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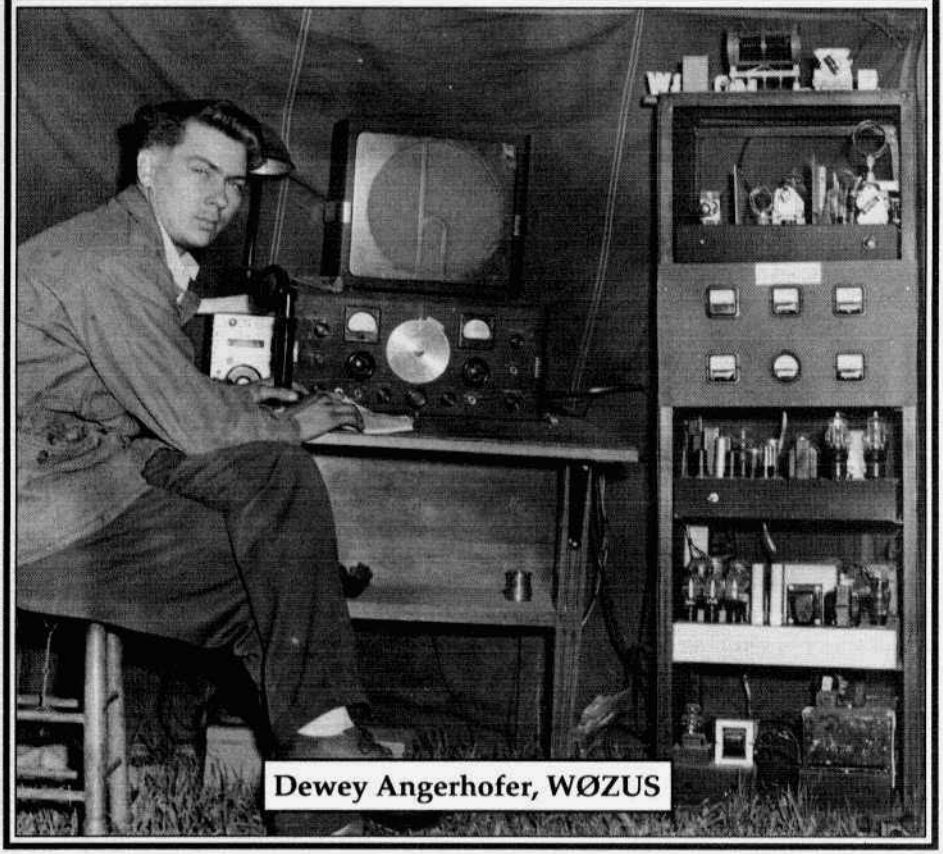
ELECTRIC RADIO

celebrating a bygone era

Number 69 January 1995



Dewey Angerhofer, WØZUS

ELECTRIC RADIO

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; John Staples, W6BM; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Jim Musgrove, K5BZH; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Dick Houston, WØPK; Andy Howard, WA4KCY; Skip Green, K7YOO; George Maier, KU1R; Albert Roehm, W2OBJ; Mike O'Brien, NØNLQ, Steve Thomason, WB4IJN; Don Meadows, N6DM; Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

We start out the New Year with the added burden of increased postal rates. The cost to us will be considerable but we have no plans to increase our subscription prices. I've decided that I'd like to make up the shortfall by increasing advertising rates. The free classified ad that subscribers receive will be reduced from 25 words to 20 and the additional word rate will be increased from 15 cents to 20. I don't think that this will cause anyone hardship but it should help us make up for the increased postal rates. Display rates will also increase.

The two 160M contests, the first on Thanksgiving weekend sponsored by AMI and the second on Dec. 26th sponsored by ER were both well attended. Next issue we'll have reports on both. So far I've received only a couple of logs for the ER contest. One of them, from Gary, W7FG, could be the winner. He worked a total of 68 stations. Although most AM'ers are not contest oriented they certainly enjoy the increased level of activities that these events create. More ER sponsored contests are in the works. The next one will probably be on 15 meters. We'll talk more about it next month.

I'm very excited about our new AM WAS award program; see page 18 for all the details. If the level of participation is as high as we think it will be, we plan on expanding on the idea. We may have a WAS award for single bands and perhaps something for Worked All Continents. And when 10 opens up again we'll consider a DXCC award. I think that it's going to be a challenge to work all states at this point in the sunspot cycle. Who's going to be first to do it?

Following the lead of another vintage radio publication, "Antique Radio Classifieds", we've separated our FOR SALE and WANTED ads in the classifieds. For some time we've been receiving requests to do this. Please let us know how you like the change.

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Cover: Dewey Angerhofer, WØZUS, (then WØZNS) at Richmond Lake, South Dakota, Field day in 1950. The transmitter shown was a group effort of the club; everyone contributed ideas and parts.

