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ELECTRIC RADIO

celebrating a bygone era

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Tom Marcellino, W3BYM

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Editor - Barry R. Wiseman, N6CSW
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Electric Radio is published primarily for those who appreciate vintage gear and those who are interested in the history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders.

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

Regular contributors include:

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

Editor's Comments

Alice Clink Schumacher, 1909-2000

Alice passed away December 20 at the age of 91. She was a remarkable woman.

I first met her when I became aware of her biography of Hiram Percy Maxim. Because the book was out of print I was interested in republishing it. I thought it was a great book and that Hiram Percy Maxim "The Father of Amateur Radio" should not be forgotten. To make a long story short, we did publish an expanded version of her original book. During the process of getting the book ready for publication I came to know Alice very well via our long phone conversations. I never got to meet her in person, although Shirley and I made plans a number of times to go up to Great Falls, Montana where she lived.

When her son Pete decided to become a ham as a young teenager, Alice learned to code to help him. Pete tells me that they sat at the dining room table sending code back and forth until he was ready to take his test. That's the kind of woman Alice was. And when young Pete couldn't find any information on Hiram Percy Maxim for a high school essay, Alice set out to write the only existing biography of HPM. She travelled back to Connecticut where she conducted extensive research that included interviews with members of the Maxim family and several visits to ARRL Headquarters.

When here daughters became interested in figure skating Alice was right there with them too. She became so involved in this sport that she wrote a novel "Lois Lane, Figure Skater".

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East and Midwest Strongest in Heavy Metal Rally

by Paul Courson, WA3VJB
Box 73
W. Friendship, MD 21794

One participant calls it "one of the finest experiences in my 48 years" on the ham bands (Al, W1UX). Another described it as "a tremendous, unbelievable amount of stations checked in" (Bob, W2ZM). And with that, the inaugural Heavy Metal Rally takes its place in the history of outstanding vintage radio events.

A total of more than 60 eastern U.S. stations including more than a dozen broadcast transmitters in the region gathered on 1885 kc the evening of December 23, 2000 for the event organized by Bill, KDØHG.

Unfortunately, participation in western states was thin, with reports of short propagation and high noise levels.

So most of the event was centered in the eastern part of the United States. The anchor station for the region was Bob, W2ZM, at Penn Yan, New York, who agreed the band never lengthened out. He said "conditions were not as good as usual, none of the long skip, we just didn't have any. Absorption was high," even though general noise levels were exceptionally low.

Excitement and enthusiasm were high, starting about an hour before sunset along the mid-Atlantic coast, where a few stations began "testing" on 1885 around 3:30 pm local time. Within a half hour, these Maryland and Virginia stations began to hear a group in upstate New York, and the two groups reacted with surprise and delight that the band was coming in early!

Quickly, it was clear the frequency would need some order and a moderator, because stations further south were starting to chat but were not yet hearing stations well to the north. Bob Raide stepped up to the task, encouraged by the others. Many recognized '2ZM from his prominent role in the Antique Wireless Association often running the AWA Net on 75 meters.

Now with an anchor station in place, the check-ins officially began. After the first dozen, with a flood of additional calls on the way, it looked overwhelming as to how to keep everyone participating. What happened was a spontaneous distribution that brought five and sometimes six independent QSOs on AM generously spaced between 1850 and 1985 kc.

Within each QSO you could typically find a half dozen stations, and nearly everyone freely moved about the conversations up and down the band, stopping by, saying hello, and either moving on or staying put to greet others who would then pass by.

Bob put in an eight-hour shift running the Heavy Metal Rally, eastern division, from 5 pm to 1am Sunday. A few of us continued onward until about 3:30 am, and while we never did hear stations much past Michigan, we enjoyed a very low-noise band, with generally strong and stable signals that were a delight to listen to.

Notes and Quotes, Premiere Heavy Metal Rally

The Heavy Metal Rally comprised the largest gathering of broadcast transmitters ever assembled at one time on the shortwave ham bands, with at least 22 rigs officially checked in nationwide.

The operators of at least a dozen additional BC xmtrs expressed interest, but were kept from joining this premiere event by a variety of electrical issues and family priorities (since it was Christmas week).

Here are some vignettes, monitored off the airwaves and posted to "The AM

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Radio's First Voice...Canadian!

by Mervyn C. Fry

Yes, it WAS a Canadian - Reginald Aubrey Fessenden - who was recognized as the "father" of radio and as the first to actually transmit the sound of the human voice without wires.

Several years prior to his first broadcast by radio, Reginald Fessenden had perfected a new method of sending Morse code more effectively than Guglielmo Marconi. To him goes the credit for successfully transmitting the sound of the human voice between two 50-foot towers on Cobb Island located in the Potomac River, Washington D.C., December 23rd, 1900.

The first radio broadcast ever in the world's history was made by Reginald Fessenden on Christmas Eve 1906 when he beamed a "Christmas concert" to the astonished crews of the ships of the United Fruit Company out in the Atlantic Ocean and the Caribbean Sea.

Beamed out from the 400-foot towers of the transmitting shack at Brant Rock, Massachusetts on the Atlantic coast, this program commenced exactly at 9 o'clock, with 'CQ CQ CQ', meaning general call to all stations within range', sent out in dots and dashes. Then, over the microphone, Reginald himself gave a brief speech as to the program to follow. This was immediately followed by one of the operators switching on the Edison phonograph and a solo voice singing Handel's 'Largo'.

The first case of "mike fright" was registered when Mr. Stein, an assistant, backed away unable to utter a word! However, Fessenden grabbed his violin and 'fiddled' through 'O Holy Night' singing as well as playing. Helen, his wife and his secretary, Miss Bent, endeavored to read parts of the Bible text, 'Glory to God in the highest and on earth peace to men of good will', but, like Mr. Stein, they suffered stage fright.

Concluding the program, Fessenden wished his listeners "A Merry Christmas".

The success of this first broadcast was verified by operators, not only from those on the ships of the United Fruit Company but also from vessels all over the south and north Atlantic, amazed at the magic and miracle of this first wireless radio broadcast.

A Brief Biography of Reginald Aubrey Fessenden

The eldest son of an Anglican minister, Reginald was born October 6th, 1866 in Knowlton, Quebec, but with his parents, Elisha and Clementina Fessenden, soon moved to Fergus, Ontario and later to Chippawa near Niagara Falls.

In his early days at school he showed remarkable aptitude in mastering mathematics, languages and music. He graduated to Trinity College, Port Hope, with honors. His next step forward was the offer of further tuition together with a paying mastership at Bishop's College, Lennoxville. This was followed by an offer of a teaching position in Bermuda which he successfully fulfilled.

For many years a subscriber to and avid reader of the "Scientific American", Reginald also kept a scrapbook crammed with news clippings relative to all the inventions of Thomas Alva Edison. His constant studies furthered a determination to make the voyage from Bermuda to New York to seek an interview with the famous inventor and, possibly, a position.

The fact that Edison was too busy to interview him at his laboratory did not deter young Fessenden. Haunting one of the Edison installations in New York, he virtually 'got in through the back door'. An instrument tester had just walked off the job. The foreman offered

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An Easy ARC-5 Power Supply/Speaker Unit

by Frank Van Zant, KOØR
2424 Virgo Drive
Colorado Springs, CO 80906
fvanzant@usa.net

A companion unit made from readily available parts, this project is for those hollow-state enthusiasts who are restoring vintage military surplus receiving equipment.

World War II has been over for 55 years, but out there in the attics, basements, garages and junk piles of Hamdom repose the remains of ARC-5 and SCR-274N receivers. Some of these are in like new condition but many have been modified and cannibalized to be cast aside as years passed. Most of the good ones have been set aside years ago to gather dust on the shelf. Occasionally, these units can still be found at hamfests and fleamarkets. Several years ago, I bought three units at a local hamfest with the thought of possibly restoring them for nostalgic reasons. My start in ham radio was made possible through converted war surplus.

Back in those days, you needed power supplies that would furnish six, twelve or twenty four volts AC for filaments and about 275 volts DC for the plate and screen voltages of the old metal tubes and miniature tubes of that era. Actually, almost any homebrew project of those days required a power supply with these qualifications. At that time, power supply components were cheap

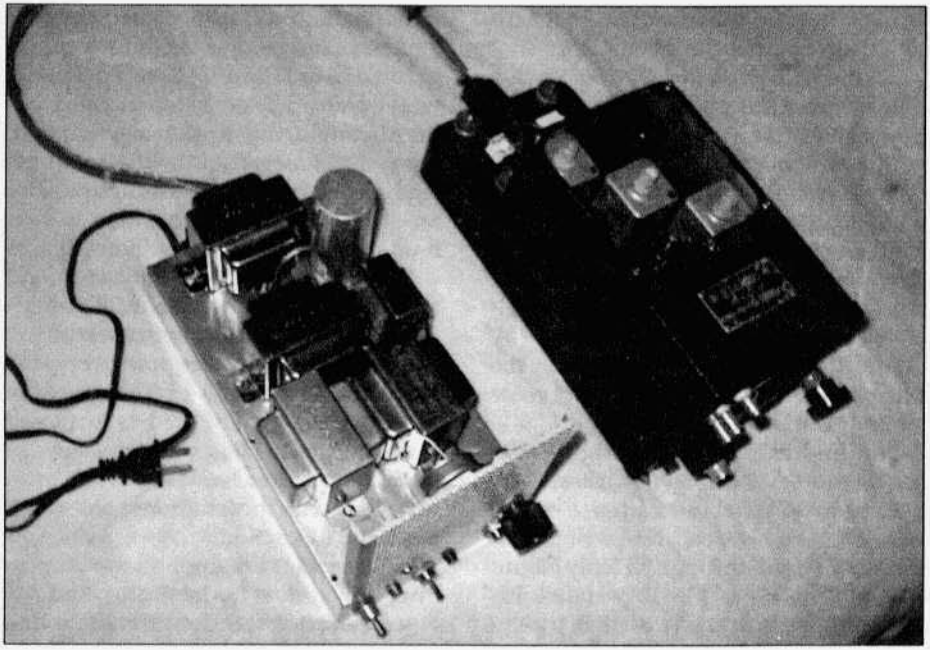

Figure 2. The author's companion power supply/speaker unit and associated receiver, the R23/ ARC-5 which covers the "long-wave" spectrum below the broadcast band.

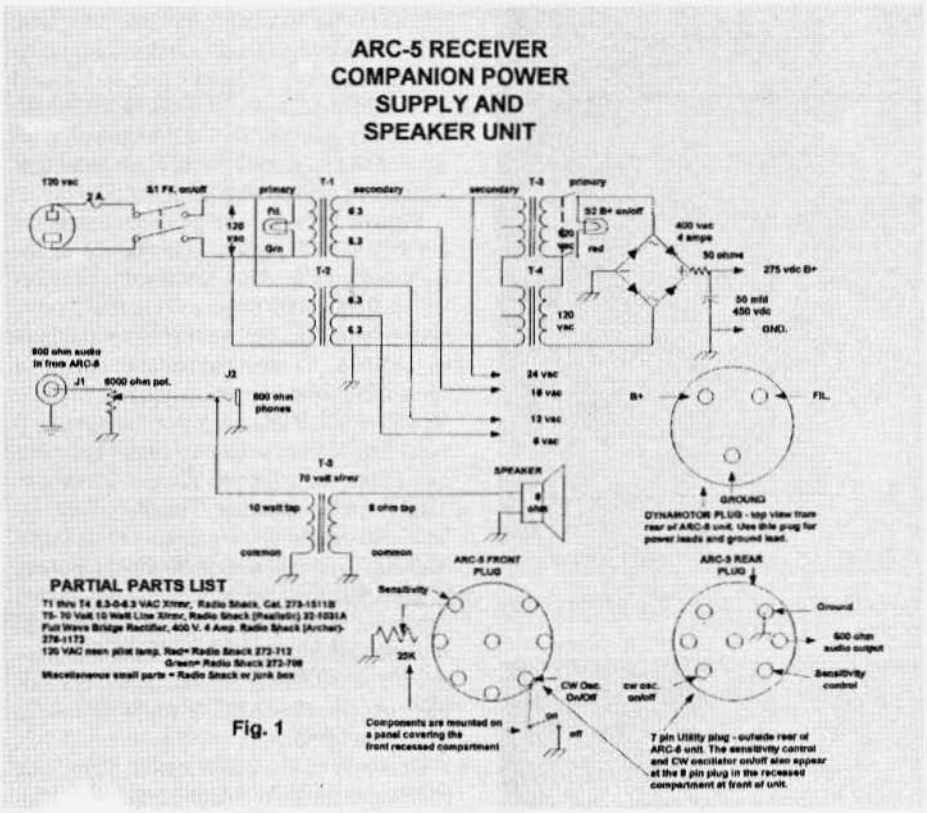

Fig. 1

and readily available. Power transformers were everywhere on the surplus market and in tube type television sets and radios of that time. High voltage electrolytic capacitors were the norm. No problem then to build a power supply.

In today's computer and solid state world, most young Hams blink unknowingly when the subject of "high" voltage power supplies comes up. Sources of appropriate components are scarce as hen's teeth. However, necessity is the mother of invention. If the three ARC-5 units I had acquired were to be restored, a way had to be found to find suitable parts. Believe it or not, a design was devised using mostly Radio Shack parts to build a suitable filament and B+ power unit that would more than adequately power the "antiques".

Surprisingly, the transformer(s) would be no problem. Through the use of four series/parallel and back to back 12.6 VAC, 3 Amp transformers, a range of voltages could be produced to not only provide 4 choices of filament voltage, but also about 275 volts D.C. voltage under load for B+. Figure 1 illustrates the circuit diagram of the arrangement that will produce 6.3, 12.6, 18.9 and 25.2 VAC of filament power. Also, using a full-wave bridge rectifier circuit, a DC voltage of about 270 volts under load will be available. As a bonus, for the ARC-5 receivers, an audio circuit was installed on the same chassis to provide either headphone or speaker output.

The only difficult or expensive parts

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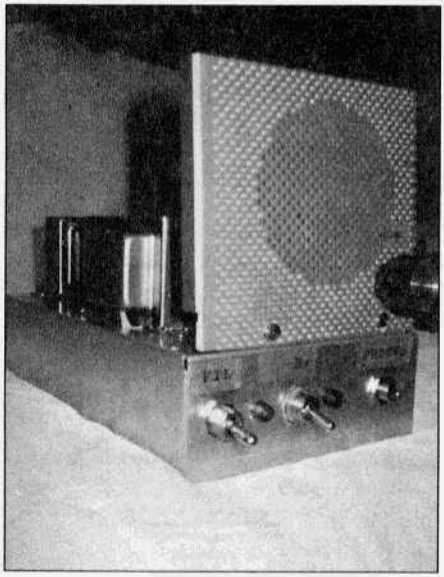

Figure 3. Front view of the power supply/speaker.

Figure 4. Rear view.

to be obtained for this project are the chassis (it's hard to believe the cost of aluminum chassis these days) and the electrolytic capacitor. If you don't want to spend the money for a real aluminum chassis box, then mount the unit on a homemade wood chassis box and masonite panel. That's what we did in the olden days. (My goodness, I sound like Methuselah). The electrolytic will probably have to be mail ordered from one of the national parts houses unless you have one in the junk box.

Figure 1 shows the plug connections on the ARC-5 series. Use the dynamotor pins for the filament and B+ connections. That will insure that the B+ receives some additional filtering inside the ARC-5. You might want to consider obtaining an extra supply of .2 or .5 or .1, 400 to 600 VDC mylar or orange drop capacitors in case any of the aluminum can capacitors in the ARC-5 blow up. That happened to me. The big triple .2 x 300-volt can in the back end of the unit blew up and created quite a stink before I could get the power turned off. It was replaced with three .5 mFd x 600 VDC mylars and everything returned to normal. The 300-volt rating of all the capacitors in the ARC-5 units is really quite marginal.

One way to cut costs with this project is to just use two transformers back to back in an adaptation of the circuit in Fig. 1. This will only provide you with two filament voltages of 6.3 and 12.6 VAC and about 130 VDC of B+. The ARC-5 receivers will work just fine with those voltages, albeit with some reduced audio output. The ARC-5's are very tolerant of voltages. One could also consider replacing the 12 volt tubes (12SK7, 12K8, 12SR7 and 12SF7) with their six volt equivalents. The 12A6 will have to remain in place since there is no 6 volt equivalent, but that will work too. Likewise, Radio Shack offers 24 VAC center tapped transformers. Two could be used back to back to yield 24 and 12 VAC and roughly 130 to 150 VDC depending on load.

The results have been excellent. The four transformers of Fig. 1 are barely warm to the touch. The R-23A/ARC-5 (190 KHz to 550 KHz) receiver plays a

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Another Chicago Icon Closes

by James Riff, K7SC
9411 E. Happy Valley Rd.
Scottsdale, AZ 85255
k7sc@cybertrails.com

We all remember the passing of such great ham stores from the Midwest, Allied, Newark, Olsen, etc. Still other great lesser known suppliers of much needed fodder were little known to those outside of the Chicago area.

