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ELECTRIC RADIO

celebrating a bygone era

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ELECTRIC RADIO

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Electric Radio is all about the restoration, maintenance, and continued use of vintage radio equipment. Founded in May of 1989 by Barry Wiseman (N6CSW), the magazine continues publication for those who appreciate the value of operating vintage equipment and the rich history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders. It is dedicated to the generations of radio amateurs, experimenters, and engineers who have preceded us, without whom many features of life, now taken for granted, would not be possible.

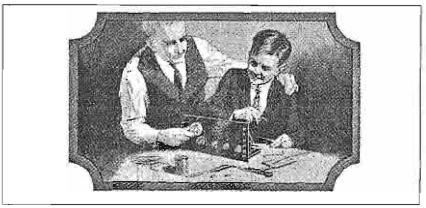
We depend on our readers to supply material for ER. Our primary interest is in articles that pertain to vintage equipment and operating with a primary emphasis on AM, but articles on CW, SSB, and shortwave listening are also needed. Photos of hams in their radio shacks are always appreciated. We invite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

Regular contributors include:
Chuck Teeters (W4MEW), Jim Hanlon (W8KGI), Tom Marcellino (W3BYM), Gary Halverson (K6GLH), David Kuraner (K2DK), Bruce Vaughan (NR5Q), Bob Grinder (K7AK), Larry Will (W3LW), Dave Gordon-Smith (G3UUR), Dale Gagnon (KW1I)

Editor's Comments

2007 Holiday Season

The 2007 holiday season is once again here. I would like to thank all subscribers and contributors to Electric Radio for your support this past year, and I hope that 2008 is a happy and prosperous year for everyone. I have learned this year, again, that the vintage ham radio community is a big family that I am proud to be associated with.



A Radio Christmas in the Elmering Tradition!

2007 Heavy Metal Rally

Please remember the popular, annual Electric Radio Heavy Metal Rally that is on Saturday, December 29 this year. The rules were printed last month in ER #222.

I am planning on operating from Rod Perala's vintage radio museum, W5CZ, in Indian Hills, Colorado, that evening. This will hopefully be a multi-operator station, and will be a great opportunity for all to hear and to work a lot of the excellent, classic equipment that is at W5CZ. I hope to work as many stations as possible and say hello to everyone!

Honor Your Elmer Contest: Time To Vote!

The first-ever "Honor Your Elmer" contest has ended November 30, 2007. At the time of this writing, we have received 34 excellent entries in the contest.

(Continued on page 2)

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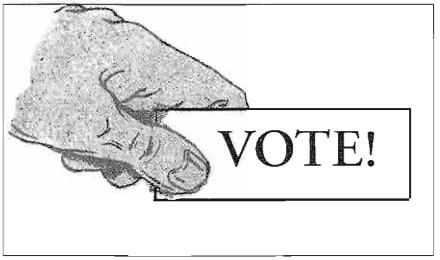
Cover: Santa finds himself in a precarious situation with high-voltage corona discharge during an unscheduled stop to try to determine the source of his GPS interference. What he thought was a house chimney turned out to be an Eimac chimney surrounding a glowing 4-1000A PA tube! (Cover art courtesy of Gary Halverson, K6GLH)



Although this is not as many as we would have hoped to received, it is still a good amount. All of the entries have been posted on the Electric Radio web site. When I read the Elmer stories, I am revisiting some almost-forgotten ham values of a bygone era and I have a colorful stroll down memory lane to a time when hams helped each other aspire to higher things, had to copy code and draw schematics for Hartley and Colpitts oscillators to get their radio tickets, and dogs ate solder.

To make this contest a success, it is time for all readers to step up and vote for the best story. Voting will mean that we can fairly select the winning stories and honor those writers who have taken time to send in their stories and enter the contest.

To vote for the best story, you need to go the Electric Radio Internet web site, (www.ermag.com) and click on the graphic on the left side of the opening page that shows a fellow operating a Hammarlund receiver. That will take you directly to the Elmer entries.

A list of all the stories will appear, and clicking on the titles will bring up the text that is underneath that particular title.

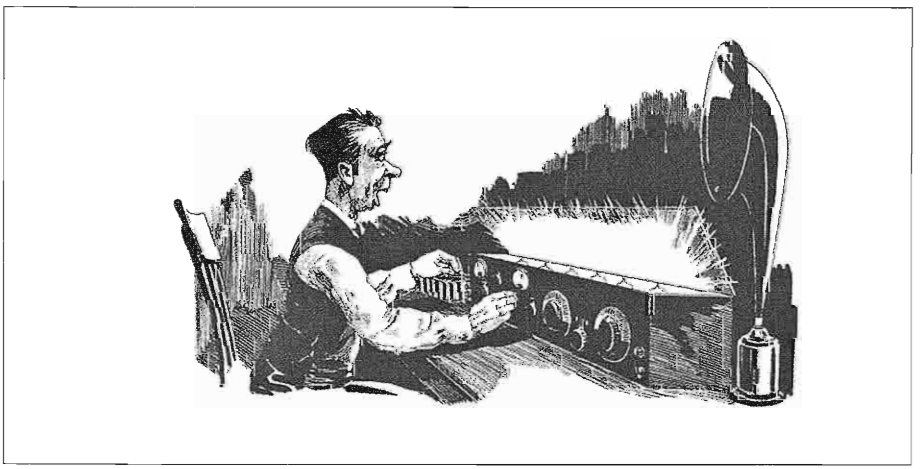
Once all of the stories have been read, write down your favorite author and send it to me by email, US mail, or call me on the telephone. The author of each story is written at the start of each one.

The voting criteria should be that the story is well written, is about the Elmer and not the writer, and that you like it! Other than those simple guidelines, there are no other rules.

Photos Needed

Right now, I am getting quite low on photos to use in the magazine. I am always looking for photos of ham events, great-looking shack photos, and anything else that applies. Nice photos for the cover are always appreciated!

73, Keep Those Filaments Lit!



Five Tubes, Five Bands, Fifty Watts: the Evolution of El Jefe (the Chief), a Homebrew Transmitter

By James "JeRB" Buchanan, K8WPI
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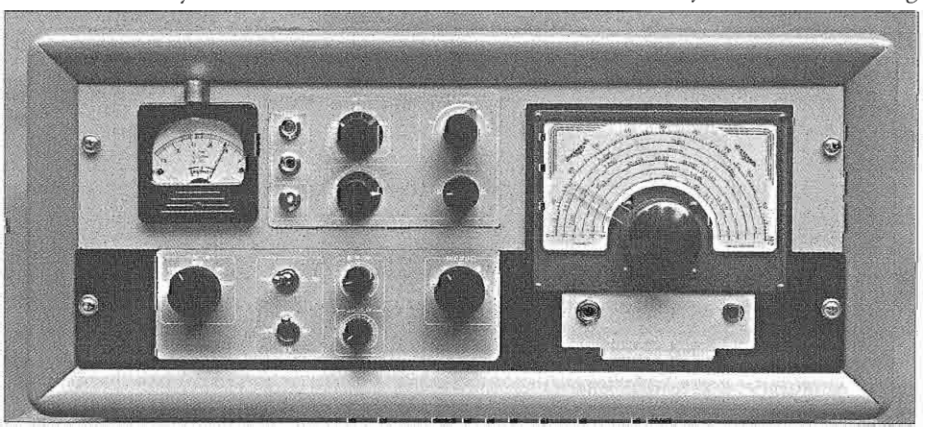
Don't get me wrong, I absolutely love Throckmorton, my big transmitter, however, the concept for El Jefe was actually inspired by Throck, all that is good, and all that is overdone. Not that overdone is necessarily bad, but sometimes it is better to be humble. So, El Jefe was to be a bit less cumbersome to build and perhaps, to operate. A little more "nimble" would be a good word, by not covering the entire HF spectrum, but just where I spend most of my time; comfortable, like an old pair of shoes. Just for a change, having a modest power output and a tube design. Keep the best of the best, try new ideas and see what happens, and see if it can be done.

The VFO Design

During design, one of the things which impressed me the most about Throck was the stability of the Vackar VFO. Designed in the 1930s, the Vackar has always enjoyed a "cult following," and received much attention in a series of articles in *Ham Radio* magazine in the 1970s. My selection of the Vackar was primarily for its linear, uniform, broadband output in a rig which tunes 500 kHz at a crack, but the absolute frequency stability really knocked me out, begging the obvious question, could a frequency-multiplying rig be viable in the 21st Century? Giving the matter lengthy, casual thought suggested multiplication could be a reasonable approach, but how do I deal with narrowing bandspread with multiplication, which I have always felt is a big flaw in this approach. Many hams have suggested an on-frequency VFO is a problem, as it is always running, and have asked me how I deal with that. "I key the VFO" is my standard reply. A discussion always ensues. I don't know if it is urban legend or a throwback to poorly-designed rigs that has people convinced VFOs can't be keyed without causing



The front-panel view of "El Jeffe," a custom-designed, homebrew transmitter is easily recognizable as a vintage rig, but not quite identifiable. It fits nicely into a vintage shack.

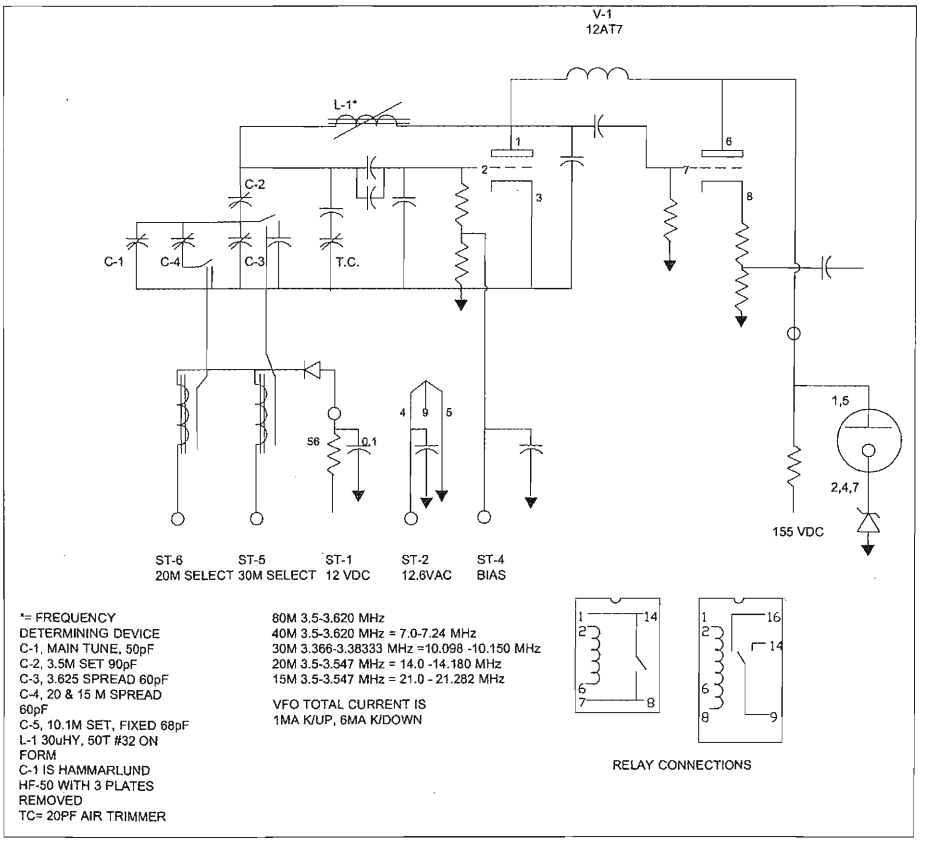


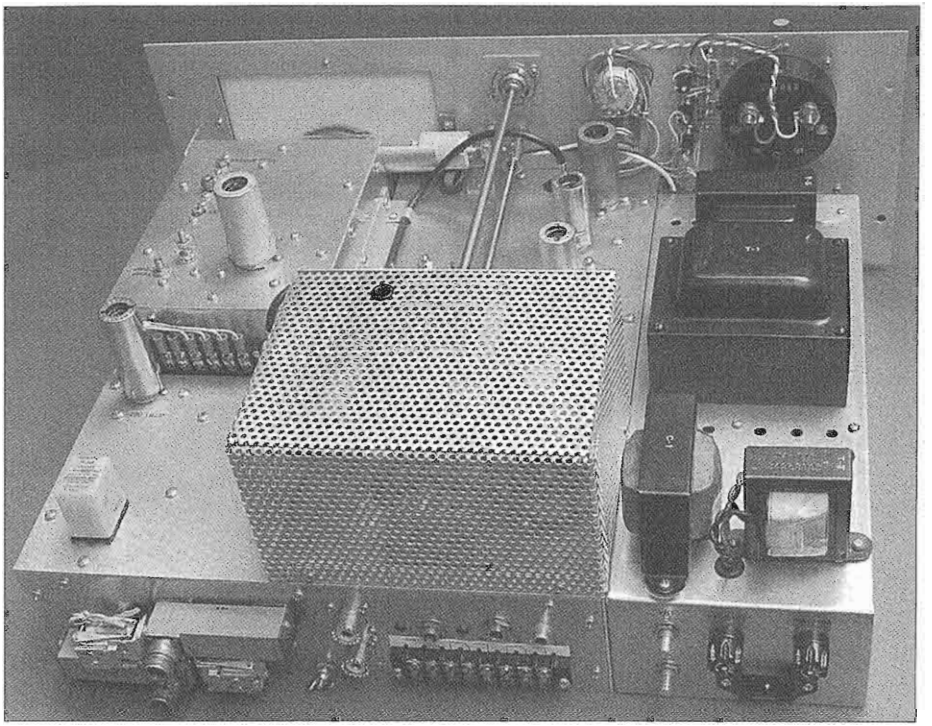
Figure 1: The Vackar VFO used in the "El Jefe" Transmitter. The Vackar oscillator was developed from the Clapp oscillator, has fairly-constant power output, good stability, and low-harmonic content. Maximum stability occurs when a tube with the highest possible ratio of mutual conductance to inter-electrode capacity is used.

problems. My experience has taught me that judicious selection of on-off bias, along with a cathode follower, which is not keyed, thereby offering an absolutely constant load, operates flawlessly. I should mention if there is any instantaneous heating of components, chirp will be generated. Long-term drift is compensated with other components; however, short-term, instantaneous drift must be cured, not compensated.

A decision was made to give the VFO a try and see what would happen. 160 meters was of little interest, so I started with an 80-meter VFO. The frequency range was limited to 3.5 to 3.7 MHz. I quickly realized it is far easier to get a tube to oscillate than a transistor, also, PN-junction heating need not be considered. The VFO worked fine, and values were balanced to offer 180-degree bandspread for this primary-frequency range. Doubling to 40 would still offer great bandspread. Stability was never an issue when doubling.

VFO Results

Well, let's see how 20-meters works out. Listening to the 4th harmonic, stability was still good, but bandspread was miserable. A fairly-simple padding



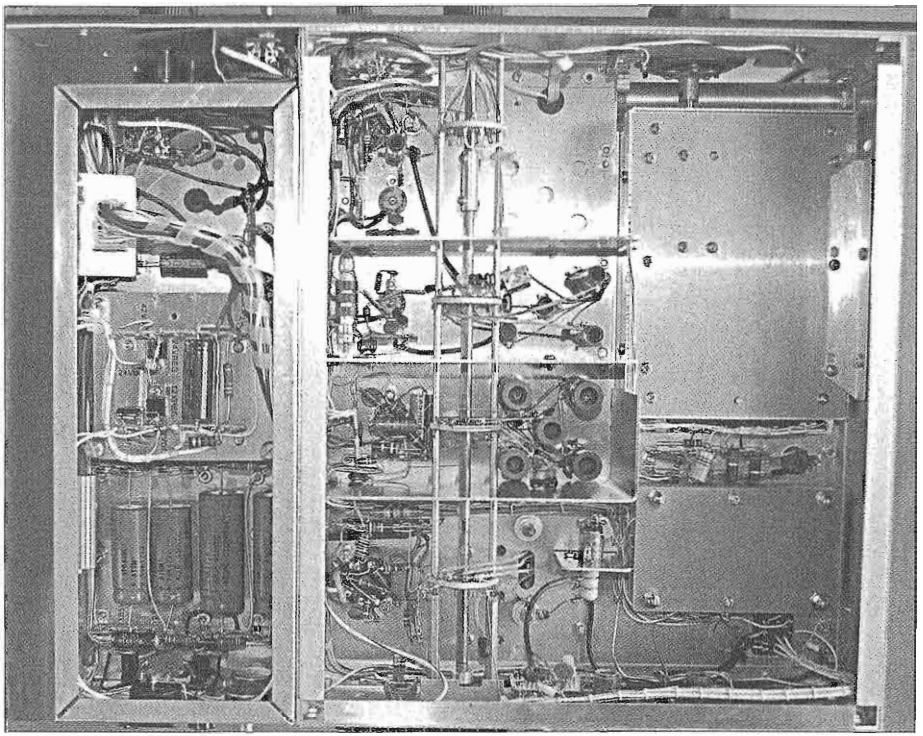
Rear-panel connections include amplifier input/output at the coaxial relays, antenna and receiver antenna connections are chassis mounted. Terminal strip is for receiver RFG connections and DPDT-auxiliary contacts. Key jack and external-bias connections are also provided. Power supply chassis holds bias controls, fuses and power cord.

scheme increased the bandspread to an acceptable portion of the dial. One more hop and I'd be on 15 meters. The only problem is, I couldn't care less about 15. Sure, it has its days and is certainly not a worthless band, it just isn't "me." Boy, I'd give nearly anything to get this rig on 30 meters, but there is no mathematical correlation to 10.1 MHz. I eventually decided that although it may not be easy, I should be able to "dual range" the primary frequency of operation, for not only 3.5-3.7, but also 3.3666-3.3833, which could be tripled to 30. That may sound easy, but looking at the percent of change and total bandwidth, this is a very wide frequency excursion. The good news is, after a reasonable amount of work, I was able to establish a dual-range VFO which, after recalculating and rebuilding resonant components, would offer nearly flat output across 3.366 to 3.7 MHz. Even better, great bandspread was available on the minuscule 13-kHz fundamental range for 30 meters.

Eventually, it became obvious this variable-range, variable-tuning, variable-frequency oscillator was too much to accomplish using only mechanics, so the essential prototype was built using miniature relays for band selection, which are mounted within the VFO. The result seemed to offer everything I was looking for.

Interstage RF Design

Knowing I could properly generate and control frequencies on the bands of most interest to me, it was time to give serious thought to the rest of the trans-



The QSK circuitry, upper right, under shield cover, is behind the VFO. A partitioned band switch isolates VFO band switching, lighting, buffer output and attenuator, multiplier, driver, and final-amplifier circuitry. A multipin-umbilical cord is mounted on an angle bracket in the power supply chassis for convenient removal. The cable is stowed around chassis wall, and is long enough to conveniently remove it and power the rig. The low-voltage regulators are mounted on a hinged plate covering the bottom of the large power transformer. This uses otherwise wasted space and hides termination of unused windings.

mitter. I knew I would want a driver running straight through before the final, so a stage or two of multiplication amps would be needed. I always liked the idea of a 2E26 as an output tube. I tried to use the 2E26 as a driver on Throck, one of a trio of tubes in the output of an otherwise solid-state rig. I eventually selected a different tube. Still curious for the new rig, I built a pi-net output tank on a prototype chassis and modeled a 2E26 at the desired 775-volt plate voltage. I drove this stage from a generic amplifier behind a signal generator, so I could make measurements at any frequency and drive level. It took a few weeks for me to come to the same conclusion I reached many years earlier with Throck; the 2E26 requires too much "bulk" of support components for the meager output power acquired under the conditions specified.

Looking around the shack, as if inspiration would leap out at me, I saw a beautiful Central Electronics 600L broadband amp, which was waiting for a "go over" for my good friend in Vermont, Tim Martin (WA1RGS). Tim is one of the "Green Mountain Radio Boys" and one of my "homies." You may

remember, this is the same 600L which Tim threw in the back of my wagon, along with a 20A, that lead to the "Mabbott" story in Electric Radio #205. Tim showed no serious interest in putting the amp on the air, explaining my delinquency. Perhaps his depositing this heavyweight in the back of my wagon was more thoughtful than I realized. I decided it was time to pay attention to my charge on the 600L, and after a thorough dissection and reassembly, it was fired up. Wow! It only required 3 watts to drive it into "full-tilt boogie," and it is no tune, very neat. "You know," I said to myself, "that would be a very nice amplifier to follow a little exciter." I called Tim and ask him if he would consider selling me the 600L.

In a typically-stoic Vermont reply, Tim said: "What took you so long? I've been waiting nearly a year and a half for this call."

I now knew what my new little rig had to do, and decided a 50-watt transmitter that could automatically drop to about 3 watts and interface with an external amplifier would be a good approach. Since the 600L is broadband, I would make the exciter as broadband as practical for the fewest knobs to tweak. I'll need to switch antenna, receiver and amplifier automatically by simply selecting mode of operation, either as transmitter or exciter. I spent a few weeks just letting my mind wander, and reminisced about every project I've ever made, which covers nearly 47 years worth. To think of minute aspects of various projects which came out perfect, or very good, or proved to be not such a good idea. I conjured up mental images of every radio I'd ever seen, both factory made and homebrew, to envision a design format. I considered absolutely every function needed, and to justify deleting the obligatory status quo. This was a time for my mind to explain to me what I should do, and what it would take to do it. At least for me, not until my mind's eye sees a completed project, right down to finish and hardware choices, would I dare start.

