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ELECTRIC RADIO

celebrating a bygone era

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Mitsugu Shigaki, JA6IBX

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

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

Regular contributors include:

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

Editor's Comments

15M AM Jamboree, October 23/24

Although I didn't give much advance notice, the 15M Jamboree was very well attended. When I got on-the-air Saturday morning about 9 am I was delighted to hear all of the activity. There were at least 5 QSOs going on between 21.400 and 21.450. Operating very casually, taking time to ragchew with each contact, I still managed to make 19 contacts by 5 PM when I shut down. On Sunday I was only able to get on for an hour or two but still managed another 3 contacts. Logs are still coming in so I'll delay my Jamboree report until next issue.

Thanksgiving AMI Jamboree

Dale Gagnon, KW1I, AMI President, has asked me to remind everyone of the AMI sponsored Thanksgiving AM Jamboree on the weekend of Friday, November 26/ Sunday, November 28. All logs submitted to AMI headquarters with more than 25 two way AM contacts will receive a certificate. Logs should contain all the usual information plus AMI numbers of the stations worked. Look for daytime activity on 10 (29.0-29.2), 15 (21.4-21.45), 20 (14.286) and 40 (7160, 7290). Evening activity will be mostly on 75 (3870, 3880, 3885, 3890) and 160 (1865, 1885).

Annual Electric Radio/N2KSZ Memorial 160M AM Contest

This year it will be on Sunday December 26 and Monday the 27th. Mark your calendars now and don't miss the best AM operating event of the year.

6th Annual Colorado Morning Group AMI Thanksgiving Day Bash

This event (on 3876) gets underway early (like 5:30 or 6 am) so everyone everywhere can participate. It's always a lot of fun with KØOJ as net control.

Real Radio

Micheal Crestohl, W1RC and Tim Smith "Timtron", WA1HLR, now have a Saturday night (7:30 EST) radio program "Real Radio" on WBCQ (7415). The half-hour program deals with topics most of us AM'ers are interested in. It also includes music and a lot of humor. Check it out, I'm sure you'll enjoy it as much as I did.
N6CSW

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Cover: Mitsugu Shigaki, JA6IBX, with some of the vintage gear in his hamshack.

Looking Back

by Lew McCoy, W1ICP
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I ended my column last month telling about my trip to Hollywood and meeting some movie stars, particularly Eva Gabor. About a year later I received an invitation to an engagement party in New York City at Eva's apartment. My wife Martha, never did believe my story about Eva (!) so I asked her if she would like to go to an engagement party in New York. When I told her whom it was for, she gave me a strange look and then agreed. Keep in mind that this is about ham radio—I would never have met these people if it had not been for ham radio. In any case, we went to New York and finally reached Eva's apartment. I rang the bell and Eva herself answered the door. "And this is your beautiful wife Martha," she said and immediately embraced her and kissed her. Martha nearly fainted.

Naturally, the party was filled with famous people but one in particular. I met and became a good friend with Ernest Hemmingway. We really hit it off and he agreed to read a short story I had written which I later sent to him.

About a year later the League had their national convention in Chicago at the Palmer House. We had a large contingent from ARRL Headquarters that attended, including our General Manager, Budlong, W1BUD. It so happened that Duke Ellington had his band at the Blue Note, a drinking spot across the street from our hotel. I had gone to school with Johnny Hodges who played sax with Ellington's Band.

In any case, that Thursday evening I slipped across the street to the Blue Note and grabbed a seat at the bar to listen to the band. The seat next to me was vacant and a guy that looked rather scruffy (that's the best word I can think of) took the open seat next to me. He looked familiar to me but it didn't register at first. He looked at me for a second and said, "I met you in New York a year ago at Eva Gabor's party, you're Lew McCoy."

I realized that it was Hemmingway and we started drinking as if a year or so hadn't even past.

"By the way, he said, I read that story of yours, it wasn't very good."(!) And then he laughed. I asked him if he was a jazz hound and he said that he had always admired Ellington.

When Hodges got through with the band set he came over to the bar and greeted me. He got a little excited when I introduced him to Hemmingway. He told us that Ellington was a fan of Hemmingway and why didn't we get a table and he would bring Ellington over. We managed to get a big table and of course Ellington came over and joined us.

We finished the evening and I asked Hemmingway where he was staying. He told me he hadn't gotten a room as yet so I told him that I had an extra bed and I would let him have it if he promised to come down to the convention and meet my boss, Budlong.

The next morning I went down to the convention and Budlong wanted to know where in the H— I was the night before. I told him about the Blue Note but not about whom I had met. He was rather gruff because I had taken off without clearing it with him.

When Hemmingway came in I took him across the booth to where Bud was sitting and I told Bud I wanted to introduce him to one of his favorite authors. I wish my readers could have seen the look on Bud's face when I said, "Bud, I would like to introduce you to my friend, Earnest Hemmingway."

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"Chick" Taylor, W8DFV, Silent Key

by Dick Callahan, W8GNV

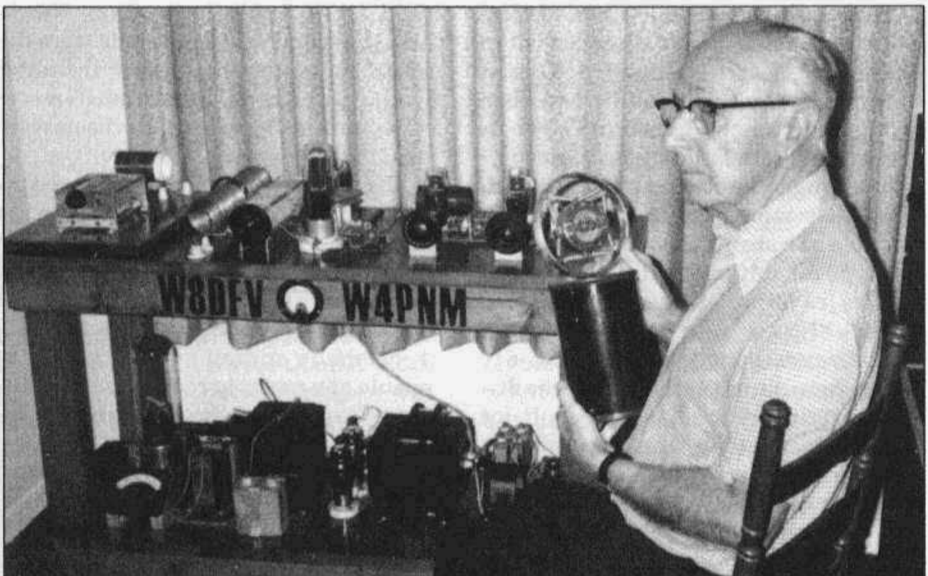
On September 20, 1999, James "Chick" Taylor, 90, died after a long illness. Chick had an intense lifelong interest in ham radio. He obtained his ham license in 1927, while working as an engineer for the "Ring-a-Lite" company. This was a company that was owned by the inventor of the modern light bulb. When radio tubes were invented the company began manufacturing them under the name "Van Horne". It was here that Chick invented the 866 Jr, a single ended version of the famous 866 rectifier tube. A little later, about 1930, they manufactured the Franklin Radio, an AM broadcast set. This was the first AC radio and the first to have a bandswitch allowing shortwave reception, in addition to the AM broadcast band. Chick was directly involved in both of these developments.

After building many Ham transmitters, throughout the thirties, Chick built the big one in 1946, a pair of 8000's modulated by a pair of 810's. Many midwest hams recognized the sound of this transmitter by the loud "thump" when it came on the air.

In the mid 1960's, Chick moved to Augusta, GA, where he joined with his son Jim, W4PNM (deceased), to form the Taylor Antenna Company. They manufactured commercial, amateur and CB antennas.

He is survived by his daughter Barbara Callahan, five grandchildren, nine great-grandchildren and one great-great-grandchild.

Chick will be greatly missed by his many ham friends. May his signal always be "Q-5". ER



This photo of Chick with his 1928 transmitter appeared on the cover of ER #16, August 1990. In the same issue Jim Taylor, W4PNM, SK, wrote a very interesting article about his father and the 1928 transmitter.

The BC-610 Revisited

Celebrated in battle, esteemed in Amateur Radio[1]

Part 2

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Section II: The BC-610E—Foremost military and amateur transmitter at mid-century.

While disinterest in the HT-4 spread among amateurs during 1939-1940, the US Army Signal Corps searched frantically for a transmitter that would facilitate communications among "fast-moving armored forces." With a major war on the horizon, finding an existing transmitter that could be mass-produced straightaway was the only viable option. Where, then, was such a transmitter?

No HT-4 was available when the Signal Corps made an exploratory visit to Hallicrafters, so Halligan delivered from home the HT-4 that he had been using in his amateur station. The engineers liked immediately its basic simplicity, ruggedness, and power output. They determined promptly that it was capable of transmitting voice, CW, and teletype reliably over varying distances while traveling over rough terrain (Read, 1943).

The several models of the BC-610 notwithstanding, the features of the BC-610E are inventoried in Section II for three reasons. First, the E-model was the workhorse of WW II; second, the E-model exceeded all other models combined in numbers manufactured; and third, the E-model via the war-surplus market has had greater impact than other models on the amateur community.

The forthcoming discussion of the BC-610E is introduced by a review of incremental improvements in the HT-4 that led it to evolve into the BC-610E. Section II concludes with commentary that describes briefly major differences between the BC-610E and the post WW II models.

Evolution of the BC-610E

Initial Signal Corps mechanical modifications to the HT-4/BC-610 made it sturdier and easier to maneuver. The tilted-back side panels inspired by the DD-1 were removed to enhance cabinet rigidity. Locking rings were added to hold tubes firmly in position. Shock-absorbers and special mounts were devised to ensure that the transmitter would not be jarred loose from its moorings, and side handles and wheels were installed for maneuverability.

Electronic modifications included installing a switch and relay to expedite CW/Phone change-over; redesigning the oscillator for variable-frequency-oscillator (VFO) as well as crystal-controlled operation; eliminating two HT-4 meters by adding a meter switch to enable one meter to read current in different exciter circuits; inserting a side-tone oscillator in the speech amplifier for monitoring CW transmissions; and adding protective relays to safeguard the equipment from overload (Hallicrafters, 1945).

A significant early modification converted the tube lineup to one that promised greater reliability when operating conditions deteriorated. On the RF deck,

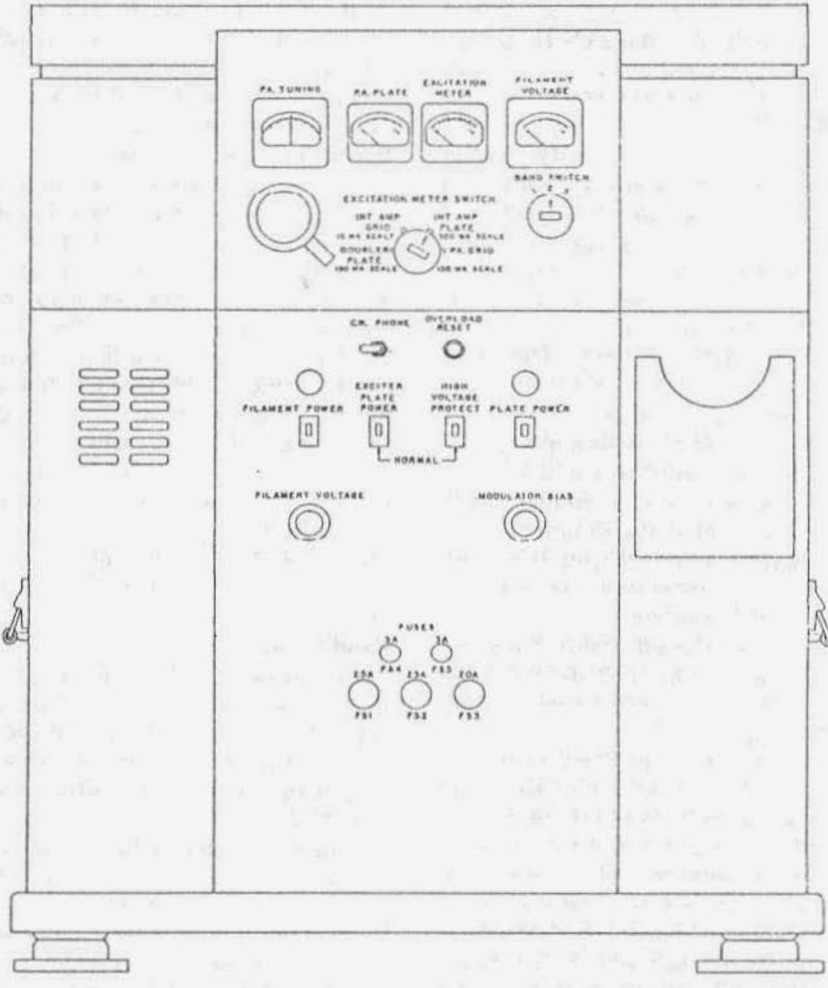

Figure 5. Pictorial representation of the location of front panel controls for the BC-610E [from DOA manual, TM 11-826, 1952, p. 23]

a 6V6 replaced a 6F6 crystal oscillator and became either a VFO or crystal-oscillator, a 6L6 buffer/doubler was retained, but parallel 807s succeeded parallel RK-39s in the intermediate-power-amplifier (IPA) stage, and a 250TH supplanted an RK-63, RF power amplifier. In the audio section, the push-pull 2A3 Class A driver stage did not change; however, 100THs replaced RK-38s as push-pull Class B modulator tubes. In the power supplies, two 5Z3s in the low voltage supplies were retained; however, three VR-150 voltage regulators were added for the 6V6 oscillator. The engineers recommended, but did not require, that two 3B28 high-voltage rectifiers replace two 866s in the high voltage supply. The original HT-4 speech amplifier used one 6J7, three 6J5s, and one 80 rectifier. The elaborated military version uses a 6SQ7, 6J5, 6SR7, 80, and three 6SN7GTs.[3]

The Electronic Features of the BC-610E

Figure 5 depicts the front panel of the BC-610E, including the location and

continued next page

name of each control. A pocket shown on the right holds tuning charts, which indicate approximate dial settings of all controls for frequencies between 2 MHz and 18 MHz. The data in Figure 5 provide a framework for identifying electronic functions associated with each control, and thereby, for describing comprehensively the major characteristics of the transmitter. The exposition below proceeds downward from the top, left to right, row by row:

Power-Amplifier Tuning Dial and Control

The top-left of Figure 5 shows the Power-Amplifier (PA) illuminated tuning dial, scaled 0-100 over 180 degrees, and, beneath the dial, a circular, 2-1/2 inch, silver-plated PA tuning control. The latter is geared so that slightly more than four revolutions are required to cover the 0-100 scale.

The parallel-tuned tank circuit utilizes a 12 inch long, split-stator, 31-151 micromicrofarad (mmFd) each section, variable capacitor. For operation in the 2-2.5 MHz range, a fixed 55 mmFd vacuum padder is clipped in parallel with the stators of the variable to provide added capacitance. Seven plug-in, five-pin coils enable the PA to cover the frequency range of the transmitter. A five-socket, EF Johnson #500JBS jack bar, or its Barker and Williamson equivalent, which is immediately adjacent to the PA variable capacitor, accepts one coil at a time.

Plate voltage is fed through a center tap on the primary of the tank coil. The plate is connected to one end; the other end is coupled back to the control grid of the 250TH for plate neutralization. Radio Frequency (RF) power is taken from the tank circuit via either a swinging-link or a fixed-link assembly, which is coupled inductively into the center of the tank coil. Power is fed to an antenna or antenna coupler through either a PL-239 coax connector or two ceramic feed-through terminals, which are located on the left side of the BC-610 cabinet.

The first of the three meters shown in Figure 5, which is to the right of the tuning dial, indicates PA plate current on a 0-500 milliampere (mA) scale.

