARC5 RX 80M 3-9 Mc. Joe, K2QPR, FL, (561) 220-7362



**FOR SALE:** Homemade galena xtal radios & parts. Write for details. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

**FOR SALE:** New knobs: small skirted 75A/32V; Superpro fluted (early) - $1.50; STD pointer - 3/$1. Lowell Thomas, AA6ZD, POB 15026, Fresno, CA 93702. (209) 227-1605

**FOR SALE:** Collins repair: FCC licensed Technician, we repair the Collins gray line, i.e. S-line, KWM-2/2A etc & other select models. Merle, W1GZS, FL, (352) 568-1676.

**FOR SALE:** Navy Model RBZ rcvr, G.C., 5-13 mcs, Emerson Radio, includes CEX-46203, CEX-19040, CEX-49214A, 79 pg orig. manual (exc.); no canvas - $75. Robert, CO (303) 988-2089) eves.

**FOR SALE:** 10's of thousands of TESTED TUBES w/Warranty! Both xmtr & rcvr tubes. Buy those spare tubes for your tube radio, audio, ham & 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 & then boxed. I give a 30 day warrenty. Send wants or SASE w/TWO stamps for list. Daniel Nelson, 1025 E. Desert Ln., Phoenix, Az 85040. (602) 243-7421 eves. djn@indirect.com.

**FOR SALE:** Gonset Comm. IV/2 meters, near-mint, orig manual - $125; National FB-7 rcvr, modified but nice, w/40M coils - $125; National pre-war HRO, badly repainted but no holes, complete, untested, 1 coil (14-30mc) - $125, National SW-343A, 13A & 35 coil sets - $50/set; RCA RAK WWII Navy VLF rcvr, no pwr sply, nice - $85; Hallicrafters SX-62B, 9.75 out of 10, orig. tubes - $275, matching R-42 spkr - add $50; Hallicrafters SR-160 HF scvr w/AC & DC sply's, cables, orig manual, AC sply unworking, one knob wrong - $180; Hallicrafters PM-23 spkr (SX-24 thru 28), good - $95; Hallicrafters 8R40 rcvr, restorable, some knobs missing, case scratched - $35; WWII Navy Collins-made MBF scvr, good - $60; TS-173/UR VHF-UHF BC-221, exc. - $55; BC-906-D Frequency Meter, near-mint in orig. O.D. crate - $30; WWII Navy RDZ VHF-UHF radio made by National, huge, as-is, orig. manual - $75; 2 stamp LSASE for list of parts, accessories, knobs & more. Don, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST wkdys

**FOR SALE:** Rare Collins R-391 & copy of manual - $420. Dan Mason, R.RT1 Box 204F, Santa Fe, NM 87501. (505) 455-3416

**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, Al 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:** National HRO-60, mint, w/coils A thru F & AC, AD - $900; Drake MN2000 2KW tuner, exc - $145. U-shp. Lasse, N7LLG, WA, (206) 545-7202

**FOR SALE:** Scott rcvr SLR-12-A - $200; RCH rack mount - $150; Johnson matchbox - $100. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI02860. (401) 723-1603

**FOR SALE:** B&W 850A PA tank, NIB Central Electronics Sideband Slicer Q-multipuer & Gated Compressor amp. Both exc condx.; NIB T-17 mics; Heath HP-10. JeRB, MI, (616) 343-5301, View2Earth(616)226-9073ol.com

**FOR SALE:** Soviet R105M, acc, English manuel, no batts - $150; Soviet TAP-77 fieldphone, English instr. - $30; SW-54, nice cabinet, needs help - $40. Mack, KC5AQO, POB 149, Lewisville, AR 71845. (501) 921-5874

**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:** Collins KWM-2 (WE), 312B-4 (WE), 30L1 (RE) - $800 + shpg; Hallicrafter SX 17 Skyrider w/orig. spkr - $150 + shpg; HQ120 - $100 + shpg. Terry, KL7JGJ, (907) 694-9575, tbeck@alaska.net

**FOR SALE:** Books, some on very early radio, some technical, some Amateur Radio. Send SASE for list. Fenton Wood, 109 Shoreline Dr., Star Harbor, Malakoff, TX. 75148 (903) 489-0204

**SELL/TRADE:** Thordarson Multiband 100W xmtr, Millen 90881 amp w/811s - $100. **WANTED:** G133 rcvr. Thanks! Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 h, 957-6420 work. tsmith@tle.com

**FOR SALE:** Rcvrs, Bretting 12 + spkr - $400; RME/69 + spkr - $400; SW3 + coils - $325; 1-10A + coils - $325; FB/7X + coils - $425; NC/44 - $225; HQ/129X - $200 + shpg. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903. (407) 727-3015