During the 50's and 60's there was an area that some would compare to the Cortland and Canal street emporiums of New York. On the south side of Chicago many surplus and odd lot electronics suppliers occupied the store fronts in the 2300 block of south Michigan avenue.

Some of their ads might bring back mail order memories: R-W Electronics, B.C. Electronics, Arrow, R-W, Mid America, and a bevy of others. On this entire block both sides of the street were occupied by various retail store fronts. Sadly this then decaying area is now high rent high rise condos, and the memory of stacks of ARC-5's and bins of switches are long gone.

One strange and eclectic holdout from this era closed his doors on December 30, 2000, and although not located on the south side of Chicago it was a Chicago institution from the 50's.

The Radio - TV Lab located at 5631 W. Irving Park Rd., in Chicago served a niche market for hams and locals. George Sopocko ran the most amazing emporium of "stuff" one has ever seen. The two large stores were connected internally, and piled floor to ceiling with EVERYTHING! A small pathway lead from the doorway only 10 or 12 feet in, and then the congestion made further travel impossible.

George served the neighborhood community, mostly eastern European clients, with repair of their European phonographs and radios. But the real jewels were the glimpse of old Collins, Hallicrafters, Knight, Heath and all the others stacked one on top of the other. There was no order or reason for this arrangement, just storage. Visibility was at a minimum, as equipment was often turned sideways or facing rearwards so only intimate knowledge of a particular rig would give you a clue as to its identity.

Along with the hundreds of kinds of non-restored ham equipment were test equipment and tons of oddball components. On my last visit to him during the Christmas holidays I asked him for some 140 pF variable capacitors. And in true fashion, George disappeared into the abyss walking at times on old transformers and chassis that littered the narrow pathway into the innards. Soon he would return with some new some old units - the right stuff!

While Mr. Sopocko will still be in the neighborhood, the contents of the store have been sold, and the future of this collection is undetermined at this time. The span from Allied to George covered a memorable era, but technology goes on and we will adapt; save for the memories. ER

Output Power Meter for the Ranger

by Tom Marcellino, W3BYM
13806 Parkland Drive
Rockville, MD 20853
W3BYM@arrl.net

This article describes an additional modification to my Johnson Ranger as a result of a previous article (ER, Dec. 2000 issue, Adjustable Ranger Output). The stock meter function switch was repaired several times and worked for a while. Eventually it became intermittent and needed to be changed. In my junk box was a brand new 2 pol 6 pos ceramic wafer rotary unit that was anxious to take its place.

The best way to go about this task isn't the easiest. Yes removal of the front panel does allow best access to the meter function switch and all its wiring. After you do this (remove the panel) a few times it becomes second nature and can be done in twenty minutes or so. The stock wiring used in Johnson transmitters is difficult to work, being very stiff insulated #20 solid conductor. The wiring to the meter switch (SW5) actually pulls on the contacts. When installing the new switch, the wires were shortened and then lengthened with stranded insulated wiring. The use of heat shrink tubing was helpful in this installation.

Now there was one difference between the two switches. The new ceramic unit offered an additional set of contacts in the OFF position. Now what to do with this set of contacts? I just couldn't see myself leaving them disconnected. So before installing the panel, a long insulated stranded wire about 20 inches in length was soldered to the positive contact and the negative was grounded to another grounded contact on the wafer.

Since the Ranger was now capable of adjustable RF output from zero to 55 watts, it made sense to incorporate an internally metered power output circuit. The switch and meter were already there and with the addition of a few more junk box parts the job would be simple and finished within a short time. Well that sure sounded easy but I had overlooked one factor, the relatively insensitive stock meter movement.

The meter has a basic movement of 5 mA. There was no logical reason for this but that's what I had to deal with. Before discovering the meter problem, I had pursued the standard voltage divider/diode rectifier tapped from the RF output SO-239 connector. It became apparent, as the top resistor in the divider was decreased to obtain full scale on the meter, that something was wrong. I proceeded anyway and finished the circuit and all was fine when connected to the dummy load on the bench.

Thinking the job was completed, the case was installed and the rig brought into the shack and connected to the rest of the system. The first time I fired it up into the system dummy load, the Power Output meter read about 20% of FS. Now what was the problem? The first thing that came to mind was a pinched wire during installation of the case. So back to the bench and off came the case. After firing up into the bench dummy load, the meter read 100% FS. So taking the case off fixed the problem? Not really. I later learned after taking the rig back into the shack and moving a small dummy load down the coax that the tuner was causing the 20% reading.

The circuit was very sensitive to the impedance offered by the tuner because of the low value of the resistor in the divider. This again was all because of

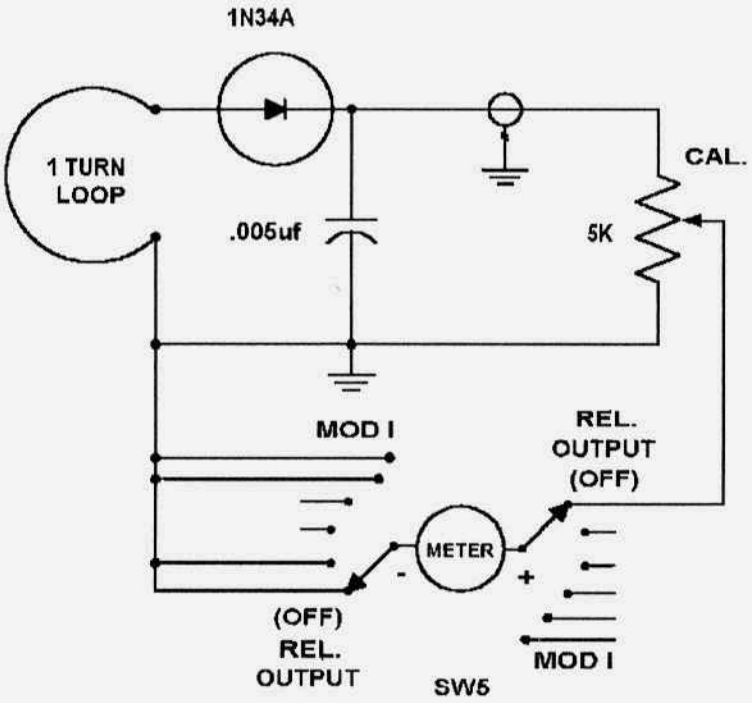

Figure 1. Power output circuit

the 5 mA meter movement. This method of sampling the RF was abandoned. I needed to find a point in the transmitter that varied with the RF Carrier Level control and it didn't necessarily have to be RF. Why not use the screen voltage on the PA Final? After all it was directly connected to the Carrier Level control. The thought here was to make the OFF position into a PA screen voltmeter that was calibrated in watts using the upper meter scale. This idea was pursued but once again the 5 mA meter movement drew enough current to pull the screen voltage. Not wanting to install a PA screen voltage regulator, this idea was likewise canned.

Finally the idea lamp lit. Why not use an RF pickup close to the final tank. Gee what a novel idea! The complete power output circuit is shown in Figure 1. A few different pickups were tried and just about anything with wire will work such as a wire wound resistor or RFC. I settled on a one turn loop of #12 insulated wire. The loop has a diameter of 2 inches and is spaced one-half inch from the end of the tank coil.

Figure 2 shows the rigid mounting for the one turn loop. A short piece of ceramic (1-1/4"x1/2"x3/16") was used with one end anchored to the top of the high voltage filter choke LP1. Fiber washers are needed on both sides of the ceramic to avoid cracking when torqued. Other holes in the ceramic provided mounts for the loop, diode and capacitor. An additional ground wire was connected from the choke-to-chassis mounting screw to the choke-to-ceramic mounting screw. This was to insure ground integrity because of the

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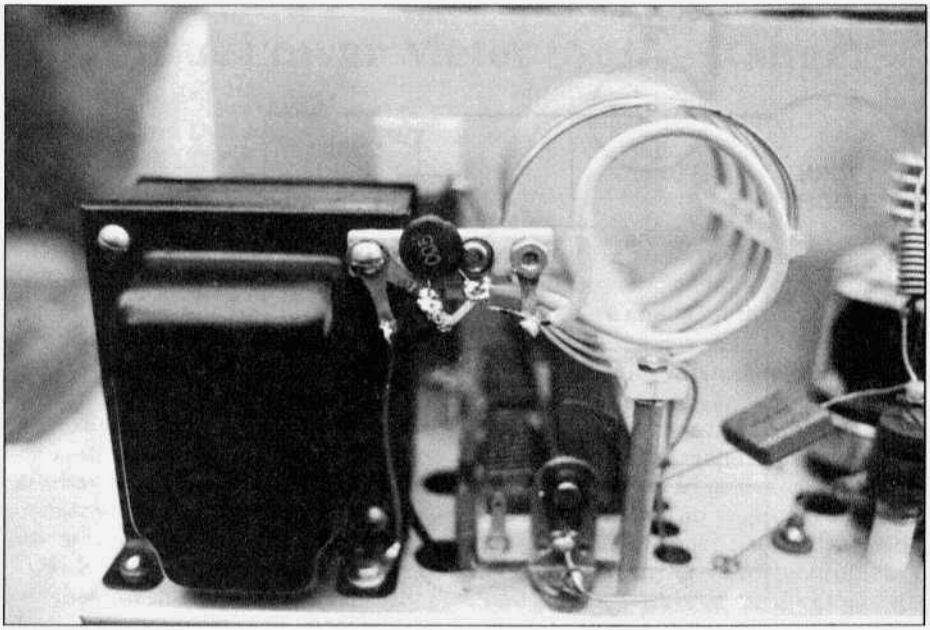

Figure 2. The RF pickup loop has a diameter of 2 inches and is spaced one-half inch from the end of the tank coil.

Figure 3. The Front panel of the modified Ranger. Note the new controls—Carrier Level and Cal.

black paint on the choke. Since these parts were located in the high RF area, I thought it best to connect the Cal. pot using miniature coax.

Now where to put the Cal. pot or can I just eliminate it and use two fixed resistors? It was determined that yes two fixed resistors could be used but the trade-off is the meter will vary 2 to 3 small divisions at full power/full scale between tune-ups. This was fine for a single frequency operation but this circuit is frequency sensitive demanding a variable calibration control and I wanted high accuracy. Next question, where do I put it on the front panel without drilling a new hole? Remember the crystal door/knob was used for the Carrier Level control. There is one place left as seen in the partial front panel photo Figure 3. The upper left red jewel (D9A) is just for looks and never was a functional lamp on the Ranger unlike its use on the Valiant.

Now the trick was to remove the VFO cover and extract the jewel. Fortunately this can be done without removing the front panel again. The Cal. pot fits very well, behind the panel with its shaft extending through the VFO cover. The knob was painted with automotive paint (Dupli-Color #DS-100) and matches the other knobs well. Final checkout of this new circuit proved very successful. The basic meter movement sensitivity is a non-factor. In fact this circuit has the capability to drive 5 times the stock value. The Cal. pot will set the meter to full scale from 160 to 10 meters at full output power. For each band used, a calibration chart will have to be produced like the one shown here for 40 meters.

The new meter function performs very well. It is calibrated to directly read the RF output of the transmitter and the power drawn is insignificant to the final with no adverse effects. It has become very handy and eliminated the need for a wattmeter in between the transmitter and amplifier. When driving the SB-220, I just tune the rig as normal for maximum AM output, set the Cal. to full scale then rotate the Carrier Level control until the meter reads between 60 and 80 on the top scale or 7 to 10 watts drive.

This will yield a resting carrier of 120 watts from the SB-220. It's also fun to run barefoot and tell others "I'm running 15 watts output today from the Ranger". Surprisingly enough in the MD, VA, PA, and OH area I often only need this low level of power for good effective communications. Bowie Bill, WC3K has offered a 2 pole 27 pos rotary switch for my meter function. Just think of the possibilities!

A calibration was performed using the top scale of the meter against the Bird 43.

The following information was recorded using 7295 kHz. ER

Bird 43	Meter Reading
55 watts	200 mA = FS
50	190
40	170
30	140
20	115
10	80
5	50

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

Communications SSB to Quality AM Using Audio Feedback

by Robert Burger, WB6VMI
11290 Sprig Ct.
Keno, OR 97627

Introduction

Audio feedback is used in a new way below to convert an older SSB transmitter into an AM transmitter with good audio. Any SSB transmitter can send AM via carrier injection at the transmitter. Unfortunately, they contain filters in the modulator that decrease the audio quality. Additionally, since modulation is low level, the power amplifiers can have distortion.

Our approach is to remove all filters from the modulator, leaving a double sideband (DSB) system. To overcome imperfect modulators and the inevitable lack of linearity in power amplifiers, this paper recommends audio feedback taken from the transmitted signal.

The main purpose of this article is to suggest solutions to technical issues that arise when using feedback to linearize transmitted audio. As an example, we have data for a 1965 TMC Model GPT-10K transmitting set in double sideband AM mode.

The Quest for Good Audio

With amateur radio leading the way, national and international broadcast AM could someday go to suppressed carrier systems that are capable of high fidelity. The goal is to make SSB sound as good as or better than the best AM.

For the moment this cannot happen because there is a vast sound difference between AM and SSB. This is especially true when hearing AM on a well adjusted AM receiver compared to SSB on a properly tuned SSB receiver. AM, when given a favorable mix of presence and emphasis can be extremely exciting. The voice contains a wealth of nonverbal information that is most obvious when audio distortion is very low.

Most SSB transceivers have an AM position that nearly every radio amateur will try at one time or another. If adjusted correctly, the AM from a SSB transceiver can be quite good, although it is seldom wonderful. For example, my Swan 500 has good AM, although it has major audio restrictions. Recently, there is interest among amateurs to correct the audio in SSB systems, WC3K for example presented the conversion of a nice old SSB rig, the SB-400 into AM [Ref 1].

Step 1: Remove all Audio, Carrier and Sideband Filters

After removing the carrier rejection filter and the sideband filter, what remains is DSB. A balanced modulator greatly attenuates the carrier. To achieve AM, the carrier has to be reinserted at the correct level. The correct level is best determined by viewing the modulated envelope with an oscilloscope to ensure that the carrier is never completely cut off (overmodulated).

Speech amplifiers should be flat in the audio range of interest and beyond. This is achieved by paying attention to coupling capacitors and transformers (they must be large to pass the low frequencies). Also, one must pay attention to bypass capacitors (they must be small to maintain the high frequencies) but not so small that RF creeps into the audio chain.

Creating broadband audio in the sense of constant audio amplitude from 20 to 20 kHz for example, is quite possible. The challenge, it is found, is to create a phase that is zero over a broad range. If phase shift in the voice range is not close to zero, audio feedback will not function properly (as explained below).

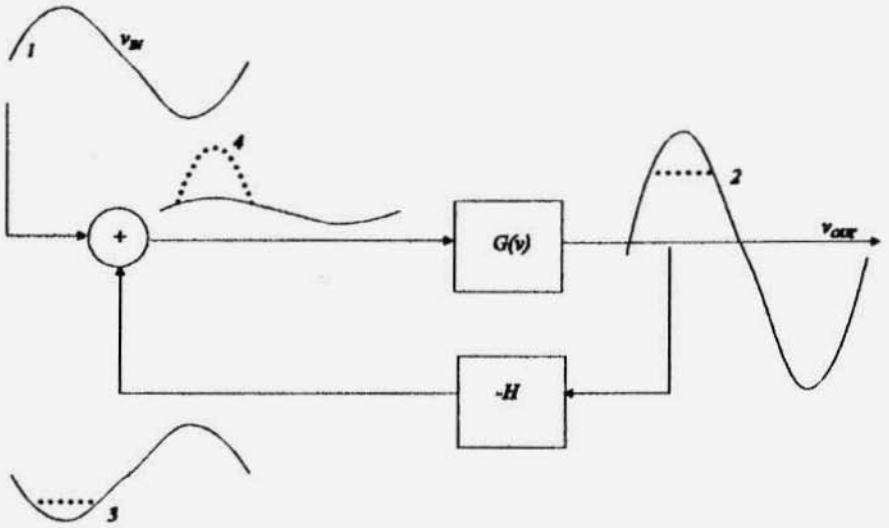

Figure 1. Automatic feedback correction of distortion

Step 2: Introducing Audio Feedback
Why Do It?

We know from decades of radio handbook experience that audio feedback can reduce distortion. The fact that it also extends bandwidth does not concern us as much since we plan to extend bandwidth by removing filters as above. In the old handbooks, the audio signal is taken from the output of a large AM modulation transformer and is fed "back" to the cathode of one of the audio preamplifiers. K6AD and W6BM provide examples of using audio feedback in plate modulated AM transmitters [2,3]. Alternately, W6BM linearizes a screen grid modulator with audio feedback [4]. WB6VMI studied a system to measure distortion in AM transmitters that have audio feedback [5].