Excitation Meter Switch

This four-position switch (top-center of the panel) determines which of four exciter functions is read by the middle of the three meters shown in Figure 5. The meter possesses [BC-610E only] three direct reading scales: 0-15 mA, 0-150 mA, and 0-300 mA. In position "1," the meter measures the 6L6 buffer-doubler plate current on its 0-150 mA scale. In position "2," it measures the grid current of the parallel 807 IPA stage on its 0-15 mA scale. In position "3," it measures IPA plate and screen current on its 0-300 mA scale. In position "4," it measures PA grid current on its 0-150 mA scale.

Band Switch

The three positions of the "Band Switch," which is located on the right side of the panel, permit selection of any one of three "tuning units." Eight plug-in tuning units control from 2 MHz to 18 MHz the operating frequencies of the BC-610 exciter. A lid on the top of the cabinet, right side, opens to expose three side-by-side sets of sockets. Any three of the eight, separately-operated, tuning units may be inserted.

Each tuning unit includes a toggle switch for selecting either VFO or crystal-controlled operation and tuning controls for adjusting the frequency of the 6V6 VFO oscillator, resonating the plate circuit of the 6L6 buffer-doubler, and resonating the plate circuit of the parallel 807s in the IPA.

When the oscillator stage is used as a VFO, the buffer-doubler stage functions as a frequency doubler for all frequencies up to 12 MHz, and as a quadrupler, from 12-18 MHz. When it is used as a crystal oscillator, the buffer-doubler stage operates as a buffer amplifier in the 2-4 MHz range, as a doubler from 4-

12 MHz and as a quadrupler in the 12-18 MHz range. The BC-610 thus utilizes 80 meter crystals for operation on the 80, 40, and 20 meter bands.

CW/Phone Toggle Switch

This switch is located in Figure 5 at the left of a row of two switches placed below the RF controls. It is a four-pole, double-throw, toggle switch, although only three poles are used. Two parallel poles carry the plate transformer primary current. In the CW position, less of the primary winding is used, which leads to higher secondary plate voltage (2,500 volts); in the phone position, the entire primary winding is used, which results in less plate voltage (2,000 volts).

The third pole controls the coil of a DPDT, 5 ampere, 2,500 volt ceramic insulated relay. In the CW position, the relay is de-energized; one set of contacts short-circuits the secondary winding of the modulation transformer; the other set changes bias from operating to cutoff for the 100TH modulator tubes. In the phone position, the relay is energized; the short circuit across the secondary of the modulation transformer is removed and the operating bias for the 100THs is restored.

Overload Reset Switch

This switch is located to the right of the "CW/Phone" switch in Figure 5.

Two relays in the BC-610 serve to protect high voltage circuits from excessive current overload. All current drawn from the high-voltage power transformer passes through the coil of a first relay, which is connected between the center tap of the secondary of the high-voltage transformer and ground. The relay is activated whenever current exceeds 670 mA. An AC path is then completed through its contacts to energize the coil of a second, DPDT relay. One set of contacts of the latter closes to maintain the energizing current in the first relay; another set opens to break the path supplying AC voltage to the "plate power" and "antenna shorting" relays. Power to the primary of the high-voltage transformer is thereby interrupted and the link-coupling of the PA RF coil is shorted. The second relay remains energized until the overload relay reset button is pressed to open its AC path.

Filament Power Switch

The "filament power" switch is in the center of the BC-610E panel, at the left of the four switches in a row (see Figure 5). It activates the filament transformers, the bias supply, and a one-inch green pilot lamp (the pilot lamp is directly above the switch). It also energizes both filament and plate power in the separate speech amplifier when it is used in conjunction with the BC-610 modulator.

The BC-610 is comprised of four sources of filament voltage: (1) 2.5 volts, 10 amperes filament transformer for the 3B28s; (2) 5 volts, 10.6 amperes, filament transformer for the 100THs; (3) a three-winding filament transformer with 5 volts, 3 amperes for the 5Z3 rectifier in the exciter, 6.3 volts, 3.5 amperes for the 6V6, 6L6, and 807 exciter tubes, and 5 volts, 10.5 amperes for the 250TH; (4) two windings on the bias supply plate transformer provide 2.5 volts, 5 amperes for the 2A3 audio drivers and 5 volts, 3 amperes for its 5Z3 rectifier.

The bias power supply constitutes the soul of the BC-610. It runs continuously when filaments are turned on. It provides filament voltages for push-pull 2A3s in the modulator driver and a 5Z3 rectifier; it furnishes plate voltage for the 2A3s and it supplies bias voltages, respectively, for the 807 IPA tubes, the 100TH modulator tubes, and the 250TH RF amplifier tube.

Samuelson (ER, 1990, #11) devised an ingenious strategy to obtain plate power for the 2A3s from the multiple negative output voltages of the bias supply, and eliminate, thereby, one power supply.

continued next page

Samuelson grounded the positive side of the supply, which places the ungrounded side approximately 360 volts negative with respect to ground. The center-tap of the filament winding for the 2A3s is connected through an 800 ohm resistor to the negative side of the supply; the plates are connected to ground through the center-tap of the driver transformer.

The tactic positions the plates at a potential of about 300 volts positive with respect to the filaments. The voltage drop results from the DC plate-current flow, which develops 60 volts for grid bias via the voltage drop across the 800-ohm resistor. The grids of the 2A3s are connected to the negative side of the resistor through a center tap on the driver input transformer.

Exciter Plate Power Switch

This switch is second from the left in the row of four switches, center of panel (see Figure 5). It controls the exciter power supply, which furnishes regulated screen (VR-150) and plate (two VR-150s in series) voltages for the 6V6 oscillator, and unregulated plate voltage of about 450 volts for the 6L6 buffer-doubler and the parallel 807 IPA tubes. In the "up" position, the power supply is energized; in the "Normal" or "Down" position, voltages are removed unless activated by a key or microphone switch.

High Voltage Protect Switch

AC input to the primary winding of the plate transformer of the BC-610E is altered by the third switch in the row of four switches, center of panel (see Figure 5). It works in tandem with the "Plate Power" switch. The "High Voltage Protect Switch," when in the protect position (up), places a 16 ohm, 600 watt, nichrome wire heating coil in series with the primary winding so that rectified secondary voltage applied to the PA is reduced during tune-up. When the switch is in the "NORMAL" (down) position, the heating coil is shorted and full power may ha supplied to the primary of the plate transformer.

Plate Power Switch

The "Plate Power" switch, fourth in the row of switches, center of panel (see Figure 5), activates (up position) a plate-power DPST on-off relay and a DPDT antenna-shorting relay. One pair of contacts of the plate-power relay closes to energize the high-voltage transformer, which applies plate power to the 100THs and the 250TH; another pair of contacts on the relay parallels the "exciter plate power" switch, and upon closing, applies power to the exciter and an antenna-shorting relay. The closed contacts of the latter open and remove a short circuit across the link coupling coil of the PA tank circuit. When this relay is de-energized, the shorted contacts prevent absorption of RF energy by the PA tank circuit when the transmitter it not in operation—a practical design strategy since transmitter and receiver, say in an SCR-299, used separate antennas.

The "Plate Power" switch is wired so that the relays may be operated remotely. A one-inch red pilot light, located directly above the "Plate Power" switch, lights when the plate-power relay is activated.

Filament Voltage Variable Resistor

The AC voltage input to the filament transformers collectively is regulated by a 15 ohm, 50 watt variable resistor, located on the left of the panel, beneath the "filament power switch" (see Figure 5). A 0-10 volt AC "Fil Voltage" meter (the third meter in the row of meters) measures the voltage at the tube socket filament pins of the 250TH PA, where 10.5 amperes are drawn.

The first step in operating the transmitter is to set the filament voltage for the 250TH between 5 and 5.3 volts. The procedure ensures uniform line voltage for all the transformers controlled by the "filament power" switch.

Figure 6. Art Rideout, WA6IPD, with his BC-610H. The BC-939 tuner is sitting on top. To the left is a Hallicrafters SX-28 with its companion speaker.

Modulator Bias Variable Resistor

A 500 ohm, 50 watt variable resistor, the "Modulator Bias Control" (front panel, right-center, Figure 5), is used to set a no-signal bias of 40 mA for the 100TH, Class B, modulator tubes. A 0-300 mA meter, located in the speech amplifiers, monitors the plate current of the modulator tubes. During CW operation, the arm of the Bias Control Resistor is disconnected by contacts on the relay controlled by the CW/Phone switch. The total output voltage of the bias power supply is then applied to the grids of the 100THs, which is sufficient to cut off entirely modulator plate current.

Fuses

Five fuses are used in the AC power circuits of the BC-610 (see bottom-center of the front panel, Figure 5). A 25 ampere fuse is in each side of the 115 volt AC input. A 20 ampere fuse protects the HV power supply. A five ampere fuse protects the filament transformers. A three ampere fuse protects the bias supply transformer.

Interlock Switches

Three interlock switches (not shown in Figure 5), one for each of two small lids on the top cover of the BC-610, which provide access, respectively, for changing the plate tank coil and adjusting the RF exciter tuning units, and one for the entire top cover of the transmitter, are wired in series so that when any one is open, power circuits are disabled. A fourth interlock switch located on the side of the modulator deck, at the rear of the transmitter, is also in series with the above three switches; its purpose is to prevent power circuits from being energized should the rear panel be removed.

Changes In Later BC-610 Models

All models of the BC-610 are substantially the same. However, the later models, which all look alike, differ in external appearance from the E-model in that the DD-1, skyscraper, deco appear-

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The Genesis of The Eimac 4CX5000A

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In November 1952 Arthur Collins selected a team of nine engineers to develop the technology and circuits for practical commercial and military SSB for both mobile and fixed stations. My assignment was the development of linear RF power amplifiers. A high degree of linearity was required particularly for multichannel voice communication. Bell Labs had developed a 4 kW PEP, four channel Independent Sideband transmitter for commercial overseas radiotelephone use. The FCC required that the four channels be confined to an emission bandwidth of 12 kHz. This LDT-2 transmitter used a 3CX2500A in the final in a grounded-grid circuit. As I recall, the IM S/D was at least 35 dB down (one tone to largest IM product). We experimented with many potential circuits including class AB1 triodes in grounded-grid circuits.

We preferred tetrode tubes because of their higher gain allowed fewer stages and fewer tuned circuits which would reduce automatic tuning system costs. Our solution was to use 12 to 15 dB of RF feedback around the last two or three tetrode RF stages.

We saw the need for a tetrode tube for use in a 5 kW PEP SSB transmitter. The RCA 6166 was larger than needed. We thoroughly analyzed the Eimac 4-1000A by cutting one apart on a glass lathe so we could measure all of the internal inductances and capacitances. We concluded that we needed a tube at least as large as three 4-1000As in parallel.

I recorded a long wish list of desirable features and ratings in my notebook. Some of the requirements were:

1. Low IM distortion.
2. Plate current rating at least 3 times that of a 4-1000A.
3. External anode.
4. At least 3 KW plate dissipation.
5. Ceramic instead of glass seals.
6. Conical connections from grid and screen to ring terminals for low internal lead inductance and better isolation between grid and plate.
7. Low drive power—preferably Class AB1.

Eimac became interested in developing such a tube. It turned out to be the 4CX5000A. Their conservative design resulted in a larger tube than needed for a 5 KW PEP transmitter. In fact it was suitable for over 10 KW PEP!

I built a prototype for a 20 KW PEP transmitter using a pair of these tubes in parallel. Tests showed good performance at this power level. The first production transmitter using the 4CX5000A was the 205J-1 45 KW PEP SSB linear. It was for the Air Force Strategic Air Command stations to maintain contact with their B52 bombers. Four tubes were operated in parallel. It was automatic servo tuned and covered 2-30 MHz. The second design was the 204C-1 10 KW PEP manually tuned SSB linear using a single 4CX5000A. Each SAC station used six of these linears which were pretuned to the six most used frequencies. The operator could respond instantly to a pilot calling in by switching in the correct linear. Some of these linears found their way to MARS stations after SAC retired them.

Both of these linears were rated for 35 dB S/D (one tone of a 2-tone test signal to the largest IM product at any signal level). This compares to 41 dB IM product-to-PEP which ham equipment manufacturers use. Both of these linears used 3-stage RF feedback which is stable

A gold plated 4CX5000A presented to the author by Eimac

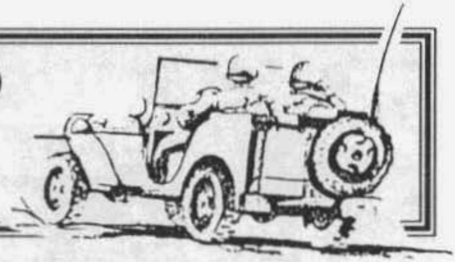
The 4CX5000A became a very popular tube and led to a large family of high power tetrode tubes. The largest I used in a transmitter design was the 4CV100,000A. One pair was used in the final of a 250 KW Shortwave Broadcast transmitter, and another pair was used in the Class B modulator. This tube was vapor cooled—i.e. it boiled water to carry the heat away from the anode in the form of steam. The steam was condensed to water and returned to the tube by a fan cooled condenser. Three of these transmitters were installed in the Voice of America station that was located near the highway south of Dayton, Ohio.

Later Eimac produced a "J" version, such as the 4CX15000J, in several sizes for better linear amplifier IM performance.

in all conditions when broad band antennas are used. All other Collins tetrode linears used 2-stage RF feedback so they would be stable even when operating into a very narrow band antenna such as a tuned whip. I included a predistorter circuit in the 205J-1 which I was able to tweak to as high as 52 dB S/D on a given frequency.

I retired from Rockwell-Collins in 1984. In 1985 I performed a favor for Varian, which then owned Eimac, and apparently as a return favor they presented me with the gold plated 4CX5000A mounted on a nice mahogany base with a plaque which reads "WARREN BRUENE Eimac 1955". Needless to say this gave me quite a thrill and I prize it very highly. ER

ELECTRIC RADIO IN UNIFORM



by Dennis DuVall, W7QHO
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Fort MacArthur WW II Communications Re-Enactment and Test

On September 12, 1999, two-way communications were achieved between Fort MacArthur, San Pedro, CA and the S.S. Lane Victory sailing in the San Pedro Channel. Vintage equipments not seen in those waters since WW II were employed in this exercise. The radio on board the ship was a BC-441 (SCR-281), a marine transmitter-receiver known to have been in use on WW II vessels patrolling the San Pedro Channel in defense of the Los Angeles Harbor and surrounding port facilities. The equipment on shore at Ft. MacArthur was the BC-669 (SCR-548), also known to have been in use during the War at that site.

The purpose of this undertaking was to reenact ship-to-shore communications with vintage equipment, an event of historic relevance to Fort MacArthur's wartime role as HQ for WW II Los Angeles harbor defense installations (see ER #123, June 1999). We also wanted to determine how effective the BC-441 and BC-669 might have been in supporting communications between the artillery

S.S. Lane Victory today

Author and BC-441D in the ship's radio room. The radio in the background is the ship's RCA Radiomarine 4U.

batteries at the Fort, and vessels operating up to 30 miles away in the Channel.

Equipment and Set-Up

The Hallicrafters developed BC-441 and BC-669 will be familiar to many readers. Detailed descriptions of these radiotelephone transmitter-receivers can be found in ER issues #100 (Aug. 1997) and #30 (Oct. 1991).

I installed my own BC-441D in the Lane Victory's original radio room. An existing end-fed antenna wire was used which entered through the ship's RF ductwork. The above-deck length was approximately 30 ft. running up to one of the masts at a 45 degree angle. Unexpectedly, I was able to load the BC-441 into this wire on 1945 kHz without an antenna tuner. Power output was approximately 20 watts. However, the plate and antenna taps on the BC-441 tank coil required to do this were so radically different from their usual settings (see ER #100) that I took the precaution of verifying the output with a frequency counter.

Fort MacArthur's BC-669 was set up in the Museum's radio exhibit area, transmitting on 1950 kHz with a power output of 40 watts. The antenna was a 90 ft. sloping wire end-fed through a transmatch working against a ground system consisting of the Fort's plumbing and ductwork. No tune-up problems were encountered with this arrangement.