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

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

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

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

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

**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:** HVDL-160 or 1000 HCS-160 coils for 160 meters. Walter Schivo, KB6BKN, 560 Eldridge Ave., Novato, CA 94947-4806. kb6bkn@juno.com

**WANTED:** Got a cosmetically good tube rcvr or xmtr you can't get around to fixing? I'll buy it for a fair price & give it a second chance at life. Ron, WØOIZ, 10701 W. 54th St., Shawnee, KS 66203. (913) 268-5973

**WANTED:** Model LF-90 converter by RME from about 1946; Riders vol. 12, CQ Surplus Schematics Handbook; Surplus Handbook vol. 1 by W6NJV & W6NJE, CW23097 control box for GF-11-12; TM for GF-11 or12; Oct 1970 Ham Radio mag. Wayne Letourneau, WB0CTE, Box 62, Wannaska, MN 56761. (218) 425-7826

**WANTED:** HQ-100 rcvr; sig tracer, 80 & 40 meter CW xtals; Collins 312B-4. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

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

**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:** 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

**WANTED:** Heath SB-100, SB-101, SB-102 parts units. Don, K8POU, MI, (616) 649-4646

**WANTED:** 1937 Frank Jones RADIO Handbook (3rd ed.); WRL UM-1 modulator. Lynn Stolz, N8AJ, OH, (614) 369-9777.

**WANTED:** NAVPERS "Radioman 3 & 2" (circa 1960's); working or repairable NAVY RBC. Robert Harding, KC5LHR, 1321 Monte Largo Dr. NE, Albuquerque, NM 87112. (505) 291-0950

**WANTED:** Mobile mount/audio amplifier, AM-2060/MT-1029 for PRC-25. Jack, WA2HWJ, NJ, (201) 927-7784.

**WANTED:** Trade Clegg 66'er, Thor 6 or HT-37 for Clegg 22'er, 22'er MK II or RME (Globe) VHF-440. Al Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

**WANTED:** VG cond., D coil assembly for HRO-60; Collins MM-1 or Turner SR90R mic. Jim Young, AA8XC, 14714 Cowley Rd., Columbia Station, OH 44028-9770. (216) 926-1231

**WANTED:** RCA CR-88 communications rcvr manual, photocopy OK. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

**WANTED:** Desperately need final tubes for my SR-500. It uses two 8236 tubes. Ron, WØOIZ, KS, (913) 268-5973.

**WANTED:** Hallicrafters SR-150, SR-400 & two 8236 tubes for my SR-500; also a SR-2000 or parts rig. Ron, WØOIZ, KS, (913) 268-5973, Fax 268-0461.

**WANTED:** TMC-350, PRC-70, PRC-74, Zenith 57128, 57120, 67222; ARRL handbook for 1937, 1938, 1940; QST for 1943. Gary, W8MFL, MN, (612) 496-3794.

**WANTED:** Manual for Knight sweep/marker sig gen, will pay good bucks for help; Hallicrafters P45 AC pwr sply for Mark II A HT-45 linear; 0-1 mA, 125 ohm, 2-1/4" panel meter. Call collect. Don Hudson, KA1TZR, CT, (203) 966-2859 after 7 PM EST.

**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:** Sig Gen TS 510. 10 to 420 MHz - $85; GR 1611A capacitance bridge - $55. U-pay UPS. Ted Stewart. W6NPB, 2157 Braemar Rd., Oakland, CA 94602. (510) 531-7042, Fax 531-7072

**FOR SALE:** Rcvr's: Knight R100A - $65; Heath HR1680 - $75; Johnson TR switch - $65; 1625 tubes, WWII NOS - 3/$10. Dave, W1DWZ, MA, (508) 378-3619.

**FREE:** Send for my free illustrated meter list. **WANTED:** Meter literature & brochures. Chris Cross, Box 94, McConnell, IL 61050.

**FOR SALE:** Heathkits: IB-1, CB-1, IM-13 & misc. manuals; other items. SASE for list. Bob Smith, K1BS, 410 Stroll Dr., Montgomery, AL 36117

**FOR SALE:** Xfmr, UTC PA307, 7000-6000-4800CT @ 300 ma CD & PA108 choke - $90; 833A pull outs - $10. W5WBA, NM, (505) 831-2646.

**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

**FOR SALE:** SX-28, spkr, manual, reversable modifications, no panel holes - $215; Heath V-4A VTVM, rough - $12. U-ship. WA7HDL, ID, (208) 756-4147 after 0830Z.