The quest was on for parts. I made a list of items, then split the list between swap hunts and the dreaded Internet, whichever would offer the best chance for success. Over the next 18 months, I collected parts. During that time, I would work on the fine details of the rig's electronics. I decided to use a 6146 for the output, only because a 6550 bottle would not fit the proportions determined for the chassis. Although the VFO would easily power a driver (still not selected) on 80 meters, there will be much less signal available at the higher frequencies, and multipliers are lossy. I built prototype multiplier stages to learn if there was an advantage, for example, of doubling to 40, then doubling to 20, or if it would be just as efficient making a quadruple jump in one stage and then a straight-through amplifier. I wanted to try a couple of different tube types so I could compare results. I should play with biasing the output tube, to see what it will take to control it, both as a transmitter and killing its gain to QRP level when driving the amp. I'd need an absolutely killer QSK circuit, a little more sophisticated than I used in Throck, considering an amplifier may follow the transmitter's output. I'd need to balance gain of input amplifier/buffers to compensate for initial frequencies of 3.36 to 3.7 MHz. Although the VFO offers extremely flat output, a typical amplifier will not offer the same response. Throck taught me it was possible to build a 100W-output transmitter which, when connected to a dummy load and sitting next to a high-performance receiver, with an open-antenna jack, could not be heard when keyed. Bravo, but this sure made the spotting circuits in Throck a bit more "wonky" than I would have liked. This time, I wanted to do something different, intentionally. As time passed, the notebook of acceptable circuits grew, as did the stockpile of parts. After nearly

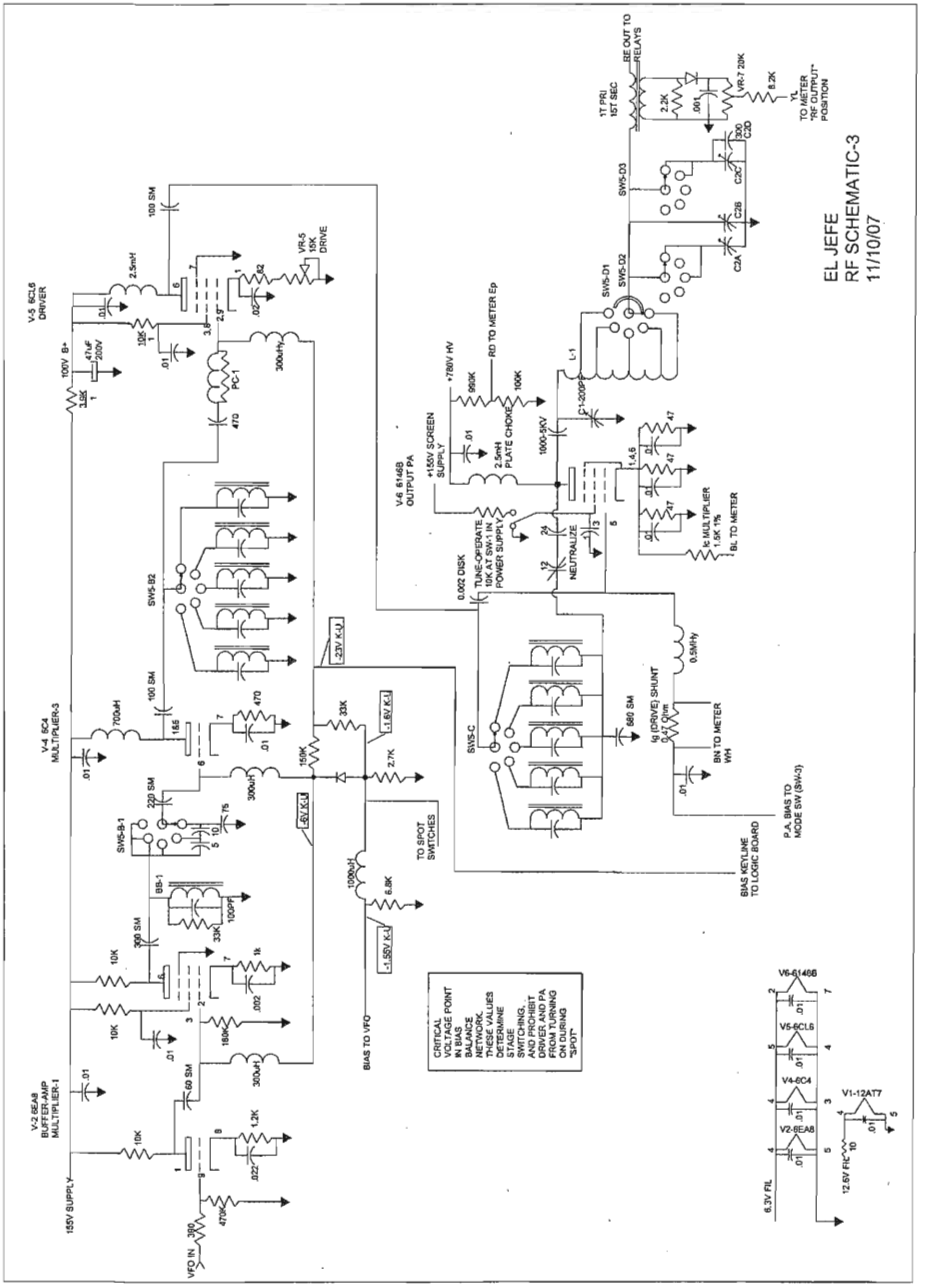


Figure 2: Here is the RF schematic. This article is not intended to be a complete guide to building an exact duplicate of the El Jeffe transmitter, but rather is supposed to be an "idea" article with general guidelines. Not all component values are shown, but are easily calculated using other published designs, experience, or basic L/C resonance.

two years, it was time to get started, although there were still a few items to acquire while other items were abandoned as unattainable. Long ago, I learned to deal with reality.

Time To Get Started

The final design of the new rig was taking shape. RF output would be limited by the conservative rating of the power supply, the 6146 would run maximum of 70-watts input. Features from Throck, which are just too nice to ignore, will be repeated, including external RF-gain control of the receiver, and one-handed spotting, variable-dial illumination, and full metering. The rig would be built as a five bander, but if 15 doesn't work to an acceptable level, it wouldn't bother me.

I already had the desired cabinet, a beautiful Bud design, with a fully-hinged top, recessed handles and a 7-inch panel size. Although the cabinet had never been used, it was scratched up a bit, and I'd been sitting on it for over 10 years. I found a new National SCN dial assembly in the original box. This was not my first choice, but it was complete, although the pointer unit had been fatally twisted, evidently from heat in an attic or boiler room. A local offered me a power transformer, I raided my own well-stocked parts supply, and continued acquiring the balance of needed parts. One spectacular find was a NIB National NC-600U piston-type neutralization capacitor made in the early '40s. I'd never seen one before. As the parts pile grew, the final "appearance" came to my mind, as did the building approach.

Justifying My Efforts

Although the National dial was made to be mounted to a flat panel with only a single, large hole for the Velvet Vernier drive, I planned to back light the entire dial. I auditioned a few pieces of translucent plastic stock to see which offered the look I desired. A piece was cut to exactly fill the dial scale area. Illumination options were also auditioned, eventually selecting a single lamp behind the panel. Individual band scales on the VFO require in-use indicators, which would also be rear mounted.

I always liked the look of a raised, two-piece panel. W9DUT's *Quad Mode Monitor* (AM, CW, SSB, FM-VHF receiver) from the early '60s was a great work. Nearly the same approach was used on some commercial gear; I offer no apologies for borrowing good design elements from others, I just try to make them my own.

To help reduce clutter under the chassis, I decided to use a more commercial approach. Rather than mounting components and running wires to and from their respective locations, I laid out the entire chassis and front panel on paper. From this layout, I placed all wiring, assigned color coding, and made two wiring harnesses, one for power distribution and one for signal-and-control circuits. After the harnesses were made, they were laid into the chassis, and wire ends trimmed and connected. This offered many advantages, although at the time it seemed to be a bit too much. Especially enhanced with this approach was the cross-chassis wiring and the umbilical cord, which connects the power-supply chassis to the rest of the transmitter. The only imperative would be *all* wiring and connections would have to be accounted for before the unit is built. In the end, I'll let the under-chassis layout speak for itself.

Previous projects with removable power supplies have proven the usefulness of such an approach. With the power/function switch mounted in the power supply and connection to the RF deck via multi-pin connector, it was very easy to perform chassis work and wire the power-supply deck. Not having the bulky power supply in the way while working on the RF deck is equally delightful. The deck bolts to the RF unit through their common wall, and can be removed without even needing to re-

move the function knob from the front panel. A fringe benefit is that with the function switch off, there are no dangerous voltages available in the RF deck.

Execution

As can be seen in the photos, the entire RF chassis was made from flat, or angle-stock material. When you insist on the size you want, sometimes rolling your own is the only solution. It is also much easier to layout, drill, punch, and cut on flat stock than fighting with 90-degree obstructions. Because I have no tolerance for sheet-metal screws, I use blind or cinch nuts on angle stock. All metal components are held together with machine screws threaded into full-depth nuts, permanently attached to the appropriate member. The obvious advantage is that later on, it may not be practical or even possible to access a nut for removal if needed. The three-piece front panel is held together with blind studs, which then affix with nuts on the rear-most panel. Yes, there are many sheet-metal parts required to use this approach, and it takes time to square every cut, but it is delightful to work with and offers tremendous flexibility. The single challenge with the multi-panel approach, although the bold presentation is quite appealing, is that panel thickness exceeds ¼ inch. Many components, which would normally mount by their bushing directly to the front panel, just won't fit, so creativity helps.

Odds and Ends

A bit frivolous, but just for fun, is the trilobed pointer for the PA-tune control, it seems a fitting flair for the delightful Oren Elliott 6:1 planetary drive. If you're not familiar with Elliott in Edgerton, Ohio, you may want to investigate them. As long as I am on the subject of the PA, you'll note the homemade taper-wound PA inductor. The coil I planned on using, although it seemed "fresh," like many older inductors, would not accept soldering. Since I would be winding a new coil, I decided to give taper winding a try. If you have not experienced this approach, treat yourself. It is amazing how many problems disappear with a better inductor. The "top hat" meter-illumination lamp was made of necessity, not being able to find an internally-illuminated meter to my suiting. The new Lucite VFO pointer is a 21st- Century take on the original.

Packaged with the SCN dial were a number of original dial scales, but they were a bit faded. I manually duplicated the originals using QuarkXPress®, keeping only the National logo for the final print. The meter face was also made in Quark®, while drawings and front panel graphics were generated in AutoCAD®. By the time I finished the rig, the band assignments were changed, so I re-tweaked the VFO calibration for 80-and-40 meters and recalibrated the VFO dial; the net result is actually better, but I'd rather not have lost the bandwidth!

On the Air

With the rig up and running as a stand-alone transmitter, it was time to put it on the air and see what quirks showed up and what operational expectations were or were not met. Not having a true operating location for the unit, I set it on the desk near a Collins 51S-1 receiver. Realizing I did not have space for an antenna tuner, I plugged in the Hy Tower, which is a single 50-ohm feed on all "old" bands. Well, within an hour or so I became excited. This little rig, which was running about 35-watts output on all bands, into a non-directional vertical radiator, which I knew would be very inefficient, was doing very well. By later that evening, I knew I had to try something. I have no evidence I've managed to work all states in 47 years on the air; maybe I have, but I never kept track. I made a list of states, and over the next ten days, during spare time operating, I ticked off 37 states, 6 Canadian Provinces and 7 countries in 3 continents. No Internet was involved, no nets, no spotting, just calling stations,

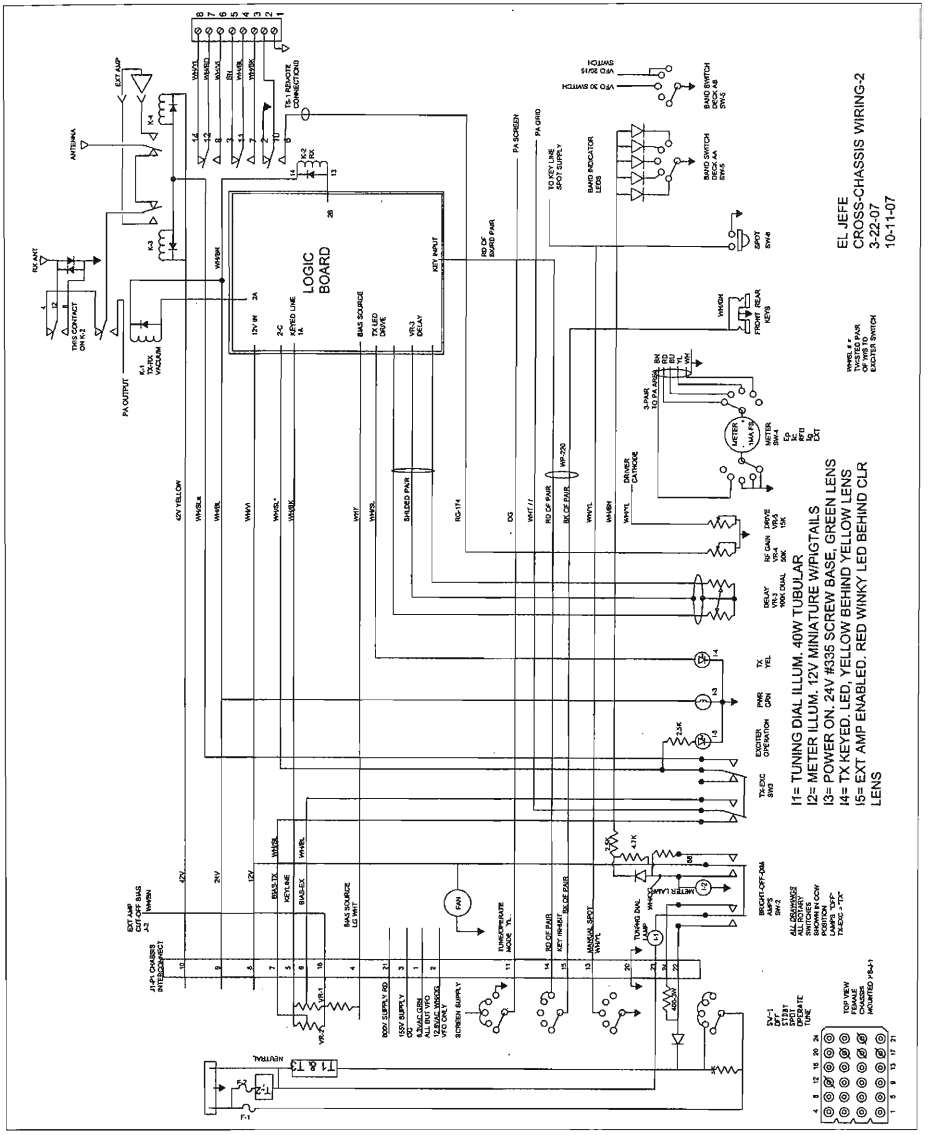


Figure 3: Transmitter Innerconnect Diagram

or CQ. Most contacts were on 80/40 meters; however, 30 and 20 added to the list. I connected a tuner to feed a Windom on 30, where the Hy Tower does not function, which led to a few contacts during the day.

El Jefe works just fine, very nimble and quick. Tuning is broad enough that after resonating the PA for a particular band, no further touch up will be needed in the band. If you don't mind running full power, just leave the drive control cranked to the stop. There has never been a project which I wouldn't change a thing or two if I were to repeat the effort; that doesn't mean anything is wrong. EJ is an absolute delight to use and has met every expectation. ***ER***

A Solid-State Rectifier Modification for the National NC-183D

By Roger Nash, W5RDN
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Heber Springs, AR 72543

My National NC-183D receiver seemed to get very hot after running for several hours, and it was noticed that most of the heat seemed to come from the 5U4-rectifier tube. Several cooling fans attached to the back cabinet panel were tried, but they were not satisfactory because of the fan noise. I did not want to cut more ventilation holes in the cabinet, so I decided to install solid-state diode rectifiers. I wanted to do this in such a way that the original 5U4 could be unplugged and replaced with my solid-state rectifier card. If for some reason I wanted to use the 5U4 again, it could be easily be plugged back in, replacing my solid-state rectifier module.

So as not to have too much B+ voltage with solid-state diodes, I installed two 200-ohm, 25-watt, 1%-resistors in series with pins 4 and 6. I cut a piece of fiberglass board approximately 4-5/8" long and 2" wide. One end was notched down to 1-1/8" wide, in the center, and approximately 22/32" deep, so it would fit inside an octal 8-pin plug. Then, wires in pins 4, 6, and 2 were installed and the card was glued vertically in the center of the plug with epoxy cement. Since the 200-ohm resistors get hot, I fabricated two pieces of .040" aluminum plate, about 3" wide and 2-5/8" high. These were attached on each side of the fiberglass board and held in place by the screws holding the resistors. This acts as a small heat sink. Near the top center of the fiberglass card, I installed a feed-thru insulator. One wire from each pin, numbers 4 and 6, attach to the bottom of each 200-ohm resistor mounted on each side of the assembly. Two 1N4007 (or 1N5408) diodes were then installed with the anodes soldered to each resistor and the cathodes to the feed-thru insulator. Lastly, the wire from pin 2 to the feedthru was soldered, see **Figure 2** for the layout.

Time-Delay Circuit

I then decided that I would like to apply power to the tube filaments so they would heat up before applying B+ voltage. The RCA tube manuals show that most receiving-tube filaments take 11 seconds to heat up to normal operating temperature. Most of what follows is due to my own personal thinking and what parts I had available.

I happened to have several Amperite time-delay relays. Most had a delay time that was too short, but I had two 115NO180s, which are 115 VAC and 180-seconds delay. These relays are built like a glass-octal tube with an 8-pin plug. Of course, a 15-or-20 second delay would work fine, but I used what I had. Some individuals might just want to use the time-delay relay contacts to interrupt the power transformer's high-voltage, center-tap winding. I preferred to have more isolation between the 120/115 VAC and the secondary-center tap. So, I decided to use a separate relay, a Tyco/P&B KRPA-5DG-12, which I ordered from Newark. This relay has a 12-volt coil. How did I get enough DC voltage to power the relay? I used a simple voltage doubler off of the 6.3-VAC filament line to get the relay power. The resulting 12 volts is switched through the time-delay relay. Then I used the contacts on the P&B relay to interrupt the center-tap winding of the power transformer.

Simply remove any wires on pin 10 of the power transformer and reinstall them

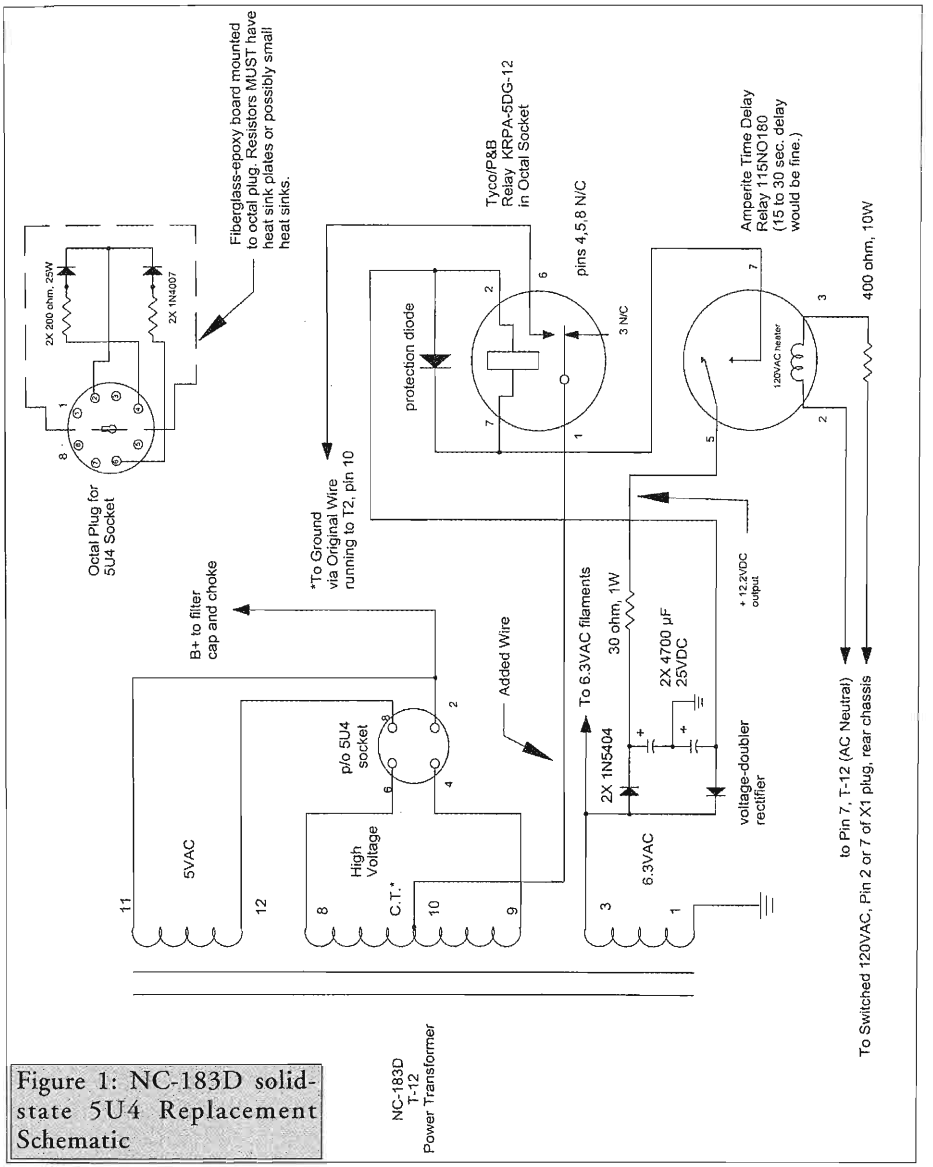

Figure 1: NC-183D solid-state 5U4 Replacement Schematic

on the normally-open contact of the relay. Then, run a new wire from pin 10 of power transformer to the arm of the relay.

The coil (or heater winding) of the time-delay relay is run through a 400-ohm, 10-watt resistor to lower the 123-VAC line voltage closer to 115 VAC. The other end of the resistor connects to pin 2 or 7 of the X-1 power socket (AC/BATT plug) on the rear of the chassis. The other side of the coil goes to pin 7 of T-12, the power transformer neutral. The P&B relay fits a standard octal 8-pin socket.

The voltage doubler is standard. I used two 1N5404 diodes with the polarity reversed and a pair of 4700-µF, 25-

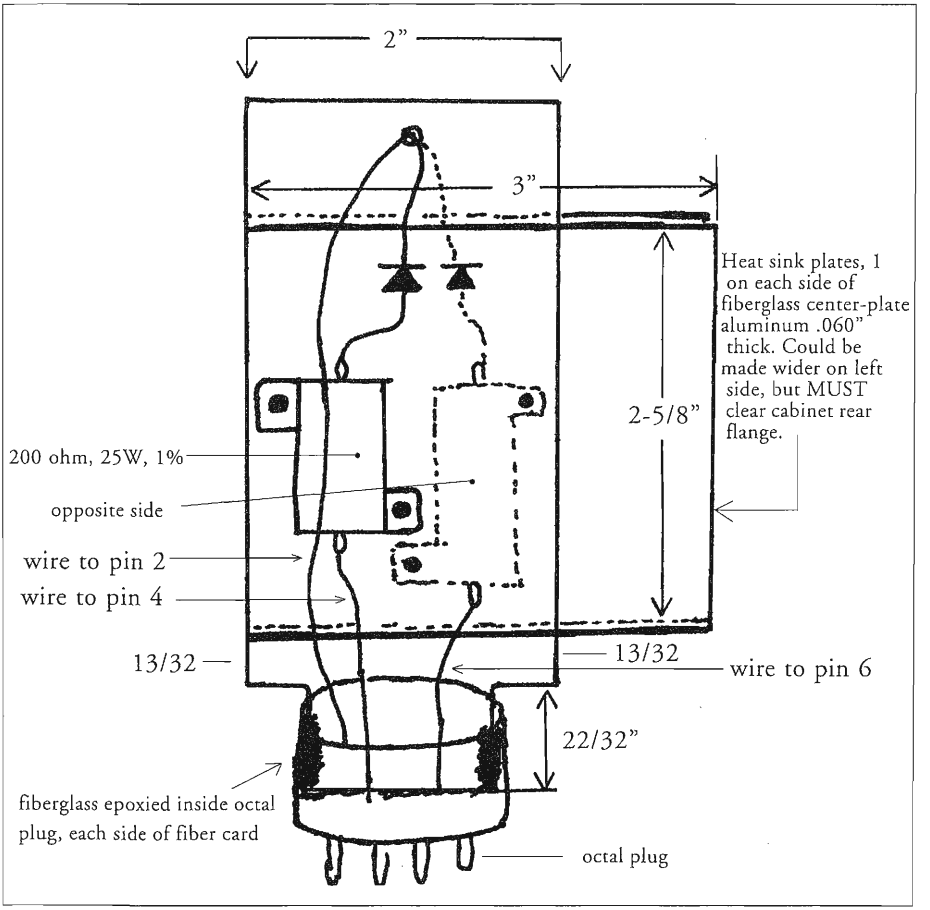

Figure 2: NC-183D Replacement Rectifier Modification. (It might be possible to replace the plates with 2 small heat sinks.)

VDC electrolytic capacitors, with the correct polarity for each diode. A 30-ohm, 1-watt resistor was used to lower the DC to 12.2 volts. The voltage doubler was built on a small terminal strip and mounted to the band switch/coil side-compartment plate. A protection diode was installed across the coil winding of the P&B relay, see Figure 1.

The physical mounting of the two relay sockets was relatively easy. Looking inside the bottom cover of the NC-183D, there is a metal bracket that screws to the rear chassis, right at one side of the antenna-terminal strip. The other side of this bracket is screwed onto the band switch/coil compartment. I simply mounted one octal socket on standoff spacers on each side of this bracket. The Amperite relay is mounted directly behind the band switch/coil compartment, and the P&B relay mounts opposite, below the accessory socket. These relays are then mounted horizontally when the bracket is reattached to the chassis.