Operations

The preliminary test run from the ship at dock-side was not encouraging. I could hear the Fort but was experiencing serious interference on receive by what appeared to be strong broadcast station (BC) intermodulation products. Even worse, the Fort was experiencing a very high local noise level of a different kind and didn't hear me at all even though we were less than 3 miles apart. A subsequent checkout, however, revealed the BC-669 receiver tuning dial was reading significantly off frequency, and it was decided to go ahead with the exercise as scheduled.

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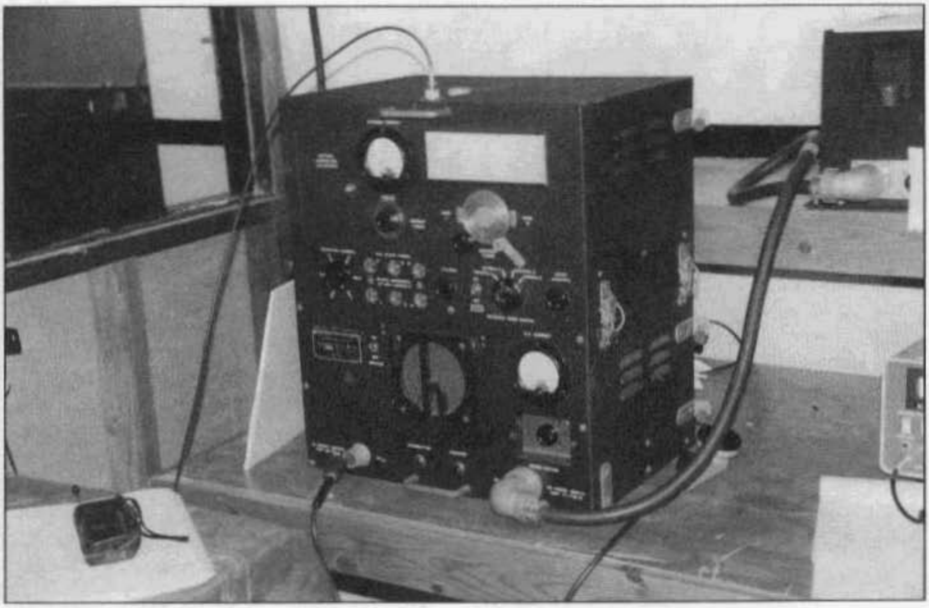

BC-669B at the Fort MacArthur Military Museum.

Happily, everything worked out fine a few days later during the actual event. I was operating under the ship's club call W6LV/MM (see below). My friend Tom Coleman was holding down the Fort end as K6VW/6, ably assisted by Lane Victory Club member Terry Tobin, KF6GKR. Signal reports were consistently 5/9 both ways out to the maximum distance of approximately 25 miles reached during the cruise. Several other amateur stations in the Los Angeles area were also worked from the ship during a two-hour operating period in the early afternoon.

During the cruise I was still experiencing a significant level of BC interference, and it was suggested by the ship's radio officer of the day, Mr. Jay Flynn (WB9AWX), that this could be due to corroded joints in the ship's metalwork acting as diode harmonic generators. (Does anyone out there have another idea)? This particular problem does not occur at Ft. MacArthur which would be in the same BC environment.

Fort MacArthur

Fort MacArthur is located in San Pedro, CA, and is home of the Fort MacArthur Military Museum (see ER #123, June 1999). Ongoing Museum efforts include a project to illustrate and replicate the Fort's WW II communications activities. Serendipitously, the activities of another historic attraction in the area, the S.S. Lane Victory, afforded a unique opportunity to further the project described above.

The S.S. Lane Victory

Most readers will be familiar with the famous Liberty ships of WW II built by Kaiser and others. The less well-known successors to these were the Victory ships which were larger and, most importantly, faster being driven by dual steam turbines rather than the reciprocating engines of the Liberties.

The S.S. Lane Victory, docked in San Pedro, is the world's last remaining operational Victory ship. This vessel was built in 1945 by the California Shipbuilding Company in San Pedro and

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The OFC (Old Friends Club) and the Gault Challenge

by Lea Salter, K4VWD
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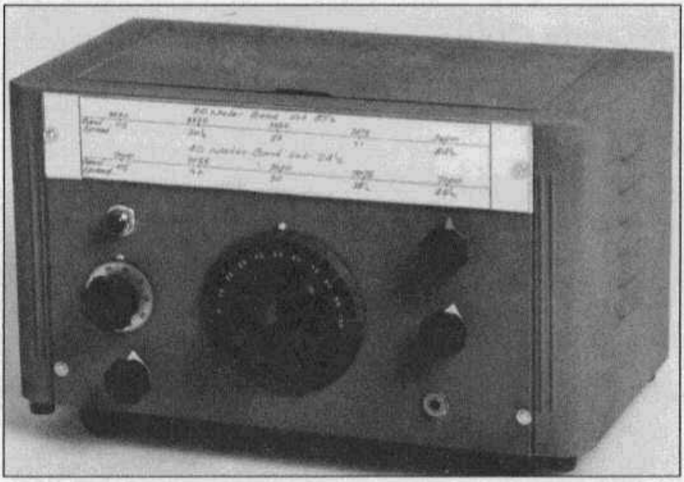
A few years ago there were three or four AM fans who got together occasionally for lunch to talk about old ham gear. Our numbers increased some and we decided to make it a regular get together and invite some others to join. We grew to about fifteen and chose the first Friday in each month as a meeting date. Along the way, we also added a weekly meeting on the air using AM. We now meet on the air Sunday afternoon at 2:30 local time on 3790.

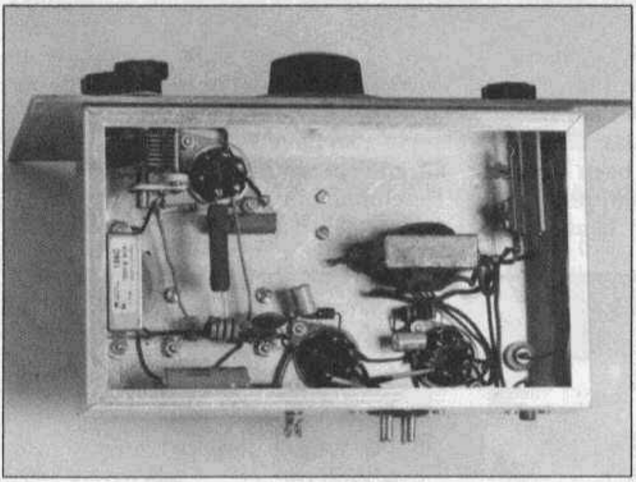
During our monthly lunch meetings everyone is to bring something from the past to share. We have had many interesting things to discuss. Some of the items presented have been simple receivers, one tube transmitters, old tubes, wave meters, WW II survival gear, old kit-built items, how to make discarded items into something useful and attractive, old radar tubes, HBR-16, keys, homemade keys, SW-3, Gibson girl equipment, SOS senders from WW II, first issue of QST, homemade motors, etc., etc. What a great group with which to be associated!

As you can tell from the picture we are not "spring chickens" anymore. Harry, K4HU, is the oldest at 92. He is amazing. He takes no medication, and gets up everyday looking forward to working on ham gear. He was on the air in 1920.

We also have Fritz, W4NTO, who is 82, and spends his time helping others. He climbs our towers, puts up antennas, fixes all kinds of electrical gear

The Old Friends Club members. Seated L to R: George, KF4YGM; Lloyd, W4LSK; Earl,W4ZEQ; Ken, W4HKZ; Harry, K4HU; Herm, W9FHW. Standing L to R: George, W4BUW; Joe, W4WZ; Dave, AE4SQ; Fritz, W4NTO; Ellis, W4CW; Charlie, W1HVA; Lea, K4VWD





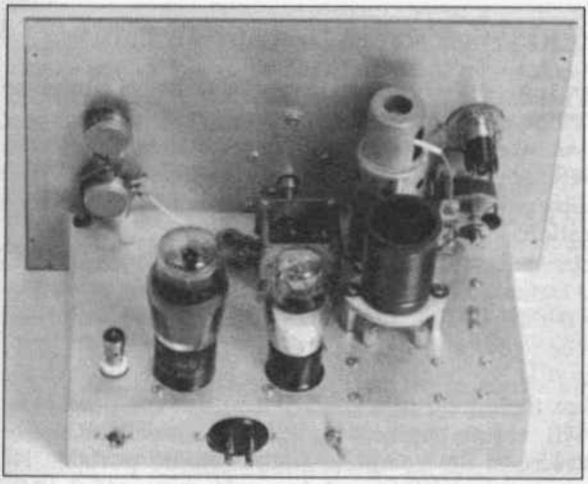
including radios and works as a volunteer with the Red Cross.

Joe Gault, W4WZ, has been a school teacher and a college president. He is always building some kind of radio gear. He challenged me to build a receiver and a transmitter and to make contacts using both. This is what I call "The Gault Challenge". I, in turn, challenged the OFC, even though many of them had already done this. The second part of the challenge was to build from yours or a friend's "junk box". In other words, buy as little as possible.

When Bob Dennison did his article in ER #118, February, 1999, about the regenerative receiver, I decided it was time to answer the challenge. This is the first part of a two part project: First, build a similar receiver. Then, build a transmitter and work it with the receiver.

The basic decision was made to make a three tube receiver, but I would use tubes with 6.3 volt filaments instead of 2.5 volts. The tubes I used are a 6D6 detector, 37 first audio amplifier and a 42 for the second audio amplifier. I had the tubes but had to scrounge the sockets. I also had to find the 1000 henry choke but I could not find one, so I bought a 150 henry choke from Hammond and it seems to work fine. I had a 10x6x2 chassis and a Bud cabinet that I picked up at the Dalton Hamfest three or four years ago. I obtained a piece of one eighth inch aluminum for a front panel. With the stiff panel and a cabinet, I would not use braces. The power supply is on a separate chassis, but I put the second audio amplifier on the chassis with the other tubes so that all the parts of the receiver, except for the choke, I already had or was able to scrounge.

In laying out the components the arrangement used was to keep all leads as short as possible. The tuning range desired is small. The idea is to cover some of the 80 meter CW band and the 40 meter CW band. Anything that could be heard outside of this would be fine



The coil for the 80 meter band has 26 turns for L1 and 5 turns for L2. For 40 it is 14 and 4. The forms are 1-1/2 inch Nationals.

There were some other changes made for this receiver which were not included in Mr. Dennison's. Some of them and the reasons for the changes are listed below:

1. R8 and C10 were added because there was some motorboating when the receiver was operated.

2. R11, a 24 ohm resistor, was added to protect the output transformer in case I turned the set on with no earphones or speaker connected.

3. R3 was added because there was a very pronounced plop when operating the regeneration control. This resistor reduces the plop and makes the control easier to use.

but our main desire is for CW on these two bands. All of the OFC have a 3528 crystal for their transmitter so that we can all be on the same frequency when we have an old time CW get together.

After all the sheet metal work was done and the parts were mounted the wiring was begun. As the completion of the wiring approached, I had a lesson in coil winding from Fritz, my Elmer for the project.

With everything complete, I threw the switch and blew a fuse. After this was solved, there was a hum, and finally, after the hum was cleared up, the radio worked. What a relief!

Next came the fine tuning and calibration. The strip on top of the front panel is a calibration chart for 80 and 40.

I used a tickler coil instead of the tapped coil as Mr. Dennison did. The dial on the front panel for the band-spread has 100 divisions for 180 degrees of rotation. With the bandset capacitor set properly the receiver tunes from 3500 to 3600 in 80 divisions on the knob and from 7000 to 7100 in 45 divisions. This covers 3528 and 7056 just fine. Please note that C2 is a trimmer that was used so that no plates of the band spread capacitor would have to be removed. The reference marks for the bandset and band-spread capacitors are bolt heads with the slots vertical.

There was a period during some minor changes that the 150 henry choke was not connected. Using clip leads, I connected a resistor and either side of an interstage transformer in place of the 150 henry choke. They all worked but I did not do any detailed testing.

There are two disappointments. First, there is not much volume. This will be addressed in the next article. Second, the audio has a slight warble to it. I will do some testing to solve this problem.

I thank Mr. Dennison for his excellent article. Without it, I might not have started this project. I have learned more than I can express and I have a renewed and increased respect for the men in our "Old Friends Club" who have gone before and are now helping us newcomers.

On to the transmitter. It will not be a 30's version, but it will be basic and it will be fun. I encourage everyone to accept the Gault Challenge. ER

Federal Govenment Reverses Radio Destruction Policy

The Federal Government has apparently reversed its policy of destroying some of the surplus Collins Radio communications equipment in their inventories.

According to a letter dated October 6th 1999 sent to Michael Crestohl, W1RC, (also VE2XZ) Department of Defense (DoD) officials have recently determined that some pieces of the Collins Radio equipment used by the military and government no longer require "demilitarization".

The letter was from the Defense Reutilization and Marketing Service (DRMS) which is a division of the DoD Defense Logistics Agency (DLA). It was signed by Mark D Vincent, Leader of the DEMIL Business Unit. The DRMS is responsible for disposing of excess and unneeded government property.

The letter continued to state that the DEMIL Coding has been modified in the DRMS mechanized system that their field offices (DRMOs) use for processing property to reflect the no-DEMIL requirement for the FRC-93. The FRC-93 is the military nomenclature that describes the complete Collins Radio portable HF communication station consisting of the KWM-2A, 30L-1, 312B-4/5, 516F-2, PM2, CC-2/3 carrying cases, 637T-2 transportable antenna and other related equipment. This equipment was all originally sold on the open market to radio amateurs by authorized Collins Radio dealers from the 1950s through to the early 1980s.

In addition to the FRC-93, the DRMS letter also stated that the DEMIL Coding for the Collins-designed R-390, R-390A, R-725 and R-392 has also been changed to reflect their non-DEMIL status. However, the DoD Item Manager has advised the DRMS that some of the components of the radio may be radioactive and must be removed. This refers to the meters.

The letter was sent in response to an inquiry made by Michael Crestohl, an amateur radio operator whose call sign is W1RC. W1RC is the Editor of *THE SIGNAL* which is the quarterly journal of the Collins Collectors Association. This group consisting of about 700 members is dedicated to the preservation, restoration and documentation of communications equipment manufactured by the Collins Radio Company of Cedar Rapids Iowa (now Rockwell Collins).

W1RC was angered when he saw several KWM-2As, 30L-1s and 312B-4s that had been thusly "demilitarized" at a hamfest flea market in Rochester, New York last June. In an editorial in *THE SIGNAL* he wondered why these items were being routinely destroyed when he knew of no possible reason for this action. He then contacted the DRMS' Public Affairs Office to try to find out why.

"I am absolutely amazed that they actually changed the DEMIL Codes", stated W1RC. "Of course, I am delighted. We are all very fortunate that the two people at the DRMS I was dealing with were sympathetic to the situation and were able to research the items listed in my inquiry to a happy conclusion."

"I am pleased that the lines of communications are now open to the appropriate authorities at the DRMS," commented W1RC. "However, the work is only beginning and there is much to do. I have set up a special DEMIL TASK FORCE to research the National Stock Numbers (NSN) on equipment that has historical significance which is the number used by the DoD and the DRMS to track all items. Then we can submit these NSNs to them for reconsideration and hopefully positive action."

"We are actively looking for knowledgeable participants for the DEMIL Special Task Force. A special e-mail address (NO-DEMIL@hotmail.com) has been set up as a point of contact."

VINTAGE NETS

Arizona 40M AM Group: Meets on 7293 kHz at 10:00 AM MST (1700 UTC) on Sat. and Sun.

West Coast AM Net **meets Wednesdays 9PM Pacific on or about 3870kc. Summer conditions have moved the net control to California with John, W6MIT and Tom, K6AD as net controls. In the winter months Randy, KK7TV usually runs the net.**

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.

California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835

Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net controls are Andy, WA4KCY and Sam, KF4TXQ. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.

Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.

Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.

K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours.

Arizona AM Net: Sundays at 3 PM MT on 3855. On 6 meters (50.4) at 8 PM MT Saturdays.

Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.

DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.

Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0500 ET on 3885 + or - QRM.

Westcoast Military Radio Collectors Net: Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.

Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html

Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.

Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.

Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.

Drake Users Net: This group gets together on 3865 Tuesday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.

Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.

Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.