**FOR SALE:** PRC-8 government recondx. w/NOS accessories & manuals. - $350 pair OBO, U-shp. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (520) 624-8029

**FOR SALE:** National RBL-6, very nice VLF rcvr 14 to 640 kHz - $225; NC-300 - $185. Charlie Talbott, K3ICH, 13192 Pinnacle Ln., Leesburg, VA 20176. (540) 822-5643

**FOR SALE:** Heath DX-60B - $75; Johnson 6N2 - $75; big Telrex 500-RIS worm-drive rotator - $1000. Charlie Talbott, K3ICH, 13192 Pinnacle Ln., Leesburg, VA, 20176. (540) 822-5643

**FOR SALE:** Kilowatt Matchbox w/meter & coupler - $275; Hallicrafters SX-117 - $250. All + UPS. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319, bears@wco.com

**FOR SALE:** Heath HD15 patch, mint w/manual - $15; Drake TR7 service jumper board - $9 + shpg. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

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

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

**WANTED:** 6 position 2 deck bandswitch, 2 kw capability. J.M. Roseman, W9UD, IL, (309) 799-7447

**WANTED:** Manual for Collins 75S-3 rcvr; second or third ed., showing BFO output jack. Kurt, AZ, (602) 443-0896.

**WANTED:** Meter mount for Simpson 260 VOM. Ken Kolthoff, 5753 David Pl., Fairfield, OH 45014-3507. (513) 858-2161

**WANTED:** Panadapter spectrum analyzer for 455 kc in working order, preferably rackmount. Peter, NY, office (212) 623-3965, I'll call back.

**WANTED:** Navy RBB/RBC rcvr + accessories, any condx. Paul Busnuk, N3YBO, 2110 E. Lombard St., Baltimore, MD 21231. (410) 327-5895

**WANTED:** Hammarlund noise immunizer kit PN: 9208-00-00002 for 180 rcvr. John, Alaska Time (907) 337-9157.

**WANTED:** Condensers .001 to .05 mfd 600 or 1200 DC volts. Alan Mark, POB 372, Pembroke, MA 02359.

**WANTED:** National NC-155 in exc condx; Johnson Adventurer in exc condx; HA-5 VFO; Globe WRL V-10 VFO. Ron, 10701 W. 54th St., Shawnee, KS 66203. (913) 268-5973



**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, integra@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:** 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:** In pristine condx.: Collins 32V3, 75A1, 30S1, 270G-1, 32S3A (RE), 310B3, 30K1, mech filter adapters, 55G1, SP-600X, cabinet, TV-7 tube checker & 75A-4. Lee, W9VTC, IL, (847) 439-4700 d, 726-1660 eves.

**WANTED:** Need set of J.W. Miller inductors 9001-9008; many thanks. H.R. Quarles, 9021 Weldon Dr., Richmond, VA 23229.

**WANTED:** Hallicrafters HT-1, HT-4, HT-9; National SW-3 model I, 2 volt version, uses 32 & 30 tubes; Hammarlund Comet Pro coils & coil sets; Millen 90801 exciter; other pre 1950 ham gear. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

**WANTED:** Manuals on the following Morrow equip: RVP2608, TV600A, RTS6005, MBR5, MB565, MB560A. Don Knotts, W7HJS, 3158 NE Azalea, Hillsboro, OR 97124. (503) 648-1738

**WANTED:** Mod xfmr for Ranger; current address for Dentron Corp. Ken, K8TFD, 11152 Edington Rd., Livonia, MI 48150. (313) 522-8645

**WANTED:** Hallicrafters SX-100. Gene Peroni, KA6NNR, Box 58003, Philadelphia, PA 19102. (215) 665-6182 dys.

**WANTED:** Copy Collins HF380 Service Manual. for Collins KWS1, T503 HV plate xfmr (6630-0155-00). Woody, WRØS (303) 660-1616, rlinwood@worldnet.att.net

**WANTED:** Exc R-389, GPR-92 and SP600JX; Collins amp 204H-1. Mitsugu Shigaki/ 2825-2, Jozan Kamidai Machi. Kumamoto 860 JAPAN. FAX (0)96-329-4601, shigaki@mxw.meshnet.or.jp"

**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:** Electro Voice 664 mic; Drake 2B, 2BQ rcvr. W7EGO, WA, (206) 833-3313.

**WANTED:** Knight equip, all types; ham, shortwave, CB test, etc. Thank you. Walter, CA, (818) 297-7249.

**WANTED:** Manual TMC PAL-1K; tubes VT25/10Y; 843; 801A; Bird 43, HT20, 800 Hz inverter. John, POB 1773, Pinehurst, NC 28374.