Figure 1 illustrates a basic feedback model. "G" represents the net voltage gain of the main system; "N" represents the voltage gain of the feedback. Note that the output of the system is subtracted from the input to achieve a closed loop. Mathematically in a linear system, the output depends on the input according to the following equation:

$$v_{OUT} = v_{IN} \frac{G}{1+GH}$$

As the magnitude of the variable H is brought from 0 to a positive value, the amplitude of Vout will decrease. According to the equation, the output will not depend on distortion generated in G if the product GH is more than 1. In fact, if GH >> 1, we can ignore the 1, and we have Vout = VIN/H. GH is open loop gain.

The amount of feedback can be defined to be the ratio of Vout when H = 0, to vout when H is set at some value. We measure feedback (FB) in decibels:

$$FB = 20\log\frac{G}{\frac{G}{1+GH}} = 20\log(1+GH)$$

For example, 10 dB of feedback means that the voter with feedback is about 1/3 of the vout without feedback (when H = 0).

Figure 1 illustrates how feedback reduces distortion. If, for example, the output tends to saturate on a positive peak (refer to point 2), then the output positive amplitude does not go as high as it should, When this part of the wave is subtracted from the input (1), a correction signal is created in the differ-

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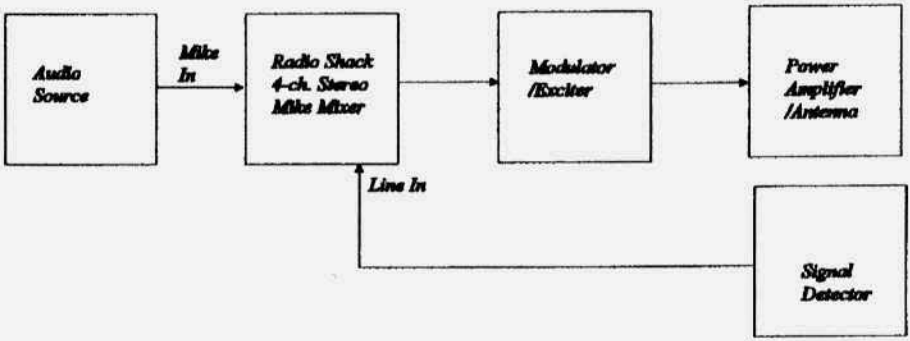

Figure 2. Practical system of audio feedback

ence (4) that tries to push the positive peak up where it belongs. Thus, feedback tends to force the output waveform to be identical to the input waveform (1).

The figure illustrates no phase shift in either G. That is, each wave crosses zero at the same instant. In a practical system of electronic components, when the loop is opened at point 3, waveform (3) could lead the input waveform (1) in time (that is, it is to the left of waveform (3) on the oscilloscope). This is defined here to be positive phase shift. If waveform (3) lags the input in time, it is negative phase shift.

Feedback via a closed loop works best when there is no phase shift. However, simulations (using Matlab Simulink) indicate that feedback results in less distortion even when there is significant phase shift.

When phase shift is severe in the audio range, approaching 180 degrees for example, the allowed amount of feedback is greatly reduced. Under such conditions, attempting to use feedback beyond some small amount causes "instability." Instability means that the output of the system no longer follows the input to the system; hence, instability defeats the purpose of having feedback. When properly adjusted, however, the drawbacks of having to adjust feedback (and then not changing it) are outweighed by the advantages of system linearization.

When feedback exceeds what is allowed, it will result in instability; the most common result is oscillation at some frequency.

The Allowed Amount of Feedback?

The best way to explain feedback is to consider a practical example. My TMC transmitter can be viewed at (http://www.geocities.com/vintagetmc/robgpt10kpic.html) Figure 2 shows a practical feedback system.

The Radio Shack mixer is a convenience. The mic input amplifies by a factor of about -1.8; the line input attenuates by about +0.025. The plan is to connect the signal detector into a line input.

The diode detector in Figure 3 was constructed by hand. The tuned circuit was constructed in a separate plastic box to be placed several centimeters from the final tank coil. The purpose of the 1.5V battery is to ensure that the diode conducts all the way down to zero voltage output. Normally the diode would stop conducting at a voltage of about 0.75V, creating a flat bottom on the negative audio peaks.

In my system at 300 watts of RF power, assuming the detector head in a given location, the detector contributes about 15V peak to peak of sinewave when the audio to a mic input is set to 0.1V. This gives close to 100 % modulation of the carrier.

The mic input amplifies by a factor of about -1.8 as determined with each chan-

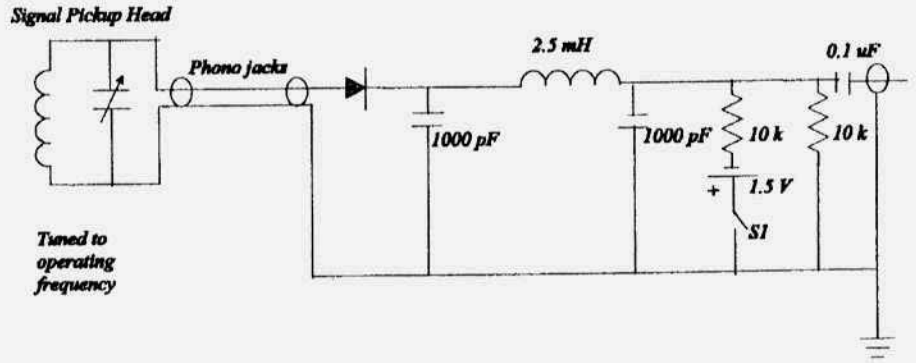

Figure 3. Audio Detector

nel at its maximum setting; the line input attenuates by about +0.025. From the above information, the open loop gain, that is GH, can be estimated to be about 2 (the input is 0.1V x 1.8; the output is 15V x 0.025; relative to the output of the mixer, loop gain GH is 2.08). Thus, the amount of feedback using these numbers is about 9.5 dB.

Using the oscilloscope and the audio generator to measure gain and phase, Figure 4 resulted. In LSB mode, the phase varies radically because of the filters. In DSB mode with the filters removed, the phase variations are gentler in the audio range between 2 x 10(2) and 3 x10(3) Hz because of removing the carrier and sideband filters.

The condition for feedback stability is that the loop gain must be less than unity when the phase shift is plus or minus 180 degrees. This is because a phase shift of 180 degrees in a negative feedback loop is equivalent to "positive" feedback. With positive feedback and gain more than one, a system is unstable. In fact, the figure suggests that my TMC system is unstable, because at -180 degrees shift the open loop gain is slightly more than unity. The loop gain will have to be reduced slightly.

When a system is unstable, it can oscillate at that particular frequency where the phase shift is 180 degrees.

Experimental Results

Figure 4 indicates that the phase shift is -180 degrees at about 10 kHz. At this point the gain is slightly above unity, so the system is unstable. Indeed, in practice we observed audio oscillations at about 10 kHz. The oscillations drive the transmitter to maximum output, so it is wise to minimize the time during which such oscillations are allowed to occur.

In DSB mode, by using the mixer to decrease the feedback, it is found that the audio in the modulated envelope is stable at a peak to peak level of 4 units. When the mixer decreases the feedback to zero, the audio in the modulated envelope is 10 units. The ratio of 10/4 amounts to about 8 dB of feedback, which quite close to the predicted 9.5 dB from the above analysis. Eight decibels results in a stable system.

Because of the excessive phase shift, the LSB system cannot tolerate feedback. Indeed, distortion of audio input and a tendency to oscillate was observed.

Conclusions

The DSB system of AM from the TMC transmitter was improved by applying audio feedback up to about 8 dB. To achieve more feedback, it will be necessary to redesign the balanced modulator to give less phase shift.

The diode detector is quite effective in that no physical connection is required to the amplifier. A drawback is that the pickup box contains a tuned

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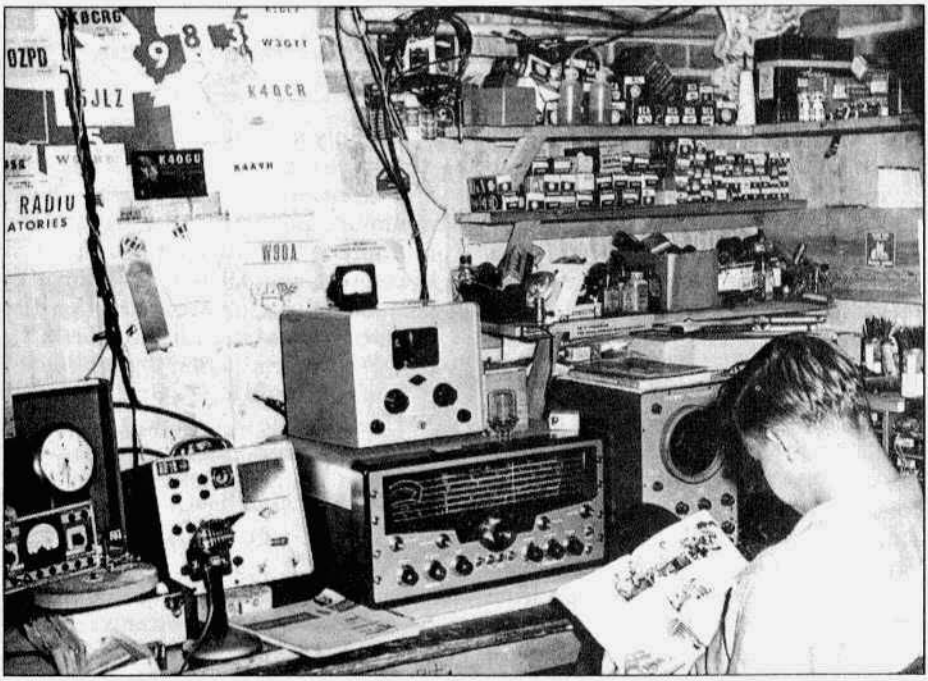
Photo by Andy Howard, WA4KCY.

Southeastern AM Radio Club Organized

We just finished the winter get together at my house today, December 30. The Southeastern AM Radio Club was organized in June of this year. We applied for and received a club call of W4AMI. The officers are: Andy Howard, WA4KCY, President; Sam Timberlake, KF4TXQ, Vice-President; Ron Johnson, WB4GWA, Callsign Trustee; Steve Waters, AE4IN, Secretary and Tom Hand, W4WDS, Treasurer. Presently we have 47 members and are continuing to grow through a continuous presence on the band operating AM and our Tuesday evening swap and fellowship net.

Members who attended the meeting and the luncheon are pictured as follows: Standing, left to right; Lou Duncan, K4MNY; Steve Waters, AE4IN; Johnny Thompson, WA4OGD; Gary Taylor, WB8BEM; Tom Hand, W4WDS; Sam Timberlake, KB4TXQ; Allen Cutts, N4OZI; Ron Johnson, WB4GWA and Wayne Banks, WB4WB. Sitting from left to right; Jimmy Brown, KQ4S; John Scarborough, KN4ME and Greg Carter, KX4R. Others attending but not pictured: Jim Olson, W4JO; Chuck Teeters, W4MEW; Don Flenner, W4YCH and Ray Eberly, W4OB.

Andrew E. Howard, Sr., WA4KCY
133 Cartbody Road
Carrollton, Georgia 30116
Web Page URL - www.wa4kcy.com



Jim Riff, K7SC, at his first station K9JSC in Chicago during 1958. Today he's still using the old Gonset on the 2M AM net in Phoenix Arizona. The net is on Tuesday nights at 7:30 PM MST, 144.425.

One of Kentucky's most active AM'ers, Toggy Toggweiler, KB4YST, in his hamshack.

2001 Winter Classic (& Homebrew) Radio Exchange

The Classic Radio Exchange ("CX") is a contest celebrating the older commercial and homebrew equipment that was the pride of our ham shacks and our bands just a few short decades ago. Our object is to encourage restoration, operation and enjoyment of this older equipment. A "Classic" radio is at least ten years old (age figured from first year of manufacture), but is NOT REQUIRED to participate in the Classic Exchange.

YOU MAY USE ANYTHING in the contest, although new gear is a distinct scoring liability. You can still work the "great ones" with your new equipment!

The Classic Exchange will run from 2000 UTC February 4 to 0500 UTC February 5, 2001 (3 PM EST to midnight EST Sunday). Exchange your name, RST, QTH (state US, province for Canada; country for DX), receiver and transmitter type (homebrew send final amp tube or transistor), and other interesting conversation.

The same station may be worked with different equipment combinations on each band and on each mode.

CW call "CQ CX;" phone call "CQ Classic Exchange." Nonparticipants may be worked for credit.

Suggested frequencies:

CW: 3.545, 7.045, 14.045, 21.135, 28.180

Novice/Tech Plus: 3.695, 7.120, 21.135, 28.180

Phone: 3.880, 7.290, 14.280, 21.380, 28.320

7.045 and 3.545 will probably be the most popular CX frequencies.

Scoring: Multiply total QSO's (all bands) by total number of different receivers plus transmitters (transceivers count as both xmtr and rcvr) plus states/provinces/countries worked on each band and mode.

Multiply that total by your CX Multiplier, the total years old of all receivers and transmitters used, three QSO's minimum per unit. For transceiver, multiply age by two. If equipment is homebrew, count it as a minimum of 25 years old unless actual construction date or date of its construction article (in the case of a "reproduction") is older.

Total QSO's all bands times RCVRs + XMTRs + states/provinces/countries (total each band and mode separately; add totals together) times CX Multiplier:

SCORE = QSO's x (Rx + Tx + QTH's) x CX Mult

Certificates and appropriate memorabilia are awarded every now and then for the highest score, the longest DX, exotic equipment, best excuses and other unusual achievements. Send logs, comments, anecdotes, pictures to Allan Stephens, 106 Bobolink Dr., Richmond, KY 40475.

Include TWO-stamp SASE for next CX Newsletter and announcement of next CX. E-mail reports may be sent to modsteph@acs.eku.edu (Al, N5AIT).

Classic Exchange Logger

The Classic Exchange Logger program by K8NU logs your contacts with very easy entry of the information, and it computes your score and prints your log with the click of a mouse. There are fields for call, name, QTH, RST, and receiver and transmitter. These equipment fields are combo boxes ("pop-ups"). They're pre-programmed with hundreds of receivers and transmitters. You can type the first part of the rig's name, you can pick the name from a list, or you can enter a rig that is not already on the list. Band and mode are also on combo boxes, as are your receivers and

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VINTAGE NETS

Arizona 40M AM Group: Meets on 7293 kHz at 10:00 AM MST (1700 UTC) on Sat. and Sun.
West Coast AM Net meets Wednesdays 9PM Pacific on or about 3870kc. Net control alternates between John, W6MIT and Ken, K6CJA.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3860 +/-
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net controls are Andy, WA4KCY and Sam, KF4TXQ. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours.
Arizona AM Net: Sundays at 3 PM MT on 3855. On 6 meters (50.4) at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0500 ET on 3885 + or - QRM.
Westcoast Military Radio Collectors Net: Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. http://www.crompton.com/grayhair
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet on Tuesday nights on 3805 at 2100 Eastern and on Thursday nights on 3875. West Coast 75M net that takes place on 3895 at 2000 Pacific Time.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Collins Collector Association Monthly AM Night: The first Wed. of each month on 3885 kHz starting at 2000 CST (0200 UTC).
Drake Users Net: This group gets together on 3865 Tuesday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, W8NS; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. NC is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745.
Midwest Classic Radio Net: Sat. mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.
Boatanchors CW Group: Meets nightly at 0200Z-0300Z on 3578-80 kHz. During the day at 7050 or 7147. Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the second Sunday of every month on 7.175 +/- 25 kHz at 1900Z (3760 +/- 25 kHz alternate). Net control is Dave, VA3ORP.
Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22.00 UTC on 7220. Net control is Dennis, VE7DH.
Nets that are underlined are new or have changed times or frequency since the last issue.

160M AM for the Heathkit DX-60

by Bill Breshears, WC3K
6303 Homestake Place
Bowie, MD 20720
bbuck@ccconline.net

There was a time in the 1950s - 60s when the 160 meter band was fragmented with navigation services and operating constraints that rendered it almost useless as an amateur band. So much so that many of the favorite boatanchor transmitters of the era don't even have 160 meters on the bandswitch. The Heathkit DX-60 is one of those.

