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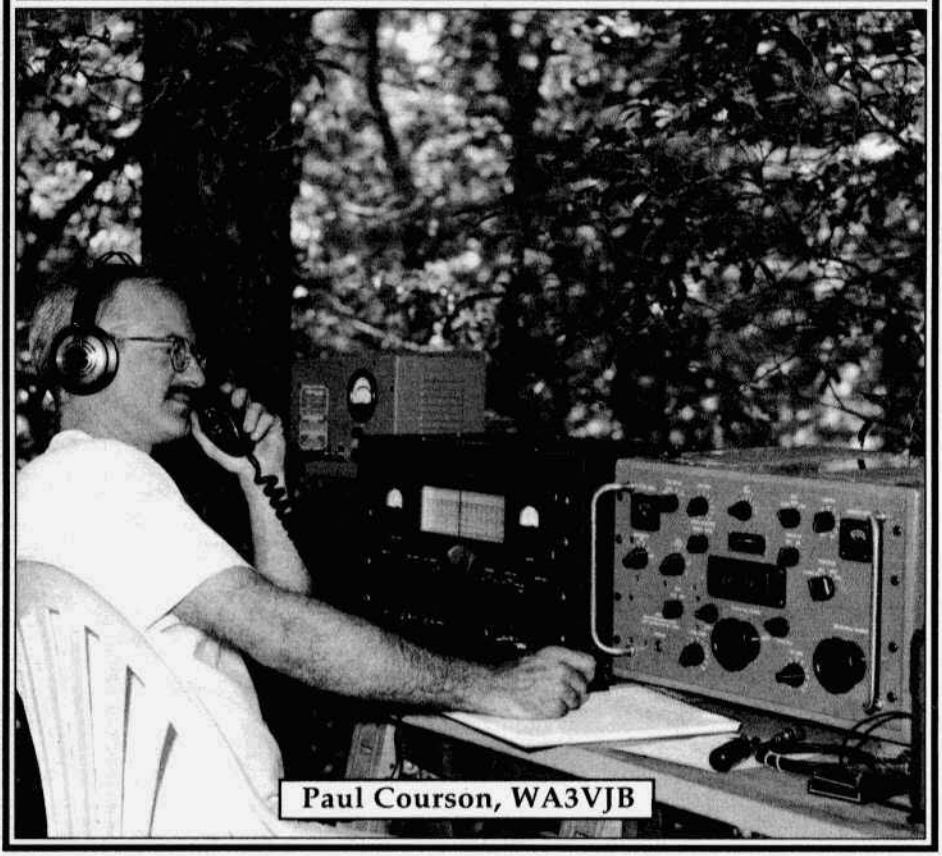
ELECTRIC RADIO

celebrating a bygone era

Number 99 July 1997



Paul Courson, WA3VJB

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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, NS6V; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY and others.

EDITOR'S COMMENTS

The First Annual ER Sponsored Vintage Field Day wasn't entirely successful. In fact, from my perspective and from the few reports I've received so far, it was a failure. First of all, the propagation was awful - as bad as it gets - and out here in the west 40 and 75 were almost unbearably noisy from thunderstorm activity. And for some reason - maybe because of Father's Day - there was not the level of participation that I expected. Although I'm disappointed with VFD #1, I'm dedicated to trying it again next year. Maybe we'll change the date and maybe we'll try to make it more 'special event station' oriented rather than contest oriented. And we're going to have to promote and advertise it better; beyond just ER. Next issue we'll have more on VFD.

The Tuesday after VFD I took off to Canada where I had a 9-day vacation that I really needed badly. Shirley stayed home to hold down the fort. She had a few problems that some of you may have become aware of. First of all, our new fax developed problems, then we had a fire on our county road that took out some telephone poles and the ER telephone line for 2 days. And then for some reason Shirley started having problems with Netscape, our internet program. It was a hard 9 days for Shirley - Murphy's law, etc. - but now everything's back to normal. We apologize for any inconvenience some of you may have experienced.

My trip to Canada, back to where I was born in Saskatchewan, was wonderful. I had the most quiet and relaxing vacation that I've ever had. I'm full of energy again now and excited about being back to work. We should all take a break from our work now and then, it's well worth it. N6CSW

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Looking Back

by Lew McCoy, W1ICP
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I had written earlier about starting out with the TVI lectures. The League realized early on that TVI could mean disaster to Amateur Radio. To that end, I was hired by George Grammer in the Technical department to go out, travel the USA and Canada, showing amateurs and TV servicemen how to cure TVI.

The reader must realize several important points about this era in our history. Television was just starting in the latter part of the 1940 decade. The first TV sets were usually five-inch jobs, and were mostly used in taverns or bars to show the Saturday night fights, or Milton Berle on Tuesday nights. The sets were just starting to reach homes and the League was already getting flooded with complaints. How to cure the problem became a big project. Phil Rand, W1DBM, had been doing research with promising results as far as cleaning up harmonics was concerned. It meant completely new construction techniques.

On the television side of the problem, we had inadequate design in the TV sets in that they had very poor front ends, not near enough selectivity, poor image rejection, and bad sensitivity. The TV stations were another bad problem. They had relatively low power output, 5000 watts ERP (Effective Radiated Power) and their antenna design left much to be desired. The power problem was one primarily of tube design.

How bad was all this? A family on the very fringe of reception would buy a TV set and expect to get reasonable reception. But the TV signal would be very snowy, would not hold sync, and if an amateur lived nearby, the picture would be completely destroyed! In testing, we realized that a TV signal of 1000 microvolts received at the TV set would give a fairly good viewing picture-not really good but "fairly" good. However, an amateur signal of only 10 microvolts in strength would put bad cross-hatching across the TV screen.

The only answer from the amateur's standpoint was extremely thorough shielding of his rig, plus the use of a low-pass filter to attenuate the harmonics. However, we still had the problem of overloading of the front end of the neighboring TV set from the ham's. But at that point in our history, TV manufacturers had not yet been educated in the use of high-pass filters.

The ARRL purchased a station wagon and I equipped myself with two RCA TV sets, a shielded transmitter, a device that I built up that could create all common types of interference. This included spark noise (an old Ford spark coil), the old filament type of light bulb that radiated horrendous interference, electric brush type motors, and other units.

We decided to visit only cities that provided low-band TV-channels 2 through 6.

It was discovered early on that hams, even with 10-meter operation, didn't have harmonic problems with channels 7 through 13. It was decided that I would go to all the cities in the midwest that had low-band TV. This was a start. I already recounted my first stop, in Chicago.

I hauled the stuff in the station wagon and then on arriving at my show stop, set up the two TV sets, strung up a 20-meter dipole antenna, and got all my gear ready for the show. Without fail, there would be a really full house, usually standing room only. The local TV station would be running on both sets and my first demonstration would be to turn on the 20-meter rig and immedi-

ately the one set would blank out from the interference. I would then explain about fundamental overload. Next, I would install a high pass filter into the set with the interference and turn the rig back on. Naturally, there would be oohs and ahhs as it became apparent the filter really worked. I showed all kinds of interference - one was particularly interesting. I had made a short dipole, a few feet long, and across the center I had connected a 1N34 diode. When I turned the transmitter on, I could walk around the hall holding up this diode dipole and the TV crosshatching from the harmonics being generated was very obvious. This went to show that a TV owner's house could have places where bad metal connections could and did generate this kind of effect.

The show was a tremendous success, I eventually covered every city in the US and Canada that had low-band TV. I also did many ham conventions - giving the show in Dayton at the Dayton Hamvention in, as I recall, about 1952. Keep in mind that during all this travel, I still had to produce a monthly article for QST aimed at the Novice - I was really a busy young ham - but I loved every minute of it. The TVI trips produced many humorous and interesting events.

One funny one was in Cincinnati where the hall was near the top floor of a very large building. I set up my equipment, turned on the TV sets, and was immediately confronted with severe interference. I asked the local gang if there was something around that could be radiating and causing problems. It turned out there was a TV station on floor immediately above me, and I was directly below their transmitter!!

I really was at a loss for a while because there was no way I could cure the problem which was caused by adjacent channel interference. It so happened that I always worked closely with FCC people on this TVI tour so the EIC (Engineer in Charge of FCC) and I went upstairs to visit the TV station to see what we could work out.

They were on channel 6 and the station I had planned to use was on Channel 4. In any case, all the guys working in the station were hams, and I guess the EIC impressed the heck out of them. They agreed to shut down the station (!!) for one hour if I agreed to come on the station after the news and talk about interference. I readily agreed. They announced several times that they would be shutting down for technical difficulties because of my interference lecture. I never expected that and we really had a mob of people that night to see the show! My show on the TV station went on at 10:30 for one hour but I didn't get away from answering the phone there until 2:00 a.m.!!

I could go on here for pages but Barry is going to shut me off. One last humorous incident. Usually, one of the local RCA reps would attend to help out because we used RCA TV sets. At this one occasion, I gave the local RCA rep a few minutes for his pitch and he remarked that he had grown up on a farm. Every once in a while, his father would have him take one of the cows over to another farm where there was a bull to get the cow "serviced". He told the audience that whenever he saw a TV service truck going by he wondered what customer was going to get serviced! W1ICP

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ELECTRIC RADIO IN UNIFORM

by Dennis L. DuVall, WA3YXN
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Severn, MD 21144
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A letter from Lee Auric, W1SE

The following letter was received from Mr. Lee Auric, W1SE, during an exchange of correspondence between us prompted by my article on the BC-312 and 342 receivers (ER, March 1997). During the exchange, I had also had provided Lee with copies of earlier ER articles on the BC-375/191 (ER #13) and the BC-610 (ER #34) written by Walt Hutchens, KJ4KV.

I found Lee's reminiscences and observations to be extremely interesting and took the liberty of sharing them with several of my friends in the East Coast Military Net. Our unanimous opinion was that the letter would be equally fascinating to a broad spectrum of the ER readership and Barry agreed. And so, with his kind permission, Lee's letter (slightly edited) follows.

1043 Deer Run Road
Winter Springs, FL 32708
April 18, 1997

Dear Dennis,

Thank you very much for your letter of the 11th. Your letter, as well as the 'Electric Radio In Uniform' articles, took me back more than 50 years to the time when I was operating that gear. You have stimulated many memories which I thought were all but forgotten. I'd like to share a few of them with you, for, as a collector, they will likely only sharpen your appreciation for the equipment in your possession.

I never saw, or heard of a BC-375, the 24 volt version of the BC-191, but that is not too hard to understand, as I was in the Army Signal Corps, and it is my understanding that the former were used in the Air Corps.

As to the BC-610; a friend of mine has one, though it appears to be a later model than the one I sat next to for three years. It has slightly rounded edges, such as on a modern refrigerator.

Perhaps you know my friend, in your collector circles. He is Steve Berg, KB4IRB, who lives in nearby Castelberry, Florida. Steve's shack overflowed with operable WW II and other antique gear and he had to build a separate small house on his property just to house the rest of his collection. (A man after my own heart - DLD)

You mention that your friend Don (see Note 1) reported frequent instances of jamming in Korea. We had it nightly, in Germany, in WW II. The problem grew as we moved further and further into Germany. We were, of course, getting closer and closer to the enemy jamming transmitters. Our operation at that time was all CW. They used a series of tones (step-tone jamming), that after a time of trying to copy through it, it would just about make the 'phones rise off your head. It was very fatiguing to copy through the garbage, but we became quite adept at it. After all, the best filter we humans possess is the one between our ears. And we had nightly practice.

The author, second from right, headphones on head, in Marche, Belgium, January 5, 1945 just after the peak of the action in the Battle of The Bulge, clowning with his radio team on the tailgate of the SCR-399. In the foreground is the canvas-covered top of the trailer containing the jeep-engine driven 5 KW PE-95 generator. At the extreme left is Jim Balch, W5ILF, whom the author skeds each week.

The author, a few weeks after the picture at left was taken, after a shower and some much needed sleep.

A few comments about the SCR-399. Normally, my outfit, the 84th Division Signal Co, was supposed to operate in the Corps Command Net. However, this became a very mundane job, and when we moved to Belgium, during the Battle of the Bulge, where no one knew where anyone else was, radio, which had been mainly dormant until then, became a very important thing to our Commanding General, Major General Alexander Bolling. A BC-191-equipped team in a Weapons Carrier (a 3/4 ton vehicle) was placed in the Corps Net.

The SCR-399 was moved next to his HQ, against the protestations of many of his Staff Officers that the strong signals put out by the radio would attract enemy direction-finding, and shellfire.

The General wanted to talk directly to his Colonels in charge of the Infantry Regiments, and he didn't want to have to go through the Message Center, where his words would have to be encrypted and decrypted. Time was of the essence, everything was happening at double-time, and he wanted the immediacy that only radio could provide. I began operating remotely from his War Room, and only a few feet away from the General.

Prior to this change in operations, the General stopped me once, during the heat of battle in Belgium, and said "Sergeant, don't let me out of your sight." From that moment on, until the end of the War, I or one of my operators, was in his shadow at all times. We began using voice operation exclusively, so that the General could talk directly to his Regimental Commanders. To illustrate the immediacy of our communications, at one point the General had me call the Colonel in command of the Tank Destroyer Battalion attached to us. After reaching the Colonel, I handed the

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microphone to the General, who gave the Colonel the map coordinates of an enemy roadblock that was giving our Infantry a problem, and that he wanted eliminated. The Colonel acknowledged the General's order, and in five minutes time the Colonel was back asking to talk to the General. The roadblock had been eliminated. It was radio "blitz", in action.

The General had been brought up with radios such as the BC-191, and earlier gear, in which the range of his voice transmission was almost in direct ratio to how loudly he assaulted the microphone. Talking over the SCR-399 was a new experience for him. He had a bit of a problem becoming accustomed to this different type of radio. He would sometimes end a transmission, and the officer at the other end was heard to say something like, "Sir, I missed everything after 'I want you to ----'". The General, on a few occasions, thrust the microphone back to me and said, "Here, Sergeant, you tell him." I pondered how to tell the General. Finally, at a moment when he appeared least distracted, and no one else was around, I said that I would like to explain something to him that would help him to communicate with his officers. He said, "Fire away Sergeant." I explained that I had a device in the radio truck that would permit him to talk as loudly or as softly as he wished (the gain control). If he wished to talk softly, I could still make him 'roar'. However, I, and my operator in the truck, had to know so that the controls could be properly adjusted. He thanked me profusely for this information, and told me that any time I had something to tell him that would be helpful, please do not hesitate to tell him. It didn't do any good. The very next time I handed him the microphone, he bellowed into it, and tripped the overload-relay in the truck. Finally, I worked out a signal with my operators. I would click the button on the T-17 microphone several times. The operator could hear the relay in the truck, and would dive for the gain control. It was crude but effective. It was also possible for the operator in the truck to monitor the transmission just by listening to the modulation transformer 'talking'.

You wondered about reliability. It was excellent. I seem to recall that we 'changed out' a receiver or two, while we were in combat, and experienced the worst winter Europe had seen in seventy-five years (the winter of '44-'45), but certainly nothing that ever caused us to go 'down'. Our Signal Company had a repair section that we seldom saw, as we seldom had a problem.

However, one problem with the BC-610 I shall never forget. We had been ordered by the Corps Net NCS to change frequency. We had crazy alternate frequencies that were in the 12-Megacycle range, and they were certainly not better than the 2 - 3 Meg range on which we normally operated. However, some frequency coordinator back in the States had made a decision, and we were stuck with whatever our Signal Operating Instructions (SOI) said.

After shutting down the PE-95 generator (powered by a Jeep engine, by the way), I withdrew the proper tuning unit and coil from the cabinet behind the operating position (at the operator's back), and opened the small door on the top of the BC-610, to the left of the Tuning Unit. The moment I touched the coil, and with my other arm resting on the cabinet, I thought I had been run over by a tank. I tore my arm out of the opening, and in doing so, tore the skin off the back of my hand. The force with which my muscles reacted caused me to hit my hand on the roof of the radio shelter. This latter movement caused perhaps the greatest injury. I sat numbly (I was alone), waiting for something to happen. I'd been an electronic technician with the Western Electric Com-

W1SE today, fifty-two years later. In the shadowbox on the windowsill, and the only items which may be identified, his 84th Division shoulder patch, Technical Sergeant stripes, and just above, his ID bracelet.

pany before the war, and was familiar with the dangers of cardiac fibrillation. I just felt terrible, but in a few moments the effects of the shock passed (estimated at more than 2000-volts). Then my hand began to hurt, and I was able to survey the damage. In addition to tearing the skin from the back of my right hand (I was covered with blood in just a few minutes), I had severely bruised the bones when it hit the roof of the shelter. It was sore for weeks. I then shorted out the tank coil with a screw driver, drew a small residual spark, placed the new tuning unit and coil in position, and tuned up the transmitter on the new frequency. The BC-221 we carried was priceless for this kind of operation. The problem with the transmitter bothered me, as I had done this simple operation many times before. We had to wait until we were out of action for a day or so, and I could get the repair boys to remove the BC-610 to their repair facility. I learned that (wouldn't you know?) the bleeder resistor in the power supply had opened. I was hit with whatever was left in the caps, after I shut down the PE-95. The rough roads in war-torn Belgium and Germany had been too much for the resistor, and it almost finished me off, when, so far, I had survived bombs, shells, and tank fire, plus a few other things designed to ruin one's day.