**WANTED:** Dial drum for Heath Apache TX-1. Steve Johnston, WD8DAS, 3350 Oakham Dr., York, PA 17402. (717) 755-3920.

**WANTED:** Manual/schematic, Sencore tube tester Continental II; type MU 150. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

**WANTED:** Old battery or pwr sply & telegraph key for TBY xcvr. Bob Forte, K2RGM, POB 160, Lake Luzerne, NY 12846. (518) 696-2400.

**WANTED:** HT-18 & S53/53A parts units; R-44 spkr. Bill Bowes, N7MOB, WA, (206) 839-8591.

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

**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:** 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:** 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:** 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:** Clegg 66er in VGC, trade Johnson 6N2 xmtr in VGC + cash. Bill, W7US, AZ, (520) 290-6064.

**WANTED:** Board layout for Swan SS-200. I have the schematic. Harry Mills, K4HU, 631 4th Ave., W, Hendersonville, NC 28739. (704) 693-7519.

**WANTED:** Working VTVM with HV probe and manual under 50 buckeroos if possible. Bill Bogart, KA9CWK, 4146 S. Goff Rd., Hillsboro, IN 47949 bogart@glenmar.com.

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

**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

**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:** Drake R4C, T4XC, AC4 cables & manuals - $250. Gene, AZ, (520) 646-0370.

**FOR SALE:** HQ180 - $200; NC46 - $75; Drake 2C, near mint - $120; NC125 - $75; RME DB20 reselector - $40. All + shpg, prefer PU. Larry, CA, (310) 924-7282.

**FOR SALE:** Morrow MB 560A, MB 565 - $50/both; Swan 350 w/AC-DC ps; Johnson Challenger; DX60, needs work; 833A/C. R. Berkemeyer, MO, (314) 394-0441.

**TRADE:** My nice cond's Drake T-4X/R-4A/AC-4 for your Hallicrafters HT-44/SX-117/ps-150 in similar shape. Wayne, K8WB, 5261 Jane Way, Las Vegas, NV 89119. (702) 795-2652.

**FOR SALE:** Harris HFL1000 amp w/150lb pwr sply & SG70 exciter - $1500; lots more. V. Vogt, 2311 Pimmit Dr., #114E, Falls Church, VA 22043. (703) 573-8142.

**FOR SALE:** R-390 w/meters - $130; Drake 2-NT & manual - $65. All + UPS. **WANTED:** Manual or diagram for Hickok 752 A tube tester. Dan Mason, R.R.T1 Box 204F, Santa Fe, NM 87501. (505) 455-3416.

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**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:** Collins 75A-4 w/2 filters exc, Sn 3500+ - $750; Collins 51S1, WE, in cabinet, VGC - $800; Collins KWM2-A WE, 516F-2, 312B-5 - $1400. U ship. P. Jay Spivack, 325 S. Washington, Kent, WA 98032. (206) 859-2680.

**FOR SALE:** Sprague electrolytics: 150MF-200 volts - 25¢ ea; 33MF-160 volts, 47 MF-160 - 50¢ ea; 47-200V, .001-600V, 48,000MF-40 volt. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075.

**FOR SALE:** Heath: DX-20 xmtr; Q-multiplier; 100 kc calibrator; electronic keyer; HW-32A xcvr, complete; audiogen; VTVM; pair pre amps; reel to reel player. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075.

**FOR SALE:** 1935 Victor model 24 sound on film projector w/matching spkr, 3 reels & paper wrk. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075.

**FOR SALE:** DX60B, HG10, manuals - $125; NC-300 - $225; Ranger I - $275. **WANTED:** Hallicrafters SR-150, SR-400, SR-2000 or prts unit; desperately need SR-500 final tubes #8236. Ron, WØOIZ, KS, (913) 268-5973 or fax 268-0461.

**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/TRADE:** C/U F/O 40' tower HAM-4, Moseley TA-33 SR; RAL-6 & ps. Ray, MO, (314) 428-1963.

**FOR SALE:** Pierce Simpson (Marine 2 MHz) Gulfstream 150A - $50; Bimini 550 - $75; dynamotors 12V-275V-150A, 12V-680V-210A - $40 ea; Motorola Universal alternator/regulator, new - $40; (2) Vocaline JRC-425 - $75. Bob Napoli, K2LGO, Box 158, Riverhead, NY 11901. Please 5-8PM EST ONLY- (516) 722-5737.

**FOR SALE:** RME 70 & spkr - $250; RME69 - $175; RME DB-23 -$45; Collins mechanical filter adaptor - $135; Hallicrafters Panadapter - $225; SX-100, wrkg - $95; Heath HW 5400 xcvr - $350; Heath HR 1680 & spkr - $165; NC-109 & spkr - $165; free lists, manual/equip. Richard Prester, 131 Ridge Rd., W Milford, NJ 07480. (201) 728-2454.