Results

This modification has cut the heat problem at least in half, or better, after operating for several hours.

ER

QSL Cards

By Bruce Vaughan, NR5Q
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Aristotle: "*A soul never thinks without a mental picture.*"

It was once standard operating practice to follow up a QSO with a QSL card. Today the custom is considered by some as nothing more than an expensive nuisance. I have heard many on the air reply to a QSL request in less than a polite manner. "I have thousands of them—why would I want to spend money for something I don't need or want?"

To be perfectly fair, I can well understand those who no longer complete a QSO with the final courtesy of a QSL. Years ago, contacts did not come all that easy. In the pre-WWII days I often set my alarm clock for 2:00 AM so I could work stations on 80 or 40 meters without a lot of QRM. After giving up four hours sleep trying to establish contact with other night owls, I often had only three or four QSOs to show for my effort. Four inexpensive cards and four cents *total* postage usually resulted in 3 cards in return. That 75%-return estimate would shrink as postage and printing costs increased.

Today, four hours operating—even if you include some rag chewing—will result in more than a dozen QSOs. If you are the hit-and-run type, you can very easily fill one page in your log book with 20 to 25 QSOs. Figure about 6-to-9 cents each to get good QSLs printed, and 41-cents postage, and you are talking ten-to-twelve bucks for four hours operating, if you QSL 100%. The obvious answer is, we have to be selective in those we QSL with. I might also add that your return rate will be much less than it was years ago. Today, you can figure that every QSL you receive will involve an expenditure of from one-to-two dollars. Direct QSLs to DX stations, or their managers, will be closer to five bucks.

Sure, you can exchange QSLs with many stations via email. The confirmation may be there, but a flimsy piece of printer paper does not carry the same mystery, the romance, or the thrill of a QSL.

I have heard many hams say that in case of fire the first item to be removed from their burning house will be their QSL files. I have never counted my QSLs; they fill five 4-by-5 file cabinets, about 18 inches deep, several albums, and also do duty as wallpaper. To me, they are a vital part of ham radio.

As I look at my cards today, I see that many are turning brown with age. Those that are filled out with ink are sometimes difficult to read due to fading. Some cards were simple penny post cards with the contact details written on the back. Others are photographic post cards of the area where the station was located. Still others may be in multicolor, on nice glossy card stock. But when I look at these cards today, they all contain pictures; mental images that are razor sharp and thrilling.

Today, I pulled a few cards from my file. The first card was the one I prize most highly—my first on-the-air QSO. I see the pictures as plain as if they were on a 50-inch plasma HDTV—no, they are even more detail.

I was in my third year of High School. It was a warm day for late November. As usual the school day ended at 3:15. I walked the 1-½ mile route home in record time. I wanted to listen to 40 meters. I remember pulling my sweater off as I walked under the feeders where

they entered the shack. I tossed the garment over the feeders and stopped a minute to admire the antenna. The copper wire glistened in the afternoon sun. The hours I spent polishing the copper now appeared to be worthwhile.

It was a 66-foot long Zepp, fed with 33-foot feeders. Though it seemed at the time that I was risking life and limb putting it up, I seriously doubt it was more than 20 feet in the air. Actually, this was the second antenna I'd installed during the summer. My first antenna was made of number-12 galvanized "grape wire."

N.W. Arkansas was a large grape-growing area at the time. Several wineries, plus the local Welch Grape Juice company, processed many tons of grapes during the growing season. Why is this important to a young ham? There always seemed to be an endless supply of old grape wire—provided you did not get caught removing it from vineyards. It was good for guy wires, and for somewhat less-than-perfect wire antennas. When my antenna work seemed at end, Raymond, soon to be W5HTV, came into hundreds of feet of "high-carbon core" copper wire. He insisted I change out my wire with some of his copper wire because it had less resistance. There was only one item in the antenna that was from a ham-radio supply store—the insulator at the feed point. It was a beautiful thing, white-ceramic material about 10-inches long with a 6-inch crossmember—all molded into one unit. This in effect gave you a "universal joint" where your feeders connected. It cost 40 cents. The insulator on the end of the flat top was three glass-radio antenna insulators in series. You can't be too careful when you are running high power—all of 30 watts into the antenna.

I went inside our modest—OK, less than modest—home. The rig was in a corner of my bedroom. Both of my parents worked. I would be home by myself for the next two hours. I decided to turn the rig on and check the neutralization of the mighty push-pull 45s in my output. It was OK, just as it had been every day for the past month—ever since I took the Class-C exam in this very room.

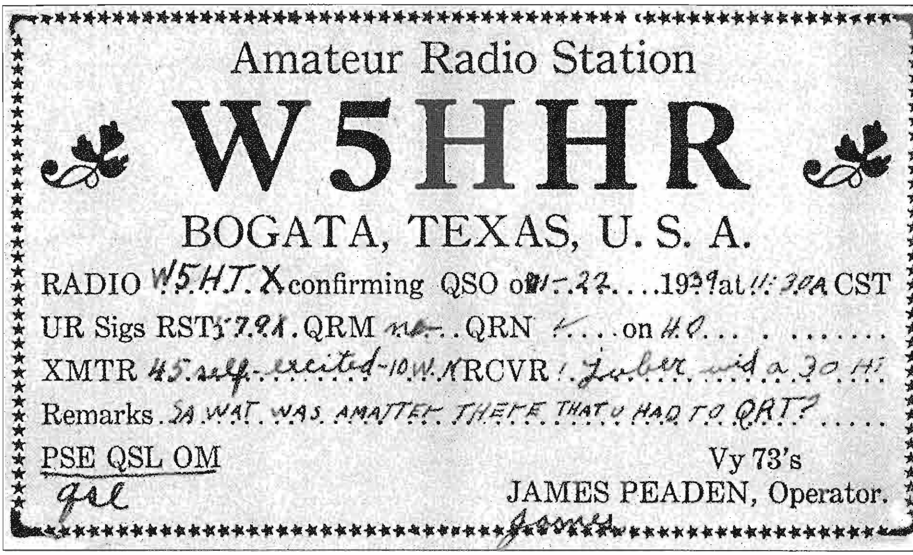
Wade, W5GWA, was a year younger than me. He had been licensed for over a year now. Almost every night, he would come over and visit. We would listen to my Sky Buddy, and talk ham radio until 11:00 PM, his curfew time. Wade had never been on the air. His problem was much the same as mine—poverty. The only difference was that I was more willing to get on the air with whatever I had, rather than waiting for an ideal station.

"Fire that thing up," Wade told me over and over. "No one is going to shoot us, or even find out about it. Go ahead and see if you can work someone."

I was reluctant to do that—after all; my license should be arriving any day. Allen, the ham who administered my Class-C exam told me he was 100% sure I passed it.

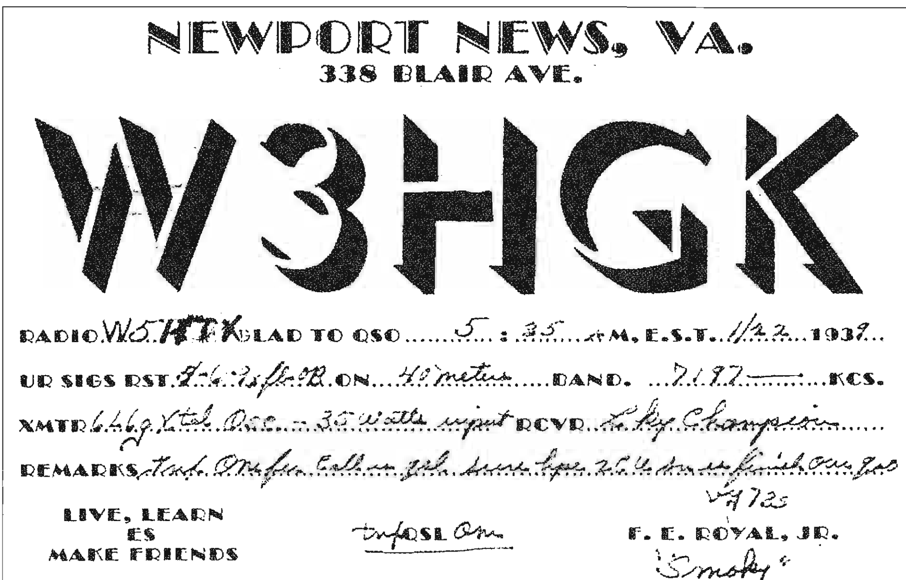
I left the filaments of the rig turned on. Perhaps I knew in some dark remote corner of my brain that today was the day, the day when I would hurl a message into the ether. I tuned the Sky Buddy across the 40-meter band. It was relatively quiet; very little QRM, or QRN. I copied about six or eight stations between 7000 and 7300 kc.

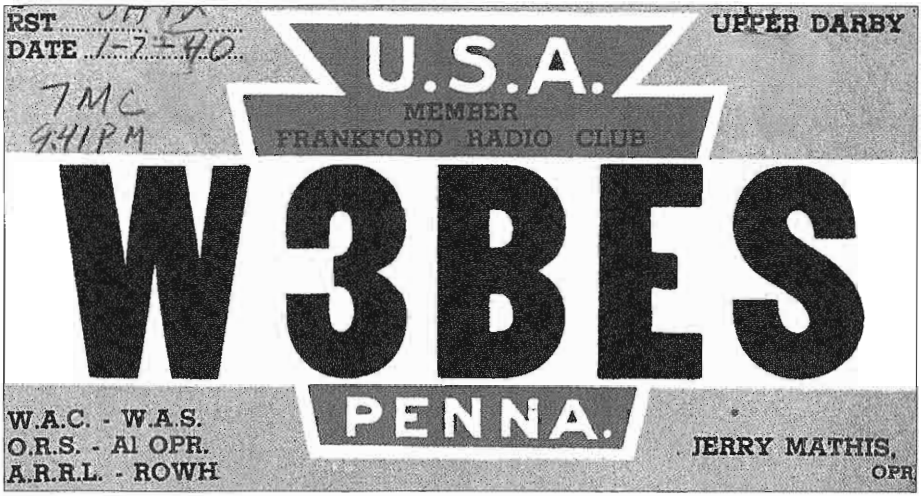
I suppose it was the Devil sitting on my shoulder that made me do it. Suddenly, I could wait no longer. I threw the antenna changeover switch to transmit, flipped the plate switch on, turned the volume control back on the Sky Buddy, and using my trusty taillight bulb with one-turn loop of wire, I loaded the antenna. I checked the 79-cent "Readrite" meter. The 45s were pulling about 60 mils. I did not know for sure what my plate voltage was, but guessed it at 400 volts. With less than 25-watts input I was relatively sure no one would hear



me. I nervously sent a 3-minute CQ. I began listening at the low end of the band, slowly tuning upward, listening for W5GWA as I passed each signal. Suddenly I froze with fear—"W5GWA, W5GWA, W5GWA, de W5HHR, W5HHR." My heart was thumping in my chest as I nervously sent a reply. Now, I had no problem reading the code, but suddenly the impact of what I had done blocked my teenage brain. With a trembling hand, I grabbed the filament switch and shut down the station. I went outside and sat on the porch swing thinking of the marvel of radio communication.

Looking at the card today I could see James, W5HHR as he tried to complete





his QSO. His rig was a 45 self-excited oscillator, built on a breadboard, no doubt. His receiver was a single-30 regenerative detector—battery powered. The call would indicate that he had been licensed for a two-or-three months before I received mine. I'd bet that he was an experienced operator with maybe a dozen or more contacts to his credit.

I was proud that I had, more or less, worked another ham station, but I also suffered terrible guilt for bootlegging a call, and was deeply ashamed of my fear and nervousness. I resolved to do something about it.

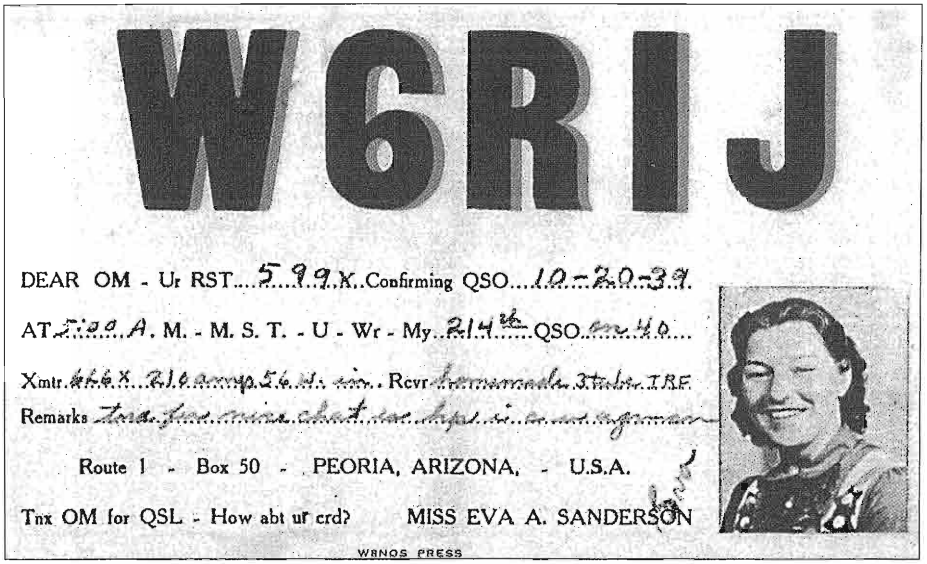
The following morning I got up at 3:00 AM and turned on the rig. Within minutes I worked W3HGK in Newport News. "Smokey" Royal, W3HGK, apparently had the same effect on me. His card shows he was using a Sky Champion, and a 6L6-crystal oscillator. Across the bottom of his card he writes, "Tnx fer the call, I hope to c u agn es finish QSO."

Before dawn that morning I completed, fully completed, two more QSOs. I never experienced that paralyzing fear again when operating the radio.

In the '30s, you could find the call "W3BES" in almost every QST. Jerry Mathis was a very active ham. His card proudly proclaims WAC, WAS, ORS, A1 OPR, ARRL, ROWH, and SCM of East PA. I was thrilled to work, and complete, a QSO with Jerry shortly after my ticket "W5HTX" arrived. I know from pictures in QST what Jerry looked like and what his rig looked like at the time. Looking at his QSL brings the pictures in sharp focus.

I was on the air practically every afternoon after school. The sunspots were kind to new hams in 1938 and 1939. I worked W6RIJ, Miss Eva Sanderson, Route 1, Box 50, Peoria, Arizona, several times. Her QSL card has her picture on it—an attractive young lady about my age, I guessed. Her rig is a 6L6 oscillator driving a single 210-to-50 watts input. Her receiver is a home brew, 3-tube TRF. I remember the note on the back of her QSL. She was indeed 17 years old, and had worked 25 states plus K6, KD6, and XE. At the time, "K6" was Hawaii. Eva and I exchanged letters as well as QSOs.

Today, looking at her card, I can see in my mind a young girl sitting at a table cluttered with home-built gear. I can visualize copper wire glistening in the bright sun, while in the distance the beautiful Arizona landscape serves as a perfect foil for her antenna. I looked



Peoria up on "Google Earth." Mary and I have spent several vacations in the area. That part of Arizona is one of our favorite places to visit. I hope Eva had a good life and continued hamming.

Another station I worked with regularity in 1939 and 1940 was W5HMV, "Windy Bill" Waller, from Baton Rouge, LA. Bill was a cab driver in New Orleans, working the night shift. He went to work late in the afternoons. Usually he could be found on the air from 3:00 PM until 5:00 PM. We even exchanged pictures of ourselves and our stations.

I remember his station. It was one of the few well-equipped stations I worked in my early years. Bill had a Hallicrafters SX-16—it is printed right here on his green and white QSL. His transmitter was Utah kits #1, 2, & 3.

My family moved into a larger house in late 1939, and I was inoperative for a few weeks while getting my antenna back up in the air. Then I started to college and lost contact with Bill for the next few years.

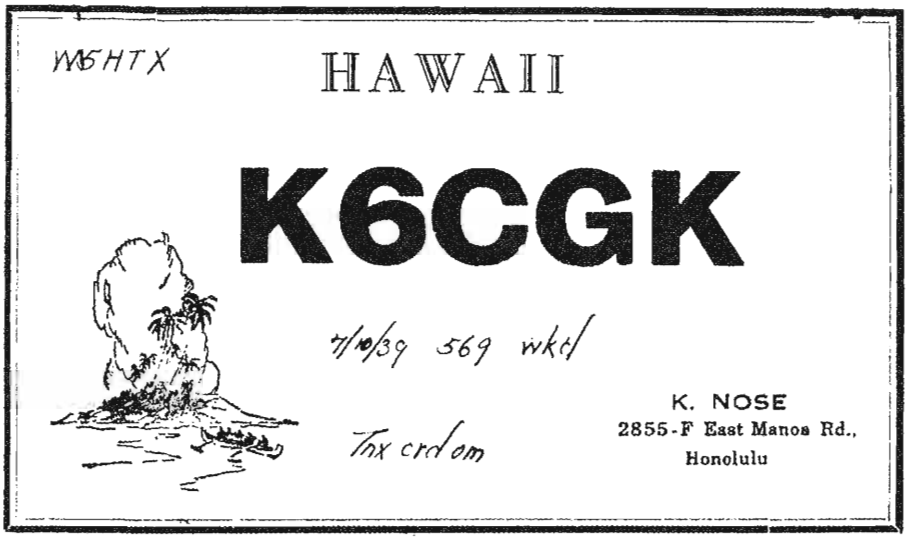
I was sitting in the mess hall one morning at our Nottingham Air Base having powdered eggs, and dark-green colored GI coffee for breakfast. I know it was powdered eggs because the Mess Sergeant said so. Actually, they had a taste of cardboard fried in latex. If I remember correctly, it was early March of 1944. I turned to Corporal Hills, sitting next to me and asked "Who is that husky Staff Sergeant standing in the chow line? I don't think I have seen him before."

"Oh, him," replied Ralph, "He is one of the new replacement Radio Operators that came in last night. I understand he is assigned to our Squadron. I have not met him, but someone said he was from New Orleans."

I kept looking at the fellow—it seemed I should know him from somewhere. Then it hit me like a thunderbolt—"Windy Bill" Waller!

"Hey, Bill, W5HMV, come over here when you fill your mess kit," I yelled across the mess hall. I could see he was puzzled. He came over and stood looking at me a few seconds before a big grin came over his face. "W5HTX, am I right?"

We were together until I was discharged from the service. So many memories come back as I thumb thru a few old cards.



Here is one I'll never forget, K6CGK. Late one night I was tuning the band. I had never worked a station outside the US—except a few VEs—when I heard a faint CQ. I had been licensed almost four months. As most of you know, the Sky Buddy has no RF stage and one stage of IF. It was about as basic as a receiver that could be built. I strained to get the call. My heart gave a leap as I finally got it—"K6CGK."

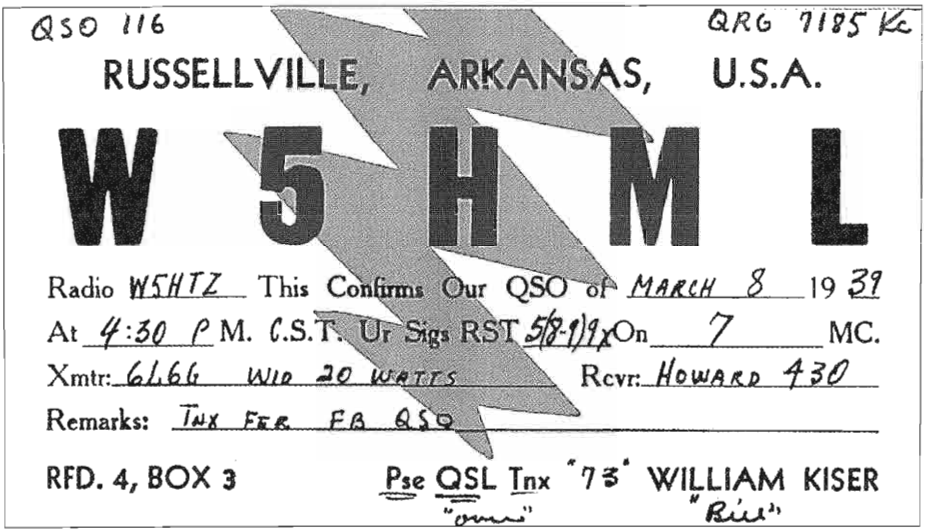
I grabbed the straight key and gave him a call, signing my call several times. I stood by and listened. Nothing but a lot of noise—then out of the noise I heard him sign his call and give a report of "RST 569," but was he talking to me? Honestly, I wonder today if I actually worked Mr. Nose. Of course I sent him a QSL, and explained that I only hoped I worked him. I could not be sure.

I received his QSL and prize it highly. Did I actually work K6CGK or did he not want to disappoint me and sent me a card out of the goodness of his heart? I wonder.

One of my greatest pleasures in ham radio is rag chewing with a good CW operator using a 'bug.' It is especially enjoyable when their speed is near my speed. I learned CW at an early age and had no trouble moving up to 35 WPM—but there I leveled off. At speeds of more than 35 WPM copying CW becomes work, at 45 WPM I miss about as much as I get. Fifty WPM is beyond my capability. I will never be a speed merchant.

One of the best fists I ever copied was W5IGO, Thelma, from Minco, Oklahoma. For many months we enjoyed more-or-less regular QSOs. She and I were both happy to relax and keep our speed around 30 to 35 WPM. Then, I started a family and at the same time started work on a larger building for my radio shop. I became inactive for quite a long period of time—during which I lost touch with many old friends.

Years later, I worked a station in Minco, and asked about Thelma Ferguson. The operator had never heard of her. I did a little research and found she moved from Minco to Albuquerque. When in Albuquerque visiting my son, I decided to look her up and say hello. She was a silent key. Think of the many missed QSOs. Such a pity. Thelma was running a home brew transmitter; a 6L6 into a single 807 with 25-watts input. Her receiver was a Sky Champion.



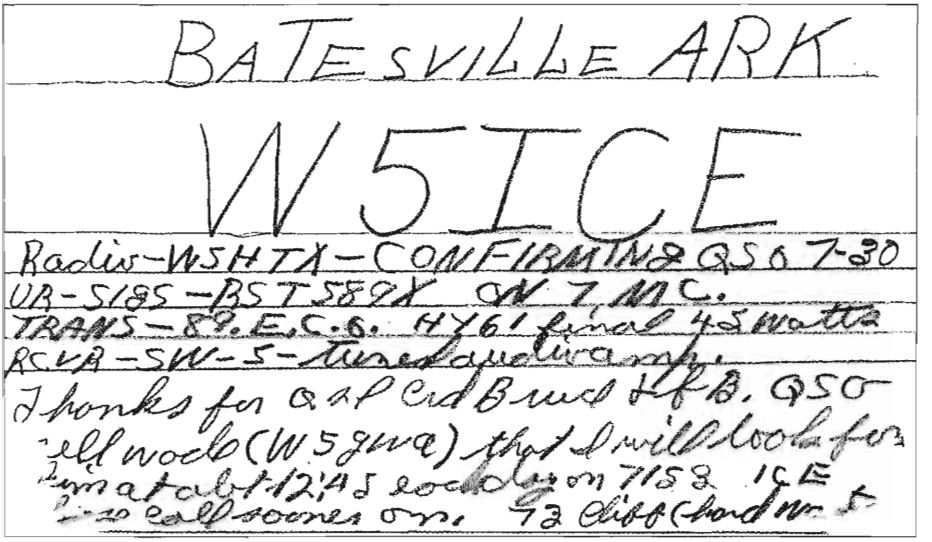
W5HML, Bill Kaiser, of Russellville, Arkansas, was one of my very first contacts. He was an old timer. His QSL proudly proclaims that I was his 116th QSO. Bill was running 20-watts input to a single 6L6. His receiver was a Howard 430. We were only about 140 miles apart—maybe less, so QSOs on 40 meters at 4:00 PM popped up several times. Bill decided to come and visit me. We were both 17 years old and as interested in girls as in radio. We spent his entire visit driving around town trying to pick up girls, an endeavor less than successful, I might add.