The BC-191, as you know, was not designed to be remotely operated. However, a little 'Yankee ingenuity', and some cables and extra speakers scrounged from the Signal Depot enabled us to accomplish the job. It relieved our operators from spending countless freezing hours, in below freezing weather, and directly saved the life of one of our operators. An enemy 88-mm shell landed under the right-front wheel of the Weapons Carrier, and tore off the wheel. A fragment of the shell

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went through the center of the BC-191, in the back of the truck, exactly where the operator would have been sitting, had he not been comfortably ensconced in a nearby basement. We could replace damaged or destroyed equipment, but getting another trained radio operator was out of the question. We lost one radio team in the Bulge, when they were ambushed, and operated short-handed for the rest of the war.

Incidentally, I was in the General's War Room when a squad of war correspondents showed up. The General began explaining where our lines were, when one of them said "General, that looks like a huge bulge in our lines." The General replied that was exactly what it was, and that we were working to eliminate it as quickly as possible. In ten days we were reading about "The Battle of the Bulge" in the Army's "Stars and Stripes", and hearing about it in letters from home. I was there when the phrase was coined.

As to the BC-312 being used only in emergencies, as one author suggests (see Note 2), perish the thought. We used the receiver, powered by two six-volt batteries that were always on 'trickle charge'. One radio, either the BC-312 or BC-342, was always tuned to the Net in which we were active. The other was always tuned to the BBC. How else would we know what was happening? One night, as I was on duty in the SCR-399, I heard BBC London announce that they regretted to report that the city of Marche, Belgium had just fallen to the enemy. When I went on duty that night, and closed and shuttered the door behind me, I was distinctly under the impression that the truck was parked in the driveway of the Marche City Hall, the site of the General's HQ.

I turned out the lights over both receivers, and cautiously opened the door. It was like a graveyard, except that I could hear tank fire, just down the street. I rang up the message center, on the EE-8 telephone, and found out that things were nip and tuck just down the street, about a hundred yards. Then Message Center called and said that we were to expect to be infiltrated by enemy paratroopers in GI uniforms. I told the Message Center that when they sent someone to either pick up a message or to deliver one, that they were to knock on the door first, then call me by name. Anyone who didn't follow this procedure, and tried to open the door, was going to be shot. I operated the rest of the night with my carbine, cocked, and with the safety off, on my lap. It was amazing how quickly my instructions were followed, and to the letter.

One example will serve to tell of the rugged nature of the BC-191 transmitter. As operated, it was installed in a Command Car. During field maneuvers in Louisiana we were providing communications for the Umpires, who were scoring the Infantry Battalions on their training. One of our Command Cars was constantly getting hung up fording a boulder-strewn stream. They would then radio back to me back at HQ to come and pull them out with a winch mounted on the front of a Weapons Carrier. I did this perhaps ten times, when I finally told them that when they reached this part of the terrain, call me before they tried to cross the stream. They did, and I responded. I met them, and climbed behind the wheel of the Command Car. I put it in low-low, four-wheel drive, at the bank of the stream, and floor boarded it. The vehicle went into the stream, the front dropped, balanced precariously for a moment on its front bumper, and then fell back on all four wheels with a resounding crash, and climbed up the far embankment. I looked behind me, and found that the BC-191 had popped out of its vibration-proof mountings, in the metal cabinet just behind the front seat, and had landed unceremoniously on the rear seat. I picked it up, made some adjust-

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Letters

Dear ER

What I have to say is not new -- has been said before -- probably better than these words will convey.

In my mind there is no way to approach this subject without sounding morbid or negative, that's why I have never written about what has for years become a growing concern, but neither will my concern go away, and with each passing month and year the matter before us gets markedly worse.

I write of the almost rampant misconduct on the lower bands, particularly 75, 40 and 20 meters, by what is certainly only a few of us, 10, 20 -- I'll bet no more than 50. I know most of us, whatever our faults, and we do have them, are saying - yes, this has been said -- let's not air our dirty laundry once again.

But, you see, to hide from it, to deny it, doesn't seem to be helping either. Now I will submit this - and of this I am certain -- when encountering this kind of behavior on the air -- the only response must be no response. That is neither the place or the time to try -- even with the best of intentions, to inspire, change or as we are often tempted -- to cajole or do battle.

The solution: two thoughts. One, no response is what the agitator wants least. Doing our very best-- like a good card player -- to ignore the offensive behavior is probably the most discouraging response for the offending person. They really do cry for attention. Let's not give them that satisfaction. Time and space do not allow an examination of the mind-set or emotional state of such persons, but suffice it to say, their lives in general probably reflect a need for a lot of conflict resolution, therapy and our help - but not on the air in response to bad behavior as they act out their emotional needs.

Secondly, FCC enforcement and our own personal observations, diligence and vigilance must increase dramatically (these persons must live near some of us!). The flavor that this behavior of a relative few leaves on our bands is surely causing some of the young and old to leave our beloved hobby. I can think of no single issue or even combination of issues that will destroy this community (of communicators) quicker then the example of non-communication that this behavior presents for all to hear. Imagine one of our legislators with an interest in telecommunications listening in on any evening at a friend's house on 75 meters. And then imagine that legislator discussing the future of our limited band spectrum with the spectrum hungry and wealthy commercial interests out there.

Well, I know this is preaching to the choir -- but maybe -- just maybe, if one of the offending parties reads this and is touched to modify his -- yes his behavior (I can't imagine one of our fellow female hams participating in this -- it is a male problem), then maybe airing our dirty linen once more is worth my writing and your reading.

Ben Booth, W4CT

Dear ER

From the very beginning, I was intrigued by Vintage Field Day. I "participated" using a GRC-109, powered off the "large" p/s, which can accept the 6V tractor battery I bought awhile back (for it and the RT-70)

I made no actual contacts, probably because I operate QLF (using my left foot), but I did determine that the Autek outboard audio filter gave me single-signal reception, despite the 9-kc bandwidth of the R-1004's IF. I called a local CW aficionado who gave me a signal report as FB: no buzz or whine, good power, etc. He begged off Tx'ing back, claiming he'd loaned his keyer to his distant son, even tho I offered to run a straight key over to him (he's only 6

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The Cosmophones - Part Two

Thirty-Five Exposure

by Brian K. Harris, WA5UEK
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Bi-What?

Let's face it. This is the 90's. In spite being an AM-oriented publication, I venture to say most ER readers have spent a few minutes pondering the block diagram of a filter-type SSB transmitter. Furthermore, I bet the majority can accurately sketch the block diagram of a generic SSB receiver. The technically inclined undoubtedly understand their mirror-image similarity and how it is utilized in modern SSB transceivers. Long before the commercial blending of SSB transmitting and receiving technology occurred, Butch Mason, W6KAG, recognized this similarity and felt it could be used to build a compact mobile SSB transceiver. The architecture would later be called "bilateral", as the modulated signal travels one direction through the filter during transmit and the opposite way during receive. Over a decade would pass before such designs appeared in ARRL technical publications. Today, over forty years later, bilateral transceiver architecture remains the norm.

The Cosmos Connection

On August 16, 1952, Butch Mason logged the first two hours of work on his Portsider. Over 600 development hours later, on October 24, 1953, he made the last entry in his engineering notebook. Being justifiably proud of his design, he felt a manufacturer might be interested in producing it. Accordingly, Butch personally took his creation to both RME and Collins and had Harold "Robby" Robinson, W3RE, show it to Gonset. Perhaps it was the recent Electro-Voice takeover and their uncertain amateur radio future that resulted in RME's disinterest.

Likewise, Collins was not interested. In fact, Art told Butch that Collins would never build a rig that could not transmit and receive on different frequencies because of out-of-band DX needs. At the time, Butch was not aware of Collins' strict NIH (not-invented-here) policy nor that they were working on the KWM-1 (a rig that I believe is limited to transmitting and receiving on the same frequency). During this meeting Butch learned of Collins' broad patent covering bilateral circuitry, a technology they had not yet publicly demonstrated with SSB.

Art's rejection turned Butch back to the drawing board to solve the limitation of transceiving on the same frequency and to, perhaps, get around the patent issue. In this second effort, he created an innovative dual VFO design with two tuning capacitors, which used relay contacts to select the desired capacitor. This technique was applied in the Cosmophone 35, making it the first commercial SSB transceiver to include dual VFOs, a feature that did not reach other transceivers for many years. Note - the KWM-1 was the first available SSB transceiver (1957) and the Cosmophone was the second (1958).

We have all heard the saying, "Timing is Everything". Butch was poised to approach Collins again, when he had an on-the-air discussion of his design

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For further information, check number 20 on page 126.

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Less power supply

P35 Power Supply - **$139.50** NET

6.3V at 13 amps
600V at 100 ma — 210V Regulated at 45 ma
300V at 160 ma — -150V Regulated at 25 ma

COSMOS INDUSTRIES, INC.

31-28 Queens Boulevard — Long Island City 1, N. Y.

with Ed Piller, W2KJY. Ed had an ex-classmate in the electronic manufacturing business. This classmate was Hal Goodman, the president of Cosmos Industries, a Long Island based electronics firm well known for their PTOs. Butch took his Portsider to Ed for his evaluation. In turn, Ed showed it to Hal Goodman, who was looking for something to fill the gaps between military contracts. Hal agreed to the project. The legal matters were quickly handled and the commercial development of what ultimately would be called the Cosmophone 35 began.

Much to his dismay, after Butch inked the deal with Cosmos Industries, Gonset offered to pay him $8,000 for his design, an amount that would buy a fine home in the mid-fifties. This was far superior to his Cosmos Industries' package, which was to receive an early production unit (he did) and royalties (he didn't). Too late to renege, Butch suggested that Gonset make a transistorized version of one of the tube-type SSB units that were "sure to come". Of course, Butch was not surprised when Gonset formed Sideband Engineers, who created the SBE-33, a transceiver with an architectural resemblance to the Cosmophone.

A First Pass

Butch was given four weeks to complete another prototype that would include a Q-multiplier, a VOX option and, of course, his dual VFOs. Ed Piller would act as a consultant, assisting Butch. The VFO gear drive assemblies and dial mechanism would be designed by a German mechanical engineer named Metzer. These gear drives were trouble spots in the prototype and later in the early production units. Apparently they were satisfactorily resolved because none of my Cosmophones exhibit any such problems, including my earliest units.

If you recall, the Portsider was a compact rig designed for mobile use. Hal Goodman wanted to target the fixed station market, so a larger form factor was called for. The desired size increase is evident in the apparent 19" front panel and cabinet of the SSTR-1 that was test marketed in a CQ advertisement (September 1955). I have yet to determine (but doubt) an SSTR-1 was ever built. I do know none were sold. The picture in the ad may merely be an artist's rendition. It was definitely not the prototype that Butch Mason built. Response to the ad was more than sufficient to convince Hal to bring a SSB transceiver to production. Besides the name, much changed from the SSTR-1 to the Cosmophone 35, I can only assume these changes were a result of feedback from potential buyers or dealers. The production rig would have a meter replacing the magic eye, more than double the power output and cabinetry nearly identical to that of a 75A-4.

Inside Information

One of my goals was to speak with any Cosmos Industries employees that were remotely involved with the Cosmophone. Armed with my CD-ROM data base, another phase of my research began.

First, I tried to find the author of the CQ article on the Cosmophone 35. Besides being an Associate Editor of CQ magazine, Ken Greyson, W2HDM, also worked at Cosmos Industries. My attempt to find him failed. Later, I learned he was a Silent Key. Although he was not directly involved with the Cosmophone, I am sure a conversation with him would have been informative.

According to Ken's article, Gerald Harrison, W2ZGA, was hired by Cosmos as a project engineer to resolve design issues with Butch's prototype and to bring it to production. Reaching Gerald seemed critical and I was relieved when I did. Ken's description of Gerald's involvement in the design was an understatement. Quite predictably, there were many aspects of Butch's de-

continued on next page

sign that Gerald did not like, so he set about re-engineering much of it. Although the two designs are similar, more is different than is common. An interesting aside is that Gerald wrote his Master's thesis based on his Cosmophone development work. He confirmed ordering enough parts to build 100 units, however, he left the company after about thirty units had been produced - but not before he modified one unit by installing a single 4CX300A, which put out about 300 watts.

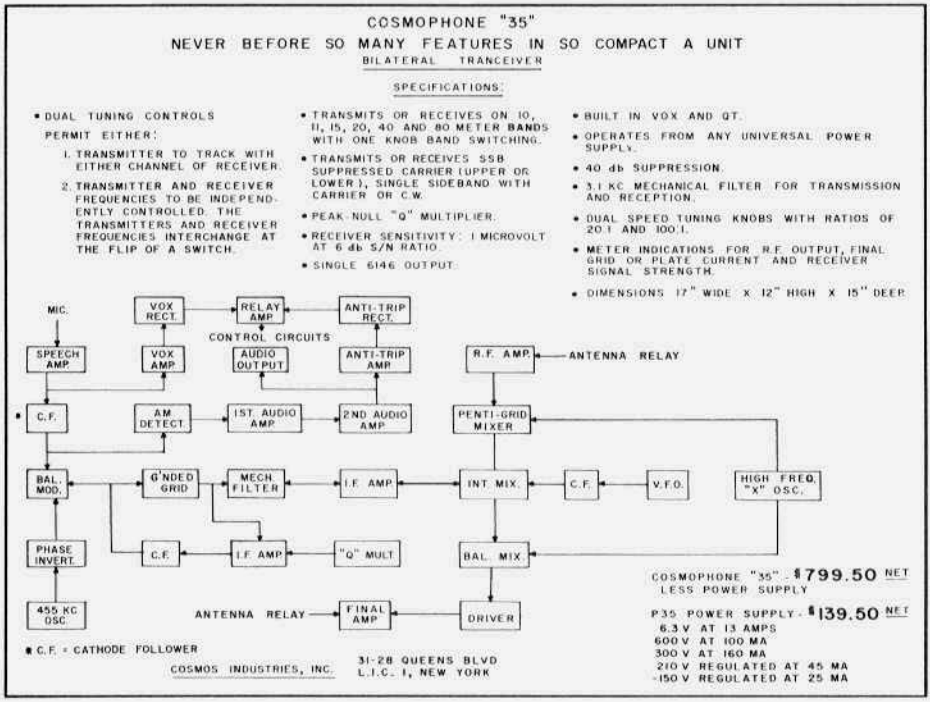
Of course, I wanted to talk to the president, Hal Goodman. On contacting him, I learned more about the Cosmophone and Cosmos Industries. The company records were not available, so I was unable to determine the exact number of Cosmophones sold. He did remember they made a production run of only 100 units and was positive they did not sell all of them. He did recall a significant number, perhaps ten to twenty, were kept for use on other projects. Others in inventory were damaged during a fire, primarily from water. Some of these were sold at a tremendous discount. Any remaining Cosmophones would have been sold as scrap when Hal closed the business in 1986. Almost four decades after its introduction, Hal still has a decidedly negative attitude about the Cosmophone. This is not because of its performance, but because Cosmos Industries lost a great deal of money on the project due to its lackluster sales. His attitude is easily understood. He was a businessman first and a ham second.

Gerald gave me the name and call of his chief technician, Arnold Trossman, W2DTJ, from whom I learned even more, as he was directly involved with the Cosmophone development. Hal suggested that I contact Steve Miele, W2MRM, who worked for quite some time in the engineering department. I was fortunate in contacting him, as he also provided many interesting tidbits of information. Steve came to work shortly after Gerald Harrison left the company and was involved with the production of the later serial numbered Cosmophones. More important, he developed the Cosmophone 1000. The only other direct employee I was able to reach was Steve Korn, K2MDD, who worked as a technician for only a year (1962). This was long after the development work ended, therefore he was unable to add much to the information I had already received.