The 160 meter band has become one of the bands used for AM operation principally around a frequency of 1.885 mHz. One reason is that hams are obtaining and restoring majestic old broadcast transmitters that are readily converted to 160 meters operation. Justifiably some have begun to call them "Tall Ships". While I don't have one yet, I figured it would be fun to give 160 meters a try. My trusty Heathkit DX-60 and linear amplifier combination would give me a creditable AM signal on the band with an added kick of irony, a "Lil' Green Submarine" amongst the "Tall Ships". My original intent was to temporarily tack in a few components, have a few contacts, and as the highlight participate in the First Annual AMI/Electric Radio Heavy Metal Rally and QSO Party. I even considered modifying a DX-60 dedicated to 160. However, as often happens, this project soon took on a life of its own. A closer look at the band switch revealed 160 could be added without too much additional trouble if one is at ease with rebuilding bandswitches. The article describes how to add 160 to your DX-60 and also details a way to modify or repair wafer switch contacts that works for other projects as well.

The 160M Modification

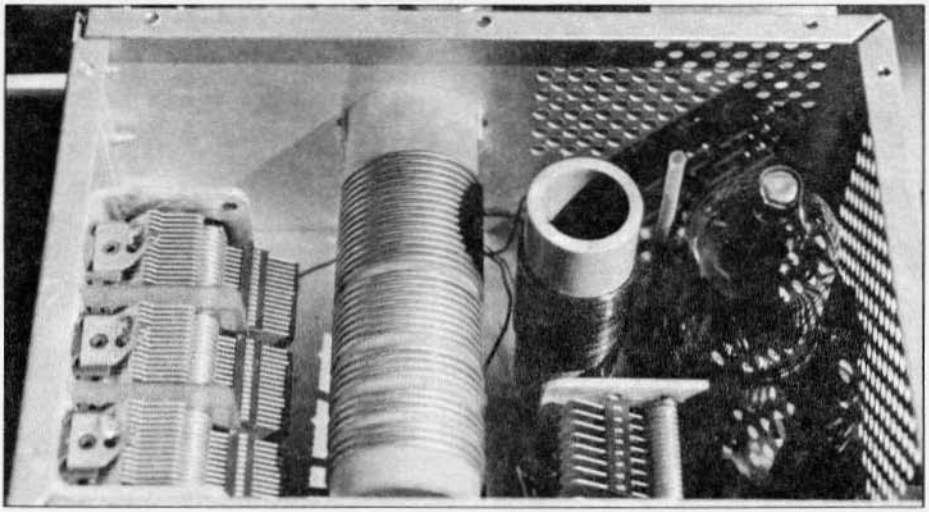
The basic modification is straight forward and consists of adding another BAND switch position, located one position counterclockwise below the "80" position the logical place for "160" to be. In this new position additional components to make the 6146 grid and plate circuits tune 160 meters are added. The modifications needed are shown by the abbreviated DX-60 schematic.

The Grid Circuit

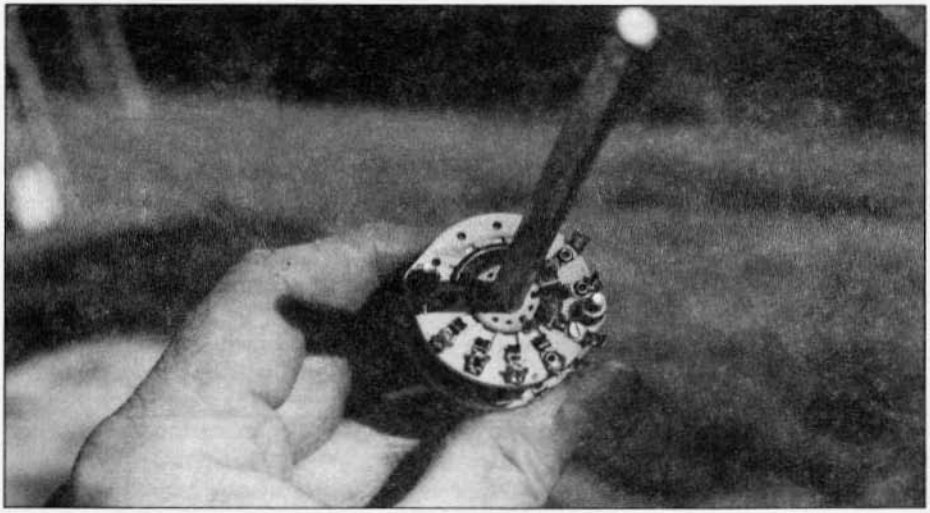
The grid tuning circuit has a very high L to C ratio. The existing 80 meter coil inductance measures approximately 60 uH. This fortunate situation accommodates adding mica capacitors of a total value between 80 and 100 pFd, 400 v, to allow the 80 meter coil and existing variable to tune about half of the 160 meter band. The actual capacitance depends on which part of 160 your operations favor and is very sensitive as to its final value to get it within range of the variable capacitor. This will allow tuning the 1.885 MHz AM channel. If you are 'techno-compulsive' like I seem to be, and want the entire band, replace the Heathkit 21 pFd grid variable with a 50 pFd variable capacitor. It will just fit. The added fixed micas are switched into the circuit by a new switch position/contact (actually two contacts) added to the grid coil band switch section.

The Plate Tank Coil

The final plate pi network circuit 80 meter coil (14.7 uH) does not have enough inductance to work well on 160. Another 16 uH is added in series with



DX-60 RF enclosure showing the location of the added coil for 160 meters.



Typical switch section showing an added contact terminal on the right.

the existing coil. See the coil construction details and photo. The new coil is located as far away from metal surfaces as the available space will allow. It is, as pictured midway between the existing coil, the variable capacitor, and the 6146. Double sided foam tape secures the bottom end of the coil form to the chassis. The leads provide additional support. The output end of the original tank coil has a loop formed in the lead to serve as a connection point for the output capacitor and the lo-pass filter. Unsolder both and solder the top lead of the new coil to the loop. A little tough to access, however a solder gun or pencil iron does reach when the 6146 is removed. Solder the short folded tinned bottom lead of the new coil together with the output variable capacitor and filter leads. Dress the remaining long bottom coil lead through the chassis

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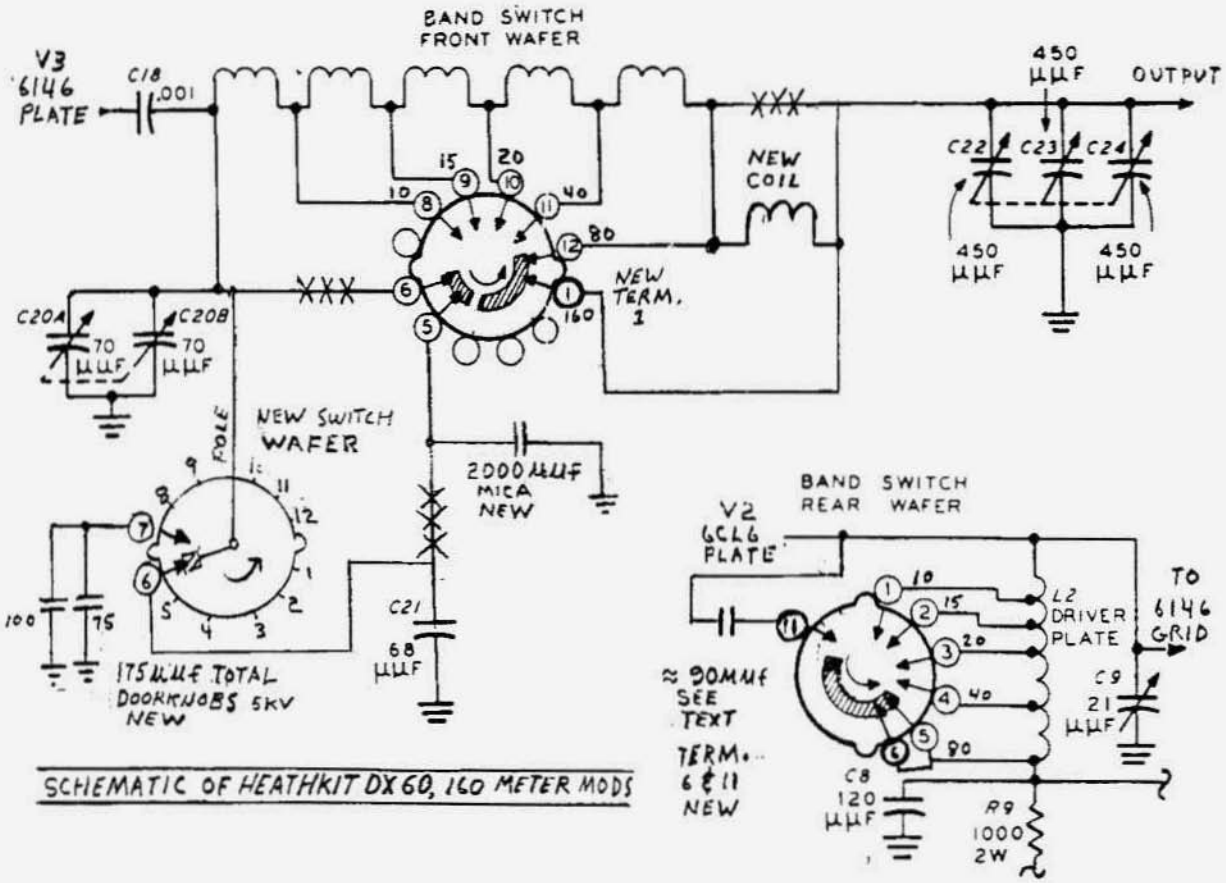
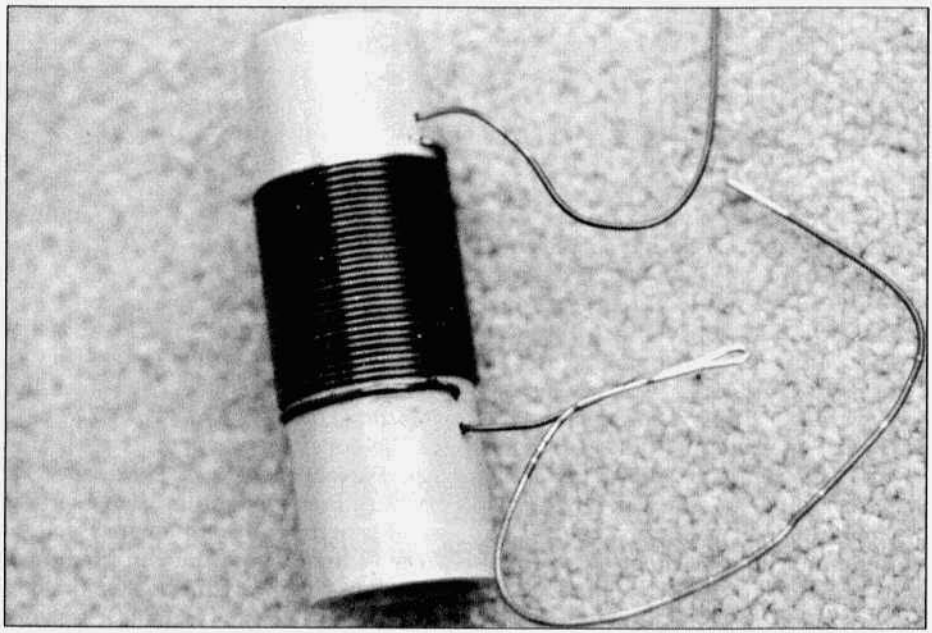


SCHEMATIC OF HEATHKIT DX 60, 160 METER MODS



160M coil ready for installation into the DX-60

Coil Construction Details

Thirty, close spaced, turns of #18 enameled copper wire are wound on a 3-1/4 inch long piece of 1-1/16 inch (measured OD) PVC conduit. 12 feet of wire will easily do it. The winding takes 1-5/16 inch in length and is spaced in the middle of the form with two anchor holes on each end of the winding. Top pigtail is trimmed to 3 inches long. Bottom pigtail is trimmed to 9 inches long, then doubled back as shown to create a 1-3/4 inch short section as well as a longer piece. All three ends are tinned. The coil winding is coated with coil dope, epoxy or clear fingernail polish.

opening for connection to the new contact #1 of the band switch.

The Plate Tank Capacitors

Additional capacitance, (175 pFd), is added in parallel with the 6146 plate variable capacitor in the 160 meter switch position. Most ceramic caps made today will not handle the RF current and there is 800V plate voltage so 500V micas are not suitable either. Two doorknobs (100 pFd, 5 kv and 75 pFd, 7.5 kv, Fair Radio Sales) in parallel works well with plenty of margin. These are added when in the 160 position by a new wafer to the band switch. The plate capacitor stator is removed from its old switch connection and moved to the new switch pole connection. Note that when the BAND switch is in the 80 position this same new wafer adds the existing 68 pFd padder to the plate variable capacitor.

A 2000 pFd, 400V min, mica capacitor is added in parallel with the three section output capacitor when in the 160 meter switch position. It uses the switch position vacated by the above 68 pFd cap, terminal 5, of the old bandswitch section.

Bandswitch Modifications

The remaining section gives details necessary to add the new 160 position

continued next page

on BAND switch, one detent, counterclockwise, below the 80 position. After the changes all other BAND switch positions will perform as usual.

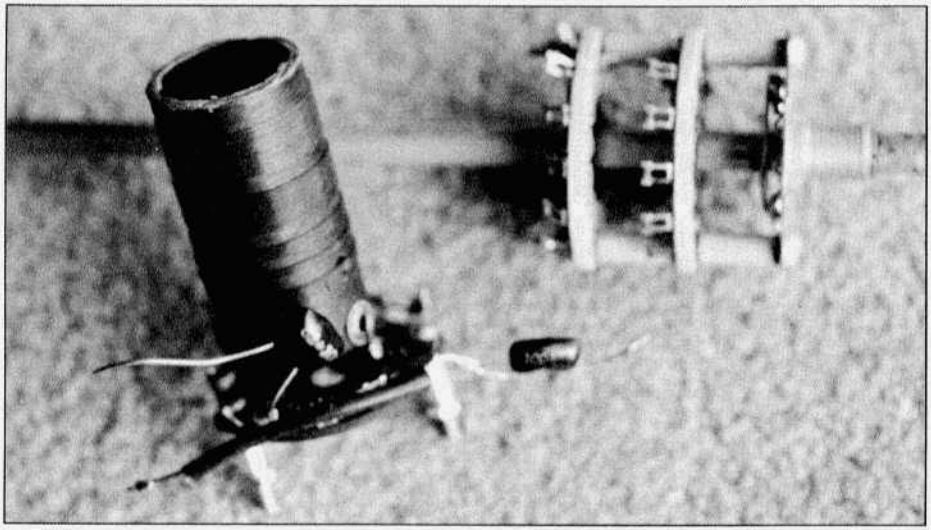
The most difficult part of this change is the modification to the bandswitch. However with the information presented here it is really easy once a suitable switch section is located in the junk box or hamfest swap meet. Obtain a surplus rotary switch with at least one 1 1/4 inch diameter wafer section (30 degree, 12 position detent spacing). A single pole, 12 position, wafer is easiest to use. Either fiber or ceramic wafers will work. A switch with at least 4 of those 7/16 inch wafer divider spacers will be handy and if your switch is ceramic, fiber washers are needed at each ceramic interface to prevent stress cracking. The original Heathkit switch is a Centralab manufactured unit, however the specs are standard and many others will work. Another important item is a source of tiny 1.6 mm, 6 mm long, metric screws together with their tiny nuts and washers. Only three of each will be needed, however I lost at least another three to that 'Hungry Monster' that eats such things that are dropped and roll under the workbench. The local neighborhood hardware store (not Big Home store) had them in a display labeled "Serv-A-Lite" (a display collection of yellow trays) under "Metric Miniature Machine Screws". I was told they are widely available. Hobby/model shops also carry small hardware that is suitable.

Removing the Bandswitch

The bandswitch must be removed for rebuild. For ease in proper reassembly position the BAND switch to 80 and leave it there. Make a sketch and mark the wires on the front ceramic switch section, and carefully unsolder at each of the 7 switch terminals.

The grid coil, its fiber switch section, and mica cap are first removed as a unit. Free the assembly by unsoldering only the following three points: 1. The wire attached at the grid tuning capacitor stator. 2. The lead from the 100 pFd cap at the terminal strip. 3. The bundle of three wires (neutralize wire, 1000 ohm 2 watt, mica cap) as a unit from terminal 5 of the switch wafer. This allows the coil assembly to be removed by sliding it back off the switch shaft when the two nuts mounting it to the shield are removed. Be very careful and don't force or damage will occur to the sliding contacts. Ol' Bills, heavy handed, 'give it a whack', approach resulted in a rebuild of the section. Also make a note of the coil orientation for reassembly use. Ease of removal depends on how careful the original builder was in assembly of the coil on the switch section. When I finally got mine out I removed about 1/4 inch off the top of the coil form with a hacksaw to make it easier to reassemble. Two new contacts must be added at position 6 and position 11. However set this aside until a little more practice is obtained on the easier to access tank circuit switch mods as follows:

Remove the band switch by removing the shaft nut on the front panel, sliding the switch back and lifting the front free of the chassis. By inspection the workings of the switch can be seen. Note certain standards apply, if the switch is in its full ccw position (80) a little half hole on the rotor disk appears just to the left of one of the shaft 'flats' as viewed from the shaft end and is the index used to assemble all other sections on the shaft. This index is now resting between switch position terminals 9 and 10 of the possible 12 total, from this reference, mark all from 1 through 12. The two long, switch section support, screws will be 90 degrees from that index between 12 and 1, and between 6 and 7. Pencil index marks might also help in putting this switch back together after rework. Not all positions have switch contacts. This modi-



The modified DX-60 bandswitch and grid coil assembly prior to installation.

fication requires addition of a contact in position 1 on this wafer and addition of another wafer between the existing one and the front panel.