The AWA James Millen Memorial Station Special Event

by William B. Fizette, K3ZJW, V.P. AWA
and
Bruce Kelley, W2ICE, Curator, AWA Museum

News Flash! Millen Transmitter Generates Pileup!

Promptly at 3 PM, December 4th, 1994 the restored James Millen AM transmitter and HRO receiver, located at the Museum Annex of the Antique Wireless Association in Bloomfield, NY, went back on the air as W2AN on 3867 kHz.

Bruce Kelley started the event by working VE3HC after which time he turned the mike over to Bob Raide, W2ZM. Stations were piled up on or near the frequency for the next 3-1/2 hours eagerly trying to make contact.

Bob handled the situation like an old pro. You would be led to believe he had been in similar situations fighting DX'ers seeking a new and rare country. For a time he was making new contacts in less than a minute each! I am sure James Millen, the Father of the HRO receiver, would be proud of Bob and knowing his 60 year old transmitter was commanding so much attention.

Not having time to write, he kept his son Mike, KF2MW, busy entering new stations worked in the log. Here are some of the comments from those worked:

"I haven't heard an AM pileup like this in 40 years!" ---W2LV
"I read about this xmtr in 1937 and never dreamed I would work it!"--- NØTE
"Beautiful signal ---" AB1I
"Millen xmtr great--makes me glad to be AWA member.."--- KC4GQA
"A great thrill."--- KB1BFZ
"My 2nd AM contact in 20 years." --- W1YCW
"Great signal and audio."--- N3LHB
"A masterful job - never heard such a pileup on AM."--- N2GIG
"Sounds great and turnout even greater!"--- W3OER
"Thrilled to work the Millen W1HRX station."--- W5USP
"Sounded super with broadcast quality."--- N2SHG
"Excellent AM audio!"--- K2CAB
"Great fun to work a bit of history. . ."---KA2KGM
"What a pileup! Wouldn't have missed it for the world."--- VE3CUI
"Sounds great--pleased to work a piece of history."--- KD3SK
"Millen xmtr fb!"--- N8MS
"Glad to work Millen station. S9+ in Arkansas."--- W5PV
"Audio & signal incredible! Thanks for the memories."--- AE8O
"Transmitter brings back memories as former Millen employee."--- W1MGP
"Provided amateurs a chance to share illustrious past."--- WB8HUZ
"Thanks for bringing history back on the air. . ."--- VA3SW

History of The Millen Station

AWA members are aware of the James Millen station's history and how it arrived at AWA. Briefly, for the benefit of readers of *ER*, the station was donated by Jim Millen to AWA in 1983, and transported to the AWA Museum at Bloomfield, NY in 1985. The transmitter was restored by W2ZM and the receiver by K3ZJW during the winter of 1993-1994, and the special event reported upon above was held on December 4th and 11th, 1994. Over 250 75-meter stations were worked on all modes, the Millen HRO being used for the AM stations and a 75A-4 for the SSB and CW contacts.

Millen, the GM of The National Company, used the station as a proving

Front and back of the special event QSL card.

ground both for circuits and National-produced components, and as a source of much written material. He also had developed a close relationship with ARRL and with Ross Hull, the editor of *QST*, who, the story says, used the station to talk back home to Australia. In effect, Jim Millen, besides being a competent engineer and a visionary, was an expert at "networking" with people and resources, long before the term came into popular use.

The complete station assembly comprises three six-foot relay racks, and includes a receiver and two transmitters. The actual restored high-power transmitter consists of a 53 crystal oscillator, feeding a pair of RK20s in push-pull, coupled into the PP finals. The modulator is a pair of 851's driven by a National NSA speech amplifier, and separate power supplies feed the various stages. The AWA Annex antenna used for the event is a 160-meter dipole mounted as an open horizontal loop, about 40 feet off the ground. A conventional antenna tuner completes the assembly.

The restoration process of the transmitter consisted mainly of locating replacement HV and modulation transformers and reconfiguring it for the 75-meter band from the original 20-meter setup. Also, it was necessary to reduce the power levels from Millen's day to the present-day 1500-watt PEP limit. Unfortunately, the original WE 251A triodes were found to be broken, and direct replacements were not available. Suitable substitutes were found in the vintage 204A, which performed to the complete satisfaction of all.

The NSA speech amplifier was made operational by the usual process, that of replacing all capacitors with modern Mylars and new electrolytics. Being his-

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The SB-33 Transceiver

by Walt Hutchens, KJ4KV
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Arlington, VA 22207

Okay, pop quiz. Who built the first compact ham SSB transceiver? And when was it marketed? ICOM in the '70's? Surely not National or Collins . . . Could it be Yaesu's FT-101, in 1968?