No $ale

Why did the Cosmophone sell so poorly when it performed so well? One can only hazard to guess. Was it price? Perhaps, but I don't think that was the primary factor. For example, the KWM-1, with its 100 Watt output and tri-band coverage, sold well at $770. The Cosmophone fetched $799.50 and provided 80-10/11 meters, although it only had 35 Watts output. Both units were a significant investment if you added the optional power supplies. In reviewing the prices of receivers and transmitters available in the late fifties, one finds a quality station typically cost from $800 to $1200. Considering the 1957 Chevrolet BelAir sitting in my garage cost $2299 when new, to purchase an entirely new station required a much greater percentage of one's income than it does today.

My guess is the poor sales were also due to the Cosmophone's formidable size and weight. While it is smaller and lighter than most of the separate receiver and transmitter combinations that preceded it, with dimensions of 17" x 12" x 15" and 57-3/4 pounds, it has almost four times the volume and mass of the KWM-1. Yes, the KWM-1 was designed with mobile operation in mind, but it found significant use in fixed stations and signaled the trend toward smaller rigs. Perhaps the tough-



est competitor for the Cosmophone was the KWM-2, which was introduced in 1959. We all know it enjoyed monumental success. In spite of costing over $300 more than the Cosmophone, the M2's size, power and simplicity, coupled with the Collins reputation did not make it any easier for the Cosmos Industries' first entry into amateur radio.

Another limit to sales was the Cosmophone's low output power of 35 watts. It was more than sufficient for most grid-driven amplifiers, but way too low to fully drive grounded-grid linears or compete barefoot against the remaining kilowatt AM rigs. While there were some rigs with even lower power, most of the available SSB transmitters sported at least 100 Watts input, if not output.

Overview

With the availability of the two excellent Cosmophone 35 reviews referred to in Part One of this article (ER #98), there is no need to repeat the precise details of the design. However, for those readers that do not have access to these reviews, I offer this brief description. The Cosmophone 35 is a complete six band SSB/AM/CW station. Its dual VFOs make it almost like two transmitters and two receivers, with the ability to switch among the four possible transmit/receive combinations with the flip of a single switch. At the core of its 24 tubes, which comprise 35 stages, is a Collins 3.1 KHz wide mechanical filter. The receiver is double conversion on all bands and has a crystal controlled first LO.

VOX operation is included, along with a powerful Q-multiplier. All controls are on the front panel. The rear apron contains separate SO-239 connectors for receive and transmit, the power supply connector, two terminal strips and connectors for a mike and a key. A four-

continued on next page

position meter switch allows monitoring of the final plate and grid currents, as well as AVC and relative RF output. Although there is a bandswitch that controls the receive and low level transmit stages, the final tank is a National MB-40L, an all-band HF tank circuit that requires no switching.

Judgement Day

While I have not made quantitative measurements, the receiver in the Cosmophone is one of the most sensitive in my shack. This is no simple feat, as it competes against some of the world's best. I would compare its performance to that of a 75A4 without passband tuning, however, the peak/notch capability of its Q-multiplier more than compensates. In the sixties, Bob Alexander, WA6GCR, did a side-by-side receiver comparison of his Cosmophone (#18) with several new rigs, including a KWM-2. His Cosmophone outperformed them all.

Much has already been said about the Cosmophone dual VFOs. There is no doubting the flexibility they offer for general operation, but when it comes to net activity or DX'ing, the feature cannot be overemphasized. For example, Arnie Freeman (SK), W2YD, won many DX contests using only his Cosmophone 35. His competitors could only guess how he could occupy two frequencies at basically the same time. By the way, he didn't run his Cosmophone (#8) barefoot or with an amplifier. Rather, he removed the 6146 and the MB-40L tank and installed a 4X250B and a pi network.

Another important VFO characteristic is its minimal drift with temperature. This drift was low enough to prompt Cosmos Industries to publish it in the form of a graphical advertisement showing the drift of serial numbers 16, 19 and 23, all of which had less than 100 cycles drift in one hour from a cold start. The behavior of my Cosmophones is similar. The two VFO controls have dual tuning rates and are wonderfully smooth. Using the high speed dial (60 KHz/R), you can span the 600 KHz slide rule dial very quickly. The low speed dial (12 KHz/R) offers comfortably paced tuning of CW and SSB signals.

Getting a meaningful SSB audio report is difficult these days because of the ubiquitous 2.1 or 2.7 KHz wide receiver filters. Although I have not yet come up against a phasing or crystal lattice rig, my Cosmophones typically get better audio reports than most transmitters when I am in multi-party QSOs, in spite of my very non-broadcast quality voice. This is a testimony to the 3.1 KHz mechanical filter and the selection method that Cosmos Industries used to choose the upper and lower sideband oscillator crystals. There is no means of frequency adjustment in the Cosmophone for these crystals, therefore a special test station was constructed to select crystals that were best suited for the particular mechanical filter, thereby creating a matched set.

There are always things that don't show up in photographs or that are hidden beneath the skin. In the Cosmophone this certainly applies. For example, the front panel has tri-colored silk screening. All markings are white, with the exception of those dealing with the dual VFOs, where red and green are used for clarification. All the knobs are black, except for the VFO selection control, which is dark red. The high gloss grey front panel paint was done extremely well. Everyone I have seen merely needed polishing to make it look new. In contrast, the cabinet paint is another story. It is grey wrinkle, but the surface preparation was done poorly, if at all. All but one unit I have has some flaking paint, usually on the top and near the rear.

On the inside of the Cosmophone, in addition to the main chassis, there are several other sub-chassis, some of which

are copper, some of which are copper-plated steel. Most units I have found have varying degrees of corrosion, primarily of the steel chassis. The construction practice hints of military equipment, which comes as no surprise since that was Cosmos Industries' primary business. An example is the military style wire and tightly laced cable harness.

The bandswitching mechanism is most interesting. A long shaft extends from the front panel to the rear, vertically-mounted, RF sub-chassis. On this chassis there are five wafer switches that are rotated by steel pulleys connected with a wire cord. Initially, this was to be cloth dial cord, but Arnold Trossman suggested the use of wire. He caught flak for this because of its cost, but it turned out to be a great idea because the bandswitch can be difficult to move even when everything is well lubricated. This is in spite of the fact that the wafer switches have no detents, thereby reducing the torque required to move them. Standard dial cord would never have held up.

From the beginning I questioned the single 6146 and the 600 Volt supply. The Cosmophone's 35 watt output just didn't seem right. Indeed, the HV power supply appears to be capable of supplying more than the recommended 100 mA of plate current. I later learned the original intent was to have two 6146's, but the National MB-40L tank circuit couldn't handle the power. Apparently they had a propensity to arc if the input power was raised much above 75 watts. The decision to use the switchless tank circuit was Hal Goodman's. He got a "good deal" on them. Considering the disappointing sales, perhaps his good deal was not so good after all. With a slight increase in the HV, a pi network and a second 6146, it would have been easy to achieve 100 watts of output, a power level that would have made barefoot operation much more viable.

Aware of the power issue and desperately wanting to boost their sales, Cosmos Industries made a common marketing move - change the model name and introduce a "new" product. Advertisements for the Cosmophone 50 boasted its input power of 60 watts PEP. In actuality, the Cosmophone 50 is nothing more than a re-marked Cosmophone 35. In fact, you could return your "35" to the factory and they would "convert" it for you. Only one of my units (#98) is a Cosmophone 50.

Gotchas

A feature I feel should have been included in a rig of this class is a crystal calibrator. A previous owner of one of my Cosmophones felt the same and installed a Knight unit the easy way, by drilling a big hole in the front panel for its toggle switch. A minor gripe I have concerns the slotted shaft of the carrier insertion potentiometer. Although this control is not adjusted often, it deserves a knob. Several of my Cosmophones have had this pot changed and a knob added. I suspect the location for this control was decided after the well balanced front panel arrangement was complete and a knob was purposely not included so as not to upset that balance.

No fewer than six relays are energized when switching from receive to transmit. While their sound does not match that of a Valiant, I avoid using VOX. The most common problem in Cosmophones is the malfunction of one of these relays (K1), which switches both low level and high voltage signals. While burnishing typically cures any problems, it is a pain to do. This is another reason I don't use VOX. Some day I will develop a reversible modification that will utilize electronic switching.

Another problem area is the metering switch. If you move this switch while transmitting, you will fry the panel meter. Why? HV is present on this switch and it tends to arc. Several of my

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Vintage Field Day, Annapolis

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

I had a great time getting back to the kind of Field Day I remember when I first got into the hobby. In those days, it really took something to assemble a portable station with transmitter, receiver, generator, and assorted support hardware like antennas, food & suitable beverage.

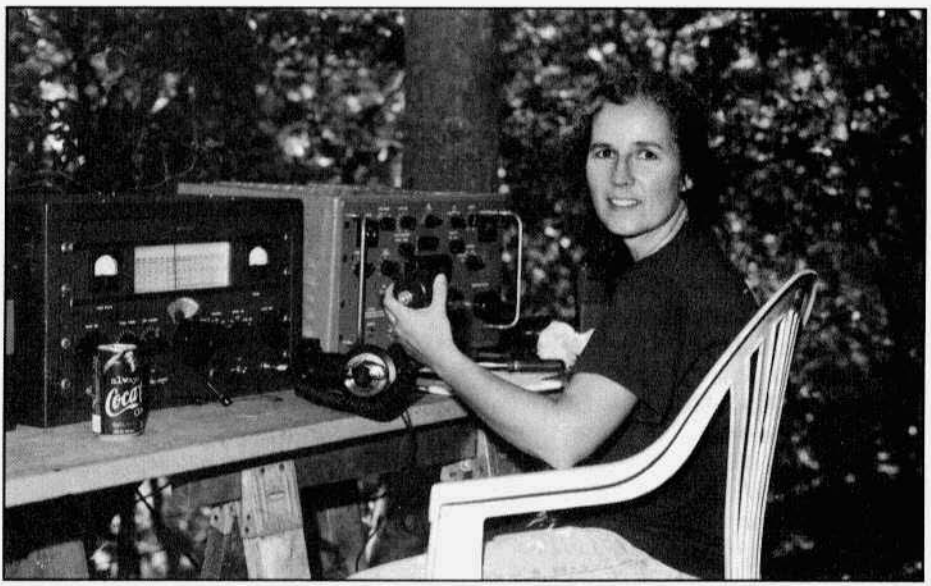
But Vintage Field Day allowed a wonderful difference from the mainstream contest mentality in the routine Field Day. I was able to portray my outfit as a "special event station" to showcase the old gear and the wonderful sound of AM.

I really wasn't interested in racking up points, so after confirmable contacts on 75, 40 and 20 meters, I was content to just work whoever happened to come along. It was very satisfying to have a low pressure, conversational approach.

The station antenna, all situated in the trees of Patuxent River State Park, consisted of a 90-foot vertical wire, with about a dozen ground radials, some of which were sunk in the riverbed. A wire tuner allowed multiband operation.

Thanks for a good event, and here's hoping for more success next year. **ER**

Official Station, Log
20M - N6EU, Chuck, Saturday 06/14/2235 GMT, 14285 kcs, NE Oklahoma
40M - K1JCL, Bob, Sunday 06/15/1739 GMT, 7288 kcs, ART-13/SP-600, WW II generator
75M - WA2PZI, Larry, Sunday 06/15/1818 GMT, 3886 kcs, DX-100/SB303



Pam Courson, XYL of WA3VJB and 'co-operator' during VFD. *Photo by WA3VJB.*

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
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 Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Grey Hair Net: The oldest (or one of the oldest!-43+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:30 PM EST & EDST. Call-up at 8 PM.
Vintage CW Net: For CW ops who enjoy using vintage equipment. This is not a traffic net; speed is not important. The net meets on 14037 Sundays at 7 PM Eastern. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Andy, WB0SNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same 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 at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.
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. For hams who enjoy using AM, restoring and operating.
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.

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

The Knight-Kit VFO

by Jim Hanlon, W8KGI
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Sandia Park, NM 87047

Once upon a time, forty or more years ago, when the Novice License was young and the entry port for a flood of new, young radio amateurs, the standard entry-level rig was crystal controlled and ran 75 watts or less. Crystal control had been mandated by the FCC in 1951 when they started the Novice ticket; they probably thought it would keep us safely inside the Novice bands, which were in turn safely inside the larger ham bands. Likewise, 75 watts was more than enough to talk nationwide on our 80 meter band in the evening when it was open or on 11 in the early days when the sunspots smiled. We even made intercontinental QSO's when we got 40 and 15; all with a two-stage rig ending in an 807 or the then new 6146 or even a TV sweep tube. Such grand old kit rigs as the Globe Scouts and Chiefs, Heath's AT-1, DX-20, 35, 40 and 60, Viking Adventurer and the Knight T-50 quickly came on the market to satisfy the new Novices' demands for inexpensive, yet effective transmitters.

One of the first things a newly upgraded General Class licensee wanted to do was to acquire the freedom of a VFO and move out of the Novice bands. And there were several new market offerings to satisfy that desire. The Heath VF-1 at $19.95 was a very popular, hands down best buy from 1952 to 1961, and from the look of its prices in today's ER classified ads it continues to be a sought-after favorite. Heath's 1961 to 1976 HG-10/B at $37.95 is likewise well regarded. WRL offered its companion 755 VFO to the Globe rigs for $49.95. Johnson had its 122 VFO, developed first in 1952 for the Viking I and selling for $42.75. Most of these VFO's have been described in past issues of Electric Radio. Knight also offered a VFO, not as popular or well known then, perhaps because the companion Knight T-50 was itself not as popular as its Globe, Heath or Viking cousins. But the Knight VFO was then and remains today as good a VFO as any of the others, it was price competitive at $27.50, and it offers the additional advantage of a built-in power supply.

The Allied Radio name for the 1955 version of the Knight VFO was the "Knight-kit V-44 VFO 83Y725." I have no idea what V-44 stands for, but I do know that 83Y725 was its Allied Catalog stock number. You will not find either of these obscure designations anywhere on the cabinet or chassis of the VFO. Two of them have found their way to my hamshack along with a 1955 manual copy. There are several small differences between them, which leads me to guess that the "V-44" was a second generation version of a design that started a few years earlier. You readers who have a good stock of 1950's QST's or Allied catalogs can straighten me out on this.

The basic Knight VFO uses a 6BH6 in the series-tuned "Clapp" oscillator that was known for good stability and performance in its day. Before I started this article, I had always assumed that the oscillator ran on 80 meters and that the following 6AK6 was either a straight through buffer or a doubler to 40. There is nothing in the kit manual that really says this, but the front panel "output" switch says "off-80-40,20,15,10." You can

Allied Radio's Knight-kit V-44 VFO. Controls include the Tuning Dial, Bandswitch, Power and Output Switch, Calibrate/Standby/Transmit Switch.

imagine my surprise when I put my Heathkit counter on the output of the newer of my VFO's to check it for stability, and the counter read 1750 kHz! It turns out that the oscillator runs on 160 meters only and that the 6AK6, at least as Knight originally intended it, either doubles to 80 or quadruples to 40 meters. The previous owner of my newer VFO, however, had padded the slug tuned inductors in the 6AK6 plate with fixed capacitors so that they tuned instead to 160 when the output switch was on 80 and to 80 when the output switch was on 40. The older VFO, on the other hand, is assembled per the manual and its output comes out on 80 and 40 meters. Once I figured this out, I changed the newer VFO to give output on 160 and 40, an ideal match for my Globe Chief 90, which covers 160 through 10. The older VFO I'm using as-is to drive my 80 to 10 meter DX-20.

Meanwhile, back at the original design, the VFO has a two-gang tuning capacitor. One section is sized for good bandspread across the entire 80 meter band, while the other tunes the VFO only from 1750 to a little above 1850 kHz, affording appropriate coverage and good bandspread for the higher frequency bands. There are separate air trimmer capacitors on the side of the chassis that allow setting the oscillator calibration on each range. Interestingly, the 3.5 Mc calibration point on the 80 meter band does not fall at the far left of the dial, even though the 7.0 Mc and higher band edges do. When I acquired my second Knight VFO, I found that blank space below the 80 meter band to be filled with calibration for the old 11 meter band which had been given away to CB by 1955 when the V-44 version of the VFO came out. So now I know why the blank spot is there. Perhaps it will come in handy again some time if the powers that be realign 40 meters down 100 kHz in the next WARC meetings.

According to the schematic, the oscillator is followed by a 6AK6 multiplier whose output is broad-band tuned and switchable to either 80 or 40 meters. My 1955 VFO does have a 6AK6 in this socket, but the older one has another 6BH6 there. The pinout of the two tubes is the same, and the other parts associated with the multiplier are the same in both units. However, as I'll report a

continued next page

The Knight-Kit VFO from previous page

little later on, the 6AK6 does provide better output on 40, so I guess I'd better get busy and find another 6AK6 for the old guy too.