Adding Switch Contacts

A total of three loose switch contact terminals will be needed and can be removed from a spare wafer. If you have only one new wafer, make sure the three terminals necessary to have closures when it is in switch position #6 (80) and #7 (160) are retained. Any others may be removed for use by drilling the rivet, on the thinner, contact side, with a sharp 1/16 inch drill. Don't use the drill bit you used on those steel chassis. A conical burr in the Dremel tool is even better. The idea is to just cut the rivet. Use a gentle touch, I still lose about 1 in 6. Push the rivet out with an ice pick type point. Handle carefully to preserve a tight contacting grip.

Add one of the freed switch contact terminals to position #1 of the existing plate coil switch wafer using a 1.6 mm screw. The head of the screw is on the terminal side. Secure with washer and nut, don't over tighten or the ceramic may crack later from stresses. Lock the nut with a wee drop of epoxy or finger nail polish (Locktite?) on the nut side.

Now that you are expert, add two contact terminals to the grid coil switch assembly in position 6 and 11. Solder a short jumper between terminals 5 and 6. Also solder an 80 pFd mica capacitor to terminal 11, leave enough lead to allow shunting it with other small values. Later the remaining end will be soldered to the variable cap stator. This will allow the switch pole to add the capacitor across the coil when in the new 160 position.

Add a New Switch Wafer

Add the switch wafer that will close a contact when in position 6 (80) and 7 (160) between the plate tank capacitor and the 68 pFd or 175 pFd doorknobs respectively. If you have four 7/16 in. long spacers it is easy, otherwise make four out of the long metal ones on the original switch with a hack saw. When you reassemble the switch place extra fiber washers under the end nuts or sections to assure the RF gap on switch contacts is not too close to ground. (Where is that ugly red Glyptol I saved from 1950?)

Switch Stop

A stop prevents the rotor from mov-

continued on page 41

A Two-Band Five-Tube Superheterodyne

by Michael Janis, KE3OQ / VE4EW
149 Silo Circle
Nazareth, PA 18064

This receiver was first described in QST for January 1953 with later improvements published in the December issue. The design made it to the ARRL handbook and it was featured for several years in the mid to late 1950's handbooks.

It is an 80 / 40 meter double conversion receiver with the first converter VFO operating over a frequency range on 5.2 to 5.7 Mcs providing an initial IF of 1700 KC. A second mixer utilizing a 1600 KC crystal oscillator converts the first IF to 100 KC and a 6SN7 regenerative detector operating at 100 KC and 2 stages of audio amplification using another 6SN7 complete the signal flow.

The tubes used in the Handbook version included the following:

6AC7- First Mixer
6C4- VFO
6K8- Second Converter
6SN7- 100 KC Regenerative Detector and BFO
6SN7- Audio Amplifier

In 1958, I purchased my first ARRL Handbook and the design impressed me. I had already built a battery operated regen receiver using No 30 tubes from Alfred Morgan's book, "The Boy's First Book of Radio" and home made versions of Allied Radio's "Ocean Hopper" and "Space Spanner" using parts scrounged from defunct broadcast receivers and the circuits published in "Popular Electronics" magazine. I also had built a regen receiver using 2 - 6AQ5's from another ARRL publication "How to Become a Radio Amateur". This was to be my next project in 1958.

I obtained many parts from old radios and made my own chassis from salvage yard aluminum scraps. The IF transformers, coil forms, audio choke and miniductor stock were bought from Allied Radio in Chicago. The dial was made from parts from an old RCA broadcast receiver that was also the donor for the power transformer and knobs.

I remember the night it was ready for the test. I plugged it in and I was rewarded with a loud hum. I spent the next two weeks trying to eliminate the buzz to no avail. I wrote the ARRL in desperation. The reply came back to check the filament leads to the audio amplifier and move them away from the grid input. I did this and used shielded wire for the grid feed and the hum disappeared.

I subsequently built a signal generator for alignment and a signal tracer for troubleshooting, all from scrap components. By mid 1959, the project was completed to the best of my ability at the time.

The receiver was used for several years but was never too sensitive and always needed a good antenna. I still have it and want to restore it. I welcome any comments from others that also built and operated this circuit and may have suggestions for improvement. I attach the schematic and some photos. ER

The author in his hamshack with his homebrew superhet receiver and power supply.

A view of the front panet.

more photo next page

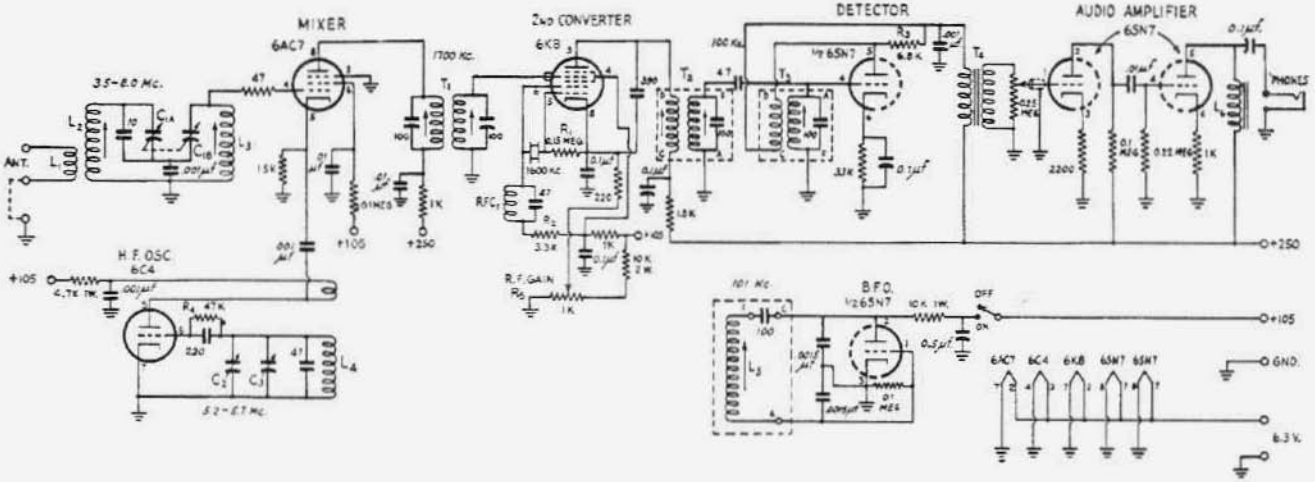


Fig. 5-34 — Wiring diagram of the five-tube receiver.

All capacitances in μμf. unless specified otherwise. All resistors ½-watt unless specified otherwise.

C_1 — 140-μμf.-per-section dual variable (Hammarlund MCD-140-M).

C_2 — 35-μμf. midget variable (Hammarlund HF-35).

C_3 — 100-μμf. midget variable (National PSR-100).

R_3 — 1000-ohm wire-wound potentiometer (Mallory A1MP).

L_1 — 8 turns No. 30 d.c.c. close-wound over ground end of L_2.

L_2, L_3 — 35 turns No. 30 d.c.c. close-wound on National AR-50 slug-tuned form.

L_4 — 23 turns No. 24 bare space-wound 32 turns per inch, ¾-inch diam. Tickler is 1¾ turns spaced 1 turn from L_4. See text. (Made from B & W 3008 Miniductor.)

L_5 — 20-mh. (approx.) slug-tuned coil (RCA 205R1).

L_6 — 20 henry, 15 ma. choke (Stancor C1515).

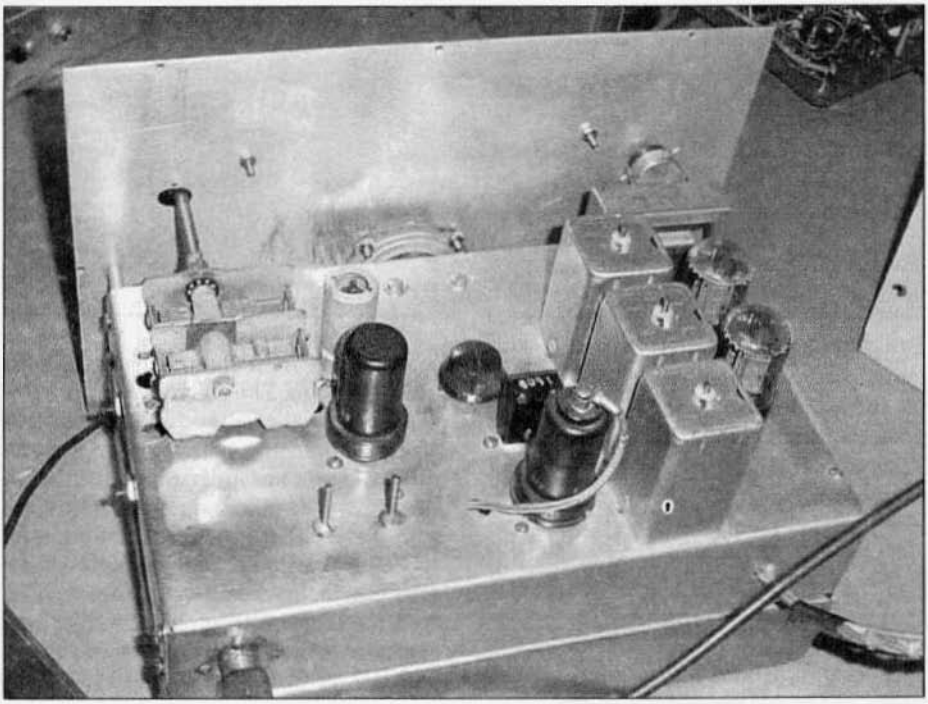
T_1 — 1700-kc. i.f. transformer (made from two Vari Loopsticks shunted by 100-μμf. mica capacitors. See text).

T_2, T_3 — 100-kc. transformers made from TV components (RCA 73576 or Merit TV-162). See text.

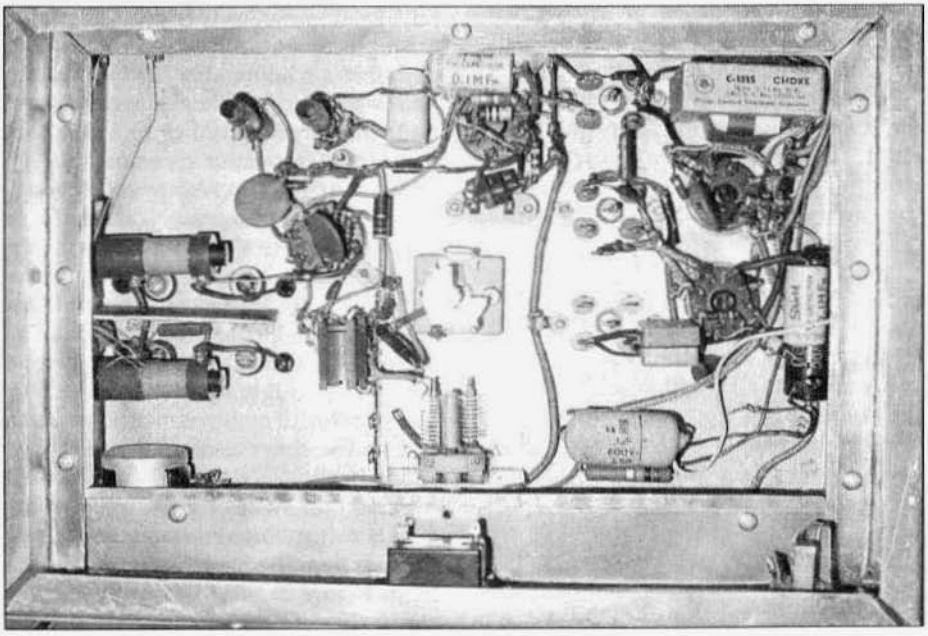
T_4 — Small 3:1 audio transformer (Stancor A-63-C).

RFC_1 — 750 μh. (National R-33).

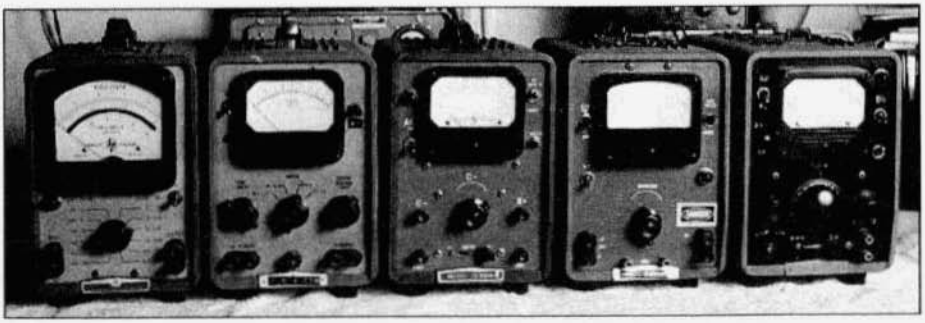
The 1600-kc. crystal is a Peterson Radio type Z-2.



Rear view



Underchassis view



HP400/415/Etc

by John Svoboda, W6MIT
2261 Peaceful Garden Way
Rescue, CA 95672

This is the HP400/415/ETC story. No, it's not the detailed history of the design, the struggles of the men, women(?) that went into these fine instruments of yesteryear. Rather is recognition of the sad state of affairs that many of these fine old friends face today. Today one finds many of these relegated to the space under the swap table, dirty, not priced, and considered nearly worthless and sometimes marked FREE. Admittedly, one can use only so many HP400's. I'd guess two is about all one can justify supporting. More than one HP415 is definitely hard to support since most of us don't do that type SWR measurements, as instructive as they are.

This could be a new requirement for 75 meters, that no one should be permitted to talk about SWR until they have had intimate relations with a HP415 and a slotted line, etc.

Although the HP400 and HP415 are the peers of this geometry, there are a few other models that appear in the same housings. Consider for a moment the endless list of testers that would have fit in those cases. It would be really interesting to get a list of rejected ideas from HP. Certainly, at the time, a little snobbery was in order, "HP means science no TV test stuff....

All these instruments have a common heritage. They usually sport a 0-1 mA, high quality meter, a very practical sized cabinet, and always, an assortment of switches and other stuff that is useful like double banana terminal assemblies. After stripping the chassis, flip over the panel and you will have a clean surface to design you new project. A little lacquer thinner, carefully applied, will remove unnecessary meter scales.

My "renewals" began with as a receiver for a remote field strength meter, it was later described in detail in the ARRL Antenna Compendium #3. Later my requirements turned to bench power supplies. An adjustable 12 volt, 10 amp, and a fixed 5V at 1 amp supply were built in a former factory test case that included a fan. Later an adjustable 125 to 300 v at 100 mA using a 6080 and a couple VR's was assembled. It also provides 6.3 and 12.6 vac at 6 amps. Later, a third supply was assembled to provide 450V at 200 mA and included a bonus of an adjustable bias supply. The internals for all these units are typical of what one might have in the junk box. Each is fully metered with multiple ranges and don't take up a lot of bench space.

Other "renewal" ideas might include a high voltage breakdown tester, a nice to have item to check out used components before installing them in the new rig. A direct reading capacitor checker with leakage measurement features

would be real handy. (A good circuit for the value measurement portion, using a duel NE555, can be found in the Editors & Engineers Handbook.). The leakage section is up to your design and found parts. And after all these years of doing it the hard way, put that Variac in a box with a good meter and few bonus features like 6.3 & 12.6VAC. How about a good battery charger? etc ,etc ,etc. ER

Military Radio Collectors Group Meeting 2001

Time to mark your calendars for the sixth annual meeting of the Military Radio Collectors Group (MRCG). The 2001 meeting will be held on the 4th and 5th of May at Camp San Luis Obispo, CA. Early birds start gathering the day before in the RV park, BTW.

Friday will be devoted to equipment setup, operating events and informal get-togethers at the NCO Club and the adjacent RV area. Those wishing to set up and operate may do so under their own calls. The swap meet starts Saturday (6 May) at sunup in the parking area adjacent to the Club, and the formal program will follow at 0900. A full program of speakers and demonstrations will be presented.

Pizza will be available Friday evening and a BBQ lunch is planned for Saturday.