Actually, no - take a look at that rusty and smoke stained box over there, on that hamfest 'estate sale' table. It's clearly a transceiver – and all there, including a rotted line cord and an external VOX accessory. What a mess . . . but somewhere inside every vintage enthusiast there's a small voice that says the thicker the dirt, the better the radio. . . At $5, the price seems right, so let's take it home. "The guy ahead of you got the linear" says the seller.

Overview

The Sideband Engineers SB-33 is an amateur transceiver covering 200 kcs segments of 80, 40, 20 and 15 meters.

The set measures 6" x 12" x 10" (H x W x D) and weighs 15 pounds including the built-in 110 VAC power supply. It operates USB/LSB only (no AM or CW) and is rated at 75 watts PEP output.

The set is designed to match a 50 to 125 ohm unbalanced antenna. There are 8 front panel controls and a built-in loudspeaker. The meter reads PA plate current or relative output; it is unused on receive. Jacks on the rear panel of later versions accept another mic or loudspeaker. There's a rear panel adjustment for carrier balance.

The main dial is directly calibrated in units of 10 kcs; the tuning rate is 30 kcs per knob revolution. The SB-33 uses three tubes and 19 transistors.

Advertised accessories included a carrying case, an inverter to allow operation from 12 VDC, a VOX unit, the SB1-LA 1 KW (PEP input) linear amplifier, and a microphone.

History

The first mention of the set in *QST* is a two page ad in the December, 1962 issue announcing the formation of a new company called Sideband Engineers with Faust Gonset as president and located in Rancho Santa Fe, California. The SB-33 was to be available in February, 1963 at a price of $389.50. Following monthly ads rounded out a line of accessories; some showed the set next to a pack of Marlboros to emphasize its compact design. The December, 1963 ad lists the company as "An Operation of the Webster Company" and gives the address as 317 Roebling Rd, South San Francisco - the same as on Webster's ads for their mobile antennas.

In January 1964, the SB1-LA linear amp was announced, at $279.50. Ads now featured compact home and mobile kilowatt (PEP input) installations but offered no hint about where you'd find the 120 amp alternator needed to power the pair as a mobile. *QST* reviewed the SB-33 in April 1964; the reviewer thought the tuning knob a bit too small but there's no other sign that he actually used the set. The SB1-LA was reviewed in the same hard-hitting manner in September.

The SB-34, essentially a repackaged and improved version of the -33, was announced in December, 1964. The -34 was followed around 1970 by the SB-35 and then finally by the SB-36. Not long after the -36, SBE left the ham market in favor of CB equipment.

I have SB-33's with serial numbers 1625, 103,322 and 122,427. My SB-34's are 149,934 and 188,847. I suspect that only a few thousand SB-33s were built

The SB-33. Not only is this one of the simplest front panels on a 1960-vintage set, the polished stainless steel panel with light blue knobs, bezels and markings make it one of the best looking.

at Rancho Santa Fe. Then, when SBE was acquired by Webster and moved to San Francisco, the set was slightly redesigned and serial numbers were restarted from 100,000. Total production might be around 30,000 sets.

The SB-33 was made in at least three versions; though all look the same from the front they can be identified by markings on the rear or from design differences.

Design

The mechanical design of the SB-33 is fairly conventional - but easy to build, as you might expect from a new company. It is made of aluminum and consists of a shallow upside down 'U' chassis with front and rear panel 'U's fitted around it. There are several shield plates including a large one that covers the entire top of the set; with everything in place this radio is stiff enough that you can pick it up without changing the pitch of a sideband signal. The set is held together with sheet metal screws; on the early sets these have clutch heads!

The front panel is a stainless steel plate riveted to an aluminum subpanel. The markings are etched and filled in a light blue to match the plastic parts. The case is steel, with a light blue-gray epoxy base splatter finish.

The electronic construction is definitely 'vintage', with socketed transistors and point-to-point wiring. (Later models 'series SF' and 'series SF-1' have three printed circuit boards). The transistors are mostly PNP germaniums.

The circuitry is innovative. An RF amplifier feeds a mixer that converts the signal to the range 3225-3425 kcs. The required mixing signal is on 7225, 10575, 17625, and 24675 kcs for the bands beginning at 3800, 7150, 14200 and 21250 kcs, respectively. The middle two of these frequencies are in the ratio of 3:5 and they are supplied as the third and fifth overtones of the same crystal. This is a clever way to make one crystal do the work of two, with the disadvantage that such frequencies are never exactly in the ratio of 3:5. The error is about 4 kcs.

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The 3225-3425 kcs IF signal is selected by two tuned circuits ganged to the VFO dial and then amplified by another transistor stage. It is then mixed with the 5507.25 to 5707.25 kcs VFO signal to yield a 2282.25 kcs upper or lower sideband signal.