**FOR SALE:** Lafayette HE-10 rcvr - $75; McIntosh MC-250 amp - $300. Pat, WB9GKZ, WI, (414) 434-9016.

**FOR SALE:** Collins manuals (copies); R388, R390, R390A, R391; military mic; Fisher spacexpander; tube reverb. Charles Zafonte, N1FRX, RR3 Box 2075, Fort Kent, ME 04743. (207) 834-6273.

**FOR SALE:** Used 807 tubes, tested OK, guaranteed - $5 each plus $3 priority mail. James Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 748-5968.

**FOR SALE:** Gonset Communicator III, 2 meter AM xcvr, orange CD, mint w/new canvas cover, 3 xtals, orig. manual - $65; 1946 GE metal portable model 250, 5 tube battery or electric, nice shape - $45; RCA 1941 BP-10, 4 tube small portable, nice shape - $40. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699.

**FOR SALE:** 186 pg soft cover book, 'Tube Lore' by Ludwell Sibley - $12 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (847) 679-8641.

**FOR SALE:** RME69 cabinet; collector exc KWM2, WE, - $500. **WANTED:** Collins 312B5 or 399C1 VFO. K5YY, AR, (501) 756-5010, eves.

**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:** 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:** HW101, HP23A, SB600, SB650, manuals, exc - $425; SX140/HT40 - $125. **WANTED:** HQ180 spkr. Dick Dixon, W7QZO, 16032 Lost Coyote Ln, Mitchell, OR 97750. (541) 462-3078.

**FOR SALE:** Automatic Electric candlestick telephone - $75; National NC-46 w/spkr - $75; NC-109 w/spkr - $100; VFO-62 - $40; panel-mount 1.75A variacs - $15 ea; Simpson 312 VTVM, solidstate, vg - $30; Rider's vols. 6, 7, 9, 10, 16 - $15 ea; Short Wave Craft (33 issues) - $60/all. Send LSASE for four pages of magazines, books (radio history, recent releases, technical), misc gear. Wayne Childress, KF4MNL, Rt.1 Box 200A, Altavista, VA 24517. (804) 369-4072.

**FOR SALE:** Drake TR-4C - $185; T-4XB - $150; AC-4 - $90; P-75 - $70; Collins 312B-4 (W) exc - $165; Hygain collectable rotor repeater - $60 + UPS. WA1APX/8, MI, (810) 781-9717.

**FOR SALE:** Globe King 275, orig., remarkably pristine & wrkg - BO; B&W 5100B, clean - $350. Bill, N2WXJ, NY, (914) 356-6553.

**FOR SALE:** Clegg 22er - $60, shpd; Clegg 99er - $80, shpd; NC-183D - $200 PU only. Mike, WB3CTC, SE PA, (717) 656-8746.

**FOR SALE:** Heath SB-10 chassis only - $15; HD-10 keyer, prts rig - $10; early Heath test gear manuals - $25 for lot; HW-9 12, 17, 30 meter band kit, NIB - $50; GR-81 rcvr - $45; Heath HX-10 prts - call for price; DX-40, needs help - $25; Collins 30L-1 amp w/manual - $550; Collins KWS-1, mint - $2200. Marty, NJ, (609) 466-4519.

**FOR SALE:** R1051D/URR rcvr w/manual - $250. **WANTED:** BC342 panel parts (locks & handles). Dean, KK1K, VT, (802) 878-8293.

**FOR SALE:** RCA WO-33-A 3" scope w/leads & manual, like new - $40 + UPS. Ken, TX, (817) 772-7307.

**FOR SALE:** Gonset communicator III 6M - $30 + shpg. Jim, W8HPL, 13549 Morse Rd., Pataskala, OH 43062. (614) 927-2592.

**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:** Heath VFO model VF-1 w/manual (copy), looks orig., exc - $45. Harry Blesy, N9CQX, 95 740 Clarendon Hills Rd., Hinsdale, IL 60521. (630) 789-1793.

**FOR SALE:** Cabinet for R-390A, almost new premier metal products DCR-100, #16 gauge steel, finished in dark gray Sandtex. The R-390A is a perfect fit, beautiful - $80 + UPS. Jeffrey Hopkins, WA2DPK, 2482 Remington Rd., Elizabeth, CO 80107. (303) 646-0139.

**FOR SALE:** Heath Sale: HD-11-Q-mult, AM-2-SWR, CPO-HD1416, spkr-HS-24 - $16 ea + shpg. H. Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103.