Numerous examples of both vintage and modern equipment will be in operation and on display throughout the meet.

For more information contact Dennis DuVall, W7QHO (w7qho@aol.com); Trish Gibbons, WA6UBE (wa6ube@tactical-link.com); or Hank Brown, W6DJX (htbrown@earthlink.net).

Dennis DuVall, W7QHO

When I'm Gone Where Will My Stuff Go?

by Bud Larson, W7LNG
1325 Ridgeway
Medford, OR 97504

That's the question that wives and other relatives face when a collector dies. "Let the heirs worry about it; I won't be here."

Recently a radio collector died in Medford, Oregon leaving a house full, shed full, yard full, and an old ham shack full of various electronic goods collected over the last fifty plus years. Radios, working and not working, TVs, hi-fi's, tubes, books, radio magazines ('30s to present), boxes and drawers of capacitors, resistors, transistors, diodes, transformers, antennas, rolls of wire, heat-shrink tubing, hardware, test equipment, ham radios, and who knows what else littered the place.

Some of this went to the junk yard, some to the dump, some given away, the more usable items went into storage. There was just too much. This retired TV repairman was said to know where everything was. He would sell many surplus items for a reasonable price but kept some things for possible future use. He claimed it was just a hobby—not for profit. I'm sure that was right. He had a vast knowledge of electronics and freely shared it. We miss you, Dave.

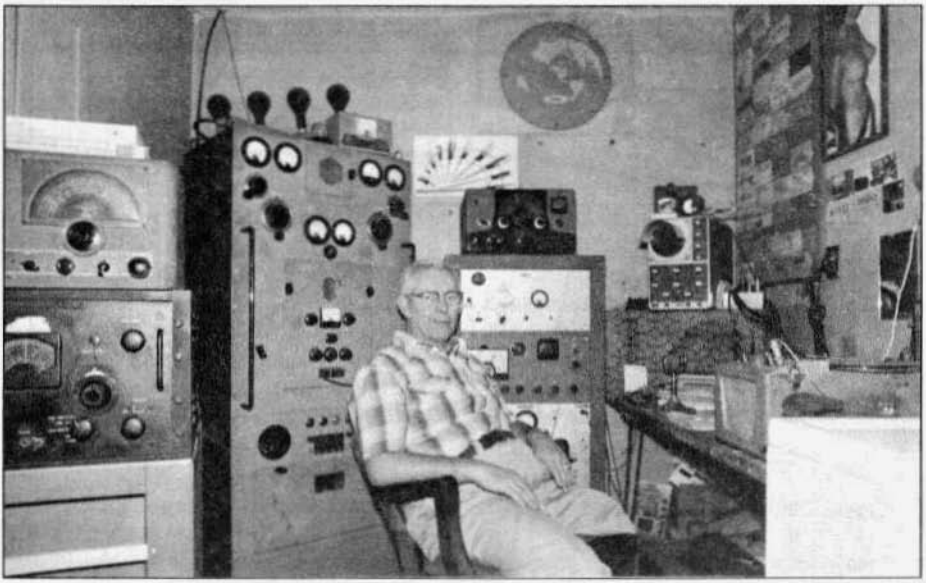
It took months to sort out the valuable, questionable, and worthless stuff. The house is empty now. Van Sias, K7VS, bought the estate and has a garage full of older test equipment, and some nice ham radios for sale. His phone number is (541) 779-0723 in Medford, Oregon. ER

K8MLV/Ø Photos

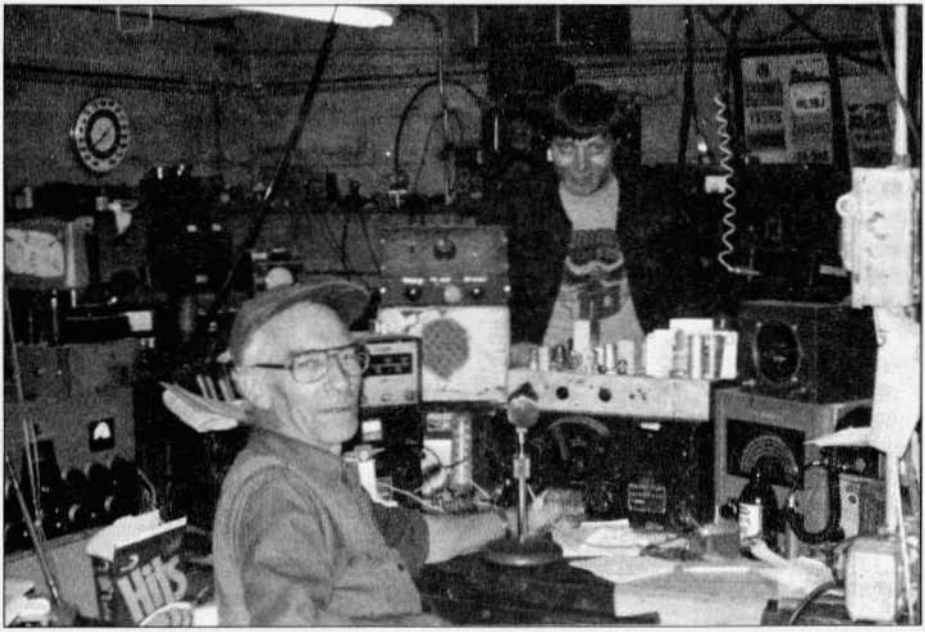
Earlier this year Rick Miczak, K8MLV/Ø (aka Ricardo) much beloved AM enthusiast passed away. Although he was only in his 50's at his passing, he was a true 'old timer' (I'm sure Rick would have appreciated me giving him this distinction).

Like a lot of us, Ricardo's best friends were his on-the-air AM'er friends and it's not surprising that he had accumulated a large photo archive of these hams when he died. Recently, I came in contact with Jim Shoemaker, WØNKL, who bought all of Rick's radio-related stuff. I inquired about Rick's logs and photos and Jim said that he had them and would send them out. For the next few month's I'll run a few of the photos in each issue. At some point I'll also talk about what I gleaned from the K8MLV/Ø logs. N6CSW

This is the earliest photo of 'Ozona Bob", W5PYT that I've seen. When this photo was taken his call was W5KDI. This photo must have been taken about 30 years ago. Bob passed away in 1998.



This is a photo of Les Lester, K6HQI who ran the 14.286 AM net for over 20 years. The homebrew transmitter behind him ran a pair of 833As modulated by 833As.The receiver he used and his yagi antenna were also homebrew. He passed away 5 or 6 years ago.



Here's an old photo of Ricardo and his good friend 'Ashtabula Bill', W8VYZ. It was taken about 20 years ago in Bill's hamshack.When K6HQI passed away Bill became net control on the 14.286 AM net.

SSB to Quality AM from page 15

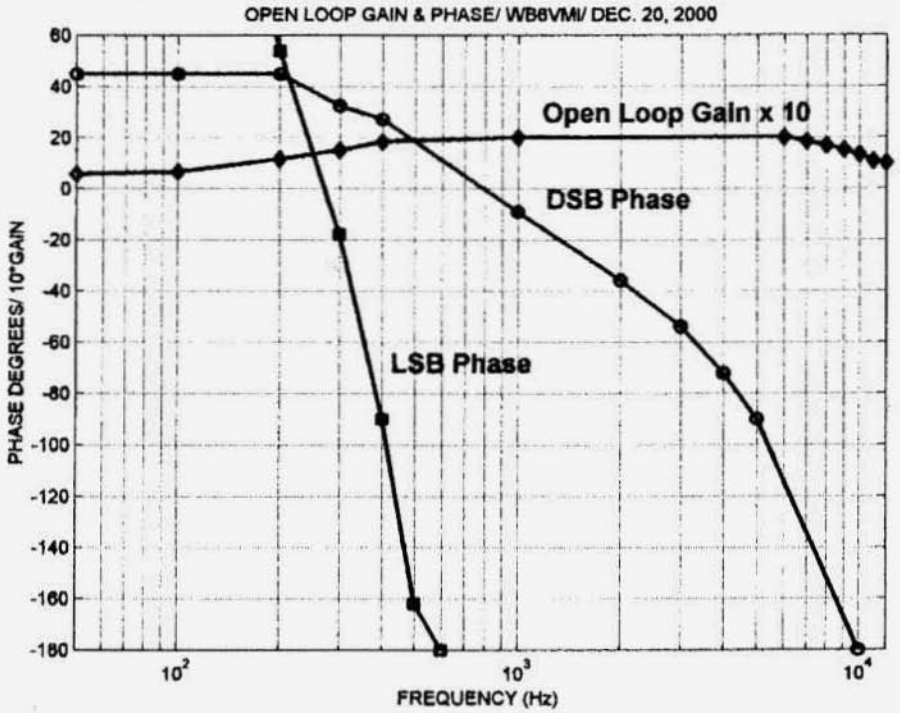


Figure 4. Open loop gain & phase

circuit, making it more difficult to change operating bands.

Any amateur could repeat the above experiments. The main equipment required is an audio oscillator and a dual channel oscilloscope.

The next step, as radio amateurs lead the way, is to experiment with DSB suppressed carrier systems that use audio feedback. We also need to find a better way for the public to receive such transmissions without having to set the frequency to ±1 Hz accuracy. If such experiments are successful, we will have a system of high fidelity that is superior to ordinary AM in terms of amplifier efficiency. On the horizon remains the problem of creating high fidelity SSB. ER

References

[I] ER 139, Dec. 2000
[21 ER 111, July 1998
[31 ER 24, April 1991
[4] ER 120, Dec. 1999
[5] ER 78, Oct. 1995

Exchange Logger from page 18

transmitters (you enter them in a "setup" dialog). There are buttons for working the same station again, viewing all QSOs with a particular station, and for editing or deleting a QSO.

Requirements: a modern Windows 9x/NT/ME/2000 PC with a monitor resolution of at least 800X600.

Price: free if I can send it by e-mail (one 3+ meg file or 4 separate approx. 1 meg e-mails). $5 if I have to snail-mail it.

73, Carl Yaffey, K8NU

Radio's First Voice...Canadian! from page 3

the position to Fessenden and he soon became chief tester. In this capacity he gained further knowledge and practical experience both inside and out as he was frequently called out as electrical 'trouble shooter'. Many wealthy men had their own private generating plants. A breakdown in the dynamo or fire in the wiring, as occurred at the mansion of financier J. Pierpont Morgan, meant a call for Fessenden to end the darkness.

Mr. Morgan was so pleased to have the power restored that he gave Fessenden a liberal reward for his services and asked him to inspect the wiring. The wires in use were bare and Fessenden suggested replacing them with wiring covered with rubber insulation and encased in galvanized tubing. He later improved on this principle in the Edison chemical laboratory.

When word of the skilled work that Fessenden was performing reached him, Mr. Edison told Mr. Kreusi, the plant foreman, that he needed Fessenden as his assistant to carry out experiments on generators and to develop a rubber insulation for conducting wires at the main Edison plant in New Jersey. The New Jersey plant was at the time considered to be the finest experimental laboratory in the world.

With access to a huge library and the use of all equipment in the Weston instruments building, Fessenden developed more inventions including some of his own. In 1890, after two years, he was elevated to the post of chief chemist. During this period he met men of great renown in the scientific world ... Lord Kelvin, Dr. Kennelly, George Westinghouse, the inventor of air brakes for trains.

Realizing his worth, Mr. Westinghouse offered Fessenden the position of supervisor of work on generators and the improvement of electric light bulbs in the laboratory of the Westinghouse plant at Newark, New Jersey, as well as his work at the Weston instrument plant. By designing new lead-in wires for the bulbs, Fessenden soon solved Mr. Westinghouse's problems enabling him to fulfill his contract to light the huge Columbian Exposition in Chicago.

After solving other urgent problems Fessenden visited England where, at Newcastle-on-Tyne, he observed the operation of the newly invented steam turbine of Charles Parsons. Fessenden remarked on the great possibilities of applying the steam turbine-electric drive to propel ships of all sizes.. another prediction which has come true.

On his return from England, Fessenden found a teaching appointment awaiting him at Purdue University in Lafayette, Indiana. As Professor Fessenden he was given a free hand by the University principal, Dr. Smart, to purchase all necessary equipment. He was thus enabled to conduct laboratory experiments furthering his cherished ambition, the development of sound vibration and transmitting sound without wires.

At the end of the school year Professor Fessenden, much to the regret of the trustees and students, decided to leave Purdue in order to devote all his time and energies to developing his own inventions. However, he received a letter from George Westinghouse with which was enclosed one thousand dollars, but with the stipulation that the Professor come to Pittsburgh. Accordingly, Fessenden, with his wife Helen and their only son, Reginald Kennelly Fessenden, moved to a fine comfortable home on the outskirts of Pittsburgh.

While engaged in further research, Fessenden developed and patented some of his own inventions, one of which, microphotography, is of great importance today and is used by banks and business concerns as well as libraries and other professional institutions throughout the world for 'mini-recording' of cheques, documents, etc.

continued next page

Following an impressive demonstration of his improved telegraph system to the United States Weather Bureau in Washington, Fessenden was employed at a salary of $3,000 yearly and furnished with a testing station and aerial masts at Cobb Island in the Potomac River. Bureau chief and officials were astounded when Fessenden transmitted his signals without wires from Cobb Island to Arlington, Virginia, a distance of 50 miles.

However, it was the transmission of speech, not "dots and dashes", which spurred Fessenden to greater effort. Toiling day and night, he cut almost microscopic incisions into a phonograph cylinder in order that his interrupter would break the circuit 10,000 times each second. At the first trials voice sounds were unintelligible, but after persistent effort Fessenden was rewarded by performing the first miracle of transmitting the human voice without wires even though it was over the short distance of one mile.

This historic first message was: "One, two, three, four. Is it snowing where you are Mr. Thiessen? If it is, telegraph back and let me know." So, at Cobb Island on December 23rd, 1900, for the first time in the world's history, intelligible speech was transmitted by electromagnetic waves. Thus the honor of taking the first step in the development of what is now universally termed 'radio' deservedly belongs to Reginald Aubrey Fessenden.

On renewal of his contract for two years, the U.S. Weather Bureau decided to enlarge the scope of their activities by building new stations and three high aerial towers at Roanoke Island off the Carolina coast, to which Fessenden moved. Additional towers were built and with improved equipment and competent workmen, long distance code signals were transmitted. Rather than be tricked out of his inventions, Fessenden resigned.

Hearing of the inventor's technical ability, two Pittsburgh millionaires, Walker and Given, agreed to form and finance a company, the National Electric Signaling Company, employing Fessenden on condition that he place his inventions in the name of the Company. Two wireless stations were built at Brant Rock, Massachusetts, with 400-foot antenna towers and the latest equipment installed. As a result of their excellent performance, three more stations were built in New York, Philadelphia and Washington.

These Fessenden installations were the first to send wireless dot and dash messages overland, establishing a record 6,000 miles, even to Alexandria, Egypt, one quarter of the way around the world. For the United Fruit Company, Fessenden had established wireless stations in New Orleans, on their ships, and at their plantations in Guatemala. Best of all, he had beaten Marconi by transmitting Morse code in both directions across the Atlantic.

In Canada, by Special Act of Parliament, the Fessenden Wireless Telegraph Company of Canada was created with such prominent men as Sir Frederick Borden serving on the Board of Directors. Fessenden was also called to a formative commission meeting relative to harnessing the enormous potential power of Niagara Falls, but his ideas proved too advanced for acceptance by Adam Beck and others.

To carry out transatlantic transmission experiments the Company built a station at Machrihanish, Scotland, installing equipment the duplicate of that at Brant Rock. In spite of all effort at Brant Rock it became evident that no signals were coming through from Machrihanish. Fessenden sent his best engineer, Mr. Armor, to Scotland. Two weeks later, after anxious waiting, in January 1906, a cable message came through from Mr. Armor, "We are getting you Brant Rock loud and clear."

Spurred on by this success, Fessenden improved the efficiency of his high frequency alternator and with a new type of umbrella antenna of his own design, both stations were in regular communication. In June a small testing station had been built at Plymouth, eleven miles from Brant Rock, with Fessenden conversing regularly by voice between the two stations.

In November a letter was received from Mr. Armor containing the astounding news that instead of dots and dashes he had clearly heard the complete conversation of Mr. Stein at Brant Rock telling the operator at Plymouth "how to run the dynamo". Thus the first human voice to be transmitted across the Atlantic was that of Mr. Stein.

On Christmas Eve, Fessenden and his assistants presented from Brant Rock station the world's first broadcast by radio. The program was successfully repeated on New Year's Eve.

1906 was a memorable year for the inventor himself. To speed up operations in and around the station, he had invented the 'beeper' or signal from Fessenden, which was fitted to his workmen's hats. This device later proved to be of great value. (Had a 'beeper' been operating aboard the mercy plane which was lost recently in Canada's Northwest Territories with the resultant loss of three lives and injury to the pilot, the tragedy might possibly have been averted.)