I especially value the QSL of "Hardwater Cliff," W5ICE. Cliff did not waste money on fancy QSLs. His card is a penny postcard with my report and other valuable information written with what appears to be a penny pencil. Cliff was using a National SW-5 for receiving and an 89 ECO into a HY-61 with 45-watts input as his transmitter. At the top of the card, Cliff proudly writes that he has worked all nine "W" call areas, plus a VE-3 and a VE-9. Not bad for a modest-powered homebrew station. On his card he asks me to pass his 73s to Wade, W5GWA.

But what about QSLs sent? Do they have any redeeming feature? Let me tell you a very short story—then you decide.

As I have often said before, our little town had about six hams. I can't give an exact number, as in those prewar years the ham population in our area was in a state of flux. Hams came, hams went, and we seemed to level off at five or six. A popular Sunday activity was driving to surrounding towns, searching for ham antennas. When we spotted one, we thought it was OK to knock on the door and ask to see his station. Of course, it did not take long until we knew all hams within driving distance.

One ham Wade and I had not met lived in a nearby town. He was manager of a local night spot. One night Wade and I decided we should pay him a visit. We found him with ease. He was a handsome young man of about 25 years old and dressed in the latest fashion for young men of our area. We approached him and introduced ourselves. We were promptly ignored. He turned away and started a conversation with a group nearby. We hung around for perhaps 15 minutes or so. It dawned on us at last that we were unwelcome, and not of his social class. Disappointed, we returned home.



Last year I received a call from a nice lady. She said, "My Daddy is 90 years old and in very poor health. When he was younger he had an amateur radio station. Lately, that is all he can talk about. He wants one of his QSL cards he mailed out. Did you, by any chance, ever talk to ... on the air?"

I did not immediately recognize the call so I searched my file. I called her back with a negative reply. She was disappointed. "I know it is an imposition, but could I please bring Daddy by your home and let him see an amateur radio station again?"

Of course I replied in the affirmative. When they arrived at my house, the old gentleman who came in was very unsteady on his feet. I was concerned as to whether he could climb the stairs to my second-story shack. With our help, we got him upstairs and seated in a rocker. Only then did I finally remember the name and call of the old gentleman. He was the one that did not want a visit from two 17-year-old boys.

He said, "Is there any way at all that you could help me find one of my QSL cards? You have no idea what it would mean to me."

I gave him a few magazines and circled the ads of those who will make a search for your old QSLs. He and the daughter visited for almost two hours. He had not been in a ham station for years and could not conceal his amazement.

I could not help but think that if he had visited with Wade and I for a few minutes that evening over sixty years ago, I might very well have had his card. It was a custom then to always present your QSL to those you visited, and they usually recriprocated.

I picked only nine cards out of my file to comment on. These cards are the first ones I came to that brought back vivid memories. As I look at them I realize they are nothing but yellowing, faded, paper. The total cost to print and mail the nine cards was probably less than 25 cents. The memories they bring back today are priceless. Before we abandon the custom of QSLing, perhaps we would do well to look thru our QSL files and decide which ones to toss in the waste basket. If you are like me, it will be a very difficult choice.

ER

Modifying a Fair Radio Sales BC-348 Power Supply

By Louis L. D'Antuono, WA2CBZ
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Brooklyn, NY 11209

During World War II, nearly all the military receivers that saw service were primarily powered by dynamotors, whether they were used in ships, planes or jeeps.

Dynamotors are motor-generators that convert the battery's potential to create the B+ source for the vacuum tubes. When these receivers poured onto the surplus market after the war ended, adapting them to house current posed a challenge. Some hobbyists attempted to power these boatanchors with low-voltage, high-current power supplies that duplicated the original source. Since many ham radio operators did not relish the resultant noise in and out of these dynamotors, some alternative was sought to alleviate this problem. The standard method was to build a power supply that furnished both B + and filament voltages and any bias potential that was required. Some builders rectified the filament source, citing the original circuit conditions. Despite the great demand created by surplus hounds for these power supplies, few, if any, commercial units were available at the time.

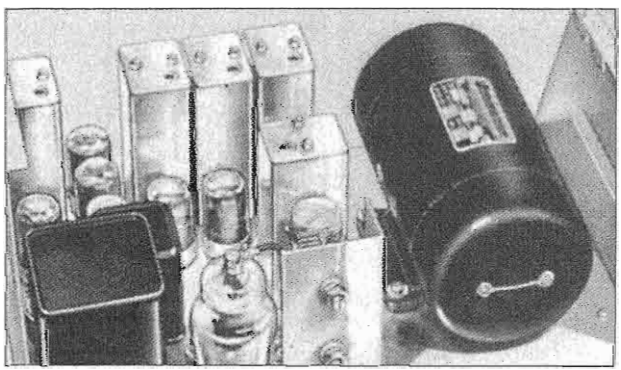
RECEIVER POWER SUPPLIES w/ SPEAKER for 115 VAC 60 Hz operation of the following
BC-453-454-455-946
R-23-24-25-26-27/ARC-5
R-10-11-15-19-22 ARC-type
BC-348 BC-639
Include dynamic speaker housed in metal cabinet with connecting cable, phone jack, volume control, BFO switch (if applicable). Output: 200/250 VDC 90/60 ma and 24 VAC 2 amps; usable with other receivers having similar requirements. Dimensions and parts vary with availability of materials. SPECIFY receiver type; 10 lbs. KIT, $32. WIRED, $40.

DC POWER SUPPLIES from 115 VAC 60 Hz input; our construction:

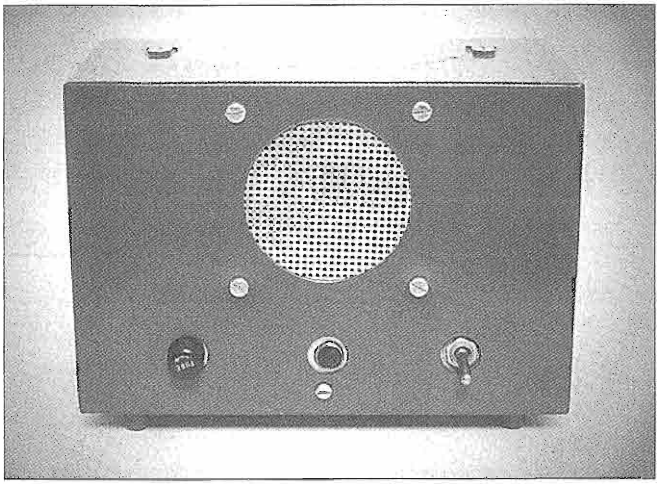
	KIT	WIRED
#24VDC2A, 24 VDC 2 amps, 12 lb	$17	$22.95
#24VDC4A, 24 VDC 4 amps, 14 lb	$20	$25.95

Receiver Power Supply/Speaker ad from the 1983 Fair Radio Catalog

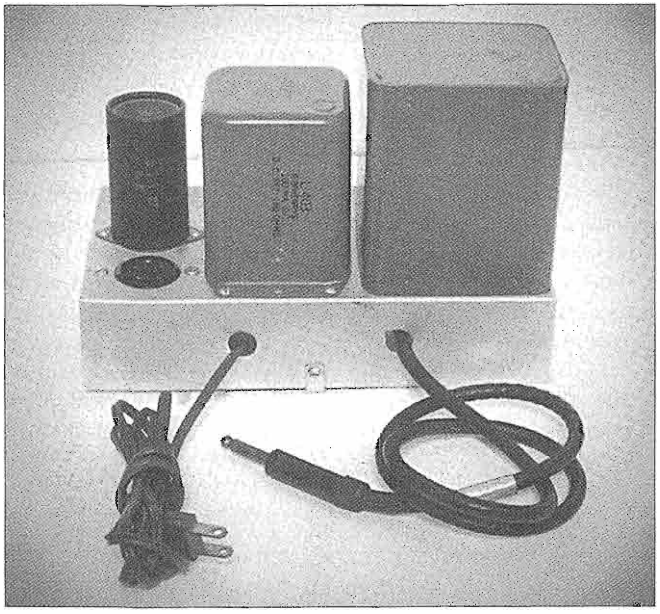
Fair Radio Sales, for many years, offered power supplies for sale, designed for these postwar-surplus military receivers. They were available in wired or kit form. Each of these was custom designed for the variety of receivers available on the surplus market. Besides providing the required filament and plate voltages, these units featured a speaker in the enclosure. The speaker's electrical connection from the unit to the receiver was accomplished by utilizing a shielded cable that plugged into the latter's audio output jack. The ones designed for the more practical receivers such as the BC-312, BC-348, RAX, and most certainly, without any doubt, the Command Sets, received the most attention.



Typical WWII-era radio equipment with a dynamotor, pictured on the right side.



Front-Panel View of the Fair Radio Power Supply/Speaker



This is a rear view of the unit after removal from the cabinet. It was designed to be used without further work, once the BC-348 had been modified.

The pictures above illustrate the type used for the BC-348 receiver. Its size is 6"H x 9" W x 5" D and weights about fifteen pounds. Most of the weight is due to the heavy-duty power transformer and huge filter choke. The power transformer's full-wave rectifier circuit provides the B-plus voltage. A choke-input filter using an 8-Henry, 100-mA filter choke terminating into a dual 30-µf, 450-VDC electrolytic capacitor completes filtering. These power supplies featured a pilot light to indicate AC power and contained a standard 24-VAC filament supply. The unit pictured here contained a 6.3-VAC filament source, which necessitated that any BC-348's standard 28-volt filament circuit had to be rewired.

I decided to modify this power supply to enhance its performance. The B+ supply voltage was much higher than the 220-VDC threshold my BC-348Q required. I wired a 50-k, 25-watt, variable-tap, wire-wound power resistor across the B+ supply and set the tap to the desired 220 VDC. A 500-k, 2-watt carbon resistor was then wired across the entire component for greater electrical safety. The power supply lacked a standby switch so I wired a SPST switch into the center-tap ground connection and mounted it in the space usually occupied by the fuse holder on the front

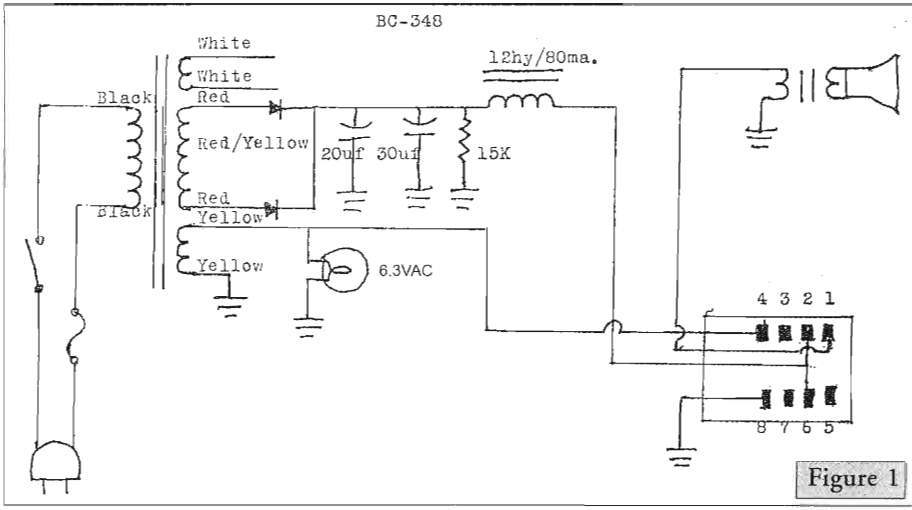
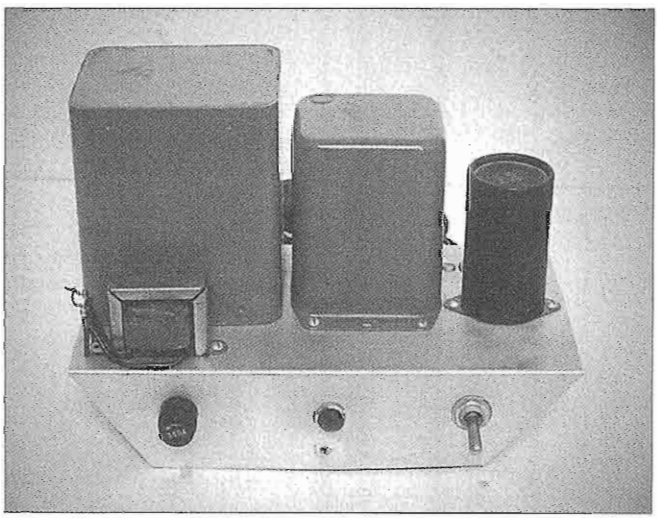


Figure 1

Original Fair Radio BC-348 AC-Power Supply Modification Instructions:

1. Remove dynamotor from BC-348
2. Remove base from dynamotor and all components from the base.
3. Connect terminal strip on end of dynamotor base as follows:
   a. Connect -HV and -LV terminals to gnd.
   b. Connect +LV termianl to center terminal.
4. Replace base in BC-348 and connect wires from set to screws from thich they were removed on terminal strip.
5. If no base in the BC-348:
   a. Ground leads in 1 & 4.
   b. Tape leads together.
   c. Tape off lead 5.



Front View of the Chassis, Out of the Cabinet

panel. I remounted the fuse holder on the rear panel and wired it back into the line-cord circuit. The power output terminates into an four-pin socket mounted at the back of the power supply's chassis.

I used this unit with my BC-348Q receiver and it performed as well as other similar power supplies that I have used in the past.

ER

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Vietnam, 1967 to 1968, Part 2, Radio Systems

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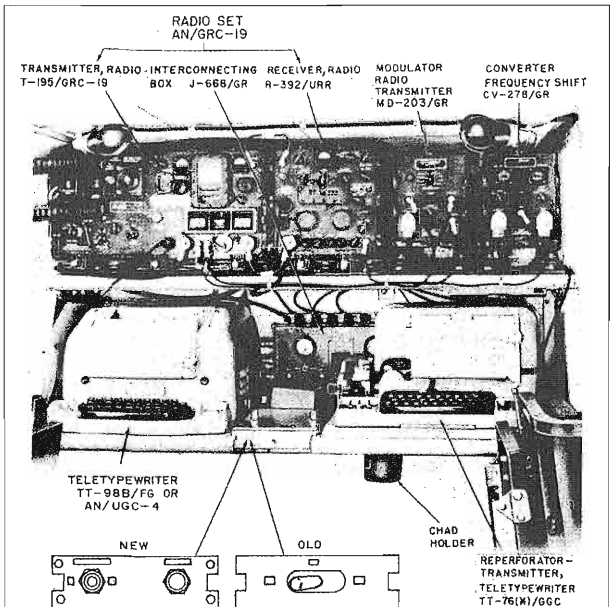
HF Systems: AM Voice and RATT

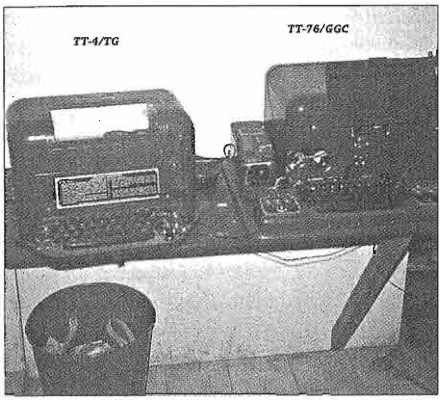
As mentioned in the Part 1 Introduction, unit radios for the 20th Engineer Brigade Headquarters (HQ), the 34th group HQ, and the separate Engineer battalions were the HF AM equipment AN/GRC-19 (*) capable of CW and non-secure AM voice, and its cousin, the AN/GRC-46 (*) used for both AM voice, 6A3, and secure frequency shift keyed RATT, 1.1F1. The radio has a CW capability but CW was never utilized. The AN/GRC-19 consists of the T-195/GRC-19 transmitter and the R-392/URR receiver. Antennas could be a 15-foot whip or a doublet. The R-392 is somewhat unique in that it uses tubes that operate with a plate voltage of 28 volts. The AN/GRC-46(*) adds a radioteletype modulator MD-203/GR, the RATT receiver converter CV-278/GR, reperforator-transmitter TT-76(*)/GGC and teletypewriter TT-98B/FG or AN/UGC-4 (**Figure** 3, 3A). For secure RATT, the TSEC/KW-7(*) was added. The transmitter operates from 1.5 to 20 MCS and the receiver operates from 0.5 to 32 Mcs.

The 34th Group Headquarters also had a complement of AN/GRC-19s for use by the key staff elements. Since all supporting units with the exception of the 36th Bn were beyond normal driving distance and visits were usually, but not always, accomplished by helicopter travel, the AN/GRC-19s were put in storage. These units were configured as the version for jeep mounting, the AN/VSC-1 also assigned to airborne units. Other versions called the AN/GRC-46, A or B mounted in either the S-89C/G or the S-144G shelter and normally placed on a 3/4-or-5/4 ton truck with a 15-foot vertical whip to allow for easy deployment as well as operation while under way, and one other variant called the AN/VRC-29 designed for installation in an armored vehicle. At the time covered by this article, the 34th Gp was static, so we were



Radio Teletypewriter Set AN/GRC-46B, interior view.

Radio Teletype Set AN/GRC-46B



The TTY sets at the 34th Gp. In 1968

able to place an S-144G shelter within the fixed building used by the SigO and his staff at the 34th. At the 34th Gp COMM CENTER, and at most fixed locations, we incorporated the adjustable AN/GRA-50 dipole antenna mounted between two 60+ foot telephone poles outside the communication building. Having the shelter within another lockable space satisfied the security issues for the TSEC/KW-7 TTY crypto gear. Since the AN/GRC-46 (*) operated on 28 VDC, a small 28-VDC generator was utilized to power the set. As far as I know, this generator was not an organic element of the radio set and was just "acquired." I do not remember its nomenclature. A repeater version of the set, which permitted FM VHF to AM HF voice repeating was known as the AN/VRC-38. None of the AN/VRC-38's were authorized in the corps-level engineer units.

When the 27th Engineer Bn, joined the group at Xuan Loc in support of the base camp construction for the 11th ACR at 65-km distance, they joined in on the HF AM/RATT net. Again, unless frequencies were around 7-to-12 Megahertz, the distance was either too far for ground wave or too close for reliable sky wave. Engineer combat battalions had both AM HF equipment and a few FM VHF sets. Secure RATT utilizing the AN/GRC-46(*) was used between all Bns and the 34th Gp.

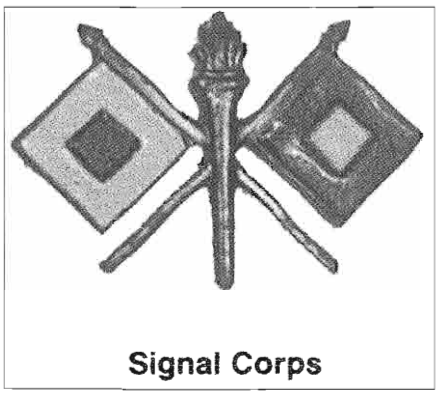
Taking over the SigO position in March 1968, and drawing on my previous assignment as a signal instructor in the Officer's Department of the USA Signal Center and School at Fort Monmouth, where I taught HF radio propagation, I knew we were in trouble because the unbelievably high atmospheric and cosmic noise levels in the tropics made AM voice with only 50-watts output power only partially reliable. As long as the assigned frequencies were around nine-to-ten Megahertz, communications was fairly satisfactory especially for the RATT traffic. The path lengths and available power (100 watts in RATT mode) with good fixed antennas generally overcame the high tropical noise levels. The noise levels on HF in the tropics (we were at about 10.5 degrees North Latitude) especially at night, were very high compared to temperate areas. Because of these conditions, we never attempted any AM or RATT communications a night. At the time, shortwave broadcasting was a big user of much of the prime spectrum and US military frequencies had to conform to national and international regulations. Casual listening in my hooch at night revealed much more "stuff" on short wave than I ever heard back in the states at 40-degrees North Latitude.

Later on, more frequent frequency changes and the inability to always have an assigned frequency near the optimum resulted in some gaps in the use of HF AM or RATT. Sometimes, the assigned channel(s) would be in the low end of 2-20 MHz (Army HF frequencies stayed below 20 Mcs as higher channels were utilized by some FM voice nets), and at times the noise won out. I was able to convince the Brigade Signal Officer that we had to stay in the 7-to-12 Mcs range if we wanted reliable secure radioteletypewriter service on a daily basis. After we initiated this constraint by judicious

use of available assigned, but unused, frequencies, the secure RATT circuits worked surprisingly well especially considering the fact that one had to maintain synchronization of the encrypted 110 baud TTY data during exchanges. The FSK RATT always outperformed the AM voice which would be expected due to the narrower bandwidth utilized.

The noise conditions at HF made vehicle-mounted, short whips about worthless for local communications. For example, mobile, local, ground-wave jeep-mounted, AM-voice radio coverage to the fixed-dipole antenna was only about 10-15 km before reaching the skip dead zone. NVIS using a whip on a moving vehicle was not really practical. As a result, the use of the vehicle-mounted AN/GRC-19 (*) was abandoned as a means of supporting organic HQ-staff communications. For secure RATT, however, we were using fixed sites with better antennas.

VHF-FM equipment in sufficient quantity was not available or authorized and as mobile to mobile, would not cover the distances in many cases due to the generally extremely flat terrain in this area of Vietnam. Since we were copying RECORD traffic, we needed high reliability so as not to make errors in the accuracy of the sent information. Casual communications where missed words or incorrect numbers were received was not good enough for mission-critical information. So, our demands of this equipment and propagation exceeded what most amateur communications would normally be deemed acceptable.



Stretching the Limits of Low-Power AM

One of the big drawbacks of the AN-GRC-19(*) and 46 was the fact that the set required a trained operator. Most of the smaller attached Engineer units were not even authorized AM-radio equipment or operators. The most notable of these was the 156th three-man Well Drilling Detachment (DET) which had a well-drilling mission on Phu Quoc island for over a year, and which required all the normal-unit communications, reports, and operational and administrative traffic of any Army-numbered unit. Much of the traffic for the 156th was handled by air courier and, for a time, by multichannel-VHF relay with the last leg using the little known AN/GRC-10 equipment. I'll cover the AN/GRC-10 in detail under the VHF-FM section to follow.

Since communications with the drilling detachment was an on-going operational issue, in late 1967 or early 1968, we decided to provide the 156th with an AN/GRC-19 (*) and train one of the well drillers to operate the radio. After completely checking out a system, we sent it to Phu Quoc along with my Comm SGT to install and provide training. We got this system to work over the 330-km mile path, but if anything went wrong so as to need operator/unit maintenance, or even a frequency change, unfortunately a signal-trained specialist would have to fly out to the island to effect repairs or retuning. I am sure that if a trained signal-radio operator would have been available, this voice circuit would have worked reasonably well.