K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.

JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.

Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.

Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. NC is Will, AA6DD.

Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.

Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745.

Midwest Classic Radio Net: Sat. mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.

Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.

Wireless Set No. 19 Net: Meets the first Sunday of every month on 7.175 +/- 5 kHz at 2000Z (3760 +/- 5 kHz alternate). Net control is Dave, VA3ORP.

Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22.00 UTC on 7220. Net control is Dennis, VE7DH.

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

Better Audio for the Collins 75A-1

Part 2

by Thomas Bonomo, K6AD
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OK, enough about the horrors of rebuilding the RF deck in a 75A-1 (Part 1 of this article appeared in Electric Radio last month). Hopefully you will be luckier than me and will not have to do this. Let's move on to the mods and tackle the AGC system first.

Before we begin, though, it may prove helpful to clear up any confusion caused by the nomenclature used in this section. You will notice mixed use of the terms "AVC" and "AGC." Before you think I have gone nuts or just carelessly mixed the terms, here is the dilemma I faced. Back when the 75A-1 was designed, Collins still used the older term AVC (automatic volume control) on both the front-panel and schematic. On the other hand, when discussing modern receiver circuit techniques, it is customary to use the more familiar term "AGC" (automatic gain control).

They are certainly the same thing, but from the perspective of writing I found it impossible to consistently use only one term—(either AVC or AGC)—throughout the entire article. It just didn't feel right referring to the "AGC" switch on the 75A-1, since it is not labeled that way on the front panel. Likewise it did not feel right using the older term "AVC" when discussing modern circuit techniques. Thus, in this article, I have adopted a mixed format. I use the older term "AVC" when referring to the front panel switch and its related functions, while using the modern term "AGC" when referring to the circuit or its electrical characteristics. This seemed to be the best compromise.

Limited AVC Switch Options

I am sure there are operators out there that may disagree with me, but I have just never been a fan of the AGC systems in many of the receivers made by Collins. Consider, for example, the three-position AVC switch on the front panel of the 75A-1. It provides the following combination of functions:

MANUAL - (RF gain, but no AVC)
AVC - (AVC, but RF gain disabled)
CW - (RF gain, but no AVC; BFO on)

I have the utmost respect for all of the engineers at Collins who worked on this receiver, but even so, I just can't figure out what they had in mind or why they configured it this way. I found this combination rather limiting. For example, why did they disable the RF GAIN control when the switch is in the AVC position? There is no position that allows both AVC and RF GAIN to be used simultaneously. Seems odd to me, anyway.

Threshold AGC Improves Performance

In addition to the limitations of the AVC switching on the front panel, the 75A-1 uses the older "linear" type of AGC system. Converting it to a "threshold-type" non-linear system will greatly improve its performance. Different manufacturers made the transition to this more modern type of AGC system at different times during the 50s but Collins had not yet made it when the 75A-1 was designed.

Before proceeding, let's first recap the benefits that a threshold-type AGC system provides. Certainly one benefit is

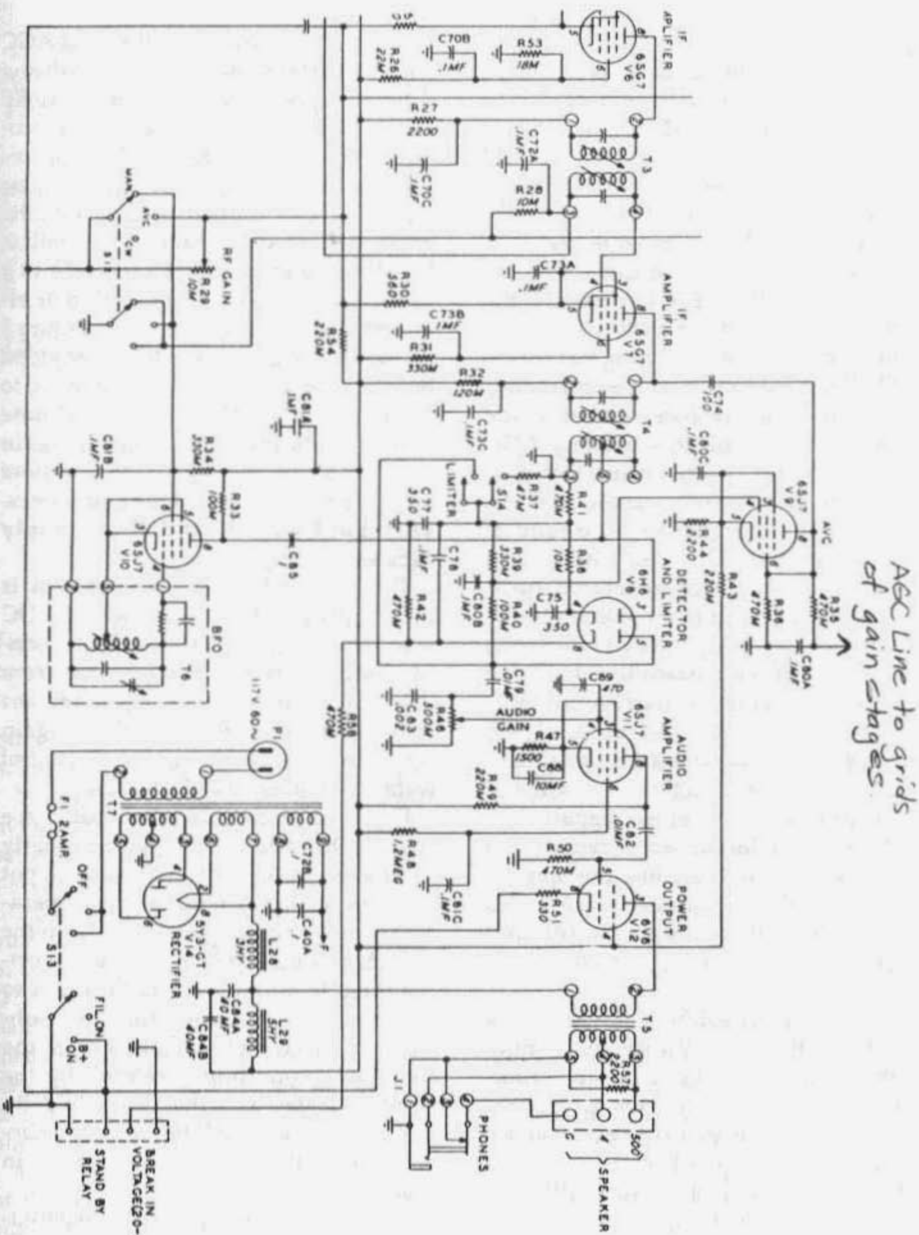

Figure 1. Partial schematic, 75A-1 receiver.

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the fact that it provides visual feedback. Just one look at the S-meter will tell you how much the RF GAIN control has reduced the gain of the receiver. This visual feedback, however, is only an extremely minor benefit. The primary benefit provided by a threshold-type AGC system is that the RF GAIN control can be used to reduce background noise and static crashes without substantially decreasing the volume level of desired signals.

I have heard some people confuse the non-linear threshold-type of system with "delayed" AGC, which merely establishes a minimum signal threshold which must first be received before the AGC detector will generate any AGC control voltage. Do not make this mistake. The purpose of "delayed" AGC is to improve the signal to noise ratio of weak signals. "Delayed" AGC and "threshold" AGC are generated quite differently and produce completely different effects. Take a look at Figure 1, and you will see that in the 75A-1, the bias network composed of R43 and R44 on the cathode of the AVC detector, V9, is primarily responsible for establishing delayed AGC action. V9 will not conduct until the received signal at the output of the last IF amplifier (V7) is large enough to overcome the bias established on the cathode of V9. No changes will be made to the delayed AGC action of the AVC detector in the 75A-1.

As originally designed, the RF GAIN control on the 75A-1 reduces everything —(both signals and noise)—in a completely linear fashion. This greatly reduces the effectiveness of having an RF GAIN control. The effect of using the RF GAIN control is not much different from turning down the volume control (except in the extremely rare case when it is needed to eliminate receiver overload from strong signals). It isn't very effective at eliminating background noise because it also reduces the volume level of desired signals. Converting to a threshold-type system fixes this problem.

In the 75A-1, the RF GAIN and AGC control voltages are each applied to a different tube control element. The RF GAIN control voltage (which is produced by self-bias in the 75A-1) is applied to the cathodes of the gain stages, while the AGC voltage is applied to the grids of those same stages. The result is that they combine within the tube in a linear manner with respect to their effect on the output of the stage. Figure 1 shows the original linear AGC system. Before proceeding, take a moment to follow the RF GAIN control and note how it feeds the cathodes of the gain stages. Follow the AGC line and note how it feeds the grids of the gain stages.

Threshold Circuit and Bias Supply Mods

The threshold-type AGC system is different because it first mixes a DC control voltage from the RF GAIN control with the AGC control voltage from the AGC detector before applying the *mixed* voltage to the grid in each gain stage. In this system, *no separate control voltage is applied to the cathodes.*

Figure 2 shows the threshold-type circuit. The cathodes that were formerly connected to the RF GAIN control pot are now grounded for normal operation. Removing the two wires from the RF GAIN control pot, R29, and connecting them together is the easiest way to accomplish this. Grounding the cathodes in this manner preserves the switched grounding provided by the stand-by relay and the "FIL ON"/"B+ ON" switch. R29 will be rewired in accordance with Figure 2, so leave it in place.

The grids are fed from the threshold-type circuit, which is composed of two distinct parts: a negative bias supply and a logical OR circuit. As shown in the photograph, the negative bias supply and the threshold AGC components

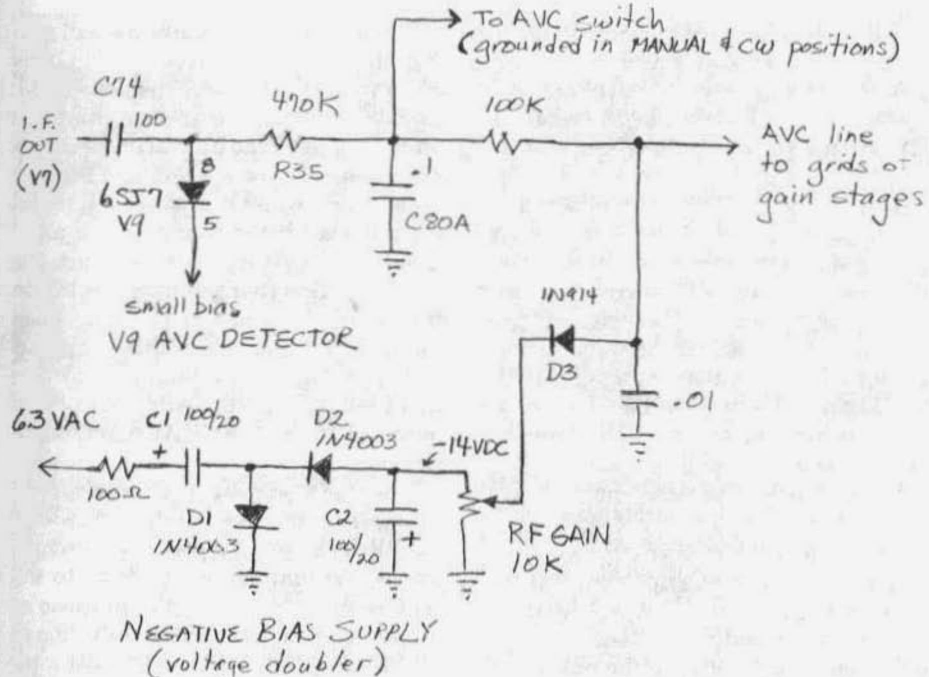


Figure 2. Threshold AGC circuit and negative bias supply. V9 is shown as equivalent circuit. Diode V9 and diode D3 form the required logical "OR" function.

can easily be built on one small terminal strip.

Your 75A-1 should be wired as shown in Figure 2. The negative bias supply is actually a voltage doubler, which consists of R1, C1, C2, D1 and D2. Using the filament supply of 6.3 VAC, it will provide about minus 14 VDC. On one half of the AC cycle, C1 charges up through D1 to about -7.7 volts. During the next half of the AC cycle, C2 charges up through D2 to about -14 volts. This negative bias is applied to the RF GAIN control, R29, to provide the variable bias needed for the logical OR circuit.

The logical OR function is comprised of diode V9 (the AGC detector/amp) and added diode D3, which receives its voltage from the wiper of the RF GAIN control. At every instant in time, the output of these two diodes will be whichever voltage is greater (AGC voltage or RF GAIN potentiometer wiper voltage) and this result is then fed to the control grids of the various gain stages. Another way to look at the logical result of this circuit is to consider that one of the diodes is *always* forward biased, while the other is *always* reverse biased. Consider the following two cases:

If the received signal generates an AGC voltage that is below that established by the setting of the RF GAIN control, then receiver gain will be determined purely by the setting of the RF GAIN control (in this case, V9 is reverse biased and D3 is forward biased). The AGC detector cannot further reduce the receiver's gain below the floor already established by the RF GAIN control.

On the other hand, once the received signal generates an AGC voltage that exceeds that established by the setting of the RF GAIN control, then the AVC detector will take control of the receiver's gain (now the situation is re-

continued next page

versed: V9 is forward biased and D3 is reverse biased). Any setting of the RF GAIN control below the level of a received signal will have *no effect* whatsoever on the volume of the received signal.

Thus, the RF GAIN can be adjusted to reduce background noise, but when a strong signal is received only the AGC detector will control its volume. The background noise is reduced, but the volume of any signal that is strong enough to exceed the setting of the RF GAIN control is not. The RF GAIN control acts just like an adjustable threshold, or floor.

Heck, this is even better than adding DSP to your 75A-1!

A Better Set of AVC Functions

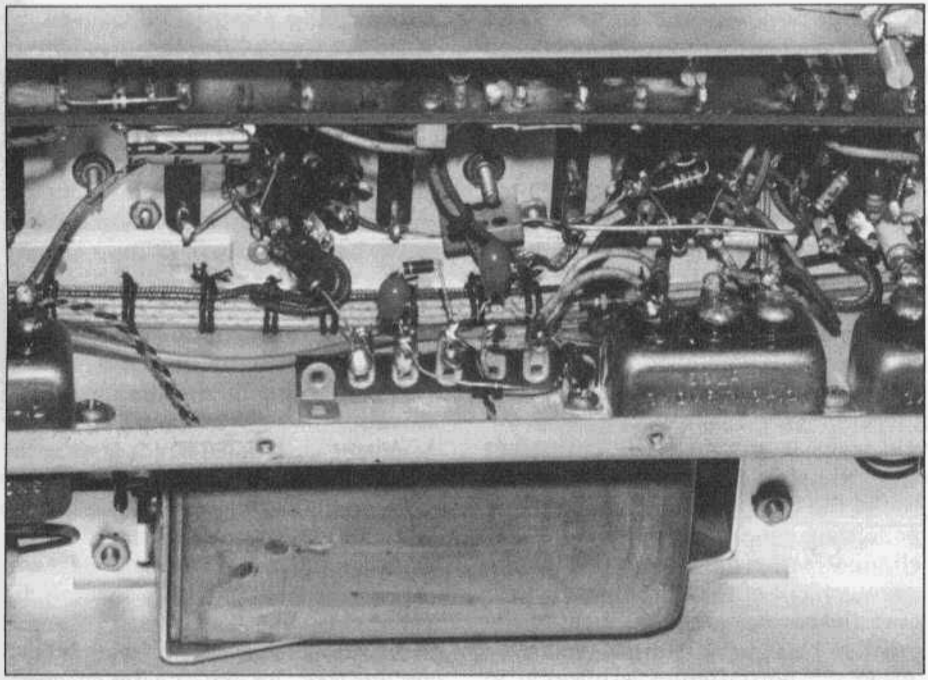
In order to improve upon the limitations of the AVC switching scheme in the 75A-1, an additional 100K resistor has been added between the output of the AGC detector circuit and the original AGC line (shown in Figure 2 at the junction of R35 and C80A). The purpose of this resistor is to allow the AVC switch to short out the AGC line in the MANUAL position while still allowing the RF GAIN control to remain operable. This way, in the "AVC" switch position, the receiver will be controlled by both the RF GAIN control and AGC system voltage. This provides much more flexibility and is consistent with the way virtually every modern receiver works.