The next mixing uses an 456.45 kcs crystal oscillator. The frequency of this signal is multiplied by either four or six to give either 1825.8 or 2738.7 kcs for lower or upper sideband operation respectively. When mixed with the 2282.25 kcs signal the result is always a 456.45 kcs lower sideband signal. After going though a Collins mechanical filter which passes 453.95 kcs to 456.05 kcs (corresponding to audio frequencies of 2.5 to 0.4 kcs) the signal is amplified in a single IF stage and a diode ring product detector drives audio and AVC circuits.

SBE's promotional literature made much of the use of 'bilateral amplification' - a two dollar term for having transistors connected in going both ways between the same two circuits. Biasing one on and the other off gives amplification in one direction and switching the bias reverses the direction. Such circuitry minimizes the number of interstage circuits and makes for simplified T/R switching but at the price of losses and feedback through the 'off' amplifying device.

On transmit the product detector becomes a balanced modulator and the signal flow is reversed as far as the first mixer where the transistor RF stage is replaced by a 12BY7 driver stage and a pair of 27GB5 finals operating class 'AB1'. A conventional pi-network is used to match the antenna.

The bandswitch and exciter/RF tuning knob tune the same circuits but because the tuning ranges are so different it is hard to combine the mechanisms. SBE's answer is taken from the dash of your car: the 'tenths' wheel of the odometer dial turns continuously while the 'miles' digit moves one step for each full revolution. This mechanism - called a 'geneva movement' - is used to give single knob bandswitching and exciter/RF tuning on the SB-33. The knob turns a full revolution to operate the tuning capacitor and the geneva mechanism steps the bandswitch one notch as you turn from the 80 meter part of the range to 40, 20 and 15. As far as I know this is the only single knob bandswitch/exciter tuning scheme and except for the mechanical digital dials used by Collins on the 50S1, R-390 etc. and a few competing sets, the only use of a geneva mechanism in ham radio.

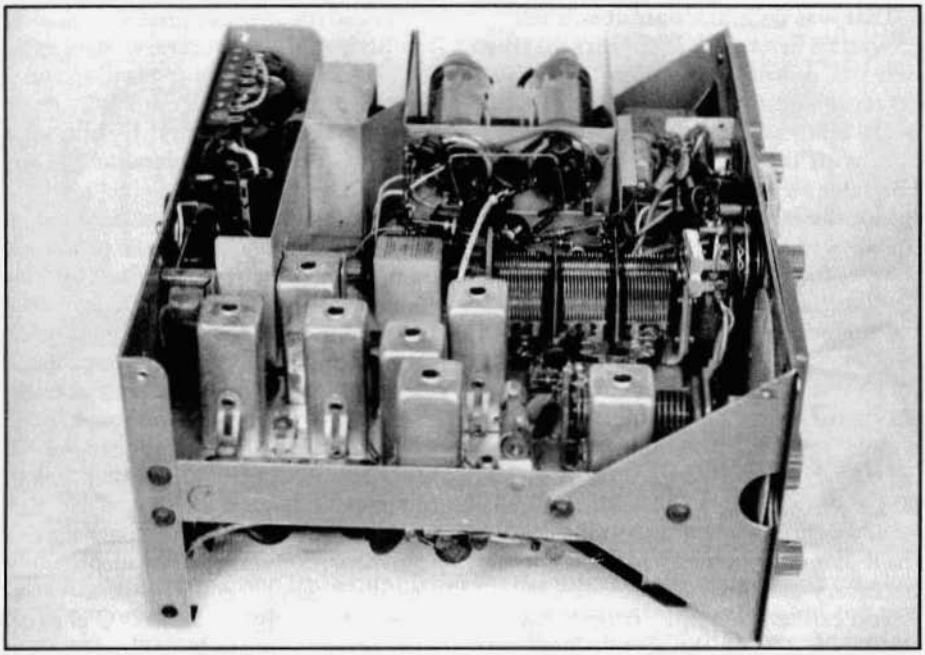
The bandswitch switches crystals and taps on the PA tank in the usual way; a linkage from the switch shaft to the exciter and RF stage coil slugs sets the band of these stages by moving the slugs in or out.

The power transformer supplies 33 VAC for the filaments: the two 27GB5s are in parallel and the 12BY7 driver (connected for six volts) is in series with them. This winding is center tapped and is rectified to deliver about 15 VDC for the audio output stage. This voltage also feeds a series regulator which supplies 10 VDC to the other transistor stages.

The high voltage supply for the (vacuum tube) driver and final stages of the transmitter is a silicon diode voltage tripler operated directly from the AC line. It furnishes about 480 VDC.