An Unauthorized AN/GRC-26D

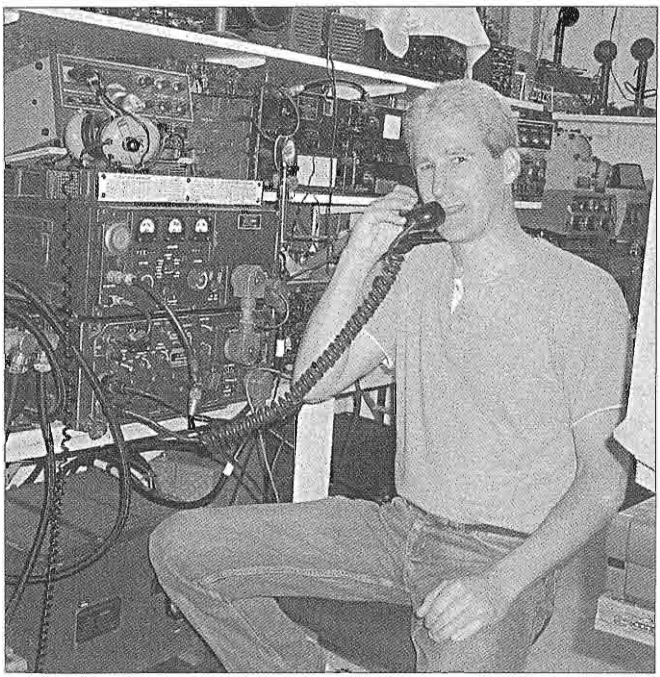
One of our organic battalions, the 36th Engr Bn (CONST), and almost co-located with the 34th HQ, somehow had latched on to a great AM and RATT

set, the AN/GRC-26D complete with the S-56(*) shelter and the associated duce-and-a-half truck. With its R-390 receivers, available diversity reception, the T-368 transmitter, with resulting high power, it would work where the 19/46 equipment would not. In addition, they also had a trained signal operator who knew how to use the set and they deployed it at their Bn HQ quite successfully. During annual inspections of the Bn, however, it lived at my facility and continued to be utilized for traffic, so as not to be reported as unauthorized by the Inspector General. While at the 34th, it operated self contained with the standard vehicle-mounted, 15-foot whip.

HF SSB

The 400-watt PEP vehicle mounted AN/GRC-106(*) (voice) developed as a replacement for the aging AN/GRC-19(*) and the AN/GRC-142 (RATT) units were being fielded in Europe while I was at Ft. Monmouth prior to deployment to Vietnam. The photo below shows Mark, KD3ZK operating his AN/GRC-106/AM-3349 from his shack. Note AC Power Supply PP-4763A, 27VDC at 50A under the bench by Mark's feet. This is the correct AC supply for the AN/GRC-106 family.

My good buddy Dick (W8RM) was the Army Project Manager for the field testing of the brassboard version of the AN/GRC-106 at Fort Bragg, NC in 1962. The AN/GRC-106 system consists of the Receiver-Transmitter RT-662/GRC-106 or RT-834/GRC-106A and the amplifier AM-3349. According to Mark, only the first 200 or so units of the RT-662 had the integrated noise blanker. The AN/GRC-142 was intended to replace the AN/GRC-46 and its development followed that of the AN/GRC-106. The radio set was already in use by some combat units in Vietnam by 1967 and was authorized for all Combat and Construction Engineer units but was not yet available based on limited production and unit priority. During the spring of 1968 the AN/GRC-106 radios started reaching engineer units. The 34th Gp assigned combat battalions had the greatest need and so were first to receive the units. Of the 34th Gp combat engineer battalions, the 86th Engineer Bn was the first to get the rigs and to train the operators. I remember distinctly a conversation on HF SSB from a ¾-ton utility truck with a 15-foot vertical whip from outside my communication facility in Vung Tau back to the 86th Bn HQ in Blackhorse in the middle of the



Mark Francis (KD3ZK) Operating His AN/GRC-106

day with R5 results. As the SSB gear came in, many of the problem plaguing HF-AM RATT and voice were eliminated and the Engineers were able to once again communicate reliably as required. I know we all like AM here, but one cannot argue with the superior communications reliability of a 400-watt PEP-SSB rig compared to a 50-watt AM rig. At the time I returned stateside in September 1968, the 34th Gp or Engineer Construction BNs still had not received the AN/GRC-106.

HF-SSB was in use by other Army units within Vietnam well before we received the AN/GRC-106 upgrades in our direct units. Army Special Forces units and ARVN advisor units directly supporting the Vietnamese forces had complete AN/FRC-93 stations using the Collins KWM-2A, station control, and 30L-1 amplifier in a real tent-mounted tactical installation. The closest such station to our HQ, which I visited to assist them with an antenna problem, was a unit at Baria about 10-12 km from Vung Tau. Also, attached to our 34th HQ, was a 1st LT Contracting Officer responsible for civilian contracts with the Vinnell Corporation for base electrical-power systems. Each of their regional HQ offices operated AN/FRC-93's right smack in the middle of the US 40-meter CW band with simple doublet-wire antennas and with great success.

VHF FM

The VHF-FM band of 20 to 75.95 Mcs was used for single-channel FM voice including RWI, RATT using FM-modulated shift tones, and for multichannel radiorelay to connect several voice-grade phone lines between company-level units.

The primary radios utilized were the AN/VRC-12 family, of which there are many variants. The engineers utilized both the AN/VRC-46 and AN/VRC-47 variants. There were two versions of the transceiver, the older RT-246/VRC with preset-pushbutton tuning and the RT-524/VRC with manual tuning. The RT-524/VRC was the one included with the AN/VRC-46 and 47. The RT-524/VRC has switchable power of 8-and-35 watts and utilizes 30F3 modulation with 50-kc channel spacing. In a fixed location, the adjustable RC-292 was utilized. On a vehicle, the VRC-12 antenna was the ½-wave, center-fed vertical AT-912/VRC. The AT-912/VRC had an integrated antenna tuner with the vehicle whip allowing good efficiency over the complete 30-76 Mcs range. The AN/VRC-47 included a second "guard" receiver, the R-442, to allow simultaneous RX monitoring of two FM-voice circuits. The radios had what the Army called as "old" and "new" squelch. "Old" squelch was simply a carrier squelch while "new" was a 150-cps, subaudible tone. However, the squelch-opening time with the tone was a bit slow, often cutting off the first part of the first word if the transmitting station starting talking too soon after keying his rig.

The PRC-25 man pack (RT-505/GRC) was also in use. An available docking station, OA-3633/GRC, allowing for vehicle or fixed-location operation coupled with an RC-292 made an acceptable base station called the AN/GRC-125. Although the 34th HQ was not authorized any of these radios, we were able to procure one on hand receipt from a nearby unit. The primary use was a base installation at the Operations Officer's desk to talk with airborne 30-76 Mcs units which were mounted in the UH-1 "Huey" helicopters. The helicopters came from the aviation Section of the 20th BDE and provided most of the transportation requirements of the 34th Gp staff. Most, if not all, tactical aircraft were equipped with the AN/ARC-54 (or similar units) 30-69.95 Mcs-FM radios for communications with supported ground units and for monitoring friendly artillery fire "guard" channels while in route.

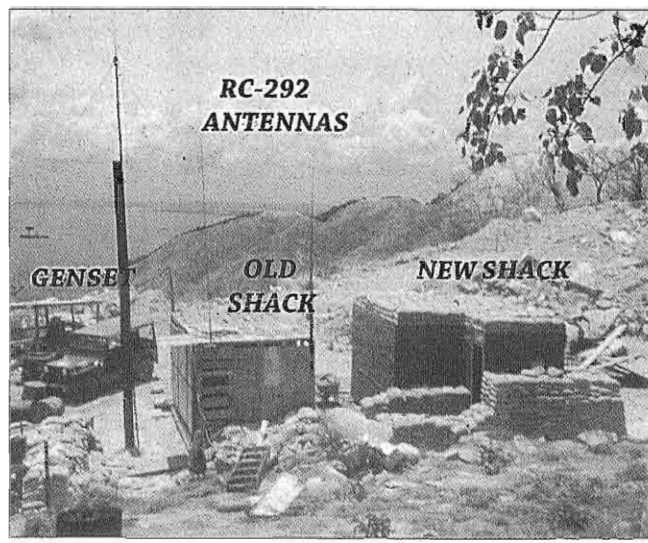
The Engineer battalions and their companies also used VHF-FM combined with RWI successfully. Most times, at

least the job sites and the company headquarters were physically close and VHF FM was highly successful. In late 1967, however, the 86th Combat Engineer Bn was split with one company relocated to My Tho in the Mekong Delta. The battalion headquarters remained at Blackhorse, 30-km NNE of Saigon. The Corps area common-user service was totally inadequate in the Delta due to limited trunk line availability. Air courier handled much of the unit traffic. This communications problem was later solved as outlined in the next section.

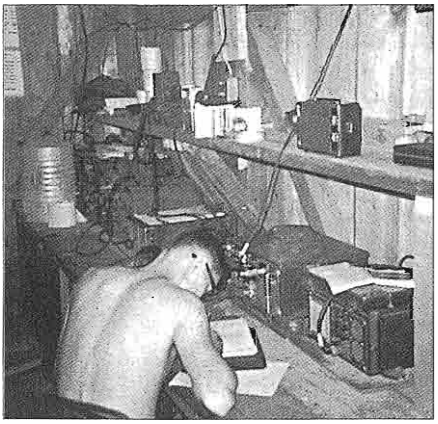
The radio-wire integration feature of the VRC-12 family was handled by the AN/GRA-39 or AN/GRA-6. These units provided either an extended local control over ordinary 2-wire phone lines or by means of a line card, interconnection as a commercial-grade trunk on either the SB-86 or SB-22 field-telephone switchboard. Sets having this option would allow a field commander, using the radio, to talk with anyone on a one-way reversible basis over the Army fixed-telephone system (RWI). The system did require an attendant at the GRA-39 or GRA-6 unit to do the manual T-R switching. Quite often, calls were initiated using RWI usually with good success. Conversations were conducted strictly with radiotelephone procedure.

VHF FM Radio Relay

Automatic and manual voice relay was possible with the VHF sets. The VRC–12 family could be configured for automatic relay (repeater) service utilizing two frequencies and separate antennas. Lack of available "legal" channels and radio and antenna groups made this option not suitable in the case of the 34th. Instead, when the 86th Engineer Bn was split in two and assigned a dual mission in both Blackhorse and My Tho, they established a 24-hour-a-day manned VHF-relay site on VC Hill in Vung Tau (**Figures** 6 and 7) to relay important command traffic to and from the detachment in My Tho to the HQ in Blackhorse. VC Hill, pictured below, was a great relay site, it was about 245 meters above sea level, right on the South China Sea and made VHF-FM relay a reliable operation. Almost immediately, communications checks confirmed reliable FM coverage to the 20th Engineer Brigade headquarters as well, so a joint operation with 86th Bn equipment and operators and 34th Engineer Group operators in a small bunker on the edge of VC Hill began. The equipment was time shared between the two needs and also was set up as an important emergency relay site and, as covered later, was used with an AN/PRC-25 in the 34th Engineer Group command bunker to relay off-line, encoded, written-message, damage and casualty reports (SITREPs and SPOTREPs) to the 20th Engineer Bri-



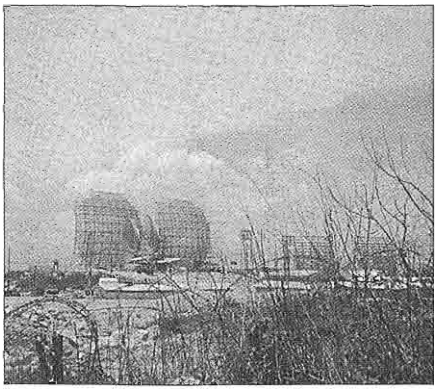
The VC Hill VHF Relay Site



Unknown 86th Engineer Bn Commo Specialist is on duty in the shelter. Note the VRC-46 units and AFVN portable radio.

gade headquarters.

In 1967-68, on-line voice encryption was not authorized in the Engineer units. Off-line text encryption took time to prepare, but nevertheless was used on a regular basis. The encrypted text could then be read over an unsecure telephone circuit. After each relay, the message was encrypted again with a different code if another telephone relay was required. A landline telephone was not available in the VC Hill bunker, so after hours the site operators would walk over to the Long Lines Bn South Troposcatter site and call urgent traffic down to the 34th Engineer Group headquarters charge of quarters (CQ). Two personnel and courier runs, one at seven AM and one at six PM, were established from the 34th Engineer Group message center, to the bunker, to replace operators from the 34th and to exchange hard-copy traffic. While on VC Hill, the operators were attached to Long Lines Bn South for meals. The 86th Bn relay site was also used to serve the 93rd Engineer Bn (CONST) when it began to be re-deployed from Long Thanh North to My Tho later in 1968. I'll have more on the 93rd communications later in the VHF/UHF radio relay section.



View looking NE from VC Hill. Smaller dishes on left in back of largest ones shot to Can Tho. Large ones behind to Udorn Thailand. Square set to Pleiku RVN. This pair is still on recent sat photos!

The VRC-12 family had a switchable wide-band IF mode called "X mode" that was suitable for connection of the voice frequency mark-and-space tones of the TTY gear thru a homemade connector allowing the relay of encrypted TTY traffic on VHF-FM. The wideband position also could be used for encrypted voice with a voice-secure MUX. However, these units were rare indeed so were never used. Since the VC Hill site was all set up, the 86th Bn, and later the 93rd Bn, used this capability to provide an initial TTY circuit between the Blackhorse and My Tho locations and between the Bearcat and Dong Tam sites.

The AN/GRC-10 Family

Prior to setting up the AN/GRC-19 on Phou Quoc Island, a little known and generally hard-to-find multichannel VHF-FM radio, the AN/GRC-10 system, was available to talk with Phu Quoc (Photo, page 33). The AN/GRC-10 was used with the AN/TTC-3 four channel telephone frequency-division multiplex carrier or MUX equipment and accessories generally designated as an AN/MRC-68A. The antennas were 3-element Yagis designated the AS-620/

GRC-10. However, this set was not owned by elements of the 34th GP, but instead was part of the Corps Area Common User telephone system and was in a network that had very little channel capacity in the various legs from Vung Tau through Saigon, Vinh Long, and Can Tho. The AN/GRC-10 used either 60F9 or 80F9 FDM modulation and was designed for up to 6 hops of up to 48 km each. Power output was switchable between 10-and-40 watts. With the wide bandwidth relatively strong signals were required for good quieting. One such pair was available and used from the mainland to Phou Qouc. I never did find out the exact length of this AN/GRC-10 shot. Just like on 6 meters, you needed good TROPO for reliably spanning the hop. There were no regularly manned facilities or available equipment to install multiple hops on the required path. Its questionable performance is what prompted the AN/GRC-19 trial mentioned previously.

[Part 3 Next Month...Ed.]

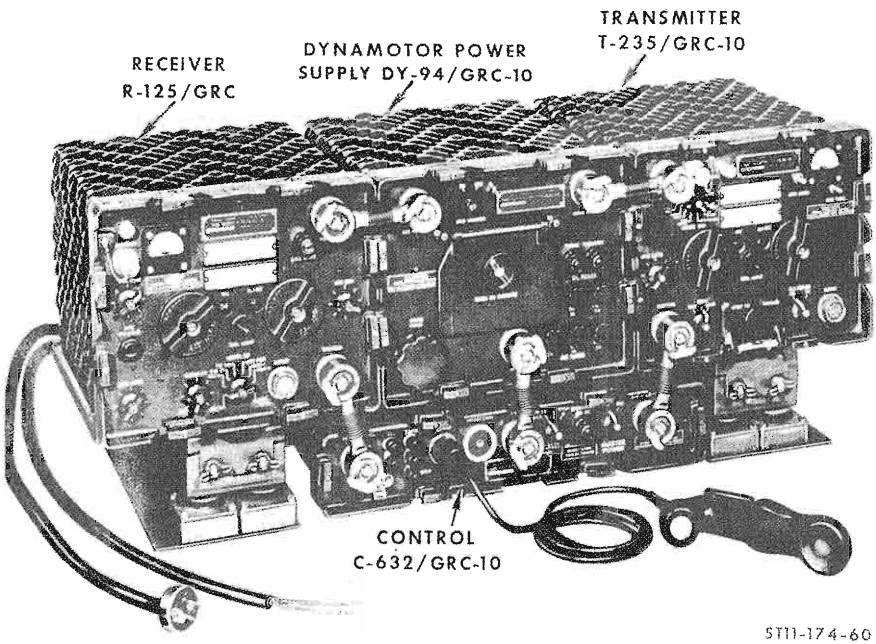
ER

CONFIGURATIONS

Radio Terminal Set AN/GRC-39: Two AN/GRC-10 sets (one in use, one spare).

Radio Repeater Set AN/GRC-40: Three AN/GRC-10 sets (two in use, one spare).

Mobile Radio Terminal Set AN/MRC-68(*): Three AN/GRC-10 sets (two in use, one spare), together with two Terminals, Telephone AN/TCC-3 and other major components mounted in Shelter, Electrical Equipment S-89/G on a 3/4-ton truck, with PU-322/G (page 91).



Radio Set AN/GRC-10.

The American VHF-AM Equipment Gallery:
Part 9, the Knight-Kit TR-108 2-Meter Transceiver

By Jim Riff, K7SC
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When the well known and common Gonsets came on the market in the 1950s, they established the standard for compact VHF transceivers. Soon to follow were other American kit builders, offering their competition to the mighty Gonsets. Established companies like Heath, Allied, Lafayette, and others, offered their equipment at lower prices owing to their "kit status," thus reducing their labor cost and the sales price to the user. Today, with the fast-growing interest in 2-meter AM activity here in the US, these old tubed "boatanchors" have become increasingly popular. The operation, maintenance, repair, and collection of these giants has become easy and fun. With the increased use of AM on the VHF bands, our ability to preserve this mode will hopefully be noted if any attempt is ever made to eliminate AM from our VHF- band plans.

In the late 1960s, Allied Radio Corporation, in Chicago, introduced their TR-108 into the Knight-Kit line. Priced well below the factory-built offerings from Gonset, Poly-Comm, Hallicrafters, and Clegg, the $119.95 price (**Figure 3**) was an instant success with hams. Although the chassis only featured 12 tubes versus up to 19 tubes in some of the competition, the performance was surprisingly good. Some interesting design ideas were incorporated into the TR-108, like high-level, Class-A, screen-and-plate modulation, and completely factory built-and- aligned front-end module, **Figure 2**. Missing from the design was not having a straight-through 2E26 final amplifier, which resulted in a low-power output of 6 watts, and no squelch control. Lacking the excessive shielding and bypassing of other rigs, the TR-108 was a much simpler radio to construct. Allied sold many of these in both the 6- meter and 2-meter versions. A companion VFO, model V-107, was offered as an accessory. While the competition offered built-in VFOs, Allied chose to keep the price low by offering the VFO as an extra-cost option. Included in the initial price was a unique, noise-canceling PTT microphone that sounded acceptable in on-the-air tests. The pleasing blue-and-

Figure 1: Front-Panel View of the Knight TR-108 2-Meter Transceiver

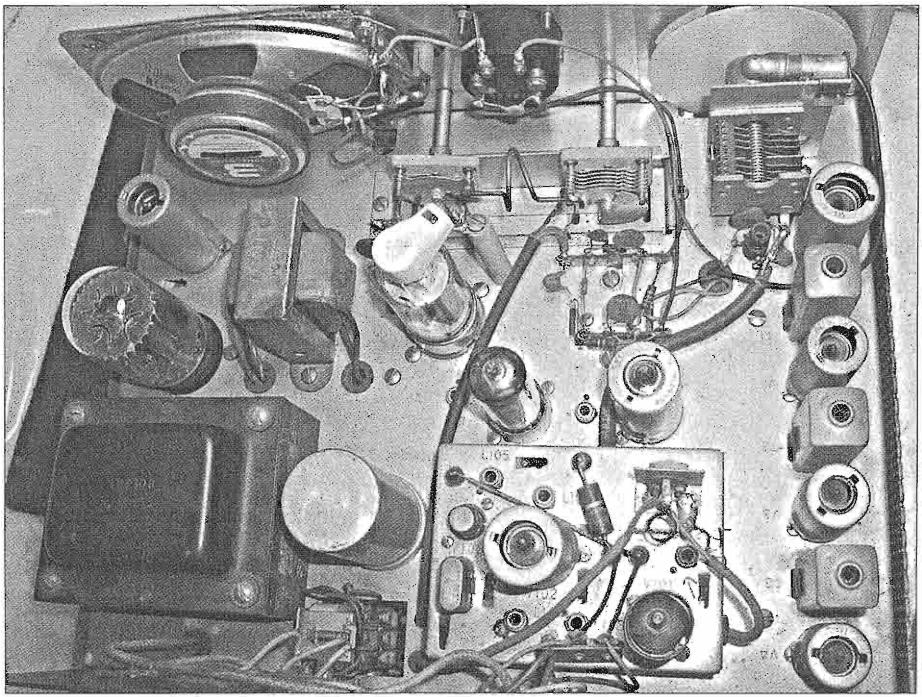

Figure 2: The TR-108 chassis view shows how VHF equipment was built at the time.

Knight-kit KITS AMATEUR GEAR

6- and 2-Meter Ham Transceiver Kit with Solid-State Power Supplies

YOUR CHOICE $119.95 Each $6 monthly

• Built-In Solid-State 110-130 VAC/12 VDC Power Supply
• Factory-Assembled and Aligned RF Mixer Stages
• Dual-Conversion Superhet Receiver has 0.5 μV Sensitivity

"... the signal sounded fine, and had no drift ... a few nights to build." 73 Magazine (TR-106)

"... puts out an excellent signal ... verified by your reviewer ... reports have been flattering." Popular Electronics (TR-108)

V-10T VFO Kit for 6 and 2 Meters $24.95 $5 monthly

VFO kit for use with 6- and 2-meter transceivers kits. Rise Clapp Oscillator circuit, carefully temperature compensated, for maximum stability. Voltage-regulator-stabilized DC supply for oscillator. Power is drawn from transceiver. Backlighted dial calibrated for 6 and 2 meters. Separate, effortless vernier tuning. Pilot switch and indicator light for standby operation. 50-54/143-148 MHz. With all parts, wire, solder, and step-by-step instructions. 6 lbs.
22 C 3461 X. $6 Monthly 24.95

TR-106 6-Meter Transceiver Kit. Performance-proven Knight-Kit meter transceiver is ideal for shack or mobile. Nuvistor RF and crystal-controlled mixer stages are factory-assembled and aligned for ... construction ease. Dual-conversion receiver section boasts 0.5 ... sensitivity. AVC action holds signal-level constant; provides blanking ANL rate ignition and pulse-type interference.

Efficient three-stage transmitter has doubler, tripler and amplifier through final amplifier. 15 watts input. Plate and screen modulation for low distortion and excellent linearity. Deluxe features include separate AF and RF gain controls; frequency spot switch; automatically switched, illuminated "S"/RF meter; vernier-drive tuning; illuminated dial; transmit indicator light. Front-panel jack for low-impedance headphones or external speaker. Built-in 6-meter antenna. Three front-panel crystal jacks. Rear panel VFO input. VFO power output. Pi-network output matches 50-90 ohm antenna. Standard 50-239 coaxial antenna connector. Built-in solid-state power supply for 110-130 V, 60 Hz AC and 12 VDC negative ground. With noise-quieting push-to-talk mike, metal case, detailed instructions. 50-54/143-147. Order crystals or VFO below.
22 C 3460 X. Shpg. wt., 22 lbs. $6 Monthly 119.9

TR-108 2-Meter Transceiver Kit. As above, but covers 144-148 MH... Has tube-type IF stage. Sensitivity, 1.0 μV.
22 C 3462 X. Shpg. wt., 22 lbs. $6 Monthly 119.9

TR-106 AND TR-108 SPECIFICATIONS

Receiver, Coverage: 6 meters, 50-52 MHz; 2 meters, 144-148 MH... Input Impedance: 50 ohms. Sensitivity: 0.5 μV for 6 meters, 1.0 ... for 2 meters. Selectivity: 6-kHz bandwidth at 6 dB down. Audio Output: More than 5 watts at 10% distortion. TRANSMITTER. RF Power Input: 15 watts nominal. Output Impedance: 50-90 ohms; pi-network coupling. Modulation: AM. Control plate and screen. Frequency Control: Fundamental-type 48 MHz crystals or VFO.