The most difficult part was tracing the AGC line from the switch because Collins tied two different sections of the AGC line together at the switch rather than on the bottom side of the chassis. This made figuring out what was going on a bit confusing at first. If you are making this mod, studying this section of the article before you proceed will save you the time of tracing the wires like I had to. It is also an implementation detail you do not want to overlook, or things will not work properly.

The objective is to make a small wiring change that will allow the RF GAIN control to always remain active. Remember the 100K resistor that was added between the output of the detector circuit and the AGC line in the previous section (at the junction of R35 and C80A)? The wiring change in this paragraph is necessary to make sure the switch section that grounds this line in the MANUAL and CW positions ends up on the correct side of this resistor as shown in Figure 2. If you do not make this change, the RF GAIN control will not work in the MANUAL and CW positions.

The easiest way to make the required change is to remove the shroud around the RF deck on the top side of the chassis so that you can gain access to the AVC switch. Note that the purpose of the switch is to ground the AVC line in the MANUAL and CW switch positions. Disconnect the two wires that are attached to the MANUAL and CW positions of the switch. These two wires are actually different legs of the AGC line, with each feeding a different section of the receiver. They are tied together by a jumper at the switch merely for convenience in manufacturing. It would be more obvious if the AGC line was continuous throughout the bottom side of the chassis, with a single wire connecting to the switch. In this case, manufacturing expediency just makes it look more complicated than it really is.

Solder the two wires you just removed together and cover with heat shrink tubing (these wires should no longer be connected to the switch but are still connected together in order to preserve the continuity of the AGC line to various sections of the receiver). Run a new wire from either terminal on the AVC switch where the AGC line wires were just removed and connect it to the junction of R35 and C80A as shown in Figure 2. This new wire grounds the output of the AGC detector in the



The negative bias supply and threshold AGC components can easily be built on one terminal strip. Note the 3-section capacitors in the metal cans (discussed in Part 1 of this article).

MANUAL and CW positions, but because it is on the opposite side of the 100K resistor that was added, the RF GAIN control can always be used, regardless of the switch position.

That's it for the AGC system. Try out your receiver and notice that the S-meter should now deflect upwards when you turn the RF GAIN control back. Notice that you can now quiet the background noise without reducing the volume level of the station you are listening to (as long as they are not right down *at* the noise level). Much more pleasant! The switch on the front panel will now allow the RF GAIN control to be used in all modes (but AGC control voltage is applied only in the AVC position). Much more useful!

Once you have experienced the improvement that a threshold-type AGC system adds to your 75A-1, you'll be hooked and will probably find yourself doing it to all your other boatanchors. I make this simple set of mods to virtually every old receiver I work on. It usually takes less than an hour or two and the "return" on this investment is very high.

Distortion Was Designed Right In!

All right, now that you have finished the AGC mods, let's turn our attention to the audio system and its noticeable distortion. A bit of experimenting will reveal that the distortion is directly related to modulation level, but—for the most part—independent of signal strength. It is quite noticeable on a well-modulated AM signal.

The culprit in the 75A-1 is the noise limiter, which adds distortion *even when it is switched off*! Tests revealed that the negative half of the audio cycle was distorted above about 50% modulation all the time, whether the noise limiter was switched on or off. On the other

continued next page

hand, the positive half of the waveform was clean when the limiter was switched off, but clipped at about 50% when the limiter was turned on. Hmmm... it didn't seem to me like it should be that way...

Before on taking on a redesign of the circuit, I first decided to consult the 75A-1 manual to see if it would shed any light on what Collins had in mind. It is instructive to see what it revealed about their design philosophy for this section of the radio:

"The circuit employed here is a new circuit developed for military use. In this circuit the negative half of the audio wave is automatically clipped at approximately 35% modulation by virtue of the heavy value of AC load impedance in the detector circuit. This eliminates the noise peaks from the negative half of the audio wave. However, the noise peaks still appear on the positive half of the audio wave so the automatic noise limiter is inserted in that is placed between the detector and the first audio stage..."

Well that certainly revealed a lot didn't it?"*...developed for military use... clipped at approximately 35% modulation...*" The resultant distortion caused by clipping at 35% modulation was intentionally designed right into the circuit. No wonder this receiver was so hard to listen to!

Perhaps AM operators are just more demanding about audio quality today than they were back in 1946 (at that time I was not yet crawling in the sandbox, so I can't render an opinion here). My objective is to have a receiver that sounds excellent, not necessarily one that has a supereffective noise limiter. Back when this receiver was designed, it is clear that audio quality was not the primary design objective. It is even more surprising to learn that the negative half of the audio cycle is subject to limiting all the time, whether the limiter is on or not!

Eliminating Distortion Caused by Negative Cycle Clipping

As I began to investigate a fix for this problem, I discovered, to my surprise, that my 75A-1 was not wired according to the schematic (of course not, why should it agree?). Careful inspection of my unit, however, showed that it had never been modified, so I was initially perplexed. A bit of studying and experimentation finally solved this puzzle with satisfying results.

Take a look at Figure 1 and find R37 (47K), which is shown feeding one side of the noise limiter switch, S14. This resistor is switched in parallel with R41 when the limiter is turned off. Well, my 75A-1 was missing R37, and the switch was a SPST, instead of the DPST shown on the schematic. I could not find R37 anywhere and resistance checks confirmed it simply did not exist on my chassis.

A bit of experimentation revealed that adding R37 eliminated clipping of the negative portion of the audio waveform. Hmmm. . . adding this resistor seemed to be in direct conflict with the verbiage quoted above that indicated that it was their *intent* to clip the negative cycle all the time. This led me to the initial hypothesis that Collins added R37 and changed the switch to a DPST as an engineering change—(mid-production)—to eliminate negative cycle clipping. Perhaps this engineering change was even the result of complaints from amateurs about poor audio quality.

Switching R37 across R41 lowers the impedance (i.e. changes the detector load), which in turn affects the point at which the audio cycle is clipped. *Lowering* the value of the detector load will *increase* the clipping point. If you want the clipping level to begin at 100% modulation (an excellent choice for good audio), empirical tests revealed that the cathode resistance should not exceed roughly 60K (R38 +R41). Since R38 is 10K then R41 must be about 50K. Hey, that is just about the value of the missing 47K resistor, R37, which was shown on the schematic!

This evidence helped to confirm the hypothesis that the addition of this resistor was probably an engineering change that was added to later units to correct audio distortion. The serial number of my unit is #1210. It would be interesting to know the serial number at the point the change was introduced. Please send me an e-mail with the serial number of your 75A-1 and the configuration of the switch in your unit. I will compile the results and if there is good response, publish them in Electric Radio. Also, if you have any information regarding factory-engineering changes to the 75A-1, I would be interested in hearing from you.

You should check the switch and the wiring in your unit before making any changes. If the noise limiter switch is a SPST, all you need to do is change R41 from 470K to 47K. The clipping level will then be set to 100% modulation level all of the time (independent of the switch position of the noise limiter). This is the change I made to my 75A-1, since it had the SPST switch.

On the other hand, if the noise limiter switch is a DPST, check to make sure you can find R37 (47K). If you find it, then the source of negative cycle distortion has been eliminated when the limiter is turned off, but the limiter will still clip the negative audio cycle at 35% when it is turned on. If you want to set the clipping level to 100%, regardless of whether the limiter is turned on or off, simply remove R37 from the circuit, and change R41 from 470K to 47K. This provides a total detector load (R41+R38) of 57K, regardless of the position of the limiter switch.

It is important to remember that the engineering trade-off is limiter effectiveness vs. cleaner audio. Clipping at 100% modulation instead of 35% will reduce the effectiveness of the noise limiter, but will produce much cleaner audio. You can, of course, try using a total detector load anywhere between 57K and 750K (R41+R38). If you exceed about 820K, you will have a nearly perfect limiter (at least for the negative half of the audio cycle), but it will produce an unintelligible signal. I was willing to trade off as much limiter effectiveness as was required to produce unclipped, undistorted audio, especially considering that the negative cycle is subject to limiting even when the noise limiter is turned off.

Eliminating Distortion Caused By Positive Cycle Clipping

All right, now we need to deal with distortion caused by clipping to the positive half of the waveform, which only occurs when the noise limiter is switched on. When the limiter is in circuit, it was also designed to clip the positive half of the audio waveform at about 35%. This seemed rather extreme, and listening tests confirmed that it was very annoying to listen to. And anyway, if the limiter introduces so much distortion that it is intolerable to use, what good is it?

A simple change in the value of the load resistor, R42, on the cathode of the limiter will move the clipping point of the positive half of the audio waveform from 35% to slightly in excess of 100% modulation. As the resistance is *decreased*, the limiting point will *increase*. The original value of R42 was 470K and it should be changed to 30K if the desired clipping point is just above 100%. This will, of course, cause the limiter to be less effective, but far more usable. Again, you have the flexibility to choose some other value (between 30K and about 470K), if you decide that you don't want to sacrifice as much limiter effectiveness for cleaner audio as I did.

You'll Love Your Modified 75A-1

Testing a 75A-1 with the clipping point set to the new values of 100% for both the positive and negative half audio cycles revealed that the limiter still removed much (but not all) impulse noise, while at the same time producing very crisp, clear, undistorted audio. These

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RBM Receivers—Navy Semi-Portables Of WW II

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After working on a variety of RCA's superbly designed RBA/RBB/RBC battleship receivers (ER #118), I was ready for another project, hopefully something lighter and less taxing on my back. This left out the RAK's, RAL's and RBL's, besides none of these behemoths had shown up at any of the hamfests I had attended, although a few did appear for sale on the e-mail reflectors. I just couldn't bring myself to pay the freight to have them delivered but this could change after all the fun of rejuvenating old Navy receivers has turned into a form of Zen therapy for me. I just wonder how many other aficionados there are for these historical relics who enjoy their restoration and use? After all, they were designed under the most serious of circumstances and would be expected to reflect the best possible practical thinking!

Looking through various references especially the NAVSHIPS master catalog of 1952 and Styeir's article in ER (#24), I decided my next quest would be the RBM twins. It's very strange that when you decide that you really want something and are willing to pay for it how it will appear from out of nowhere! No sooner had I started looking, a set was advertised on the baswaplist for trade for Drake gear. I had some Drake swap stuff and the fellow on the other end liked the deal and we made the swap. In addition, another ham had a parts unit without a case that I also acquired. So all of a sudden I had three receivers and a power supply.

The RBM twins cover 200 kc -2 MHz and 2 MHz to 18 MHz. They are 11-metal tube single conversion superhets with 140 and 1255 kHz IF's, respectively. They have 1 RF, 2 IF and 3 AF stages, including AVC, BFO and diode type noise limiter. While designed for headphones only, they have a special audio filter in the first AF stage to limit audio frequencies above 3500 cps (generator noise?). They were designed to fit side by side in a waterproof case that doubled when opened as a desk with fold-out legs (Fig. 1). Two men where supposed to be able to carry this case to its location on the beach. I suppose that a one-man radio is a portable and a multi-man radio is semi-portable in this man's Navy! The corresponding transmitter was the TBW and it weighed 200+ pounds. Supposedly six men were needed to handle the whole shebang. According to the manual, the six swabbies were supposed to get this station ashore and set up in one hour! I marvel at the size and weight of this portable gear. Our WW II Navy men must have been in great shape to rush this stuff ashore! The TBW put out about 100 watts. The weight per watt ratio is unreal but they were reliable. Everything was grossly underrated. I would love to have the transmitter but the weight most likely killed any interest in someone hauling it to a hamfest, most of them probably being scrapped? I would bet that very few show up at hamfests because of the weight issue but you do see BC-610's so there is hope. Say, if you have one and want to sell or trade it let me know.

Fig. 2 shows one of my radios after restoration. Besides the electrical work described further on, I oversprayed the cabinets and polished the panel and knobs using Brasso (a metal polish containing an ammoniated detergent and a fine abrasive dispersed clay). The Brasso, because of the fine abrasive, rubs out fine scratches or surface oxidation without damaging

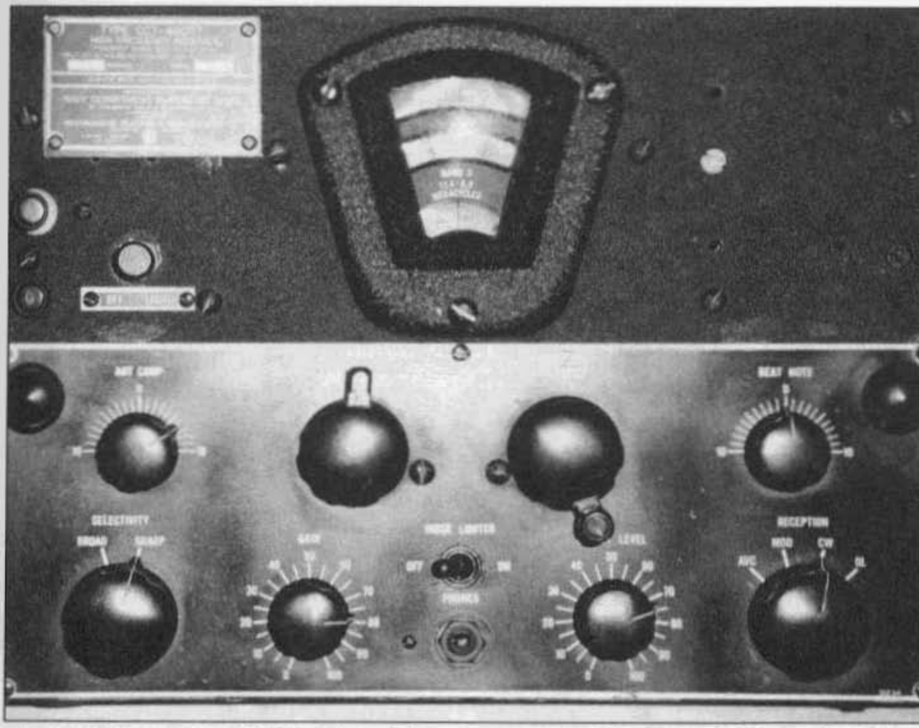

Figure 2. One of the RBM twins. These sets covered 200kc - 2MHz and 2MHz - 18MHz. The corresponding transmitter was the TBW.

the finish. It is especially good on old knobs.

The best thing about this hobby is the help you can find on the various newsgroup reflectors. No sooner had I requested documentation that I found someone (Jack, WA7DIA) willing to copy and send a manual. I try to return this favor as much as possible. After all although an original manual is fun to have, it's not necessary. It's so much more important to put the money into the acquisition of the radios! With the ability to download manuals proliferating on the web, one wonders what will happen to all the manual dealers? With the excellent detailed Navy manual you can jump in and work. They are designed for less experienced technicians like myself who can follow instructions in order to get the unit back into action. You have the feeling you could have qualified for the job!

The RBM's I got in trade were cleaner looking than I expected and I was very pleased with my acquisition. The high frequency RX however was modified in the audio section to bypass the lowpass transformers. The change improves the frequency response? Well I reversed the mod putting the RX back to original. While I was at it, I tested every resistor in the radio replacing any more than 15% high in value. Those low in value actually represent alternative circuit pathways and are just left alone unless later checks suggest problems. Several resistors were replaced with higher wattage versions. Next I checked a selection of the paper caps. In this case, bathtubs and although leaky by my Heathkit checker (400V-closed eye), they did show 10 megs resistance so I decided that I wanted to see how the RX's worked before I started a big recap job. As it turns out, I decided not to recap.

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FARFEST 99

by Norm Chipps, N3RZU
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Good times came to Ham Radio in Bowie, Md. when the so-called Gaithersburg Hamfest arrived the last Sunday in September of 1999. A lot of people missed out as a result of them looking for the old Gaithersburg Hamfest. But it was made better for a select few who were looking for a bargain in old time radio hardware or some of those elusive pieces of military gear. This fest had the biggest array of collectibles seen in the tailgate area in quite a few years.