Following the sinking of the Titanic by collision with an iceberg in the Atlantic, Fessenden stated that he had "bounced signals off icebergs by radio, measuring the distance". His invention was really the forerunner of the present-day radar. His patented invention of the Fathometer proved of great value in measuring the ocean depths. This device was of great assistance to the Allies during World War 1 (1914-1918) in the detection of enemy submarines.

It is impossible to condense into one short article all the credits and honorable awards due this distinguished inventor.

Reginald Aubrey Fessenden, this great man who gave to the world so much yet received so little, died in his home by the sea in Bermuda on July 22nd, 1932. Burial was in St. Mark's Church cemetery and over the vault was erected a memorial with fluted columns. On the stone lintel across the top were inscribed these words:

"His mind illumined the past
And the future
And wrought greatly
For the present."

Just below, in ancient Egyptian picture writings, was written:

"I AM YESTERDAY AND I KNOW TOMORROW"

Reginald Aubrey Fessenden
October 6, 1866 - July 22, 1932
(Lived in Fergus, Ontario)
(1872- 1878)

Reprinted from: THE CAT'S WHISKER Official Voice of the Canadian Vintage Wireless Association Vol. 3, No. 1 - March 1973

ARC-5 Power Supply from page 4

Denver station, 60 miles away, on 560 KHz at full room volume with just a 10 foot wire antenna. That is accomplished with the full 24-25 VAC on the unmodified series/parallel filaments and 270 VDC on the high voltage DC line. These receivers are very sensitive. The higher frequency receivers could use more selectivity; however, the R23A above has superb selectivity. It was the unit dubbed as the"Q5er" by 1950's era Hams. It was used by thousands of Hams as an accessory to their regular station receiver to provide an extremely sharp IF passband at 85 KHz.

Figure 2 shows the authors companion power supply/speaker unit and associated receiver, the R23/ ARC-5 which covers the "long-wave" spectrum below the broadcast band. Figures 3 and 4 show various views of the power supply/speaker unit. **ER**

This is the transmitter operated by Gary Kabrick, W7GMK, during the QRO Rally. This is what David, W6PSS had to say about his audio: "I am delighted to report the best sounding station was W7GMK, Gary. His carrier was strong, modulation was robust, clear, with excellent speech characteristics, i.e., a good blend of highs, midrange and lows with no pumping as evidenced by improper attack and decay settings of compressor/limiter adjustments. Noteworthy was his modulation presence that was head and shoulders above all others."

Window" internet page:

"Listening to the signals coming in here tonight, into this station, the worst sounding signals are all good!" said Bill, K2LNU, on his Gates BC1-H, "this is good for the hobby, and it's good for this mode of operation to have something like this periodically."

"The event was inspirational," said Larry, WA1LGQ. "I counted six AM QSOs up and down the band from 1850 to 1985," Larry continued, and "W2ZM did a very commendable job as master of ceremonies."

"With my RCA BTA500MX almost airworthy that weekend," said Al, W1UX, who ceremoniously lit the filaments on the trio of 833As, "it was amazing to listen to everyone on my bank of 12-inch speakers." He said "I certainly must say it's a celebration of this wonderful AM mode."

Bill, N2BC, was forced to sit back and listen after smoke came out of his RCA BTA-1R that warmed up a little too much ahead of the rally. "I sat in front of the '390 and the A-4 feeling dejected," he said, "but as W2ZM started sorting thru the stations and fellows spread out across the band it was a joy to cruise ... and hear the great audio."

"Happy Birthday AM," said Steve, WB3HUZ, who operated a GE BT-20A. It was widely noted on the air that Dec. 23, 1900 was the reported date of Reginald Fesseden's first AM transmission, and the world's first "phone" signals. The Centennial of AM is the subject of a report in an upcoming issue of ER.

"I think it was real kickoff tonight, not a lot of guys were running heavy metal radio, but I think there's some potential for next year," Gary, WA1OXT.

"I'm a little bit embarrassed, I should have my Gates 250-C1 on," lamented Joe, WA3GMS, "but I promise I'll have it on for next year! I've heard some gorgeous, gorgeous sounding signals on this evening."

"Bob, doing a helluva job," said Dave, WB3ETN, praising the rally anchor W2ZM. "Nice organization," he added, "I expected some chaos this evening when I came down, but everything is in hand and working well."

"My vote for the best sounding audio goes to Tom, W2KBW, with a lot of great sounding stations not far behind," said Mike WN3B, operating a Gates BC-250GY and who himself was nominated for the trophy.

Tom's call letters reflect his ties to Buffalo and honor the late great clear channel AM station in that city, WKBW. He operated the Heavy Metal Rally with a Collins 20V2.

"I think the next time, what we should do is organize it on 75 meters," said Herb, K2JVM, "the breakout QSOs have been (spontaneously) going on, and I think we ought to plan it so that there's one AM roundtable every 10 kilohertz from 3900 down to 3800."

One of the more unusual transmitters was a Collins 231-D, declared surplus from a now-disbanded Voice of America site at Bethany, Ohio, and acquired by Bill WA8LXJ. "It's a rather oddball transmitter," he acknowledged, "originally had a pair of 750TLs in the PA, modulated with 450TLs," but he noted only one of the big RF bottles was fired up on the ham bands.

"I don't think I have one station under 60 on the R-390A," exclaimed Nick, KG2IR, "and Bob you're up near 90 and a few other stations are not far from that."

"Just an absolutely perfect bunch of rigs," said Rick, W3RSW/8.

Station Log

Fourteen broadcast transmitters were among the tall ships sailing across the airwaves that night.

WN3B, Gates 250GY
N2YR, Gates 250GY
WA8LXJ, Collins 231-D
K2LNU, Gates BC-1H

continued next page

W2KBW, Collins 20V
WA3VJB, Collins 300-G
WB3HUZ, General Electric BT-20A
WA4HHG, Collins 20V2
K2PG, Collins 20V
K2NK, Collins 20V
N8JRJ, Gates 500T
WB3ETN, Gates 250C-1
KW1I, Collins 300-G
W2ZM, RCA 250F

Report From the West

by N6CSW

Out here in the West there was a great deal of interest in the QRO Rally. Although the total count of participating stations was only 29 (with 8 of those running BC xmtrs) we all had a lot of fun and it was one of those super-enjoyable evenings. I think the poor propagation on 160 that night kept a lot of stations off the air.

Fred, KFØOW started things off on 1885 about 6 PM and operated as net control until about 8:30 when he passed that duty over to me. I carried on until about midnight and then passed net control to Gary, W7GMK.

At this time I have no idea if there were other groups operating in the QRO event in other parts of the west. If there were I'd like to hear from them. I heard nothing from the pacific northwest, nothing east of Colorado and only 1 station from Texas.

Many thanks to Bill Kleronomos, KDØHG, for organizing the QRO Heavy Metal Rally. I hope that it becomes an annual event. I also hope that we have better propagation in the years ahead.

I'll announce the winner in the February issue of ER. If you haven't sent in your vote for the station with the best sounding audio please do so as soon as possible. Please remember that not only participants but listeners (SWLs included) are invited to vote.

Here's a list of the stations that checked in: KDØHG, VE4BX; KFØOW, Gates 250GY; KØKE, Gates BC-1J; W6PSS, BTA-250M W9LDB, Collins 300J; W7GMK, Bauer 707; W7UO, Gates BC-1G; W6UH, Collins 20V-2; K7EWE, Gates 250GY; W7QHO; N7WEK; W7ISJ ; W5EOE ; W5LUA ; W7US ; WD4PLI/6 ; K7KYC; WA6GBJ; W6BTV/K7POF ; N6BZY; KØUO; WB6YEC; K6CJA ; W8QBG; W6MIT; KØUR; ALØF; N6CSW

Editor's Comments from page 1

Alice was always filled with energy and enthusiasm. Even when I came to know her when she was in her late 80's she was always busy. She was involved in writing about the history of Montana, she was writing and reciting cowboy poetry and she was getting a new home built. A lifelong dreams of her's was to live in the country in a log cabin. I understand the new home wasn't exactly a log cabin but it looked like a log cabin and that made Alice happy. It was also gratifying to her that most of the work on the new home was done by her children and grandchildren.

Widowed in 1983 she raised four daughters and son Pete. As her children had children and those children had children Alice revelled in her role as matriarch. Her family was her number one priority and I think by her example she influenced all their lives. From what I can gather (especially from knowing her son Pete) all of her descendants are turning out just the way Alice would have wanted them to.

Alice was a good friend and I'm sure she's influenced my life. I hope when I'm old that I will still think young like her and have her energy and enthusiasm.

New Filters for the R-390A

A couple of weeks ago I received a shipment of Dave Curry's new filters for the R-390A. These filters, like the ones he manufacturers for the 75A-4,

are built using newly manufactured Collins mechanical filters. They look identical to the originals. Dave made them in the following bandwidths: 5 kc for CW; 2.5 kc for SSB and 6 kc for AM.

I installed the 6 kc filter in the 16 kc position and have found that it makes the R-390A a much better receiver for AM communications use, particularly on 75 meters where the QRM can become rather intense. Switching from the 8 kc position to the 6 kc position shows a remarkable contrast. Not only is the bandpass narrowed but the 6 kc filter is much quieter as well.

Next month we'll have a comprehensive review of the filters by Ray Osterwald, NØDMS.

The filters are now available from the ER store for $199 plus $3 shipping by Priority mail. N6CSW

160M AM for the DX-60 from page 25

ing to the new position for 160 operation. The easy way is to bend the small right angle stop tab (spring brass on back of the panel mount) straight out with needle nose pliers. This requires that you remember to avoid turning it beyond the first stop below 80 (that is the new 160 position) or above 10. More mechanically inclined may find a way to change the stop by one position.

Final Reassembly

Reinstall the bandswitch shaft assembly. Then carefully add the grid section, make sure the little half circle rotor indexes are aligned. Resolder the tank coil connections, adding the new 160 lead to new contact terminal 1. The 2000 pFd mica goes from terminal 5 to ground. On the new wafer solder a jumper between the wire coming from the plate variable capacitor through the grommet to the switch pole/rotor. The old 68 pFd solders between terminal 6 and ground. The door knob caps connect between terminal 7 and a new ground solder lug you must add on the chassis approximately under the DRIVE TUNE shaft. Resolder the grid switch section connections. The final padding capacitor value will need to be selected, (88 pFd was my final value) and installed between terminal 11 and the grid variable capacitor stator.

Conclusion

I performed a neutralization procedure and noted a small change, whether this was due to the grid mods, the new coil, my disturbing the stub, or it just needed redoing, is not known.

Unfortunately, the companion Heathkit HG-10, VFO, does not cover 160 and will not work without modification. I used both a Johnson Viking 122 VFO, I rewired for the DX-60 power plug, and a Yaesu FT-757GX transceiver to drive my DX-60. Both worked well. Tune up, operation and performance was consistent with expectations and experience on 80 and 40 meters.

Adding the 160 meter capability to the humble little DX-60 considerably increases its usefulness by now including all the significant AM bands. Together with the station linear amplifier it makes AM contacts on that band a pleasure. Just to complete the story, no, "The Lil Green Submarine" didn't win the Heavy Metal Rally, but it was there, sailing with the "Tall Ships". ER

A complete index of the entire 11 years of ER is available for viewing or downloading at the following website: http://www.qsl.net/n9oo

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FOR SALE: KWM-2 fan bracket - $12 ppd. Dave Ishmael, WA6VVL,2222 Sycamore Ave.,Tustin CA 92780. (714) 573-0901.

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

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FOR SALE: B&W 51SB-B SSB adapter for B&W 5100 xmtr - $75. Bill Smitherman, KD4AF, NC, (336) 699-8699.

FOR SALE: Jennings ant relay RB1 10 kv amps; 115AC lge coax conn - $100. Email Harry,CA, w6atc@aol.com

FOR SALE: Rider manuals, military whip antennas, military NOS dyna motors, Heath Vectorscope - $65. Bruce Beckeney, 5472 Timberway Dr., Presque Isle, MI 49777. (517) 595-6483

FOR TRADE: WRL Catalogs 1954, 1955, 1958, 1959, 1960, 1967, 1970, 1971. **WANTED:** WRL, Globe, Galaxy manuals & 1963 WRL catalog. Al, NI4Q, POB 690098, Orlando, FL 32869. (407) 351-5536 or ni4q@juno.com

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

FOR SALE: Over 600 electronics magazines, mostly 1960's & '90's - 99¢ ea + shpg; also available: electronics books, parts, etc. List for stamp. Bob Eckert, 133 E. 7th St., Clifton, NJ 07011.

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

NOTICE: T-368 Registry. For info w2zr@aol.com or W2ZR callbook address. Subscribe to T-368 reflector: www.onelist.com/t-368_bc-610

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

FOR SALE: RBM pair, hi-low band, new condx, matching serial numbers - $750. Carl Bloom, (714) 639-1679, 377811168@MCIMAIL.COM

FOR SALE: Collins 75S3B rcvr w/spkr & manual; Henry 2KD-5 amp - BO on both. PU only on amp. Charles Wilcox, 38735 Barberry Ln., Squaw Valley, CA 93675. (559) 338-2300

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FOR SALE: Books, all electronics related; 300 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. watok@email.msn.com

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

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

FOR SALE: Drake TR-4, no pwr sply - $195. Jeff Bishop, W7ID, ID, (208) 459-7502. w7id@arrl.net

FOR SALE: Warehouse museum clearance, many collections. Collins; antennas; mics; keys; ant tuners; control boxes; spectrum analyzers; test sets; teletypewriters; dummy loads; field strength meters; cavities. SASE for list & prices. Packing included, shpg extra. Harry, W6ATC, Fax, CA (310) 273-1995, w6atc@aol.com

FOR SALE: Collins 20V-2 BC xmtr; Ratheon RA-1000 parts. Rich, W9LDB, CA, (760) 739-1835.

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

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

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FOR SALE: Table radios, Philco wood Tombstone 37-62 play - $35; Zenith 6V 515 (6), nice - $20; Teletone Catlin ivory 239 - $20; West H155, needs caps push pull 25L6 - $15; 5" electro dynamic spkr 450 ohm field - $10; EICO mulitplex generator 342, mint - $25; EICO 377 audio generator, mint - $35; Hickok 630 TV voltage calibrator, mint - $25. UPS. Onerio Sabetto, W8PIU, 1717 Burgess Rd., Cleveland, OH 44112. (216) 481-1036

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FOR SALE: Sonar SRT-120 xmtr - $150; Hallicrafters: S-108 - $135; HT-40 - $75; HA-1 TO keyer - $85; Heath: SB-102 & pwr sply - $165; SB-400 - $125; HO-10 - $125; Ameco 621 VFO - $55; Gonset VFO - $75. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (973) 728-2454, rprester@warwick.net

FOR SALE: Heath SB-620 & SB-650 - $100 ea; nice HW100 w/spkr & pwr sply - $200. **WANTED:** Yaesu FTDX560. Robert Braza, W1RMB, MA, (508) 222-5553.

FOR SALE: TMC SBE-2 exciter & HB pwr sply - $100 PU only. Lou, K4LOU, VA, (540) 347-2196.

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FOR SALE: HQ140X - $80; BC348Q - $50; Allied A2515 - $40;pick up only. R.J.Eastwick, W2RJE, 400 N. Haddon Ave., Unit 109, Haddonfield, NJ 08033. (856) 429-2477

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

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 133 Cartbody Rd., Carllton, GA 30116. andy@wa4kcy.com

WANTED: For purchase. Equipment & technical information related to AN/ARN-6 Radio Compass. Jim Cavan, 6 Timberline, Norfolk, MA 02056. (508) 528-0908,jcavan566aol.com

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

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

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

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

WANTED: National Company emblems, escutcheons, WW II era equipment. Will trade HRO coils or purchase. Don Barsema, 1458 Byron SE, Grand Rapids, MI 49506. DBARSEMA@prodigy.net

WANTED: Oddball old 1930s Army and Navy dynamotors. Any condition, any weight! William Donzelli, 15 Gen MacArthur Drive, Carmel, NY 10512. (914)225-2547, aw288@osfn.org

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

WANTED: Hammarlund HX50-A in GWO. Jo, g4xxw@compuserve.com

WANTED: Knight C-555 (walkie-talkie), C-777 (walkie-talkie), Bandspanner II, TR-108, TR-106, V-107. Willis, (541) 923-2784, W0WI@JUNO.COM

WANTED: Collins 51J-4 w/all filters; clean, in good operating condx (covers?). Ron, WA2EIO, (516) 546-9884, NY, wa2eio@mindspring.com

WANTED: National NC-400 rcvr; NTS-2 spkr; also looking for a cabiner for the NC-400. James, W4JO, GA, (770)429-8189 or w4jo@worldnet.att.net

WANTED: Radio set SCR-614/BC-969A. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453.