The Knight VFO has good quality parts where it counts for stability. The oscillator coil is wound on a heavy, mechanically stable, ceramic form. The bandswitch has ceramic Pi-sections. The tuning capacitor is a double bearing type, and it's driven by a 7:1 vernier dial that is still smooth after forty some years. The padder caps are sturdy, ceramic and metal air variables. The VFO chassis is of flange welded construction. All of the frequency determining parts are below the VFO chassis in the bottom of the box where they are least likely to be affected by internal heat, and the cabinet itself has several vent holes in the back.

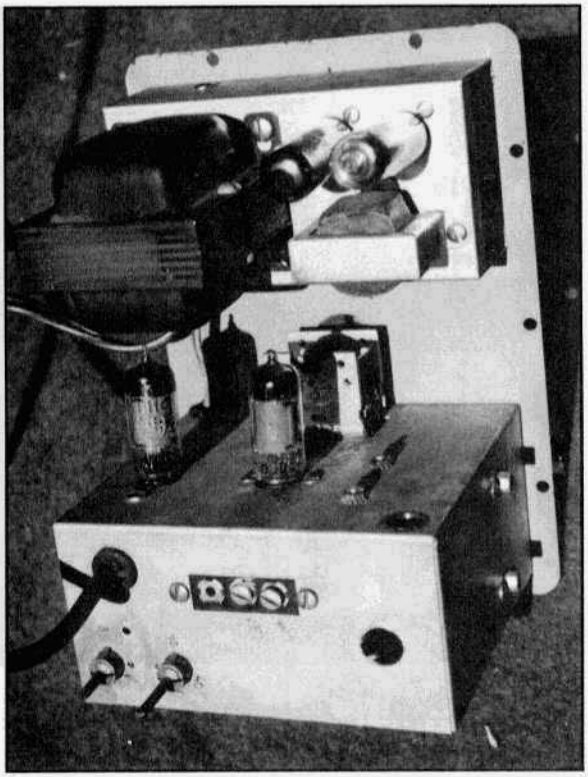
The power supply is mounted horizontally in the top of the cabinet. A small transformer supplies 6.3 volts to the VFO filaments, to a pilot light and to a 6X4 full-wave rectifier. The power filter is a choke input L/C. The multiplier stage is powered directly from the output of the filter, while an OA2 regulates the oscillator B+ to 150 volts.

There is a key jack on the front panel which is active when the switch beside it is in the "transmit" position. The key is shorted for frequency spotting when the switch is thrown to "calibrate," and it's open when the switch is in its middle, "standby" position. There is an extra set of contacts on this switch which are brought out to a terminal strip on the rear, just in case you want to control the rest of your station from the VFO. The oscillator stage is keyed in its cathode, and there is no noticeable chirp or click on either of my VFO's even on ten meters, which is quite a good trick for a keyed VFO built in 1955.

VFO output is capacity coupled from the multiplier plate through a two foot length of RG-59 which was terminated in a crystal socket plug in the original model. Slug tuned coils, accessible from the back of the cabinet, allow the user to peak the VFO output in the middle of the 80 and 40 meter bands. The newer VFO with a 6AK6 multiplier tube puts out about 48 volts rms into the Globe Chief oscillator grid on 160 and 25 volts on 40. The older VFO with a 6BH6 multiplier tube puts out 46 volts into the DX-20 oscillator on 80, but only 13 volts on 40. So you can see why I'm in the market for another 6AK6. Allied conservatively rated the VFO at 10 volts output.

Besides the 11 meter calibration on the 80 meter range, and the different output tubes and output bands which were previous owners' mods, there are several other differences between the older and newer Knight VFO's in my shack. The older VFO has a light gray panel, which at this point is showing quite a few rust spots, and a black cabinet. It looks as though that black cabinet paint may be covering a light gray undercoat, but I don't know whether the black paint was original Knight or another owner's mod. The newer VFO has a matching dark gray panel and cabinet. The older VFO fits snugly into its cabinet and has one screw in the rear which secures the oscillator chassis to the cabinet back wall. The newer VFO has a cabinet about 3/8 inch deeper, and the VFO no longer extends completely to the back wall.

A couple of things that you should be interested in if you're considering using a classic VFO on the air today are its calibration and stability. The Knight VFO is pretty decent on stability, but if you really want it to be stable give it a couple of hours of warm up time. On 160 meters, after one minute of turn-on time, my VFO drifted down 100 cycles in the first five minutes, 140 cycles in the next five, and 130 cycles in the five minutes after that. The drift slowly diminishes to 60 cycles in five minutes at half an hour, to 46 cycles in the half



Rear view of the VFO. The power supply is on top, the oscillator and multiplier are on the bottom. The multiplier plate slug tuned coils are on the rear wall of the chassis. The calibration setting air padder capacitors are on the side.

hour beginning at 75 minutes after turn-on. In the half hour after that, it drifted up all of 4 cycles. Oops, I should have said Hertz, not cycles. But then again, these guys were made in 1955 when drift was measured in cycles, or even kilocycles, rather then in Hertz.

Calibration is another matter. On my older VFO, when I set the trimmer condenser so that the 80 meter calibration was correct at 3.5 MHz and then turned the dial to an indicated 4.0 MHz, the VFO output was actually at 3979 kHz. I decided to try and improve the 80 meter calibration, so after I *added* (yes, even though my intuition said that taking turns off should move the oscillator up, it worked the other way) three turns to the VFO coil, the actual output was then at 3997 kHz when the dial was set at 4.0 MHz. This turned out to be the best available correction without putting a partial turn or smaller loop into the coil. But correcting the 80 meter calibration did not do the same for the 40 meter and higher ranges. Now with the bottom end set correctly at 7000 kHz, the actual VFO output is at 7274 kHz when the dial is set at 7300 kHz. For now I've given up trying to correct the calibration on both ranges; Apparently I can't win them all.

On the newer unit, with the cal set correctly at 3500 kHz, the output is actually at 3989.5 when the dial is set at 4000 kHz. With the cal set correctly at 7000, the output is actually at 7312 with the dial set at 7300 kHz. I haven't attempted any further corrections on this newer VFO. I suppose I could paste a new paper dial face over the original and calibrate it correctly with a counter or by spotting the VFO on a well calibrated receiver, but then it wouldn't look like a Knight VFO anymore. So I'll just put up with less than perfect calibration and continue to use one of my better receivers to spot the VFO frequency if necessary and to make sure it's inside the band.

One thing I can say about the manual for the Knight-kit V-44 VFO is that it sure isn't a Heath manual. The assembly instructions and figures are certainly adequate for putting it together and making it work, and there's even a page on how to solder properly. There's a

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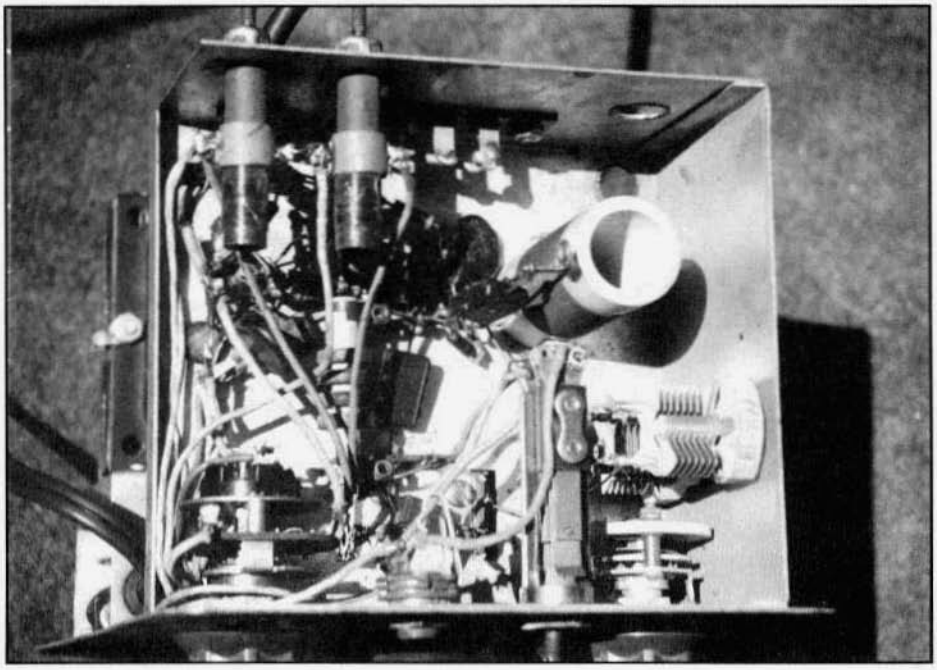
The Knight-Kit VFO from previous page



Under the VFO chassis. The air padders are on the left chassis wall. The VFO coil is wound on the ceramic form at the lower left. The multiplier plate coils mount on the rear wall at the lower right.

good schematic diagram, charts of voltage and resistance measurements, and a complete parts list. As I mentioned earlier, however, there is no clear indication that the oscillator runs on 160 meters. As close as it comes is the following description for CALIBRATION on the 80 meter band.

"If you have a 1700 kc crystal, install it in your transmitter. If not, use any crystal whose frequency is within the 80 meter band, preferably near the low end of the band. ...

"Set the VFO Band Switch to the position marked '80'. Set the Output switch to the position marked '80'. Set the dial pointer of the VFO to 3.5 megacycles if you are using a 1750 kc crystal. If not, set the dial of the VFO according to the frequency of the crystal. Tune the receiver to pick up the signal from the transmitter. Close the plates of C-1 which is the air padder nearer the top of the cabinet, by turning the screw.

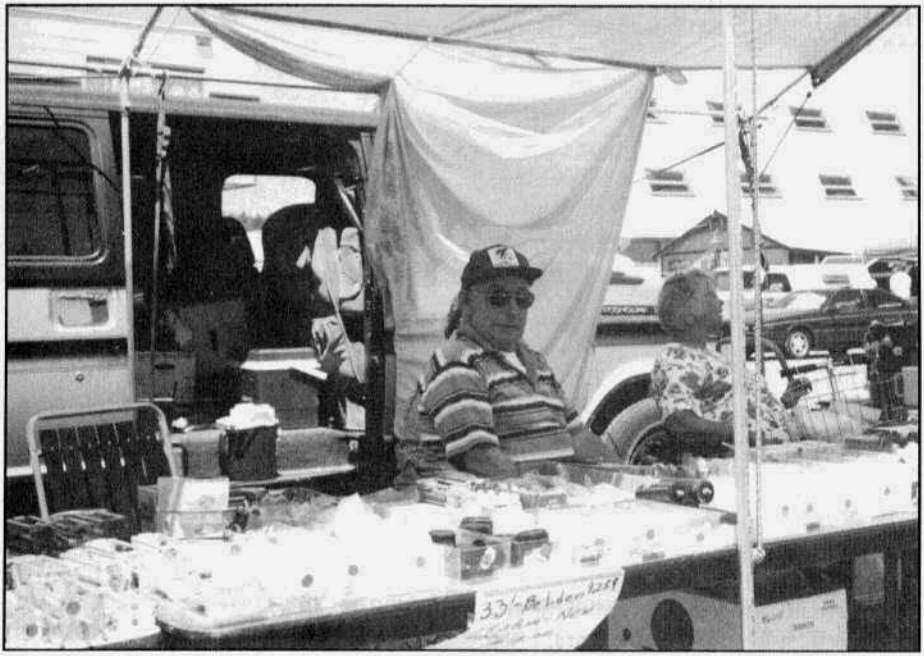
"When the equipment is warmed up, adjust C-1 until the VFO zero beats with the crystal as heard in the receiver.

"This completes the calibration of the 80 meter band."

See why I was surprised?

So, manual problems aside, the Knight-Kit VFO was a pretty good buy in its day, and it's still a "keeper" if you happen to find one at your local flea market. It will do a good job of driving any of the classic, crystal controlled novice rigs from the 50's and 60's. It keys well, and it's reasonably stable, especially after a bit of warm up. You can set the calibration at your favorite spot in the band, for example the bottom edge, but don't depend upon it to be accurate over the entire band. And you might just get lucky and not have to pay as much for it as its more popular cousins. **ER**

Jack Dubbs - Silent Key



Jack and XYL Ruth at the Fort Tuthill Hamfest (Flagstaff, Arizona) about 3 years ago. Jack died on May 22. He was 72. *Photo by N6CSW*

I first met Jack Dubbs in Albuquerque, New Mexico about ten years ago. I remember pulling into a hamfest site (I think it was at a school) very, very early in the morning. No one was there but an older couple dozing in their car in the parking lot. That couple was Jack Dubbs and his wife Ruth. They were resting after the long hard drive from their home near Colorado Springs. Their big car was absolutely jammed with boxes containing the parts they'd brought to sell. Observing Jack at that hamfest that day and after having talked with him, I concluded that he was one of the most enthusiastic and knowledgable hamfest dealers I had ever met. And like everyone else who ever met him I came to like him very much. Throughout the years since I always looked forward to seeing him at hamfests. We also had countless phone conversations. Jack always kept me well informed about hamfests that I couldn't attend.

I think that what he sold could best be described as RF parts - variable caps, vacuum variables, inductors, connectors, insulators, etc. His table was always neat and tidy with all his parts in trays. Sometimes he'd have a rig or two but mostly he sold these small parts and in my opinion he did very well. All over the country where Jack attended hamfests there are builders who will sorely miss him.

He absolutely LOVED going to hamfests. I don't think it was the money that drew him to Hamcom in Dallas, the Midland Hamfest, the Fort Tuthill Hamfest and all the hamfests around Colorado but more the camaraderie. He knew and liked everybody and everybody knew and liked him.

Hamfests for me will never be the same without Jack. N6CSW

Current Inrush Protection for the Viking 500

Jim Garland, W8ZR
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One of the most prized and collectable AM transmitters of the 1950s era is the E.F. Johnson Viking 500. With a single 4-250A (4-400A in later versions) final amplifier, modulated by a pair of 811As, this transmitter runs a conservative 500 watts input on AM, or 600 watts on CW. E.F. Johnson devotees consider the Viking 500 to represent one of the best designs the company produced.

Because of the scarcity of original Viking 500 components -particularly the transformers - it is desirable for users to treat a working transmitter with care. I was fortunate enough recently to acquire a '500' in excellent condition, and while in the process of replacing the electrolytic and paper capacitors, I noticed that the previous owner had increased the fuse ratings to higher values than specified by the manual. In checking around with other owners, I learned that the transmitter is prone to popping fuses, usually at turn-on. This fact led me to check out the current draw of the various circuits in the transmitter. The results were surprising.

There are three separately fused circuits in the Viking 500, with fuse ratings as specified:

1 Amp Slow-Blow Fuse -- RF deck filaments, power relay, fan

4 Amp Fuse -- power supply filaments, 350V pwr supply, -150V bias supply

6 Amp Fuses (x2) -- 2000V power supply

I measured the actual average AC current drawn by each of these circuits, and also the peak inrush current. To make the measurements, I temporarily removed each fuse and jumpered a 0.5 ohm power resistor across the fuse holder terminals. I used the peak-hold feature on my Fluke 87 multimeter to capture the peak voltage developed across the resistor at turn-on. I then used Ohm's law to get the peak current, which I then converted to equivalent r.m.s. value. I did about five measurements for each circuit and chose the largest (since the results depend on when during the AC cycle the switch is closed). The Fluke meter will capture a 1 msec transient. The results of the measurements are as follows:

Fuse Rating	Average AC Current	Inrush Current
1 Amp SB	0.92 Amp	5.1 Amp
4 Amp	1.28 Amp (key up) 1.36Amp (key down)	4.9 Amp
6 Amp	2.95 A (CW-600W)	23 Amp
2.52 A	(AM -500W, no modulation)	
4.46 A	(AM -500W, 100% modulation)	

(Note that the current draw of the low voltage (4 amp) circuit in my transmitter is slightly lower than normal, because I substituted solid-state replacements for the 866A rectifier tubes, and was thus not using the filament winding on the low voltage power transformer.)

These measurements suggest that factory specified fuse ratings are not well thought out. The 1 amp SB fuse rating is too low, given that the normal current draw of the circuit is nearly 1 amp. On the other hand, the 4 amp fuse rating is too high, since the circuit only draws a maximum of 1.36 amp. This choice was probably dictated by the inrush current, rather than the steady-state current demands of the circuit.