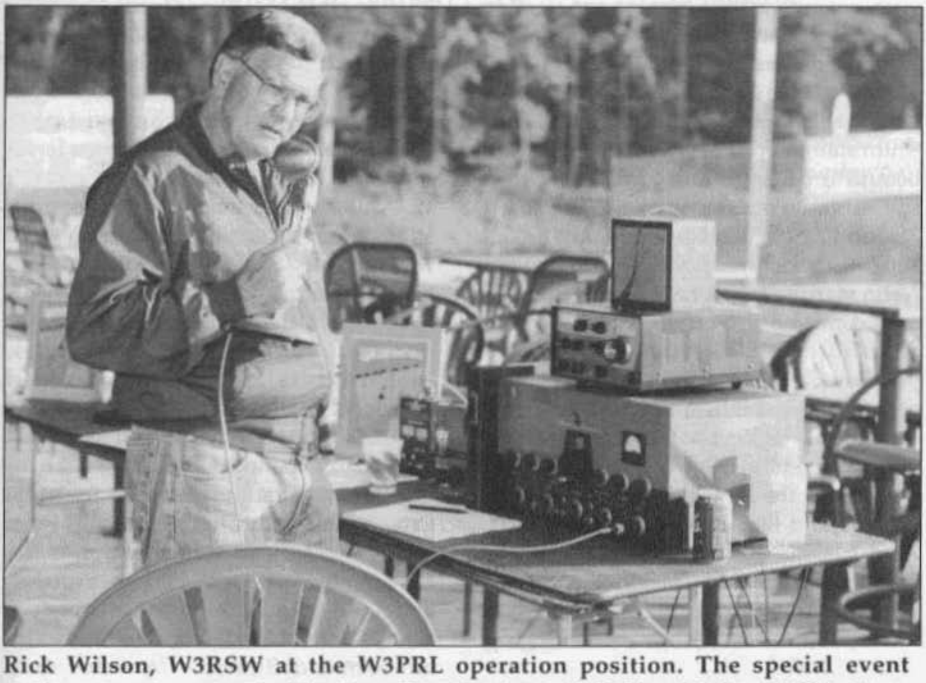
Some typical examples were items like a BC-375 with dynamotor, connectors, as well as seven tuning units for $25 and command sets starting at $5 modified, up to new in unopened cartons for $35. A new and complete crystal set for the BC-1335 in the CS-137 case for $50 and a power supply for the boatanchor RBB with dust for $5. This was only a sampling of what I saw for myself. How about a nice clean CVM-0 mod tranny for $12.50. RAX-7 looking like new for $75. Wow! Some finds were hard to describe as they just kept rolling off the Ryder and Penske trucks. Surplus was abounding such that I thought I had gone back 20 years. Paul, WA3VJB, was there on his hands and knees going through the new in box items from National, Millen and Bud, which was the highlight of one of the Penske truckloads.

A special event station was set up under the Budweiser tent and kept going with W3NP, Dave, and W3OJ, John, W3RSW, Rick, as well as other visitors. The primary station was a Johnson Viking II with a Drake R-4 receiver with a Fan Dipole stretched between two of the light poles in the Baysox Baseball Stadium. A standby station on hand was the famous Multi-Elmac AF-67 transmitter along with the companion receiver, a PMR-7. The antenna was cut for 80, 40, and 20. Next year we may put one up for 160. The light poles let you pick your height up to 150 feet. Vendors were set up along the main concourse with many being in the entrance where tables were furnished by the Foundation for Amateur Radio with this as their main fundraiser along with the proceeds of a local magazine known as Auto-Call. The proceeds help hams with scholarships in higher education throughout the country.

Next year we hope to see a slightly larger crowd as the good words spread to those that did not come. We did not see many visitors from North Carolina due to the floods but this is understandable. VE testing was available to those that turned out at 9 AM and the concession folks that normally serve the baseball crowds provided food. Maryland National Capitol Park and Planning Police provided security and they did a fine job for the day of, as well as the night before. The Radio and Television Museum of Bowie, Maryland was available in the afternoon for those who left the hustle and bustle crowd for quieter surroundings and a bit of air conditioning. They were also were able to try their luck with a QSO using a Marconi spark gap transmitter.

The stadium site seemed to make many visitors happier about the hamfest as it shortened the walk to the vendors areas. The paved parking lot eliminated the dusty fields of Gaitherburg and the parking for shoppers was much closer to the action. Keep the last of September on your calendar free for next year. We will have a bigger fest yet coming for all and we hope that all of the old surplus is not consumed or the real radios are not bought up by all of the collectors before then. **ER**

Norm Chipps, N3RZU, operating the AM special event station W3PRL at the Bowie MD Farfest. The station consisted of a Viking II transmitter with a Drake R4 receiver. *Photo by Paul Courson, WA3VJB.*



Rick Wilson, W3RSW at the W3PRL operation position. The special event station was also operated by Dave Humbertson, W3NP and John, W3OJ. *Photo by Paul Courson, WA3VJB.*

The New Hammond Museum Of Radio

by William Gittere, K2LNU
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October 2, 1999 marked the opening of the new Hammond Museum Of Radio in Guelph, Ontario, Canada. A crowd of over 100 people joined the Hammond family in dedicating the new museum to its chief promoter and architect, Fred Hammond. Fred was the founder of the previous museum but decided to erect a new and more accessible facility which could be visited on a regular basis by all people interested in radio.

The museum is broken into eight major areas featuring wireless age, broadcast, military, amateur, speakers & microphones, Hammond Manufacturing consoles & floor models and a radio room with several operating stations. It also has center islands with several large collections of various transmitting tubes. The two operating stations are Fred's personal station of VE3HC and the museum station of VE3BJ. Both are built into beautiful consoles and are located in a special radio operating room.

During the dedication ceremony, Fred's son Bill spoke to his father's dedication to radio starting when he was 11 years old and continuing over the following 76 years to today. He thanked the many people who helped in the two year project of building the museum and those who contributed equipment over the years. It was the combination of all this which makes this the largest radio museum in Canada and the second largest in North America. He gave a special thanks to Noreen Irwin and Michael Morrison who were most instrumental in the arrangements for the museum and the cataloging of its contents.

Bill went on to say that the new museum has been refocused to include a broader treatment of radio. The previous museum concentrated mainly on Amateur Radio but the scope of the new one is to include a true representation of the history of all radio. They want it to be of interest to people of all walks of life and not just the Amateur community. I think anyone would agree that they did an outstanding job of achieving this objective.

Brenda Elliott who is the Elected Member of the Ontario Parliament offered her comments regarding the influence of radio in all of our lives. She congratulated the Hammonds for constructing such a fine "hidden treasure" which is now visible for all to see. She intends to make a formal statement to the Ontario Legislature regarding this gem which will preserve the history of radio for future generations.

The museum's curator, Noreen Irwin, echoed Bill's comments about creating an exhibit which would be of interest to all people familiar with radio. She said it was designed to be a show place where people visiting the Guelph area could visit at any time during normal working hours and by appointment on the weekends. Michael Morrison, who worked extensively on the cataloging of the exhibit's pieces commented that this is a place where people can truly see the development of radio starting at the spark gap and going through the period when it was also a piece of furniture. It marks an era where people had to use their imagination to fill in for the missing pictures. For the Ham in us, over half of the museum is dedicated to Amateur radio with an extensive collection of transmitters and receivers of all eras. If vacuum

In the Amateur Radio section of the museum, from left to right: Bruce Howes, KG2IC; the author Bill Gittere, K2LNU and Rick Jurkowski, WB2WGX.

tube technology interests you, this is the place to be. As mentioned above, it houses several operating stations used in the previous museum and by its founder. It also has two KW-1s standing in a nicely arranged configuration with a couple of 75A-4s and 51J4s. This display is not operational yet but will be once the antenna lines are installed.

I want to personally thank the Hammonds for the time, effort and resources they put into building such a beautiful tribute to radio. I could never thank Fred Hammond enough for his warmth and friendship over the years. If there is one down side to this grand opening, it was that Fred was unable to attend due the need for an emergency operation. Our prayers for a successful recovery are with him.

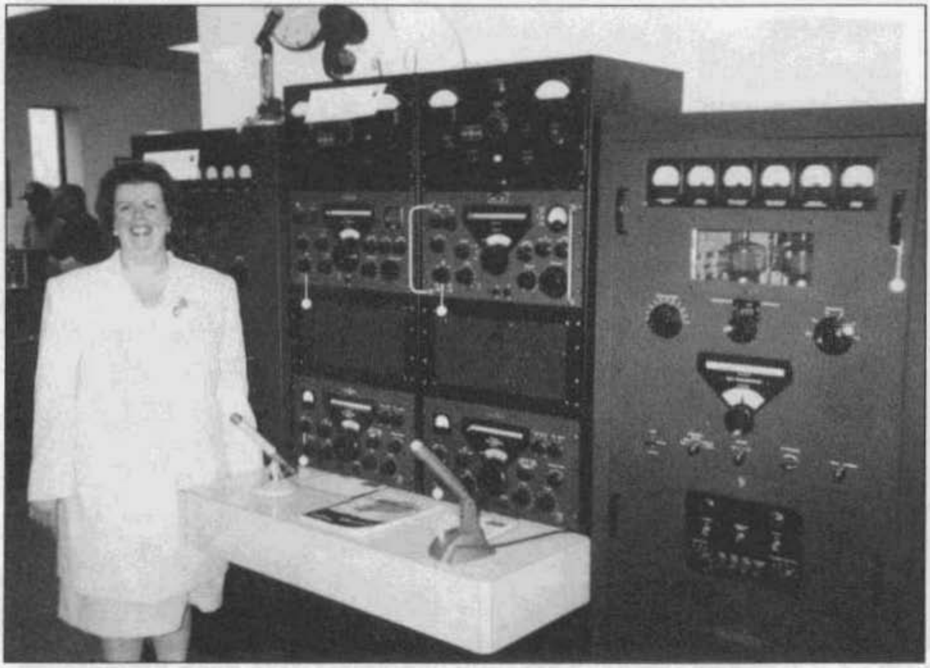
The Hammond Museum of Radio is located at the Hammond Manufacturing Plant at 595 Southgate Drive, Guelph, Ontario. You can visit without an appointment during the hours of 9:00 AM to 4:00 PM, Monday through Friday. Arrangements for visits outside of the normal hours can be made by contacting Noreen Irwin at nirwin@hammfg.com. Advanced notice of 2 to 3 weeks is recommended so that arrangements can be made to provide a host.

Bruce, KG2IC, Rich, WB2WGX, and I had a great time at this opening. We all agreed it would be a travesty to be in the area and not visit the museum. It is certainly a gem to behold for all Hams and radio enthusiasts. A special thanks to Bruce for taking the pictures. ER

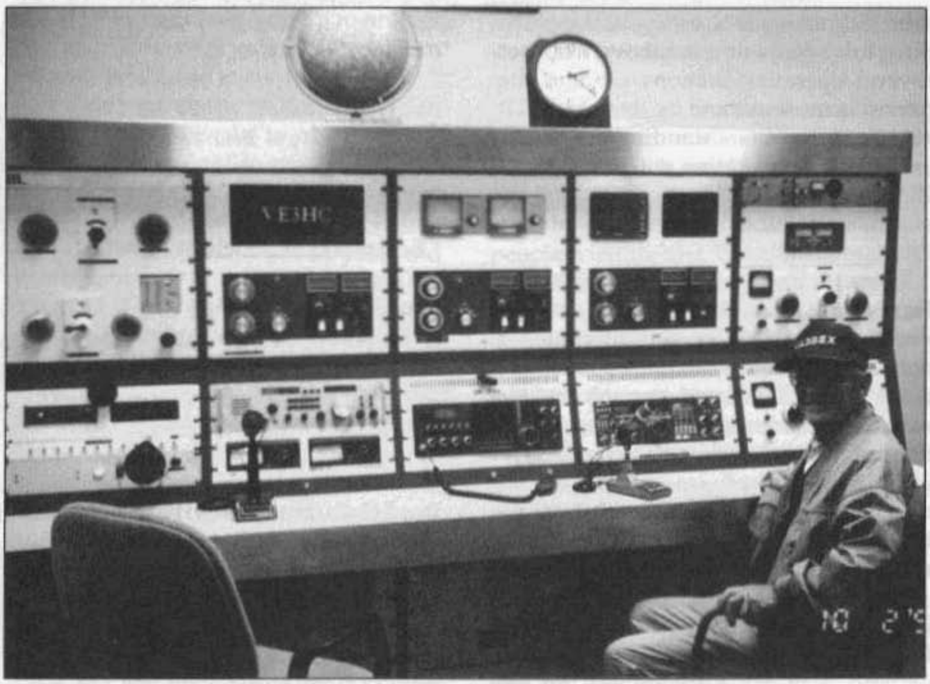
Fred Hammond, VE3HC, Silent Key

November 7, the night before the magazine was to go to the printer, we learned the sad news that Fred had died that morning at 10 AM EST. Next month we'll have more on the passing of this great radio pioneer. N6CSW

More photos on following 2 pages



Noreen Irwin, the museum's curator, standing beside the KW-1/75A-4/51J4 display.



Kenneth Bexon, VA3BEX operating Fred's station.


A view of the museum showing displays of tubes, keys, and breadboard rigs.


Another view showing communications receivers and amateur gear.

Reminiscing

by James Roberts, W4KGO
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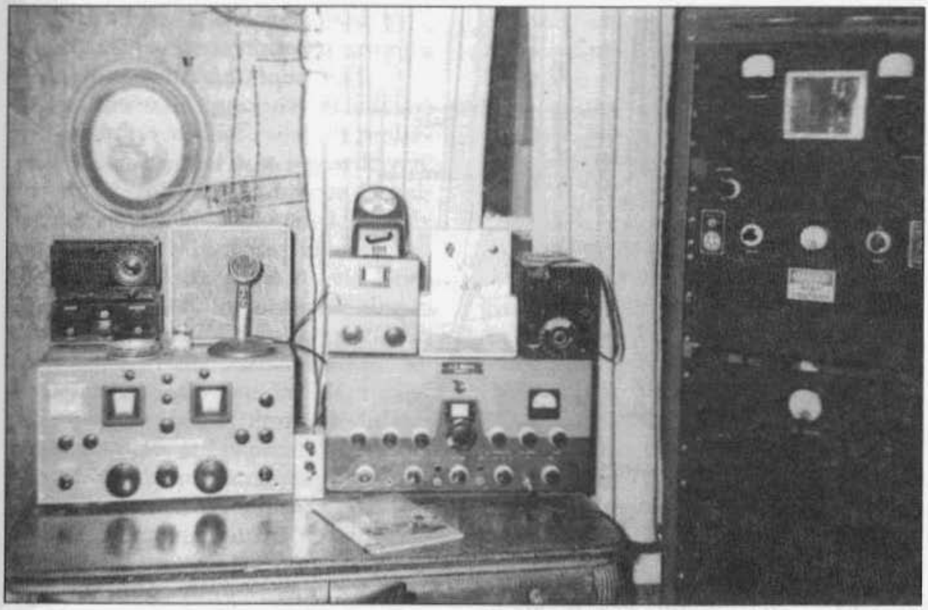
Collierville, TN 38017

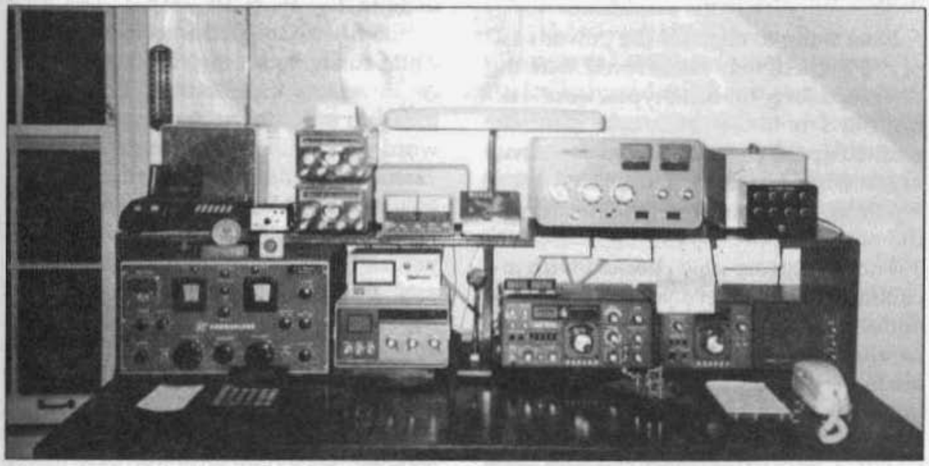
While reminiscing about the good old days, I decided to sort through all of my many photographs from years gone by, and I found several from my early ham days. One photo shows my first ham 'shack' which I occupied after my dear father stopped using it for a chicken brooder house. Still had chicken feathers around. This was in 1946 after I had just been released from the navy after serving three years as a radioman, and had just received my ham license. The code requirement was no problem which was good because I could not afford the equipment required to build a phone transmitter. I did however, come up with a 6L6 osc driving an 807, and with several xtals and close to 100 watts, (pushing the old 807 a bit hard) I had great fun using CW. I used a Hallicrafters S20R for a receiver.