ACCESSORIES FOR TR-106 AND TR-108 TRANSCEIVER KI...
22 C 3140 X. Base for Desk-Top Use. Wt., 3 lbs. ..... 3...
17 C 9404 CS. 6-m Crystal. Specify 8125-8250 kHz. (÷ 5 MHz). 3 or 7...
17 C 9402 CS. 2-m Crystal. Specify 8000-8222 kHz. (÷ 3 MHz). 3 or 7...
22 C 3129 X. Mobile Mount. Wt., 2½ lbs. ..... 5...

496 ALLIED

See Facing Page for Complete 6- and 2-Meter Outfi...

Figure 3: TR-108 Allied Catalog Page

brushed aluminum front panel, **Figure 1**, was interesting and well laid out. As the market shifted to FM and solid-state designs, Allied discontinued these "boatanchors" in the early 1970s.

Pros: It has very good receiver sensitivity and stability, great-sounding receive and transmit audio using a single 6L6GC tube, and it has well calibrated and smooth reduction-receiver tuning.

Cons: No squelch control, although the hiss is not too bad. Low power out due to doubling in the single-2E26 final.

Specifications: 15-watts input, about 6-watts RF output. Receiver sensitivity 1μv, dual conversion, 8-kHz selectivity, uses 8-MHz crystals, 120 volt and 12 volt built-in power supplies.

Conclusion: The TR-108 is probably one of the best all-around values to test the 2-meter waters on the popular 144.450 MHz AM nets found in most large cities.

ER

Eric Wenaas' Radiola: The Golden Age of RCA: A Review

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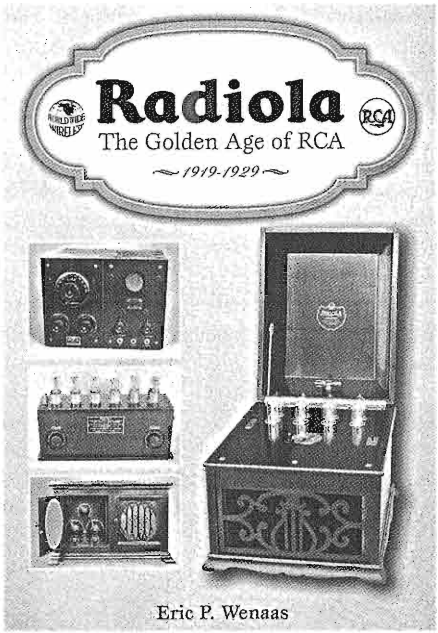
The Radio Corporation of America (RCA) was incorporated on October 17, 1919. The times were turbulent. The event straddled two momentous occasions: a year earlier armistice ended WWI, November 11, 1918; a year later KDKA transmitted the Harding/Cox presidential election returns on November 2, 1920, which hastened the onset of the broadcast era. RCA was brought into being at the behest of admirals in the United States Navy and Owen D. Young, a patriotic, vice-president and general counsel of General Electric (GE). The principals successfully terminated American Marconi's domination of transmitter sites and wireless communication facilities in the United States, absorbed its experienced personnel into RCA operations, and guaranteed American ownership of its resources. RCA was also established to distribute and market the products of a consortium of manufacturers, including GE, and importantly, authorized to cross-license patents among members of the consortium. Thereby, RCA was empowered to ensure that the products of the consortium reflected unrestrained technological expertise.

Radiola is the trade name that RCA assigned to virtually all the broadcast receivers and accessories that it marketed during the decade of the 1920s. Wenaas notes modestly that "there is still much to be discovered" about Radiolas. Certainly, historians are always motivated by the prospect of discovery, because historical analyses evolve from facts and new findings that lead to revised interpretations and insights. No historical work can ever be said to be complete. Nevertheless, in respect to the universe of Radiolas described in *Radiola*, author Eric Wenaas and editor/designer George Fathauer, Jr., Sonoran Publishing LLC, have partnered to create a book of social-historical significance. I doubt seriously that it will be superseded.

The sum of two creative efforts in the social sciences literally can be greater than each effort taken separately. The cliché is true in respect to *Radiola*. Since author and editor drew upon different backgrounds to generate their collective synthesis, their preparations for the task warrant comment at the outset of this review.

Eric Wenaas earned a Ph.D. in "Interdisciplinary Studies in Engineering," and he acquired the skills necessary for writing *Radiola* while writing as an engineer and as an administrator. Retiring from professional life in 2002, he focused on writing *Radiola*. He said that "every attempt has been made to locate and cite original documents...to ensure accuracy and minimize dependence on secondary sources" (p. vii). To this end, he made 18 trips to the Smithsonian Institute to research The George H. Clark Radioana Collection, invaluable to RCA historians. Consisting of over 500 boxes of records, Wenaas searched for Radiola information. He photographed more than 5000 documents and illustrations with a Nikon D70s SLR with 28-105 mm lens and a macro for close-ups. He used documents and photographs from other museums, e.g., the Museum & Suits-Bueche Planetarium, Schenectady, NY, the Antique Wireless Association (AWA) Electronic Communications



Museum, Bloomfield, NY, and the American Museum of Radio, Bellingham, WA.

Wenaas accessed 4000 pages of testimony from the Federal Trade Commission (FTC) hearings that pertained to RCA antitrust litigation; he examined contemporary literature, like RCA memos to distributors, RCA planning documents, RCA receiver instruction manuals, RCA and distributor catalogues, RCA and distributor price lists, and Radiola advertisements in newspapers and in radio, trade, and popular magazines. Finally, Wenaas reports that he acquired and/or observed first hand almost all of the radio apparatus marketed by RCA in the 1920s—as well as a number of prototype receivers.

The book is 475 pages in length; every page is printed on 70-pound, glossy, heavy stock, 8-½ by 11 inches, and the book weighs all of 4 lbs. Perhaps the most striking feature of the book is how text material occupies only 4-¾ inches of the outside margin of a page, whereas about 2-3/8 inches of the 3-¾ inches of the inside margin is reserved for illustrations and legends. Narrative text never encroaches upon the inside margin; however, relatively large illustrations often displace text.

Wenaas draws upon nearly 700 bright photos of apparatus, magazine advertisements, and promotional literature to reinforce visually his narratives. A reader's eyes are flooded with illustrations whenever the book is opened to any two opposing pages. Readers are thus attracted into perusing it in three ways: First, practically every reader, even those unfamiliar with Radiolas, upon opening the book will thumb through its pages irresistibly, simply mesmerized by beautiful art. Second, other readers, perhaps experienced Radiola collectors, will turn to Wenaas' tables of categorical data in his appendices to check the status of a receiver. Third, readers who are acquainted with amateur-radio history, initial broadcasting, and early RCA receivers will mine Wenaas' comprehensive text for additional perspective.

Commentary on Layout

Wenaas addresses subject matter in eleven chapters and nine appendices. All chapters conclude with a list of citations entitled "Endnotes (annotations) and References." Consecutive numbers that correspond to the citations appear as superscripts in the text. The first chapter reviews the history of the Marconi Wireless Telegraph Company of America. Wenaas argues that American Marconi's intractableness led relentlessly to the creation of RCA and its acquisition of Marconi's assets in the United States.

The second chapter examines the efforts of RCA to upgrade the transoceanic stations that it obtained from Marconi and to establish itself as a major player in worldwide communications. The third chapter deals mainly with (a) the struggles of RCA to dominate broadcast receiver marketing via cross-licensing patents with General Electric, Westinghouse, and other manufactur-

ers; (b) the receivers that Westinghouse manufactured for the public before it joined the RCA consortium, and (c) the receivers that Wireless Specialty Apparatus (WSA) manufactured for maritime services, like the IP-501, which were marketed eventually by RCA for the broadcast-listener market.

The next seven chapters, four through ten (pp. 127-358), appraise Radiolas and RCA accessories that between 1922 and mid-1930 were "mass produced for and marketed by RCA" (p. viii). These chapters, including chapter eleven, constitute "the main portion of the book" (p. viii), and they correspond chronologically to the selling seasons of RCA. A "Table of new Models" at the outset of each chapter orients readers to the receivers in the order in which they are introduced in the chapter. Chapter eleven assesses the role of RCA in repackaging Radiolas for radio/phonograph combinations of The Brunswick-Balke-Collender Company and The Victor Talking Machine Company.

Wenaas has inserted a section entitled "Afterwords" after the chapters and before the Appendices. Its heading in the Table of Contents is highlighted in italics. "Afterwords" describes how RCA emerged in the early 1930s as a holding company, and later, following litigation instigated by the FTC, how RCA itself became a manufacturing company that was independent of GE and Westinghouse.

The sixty-three pages of the nine Appendices (pp. 397-460) collectively present 17 different tables of concise information about Radiolas and RCA accessories. Casual readers may regard these data as superfluous, but serious collectors and historians will find them indispensable in pinpointing how RCA distinguished the attributes of its Radiolas.

Summary data are put forward in the first six Appendices, A-F. Appendix A is comprised of four different tables: (A-1) broadcast receivers RCA marketed between 1922 and 1929; (A-2) Radiola loudspeakers; (A-3) broadcast receiver accessories; (A-4) marine/wireless receivers RCA sold in the early 1920s. Appendix B includes four tables that list the vacuum tubes that RCA utilized in its Radiolas: (B-1) early battery sets before power amplifier tubes; (B-2) later battery and DC lighting–circuit sets with power amplifier tubes; (B-3) early AC lighting-circuit sets before AC-filament tubes; (B-4) later AC lighting–circuit sets with AC-filament tubes. Appendix C has two tables: (C-1) the dates on which Radiola receivers were both introduced and discontinued; (C-2) the dates when RCA lines first appeared in price lists, advertising, and radio shows.

Appendix D provides four tables of serial-number data: (D-1) Westinghouse, 1920-1923; (D-2) Radiola III, IIIA, and Balanced Amplifier (BA); (D-3) General Electric, 1924-25; and (D-4) Wireless Specialty Apparatus. Appendix E is divided into two tables that show the current relative availability of: (E-1) Radiola receivers; and (E-2) Radiola loudspeakers. Appendix E data may be extrapolated to constitute a crude but perhaps somewhat serviceable price guide. On the presumption that availability and dollar-value of receivers and accessories, respectively, are inversely correlated, decreases in availability should correlate with increases in dollar-value, and vice versa. Appendix F describes schema devised for RCA model designations.

Appendix G in Table G-1 lists graphic artists who created Radiola advertising in the 1920s. Appendix H sets forth the names of companies other than RCA that used the Radiola trade name in the United States and foreign countries. Finally, Appendix I denotes receivers of the Graybar Electric Company that used Radiola apparatus.

Two reference sections, entitled, respectively, "Books and Articles" and "Pe-

riodicals" follow the Appendices. The two are subsumed under the heading, "Selected Bibliography". My assumption is that the "Selected Bibliography" sections are included mainly to indicate suggestions for additional reading.

Finally, two useful indices follow the "Selected Bibliography". A "General Index" specifies pages in the text on which especially significant individuals and topics are discussed—many names of individuals cited in the text, however, are not included in the General Index. An "Index to Radios, Phonographs, and accessories by Model," is perhaps the most inclusive reference section in *Radiola*, and it is the resource that engrossed readers will frequent most often. This index notes the page number(s) on which receivers and accessories are identified in the book. And importantly, it lists in bold type the pages that correspond to titled subsections where 128 of the approximately 500 hundred receivers encompassed by *Radiola* are analyzed extensively.

Commentary on Manufacturing and Marketing Radiolas

Wenaas' views "the ten-year period from 1919 to 1929 as "The Golden Age of RCA." During this period "RCA changed it original mission from providing point-to-point communication services to a mission focused on broadcast radio in general and radio receivers and accessories in particular" (p. vii). The initial offerings of RCA in 1922 constituted an odd mixture of available receivers, since they were mainly products of GE and Westinghouse. Moreover, RCA was prohibited from cherry-picking the more marketable of them because its charter stipulated that RCA purchase 60% of its receivers from GE and WSA and 40% from Westinghouse. Shortly thereafter, however, RCA began to develop its own design requirements. A "RCA Research Department was tasked to test and evaluate all prospective designs from the three manufacturers, and select the models that would be offered by RCA" (p. 130). Four or five years later RCA had so standardized its specifications that two or more of its facilities could manufacture precisely the same receiver.

RCA adopted "Radiola" officially in 1922 as its principal trade name. A request for "Radiola" was filed with the U.S. patent office on October 29, 1921, and registration was obtained on March 27, 1922. A few small manufacturers, which had earlier identified their receivers as Radiolas, were caught off-guard when RCA co-opted the designation. One can imagine their chagrin when RCA forced them to desist from using it.

The RCA consortium had obtained the rights to most of the patents of significance in radio science at the beginning of the 1920s. No one objected particularly to the looming monopoly, since the domestic radio manufacturing industry had hardly any commercial significance during the period when the patents were accrued. As Morecroft (1922, p. 1), an editor of Radio Broadcast, described circumstances in the pre-broadcast era: "two years ago the only interpretation of the word 'receiver' would have been a man appointed by the courts to take over a bankrupt firm."

The advent of broadcasting, however, led consumers sometimes to trample each other in their rush to purchase receiving sets—5 million dollars worth in 1922; 15 million dollars worth in 1923, and an astonishing 100 million dollars worth in 1924 (MacLaurin, 1949, p. 139). The manufacturing facilities within the RCA consortium were swamped by the unprecedented demand, and often patent infringements escaped attention. Nevertheless, RCA aimed to rule the receiver manufacturing industry with a memorable iron fist. Hundreds of small, generally poorly-capitalized manufacturers arose only to be beaten into submission by its army of attorneys. Every radio manufacturer that RCA could ensnare

was forced to pay it a handsome royalty; meanwhile, RCA and its affluent consortium mass-produced Radiolas and advertised them with the slogan "There's a Radiola for Every Purse."

Wenaas regards the 1920s as a period "when Radiolas scored many firsts for receivers mass-produced in large quantities for the American public...selling hundreds of thousands...at popular prices ..." (p.vii). The "firsts" to which Wenaas refers are associated predominantly with superheterodyne receivers, advances in vacuum tubes, and development of light-socket or AC powered receivers. RCA was positioned advantageously in regard to the superheterodyne, because Westinghouse had acquired in 1920 patents for the regenerative and superheterodyne circuits. RCA licensed other manufacturers to produce regenerative receivers during the 1920s, but it refused to permit any manufacturer outside its consortium to produce the superior, superheterodyne receiver.

RCA thus marketed regenerative and tuned-radio-frequency receivers (TRF) along with dozens of companies. One-to three-tube regenerative, vacuum-tube receivers, which required batteries for their operation, at first flooded the broadcast-receiver marketplace. They were inexpensive, but they functioned like low-power transmitters. They raised so much havoc in urban neighborhoods that cries to outlaw them grew incessant. TRF receivers were battery operated, too—with five or six tubes they supplanted regenerative receivers in popularity in the early to mid-1920s. The vacuum tubes available then worked OK at audio frequencies, but oscillated when used as RF amplifiers.

Professor L.A. Hazeltine, of Stevens Institute of Technology, solved the problem by creating a method of "neutralizing" the offending tubes. He licensed only fourteen manufacturers to adopt his successful "neutrodyne" system. RCA attempted instead to conquer the problem of RF instability in its TRF receivers by reducing the sensitivity of their RF stages; in the process, it greatly degraded long-distance reception. The "neutrodyne" circuit appealed immensely to consumers before RCA had developed commercially its superheterodyne circuit. Threatened with losing a share of the market, RCA, in 1924, challenged in Court the manufacturers of neutrodyne sets. RCA eventually won the case in 1927, which required that the manufacturers obtain, in addition to the Hazeltine license, a license under RCA patents.

The performances of RCA TRF receivers had been only marginally successful in the late 1920s. Fortunes turned markedly for the better around April 30, 1929, after RCA introduced a screen-grid vacuum tube, the UY-224, which greatly increased stability.

General Electric and Westinghouse had been at the forefront of vacuum-tube research before the two manufacturing giants joined the RCA consortium. The early offerings of RCA utilized tubes that required batteries to supply power for both filaments and amplification. RCA, along with other manufacturers, therefore, was highly motivated to develop receivers for light-socket power and to develop tubes that would function effectively with AC filaments. Since RCA controlled the vacuum-tube patents, the industry looked to RCA to assume the initiative. RCA thus commissioned GE and Westinghouse early in 1926 to develop tubes with AC filaments. Westinghouse came up with the UX-226, useful as an amplifier of either radio- or audio-frequencies, the UY-227, a detector and general purpose tube, and the UX-171, a power amplifier tube. These tubes, including the UY-224 and others, inspired a host of new "light-socket" powered receivers, which stimulated an invigorating rise in consumer demand for TRF and superheterodyne receivers. The

revisions in circuit designs around 1928-29 in general heralded an evolutionary advance in radio science.

Wenaas particularizes the manufacture of Radiolas during the 1920s in meticulous, analytic detail, and one cannot help but admire his energy and persistence. Readers learn that Radiolas were regularly revised circuit-wise and modified cosmetically during production runs. One example is the Radiola III series. The Radiola III usually occupies a single listing without differentiation in a radio directory. Indeed, I had long assumed that RCA had marketed only one version of the Radiola III, but Wenaas has dispelled this misconception.

Wenaas supports his analysis of the Radiola III series via thirteen illustrations and two tables. His evidence (pp. 223-229) indicates that Westinghouse manufactured approximately 300,000 Radiola IIIs in four production runs over a 2 ½ year period, starting February 2, 1924. Each set was stamped with a serial number that corresponded to its production run, e.g., [in thousands]: (1) 40-52, (2) 200-299, (3) 400-499, and (4) 600-699.

Commentary on the Role of David Sarnoff

Radio historians agree uniformly that the professional growth of David Sarnoff and the rise of RCA to prominence are linked inextricably. Indeed, Sarnoff, by all accounts, was in general one of the more prominent personages in the twentieth century to have contributed to the field of radio development and was in particular the most important individual in RCA development. Wenaas acknowledges these probabilities for the first time in the "Afterwords" section of *Radiola*: he portrays Sarnoff's crucial presence within the hierarchy of RCA leadership as he details a series of episodes from which RCA enhances its national significance.

The time frame of "Afterwords" extends from about 1927 to 1932. RCA had transformed itself from a company dealing with transoceanic and marine communication services with revenues of around $2 million in 1920 to marketing radio broadcast equipment worth about $182 million in 1929. Major restructuring of RCA was long overdue. Accordingly, David Sarnoff headed a committee in 1927 to explore the feasibility of consolidating engineering and manufacturing in one location. Sarnoff subsequently arranged to purchase the Victor Talking Machine Company, in whose factory RCA could center its manufacturing activities.

Unfortunately, the carefully crafted restructuring survived only until May 13, 1930 when the Justice Department filed an antitrust suit against RCA, naming RCA, GE, Westinghouse, AT&T and others as co-defendants.

Legal proceedings advanced cautiously until November 21, 1932, when deliberations metamorphosed RCA into an independent manufacturing company.

Sarnoff's name surfaced previously in *Radiola*, very briefly, in only four contexts: a prediction about revenue to be derived from "music boxes" (radios) should broadcasting become reality; an order to cancel the 1924 Radiola line in favor of the superheterodyne receiver, a critique of a Radiola cabinet; and a dispute with the Victor Talking Machine Company. So few, fleeting allusions to Sarnoff in the main portion of *Radiola* are surprising.

David Sarnoff had been a "boy wonder" in the growth of American Marconi. Within a period of only thirteen years—until RCA absorbed the assets of American Marconi—his status in the company elevated from filing clerk to junior-wireless operator, to chief-telegraph operator, to chief inspector of ship-radio equipment, to assistant chief engineer, and finally, to Commercial Manager.

Yet, when Wenaas lists (p. 29) the names of the principals in America Mar-

coni who "became the core of the new RCA management", Sarnoff's name is not included among them. However, in citing correspondence dated about six months after the birth of RCA, Wenaas (p. 114) observes that Sarnoff was the Commercial Manager of RCA—he was occupying the same upper-management position that he once held at American Marconi. A year later, April 29, 1921, Sarnoff was appointed General Manager of RCA. Moreover, he had realized prior to the KDKA broadcast that enormous possibilities for profits resided in entertainment broadcasting, and he had urged his superiors to make RCA a leader in this field. The RCA Board of Directors eventually concurred, and Chairman Young, January 1, 1923, replaced the existing President of RCA, who had been inherited from American Marconi, with a former Army General in a move to strengthen relations between RCA and the government. Simultaneously, David Sarnoff, 31 years of age, was made Executive Vice President of RCA.

The substance of Wenaas' few references to Sarnoff's responsibilities in chapters four to eleven is consonant with the view that Sarnoff was personally involved in RCA day-to-day operations. It is likely that in fact he macro-managed the styling, design, manufacture, and marketing of Radiolas throughout the 1920s. Consequently, while reading Wenaas' history of Radiolas, the proverbial expression about an elephant being in the room came to mind. He was not talked about, but his footprints were everywhere.

Why did Wenaas not provide opportunity for readers to empathize more fully with tribulations in the professional life of David Sarnoff? And why did he not provide readers with more than a glimpse at the roles in RCA history of such luminaries as: Guglielmo Marconi, who had demonstrated late in 1901 that wireless signals could transcend the horizon and who had acquired a mindset to dominate commercially viable, world-wide communications; Owen D. Young, who negotiated the formation of RCA and the demise of American Marconi; and Dr. Alfred Goldsmith, who headed the RCA Research Laboratory and who exercised—at least partially— life or death judgment over whether Sarnoff ordered his manufacturers to put a given Radiola into production?

Surely the George H. Clark Radioana Collection is loaded with references to pioneers who were influential in the development of RCA. My hunch is that specific references to David Sarnoff's personal investment in the affairs of RCA materialize frequently on the pages of the Radioana Collection. On the one hand, maybe Wenaas deliberately sanitized his treatment of personalities in *Radiola* to focus readers' attention solely on apparatus? My sense, however, is that he would have enlivened his narratives had he also given weight to the roles of the principals who were responsible in general for the creation of RCA and in particular for the production of Radiolas. On the other hand, perhaps Wenaas is accumulating data for a sequel that will shed light more thoroughly than has anyone so far on the contributions of David Sarnoff and others to RCA development. I hope that this scenario eventually plays out.

References

MacLaurin, W. P. (1949). Invention & Innovation in the Radio Industry. New York: Macmillan Co., 1-304.

Morecroft, J. M. (1923, May), The March of Radio. Radio Broadcast, 2, p. 356.

[Radiola is available from the Electric Radio bookstore, see page 62... Ed.]

ER

Bandwidth-Based Coordination Scheme Again Stings ARRL

By Paul Courson, WA3VJB
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The International Amateur Radio Union (IARU), in January, will implement a bandwidth-based bandplan for Amateur licensees in the region that includes the United States, and the IARU wants delegates to try to get the voluntary scheme adopted as country law.

The international plan contains certain elements and rationale of proposals from the ARRL, a delegate to the IARU, that have already failed domestically, prompting criticism that the group has tried to use an international venue for an "end run" around U.S. opposition to its agenda.

Most HF operators using SSB may not support the IARU plan. Vague measurement standards mean they will be unable to check whether they comply with the specified phone bandwidth of 2.7 kHz. That suggested bandwidth also means AM operators are nearly completely shut out from being able to support the plan.

ARRL Declines To Reveal Planning

The ARRL, the club that has been allowed to represent all U.S. licensees at the IARU, surprised many, including the FCC, about the heavy role the League played in crafting the international plan, since the group had not sought public input and affirmation for positions it would take in September when multinational delegates gathered for the IARU's conference in Brazil.

The apparent secrecy is the topic of a December 2007 CQ Magazine article by Editor Rich Moseson (W2VU), who wrote in part that it is "unfortunate that there was no opportunity for the general ham public to discuss or debate any of this before the new plan was adopted. The nameplate on the door may say IARU, but the door itself is in Newington, and change comes very slowly in Newington. The secret society is alive and well."