The specified 6 amp fuses seem about right for the current draw of the HV

The author working on his Johnson 500. The power supply/modulator is on the right.

supply. However, I quickly discovered that it was necessary to use 8 amp fuses, because of fuse-popping resulting from the inrush current. This lesson has been learned by many Viking 500 owners.

After reviewing these measurements, it seemed desirable to add current-inrush thermistors in the primary of each of the circuits. Doing so protects the power switch and relay contacts, not to mention the nearly irreplaceable transformers. Current-limiting thermistors are readily available from Mouser, Digikey, and other suppliers, and are inexpensive. Adding them to your Viking 500 will cost about ten bucks and two hours time, but could save your transmitter.

For the 1 Amp circuit: Use Digikey KC014L-ND

For the 4 Amp circuit: Use Digikey KC020L-ND

For the 6 Amp circuit: Use Digikey KC007L-ND (two required)

All surge limiters are located in the remote power supply and are in series with the primary winding of the appropriate power transformer. The surge limiters, which resemble disc ceramic capacitors, run too hot to touch in normal operation, so should be mounted in the clear, away from other components.

For the 1 amp circuit, I mounted the surge limiter on two unused pins of the VR tube located nearest the rear of the power supply chassis. I cut the orange wire to the 1 amp fuseholder and routed the wire to one of the surge limiter leads. I then ran a wire from the other lead to the 1 amp fuseholder. I left about 1 inch lead length on the limiter, and insulated each lead with sleeving. I positioned the limiter horizontally, to maximize heat convection upwards.

To install the limiter for the 4 amp circuit, I mounted a one-lug terminal strip on a connector mounting screw next to the 4 amp fuseholder. I relocated one of the wires from the fuseholder to the lug, and bridged the limiter between the lug and the vacated terminal on the fuseholder. Again, I oriented the limiter for heat convection, using long leads, and kept it well

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The Babcock Mobile D-XMITTER

by Art Rideout, WA6IPD
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Fallbrook, CA 92028

I recently attended a radio swap meet and came across an interesting mobile transmitter. The unit was in a factory carton with instruction books, a manufacturer's brochure and some engineering notes. The unit was identified as a "Babcock Mobile D-X Mitter". The price was right and I really needed another transmitter, Hi! From my files the only reference to Babcock that I could find was in a 1952 QST advertisement. The instruction book listed a William F. Bullman as the project engineer and was dated 4 September 1952. Thanks to the internet I was able to contact Mr. Bullman at his home in Playa Del Rey, California. He stated that about 1000 units were built in the 52-53 time period and that they were meant to compete with the Gonset Commander, this and the related power supplies were the only amateur products built by Babcock. Mr. Bullman later left the company and joined Hughes aircraft. Babcock was purchased by Northrup around 1965 and was renamed Babcock Relays. Mr. Bullman was an amateur from 1936 to 1956.

First let me describe the D-X Mitter and then I will briefly describe the unit that I purchased, which is unique.

The D-X Mitter is a push-to-talk crystal/VFO controlled 5-tube multi-band bandswitching transmitter. It was manufactured by Babcock Radio Engineering, Inc., 7942 Woodley Avenue, Van Nuys, California. Advertised price $119.50. There were two versions, one for 6 volt vehicles, the model MT-5A, the other for 6 or 12 volts, model MT-5B. The plate supply required 350 volts at 250 mA. The layout of both units were similar, a crystal oscillator with space for four crystals, each selected by a four position band switch, driving a single 6146 modulated with a pair of 6AQ5s which in turn were driven by a single 12AU7 speech amp.

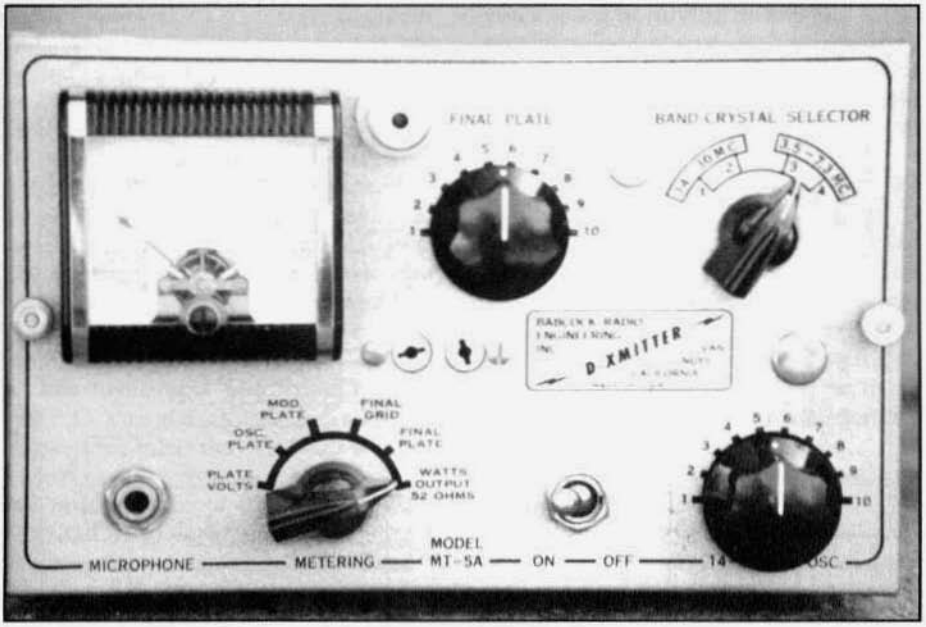
The company recommended the use of a surplus carbon microphone and advertised "high level speech compression". The unit was very compact measuring 5" high, 8" wide, 7" deep and weighing in at 9 lbs. It was designed for 75-10 meter operation with 35-50 watts input.

The oscillator tube in the "A" 6 volt model was a 6BK5 but in the "B" 12 volt model it was necessary to go to a 6CL6 to arrive at the correct current/voltage filament combination. A unique feature of the "B" model was the provision for a remote tubeless VFO. The amateur was encouraged to build his own VFO from information furnished, there were none for sale. This VFO consisted of coils and associated capacitors in a remote box connecting into a front panel receptacle via a short piece of RG-58. This type of tubeless VFO was also described in early ARRL handbooks and was used in other transmitters of the day.

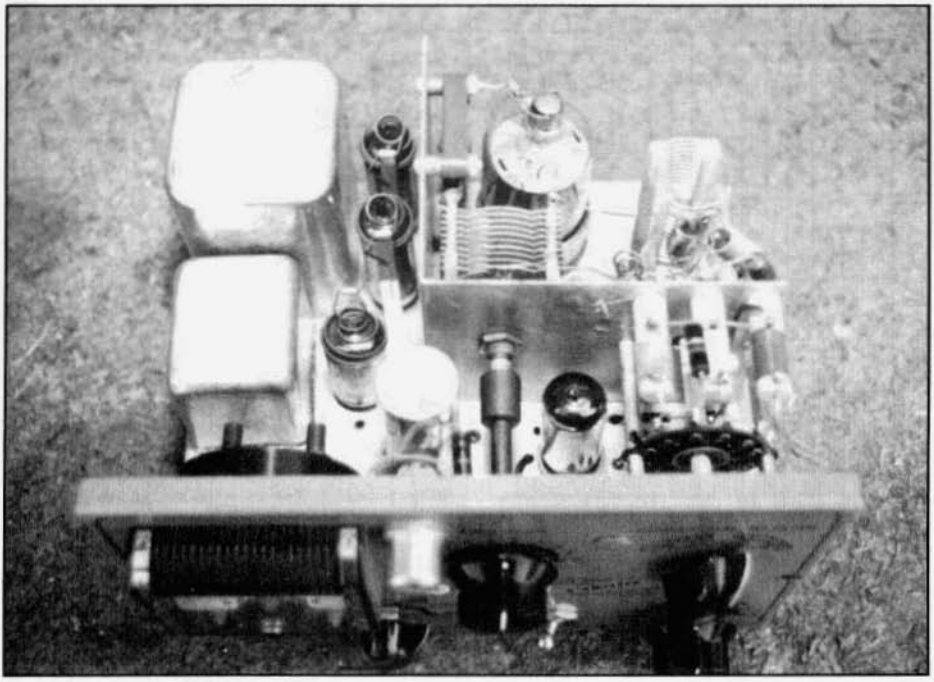
Another nice feature was the measurement of output power by the front panel meter to facilitate tuning.

Three power supplies were offered: a PS-4A vibrator supply for 6 volt operation, $67.50, a PS-CA Dynamotor for 12 volt operation, $79.50, and a PS-1B for 110 volts, no cost was given on this latter supply. Babcock also provided information on how to adapt a surplus 6 volt PE-103 dynamotor for use.

And now for my unit. During the



Front panel of the author's D-XMitter model MT-5A



Topside view with the cabinet removed.

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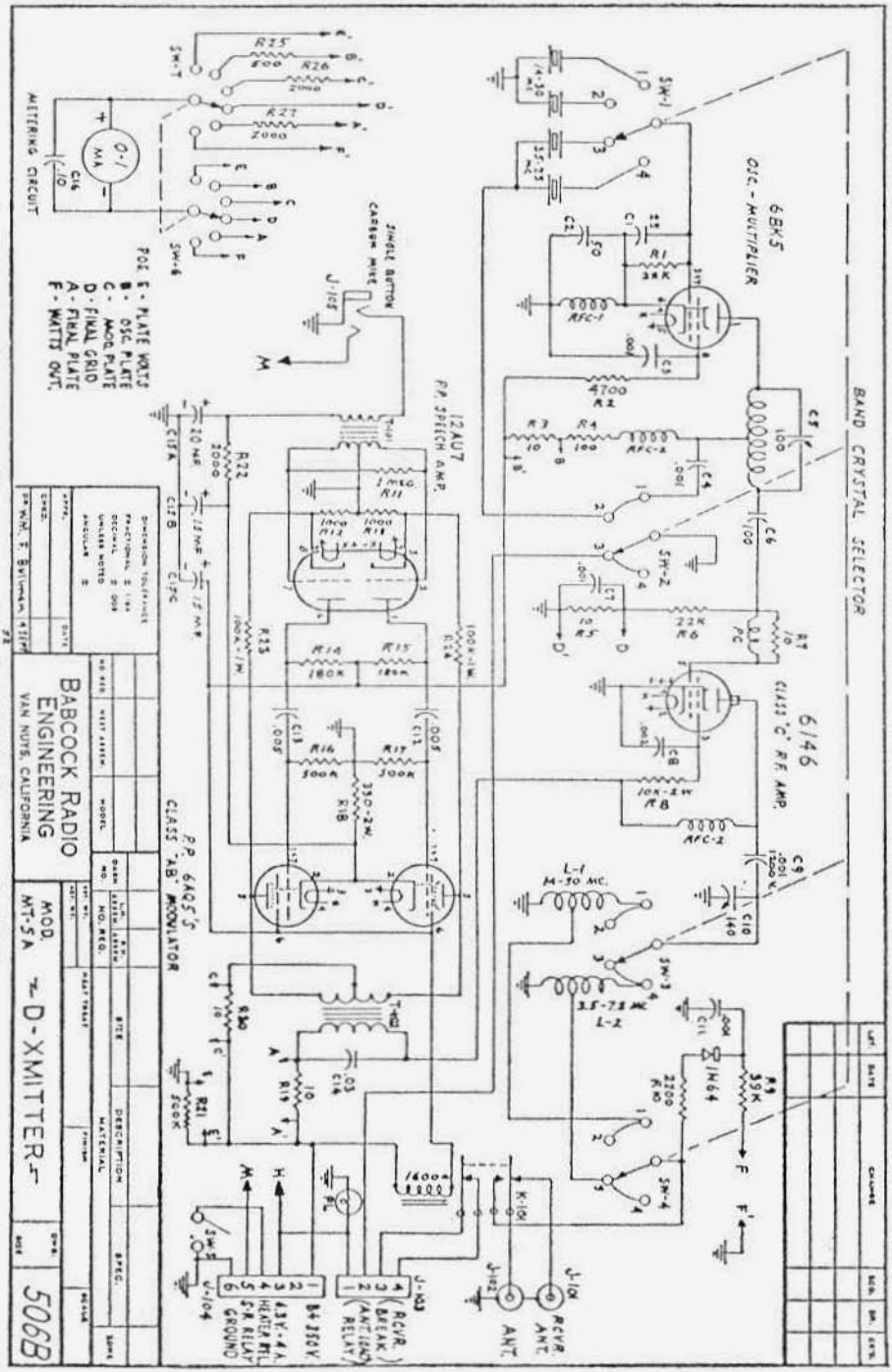


SCHEMATIC DIAGRAM OF MODEL MT-5A BABCOCK D-X MITTER

1950s I worked as a design engineer and when I examined this unit it appeared to be a factory prototype for a new "C" model that never went into production.

This unit had the A model front panel but the B model chassis. However Mr. Bullman stated that he was unaware of any such prototype or plans for one. The engineering notes and instruction books that I previously mentioned had the name of a Mr. Nick Marshall on them. Mr. Bullman knew Marshall as an employee and identified him as W6OLO. Further investigation via the internet revealed that W6OLO became a silent key two years ago. I suspect that my unit may have belonged to Mr. Marshall, who performed several very professional modifications. If so here is what he did. First the arrangement of four builtin crystals selectable by the four position band switch was eliminated. A single crystal socket was mounted on the front for easy insertion of whatever crystal was desired. Also the tubeless VFO could be connected here. Then, in the original design a variable capacitor was used to tune the oscillator plate circuit, but this was replaced by self resonant coils, one for each band, selected by a new five-position bandswitch thereby eliminating the necessity of tuning the oscillator plate. The new five position band switch also allowed for the selection of individual output links for each band in the final amplifier thus optimizing output power and the matching to a 52 ohm line.

Now.... to power this thing up I am forced to let you in on one of my best kept secrets and that is the ultra versatile Swan 117XC power supply.

Everyone thinks Swans are rather so-so rigs, and they are, but the power supply is not and you should be buying Swans just to get your hands on the power supply. They are easily modified for various output voltages and the best part is that a solid state adapter is available, the model 14-C for 12 volt mobile operation.

So my mobile station (if we ever see any sunspots) will be the Babcock MT-5? with the Swan 117XC and 14-C converter with a Gonset Super 12 converter for the receiver. This Gonset converter is a story to itself. Ever hear of 12 volt tubes? No, I am not talking about filament voltage I'm talking about B+, that's right, this converter uses tubes that use 12 volt filaments and 12 volt B+.

This converter is a snap to install and get going.

Tune up and operation of my Babcock is very simple and smooth. Its small size is a plus and makes for a neat mobile installation. I have received good reports from local amateurs and I am very pleased to own a piece of little known amateur history.

I would like to especially thank Mr. William F. Bullman for taking the time to talk with me and providing information for this article. ER

BOY, ARE YOU IN LUCK--- THE GUY WHO TRIED TO STEAL YOUR KW-1 IS STILL UNDER THERE — HE CUSHIONED THE FALL!

A Letter from NØDMS

16 June, 1997
Ray Osterwald, NØDMS
P.O. Box 582
Pine, CO 80470

Hi Barry,

I don't mean to be critical in any way of your editorials, but I feel that I would like to offer something regarding your recent statements on 10 meter propagation.

I do not believe the solar flux numbers are going to be high enough this year to support any consistent 10 meter activity. There may be a few days this fall where the band might intermittently open for an hour or two, but that's going to be all there is. The north-south contacts which have been reported are due to an entirely different propagation mode called "Sporadic-E", one which has nothing at all to do with the solar flux number or the amount of ionization in the upper layers of the atmosphere.

I realize Jacobs [George Jacobs, W3ASK, "Propagation", CQ] and others have predicted a rapid rise in solar flux indices. I'm afraid this is just wishful thinking. There is no evidence at all to support this. His statements were based on a preliminary release from an early NOAA conference. In fact, an independent group of physicists at JPL has predicted a much lower level of activity for Cycle 23 than NOAA has, based on their magnetic studies of the sun (as reported in a recent issue of Astronomy magazine). NOAA scientists base their predictions on statistical studies of past cycles. It is just too early to tell which group of "experts" will be right.

The chart I've enclosed shows the NOAA predicted flux values for the new cycle. I've penciled in the actual reported averages. As you can see, the average flux should have risen by about 20% from January to June of 1997, but it has not. It has stayed consistently near 74. An average flux of 74 is just not high enough to ionize the E-layer in a manner which supports 10 meter propagation. Also enclosed is a copy of a NOAA bulletin which says that we are still in the solar minimum between cycles 22 and 23. I hope you find this information interesting.

Really been enjoying the magazine lately, especially Lew McCoys' column. I've written to him to thank him for his efforts and to let him know how much I enjoy it.