**FOR SALE:** Meck 60TI, Telvar 60TI, instructograph 500 w/osc/11 tapes; Stancor 40P trans; Dovetron TBA1000; Heath IM4180 Dev mtr w/4180A; Johnson 250-46 phone patch; 250-20 low pass; Harvey Wells T90 xmtr, Z Match; Drake TR3/w/RV3&AC; one inch scope; 1906 Vibroplex, Blue Racer; Eldico SSB 100 M mobile Hallicrafter SX-115, + UPS. Bruce E. Walther, W9QAH, 3000 McCulloch St., Stevens Point, WI 54481. (715) 344-9099.

**FOR SALE:** Yaesu FRDX-400 rcvr - $150; HQ129X - $150; Hallicrafters S-108 w/manuals, GD to exc condx - $80. I shp. **WANTED:** Copy of CQ Nov. 1957. Burt Ostby, 2424 F-30, Mikado, MI 48745. (517) 736-8020.

**FOR TRADE:** Signal Corp BC148, BC151, BC176A. **WANTED:** Pre 1935 aviation sets, ground or air. James Treherne, 11909 Chapel Rd, Clifton, VA 20124. (703) 830-6272.

**FOR SALE:** Harvey-Wells R-9A rcvr w/manual - $75; Heath Cheyenne xmtr, manual, no sply - $50. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230.

**FOR SALE:** Resistor decade box, 1-100 MHz, 2 watts in .1 steps in water tight case, checked - $25. Tony Snider, VA, (757) 721-7129.

**FOR SALE:** Heath tube-type CB set, GW-12, exc, operating, chan 21, mic - $45. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244.

**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, W0TOK, 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:** 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:** National VFO-62 - $35; MFJ Versatuner II model MFJ-941D - $60. All + shpg. Tom Murray, 3177 Latta Rd., #409, Rochester, NY 14612. (716) 723-1672.

**FOR SALE:** PRC-77 osc bag w/handset, long & short ant, VGC - $30. Barry Fairwood, 371 Woodford Ave. Apt 28, Plainville, CT 06062.

**FOR SALE:** Harvey-Wells station: R-9A rcvr, T-90 xmtr + AC & Bandmaster Z matcher, all in good working condx w/manuals - $375 + UPS. Vern, ND, (701) 378-2710.

**FOR SALE:** BC224 - $110 + pckg & shpg. L. Schimmel, POB 1234, Spanaway, WA 98387.

**FOR SALE:** Hammarlund SP-600 JX-26. PU only, no shpg. Victor, KE6VHI, CA, (805) 583-4026.

**FOR SALE:** BC-222 - $55; Heath Seneca - $100; Multi-Elimac AF-68 w/ps - $125; AF-67 w/ps - $100; Johnson Viking Mobile - $100; Harvey-Wells TBS-50D - $50; type COL46159 radio rcvr TCS-12 - $45. George Rancourt, K1ANX, MA, (413) 527-4304.

**FOR SALE:** General Radio model 358 wavemeter - $50; Heath DX60B - $80; HW-16 - $75; HT44/SX117/ps - $350; SB-E34 - $200. U-shp. John Nauman, W9CN, 420 Patrick Ave., Merritt Island, FL 32953. (407) 452-7904.

**FOR SALE:** Pwr design #501, small benchtop 0-50V, 0-1.5A metered, portable, 115 VAC in, checked - $50. Tony Snider, VA, (757) 721-7129.

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**FOR SALE:** Countermeasures rcvr SR-212A made by ACL, solid state 30-1000 MHz in four bands, camera film type tuning, AM & FM, multi-bandwidths, AGC, built in panaromic display, line & variable audio outputs, rackmount 3" high 115 VAC checked & guareented - $600 + shpg. Tony Snider, 512 Princess Anne Rd., VA Beach, VA, 23457. (757) 721-7129, Fax 426-6459

**FOR SALE:** TO-5 keyer - $40; TV 4/U tester - $23; 1-3/4A variac - $12; GR-1214A audio oscillator - $20; hand key - $10; Hi-Z earphones - $20; RCA 6148's NIB - $15; parting Pacemaker. Who paints Johnson cabinets? Joe Sloss, K7MKS, WA, (206) 747-5349

**FOR SALE:** Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (810) 391-6660, hires@rust.net

**FOR SALE:** CU-714/SRA-22 antenna tuner. **WANTED:** R-395/PRD-1 & R-901/GR rcvrs. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

**FOR SALE:** 7B53 timebase for Tektronix 700C series o-scope, complete, unchecked - $20; checked - $35. Tony Snider, VA, (757) 721-7129.