On The Air With The SB-33

My first SB-33 came from the 1992 Berryville hamfest. It was so badly rusted that it was hard to tell what color the paint had been and had that over-all inside and out brown stain that announces years of exposure to tobacco smoke; the former owner must have had and used the Marlboro pack 'accessory'! I rarely wash radios with water because it so often gives you new problems but for this set, water was best answer. Washing didn't help the brown film on the lovely blue plastic dial and speaker bezel so they were lightly sanded and re-lacquered.



Top left view inside the SB-33. The VFO/1st IF tuning cap is at the right front; the three gang unit farther back tunes the RF 1st mixer and driver. The IF section and mechanical filter are at the left front.

The tedious clean-up and refinishing set the theme for the restoration. There were all the usual sorts of problems - lots of them. Among the worst were a bad LV filter cap and a leaky audio coupling cap. Eventually I replaced every small electrolytic in the set. Kinda reminds me of Those Darn Black Plastic Caps in the BC-348 - remember, the ones made by Aerovox. Funny thing - some of the electrolytics in the SB-33 were made by Aerovox ...

The meter movement was blown; fixing that had to wait until this year when I got a parts set at the Harrisburg 'fest - but I got a tuning knob (to replace the ugly black one that came on my set) at the same time. Careful realignment (the front end is especially touchy) put my SB-33 on the air, but transmitter output was very low. Back to 'tedious': several more out-of-tolerance resistors (including the meter shunt) had to be replaced, and the 12BY7 driver was weak - but even after fixing these, the output was still low.

Why, with a set which 'basically works' in a few hours, is there always a problem that takes a few weeks? I checked all the transistors, more of the resistors and all the easy voltages and fixed some minor problems but the TX output was still never more than 40 watts on 80 meters. The signal levels for which the manual gave numbers were fine - but there aren't enough signal levels given to isolate the problem to a single stage. In desperation I started checking the levels anyway, in hope of seeing something obvious. Hummm . . . the output of the diode mixer for the 456 kcs SSB signal and USB/LSB signal seemed very low; sure enough the front-to-back resistance ratio of this germanium point contact diode was about 1:3! A 1N34 diode with some added forward bias raised the 80 meter output to 55 watts while substantially increasing the receiver gain.

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That was cold; the output still fell to 35 watts when warm. It appears that the drive is reduced by losses in the receiver mixer transistor which (because of the bilateral amplification) is in parallel with the final transmitter mixer. SBE later switched to a 2N2495 transistor for the receiver mixer and with that installed, TX output falls much less.

Most likely the reason the output is lower on 80 than on 40 and 20 is that the inductance of the driver grid tank isn't high enough to get a really good 'Q' on that band. That's a disadvantage of the driver tuning scheme - the inductances should vary as 1/frequency (say 21.5/3.8 or 5.66:1) and that's hard to do by slug tuning a single coil. Collins did it, with the variable space wound coils of the R-390, etc. but they had to invent the necessary machinery.

You can tell that SBE struggled with the driver design: the stage runs more than 100 volts above the rated maximum plate voltage and almost double the rated plate dissipation! This stage must have a shield which touches the tube (or an insert) or you will go through tubes in a hurry.

The VFO was 'noticeably drifty', covering a couple of kilocycles up and part way back down in the first couple of hours. That's amazing for a VFO which heats so slowly and so little and really intolerable for a sideband radio so I decided to reduce it.

Why is there so often another problem that takes a few more weeks? Replacing the germanium VFO transistor with a silicon unit reduced the drift in the first five minutes from 100 cps to nil. Replacing several fixed silver mica caps in the VFO circuit with NPO disk ceramics and removing the compensating cap eliminated the 'up and back' and further reduced the drift, but it was still too high for a sideband set.

The only thing left was the coil. The oscillator coil is wound on a 9/16" porcelain standoff insulator - a clever but really bad idea, since porcelain expands too little with temperature changes to let you wind a self-compensating coil. I wound a replacement on a 1/2" polystyrene tube; on the first try the total drift was down to a tolerable 250 cps over the first hour.

The transmitter audio was muffled. A scope showed considerable RF on the mic amp output; this was corrected by putting a .01 mFd bypass on the amplifier base and moving the decoupling capacitor on the collector supply from below the chassis to the amplifier terminal strip behind the mic gain control. I have heard from others that the regulation of the +10 volt supply contributes to this problem but haven't checked that yet.

AVC was one of the problems of early transistor receivers and not surprisingly the SB-33 went through several variations. The 'early' SB-33's AVC is poor: increasing the input signal from 1 uV to 1000 uV (about S3 to S9+20) increases the output by about 16 dB. You usually have to tweak the volume control several times per rotation in a large round table.