CUL, and 73.

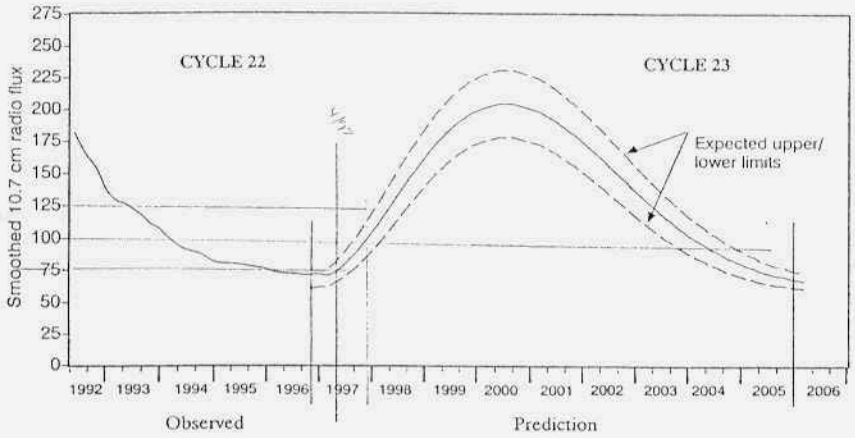
From NOAA publication "Preliminary Report and Forecast 1136, 10 June 1997

What to Expect During Cycle 23

We are now in the minimum between solar cycles 22 and 23. We expect Cycle 23 to be another large cycle, comparable to the last two cycles, but do not expect it to exceed Cycle 19, the largest cycle on record. SEC is predicting Cycle 23 to reach a smoothed sunspot number maximum of 160 (±30) early in the year 2000. The smoothed 10.7 cm radio flux maximum is expected to be 205 (±30).

Based on these predictions, what can one expect of Cycle 23 in terms of space weather? To attempt to answer this question, we examined data from recent cycles. The accompanying plots (see p.12) show annual averaged numbers of solar optical flares (for Cycles 19-22), >10 MeV energetic proton events (for Cycles 19-22), M- and X-class X-ray solar flares (for Cycles 20-22), and geomagnetic storm days (for Cycles 18-22) as a function of year in the solar cycle. Since we expect Cycle 23 activity to be comparable to recent cycles, these plots may be used to get a general idea of what to expect in the next 10 years. It is important to note that we are not attempting to forecast the magnitude or

SEC Prediction of Smoothed 10.7 cm Radio Flux



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1996	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(7)	(7)	(8)
1997	77 (9)	80 (10)	84 (11)	87 (11)	91 (12)	96 (13)	100 (14)	105 (15)	109 (15)	114 (16)	119 (17)	124 (18)
1998	129 (18)	134 (19)	139 (20)	144 (20)	149 (21)	153 (21)	158 (22)	162 (22)	167 (23)	171 (23)	175 (24)	178 (24)
1999	182 (24)	185 (25)	188 (25)	191 (25)	193 (25)	196 (26)	198 (26)	199 (26)	201 (27)	202 (27)	203 (28)	204 (28)
2000	205 (30)	205 (30)	205 (30)	205 (30)	204 (28)	203 (28)	202 (27)	201 (27)	200 (26)	199 (26)	197 (26)	195 (26)
2001	193 (25)	191 (25)	188 (25)	186 (25)	183 (24)	181 (24)	178 (24)	175 (24)	172 (23)	169 (23)	166 (23)	163 (22)
2002	160 (22)	156 (22)	153 (21)	150 (21)	147 (21)	144 (20)	140 (20)	137 (19)	134 (19)	131 (19)	128 (18)	125 (18)
2003	122 (17)	119 (17)	116 (17)	114 (16)	111 (16)	108 (15)	106 (15)	103 (14)	101 (14)	99 (14)	97 (13)	95 (13)
2004	92 (12)	91 (12)	89 (12)	87 (11)	85 (11)	84 (11)	82 (10)	81 (10)	79 (10)	78 (9)	77 (9)	75 (9)
2005	74 (8)	73 (8)	72 (8)	71 (7)	71 (7)	70 (7)	69 (7)	68 (6)	68 (6)	67 (6)	** (***)	** (***)

(##) indicates possible variations from the predictions of Solar Cycle 23's values SEC/Nelson/Borst

time of a specific event; rather we are providing general guidance for the frequency distribution of events during Cycle 23.

Flare Activity:

The greatest number of optical flares occurs during cycle maximum (see the optical flare plot) and Cycle 23 is expected to be no exception. The greatest number of flares is most likely to occur during the year of maximum, which in this case is 2000. Flare occurrences are expected to decline after 2002.

Most major flare production (x-ray class ≤ M5) is expected during 1999 to 2003. On average, M-class flares are expected to occur more than once per day during the same interval. The great-

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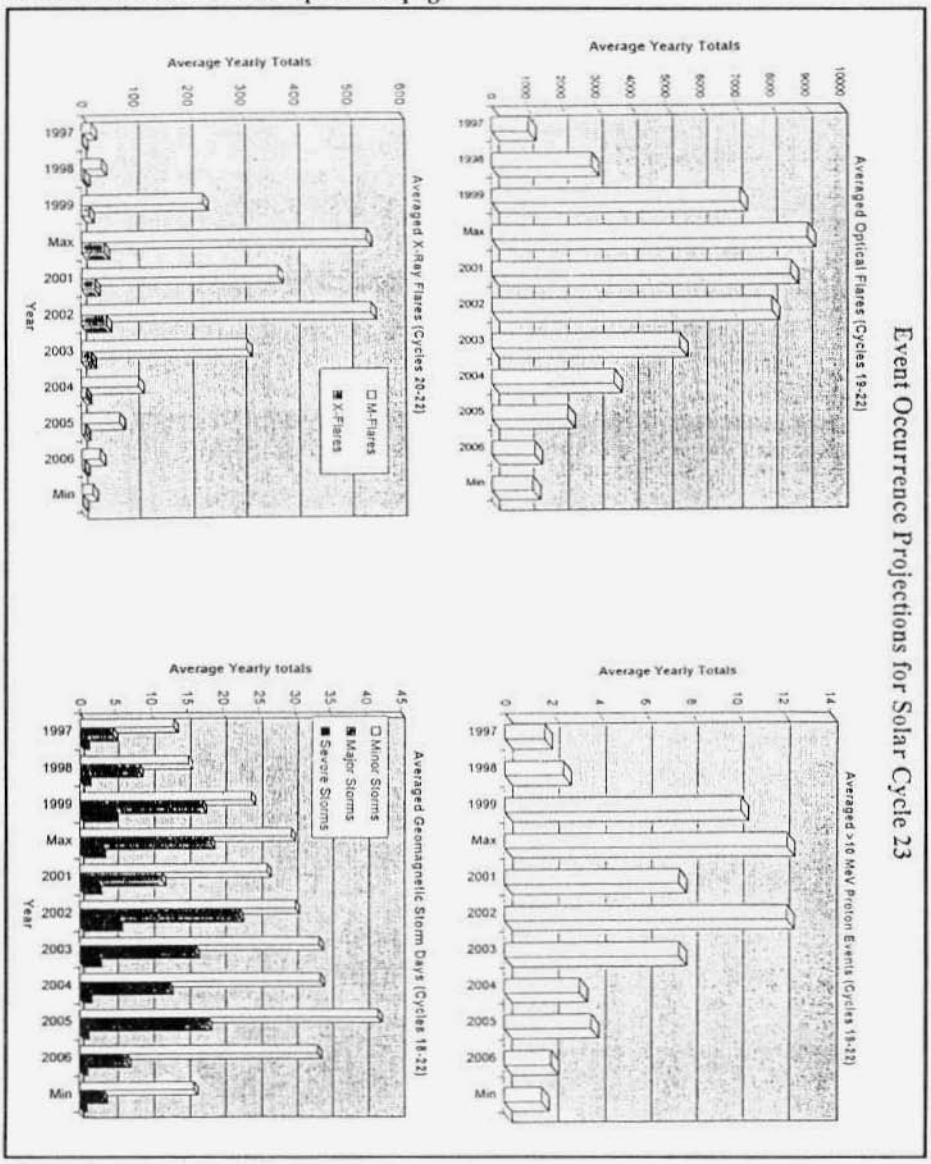

est increase in M- and X-class X-ray flares is likely to occur during maximum (2000), returning to low levels during 2004.

>10 MeV Proton Events:

Most energetic proton events are associated with M- and X-class flares even though most M- and X-class flares are not accompanied by proton events. Based on data from previous cycles, most >10 MeV proton events are expected to occur from 1999 to 2003.

Geomagnetic Storms:

We expect Cycle 23 geomagnetic activity to be near the levels experienced in earlier cycles with the highest number of storm days expected during the years 1999 - 2006.

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Oh No, Not Another Product Detector Article!!!

by Charles Talbott, K3ICH
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There are some venerable receivers out there that can be made much more useful by adding a product detector for SSB as well as CW reception. Even if you plan to use the radio only for AM & CW, you'll have to admit that it would still be nice to easily copy good sounding SSB (note 1) as well as CW. This article describes my experiences in adding this capability to several classics such as the Collins 75A-2, 75A-3, 51J-4, R390-A and the Hammarlund SP-600. After looking at all sorts of product detector circuits, both in commercial equipment and published articles, using various tubes, diodes or IC's, these are the ones I consider to be the simplest AND best performing. None are irreversible, and there are absolutely no holes required. I make no claims for originality of the circuits. They've been published before and have been around for many years.

A "product-detector" is nothing but a mixer circuit. Like any other non-linear mixer, the output is the result of two signals "mixing", or heterodyning together to produce both sum and difference frequencies. In the case of a single sideband signal, this mixer output is the difference between the IF frequency and the BFO signal which is the recovered SSB modulated audio.

In the pre-SSB days, the conventional method of simply injecting the BFO signal into the IF chain to heterodyne with an incoming keyed carrier worked fairly well for CW reception. To make this circuit function on SSB without intolerable distortion requires that the BFO level be increased considerably. In a non-product detector equipped receiver, we normally accomplish this by turning down the RF gain with the audio way up. We then use the RF gain as a volume control. Since you have effectively defeated the AGC by doing this, don't try it with earphones on! A new signal much stronger than the one you were listening to will blast you out. Sure, you can turn down the RF for comfortable audio, but face it, it's a pain to tune around like that.

Some receivers lend themselves to a single component change that will accomplish the same thing. In the Collins design R-390A for example, just increase the BFO coupling cap (C-535 on the IF chassis) from 12 pF to about 50 pF. The end result is "almost" acceptable SSB audio reception with just a hint of distortion. Early Hallicrafters receivers such as the SX-100 and SX-101's used this technique successfully, calling it "Exalted Carrier SSB reception".

For even better sound quality, another slightly more complicated "no-holes" mod is really the way to go. If your receiver uses a single tube for the BFO, such as a 6BA6, you can easily change it to a self excited product detector using a pentagrid converter tube such as the 6BE6 (note 2). You'll only need to move a couple component leads and add a couple to complete the circuit.

As an example, the BFO circuit from a Collins 75A-2/3 is shown in figure 1. (The 51J-4 is identical.) Figure 2 shows the new added components of the product detector in heavy lines. Basically, you move the cathode lead from pin 7 to pin 2. Add a cap & resistor to pin 7. Change the plate and screen resistors.

continued on next page

Product Detector from previous page

Then add the pi section low pass filter and you're done. The only other thing you need to do is run a piece of shielded wire from the pi filter (audio out) up to the mode switch on the front panel. The A-2's & A-3's have a section of the mode switch to perform this function. This was originally used to select either normal receiver audio or the audio output from the optional plug-in FM demodulator (note 3 & 4).

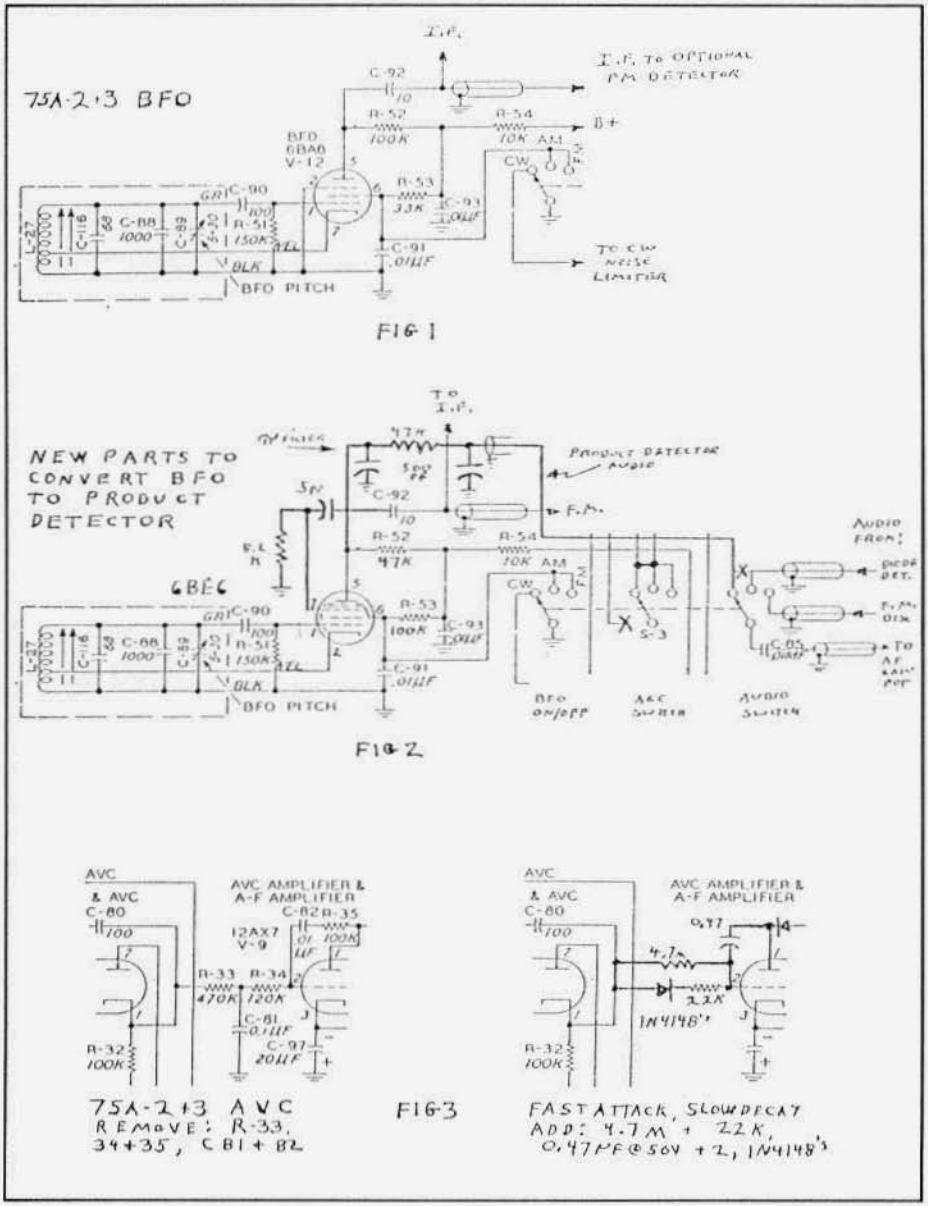
When I decided to do the first modification, I looked up every 6BE6 product detector circuit I could find and noted quite a few variations. Most are insignificant, but a couple of precautions are worth mentioning. First, don't omit the resistor from pin 7 to ground. Severe hum pickup resulted from inadvertently leaving it out once. Next, don't overdrive the 6BE6 IF input on pin 7. A couple of published circuits I tried resulted in very "heavy" audio which reminded me of too much compression, or AGC "pumping" (overshoot). You can lower this IF input by either lowering the fixed resistor to ground (4.7k to 22k) or lowering the value of the coupling capacitor (2 to 10 pF) on pin 7 of the 6BE6. If at the point of clean audio, you find that the SSB audio is much lower than the normal AM (diode detector) output, you can substitute a 1 mH choke for the 47k resistor in the pi filter off the plate (pin 5) of the 6BE6. This will eliminate the resistive loss in the 47k resistor while still removing the unwanted mixer products with the filter. Usually though, with the values of plate and screen resistors shown setting the stage gain, I find that the audio levels are sufficiently matched so as to be able to use the simpler RC network for the pi filter.

Figure 3 shows a simple AGC mod that provides the desired fast attack, slow decay characteristic, which also makes a drastic improvement to the SSB performance in both the 75A-2/3 and the 51J-4 (note 5).