My dad passed away shortly and my mom allowed me to move into the house where I set up my shack in dad's old den (reading room). This caused a little problem however, since over the years I was able to afford and build a phone transmitter running about 500 watts, two 812H's modulated by two 811's giving me 250 watts of audio. Power supplies used the 866 rectifiers. I used an ARC-5 command xmtr as a VFO and a Hammarlund HQ-150 for a receiver, which I still have. My antenna was on the roof which caused a bit of excitement by allowing RF to resonate into

Original "Brooder House" shack, 1946



The hamshack in 1960. The homebrew rock crusher is on the right.



The present-day hamshack. Note the HQ-150 that is still in use.

the house wiring feeding the lights in one bedroom. While on the air one night my mom came in all excited, saying that when she tried to turn the bedroom lights off, they got brighter. (They were already off but induced RF made them glow).

I will relate one more occurrence which proves that old hi-level AM modulation was great. My shack was near an old grandfathers clock which had beautiful chimes. I was in QSO with a ham and transmitting when the old clock chimed. When I turned it over to the other station, he said you must live next to a church. (I did, but how did he know). I asked him how he knew and he said he heard the church bells. I considered this a compliment of my old rock crusher's audio. ER

RBM Receivers from page 29

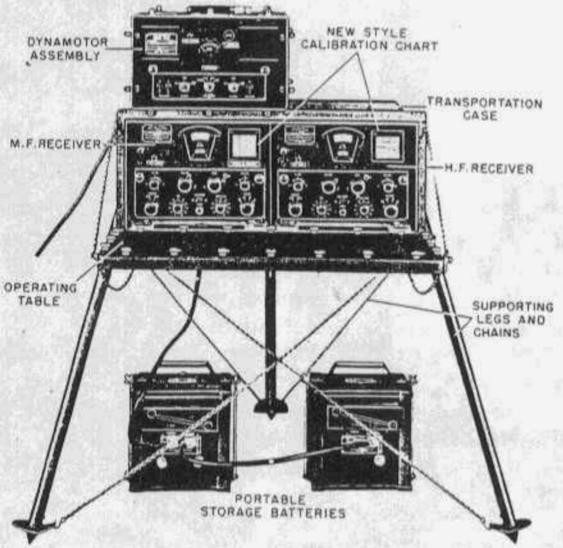


Figure 1. A typical Model RBM semi-portable radio receiving unit, Navy Model RBM-5.

Next thing to check is the power supply. I immediately discovered that the filter caps, large oil-filled types, were leaking oil. I removed both and carefully cleaned up the oil (be careful as you never know what's in this old oil). They were replaced with electrolytics. The rest of the power supply looked OK.

The tubes were now checked with my calibrated TV7D. Never assume anything about tubes in old radios! Check them carefully. First make sure the right tubes are in the right sockets! The RBM's use 12 volt tubes and the power supply produced 12V so something was not right because my radios were full of 6 volt tubes in the right sockets. I had to check the wiring to make sure it hadn't been changed! The second RX had both 6 & 12V tubes. Mind you they were in the right sockets, a 6SK7 for a 12SK7 and so forth. The tubes checked good but I replaced everything with the correct 12V tubes, cleaning the pins and sockets with Deoxit 5. Now at least I was ready for the smoke test.

I use a Variac to slowly bring up the power supply with a voltmeter on the B+ just to make sure the power supply is working. Filament voltage can usually be estimated from visual inspection of glass tubes or pilot lights. No smoke or hot transformer so it looked OK. As voltage reaches around 200V B+, RX usually start to come to life. Watch out when using a Variac as they will go above AC line voltage when turned up all the way. Well both RX's came to life and with an antenna sounded pretty good. All they needed now was a thorough alignment. With the detailed NAVSHIP manual this was a pleasurable task especially when you get big responses in gain in both the IF & RF stages. The RX's seemed to be in spec on sensitivity and could easily detect my HP600A signal at its lowest output setting. I was very pleased with their performance. One word of caution, the trimmers on the various RF and IF stages are the type that have a collar holding the rotor so it doesn't touch the stator. Do not press down with your alignment tool as it is possible to push the plates together as the collars can slip. I have no idea why our Navy tolerated this weakness; possibly they were tested to last a decade not five decades!

In conclusion, the MF receiver has adequate bandspread for 160 but the HF receiver has too little on the other bands and is really not usable on CW for anything beyond casual QSO's. On AM both receivers sound very good. Sensitivity is excellent but selectivity leaves a lot to be desired. Nevertheless, they are fun to work on and to use especially on AM. I just wish I had the TBW transmitter and the other accessories. I'm sure they did the job they were intended for and were considered hot receivers by their WW II operators. ER

The BC-610 Revisited from page 9

ance of the latter is supplanted by a shape that resembles (see Figure 6) a rectangular box standing on end.

Other noteworthy changes include: (1) sealing meters hermetically; (2) replacing the recessed, illuminated, gear driven, final-tank tuning dial with a non-illuminated, three-inch, metal-skirted, directly coupled dial; (3) changing chassis and front panel, interconnections via Jones plugs and sockets with cables running to terminal boards; (4) relocating exciter power supply components from the RF deck to the modulator deck; (5) moving the plate power relay from modulator deck to power supply deck; (6) changing the high voltage plate transformer in the F and G and early H models to one with dual windings in order that the windings may be used in series for tune-up operations, thus eliminating the 16 ohm, 600-watt heater coil in the E-model; (7) reintroducing a plate transformer with a single primary winding in both the late H and the I models and, in each, an 11 ohm, 300 watt resistor, which is connected in series during tune-up with the primary to reduce plate voltage.

Further, a significant mechanical change was made to facilitate maintenance in models subsequent to the BC-610E. For all its outstanding features, the BC-610E is implausibly difficult to service. Assume, for example, that a filter choke on the power supply deck requires replacement. First, the top cover of the E model must be lifted straight up after removing four wing bolts. Second, the back cover must be unbolted, and all leads and plugs between the decks and control panel must be disconnected. Third, the screws and nuts that fasten down the RF section must be removed so that it can be lifted away. Fourth, two individuals must support the modulator deck, one on each side, while a third person detaches the bolts that fasten it to the sides of the cabinet. Then, it has to be lifted above the sides of the cabinet to be removed. Fifth, the bolts that fasten the cabinet to the power supply deck must be extracted so that the cabinet can be lifted away. Finally, after this horrific dismantling process, the filter choke can be serviced.

The three decks—RF, modulator, and power supply—of the post-WW II, BC-610 models are on slide bases that are mounted in the side frames of the cabinet. Service may proceed expeditiously on given components or circuits because each deck can be slid independently of the others out the rear of the transmitter. **ER**

Ed. Part 3 of this article will appear in the next issue of ER. References will be at the end of Part 3.

Collins 75A-1 from page 27

AM audio.

You should also try making the simple threshold-type AGC mods. It is such a pleasure to be able to eliminate most of the background noise and static crashes, especially when working 75M AM at night during the summer months. This will significantly improve your enjoyment of the 75A-1, and make you a convert to the threshold-type of AGC system.

Despite its lack of coverage of the 160-meter band, the 75A-1 is still one of my favorite AM receivers. The precision and stability of its PTO cannot be beat and once the mods are installed, it delivers crisp, great sounding AM.

As mentioned earlier, after you make these mods, don't forget to affix a note to the chassis referencing the date and title of this article, so future owners will know what is going on inside (ER Mods Inside). And keep your fingers crossed that you never have to rebuild the RF deck—unless you have tons of spare time on your hands and nothing else to do.

OK gentlemen, start your soldering irons. **ER**

ER in Uniform from page 14
was named after Isaac Lane, a self-educated ex-slave who became an Episcopal Bishop and founder of Lane College in Jackson, Tenn. The Lane Victory served in WW II, Korea and Vietnam and also sailed in peacetime carrying commercial cargo around the world. The ship was mothballed from 1970 until 1988 when she was donated to the United States Merchant Marine Veterans of World War II (USMMVWWII) by an act of Congress.

Today the Lane Victory, restored and meticulously cared for by volunteers of the USMMVWII, serves as a living monument to all members of the Merchant Marine who so honorably served their country in war and in peace. The ship is open to visitors from 9:00 to 4:00 daily. Attractions include a museum located in the main hold in addition to the fascinating (and surprisingly accessible) workings of the ship itself. There is also a well equipped Amateur Radio Club station (W6LV) located adjacent to the Museum.

The Lane Victory undertakes six one-day summer excursion cruises across the San Pedro Channel and along the north side of Santa Catalina Island. The communications test described in this article took place on the final cruise of the 1999 season.

Final Comments

All-in-all, great fun as well as an event of historical significance. Based on the signal levels experienced, I believe reliable communications could realistically have been maintained between the Fort and vessels operating throughout the San Pedro Channel using only the 30 ft. whip antennas with which these radios were frequently equipped.

I would like to express my sincere appreciation to Mr. Saul Yochelson (W6AS), Chief of the Ship's Radio Department, Bill Marple (AA6ZW), President of the Radio Club and the other members of the Lane Victory crew for their support and encouragement. It is hoped that operation of vintage radio gear can become a regular part of the ship's activities. **ER**

Looking Back from page 2

I had never seen Bud lose his cool but he did then. He first turned white and then red and then practically bowed when he got up to shake Hemmingway's hand. That was the last I saw of both of them for a couple of hours. I knew the bar in the hotel was open and I guess that is where they spent the morning.

About a year later I was scheduled to go down to Key West and I wasted no time in calling Hemmingway, who was there at his home. I tried to convince him to become a ham. I told him "You get a ham license and you can use a nickname on the air, in other words you can be incognito."

He looked at me for a second and said, "Why in Hell would I ever want to be INCOGNITO!"

I would have liked to make him a ham. I know he was interested because he liked people.

Meeting all these famous people—and I knew many—was all because of my connection with amateur radio. Anyhow, very 73 and my new e-mail is lewmccoy@uswest.net. W1ICP

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Don't forget the AMI Thanksgiving Jamboree, November 26 - 28.

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FOR SALE: Original Hallicrafters manuals; NOS General Radio dials, 20's, 30's; Collins 75A* knobs. E-mail for lists, prices, and pix. Derek, K7FF, k7ff@inreach.com

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FOR SALE: ART-13 w/ac ps, works good - $300; Harvey-Wells TBS-50 w/factory ps. excellent - $150. Gary, MN, (612) 496-3794.

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FOR SALE: 49 copies Radio Age April 1988 to October 1992 - $24 plus $4 UPS. R J.Eastwick, N2AWC, 400 N.Haddon Ave., Unit 109, Haddonfield, N.J. 08033. (856) 429-2477

FOR SALE: Collins KWM-2, 312B-5, 75S3-B, 32S-1, Bird-43 wattmeter, Vomax speech processor, Laffayette HE-80, all mint. Jeff Covelli, WA8SAJ, (440)-951-6406, wa8saj@ncweb.com/

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INFORMATION: Available on classic communications gear. Just look at: http://www.geocities.com/SiliconValley/6992/index.htm. Thanks for your visit!. Jose, EB5AGV, eb5agv@amsat.org

FOR SALE: Various parts for homebrewing. List at: http://home.earthlink.net/~af4k/trade.htm FREE: Buy/Sell crystals at: http://pluto.beseen.com/boardroom/b/21532/ Brian Carling, AF4K, af4k@earthlink.net

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WANTED: Working rcvr R-1004. K4TFJ, Monogram@hiwaay.net

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

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

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WANTED: Plug-In coil sets for aircraft radio RU-18, or CW-46048D, must be painted not bare aluminum. Part numbers are: CW 47105, 47112, 47107, 47108, 47068, 47069, 47070, 47072, 47075. One or all must be in good condx. Ray Chase, 1350 Marlborough Ave., Plainfield, NJ 07060. (908) 757-9741, enrpnr@erols.com.

WANTED: Cetron 3828s or any that glow; any NIB 813s. Sam Champie, W7XXX, 105 W. McKenzie, Hermiston, OR 97838. Weekends (541) 567-2879

WANTED: Hallicrafters SX-25. No rust/mods. Pay to $1,000. Mint operating condx. Steve Schneider, Box 22801, Telluride, CO 81435. spsmpc@rmi.net

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

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FOR SALE: RELiant S-119 communications system, Collins plug-in filter, working. Dick Bean, K1HC, 422 Everett St., Westwood, MA 02090-2218, (781) 461-0101, K1HC@AOL.COM

FOR SALE: Heath HW-202 & HW-202-1, AC PS w/manuals; BC-348L parts radio; ARC-5's; Clegg 22er, AM. Marvin, 2957 Caffney Rd., Richmond, VA 23235. (804) 275-1252, wa4toj@juno.com

FOR SALE: Heath HW 202 2 meter fm rig with HS-20 spkr and fixed station ps, also have mike, all for $75; Heath AM-1 ant bridge, dial has crack, rare item - $20; Hallicrafters SX-101 needs pitch control and knob - $75; National NC-300, works, case needs work, front panel has some wear - $175; AM-2 swr meter good shape - $20. Shpg not included on the above. Marty, WB2FOU, NJ, (609) 466-4519

FOR SALE: Collins: KWM380; HF2050; 51J4 manual; 112 66J tube shields; HF 3-ring brinders; dual amplifier 528-0220-005; 7553 front panel; GPS mobil mounts; R392 pwr sply; 7 panel meters; (3) 807s; AC control pan™el; So™™la continous voltage xfmr. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

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

FOR SALE/TRADE: Manuals for Johnson, Elmac, Gonset, RME, Harvey-Wells, Morrow, Drake, Clegg, Swan. NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536, ni4q@juno.com

FOR SALE: Galena xtal radios or parts; small radio parts are FREE S & H not. L. Gardner, 1158 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

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

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (248) 391-6660, hires@rust.net

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FOR SALE: Estate: Globe King 500A; VFO 755A; DX100; DX-100B; Viking Ranger; DX60; HG10B; VF1; DX40; AT1; EICO 720; EICO 730; Conar 400 & 500; Knight T150A; SX42 w/R42 Reproducer; SX99; R46; R46B; R42 Reproducer; Tempo1 w/pwr sply; R390A; Heath CR1; Skyhawk model 21; unbuilt Heathkits; Radio Craft 1930s & '40s; SX71 black face; Drake 2 B w/matching spkr QX, R4B, MS & PS4; TMC PMO5; National coils (plug-in); Aerocom 100XLA xmtr & pwr modulator; Hallicrafters HT40, VF5, VFO; Vibroflex Blue Racer. Pictures available. Bill, KB8IJC, WV, (304) 842-4635.

FOR SALE: B&K model 415 television sweep marker gen - $50; RF communications RF-403 VHF xcvr - $50; Heath HD-15 phone patch - $25. Al, WA1RWB, MA, (508) 325-7122

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WANTED: Heath HA-10 Warrior amplifier. Cliff, WA9SUE, WI, (608) 625-4527 after 6pm.

Please remember to count the words in your ad and if you're over 20 words send 20 cents for each extra word.