The AVC of the Series SF-1 'late' unit is considerably better and with that inspiration (and after noting that the method used in both sets caused distortion when the amount of reverse gain was raised) I wired up a conventional audio AVC circuit for my -33. This circuit won't give the 3-watt maximum audio output of the original but it is plenty loud and you get much better AVC in exchange.

I don't like wired-in fuses so I mounted a post-type holder on the rear panel. A UG-290/U BNC connector was a perfect replacement for the crumbling RCA-style antenna connector. There was a loud clunk-clack from the loudspeaker when keying/unkeying the mic; after determining that this was normal for the circuit I wired a Radio Shack reed relay to short the speaker coil on transmit.

The SB1-LA companion linear amplifier for the SB-33. If the meters look crooked and 'wrong', it's because they are oversize replacements, installed not too precisely by a former owner. I used a computer to make new SBE-like faces to replace the ones he calibrated with a ball-point pen. The proper meters match the one in the SB-33 and the knobs should be light blue rather than Radio Shack black. With six 6JE6's and an 800 volt/1.2 amp power supply in a package the size of the SB-33 the unit is a fraction the size of competing 500+ PEP watt output units even though the 40-pound weight makes it less than truly portable.

My SB-33 has become a constant companion when traveling. The SB-34 should be even better for portable use because many problems were fixed and the built-in supply works on either 120 VAC or 12 VDC, but isn't nearly as beautiful and because it is slightly smaller and has more parts it is harder to work on.

Conclusions

The SB-33 makes the best use of the technology available when it was designed of any ham set I've studied - far ahead of any of the Collins ham products of the time. It is outstandingly innovative, for example, the combined exciter tuning and bandswitch mechanism, the use of one crystal for two bands, the USB/LSB switching, the transformerless high voltage and the bilateral design.

The AVC is very poor for roundtable use but the use of a combination RF/AF gain control makes it work pretty well on a single station, especially on the later versions. The receiver audio is clear and crisp - the equal of any set I've used.

The manual consists of twelve 8-1/2" x 11" pages printed front and back on a single folded sheet. It's not large, but it is excellent - clear theory, good practical tuneup and troubleshooting info and 'A+' writing. One big omission is stage by stage signal levels without which troubleshooting an obscure problem is hard.

There are a few shortcomings. The electrical safety design inside the SB-33 should have been better - the full PA high voltage is exposed in several places near the upper or lower edge of the front and rear panels. There is no cover for the PA compartment; cardboard plate cap covers only mostly hide the 480 volt supply. **'Case off' work on this**

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The Econodyne Four Tube Superhet

Part Two, Construction, Alignment and Calibration

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Westmont, NJ 08108

The Econodyne is a simple 4-tube superhet designed for use in the AWA Old Timer's Contest. It covers the lower 120 kc of both the 80 and 40M bands. A single dial calibration serves for both bands. Good CW selectivity is achieved through the use of a crystal lattice filter - see part 1 for details. The home-made dial and tuning system is similar to that used in a previous *ER* article.(1)

Converter Stage

This receiver uses the band-imaging technique that has been used in a couple of ARRL Handbook sets and recently in the R-8040 built by Walt Hutchens(2,3) The main difference here is that the oscillator tunes from 5250 to 5370 kc. This choice of frequencies together with the 1750 kc IF results in tuning ranges of 3500-3620 and 7000-7120 kc. Moreover, these two bands coincide on the dial and tune in the same direction so the dial is simply calibrated 0 to 120. There is a problem with this arrangement. The harmonics of the IF and BFO fall at the low end of the tuning range. But this receiver is used only in the AWA contest and not for working DX so this is not a problem. Another potential problem is that receivers using band-imaging will pick up signals on the image frequency unless the input tuned circuits provide adequate selectivity. With just one tuned circuit the selectivity is limited because the antenna loads the input circuit and lowers its Q. In the Econodyne, the rejection of 80M signals when tuned to 40M is about 37 dB while the rejection of 40M signals (on 80M) is 40 dB. This may not be serious in the present application since the frequencies in this contest are not harmonically related. Thus if I hear an image signal, it won't be sending CQ AWA and can be ignored.

Coil Data

Coil data for the converter stage is shown in Figure 2. The 80M antenna coil is wound on a solid polystyrene rod 1-5/8" long and 1/2" diameter. The bottom of the form is drilled and tapped for a 6-32 screw. Both the 40M antenna coil and the oscillator coil are wound on forms made by Cambridge Thermionic Corp, type PLS5-2C4L with 20063-B tuning slugs (1-20 Mc type). On all coils, the larger, secondary, winding is wound first. Then apply a one turn wrap of cellophane tape and add the primary. Coat with Q-Max or polystyrene coil dope. Note: On the oscillator coil, the windings must go in the same direction. The antenna coils were designed to give about 500 ohms input resistance. The oscillator grid tickler winding was adjusted to give 150 uA grid current with an average tube. The other coils (L7, L8, L9 and L12) are North Hills SE-120 type. I was lucky and found one to use at L7 that was center tapped. Alternatively, one could connect B+ to the bottom end if the .5 mH RFC is increased to 1 mH.