League Signs On, But Claims It Will Not Push the Plan

Despite endorsing the IARU plan it helped create, League officials say they have no plans to comply with it, and asserted that U.S. licensees may do the same. These officials were unable to answer questions from active, concerned American hams who want an IARU plan they can support. The ARRL also failed to specify which, if any, Region 2 countries may benefit from the IARU plan, and the motive to implement it is not clear.

Nearly two months after questions first were raised; ARRL executive Dave Sumner denied that his group is behind the enumerated bandwidth in the Region 2 plan, claiming the figures come from the International Telecommunications Union.

"For analog modes, necessary bandwidth is defined as 2700 Hz for voice SSB and 6000 Hz for voice DSB," Sumner wrote, "That's an ITU recommendation and did not originate with the ARRL."

Sumner did not cite the context and intent of the figures he attributes to the ITU in his response to deep concerns expressed by a longtime subscriber to the ARRL, Al Feder (W1UX).

The reference from Sumner could not be found in an advanced search of the ITU website.

Steve Johnston (WD8DAS) wrote "I am a longtime member of the ARRL, and my respectful and gently-expressed opinions on the bandplan have been ignored, insulted, attacked, scorned, belittled, and pooh-poohed."

Particularly egregious was a patronizing email sent to a large group by the ARRL's George R. Isely (W9GIG), the elected Central Division Director. He

was responding to concerns expressed by active U.S. licensees in their letters to him and other IARU and ARRL officials.

"The current mini-uproar is the result of a very few ignorant people with issues making postings to various un-moderated Internet email reflectors," Isley said, in part. He later apologized to Johnston, but did not issue a revised notice to his constituents.

ARRL President Joel Harrison, stepping up to respond to complaints, said "I don't believe good operating practice should be mandated by regulation." Harrison apparently disagrees with FCC §97.101, which states in part "each amateur station must be operated in accordance with good engineering and good amateur practice."

Given his suggestion the U.S. can ignore the IARU plan, Harrison did not address why his club did not formally ask to be excused from the international body's call to now pitch the plan to U.S. and other regulators.

League Stuck On Recurring Theme

The FCC, nearly 10 years ago, rejected an ARRL request (RM-9259) to make it a federal violation to not comply with voluntary band plans like the one taking effect in January. The League recently was also forced, after massive opposition, to withdraw a Petition for Rule Making (RM-11306) that proposed a scheme of bandwidth-based segregation similar to the IARU plan now at hand.

CQ Editor Moseson, in his editorial, said "The ARRL's original petition to the FCC called for the bandwidth on the current phone bands to be 3.5 kHz; its revised plan dropped that (without explanation) to 3 kHz; and now the maximum bandwidth for SSB in the IARU band plan is 2.7 kHz. It's the incredible shrinking sideband signal..."

The FCC, in November, 2004 rejected a Petition (RM-10740) to establish most HF amateur Phone bandwidth at 2.8 kHz, declaring that the proposal was not needed and was "inconsistent" with the Commission's goal of promoting experimentation.

Despite the FCC's stance on band plans, its opposition to enumerated bandwidth constraints, and clearly-stated support among American hams for the long-standing system of mode-based coordination, the ARRL did not refute the IARU suggestion that Region 2 clubs should work with authorities to "incorporate it in their regulations and promote it widely with their radio amateur communities," as stated in the introduction to the plan.

FCC officials familiar with the matter say they were surprised as calls came in. They had not been approached by the League at any point regarding the IARU plan as of late November. Harrison, the League president, said there are no plans to do so, but in the group's published accounts the League has left open the possibility it may revisit its threat to ask the FCC to impose a bandwidth-based coordination scheme in the future.

AM's Leadership Overlooked

A recent ARRL Board of Directors' survey of subscribers found nearly 20 percent listing AM among their HF activities. The poll was designed to help the Board direct the paid staff in Newington, and it drew nearly 3000 responses in the Great Lakes, Atlantic, and Delta divisions. The results have not been widely published, and do not appear on the League's website, which is run by paid staff.

In a letter of concern sent to a list of IARU officials from the 1900-strong AM enthusiast website *http://amfone.net* it was noted that "AMers have a long and successful leadership role in coordinating our operations to minimize friction with incompatible modes and activities. The Region 2 plan fails to acknowledge this leadership as it imposes a bandwidth specification that would be impossible for us to meet."

The ARRL's chief delegate at the IARU talks in Brazil was Paul Rinaldo who has not responded to repeated requests to publicly detail what went on. His boss,

Sumner, did not dispute that Rinaldo offered the strict ITU numbers as the plan moved along.

Broad Opposition Expressed

As details came out that the approved IARU plan contained specific bandwidth limitations that do not support AM and typical SSB operations, ARRL and IARU officials faced outcry from U.S. licensees, many of whom had publicly registered their opposition in the earlier FCC proceeding against the League with a margin of at least six-to-one.

The 900-member Society for the Preservation of Amateur Radio (SPAR) sent a letter of concern to a variety of IARU officials about the imminent band plan. It read, in part, "SPAR is concerned that the inclusion of an explicit bandwidth limit in a voluntary bandplan is counter to the wishes of most amateurs, as evidenced by the recent outcry against the ARRL's proposal to the FCC. It should be noted that bandwidth limits were soundly rejected by an overwhelming majority of the commentaries and the ARRL petition was subsequently withdrawn. Without the means to make bandwidth measurements, the mention of a specific bandwidth limit adds nothing to the bandplan."

Basis of Plan a Mystery

There is no known public input as part of the IARU plan. Harrison, who admitted he was not part of the Brazil deliberations, has said in public correspondence that the League's elected Board of Directors would have developed a policy that the U.S. delegation would then bring to the IARU regional planning table. But despite repeated requests, Harrison and other League officials have declined to provide details of this reputed advance planning.

John Fitzsimmons (W3JN) is alarmed by the ARRL's insistence that the Region 2 plan simply builds on a template established in Region 1. "I think the suspicion is that once all of these bandplans line up, the goal of the ARRL is perhaps to lobby the ITU to institutionalize them at the next ITU WRC. Once so accepted by the US they would have the effect of being a treaty," he wrote.

Rinaldo met with ITU officials in late November about the planning process, according to IARU president Larry Price, who said no decisions were made at the meeting in Geneva. Price was League president in the 1980s when Rinaldo was editor of the ARRL Handbook.

Non-U.S. Delegates Try To Fix Plan

As the ARRL prepared to resist any changes in the plan, IARU Delegates from Mexico and Canada were among those indicating they were dismayed as licensees began to contact them.

Canada's IARU Region 2 representative, Daniel Lamoureux (VE2KA), offered an abject apology about the bandwidth specifications when he was told the history of the ARRL scheme, and he immediately volunteered to help implement revisions to win wider support for the latest IARU plan, which replaces a version that does not specify bandwidth.

"We are here to help you," he said, "tell me how we can rework it." A second version was soon published on the IARU website that contained additional footnotes acknowledging a few established areas where a 2.7 kHz bandwidth should not apply. Abandoning altogether the ill-advised bandwidth specifications was considered beyond the scope of making simple revisions to the approved plan.

Mexico's IARU Region 2 delegate, Ramon Santoyo (XE1KK), when asked how the bandwidth enumeration came about, said "that was from Paul Rinaldo. He said Rinaldo was concerned "that some people are running wider than that." Santoyo did not recall that the ARRL delegate made any reference to a specific mode or activity, and said Rinaldo presented no supporting evidence of a problem.

Fingerprints From the Past

Rinaldo, 76, for now is the League's technology lobbyist, and is widely seen as the chief proponent within the ARRL of the failed bandwidth petition the League had submitted to the FCC. Dur-

ing the drafting of that petition several years ago, Rinaldo, according to an ARRL board member, seemed impatient that the Board did not immediately see what he felt were the merits of such a plan. The board member said Rinaldo then conducted a strident discussion that eventually let to the Board's vote to move ahead with the ill-fated petition.

Most recently, there has been no public documentation to support Rinaldo's basis and political authority to propose the 2.7 kHz bandwidth overlay as appropriate in the IARU plan.

Among those questioning the plan's very specific constraint, Phil Galasso (K2PG) wrote "How is this 2700 Hz "maximum bandwidth" specification defined? Is it at the 6 dB points, the 26 dB points, or at some other arbitrary figure? There is nothing in the bandplan to explain this." His question, shared by many, has not been answered for those hoping to support the IARU's effort to coordinate modes and activities.

League officials later said Santoyo's comments attributing the bandwidth number to Rinaldo were "misrepresented," but there has been no disclosure of Rinaldo's specific remarks for consideration that could clarify.

Reached again, Santoyo said he now has been asked to defer questions from U.S. licensees to the ARRL. Canada's representative and other Region 2 delegates also have deflected to the ARRL any U.S. questions and requests to improve the plan.

One request, not met, is from Don Chester (K4KYV), who wrote "The revised IARU Region 2 can be made acceptable by making two minor changes" before it is implemented. He asked "that all references to occupied bandwidth be deleted," and also called for voice transmission to be referred to simply as "phone."

Others have suggested replacing hard numbers with generalized references to bandwidth that describe a signal's footprint such as "wide," "medium" and "narrow," to effectively provide the same suggested guidance on signal placement.

Other Players on the Sidelines

IARU and ARRL executive Dave Sumner said he was not involved in the Region 2 process. Price, the onetime ARRL president, said he was not involved in the Region 2 deliberations, and that it will be his judgment as IARU president whether to take action if he concludes there has been poor handling of the Region 2 matter.

Price , Sumner and Rinaldo are among the IARU delegates from the U.S. who represent amateur interests at the ITU, which Sumner now cites as the source for the bandwidth limitations in the Region 2 plan.

ARRL Dismisses Lost Support

In response to concerns about the latest attempt to use bandwidth to coordinate operating activities, League officials have avoided addressing the lost support from American hams unhappy about the Region 2 plan. The ARRL instead has emphasized U.S. operators are not required to comply with the IARU band plan.

FCC Enforcement Counsel Riley Hollingsworth, when asked to comment on the potential harm to AM activity from the IARU band plan, said FCC officials "have been assured by the ARRL, the U.S. representative to the IARU, that these operators have nothing to worry about."

Reinaldo Leandro (YV5AMH), the head of the IARU Region 2 executive committee, indicates the plan will not be repaired before January's implementation. "Any concerns regarding the band plan should be addressed to your own IARU Member Society which is the American Radio Relay League. The American Radio Relay League can then address any concerns at the next regional triennial conference in 2010," Leandro wrote.

The IARU Bandplan is on the Internet. See http://www.iaru-r2.org/wp-content/uploads/region-2-mf-hf-bandplan-e.pdf *ER*

VINTAGE NETS

AM Carrier Net: Sunday mornings, 8:30AM local Eastern time, 3835 kc. QSX W2DAP. Friendly format.

Arizona AM Nets: Sat & Sun: 160M 1885 kc @ sunrise. 75M 3855 kc @ 6 AM MST. 40M 7293 kc 10 AM MST. 6M 50.4 Mc Sat 8PM MST. Tuesday: 2M 144.45 7:30 PM MST.

Boatanchors CW Group: QNI "CQ BA or CQ GB" 3546.5, 7050, 7147, 10120, 14050 kc. Check 80M winter nights, 40 summer nights, 20 and 30 meters day. Informal nightly net about 0200-0400Z.

California Early Bird Net: Sat. mornings @ 8 AM PST on 3870 kc.

California Vintage SSB Net: Sun. mornings @ 8AM PST on 3860 +/-

Colorado Morning Net: Informal AMers on 3875 kc daily @ 6:00 to 6:15 AM, MT. QSX KØOJ

Canadian Boatanchor Net: Daily 3725 kc (+/-) @ 8:00 PM ET. Hosts are AL (VE3AJM) and Ken (VE3MAW)

Collins Collectors Association (CCA) Nets: Sunday, 14.263 Mc @ 2000Z. Informal ragchew net Tue. evening, 3805 kc @ 2100 ET, Thu. 3875 kc. West Coast 75M net, 3895 kc 2000 PT. 10M AM net 1800Z, 29.05 Mc Sunday, QSX 1700Z. CCA First Wednesday AM Night each month, 3880 kc starting @ 2000 CST, or 0200 UTC.

Drake Technical Net: Meets Sun. on 7238 kc, 2000Z. Hosted by John (KB9AT), Jeff (WA8SAJ), and Mark (WBØIQK).

Drake Users Net: Check 3865 kc, Tue. nights @ 8 PM ET. QSX Gary (KG4D), Don (W8NS), and Dan (WA4SDE)

DX-60 Net: Meets on 3880 Kc @ 0800 AM, ET on Sun. QSX op is Mike (N8ECR), with alternates. The net is all about classic entry-level AM rigs like the Heath DX-60.

Eastern AM Swap Net: Thu. evenings on 3885 kc @ 7:30 PM ET. Net is for exchange of AM related equipment only.

Eastcoast Military Net: Sat. mornings starting 0500, 3885 kc +/- QRM. QSX Ted, W3PWW. It isn't necessary to check in with military gear, but that is what this net is all about. Late checkins are welcome.

Florida AM Group: A large group meeting every Sunday, 7:30AM ET, 3875 kc and pre-net checkin 7:00AM ET, 3675 kc. QSX Maury, N4GUI. Also, Florida vintage SSB net "AFLAC" meets Wed., 3910 kc, 9PM ET. QSX Warren, W1GUD.

Fort Wayne Area 6-Meter AM net: Meets nightly @ 7 PM ET on 50.58 Mc. Another long-time net, meeting since the late '50s. Most members use vintage or homebrew gear.

Gulf Coast Mullet Society: Thu. @ 6PM CT, 3885 kc, QSX control op W4GCN in Pensacola.

Gray Hair Net: One of the oldest nets, @44+ years ,160 meter AM Tue. evening 1945 kc @8:00 PM EST and 8:30 EDT. Also check www.hamelectronics.com/ghn

Heathkit Net: Sun. on 14.293 Mc 2030Z right after the Vintage SSB net. QSX op W6LRG, Don.

K1JCL 6-meter AM repeater: Operates 50.4 Mc in, 50.4 Mc out. Repeater QTH is Connecticut.

K6HQI Memorial 20 Meter Net: Flagship AM net 14.286 Mc daily for 25+ years. Check 5:00 PM Pacific Time.

Lake Erie Boatanchor CW Net: Saturday morning, 1 PM ET, 7094 kc QSX op Steve (WA3JJT) or Ron (W8KYD).

Midwest Classic Radio Net: Sat. morning 3885 kc @ 7:30 AM, CT. Only AM checkins. Swap/sale, hamfest info, tech. help are frequent topics. QSX op is Rob (WA9ZTY).

Mighty Elmac Net: Wed. nights @8PM ET (not the first Wed., reserved for CCA AM Net), 3880 +5 kc. Closes for a few summer months. QSX op N8ECR.

MOKAM AM'ers: 1500Z Mon. thru Fri. on 3885 kc. A ragchew net open to all interested in old equipment.

Northwest AM Net: AM daily 3870 kc 3PM-5PM winter, 5-7 PM summer, local. 6M @50.4 Mc. Sun., Wed. @8:00 PM. 2M Tues. and Thurs. @ 8:00 PM on 144.4 Mc.

Nostalgia/Hi-Fi Net: Started in 1978, this net meets Fri. @7 PM PT, 1930 kc.

Old Buzzards Net: Daily @10 AM ET, 3945 kc in the New England area. QSX op George (W1GAC) and Paul (W1ECO).

Southeast AM Radio Club: Tue. evening swap, 3885 @7:30 ET/6:30 CT. QSX op Andy (WA4KCY), Sam (KF4TXQ), Wayne (WB4WB). SAMRC also for Sun. Morning Coffee Club Net, 3885 @ 7:30 ET, 6:30 CT.

Southern Calif. Sun. Morning 6 Meter AM Net: 10 AM on 50.4 Mc. QSX op is Will (AA6DD).

Swan Nets: User Net Sun 2200z winter 14.250Mc+/-QRM. QSX op rotates: Steven (KB7BGS), Jay (WB6MWL), Bill (W4WHW), Ed (N4KNO). Tech Nets: Wed 2300z 14.251Mc / Sat 1900z 7.235Mc QSX op Stu (K4BOV), Steven (KB7BGS).

Vintage SSB Net: Sun. 1900Z-2000Z 14.293 & 0300Z Wed. QSX op Lynn (K5LYN) and Andy (WBØSNF)

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Brian (NI6Q), Skip (K6LGL), Don (W6BCN), or Vic (KF6RIP)

Westcoast Military Radio Collectors Net: Meets Sat. @ 2130 Pacific Time on 3980 kc +/- QRM. QSX W7QHO.

Wireless Set No. 19 Net: Meets second Sun., monthly, 7270 kc (+/- 25 Kc) @ 1800Z. Alternate 3760 kc, +/- 25 kc. QSX Dave (VA3ORP).

CLASSIFIEDS

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Deadline for the Jan. 2008 issue: Thursday, Dec. 27!

SERVICE FOR SALE: Repair and restoration on all vintage equipment; over 50 years of experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. 303-770-5314

MANUALS FOR SALE: Military Radio manuals, orig. & reprints. List for address label & $1.50. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, wa5cab@cs.com

SERVICE FOR SALE: JOHNSON "TURBO" RANGER, Valiant, Viking 500, Viking II, includes panel and cabinet refinish. Hammarlund 180(A), National 300, 303, R390(A). http://w4pnt.8k.com Patty & Dee's Marina: 534 W. Main St. Waynesboro, VA. 22980 w4pnt@highspeedlink.net 540-249-3161 Cell: 540-480-7179

FOR SALE: R-390A $700. BC-375 TU-10B tuning unit $30. Pix & details avail. Walt, N4GL, sjotrollet@yahoo.com

FOR SALE or TRADE: Prewar items! Collins 4A, 32F, 45A, 30FXC; National SW-3 and "Pearl Button" HRO packages; more. Hammarlund HQ-180C (s/n 1457) & matching speaker, excellent, $600. Gary, 209-286-0931 or k6glh@volcano.net

FOR SALE: Rare NIB WE & Tung-Sol 717A vacuum tubes. Gary Peterson, KØCX, 605-343-6739 evenings, kzerocx@rap.midco.net

FOR SALE: T-195A transmitter, w/ meters & manuals. $300 + shpping. Doug, dwheeler@sti.net 559-683-0530

FOR SALE: HQ145, near mint condition with manual $250 + $50 for shipping as it will need to be triple boxed. Herman Gibbs, KD8PD, Wooster, OH 330-263-2212, leave message.

FOR SALE: G66B, AF67, G76, HQ170, GRR5, PMR6A, PSR6, 75S1, 32S1. All look/work good. W7HDL, 167 Highway 93 South, Salmon, Idaho 83467 208-756-4147, gbabits@salmoninternet.com

FOR SALE OR TRADE: Nice WW I Signal Corp Gear, all working: BC 104 Heterodyne Tuner/Oscillator, uses O1A; BC 138 Antenna Tuner; BC 118 four stage tuned RF, two stage AF Amp, uses six VT 5's, tubes included; National 1-10A, all coils! Extra acorn tubes. Hammarlund USN RBG, version of HQ 140, exc. cosmetics & works fine—when it wants to (intermittent); Collins MBF Transceiver, nice; BC 312N, nice; British 1154 Lancaster Bomber Transmitter, very nice; 1155 Receiver, super clean, good as you'll find; RCA Coin-op from 40's, very nice & working, no coin-op. CONSIDER CASH, PREFER TRADE FOR: National RAS Coils for RAS type receivers, look like black HRO, but 175 kc IF; two volt/six volt doghouse/rack Power Supplies for HRO; SW3/5 Coil Sets; Accessories for ART-13 & DY 17 Dynamotor; TU-5, TU-6 Tuning Units for BC 375. ALWAYS BUYING: Vintage mics; Stands; Tube Compressors; Mic Pre's, etc., Broadcast Recording type Gear. Ward Kremer, KI4JHA, 57262 Poppy Rd., South Bend, IN 466189, Ph/Fax: 574-204-2877, E-mail: witzend99@comcast.net, website: http://www.radioattic.com/kremer.

FOR SALE: Collection of over 35 lbs quartz crystals: FT243, CR1A, DC11, AR3, FT171 plus many others. $60. Bill Ford, 23 George St. N., Smiths Falls, ON Canada K7A 1Y3 613-284-0700

FOR SALE: Precision 10-60 tube checker. Very nice and clean. Includes many solid state devices, as well as every base tube. $65. JeRB K8WPI, 269-226-8873, Oldbugger@copper.net

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FOR SALE: Have 5 Racal 6778C radios available as a lot for $3500. Afraid must be pickup only. Bill Ford, 23 George St. N., Smiths Falls, ON Canada K7A 1Y3 613-284-0700

FOR SALE: Clegg Venus, AC supply, works, rec great, 45W output. Average condx. Clegg 6M amp, works, needs new finals, $300, VGC. SS Booster, probably not working $10. Prices FOB Houston. Guaranteed. Don, K5AAD. 713-942-9747

FOR SALE: Collins KWM2A (WE) with Collins blanker $800. Collins 516F2 Power Supply (RE) $150. Pickup preferred. Shipping extra. Harry, WA6IUR, flynham@aol.com, 626-355-0290.

FOR SALE: V70D tubes (mfg United) and Taylor TZ40 tubes Cliff, WA9SUE. wa9sue@mwt.net or 608-625-4527

FOR SALE: RCA BTA500MX, mid 1950s broadcast transmitter. Good condition. Complete with some spares. $500. John Tiedeck, 610-574-0423. jtiedeck@aol.com

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FOR SALE: Collins KWM2, RE, aftermarket fan kit installed, $500. Winged KWM2A, new bezel (old one cracked), looks rough, $500. Both work, w/books. Prices FOB Houston. Guaranteed. Don, K5AAD. 713-942-9747

FOR SALE: Collins MM2, $300. 30L-1, RE, $500 each. Work great, not "10." W/manuals. 399C-1, perfect, call. Prices FOB Houston. Guaranteed. Don, K5AAD. 713-942-9747

FOR SALE: Attention Builders: Excess stock of very nice hard-to-find parts for those who build nice projects. Everything from alligator clips to Z chokes. Many specialty hardware items, meters, transformers, variable caps, filiment chokes. Exotic stuff. Tell me what you are building and what you need. JeRB K8WPI, 269-226-8873, Oldbugger@copper.net

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FOR SALE: Transmitting and Receiving Tubes: 68 different types. Some new, some old, most boxed, and all tested and guaranteed. Large SASE or email for list with prices. D. Sowers, K4SUE, 5197 Burnt Quarter Dr, Vinton, VA 24179 d.sowers2@cox.net

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FOR SALE: Little Lulu transmitter, $250 + shpg, call for details. Central Electronics MM-2 monitor, $100 + shpg, call for details. Heathkit SB-104A, pwr sply/speaker, remote VFO, monitor scope, call for

details. Charles Croatman, K4ZKS, 941-747-2082, k4zks@tampabay.rr.com

COLLINS OWNERS: Solid state lamp replacements for all S-line equipment. Don, N9OO, web: http://home.wi.rr.com/n9oo/products/ or phone 262-654-0072.

FOR SALE: B&W 5100A. Central Electronics 200V. Johnson Ranger. Johnson Viking II. Hammarlund SP600 with original case. Drake B Line. All are working and are very good to excellent condition. Local pickup in Sacramento preferred/will ship, Frank, KBOW/6, 916-635-4442fdellechaie@sbcglobal.net

FOR SALE: Antique Plastic Radio Dial Covers! No waiting, Quick turnaround. 1200 molds in stock. West Tech Services 570 Hazelgreen Rd. Smithville, WV 26178. 304-349-2149. Email: westtechservices@yahoo.com or Website: www.west-techservices.com. **$15 ppd.** Thanks, Gib & Linda

MANUALS FOR SALE FOR YOU: Drawers full of vintage manuals, call me on 828-298-1847 for quality reproductions or email me at olg77tr@bellsouth.net. Web: www.w4qcfmanuals.com. I'm John, W4QCF, 66 Willowbrook Rd., Asheville, NC 28805. Licensed 1949.