This circuit worked fine in an R390A, but a "no-holes" mod is a bit tricky. The only way I could see to not mount a new connector in the IF chassis to bring out the new product detector audio was with a relay. In the A-2/3 & J-4, the BFO is turned off by grounding the screen. In the R390A, the BFO B plus is switched. I felt I could spare 4 or 5 mA of current to switch a small relay. One other product detector mod article I saw used the same method, but the author installed a larger relay on top of the IF chassis. I preferred not to have the relay visible. I used a tiny 48 volt DC "crystal can" relay with a 39k, 2 watt resistor in series to the switched B+. Now when the BFO is switched on, the relay changes the audio from normal diode detector over to the new product detector output. (note 6)

My very first product detector mod was on a Hammarlund SP-600. I had never used a couple of MC-1496 balanced modulator IC's that I had received as samples way back in 1969 when this popular IC was introduced. This is absolutely the BEST sounding product detector I have ever heard. The only obvious problem is that it needs a whole bunch of outboard parts (12 resistors and 9 capacitors!) as well as requiring at least 10 volts of fairly ripple free DC to run on. I built it on a 1.5" square perf board and powered it from a doubler/regulator circuit off the 6.3 volt filament line. If I had it to do over again, I'd probably opt for the 6BE6 type circuit. Since the SP-600 uses a 6C4 for the BFO, it should lend itself easily to the pentagrid conversion circuit. Another possibility for this receiver is to utilize the BFO buffer amplifier V-12, a 6BA6 as a product detector.

I never tried using a 7360 balanced modulator tube for about the same reasons as the MC1496. It requires more parts, including balancing pots to do it right. A 7-pin 6BA6 BFO tube socket would have to be changed to accommo-



date the 7360's 9 pins, plus you'd better be sitting down if you price one of those golden bottles! I'm sure it would work fine but there are just too many negatives to make that circuit practical. (note 7)

This was not intended to be a "Heathkit" style mod article, or cover every nuance of product detectors, but I hope some of my experiences will be helpful in your efforts. It's just too much detail to cover at one time, plus, you'd be asleep long before you finished reading it. I'll be glad to supply further

continued next page

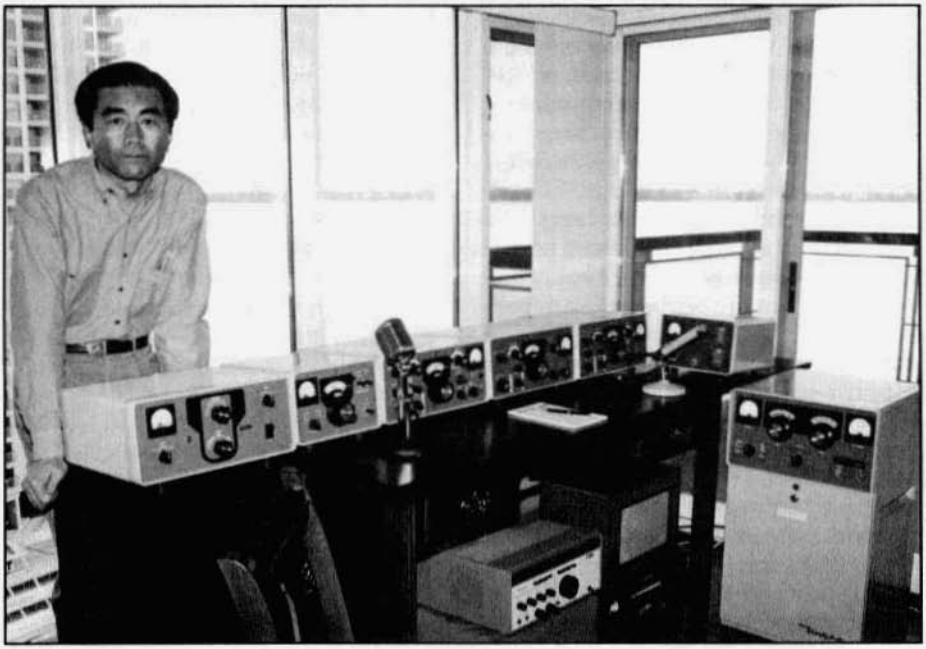
Product Detector from previous page

details on any of the individual receiver mods if you send me a SASE. (note 8) ER

NOTES:

1. Some AMers claim that there is no such thing as "good sounding" SSB!
2. I've only used the 6BE6 here but the others such as the 6BY6 and 6CS6 are pin compatible. If your radio uses octal tubes, the BFO is probably a 6SG7. You should be able to use a 6SA7 for the product detector circuit.
3. A lot of people recommend building a product detector into a small minibox which plugs into this socket. This really requires a lot of redundant circuitry and effort as well as eliminating the possibility of ever using an FM discriminator in that spot.
4. The Collins 51J-4 has a set of unused contacts on the mode switch which are perfect for switching the audio.
5. Look at the receiver schematic and you'll see that the AGC is switched out for CW. This function must be eliminated so that the AGC is on for all modes. Just add a jumper to that section of the mode switch and remove (& cap) the wire that went to that terminal.
6. Get rid of that ridiculous (& expensive) current regulator by shorting it out and substituting two 12 volt tubes in the PTO (6BA6 to 12BA6) and product detector (6BE6 to 12BE6) that have their filaments regulated.
7. I have a 75A-4 that has had its 6BA7 mixers changed to 7360's. It seems to outperform other mods (6DJ8's, 12AT7's etc.) and is a vast improvement over the noisy 6BA7's.
8. Most of the circuit information has been published either in Electric Radio, or in the original Hollow State News.

Another photo of Jim Garland, W8ZR, author of the article "Current Inrush Protection for the Viking 500" on page 26 of this issue.



Hiro Sakai, AD4EC/VE3 in his Toronto hamshack. In the background is Lake Ontario.

AM'ers at the Mason-Dixon hamfest last fall. Left to right: Norm Chipps, N3RZU; Mike Oxenreider, WB3CTC; Steve Ickes, WB3HUZ and Ted Young, W3PWW. The Humvee in the background belongs to N3RZU. *Photo by WA3YXN.*

Protection for the Viking 500 from page 27
away from other components.

To install the two limiters on the 6 amp circuit, I mounted a three lug terminal strip on a connector mounting screw adjacent to the two 6 amp fuse holders. As with the 4 amp circuit, I used the two limiters to bridge between the terminal strip lugs and the fuseholders. If you don't want to tear into your Viking 500 power supply just now, then you can replace the jumpers between pins 10-11, and pins 9-12 on the rear terminal strip of the power supply with the two KC007L-ND limiters (assuming your supply is wound for 230 VAC operation). Then, at least you will have protected your HV supply.

The measured inrush currents, after the limiters were installed, are as follows:

1 Amp Circuit: 1.4 Amps
4 Amp Circuit: 1.5 Amps
6 Amp Circuit: 5.6 Amps

Clearly, these are enormous improvements over the unmodified circuit. I have checked each limiter for an extended period under key-up, key-down, AM and CW modes, with no signs of overheating or other problems.

With the greatly reduced inrush currents, it is now possible (and desirable) to change some of the fuse ratings. I now use a 1.5A (non slow-blow) fuse in the 1 amp circuit, a 2 amp non-slow-blow fuse in the 4 amp circuit, and 6 amp non-slow-blow fuses in the HV circuit. (Before the modification, I had to use 8 amp fuses in the HV circuit to keep them from popping at turn-on.) After installing the surge limiters, I've had no problem whatsoever with popping fuses. I'm so pleased with the results, that I'm thinking about doing a similar modification for my Valiant and Ranger transmitters. I'd rather spend my time on the air than chasing down replacement transformers and other components! ER

The Cosmophones - Part Two from page 17
Cosmophones have had more robust switches installed. Fortunately, the meter was made by Ideal Precision and has the same movement as those used in many Heath instruments.

Missing Pieces

Of my thirteen Cosmophones, twelve have their serial numbers. They are: 6,7,8,15,17,18,21,26,62,74,88,98. The thirteenth is missing its cabinet and serial number. I have located seven other units and documented their serial numbers. They are: 10,16,20,28,65,81,91. I know of four other units but I have yet to determine their serial numbers. With three known destroyed, this leaves seventy-three of the 100 built unaccounted for. The government reportedly bought some for evaluation and it was rumored the CIA bought some for use. Perhaps this explains the gaping holes in the serial numbers (the 30's, 40's, 50's)? Where are the rest? I don't know but my search continues.

My goal for this article series is to raise the readers' awareness and appreciation of the Cosmophones, while passing on the bulk of the history and information I have gathered. I hope that some of you will choose to assist in my campaign of finding the remaining Cosmophones. I will greatly appreciate any information or feedback. Should you be so fortunate as to find one for sale, I highly recommend acquiring it as it will make a very worthwhile addition to any ham shack.

As in a good meal, dessert comes last. So cleanse your palate in preparation for Part Three, where you shall be treated to the champion of all transceivers, the Cosmophone 1000. ER

Please remember: If you'd like to get a picture of your shack in ER you must be in it.

Electric Radio in Uniform from page 8

ments to the restraining hardware, and placed the transmitter back in operation. I walked away, saying, "Now that's the way I want you to cross this stream in the future."

The guys were speechless, but I never had to fetch them out of that stream again.

I had always heard the old saw about "loading a barbed wire fence" and had wondered if it were possible. Well, one day, on maneuvers, I found myself parked about two feet away from such a fence. I found an extra piece of wire, and it took me only a minute to wrap the wire snugly around the fence, and attach it to my BC-191 transmitter. Sure enough, it loaded fine; differently than the whip, of course, but I made many contacts with it for the next hour or so.

It's been fun reliving these events, as I put them down on paper for you, Dennis. I can only hope that you enjoy reading them as much. Hope that I haven't bored you. (Quite the contrary - DLD)

Good luck and best wishes with your work at preserving these 'work horse' radios.

VY 73, Lee Aurick, W1SE

Notes:

1. Letter from Don Webster, K9MUF, describing his experiences with the BC-312 and BC-342 in Korea.
2. See ER #34, February 1992.

A Letter from NODMS from page 33

Minor storm activity (days with Ap 30-49) occurs most often during the declining phase of the solar cycle, due to the increased presence and influence of coronal holes. Using recent cycle activity as a guide, expect most minor storm days to occur during 2005. Major storms (days with Ap 50-99) are likely during the 1999-2005 time frame. During recent cycles most major storm days occurred during the second year after sunspot maximum (2002 for Cycle 23). Severe storm (days with Ap ≤100) occurrences are not well predicted due to their rarity. **ER**

Letters from page 9

miles away).

I'll have to re-setup my "station' (no big deal) in order to photo it, but I wanted to add my 2 cents worth of applause to the idea.

Following the concept introduced in WA7HDL's letter you printed in ER 98, I'd suggest multipliers as follows:

1. 1x for AC line (let's be nice, no need to exclude someone just 'cause they don't have e-power)

2. 2x for hydrocarbon power: e.g., gasoline, propane, diesel, with the exception of home-generated methane (now there's a rarity!)

3. 3x for battery/solar, wind, water, home-done methane, etc.

4. 4x for hand-crank or pedal-power, gerbils in a cage, June bugs on a whirligig, etc.

5. Wattage multipliers: based on the final used. Examples of categories: 5x for 5 watt or less for "Lunchboxes", BC-474, and HW-7 type rigs; 4x for 20 watt, 2E22/24/26 type finals (old AM mobiles, GRC-9, CONAR, etc.); 3x for 50 watt rigs such as Bimini 550, and the BC-654 (actually 30 watts, but you gotta break somewhere); 2x for 100W or less finals using such as the 807/1625, and 6146's (would take in PRC-47 as well); etc, etc. You get the idea.

I'll bore you with more details of my actual VFD operation when I send in the photos. This will take a coupla weeks, as I'm vice-prez of the local ham club; write, edit and publish the bi-monthly newsletter, and am chairman of the ARRL field day (we had a nice one -- I won't bore you with an account, but suffice to say I use the premise: "set it up, and they will come.") At least 3 special awards are due for outstanding effort on the part of some members, such as Mr. "Open All Night": he stayed at the scene, and mostly at the mike, for 8 and 1/2 hours!

Enough chatter. Yes! Let's have another VFD!

Eric Jones, N4TGC

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FOR SALE: Nice National NC46 w/spkr - $175; Meisner Signal Shifter - $160; Multi Elmac AF68A xmtr - $150; SBE 34 xcvr - $150. Larry, VE3RF, Box 509, Ayr, Ont. N0B 1E0, Canada (519) 632-7921 eves.

FOR SALE: Collins, 312B-5 VFO/station console, very rare, clean - $750; 75A4 w/3 filters, 270G-2 spkr - $1200; 75A2 clean, no cabinet - $265; Collins 75S1, 32S1, 312B-4, 516F2 complete S-Line, clean - $880; Collins ant tuner 180S-1 (1 KW) for 30S-1/30L-1 - $225; 75S3A, clean - $630; 75S3, very clean - $460; 75A4 CW filter 500 Hz - $225. David, IL, (630) 790-8436.

FOR SALE: Yaesu twins, FRDX400 rcvr, exc, FLDX400 xmtr, new finals, needs some work, both manuals, matching mic, spkr - $250 pkge. Dave, W1DWZ, 49 Cedar St., E. Bridgewater, MA 02333. (508) 378-3619.

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FOR SALE: Service. Reproduction dial covers, clock lenses (Hammarlund,etc) old or dimensioned drawing - $10 ppd. William P. Turner, WAØABI, 1117 Pike St., St. Charles, MO 63301. (314) 925-1307

FOR SALE: Collins 75A-4 rcvr w/spkr; CP-1 xtal pack; 312B-4 spkr/control; 75A-4 & S-line filters. Bill Mills, KC5PF, GA, (912) 452-2957 after 7 PM EST. wmills@gmc.cc.ga.us.

FOR SALE: Heath AR-3 - $50; Johnson Adventurer - $80; Lampkin frequency meter - $20. Carter Elliott, VA, (804) 979-7383.

FOR SALE: New Amperite time-delay relays for the 30S-1 amplifier, part #115NO120 - $24.95. Steve, W4IJ, SC, (803) 873-2499 X 200 days, 871-7749 eves.

FOR SALE: Heath equip, HD-11 Q-multiplier - $25; HB-10B VFO (2) - $50 ea; PS-23 pwr sply - $60. All + UPS. Jim, WØJJL, 2207 Madison Ave., Norfolk NE 68701-4534 (402) 371-3477.

FOR SALE: Lafayette StarFlite xmtr, matching VFO, exc. condx, manuals, both - $100 shpd. Richard Lucchesi, NY, WA2RQY (516) 798-1230 RLUCCH20986@aol.com

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), 998 Whipple, Grayland, WA 98547-0697. (360) 267-4011

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

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

FOR SALE: Xtals 7010 kHz, type CR-1, NOS military - $2 ea, quantity pricing available. WA5THJ, Rt 9 Box 163, Alvin, TX 77511. (281) 331-2956

MESSAGE: Spark enthusiasts: (I have five) I believe in applauding good commercial concerns & want to especially compliment the Peter Dahl Co & Mr. Dahl. When no one else would, they rebuilt my 80 year old basket case 25,000 volt spark xfmr absolutely like new. Peter is a gentleman and his help excellent. Paul C. Crum, W9LC, 6272 N. Cicero Ave., Chicago, IL 60646-4918.

FOR SALE: Beautiful Swan 500CX, 250 watts out, w/manual - $225 + shpg; exc National NCX-3 w/ps & manual - $150; rare Globe HG-303, exc manual - $100; Hallicrafters SR-400 Cyclone xc - $300. **WANTED:** National NCX-500. Ron, KS, (913) 268-5973, arongv@aol.com

WANTED: Very early Hallicrafters and Hallicrafters/Silver Marshall equipment including Skyriders with entire front panel dull aluminum color, S-30 radio compass, S-33 Skytrainer, S-35 panadaptor, wood console speakers - R-8 & R-12, HT-2, HT-3, BC-939 antenna tuner, parts, advertising signs, paper memorabilia of Hallicrafters. Also want RCA model AVR-11 airport tower receiver. Chuck Dachis, WD5EOC, "The Hallicrafters Collector", 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

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

WANTED: WW II Japanese, German, Italian radios & communication equip for display in intelligence museum. LTC William L. Howard, 219 Harborview Ln., Largo, FL 33770. (813) 585-7756

WANTED: JW Miller RF coils, IF trans, chokes. Buying JW Miller & Millen parts, esp. need Miller B-727, B-727C, S-27, 912-C2, 912-C4, 912-C5. WA5THJ, Rt9 Box 163, Alvin, TX 77511. (281) 331-2956.