WANTED: Manual schematic for Comtronic 6 meter FM xcvr, clean copy OK. Jim Eberwine, W4APV, 8118 37th Ave. N, St. Peterson, FL 33710. (727) 347-0942

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

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

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

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

WANTED: PreWW-II Iowa QSL cards; materials of 1920s Iowa Radio Relay League. Will trade or purchase. Bill Smith, W5USM, w5usm@aol.com

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

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

WANTED: Unmodified BC-348 rcvr. Bob Lackey, 1252 Worley Creek Rd., Lakemont, GA 30552. (706) 782-3670

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

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WANTED: Manuals for Lafayette TE-18 GDO; MC Jones, Micromatch model 263 pwr meter. Louis L. D'Antuono, 8802 Ridge Blvd, Brooklyn, NY 11209. (718) 748-9612 after 6pm.

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516-294-4416, mauricsch@cs.com

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

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FOR SALE: Navy tube tester OQ3 (Weston) in wood case, tests up to 7-pin minatures, w/book - $250; BC221M w/pwr sply - $50; Valiant, needs work, $100; HP650A test oscillator (rack mount) - $50; 4 pg list - $1. Robert Larson, W7LNG,1325 Ridgeway, Medford, OR 97504. (541)773-5214 or w7lng@arrl.net

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FOR SALE: Seeking good home for my Novice xmtr, Johnson Ranger I. Prefer deliver at Dayton. n8zr@arrl.net

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

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

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

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FOR SALE: Swan 410 VFO; Heath Mohican; HP-23B; TMC SBE-2; EFJ 250-35 LoPass; NovaStar AeroEar. U-ship. WA7HDL, ID, (208) 756-4147

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FOR SALE: I am making aluminum plate and grid connectors for T series tubes. If interested contact Alan Price at fixt75268@cs.com

FOR SALE: Drake, Collins, Heath, ham equipment & testers. Garage full, call your needs. Van Sias, K7VS, Medford, OR, (541) 779-0723

FOR SALE: Every issue Popular Electronics Magazine, 1954-1982, less five 1955 issues - $250. Kirk Ellis, K1ARK, 203 Edgebrook Dr., Pikeville NC 27863. (919) 242-6000, kirke@goldsboro.net

FOR SALE: Radar, APS-88, ex Grumman S2A Tracker, complete, antenna and mount, rcvr/xmtr, synchronizer, control amp, display, antenna control box, system control box, 65KW, X-band - $1500, no cables, manual available, extra. Carl Bloom, (714) 639-1679, 37781116@MCIMAIL.COM

FOR SALE: NOS RCA reproducer, 5 watts speech - $45; Wilson VHF 2W T1402SM w/charger - $50. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: 3 ft X 5 ft professional reprint of schematic diagram for Collins KW-1 TX - $27, shpd USA. Tom Berry, W5LTR, 1617 W. Highland, Chicago, IL 60660. (773-262-5360, 262-0016.

FOR SALE: Rider manuals; NOS dynamotors; military whip antennas. Bruce Beckency, 5472 Timberway Dr., Presque Isle, MI 49777. (517) 595-6483

FOR SALE: BC-654 rcvr & xmtr; BC-348 modified - $30; BC-611F - trade; BC-1000 rcvr & xmtr, NATO, w/battery box - $100; BC-221 - $50; USM 24C scope - $25; RU-19, missing tubes W/some coils - $175; PP-114 VIB, pwr sply. Steve Bartkowski, 4923 W. 28th St., Cicero, IL 60804. (708) 863-3090

FOR SALE: Jenning ant relay RB1 10 kv amps RS - $10; 115AC lge coax conn - $100. W6ATC, w6atc@aol.com

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

FOR SALE: EICO 723, gud - $60; 540A, vg - $80; EICO 730, exc - $125. Chuck, NZ5M, (806) 698-8767

FOR SALE: ARRL Handbooks 1942,44,55,75,78; E&E Radio Handbook 9th edition, 1942; Prentice Hall 1942, Fundamentals of Radio; Heath code osc HD1416 & ps. Lys Carey, 13495 W Center Dr., Lakewood, CO. 80228. (303) 986-5420, lyscarey@juno.com

TRADE: Will swap Collins S-Line for T-368 or Globe King 500C or Johnson Desk. George, N1TNQ, (401) 331-1279

FOR SALE: Heath SB-401/SB-303 w/manuals - $250, U-ship. **WANTED:** Dentron Clipperton-L amp; manuals for RCA AR-88LF rcvr; Hallicrafters HT-4H xmtr. Steve Davis, KD2NX, 11 Vineyard Ave., Middletown, NJ 07748. (732) 495-3241, kd2nx@worldnet.att.net

FOR SALE: Johnson & Hammarlund panels, cabs refinished. Done in same finish as new cars. Ranger-1, Ranger-II (price, call), Valiant-1, HQ-180 (series), $250. + shpg. Visa/MC/AMX. Dee, W4PNT, VA, (540)249-3161, cell (540)471-7023 or w4pnt@rica.net for jpg's

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

WANTED: National FRR-59; Hallicrafters SX73; Scott Special Communications rcvr. EA4JL, please call, Kurt Keller, CT, (203) 431-6850

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

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

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

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

WANTED: Info on Sierra 303A rcvr. Need manual/copy &/or location of manufacturer. K2SSE, 15435 Vinola Dr., Montverde, FL 34756. (407) 256-9907 or k2sse@gdi.net

WANTED: Gonset G76 AC pwr sply model 3349 & TenTec model 248 noise blanker. **FOR SALE:** TenTec model 244 digital readout. Jerry Whitmore, K9HAW, 1320 Lake Dr., Mendota, IL 61342.

WANTED: WW II military remote control rcvrs #ARW/CRW, xmtrs, dynamotors PE186 PE126, joy sticks, Gyroscopes for the GB, Azon glide bombs. Maurice Schechter, NY, (516) 294-4416 or mauricsch@cs.com

Internet Auction

Dozens of rare WW II Nazi and Japanese military radios for sale via internet auction. Museums and collectors take note—like nothing you've ever seen. E-mail me for link to my website. Vernon Vogt, v22043@hotmail.com

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

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

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

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

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

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

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

WANTED: Basket case variometers w/loose or missing wiring, provided the rotor, stator & framework is in good condition. Roland V. Matson, POB 956, Lake Panasoffkee, FL 33538

WANTED: Clean Mackay 3010C & Kenwood R599D w/all filters & manual. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Amplifier AM3007 for T-827F, R-1059B AN/WRC-1 set. Don, WA2ELD, KY, (859) 254-1886 or LBrooke@flex.infi.net

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

FOR SALE: Repro Nameplates, R-390A generic - $9; 51J-3 and 51J-4 exact replicas - $12. Tom Marcotte, N5OFF, 242 Chestnut Oak Dr., Mandeville, LA 70448. marcotte@iamerica.net

FOR SALE: Gates BC250-GY broadcast xmtr w/ manual, spare finals & Gates accessory equip such as modulation & frequency monitors - $500; BC-223-A xmtr w/2 spare tuner boxes - $125. **WANTED:** G coil to fit my HRO-5. Thanks. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429. (281) 376-3436 or tsmith@thal-pc.org

FOR SALE: Transformers, capacitors, meters, publications on radio. SASE for list. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405

FOR SALE: WWII Merchant Marine rcvrs, Mackay 128AY, Radiomarine/RCA AR8506B, AR8510, EH Scot SLRH, SLRM, any rcvr - $250. Carl Bloom, (714) 639-1679, 377811 1@MCIMAIL.COM

FOR SALE: Naval rcvrs, RAK, RAL, RAO, RBA, RBB, RBC, RBL, pwr splys available, prices from $75 to $350 depending on type, condx. Carl Bloom, (714) 639-1679, 377811 1@MCIMAIL.COM

FOR SALE: Johnson Desk KW w/1 spare 4-400 - $2300. Herb, K9GTB, IL, (618) 362-6539.

FOR SALE: Repair! Radio repair, tube or solid state. Reasonable charges. J. Dan Rupe, W7DDF, 998 Whipple, POB 697, Grayland, WA 98547. (360) 267-4011, w7ddf@yahoo.com

FOR SALE: RCA tube manuals, RC-15, RC-20, RC-25; ARRL Handbooks, 1965, 1968, 1972 & 1978. LSASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660, brett3729@aol.com

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

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

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

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

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

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WANTED: Mohican; SB-200; SB-220; SB-100; SB-101; SB-102; Knightkit Band Spanner II; Heath GW-12A; GW22A; GW42. Debbie, AR, (870) 857-3366.

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

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

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

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

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WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, (631) 360-9011, george2f@aol.com

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WANTED: Johnson Viking I front panel or complete radio; 300-500 vari-match mod xfmr. Dale Hagert, WØIR, MN, w0ir@mn.mediaone.net

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WANTED: DX60; Westinghouse MW2 RF unit, modulator, and/or pwr sply. Will pick up. Gary, WA4ODY, Houston, TX, (281) 291-7701, myctpab@earthlink.net

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

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

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WANTED: Cash for Collins: 5M-1, 2, 3; 55G-1; 62S-1; 399C-1, 51S-1, 75S-3A, C 32S-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

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WANTED: 80 & 40 meter xtals in FT243 holders. Howard Weinstein, K3HW, 4041 Ridge Ave. Apt 4-405, Philadelphia, PA 19129. (215) 843-1180. k3hw@arrl.net

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WANTED: Merchant ship radio memorabilia, radios, keys, parts, clocks, documentation. Tom Mackie, W2ILA, 14 Washington St., Jamestown, RI 02835. (401) 846-1200

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

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

WANTED: June 1943 "Electronics" magazine, June 1987 CQ "World of Ideas" column (copy fine). Chris Bisaillon VE3CBK, 1324 Old Carp Road, Kanata, Ontario, Canada, K2K 1X7

WANTED: Hickok 539, 580, 752 tube tester. Carter Elliott, (804) 979-7383, CElliott146@aol.com

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WANTED: Manuals for Datron 1061B and 1062 multimeters, copies OK. Geoff Fors, WB6NVH, POB 342, Monterey CA 93942. wb6nvh@mbay.net

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WANTED: HRO 5TA1 or earlier HRO rcvr. Ivan, WA6SWA, POB 248, Reno, NV 89504. (775) 329-7738, idh@cs.unr.edu

The Collins Video Library

The Collins KWM-2 Video 4 hours - $89.95. Highly detailed video on operation, rebuilding, alignment, troubleshooting and neutralizing of this classic! A must for anyone who owns and operates a KWM-2/2A. Printed documentation included.

The Collins 75S-3/32S-3 Video 3.5 hours - $74.95. An in depth examination of the most popular version of the S-Line. Operation, modification, alignment, neutralizing and more! Much of this information applies to all versions of the S-Line!

The Collins 30L-1 Video 1 hour - $39.95. A complete guide to the 30L-1 amplifier. Operation and safety, updates and a discussin of the 811A triode. Learn the secrets to greater performance.

The Collins 30S-1 Video 1 hour - $39.95. Finally, the one everybody has wanted! This extraordinary video describes operation and user safety, maintenance and modifications of this classic Collins amplifier. Very informative—truly a must for all 30S-1 owners. Printed documentation included.

The Collins Amateur Radio Equipment Video Spotter's Guide 1 hour, 40 minutes - $24.95. Close to 90 individual pieces of Collins Radio equipment are shown in the video. Examples of some of the gear covered are: KW-1, KWS-1, 30K-1, 20V-3, 75A-4, KWM-2, S-Line, KWM-1, 30S-1, 30L-1, KWM-380 and much more!

The Collins KWS-1 Video 2 hours - $39.95. This video is the perfect companion to the 75A-4 video for owners of the "Gold Dust Twins"! Butch Schartau, KØBS, shows you how to operate, maintain and repair your KWS-1. Watch as Butch goes through the entire alignment and neutralization process, as well as showing you how to properly operate this famous transmitter.

The Collins 75A-4 Video 4 hours - $89.95. This video is four hours of information on how to repair, maintain and restore this classic receiver. Butch Schartau, KØBS, guides you through all aspects of keeping your own 75A-4 running like a top.

R-390A Video 7 hours - $109.95. Here it is! Long awaited by serious "boatanchor" enthusiasts! The ultimate receiver now has the ultimate video to go along with it. R-390A expert Chuck Rippel, WA4HHG, covers an absolutely incredible array of information in this "heavy duty" video. This video looks at operation, its modules, circuit description, front and rear panel details, complete mechanical and electrical alignment, PTOs, performance evaluation, modifications, troubleshooting and restoration. There is nothing like this video available today, at any price!

R-390A Addendum Video - $49.95. Another 3 hours and 40 minutes of R-390A information from Chuck Rippel, WA4HHG

SP-600-JX Video 4 hours - $89.95. Chuck Rippel, WA4HHG, takes us through all aspects of the SP-600-JX—repairs, restoration and modifications. This video is a must for any newcomer attempting to work on the SP-600.

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Produced by Floyd Soo, W8RO (ex-KF8AT)

ER Bookstore, 14643 County Road G, Cortez, CO 81321

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

WANTED: Ampex tube type decks, mixers, amps. George, OH, (216) 486-6489, blksub4806@yahoo.com

WANTED: Hallicrafters SX-88 parts radio w/ complete front panel, w/knobs and gear trains. Al Royce, KE6CPS, 873 Fifth St., Norco, CA 92860. (909) 734-0623, Alan.Royce@trw.com

WANTED: Gross, Temco, Collins, RCA, Stancor xmtrs from 30's & 40's; Hallicrafters HT-1, HT-6. Ken Seymour, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 720-2200. KA7OSM@aol.com

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

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

WANTED: My school days covetous BC-348R. Katsu, ex.N8EYH, Japan. mxc04040@nifty.ne.jp

WANTED: Collins unnumbered clear plastic dial to fit a 75S-1, not the fiduciary w/ red line, the one with black hash marks. Will buy entire assembly. Anyone parting out a 75S or 32S? Doug Owen, KC8JT, 1539 North Rd., Troy, OH 45373. (937) 335-1300, dowen3@erinet.com

WANTED: Vibroplex bug with a three inch wide grey or black base. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA, 16123. (724) 758-2688. k9vky@stargate.net

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

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

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

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 399C-1, 625-1; KWM-1; 302C-3; 51S-1; 75S-3C; 32S-3A. I buy any Collins equip. Leo, KJ6HI, CA, Ph/Fx (310) 670-6969. radioleo@earthlink.net

WANTED: RF & detector coils for any model National SW-3. Leland Smith, W5KL, 10 Hawthorne Dr., Harrison, AR 72601. w5kl@alltel.net

WANTED: QSL cards from old/pre WW II Ham DX countries; old regen kits. Hajime Suzuki, Nishikuniyoshi 1644-24, Ichihara-Shi, Chiba-Ken, 290-0231 Japan

WANTED: Manual and accessories for GRC-13; AN-29 antenna for BC-222. Joseph Pinner, 818 Hill St., Kingston, TN 37763. (865) 376-0996, kc5ijd@sprintmail.com

WANTED: Western Electric horns, spkrs, amps, mics, theater equipment. Barry Nadel, POB 29303, San Francisco, CA 94129. bnadel@ccnet.com

WANTED: Info on putting 11M Johnson Messinger on 10M. Will pay. Mike Suits, KM4KO, VA, (757) 672-2968 or km4ko@hotmail.com

WANTED: AC pwr sply for GRC-9. George, W2AMR, (856) 848-6699 or rock3016@snip.net

WANTED: QSTs before 1925 and ARRL Handbook editions 4,5,8,14,15 and 16 for personal collection. Gary Yantis, WØTM, 800-844-9860, gary@w0tm.com

ELECTRIC RADIO STORE

BACK ISSUES

All back issues are available at $34 per year or $3.25 for individual copies. Buy the entire first 11 years (#1-#132) for $290. This price includes delivery in the U.S. Foreign orders please inquire.

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Service Modification Compendium for the KWS-1, 32V and 75A series - 42 pages - $15 plus $3 S&H

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The front displays the logo from the cover of ER (the tube outline, Electric Radio, and 'celebrating a bygone era'). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio).The T-shirts are U.S. made by Hanes and come in S-M-L-XL-XXL. The color is just a little lighter than the cover of ER - $15 del. ($16 for XXL)

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Radios By Hallicrafters by Chuck Dachis----------$29.95

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Receivers Past and Present, Communications Receivers, 1942-1997, 3rd Edition, by Fred Osterman, ----------$24.95

Hiram Percy Maxim by Alice Clink Schumacher.....$19.95

Tube Lore by Ludwell Sibley.....$16.95

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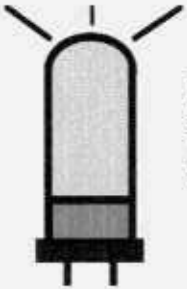

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