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

WANTED: Connector 49134 female for LM-13 frequency meter. Picture at http://www.shlrc.mq.edu.au/~robinson/museum/plugs/49134.gif. Ray Robinson, VK2ILV, 7 Roland Ave., Wahroonga, 2076 N.S.W. Australia (612)94898561

WANTED: Crystal set. It looks like a rocket ship, the nose cone goes up and down to adjust the station, has earphone and alligator clip to ground. Jim, KD5GHO, (918) 836-9113, JRoden1013@aol.com

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

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

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

FOR SALE: Dial/clock covers. Send bezel, old or drawing, make/model, guaranteed satisfaction - $10 ppd. William P. Turner, WAØABI, 1117 Pike St., St. Charles, MO 63301. (314) 949-2210

WANTED: TM or NAVSHIPS orig. if possible w/ schematics for AN/URM-25 & AN/URM-26. David Boardman, VA2DVD, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4, Canada (418) 877-1316

WANTED: Model number for Silvertone Radio with large 7" round dial, 6 tubes, tuning eye, 4 knobs, 8" dynamic speaker with 12-1/4" extension collar. Need schematic. Werner Dolder AA4IX, 327 Heber Rd., Summerville, SC 29485. aa4ix @ juno.com

WANTED: Scott SLR-F rcvr. Prefer clean, working, unmodified example of this WWII merchant ship rcvr. Tom Mackie, W2ILA, 14 Washington St. Jamestown, RI 02835. (401) 846-1200, wilax@aol.com

WANTED: WW-2 Japanese military radio of any kind; Hammarlund PRO-310. Takashi Doi 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069, takadoi@carrot.ocn.ne.jp

WANTED: WW2 radar stuff - shipboard, aircraft, ground, little and big. ASB antennae most needed. William Donzelli, 15 Gen. MacArthur Dr., Carmel, NY 10512. (914) 225-2547, aw288@osfn.org

WANTED: Transconductance tube tester; Heath, Cornell or other tuning eye type condenser checker, in good condx; FL-10 filter, misc. female connectors for BC-474A. Carl, KN6AL, POB 3531 Laramie, WY 82071. (307) 742-0711,

WANTED: Broadcast gear; tube or solid-state, compressors, limiters, equalizers, microphones, consoles, micpreamps, recorders. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax or mstates@polarnet.com

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. (307) 322-5858, feltoned@coffey.com

FOR SALE: Dr. Radio repairs vintage ham gear. Steve Trimble, K5DJH, Box 73, Weston, TX 75097-0073. (888) 73-K5DJH. k5djh@texoma.net

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

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

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

FOR SALE: 'The Gonset Guy', basement full of Communicators, 10 meters thru 144 MHz, including CD aircraft versions; many mobile converters & VFOs, phone patches etc - Ask. Steve Gross, N4PZ, IL, (815) 734-4255.

WANTED: Documentation R274D/FRR military SX-73 modification replacing xtal filter w/3 Collins mechanical filters. Professional modification but have no schematic. From estate W5HWJ. Clement Burke, W5IXR, NM, (505) 689-2367

WANTED: Tube Mallory TV 101 UHF converter, working & reasonable. Hoover Noonan, Rt 1 Box 187, Pineland, SC 29934. (843) 726-5762

WANTED: Winchester plug to mate w/M-10-P chassis mounted connector. Leonard Meek, 2265 Komo Mai Dr., Pearl City, HI 96782.

WANTED: Heath DX-100B xmtr & a HW-104 Heath station. Pete Culhum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

WANTED: Swan 80 meter monobander xcvr & Swan 160 xcvr. Ted, CO, (303) 680-3922, nettz@aol.com

WANTED: Coil sets B & D for National HRO-5A1 rcvr. These particular coil sets have a 8x2" etched aluminum dial calibration chart on the front plate. Would consider complete rcvr. **FOR SALE/TRADE:** Coil set A & C for National HRO-7. Roger Zaun, W9UVV, 4902 W Parkview Dr., Mequon, WI 53092. (262) 242-4931

WANTED: Restorable cabinet for SX-101 rcvr. Marv, W5TQO, 512 River Oaks Rd., Comfort, TX 78913-2705. (830) 995-3571

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

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 399C-1; 62S-1; KWM-1; 302C-3; 51S-1; 75S-3C; 32S-3A. I buy any Collins equip. Leo, KJ6HI, CA, Ph/Fx (310) 670-6969. radioleo@earthlink.net

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WANTED: Information-WW2 TCS Radio System: Design, Manufacturing & Operation for article. Any help appreciated. Thanks. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. (707) 523-9122 (message) greg6fzh@aol.com

WANTED: Tube-type Hi-Fi & guitar amplifiers by ACRO, EICO, Fender, Marantz, McIntosh, Pilot, Triad, UTC. Rob, CA, (510) 845-2625.

WANTED: Narrow based Vibroplex bug (3" or less); front panel for EAC R-390A. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688

WANTED: Rohde & Schwarz rcvr EK-07. Harry A. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: 3.1 filter for 51J4. George E. Speers, 47145 Ford Rd., Canton, MI 48187. (734) 981-3899

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

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

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

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

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

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

WANTED: Parts for TCS rcvr & xmtr that I am restoring. K6GPB, 5319 Sierra Vista Rd., Murphys, CA 95247. earlw@goldrush.com

WANTED: Scott Special Communication rcvr; Hallicrafters SX73. EA4JL, contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: Military radios: British C-13, PRC-316; Czech RM-31; Soviet R129. Leroy Sparks, W6SYC, 924 W McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123, leroysparks@earthlink.net

WANTED: Data or schematic of navy rcvr CCT46217 as part of RBS-1 system. R. Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083. (856) 783-4175

WANTED: Hallicrafters R-R console spkr; Riders 1-4, 15, 23. **FOR SALE:** Riders 6, 9-15 - $20 ea; Heath HP13 - $45. Tom Stiefel, ABØER, 611 2nd St., Yutan, NE 68073. (402) 625-2013

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WANTED: Plate current meter for Knight T150A. Bob, K6GKU, AZ, (602) 770-7829 photobob@prodigy.net

FOR SALE: McMurdo Silver plug-in coils, 5-pin 100-106, 6 total NOS - $35. Henry Engstrom, KD6KWH, CA, (707) 544-5179, pacifica@sonic.net

FOR SALE: SX-42, fair - $100; rare Swan MK-1 linear, mint - $650. Keith Perry, K7PSZ, 384 S. 48th St., Springfield, OR 97478. (541) 726-1512

FOR SALE: Full years QST 1937, 1938 - $30 ea; 1931 - $35. Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660. (773) 262-5360, 262-0016

FOR SALE: Thomas A. Edison TG-8-C code transmitter & recorder w/spools & manual, exc condx - BO. , W7MXM, ID, (208) 522-5854, W7MXM@juno.com

FOR SALE/TRADE: UTC S-18 modulation xfmr NIB; also old catalogs, magazines, handbooks, manuals. Al Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536, ni4q@juno.com

FOR SALE: Buck or Boost trans 2 KVA 120/240 PRI 16-32V sec - $70. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: Transformers: pwr, line, filament, most brand new, filter chokes. SASE for list. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405-2375.

FOR SALE: Morrow Twins - $225; Hallicrafters HT-40 - $75; SX-42 - $325; SX-100 - $285; Heath HO-13 - $130; HW-16 - $115; SB303 & CW - $195; Lysco GDO - $65. Free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. rprester@warwick.net

FOR SALE: Heath audio amp AA-100 and AJ-41 sterio rcvr - $125 for pair. Plus shpg on both. Marty, WB2FOU, NJ, (609) 466-4519

FOR SALE: Tube type kits for CW/AM. Vintage Radio Kit Co, 427 North Main St., Sharon, MA 02067. email us at CPCW-5 @aol.com or visit our web site at: http://www.mnsinc.com/bry/vintage.htm

FOR SALE: One HTX 100, 10 meter xcvr - $125. James Barton, POB 417, Burke, SD 57523. (605) 775-2044

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FOR SALE: Cleaning out storage: 72 pieces test equip; 30 pieces shortwaves & amateur radio; 50 pieces audio; 1000+ Sams photofacts; semi-trailer full of misc. PU only on lge items 100 miles north of New York City or will meet within same. Send SASE or e-mail for list. Clayton Vedder, 1037 Rte 23A, Catskill, NY 12414. (518) 678-0475 or cvedder@mhonline.net.

WANTED: TMC GPT-750, TAC Tuner, GPR-90/92 & GSB-1. Alan Gray, W3BV, PA, (215) 795-0943.

WANTED: Hallicrafters S-39 rcvr Skyranger. Bob, K1YJK, CO, (303) 768-9200, k1yjk@arrl.net

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

WANTED: National NCX5 & NCX1000. Bob Zarkovich, 9501 Brien St., Anchorage, AK 99516. (907) 346-1044

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

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

WANTED: A quartz crystal historian is looking for documentation, specifications, films, and other materials relating to crystal resonator design, manufacturing, and use both before and during WW II. Common items (QST articles, Buchannan's book, etc.) are not needed. Looking for items like: The 62 mimeographed bulletins which were published by the Galvin Manufacturing Company of Chicago, Illinois during WW II; MIL-C-16B Crystal Unit, Quartz (CR-1A/AR, Pressure Mounted); Frondel, et al., "Handbook of Manufacture of Quartz Oscillator Plates", Quartz Crystal Section (OCSigO), 20 August 1942. Contact me for a list of items sought. Ken Burch, WB9TRY, 11309 April Dr., Austin TX 78753-2946. ep5231@email.sps.mot.com

WANTED: Four to six foot equipment rack. Al, W1BY, 26 Foster Rd., Essex Jct., VT 05452. w1by@hotmail.com

WANTED: HT-5 speech amp for BC-610; tubes 100TH & 250TH. Gary Wiley, W4ZXS, 8125 Lunenburg Rd., Keysville, VA 23947. (804) 736-9029

WANTED: Female plugs for BC375 or BC191. Charles R. Lackey, W4QBE, 1252 Worley Creek Rd., Lakemont, GA 30552. (706) 782-3670

WANTED: BC-610E mod xfmr, DM-24 dynamotor. Pete Hamersma, WB2JWU, POB 467, Holderness, NH 03245.

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

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

WANTED: McKay Dymek radio literature & info. Gene Peroni, KA6NNR, POB 58003, Philadelphia, PA 19102. (215) 665-6182

WANTED: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1, 51S-1; 75S-3A, C32S-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: Tube type shortwave converters, preferably pre-war. David L. Muse, 510 Minturn Ave., Hamlet, NC 28345.

WANTED: Hallicrafters SX-88 in good working order, will pay top price for clean radio. John Evans, N3HBX, MD, (301) 253-1847

FOR SALE: Collins SM1 - $200, SM3 - $200; SM2 as new/orig box - $250; 180S-1 RE as new - $375; CP1 exc - $125; 136B-2 blanker c/w dual gain pot & knobs - $150; orig 6.0 kHz AM filters, 75A-4 - $250, 75S3-C - $250; 51S-1 - $250, 51J4 - $200; ARRL H/BKS 4th Ed - $80, 8/9/10th Ed - $60 ea; Drake Cyclopedia 1927, mint - $80; 200 Mtrs & Down 1936 - $60; Jones 1936 ant h/bk - $50; Progressive TX Contruction Guide & Supplement 1936 - $50; early radio books & mags, 1912-1929, send for list. Garry Marcon, VK3GY, POB 557, Heathcote 3523, Victoria Australia. Tel: 03 54 333 973

FOR SALE: TMC SBE-2 exciter & HB pwr sply - $150. PU only. Lou, K4LOU, VA, (540) 347-2196.

FOR SALE: (1) ea SX100, mint w/manual; MK1B; BC639A, mint; HQ110C. Frank, TX, (972) 562-8327. frcis54aol.com

FOR SALE: Hallicrafters S19R, 1939, very clean, no mods, working - $150, OBO; Collins manuals: KWS1 - $25, 32S1 - $15; Kenwood 701A w/pwr sply - $300; Yaesu FT51R like new - $320; Kenwood 7930 - $125. G Stevens, WØATA, Box 704, Longmont, CO 80502. (303) 776-9036, vintage1@prodigy.net

FOR SALE: Military radio TM's, origs & reprints. New list. Send $1 & address label to Robert Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043-2410. (713) 467-5614

FOR SALE: Hallicrafters S-22 rcvr, fair to good condx, no book. Fred Clinger, OH, (419) 468-6117 after 6 PM.

FOR SALE: Swan 350A w/pwr sply - $150. **WANTED:** Hallicrafters SX42 & SR-400. Robert Braza, W1RMB, RI, (401) 434-1629.

FOR SALE: Classic gear - SASE for list. **WANTED:** Vintage rigs. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (734) 454-1890

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

FOR SALE: SASE for list of reconditioned gear. Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670

FOR SALE: Military and commercial communications items: www.maxpages.com/murphyjunk. For up to date lists: murphy@cts.com. Mike Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. (619) 444-7717

FOR SALE: Join SPAM, the society for the promotion of AM. Lifetime certificate $1, SASE. W4CJL, 202 Baker Dr., Florence, AL 35630.

FOR SALE: Swan 500CX w/PS, 508VFO, VOX & manual, very clean, not tested - $325 + shpg. Chuck Storni, 772 Johnson, San Luis Obispo, CA 93401. (805) 544-8865

FOR SALE: JBL Signiture series 2-way monaural spkr system (from 1959) w/a N-1200 crossover network, in a 36" x 15-3/4" x 25-1/2" mahogany cabinet plus a Sherwood S-2000 FM/AM monaural tuner & S-1000-II 36 watt monaural amp (tube types). Rich hi-fi sound w/deep bass. Spkr in exc condx. Sherwood tuner & amplifier both work but need reconditioning & some repair - $595. PU only, too big to ship. Bob Eckert, 133 E. 7th St., Clifton, NJ 07011-1104. (973) 340-0579

FOR SALE: Millen 90651 grid dip meter - $85; Millen 10039 dial assy, NIB - $35; open wire relay assy in alm box, 2.5x 4.5x 6.5, w/beehive ins, new - $50; Hallcrafters main tuning knob - $14; two 1-1/8" knobs for S22-Sx24-Sx26 etc - $12 both. **TRADE:** New or used 304-TL sockets for 833 sockets. Boyd, KØLGG, NE, (402) 551-3085

FOR SALE/TRADE: Outstanding HO-13 scope for HO-10, SB610 or S-200 spkr. Greg Yost, W8RCA, 744 Patterson Lake Rd., Pinckney, MI 48169. (734) 878-2465

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

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

FOR SALE: Hallicrafters SX-101A w/orig manual - $170; BC348M w/orig military manual - $150; Heath HW-101 & HW22 xcvrs w/HP23B AC pwr sply & Heath spkr, manuals - $150 for all 3; EF Johnson 6N2 converter $25. + shpg. Jerry Kopack, KF6MYE, 654 Shanas Ln., Encinitas, CA 92024. (760) 436-6238, jerry_kopac@MSN.COM

FOR SALE: HRO-W rcvr w/coil for 1.7 to 4 MHz - $150; RAK-7 rcvr, 10 kHz to 600 kHz - $50; RAL-7 rcvr, 300 kHz to 23 MHz - $95; SX-28A rcvr - $250; TCS xmtr - $50. Buyer must PU, no shpg. James Owens, NWØO, 1363 Tipperary St., Boulder, CO 80303. Call between 6 & 9 pm (303) 673-9019

FOR SALE: National WWII RBL-2 & NC-120 rcvrs, clean, working - $500 for pair. Stuart T. Carter II, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904-1995. (407) 727-3015

FOR SALE: BC-348Q orig condx w/dynamotor & rack, works good - $200. Gary, W8MFL, MN, (612) 496-3794.

FOR SALE: QST 1977 to date - $275; RCA RHC 17N RLC20 AM FM - $10 ea; all + shpg. Onerio Lou Sabetto, W8PIU, 1717 Burgess Rd., Cleveland, OH 44112. (216) 481-1036

FOR SALE: Collins mechanical filters, probably military, circa 1950s, list SASE, call afterwords; Gonset II. Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612

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WANTED

Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011. FAX (805) 259-3830

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