The BFO

As mentioned in Part 1, the BFO frequency is set about 800 Hz below the peak of the crystal filter response. There is no front panel adjustment of the BFO frequency; instead, it is permanently set by means of the slug in L12. Thus it is important that the BFO be very stable and capable of holding its adjustment. At first, I used a 6L5-G because its fila-

Front view of the Econodyne-4.

ment current was only .15 A. Later this was changed to a 6J5 because metal tubes are more rugged, less microphonic and more stable as oscillators. Condenser C33 (680 pF) is an orange dot (+100 ppm/°C) mica, C31 is an NPO ceramic and C32 is a -750 ppm/°C ceramic for temperature compensation. After the frequency is set, add a nut to the L12 adjustment screw and lock it up tight to prevent the adjustment from jarring loose. The final drift after one hour warm up was +34 Hz.

Detector, Amplifier, Power Supply

The detector uses one-half of a 6C8-G and the other half of the tube is the audio amplifier. Impedance coupling is used to keep B+ off the headphones. Jack J1 permits a remotesend-receive switch to open the amplifier cathode during send. The power supply uses silicon diodes and I imagine that Bruce Kelley will remind me that they didn't have these before the war. If you're a purist, you could eliminate the power transformer, put a 25Z5 or 1-V in its place and employ an a-c line cord with built-in filament voltage dropping resistor. If you do this and hum is a problem, you may have to change the 6C8-G to a 6F8-G. And good luck trying to find one of those resistor line cords.

Construction

The panel, of .08" aluminum, is 10" wide and 6-5/8" high. After the holes were made, it was given a coat of Krylon No. 1345 yellow primer and baked two hours at 200°F. The final coat was Plastikote No. 1105 medium gray. This also was baked. I bake my panels in the kitchen oven and its a good idea to run the exhaust fan and do this while the XYL is out shopping! Let the paint continue to harden a few days before adding the Dri-Transfer Lettering.(4)

A string and drum (2.75" dia.) dial drive similar to that used in many AC-DC sets together with a ball-bearing tuning condenser results in smooth, effortless tuning. The tuning condenser is mounted on spacers 1/8" above the chassis. There is a .5 x 3 inch cutout in the chassis to provide clearance for the drum. The dial well and escutcheon are

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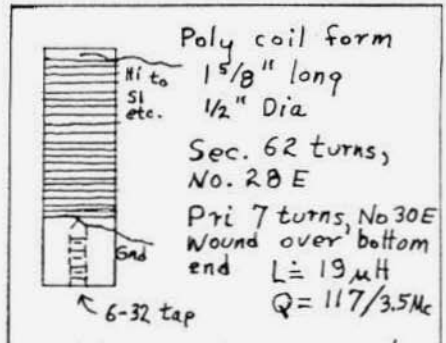
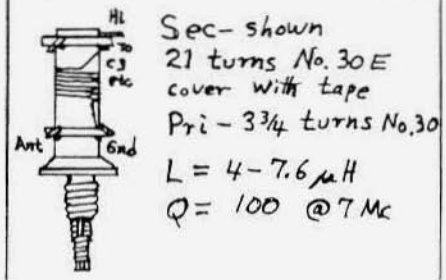
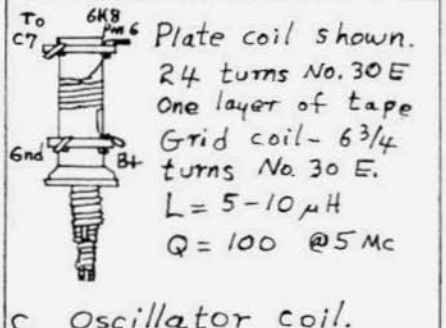