FOR SALE: New Collins handles for transmitters 32V, KWS-1, KW-1. Replace those beat up and gouged front panel handles on your Collins A-line gear! Handles are finished in high gloss epoxy. Uses existing screws. $20 each. Include $37.50 per pair for priority mail shipping. Please order via EMAIL: w3hm@frontiernet.net or by phone, 304-876-6483, or by regular mail with money order to: W3HM Radio Labs, 570 Acorn Circle, Harpers Ferry, WV 25425

FOR SALE: 50 year collection of radios and parts, PU local in W. NY Buffalo area. QSTs Cheap, 1924 to 1990! Rudy, W2ZIA, 716-937-9279

WANTED: 23 channel CB radios, Johnson 323, Sonar J23 and others. Base or mobile. Ed, WA7DAX, 1649 E. Stratford Ave., Salt Lake City, UT 84106. 801-484-5853

SERVICE FOR SALE: Quality repair of your vintage radios. Work is guaranteed. Check website for info: www.westonelectronics.com Jim Weston, K4COD, PO Box 294, Concord, GA 30206, 770-884-3202

FOR SALE: Hammarlund clock reproductions, 12 hour (easier to read) or 24 hour, specify, $35 each, shipped. Rob Hummel, WA9ZTY, 202 Midvale Dr, Marshall WI, 53559-9616

FOR SALE Sprague Orange Drop capacitors New/NOS. Many values/voltages. 50% off retail. Mix or match values. eMail for complete list. gg136@aol.com

FOR SALE: KWM-2 CDs. All original material, not a copy of the manual. High resolution color pictures which will really help locate parts, plus much more. For more information visit my web page at http://www.heavymetalradios.com/ or E-Mail me at boatanchors@comcast.net, DW Holtman, WB7SSN

FOR SALE: Technical Books & CDs. Harold Kinley (WA4GIB), 204 Tanglewylde Dr., Spartanburg, SC 29301 www.radiotechnologies.net

FOR SALE: New, universal power supply for Elmac, Gonset, Harvey Wells, others. SASE for brochure. Harold Smith, W4PQW, 1435 Bush St., Pensacola, Fl. 32534 850-476 8107 w4pqw@cox.net

FOR SALE: Chinese Army type 65 hand crank generators for 102E radio sets. Ken, KD6B, kd6b@bendbroadband.com 541-923-1013, POB 310, Redmond, OR 97756

FOR SALE: Telephone Filters, suppress >1MHz interference, plug in, 1/$7, 2/$11, 3/$14, 4/$16.75, shipped U.S. Brian Harris WA5UEK 3521 Teakwood Lane, Plano TX 75075 brian.k.harris@philips.com 214-763-5977

FOR SALE: "Unique Radio Parts", LLC. www.wa9tgt.com (Replacement parts for "Drake" radio equipment)

FOR SALE: Atwater-Kent dual speed tuner repair kit. Complete details at www.adamsradio.com Adams Manufacturing CO., POB 1005, Lincoln Park, MI 48146

FOR SALE: Galena crystals and detector assemblies. Also radio tubes at very low prices. Len Gardner, 458 Two Mile Creek Rd, Tonawanda, NY 14150, radiolen@att.net

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FOR SALE: DRAKE TR-7/TR-7A/R-7/R-7A service kit. Includes 13 extender boards and digital jumper card. $64.60 includes postage. See http://pweb.amerion.com/~w7avk, Bob, W7AVK, 807 Westshore J28, Moses Lake, WA 98837, w7avk@arrl.net 509-766-7277.

FOR SALE/TRADE: Transmitting/Receiving tubes, new and used. LSASE or email for list. WANTED: Taylor 204A, 211, TR40M and Eimac 500T. John H. Walker Jr., 13406 W. 128th Terr., Overland Park, KS. 66213. PH: 913-782-6455, Email: jwalker83@kc.rr.com

DRAKE OWNERS: New Sylvania 6JB6, same date code, tubes for sale. Price: $23 ea. Call Dick at 207-490-5870

FOR SALE: FT243 Crystals: 1000, 1822, 1880, 1942.5, 3530, 3535, 3540, 3545, 3550, 3625, 3675, 3735, 3800, 3825, 3870, 4325, 4335, 4340, 7040, 7050, 7123, 7140, 7143, 8400, 10106, 28238, 28258, 28571 kHz more. 100kHz, 455kHz HC51U wire leads. Some FT171B, HC6U Crystals. Contact af4k@hotmail.com or send SASE to Brian Carling, AF4K, 117 Sterling Pine Street, Sanford, FL 32773 or call 407-323-4178 http://www.af4k.com/crystals.htm

HALLICRAFTERS SERVICE MANUALS: Ham, SWL, CB, Consumer, Military. Need your model number. Write or email. Ardco Electronics, PO Box 24, Palos Park IL,

60464, wa9gob@aol.com 708-361-9012 www.Ardcoelectronics.com

DRAKE INFO FOR SALE: Drake C-Line Service Information. Hi-Res Color photos of boards and chassis with parts identified. CD also includes Hi-Res scans of R-4C and T-4XC manuals, various version schematics and more. Garey Barrell, k4oah@mindspring.com 4126 Howell Ferry Rd, Duluth, GA 30096. 404-641-2717

DRAKE SERVICE FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covelli, WA8SAJ, Telephone 440-951-6406 or email: wa8saj@ncweb.com

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SERVICE FOR SALE: Repair, upgrade, performance modification of tube comm. & test equip. Accepting most military, all Collins & Drake, & better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, 1115 S. Greeley Hwy, Cheyenne, WY 82007. 307-634-5858 feltondesign@yahoo.com

FOR SALE: Radio parts and hardware. Some are 60 years young! Free flyer, USA only. Bigelow Electronics, POB 125, Bluffton, OH 45817-0125

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

SERVICE FOR SALE: Repair of tube and solid state 1930 to 1975 radio equipment, auto, shortwave and older amateur gear. Please contact Ken Hubbard, KA9WRN, at 608-362-1896 or write Vintage Radio Service, POB 792, Beloit, WI 53512-0792.

SERVICE FOR SALE: Authorized repairs and sales of all types of amateur radio, communications, and test equipment. Please call Land Air Communications, 718-847-3090, visit our web site: www.landaircom.com. We have over 3,000 items in inventory and carry all types of communications parts.

BOOKS FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hi-fi, parts. Send 2 stamp, LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857. ka1edp@juno.com

JOHNSON PARTS: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig.- $17.50 ppd. Bruce Kryder, W4LWW, 277 Mallory Station Dr., Ste. 109, Franklin, TN 37067. b.kpvt@provisiontools.com

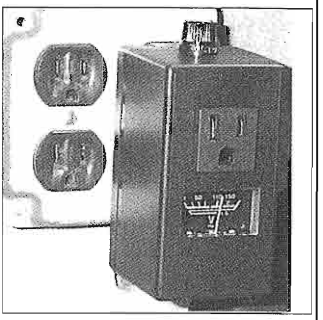
ZIM ELECTRONICS INRUSH CURRENT LIMITERS

Inrush Current Limiters are now available from the Electric Radio Store or on-line! These inrush limiters were reviewed in the September 2004 issue of Electric Radio and are available in three versions:

Model AB-1M, (With Voltmeter) $34.95
Model AB-300M, 300 watts (2.5 amps x 120 VAC) with meter $39.95
Model AB-1 (With Pilot Light) $29.95
Shipping, each limiter $5.45

(4 or more limiters are shipped free for US orders. Overseas customers please ask for shipping quotes.)

The Inrush Limiter provides a gentle, slow startup for your valuable vintage radio equipment. They also reduce the line voltage closer to original design values due to the voltage drop across the limiter element. AB-1 and AB-1M are 150W. All models come with a full money-back guarantee.



Model AB1-M

Electric Radio Store
720-924-0171

FOR SALE: FT243 CRYSTALS: 1885, 1915, 1925, 1945, 1985, 3870, 3875, 3880, 3885, 3890, 7143, 7280, 7285, 7290, 7293 kHz, more. Contact af4k@hotmail.com or send SASE to Brian Carling, AF4K, 117 Sterling Pine Street, Sanford, FL 32773 or call 407-323-4178 http://www.af4k.com/crystals.htm

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ACCESSORIES FOR SALE: KWM2/S-line metal logo pins. Meatball or winged. Excellent replica of the original. Put one on your hat, badge, or replace a missing logo on your panel, $6.25 shipped. W6ZZ, 1362 Via Rancho Pkwy, Escondido, CA 92029. 760-747-8710, w6zz@cox.net

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FOR SALE: Vintage electronics at Alameda Antique Mall, 9837 Alameda Genoa in Houston. Visit www.RadioWorld-OnLine.com Carl Blomstran, POB 890473, Houston, TX 77289

ACCESSORIES FOR SALE: Spun Aluminum Knob Inlays for most Boatanchors. Collins Dial Drum Overlays. Dakaware Knobs. Charlie Talbott, 13192 Pinnacle Lane, Leesburg VA 20176-6146. 540-822-5643, k3ich@arrl.net

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NOTICE: Visit Radioing.com, dedicated to traditional ham radio & vintage radio resources. Let's Radio! Charlie, W5AM. www.radioing.com.

ACCESSORY FOR SALE: RIT for Collins KWM-2/2A; No modifications needed. $79.95 SASE for details. John Webb, W1ETC, Box 747, Amherst NH 03031 w1etc@adelphia.net

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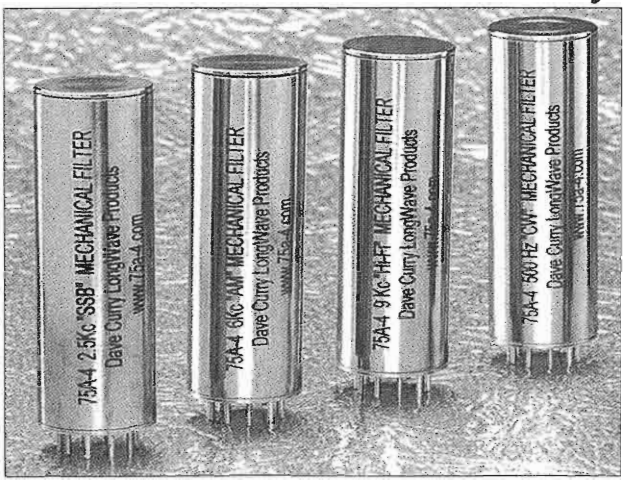
The Collins Filter Family



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WANTED: Nice 75A-4 with any serial number. Wally, W9LWC, 1865 Hines Lakeview Dr, Cumberland, WI 54829 715-822-4821

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WANTED: Looking for complete set of manuals for the URM-33a or at least the URM spectrum analyzer, the O-330B/FR. Walt, 469-831-0917

WANTED: Westinghouse Aeriola Sr or equivalent to salvage the wooden box. Basket case OK. Contact Mike Grimes; 5306 Creekside Ct.; Plano, TX 75094 or 972-898-7251 or K5MLG@verizon.net

WANTED: DY-11, -12, or -17/ART-13 dynamotor, COL-21881 dual or single dynamotor power unit for TCS series, and FT-154-( ) w/ PL-P103 (or –Q103) for BC-348-M. Ed, WA4MZS, ewsjts@comcast.net, 770-928-3775

WANTED: Receivers: National 44, 45, 46, and Meissner Traffic Scout 11-1169, any condition. Henry Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103

WANTED: Affordable collections of panel meters, aircraft instruments, Navy gauges, electrical gauges, most anything. Chris Cross, POB 94, McConnell, IL 61050 815-275-5590

WANTED: WRL 755A VFO & Globe Scout 680A. Paul, K8JJC, 616-891-8891 k8jjc@iserv.net

WANTED: Hammarlund ED-4 Transmitter. Bob Mattson, W2AMI, 16 Carly Dr, Highland, NY 12528. 845- 691-6247 w2ami@arrl.net

WANTED: DY8 or DY86 dynamotor for ARC-5 command set receivers. Rudy, W2ZIA, 716-937-9279

WANTED: Extender boards for Heath SB-303 receiver. Norbert Wokasch, WAØKJE, 3312 W. Bijou, Colorado Springs, CO 80904 719-633-5661

WANTED: May 1945 CQ Magazine. Lynn Stolz, N8AJ, 614-885-5428, n8aj@yahoo.com

WANTED: SB230 Heathkit amp with defective 8873 tube or Dentron MLA1200 with defective 8875. Bill Smitherman, KD4AF, 336-699-8699

WANTED: I am looking for a Grebe CR-18 receiver in good to excellent condition. Will pay any reasonable price, and most unreasonable ones! Bruce, W1UJR, w1ujr@arrl.net

WANTED: Dead or Alive! Harvey Wells APS-90 power supply for T-90 transmitter. K1MD, Richard San Antonio, san.antonio@cox.net or 401-732-4026

WANTED: Someone with a collection of Short Wave Craft, Radio Craft from the 1930s to collaborate on a series of articles on a substantial collection of original items from that time period. Please call Chuck, WØIUH, 320-277-3242

WANTED: James Millen plug in oscillator coils for Millen 90881 linear amplifier, Millen parts #s 43011, 43015, 43021, 43041 and 43081. Gary K2PVC; gschonwald @earthlink.net917-359-8826

WANTED: Technical Materiel Corp (TMC) power supplies PS4 (low voltage and bias) and PS5 (high voltage) for the TMC PAL 1K kilowatt linear amplifier, also known as the RFD or RFA. Gary K2PVC; gschonwald@earthlink.net917-359-8826

WANTED: Squires-Sanders SS-1R and SS-1V. Bob, WØYVA. 703-450-7049; robert@isquare.com

WANTED: Hallicrafters HT33 with salvageable power supply. The RF section is not required to be useable, need a power supply to contribute to one that is. Gary Schonwald K2PVC. gschonwald@earthlink.netphone: 917-359-8826

WANTED: Clean National Select-O-Ject, NC-183DTS and Heath VX-1. Contact Ric at c6ani@arrl.net.

WANTED: Vacuum Tubes: 279A, 212E, 249B, 258B, 271A, 242A, C120, C100A, 804, RK20, CK70, GL805, C201, ZB-120, 802. Components for rebuilding Collins 30J RF output deck, including Cardwell or equivalent dual section variable 440 pF and 240 pF capacitors. Components for Collins 12H /12N speech input console, including preamplifiers and program amplifiers. Rod, W5CZ, 303-324-2725, rodperala@aol.com

WANTED: Technical Materiel Corp rack mounted antenna tuner and RF /SWR meters to be used with the 350-watt or 1000-watt TMC linear amplifiers. Will consider other TMC transmitting equipment and accessories for collection and on-air use. Gary Schonwald K2PVC. gschonwald@earthlink.net phone: 917-359-8826

WANTED: Meter movement for Western Electric transconductance tube tester KS-15750. Walter Hughes, WB4FPD, 6 Academy Ct., Berryville, VA 22611 540-955-2635

WANTED: Will buy SP-600 and some other Hammarlund equipment, working, not, or incomplete. Al, W8UT, anchor@ec.rr.com 252-636-0837

WANTED: Early QSL cards from my Grandfather, Hal Smith (SK). His calls were KH6KA, K6YJR, K6OQE. Gladly reimburse postage plus modest finder's fee! Phil Wilson, 1355 Big Otter Dr, Blue Ridge, VA 24064 k6cra@arrl.net

WANTED: National NTE-30 Transmitter. Any condition, any price! I love National. Sylvia Thompson, n1vj@hotmail.com 33 Lawton Foster Rd., Hopkinton, RI 02833. 401-377-4912.

WANTED: One of my "KN8GCC" QSLs from the mid-1950s. Tom Root, 1508 Henry Court, Flushing, MI 48433, wb8uuj@arrl.net 810-659-5404.

WANTED: Any TMC equipment or manuals, what have you? Will buy or trade. Brent Bailey,109 Belcourt Dr., Greenwood, SC.29649, 864-227-6292, brentw2@earthlink.net

WANTED: Seeking unbuilt Heathkits, Knight kits. Gene Peroni, POB 7164, St. Davids, PA 19087. 215-806-2005

WANTED: PRESS WIRELESS, NY: Photos, information wanted on Hicksville, Baldwin, Little Neck, Centereach, Northville facilities. George Flanagan, 42 Cygnet Dr., Smithtown, NY 11787 w2krm@optonline.net 631-360-9011

WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, 631-360-9011, w2krm@optonline.net

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

WANTED: Searching for RME CT-100 or 3R9 xmtrs and info about them. David Edsall, W1TDD, 156 Sunset Ave., Amherst, MA 01002. 413-549-0349, dedsall@crocker.com

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

WANTED: QSL card from W9QLY, Frank (Mac) Maruna, from 1956 or before. WILL PAY TOP DOLLAR. Don Barsema, KC8WBM, 1458 Byron SE, Grand Rapids, MI 49506, 616-451-9874

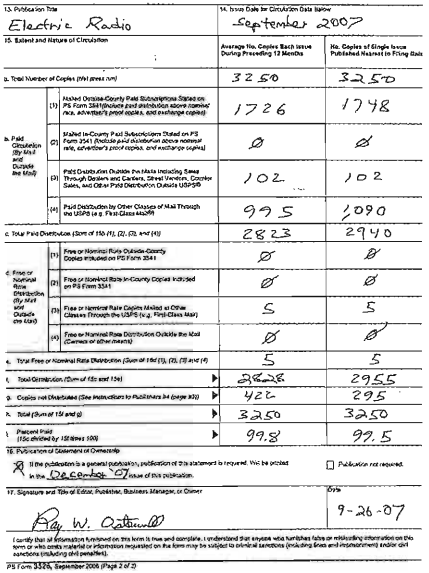
WANTED: Top dollar paid for WWII radios, PRC-1, PRC-5, AR-11, SSTR-1, SSTR-5, British B2, need pts for PRS-1 mine detector. Steve Bartkowski, 1-708-863-3090

WANTED: TCS & TBY Navy radios. Ken Kolthoff, K8AXH, PO Box 215, Craig, MO 64437. 913-634-3863.

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 900 N. San Marcos Dr. Lot 77, Apache Junction, AZ 85220

WANTED: Harvey-Wells Odds-'N-Ends: Speakers, phones, mikes, manuals, supplies, prototypes, military, aircraft. Kelley, W8GFG, 219-365-4730, 9010 Marquette St., St. John, IN 46373

WANTED: Collins R-389 LF receivers, parts, documentation, anecdotes, antidotes. W5OR Don Reaves, PO Box 241455, Little Rock AR, 72223 501-868-1287, w5or@militaryradio.com or www.r-389.com



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17. Signature and Title of Editor, Publisher, Business Manager, or Owner: Ray W. Osterwald — Date: 9-26-07

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PS Form 3526, September 2006 (Page 2 of 3)

WANTED: Incarcerated ham seeks correspondence. w/others on mil (R-390's &backpacks) & tube radios. Also copies of postwar-90's surplus catalogs, backpack specs & photos. W.K. Smith, 44684-083, FCI Cumberland Unit A-1, POB 1000, Cumberland, MD 21501.

WANTED: Receivers. Telefunken E1800, Rohde Schwarz, EK-56/4, NC-400, Racal 3712, Hallicrafters SX 88, Collins HF8054A, Collins 851S-1. Manual for Racal R2174B(P)URR 310-812-0188(w) alan.royce@ngc.com

I NEED INFO!: Radiomarine T-408/URT-12/USCG/1955. Sam, KF4TXQ, PO Box 161. Dadeville, AL 36853-0161 stimber@lakemartin.net 256-825-7305

WANTED: Scott Special Communications rcvr. EA4JL, please call Kurt Keller, CT, 203-431-6850, kkeller1@comcast.net

WANTED: SCR-602 components, BC-1083, BC-1084 displays, and APS-4 components. Carl Bloom, 714-639-1679

WANTED: Western Electric horns, speakers, amps, and mics. Barry Nadel, POB 29303, San Francisco, CA 94129 museumofsound@earthlink.net

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. 501-318-1844, Fax 623-8783 www.boatanchor.com

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

WANTED: Westinghouse SSB Transmitters MW-3 (Exciter, Amplifier, Power Supply). Also, MW-2 (AM). Will pickup anywhere. Gary, WA4ODY, Seabrook, TX 77586, 281-291-7701 myctpab@earthlink.net

DONATIONS WANTED: Southern Appalachian Radio Museum, Asheville, NC, where others can view your radio treasures. For general information or donations call Clinton Gorman, Curator, 828-299-1276

WANTED: Need test set I-135 "G" or "F" will trade WWII I-135 "E" or will purchase, also have BC-611 to trade. Steve Bartkowski, 1-708-430-5080, 7702 Austin Ave, Burkank, IL 60459

WANTED: R390, R390A and R392 receivers dead or alive or parts/ assemblies. Any condition considered. Will pickup if you have enough items. Glenn, WA4AOS, 864-684-2956

WANTED: Cabinet similar to unit on page 32, August 2007 ER issue, holds 7" x 11" chassis. Louis L. D'Antuono, WA2CBZ, 8802-Ridge Blvd., Bklyn, NY 11209. 718-748-9612 AFTER 6 PM Eastern Time.

WANTED: HBR Receiver! HBR-11 HBR-14 etc. any condition–dead or alive, unfinished considered Jeff, KEØMT, ke0mt@aol.com

WANTED: Looking to buy a Hallicrafters SX-146 5-kc filter. WB9IMR, Ron, 847-367-9342, WB9IMR@ATT.NET

NOTICE: Expert HRO-500 alignment done with modern test equipment (HP, TEK, etc.) 650-529-9180 www.nortrex.net or nortrex@bigplanet.com

WANTED: TMC single-channel receiver (Model FFR or FFRD-5 plug-in tuner). Also: inductor coil clips. Hal, KK6HY, kk6hy@arrl.net, 650-366-5060

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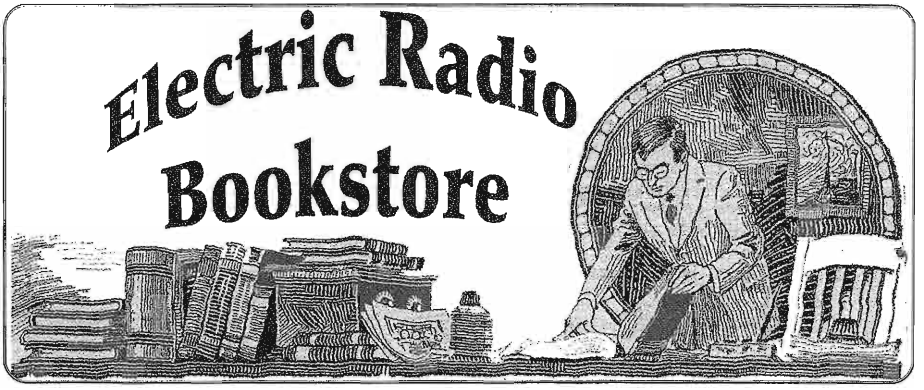

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Collector's Guide to Antique Radios, by John Slusser. The new 7th edition in 320 pages with hundreds of photos and descriptions of long-gone companies and products from 1920 to 1950.
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Crystal Clear: Crystal Sets, Crystal Detectors and Crystals: A 282 page guide to crystal sets and related US-made equipment from 1920 to 1955, by Maurice Siever---**$29.95 - 10% = $26.95**

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Heath Nostalgia: Written by Terry Perdue, K8TP, an ex-Heath employee, this 124-page book is a great history of Heath and the Heathkits that we all remember. ------- $14.95-10% = $13.45

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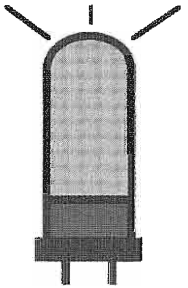

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