**FOR SALE:** Johnson 275W Matchbox w/meter, coupler & manual - $150. Ed, N5BFW, 7902 Creek Trail, San Antonio, TX 78250. (210) 684-9754

# The Radio Finder©

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**WANTED:** KWS-1, 75A-1/2/3/4; 310 exciters; 32V-1/2/3; 75S-3B/C, 32S-3/32S-3A; 51S-1; KWM-1; KWM-2/KWM-2A; MM-1, SM-1/2/3; other Collins accessories; Hallicrafters SX-28/28A; SX-42; SX-73; SX-88; SX-100; HT-20; HT-32B; HT-33.

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**FOR SALE:** Second shed cleaning; old tube radios, test equip & antennas. SASE for list. K6LLQ, Box 21608, Concord, CA 94521. (510) 682-2838.

**FOR SALE:** Bird 1000-H element, NIB - $65 - or will **TRADE** for 100-A or 100-C. Roger Snowdall, WØKWJ, MO, (816) 356-0396.

**FOR SALE:** Drake TR7, PS7, SP7, filters, extension boards, manual, exc - $595; 4-400A, new & socket - $50. Dave, W3KDD, 5129 Avoca Ave., Ellicott City, MD 21043. (410) 465-3884

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**FOR SALE:** Eldico R-104 rcvr w/Collins mech filter - $110; Gonset Comm. 2M - $50; Heathkits: DX-60B - $70, VF-1 - $40; HG-10B - $50; Conar 400 xmtr, exc - $60; Central Electronics 20A - $60. All w/manual + shpg. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881

**FOR SALE:** Nems-Clark 1674, 1501, 1509, unchecked - $100 ea; ARC-2 complete, modified - $25; ARC-38, unchecked, complete - $50; RCK VHF rcvr, complete, unchecked, w/manual & rebuilt kit - $110. Tony Snider, VA, (757) 721-7129.

**FOR SALE:** Heath 104A, pwr sply, NB monitor scope, EV mic, PTT stand - $390; Drake 2-B w/spkr Q-mult - $215, all w/manuals; six Comet Pro coils in orig. wood crate - $75. Above + shpg. Jack Iverson, KØEWU, 1110 Old Mill Dr., Palatine, IL 60067. (847) 359-0941

**FOR SALE:** HP-8640B/323 RF signal gen. in transit case, 0.45 - 540 MHz, AM, FM, CW, & pulse, 6 digit LED freq display, VGC completely functional, it is really nice - $350; a few HP-8640B commercial RF sig gens, various options - call; HP-8601 RF sig gen, sweeps broad & narrow, AM, FM, CW, metered output, step attenuated, 100 kHz to 110 MHz - $185; HP-428A clip-on DC amp meter, probe, manual copy, reads 1 ma to 10A full scale, VGC - $120; HP5328 Universal counter 512 MHz, 9 digits LED - $170; HP Big Scope, very large TV size screen, with dual vertical and delayed time based plug-ins, no squinting the eyes with this scope - $150; General Radio 5 MHz freq standard, oven, metered, 5,1,0.1 Mhz outputs, provisions for backup batteries inside, manual - $100; HP410B VTVM - $60; HP410C VTVM - $85; HP412 DC VTVM - $70; Speciality Products WWV rcvr, 2.5, 5, 10, 15, 20 MHz, 17 tubes, spkr, BFO, built in scope, all cover, rack style, very clean, a 9+ - $120; HP-652A audio gen, 10 Hz to 10 MHz, metered, step attenuated - $110; HP612A UHF gen 480-1250 MHz, VGC - $40; HP clip-on AC current probe w/ amplifier complete - $40; Marconi TF-2016A, RF sig gen, 10 to 520 MHz, AM, CW, FM, compact, lite, very well built - $125; military RF sig/sweep gene., tubed, scope display, 3 manuals, VGC - $50; Khrond-lite tube OTL amp 50 watts DC-500 kHz, massive - $100; HP 5 MHz scope probe - $25; TEK 7844 dual beam scope mainframe, 400 MHz, VGC - $160; 7000 series plug-ins available; URM/25D RF sig gen - $25, URM/26 RF sig gen, VHF model - $40; CRT12BP4A - $25, ARRL handbook 1946, 1953 - $20 ea; How To Pass Radio License Exam, 1938,44 - $15. All + shpg. Call evenings or leave message. Stan Krumme, KO6YB, 16432 Lakemont Ln., Huntington Beach, CA 92647. (714) 841-5866.

**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:** 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:** HF rcvr R1051 B made by Bendix, solid state except for 1st RF amp, 2-30 Mhz, decade tuning, synthesized osc, AM, CW, PSK, USB, LSB, ISB, built in preselector, rackmount, military construction, 115 VAC, extremely stable, will include mating URA-17 RTTY converter (unchecked) - $275 + shpg - checked & guaranteed. Tony Snider, VA, (757) 721-7129.