WANTED: CV-591/URR, Gonset Superceiver, should be in reasonalbe good shape. Thanks for reading. Don Kelly, K7RM, 27973 Bush Ln., Scappoose, OR 97056.

WANTED: AR-88, CR-88, CR-91 w/manuals, junkers or parts OK. David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4. Canada, (418) 877-1316

WANTED: UTC LS185 or CG309 plate xfmr; B&W or EFJ kilowatt coils. Martin Piepenburg, W9OLD, RR 1 Box 56B, Monterey, IN 46960. (219) 542-2591

WANTED: Any info about pre-WW II Navy aircraft xmtr, GP7 (803 tube final). Tom Coleman, K6VW, 900 Singing Wood Dr., Arcadia, CA 91006.

WANTED: Audio xfmr part no. 055-300398 for a Hallicrafter HT-37. **FOR SALE:** Stromberg Carlson 70 watt mono amp model SAU70; Harmon Kardon stereo tuner model ST360; Customusic loop tape player model CTC-60. E.F. Hayes, WØJFN, 3109 N. Douglas Ave, Loveland CO 80538-2548.

WANTED: Hammarlund: Comet, Comet Pro, HQ-66, HQ-88, HQ-225, S-200 & any other Hammarlund rarity's. Charles P. Jedlicka, 1611 Clemens Rd., Darien, IL 60561-3510. (630) 515-1836. sp600@aol.com. Hammarlund site http://home.aol.com/sp600

WANTED: Reward for W2DNN QSL card mailed 1932-1939 w/Ossining, NY QTH showing me in prison uniform operating rig in Sing Sing cell. Sam Macy, W2DNN, 486 Glenwood Trail, Elgin, IL 60120. (847) 695-0218. sammac@interaccess.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: GPR 90, 91, 92; Hallicrafters SX-88; Eddystone rcvr's. James B. Geer, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Catalogs: Walter Ashe 1947; WRL 1952, 1953, 1956, 1963; BA 1958, 1959, 1960. Al, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

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

WANTED: CB radio equip. I am looking for all types of old/vintage CB radio, amps. manuals, magazines, mics etc. Walter, CA, (818) 297-7249

WANTED: Meter for AN/URM-120 Struthers watt meter or specifications for it. Thanks. Norm, W1CIX, POB 402, W. Bridgewater, MA 02379. (508) 583-8349

WANTED: ART-13 mod xfmr; (4) 4-65A. Ted, W5RKP, NM, (505) 894-2694

WANTED: Heath PS-3 high voltage variable/regulated pwr sply. Bob, K9LCR, IL, (847) 587-7982, anytime.

WANTED: For ARC-5 xmtrs: (2) ant relays, (2) switch ????, (4) top clip-on covers, (1) ant roller mount. Ken Kolthoff, 5753 David Pl., Fairfield, OH 45014. (513) 858-2161

WANTED: Schematic & additional info on Signal Corps Box BX-4 pwr sply. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612, after 6 PM.

WANTED: R-901/GR rcvr; manual for DP-12 direction finding rcvr. Tom Brent, Box 1552, Sumas, WA 98295-1552. (604) 826-4051

WANTED: Valiant II; Swan 600R Custom; Hammarlund SP600-JX21A; TMC GPR-92. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Hallicrafters models SX-88, SX-115, HT33B, SX130, SX117, HT44, SR2000 w/ps; Collins: KWS-1, 312B5, standard set of xtals for KWM-2; S-line rack mounts. John Suker, W1TX, 216 Grove St., Rutland, VT 05701. (802) 775-6732 eves. w1tsjohn@aol.com

WANTED: 3500V 600mA xfmr; manual for HQ120. W7RBF, AZ, (602) 864-9987.

WANTED: Gonset G-76 AC pwr sply. John, NC, (919) 437-0851. burgwyn@ibm.net

WANTED: KWM-1 tuning knob; dial light knob; AC pwr sply. John, NC, (919) 437-0851. burgwyn@ibm.net

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FOR SALE: Transmitter, audio, industrial tubes. Dee, W4PNT, 534 W. Main St., Waynesboro, VA 24431. (540) 249-3161, Fax 249-5064, http://home.rica.net/soundnmind/

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

FOR SALE: Tektronix oscilloscope w/manual, Model 422, DC-15 MHz, immaculate, has sweep problem - $40. Frank S. Law, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415

FOR SALE: Collins 310B-3 exciter, exc condx except extra hole in front panel & missing ant tuner parts - $225; 75A-4, 2 filters & reduction knob, exc condx - $900; KWM2A parts rig, lots of parts gone - $50; S-line TR relays, new - $45; Heath SB-401, SB-301 & SB-600 - $230; Swan 120 untested, no pwr sply - $50; Cantenna - $15; RF coax switches, N connectors, models SA-185/U & SA-329/U - $20/$30 ea. **WANTED:** 28 inch tall relay cabinet. Have 35 inch & 10-1/2 inch, fits 51Js to trade if desired; also plug-in 80 meter kilowatt coil. John, AE4EN, NC, (910) 686-4236.

FOR SALE: Collins orig hardcover 50th year book; Johnson Viking II - $100; B&W 5100 & filter facts manuals; 44 older QSL cards; 1957 RCA reference book; Motorola HH-1AM FM radio phone. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: New Collins 500 kHz filters 2.75 kHz wide, plugs into 51J-4 for extra 12 dB gain - $125. Walter M. Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

FOR SALE: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: Galena xtal radios &/or parts to make your own. Len Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: Navy URT-2 xmtr w/manuals - $150. Paul, 2110 E. Lombard St., Baltimore, MD 21231. (410) 327-5895

FOR SALE: Ancient RCA tester, 100-1000 kc Piezo-Electric calibrator, 955 tube - $30 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: R-442 used - $180; w/mount & cable - $200; PSM-13 batt tester NOS - $25; GPM-55-PRC-25 module tester - $40; URM-120 wattmeter - $140; DY-105 - $45; AT-271 whip - $10; RL-39 reel crank NOS - $25; URM-25D for parts - $20. All + shpg. Tartan Electronics, POB 36841, Tucson, AZ 85740-6841. Fax (520) 577-7207, Ph 577-1022

FOR SALE: New Release: Send 2-stamp LSASE for Olde Tyme Radio's latest flyer NO. 197 to: Olde Tyme Radio Co., 2445 Lyttonsville Rd., Ste 317, Silver Spring, MD 20910. Ph/Fax (301) 527-5280

WANTED: Heath HS-24 spkr. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 PM

WANTED: Collins KWM2-A labeled on chassis Collins Radio Co of Japan; early KWM2 serial No. below 100. Bill, KD4AF, NC, (910) 699-8699.

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Military sets WS #29 Canadian A set; US DAS-2 Loran rcvr-indicator. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WA0AKG, NE, (402) 464-8682.

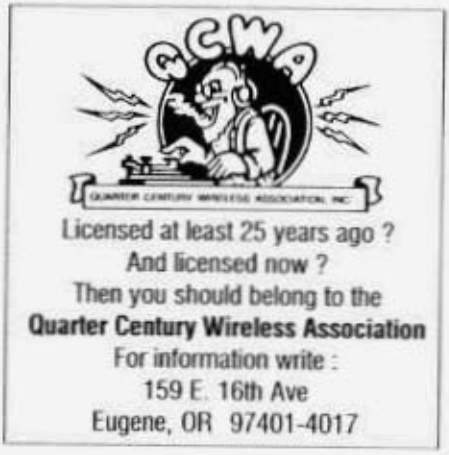
WANTED: Hallicrafters R46, P46B spkrs; S38; & the cover only for SX100 S meter. H. L. Stark, K9UBL, 3215 S. Meridian St., Indianapolis, IN 46217. (317) 788-1210

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

WANTED: Two or three new 7094 tubes; Stancor A-4761 or A-4404 15W class B driver xfmr; Johnson knobs & dials, need several sizes - what have you?; Johnson 3kV dual section variable, 2x100 pF (154-505), or 2x150 pF (154-506). Thanks. Keith Kunde, K8KK, 8355 Dalepoint Rd., Independence, OH 44131. (216) 524-7698

WANTED: National HRO rcvr, 1934 to 43, must be complete, unmodified & in good condx. Art Plummer, W6LR, POB 640493, San Francisco, CA 94164. (415) 359-1858

WANTED: GRC-109, R-1004 & PP-2684 (AC pwr sply). Joseph Falcone, N8TI, 9614 Arden, Livonia, MI 48150. (248) 357-6610 days, (313) 261-2094, eves.



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

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

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

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

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

WANTED: Hallicrafters HT-1, HT-9, HT-31, 5-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attws.com

WANTED: Info/history on WW2 TCS radio system for article. Your help appreciated. Thanks. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. gregb6fzh@aol.com

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 625-1; 399C-1; 51S-1; 302C-3; KWM-1; KWM-380; also buy estates. Leo, KJ6HI, CA, Ph/Fax (310) 670-6969.

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

WANTED: WW II Japanese military radios of any kind; pre-war Japanese QSL cards. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, 246 Japan. Fx 011-8145-301-8069. taka-doi@kk.iij4u.or.jp

WANTED: Hammarlund HQ-180AC w/S-200 spkr, must be mint or near mint. Richard E. Igou, WA5OXR, 8435 Twisted Oaks, Garden Ridge, TX 78266. (210) 651-9049, Fax 651-4259. igoure@aol.com

WANTED: Mic stands, EV418, EV419, EV423, Shure S-36 & S-36A, S-33. Numbers on bottom, Shure 333 mic. Dick Igou, WA5OXR, 8435 Twisted Oaks, Garden Ridge, Tx 78266. (210) 651-9049, Fax 651-4259. igoure@aol.com

WANTED: Broadcast gear, compressors, limiters, old mics, consoles, EQ, tube recorders, thanks! Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax.

WANTED: Navy xmtrs: TCA, TCE, TCN, TCX, TDE; rcvrs: RAX, RBD, TBM; modulator CAY-5065. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265

WANTED: WW-2 Japanese military radio of any kind; pre-war Japanese QSL cards. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069. taka-doi@kk.iij4u.or.jp

WANTED: Seeking low-priced, junker National Co. SW-3 rcvr. Al Kaiser, W3LEQ, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: Tubes: 866, 872 (not -A's); WE-101F; WE-262B; 56 mesh plate; WE-272A; VT-62/pr, 801/pr; WE-205D; 826, 808. Robert, WB6DPU, CA, (562) 928-8820. rrplife@earthlink.net

WANTED: Medical Doctors Hobbist of Amateur Antique radio, Test Equip. Alan Mark, POB 372, Pembroke, MA 02359.

WANTED: To buy or trade military surveillance & countermeasures rcvrs & jammer or related gear 1960 - present. Tony Snider, VA, (757) 721-7129.

WANTED: Cash for Collins: 5M-1, 2, 3; 312A-1, 2; 55G-1; 62S-1; 399C-1; 51S-1; 302C-3; KWM-1; KWM-380. Leo, KJ6HI, CA, (310) 670-6969 ph/fax. radioleo@earthlink.net

WANTED: Knight T-400 xmtr; Globe V-10 VFO; Globe Chief 90A. Ron, KS, (913) 268-5973. arongv@aol.com

WANTED: Collins 516F-1 AC pwr sply, 312A-1 spkr, SM-1, 2, 3 mics; Hallicrafters SX-88; Johnson Viking 500. Dennis, KC7VXD, ID, (800) 891-1990 leeid@ix.netcom.com

WANTED: Xmtg tube sockets, 813s, etc. Send SASE for list 4 tubes & socket extenders. Typetronics, POB 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, fax 583-0777

WANTED: Early Collins radio items. Your retired Vibroplex or McElroy bug; unbuilt xmtr kits. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (412) 758-2688

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

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

WANTED: Still looking for Swan 160, other Swan stuff any condx. Eric, KB0XP, Box 98, Stanton, IA 51573. (712) 829-2446

WANTED: Keyer paddles of all kinds. Cap, W0XC, CO, (970) 247-0088. capallen@frontier.net

WANTED: Collins S-line, KWM2A, 30L-1, etc. Mark pays the most for clean gear. WD4AAS, FL, (954) 776-5996 (d), 566-0014 (n).

WANTED: Mint HRO-500; CE100V; HT-33B; HT-44. Bob Struk, CA (408) 991-3747, bob.struk@sv.sc.philips.com

WANTED: Any info &/or manual for (AN/USM323) HP signal generator. Doug McArtin, K2JJ, 4 Portland Pl., Yonkers, NY 10703. (914) 968-3560 after 5 PM EST

WANTED: Good useable E or F coils for National HRO-5. John Leer, 2248 105th St., Eau Claire, WI 54703. (715) 835-5752

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

WANTED: Manual for Hewlett-Packard oscillator 50 Hz to 560 kHz, model HP236A (L-4) made for Western Electric. Allan Lurie, W9KCB, 605 E. Armstrong Ave., Peoria, IL 61603. (309) 682-1674

WANTED: National (early) HROs, any National coils, pwr splys, spkrs or parts. I love National radios. Sylvia Thompson, N1WVJ, 33 Lawton-Foster Rd., Hopkinton, RI 02833. (401) 377-4912

WANTED: ID plates for RAL & BC611; manuals: Geloso G207DR, G212TR; Harvey Wells T590 xmtr. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625-1233. (716) 671-0776

WANTED: Manual or copy Heath 'Crossfire' RTTY tuning indicator HD3006. W7MN, 225 S. 17th St., St. Helens, OR 97051. (503) 397-1046

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AMATEUR RECEIVERS: COLLINS 51J-4; R-388 w/prod det; R-388 stock; 75A-4; 75A-3; 75A-2; 75A-1; 75S-3B; 75S-3; 312B-4 console; S-line speaker; CP-1; 270-G-2/3 speakers; **DRAKE** R-7; **HALLICRAFTERS** SX-88; SX-73; SX-62A; SX-101A; SX-28; SX-17; S-40B; R46/R46B speakers; **HAMMARLUND** SP-200; HQ-170; **NATIONAL** HRO-500; HRO-60; NC-300; early 1935 HRO, complete; NC-183; National speaker; Scott SLR-F

MILITARY RECEIVERS: R-390; R-390-A; **Miltronix** R-725; R-389; R-390; R-390-A; complete R-391; R-392; FRR-59A; R-1051B; R-1051E; **CEI** 354; **WATKINS-JOHNSON** DMS 105A

TRANSCEIVERS: ATLAS 210-X w/AC console; **COLLINS** KWM-1; 516F-1 AC; 516E-1 DC; 312B-1 speaker; **HALLICRAFTERS** SR-150; SB-100; HW-16; Twoer; **NATIONAL** NCX-1000; SBE SB-34; **YAESU** FTDX-560; FT-101-EE complete line w/FL-2100B amp, remote VFO, monitor, Landliner, digital readout

FILTERS: CW for 75S-3; 75S-3B/C; 51S-1; 75A-4; 75A-3; Drake R4C – 250 hz

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FOR SALE: Racal xmtr type RA371C, all tube, servo tuned, 1.5 to 30 MHz, 1kW, beautiful unit in orig cabinet w/telescopic slides & wiring harness, complete w/spares & manuals; other Racal equip; RTA191 rcvr; TA83 & TA127 xmtrs; this equip is very scarce. Call for full details; Millen dip meter 90651, good condx - $65; military automatic antenna tuner CU2351 1.5 to 30 MHz, unused - $600; Tadiran TER100 military RTTY VDU terminal, mint - $200; coaxial dynamics directional wattmeter, very good - $100. Nigel Boyd, K4UGD, 4290 Day Rd., Conyers, GA 30207. (770) 414-0550 w, 922-8546 h

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FOR SALE: Atwater Kent console 55C, works - $100; Sears 1940 console, PU only. Ed Smith, W8JYY, 876 Arlington Ave., Mansfield, OH 44903. (419) 524-8407

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FOR SALE: 2152 page MIL-HDBK- 161 of 1959, almost new; over 3700 pg MIL-HDBK, 172 - $200; J-4 filters - $150. Walter Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

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FOR SALE: SX-115 - BO over $600; Lampkin #105 freq mtr - $15; capacitor resistor checker - $17; B&K VOM - $15; EICO signal tracer - $17; Measurements Corp xtal calibrator - $15; Heath SWR - $3; GR unit osc - $12. Joe Sloss, K7MKS, WA, (425) 747-5349.

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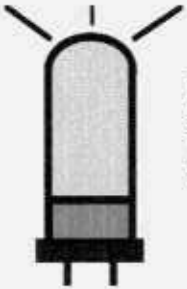

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