**FOR SALE:** Use your vintage rcvr to tune VLF on 80 meters, VLF A converter - $50 shpd. Jim, K7BTB, AZ, (520) 635-2117

**FOR SALE:** 150 antique tubes, 201A, UV-199, etc. May be duds, need to be inspected in person. Send SASE for 'antique list' and NIB list 'S'. Fred Schmidt, POB 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, Fax: 583-0777

**FOR SALE:** Book: Oscilloscope Handbook by Herrick - $10 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

**FOR SALE:** Unbuilt Heath HM-9 QRP wattmeter - $100 del.; new GE7027A's - 7@$10 ea. del. Clyde Sakir, N7IOK, AZ, (520) 323-1120 csakir@juno.com."

**FOR SALE:** KWM-2A, by Collins Radio Co. Ltd. Japan, good condx - $600 OBO. Phil, AB5TH, TX, (281)992-5762 days. pmills6@a.crl.co

# R-390A Components

**RF & xtal deck - $75**

**audio deck - $50**

**IF deck - $65**

**power supply - $20**

**PTO - $45**

**complete knob sets - $10.**

**all decks in good condition but minus some tubes**

**Complete units available minus top and bottom covers, some tubes & meters - call.**

**George Rancourt, K1ANX, 82 White Loaf Rd., Southampton, MA 01073. (413) 527-4304**

**WANTED:** Late Rockwell HF(KWM)-380, all mods, noise blanker, speech processor. Must be perfect. Fabio, I0ILBE - liber.fab@iol.it or fax 011-39-6-30710179.

**WANTED:** Following components for TSC-26 radio station: CV-1716 frequency converter, RP-149 reproducer and RD-265 recorder. Robert Bennett 5675 Shadow Hills, Las Cruces, NM 88012.

**WANTED:** Manual and schematic for Galaxy GT-550 and Galaxy V Mark III xcvrs. Karl Heimbach, KD5LR, 16214 Paula Street, Prairieville, LA 70769. (504) 622-3867

**WANTED:** Books: Radio Boys by Chapman - good readible condx and better. Chuck, NZ5M, 8705 Toledo Ave., Lubbock, TX 79424. (806) 798-1452

**WANTED:** One to four tube SW rcvrs (regenerative). Kits or homemade. Bob Mattson, KC2LK, 10 Jane Wood Rd., Highland, NY. 12528-2607 (914) 691-6247 RMattson@freemark.com

**FOR SALE:** SW-3 - $260. Hallicrafters SX-42 - $185. More. Email or SASE for list. Hank Bredehorst 2440 Adrian St. Newbury Park, CA 91320. Quailhill@aol.com

**FOR SALE:** Collins R-390-A, exc - $500; Motorola R-390-A exc - $400; AM-3349/GRC106 RF amp, exc - $250. Fred, KA8EXA, OH, (614) 282-0080

**FOR SALE:** Heath SB310, immaculate - $200; HP410B - $125 OBO; Kiwa m/w airloop - $225; Drake SPR4, w/NB - $200 OBO. Doug, OR, (541) 367-6486

**FOR SALE:** Navy RBL-3 15k to 600k rcvr, good cosmetic condx, needs elec. work. Doug Knoll, KA9IQA, 1400 4th Circle NE, Waseca, MN 56093. (507) 835-8821

**FOR SALE:** Collins KWM-1, noise blanker and 516F-1 pwr sply - $2,000 or reasonable offer. Paul Mezzapelle, WA6NLJ, P.O. Box 883, Carmichael, CA 95609, (916) 481-0145

**FOR SALE:** Hallicrafters, National, Hammarland, Elmac, Wilson, Regency, others. Bird, Drake, Ansco Test Equip. LSAE List. Don Jeffrey, POB 1164, Monrovia, CA 91017.

**FOR SALE:** 100TH and 250TH tubes, filaments good, no shorts; 3-500Z, NIB; 3CX400A7, new. Offers? John Levreault, NB1I, 53 Highland Road, Boxford, MA 01921, (508) 352-8235, jlevro@shore.net.

**FOR SALE:** HRO-50T, five coils, nine scales, matching orig spkr, wood coil box - $500. Lenox Carruth, WA5OVG, 10135 Ferndale Road, Dallas, TX 75238-1613. (214) 348-5074

**FOR SALE:** 3 element 40 meter Telrex beam, full-size. Consider sale or trade. Ron, GA, (770) 664-6931 eves.

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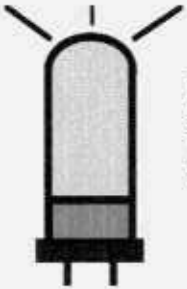

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