A. 80M Antenna coil.



B. 40M Antenna coil.



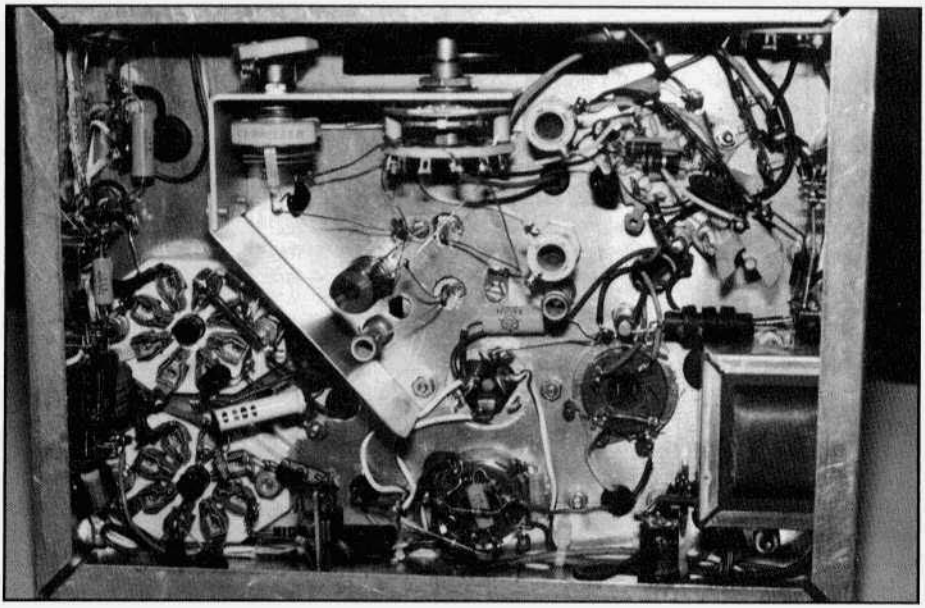
C. Oscillator coil.

Fig. 2. COIL DATA.

quite similar to those on the author's 160M receiver (1). Tubes and parts are arranged to keep wiring leads short and to minimize stray coupling. The bandswitch and antenna trimmer are mounted on a bracket. A shield fastened to this bracket reduces coupling between the BFO and the input circuits. Some of the wiring, including filament, B+ leads and shielded audio wires, was bundled into a laced cable which runs around the periphery of the chassis. The filter choke is mounted under the chassis. The IF and BFO coil shields are items I found in the junk box. Input coil L7 is mounted in a rectangular can salvaged from a Millen IF transformer. The two 3/4" square cans are Miller cans and the BFO coil is in a 7/8" diameter can that once housed an RCA video peaking coil. A set of drawings, color photographs and parts list are available from the author for $3.50.

Harness Making

A neater wiring job results if certain wires are pre-cut, stripped and cabled together into a wiring harness. Then at the proper time during assembly, this harness can be pushed into place and all the loose ends soldered to the appropriate terminals. Anyone who has assembled a kit is probably already familiar with this procedure. To make a harness, proceed as follows: Procure a piece of 3/4" lumber slightly larger than the chassis size. Fasten a piece of white paper on the board with masking tape. After the chassis has been drilled, lay it on the paper and trace all the holes and cutouts onto the paper. Don't forget the outside perimeter. Also draw a line 1/16" inside this border to show the inside boundary of the chassis. Now sketch on the paper all sockets, tie points, solder lugs, etc., where wires in the harness will be connected. It is helpful to drive small nails into the board about 5/16" in from the corners and at points where several wires will branch out of the cable. Now run wires, one at a time, from where each originates to where it terminates. Leave enough extra wire at each end so as not to be caught short later. Strip each end of the wire and temporarily hold it down on the board with tape after it is bent to follow the path of the cable. Keep a record as you go of each wire, its color, source, and destination. When all the wires are in place, tie the cable using lacing cord,



Underchassis view.

waxed string or plastic tie wraps. If the radio will be used in a damp location, you can impregnate the cable with marine varnish. When the cable is finished, lay it down in the chassis and solder the loose ends in place. You will be proud of the handsome and professional appearance it lends to your radio.

RF Alignment

Alignment of the crystal filter and the IF amplifier was discussed in Part 1. The next step is to adjust L6 and C9 so that the oscillator tunes the proper range, which is 5250 to 5370 kc. An easy way to check the 6K8 oscillator is to listen to it on a receiver having a digital readout. Connect a short wire to the digital receiver's antenna post and arrange it to lie about 6" from C2. The goal is to adjust L6 and C9 so that the 6K8 oscillator tunes from 5250 to 5370 kc when C2 runs from about 5% full mesh to 95% unmeshed. If the tuning range is less than this, increase L6 and reduce C9. If the tuning range is excessive, make the opposite adjustment. When the tuning range is satisfactory, connect the signal generator to the receiver antenna post through a 470 ohm resistor and set it to 3500 kc. Turn the bandswitch to 80M, set the antenna trimmer (C4) to mid-position and set the receiver dial to 3500 kc. Tune the receiver to exact peak and then adjust C1 for maximum output. This completes the 80M alignment. Now set the band switch to 40M and the signal generator to 7000 kc. If necessary, tune the receiver to peak output. Adjust L4 for maximum output. Turn both signal generator and receiver to 7120 kc and adjust C3 for maximum output. Repeat these two steps until no further increase in output occurs. This completes the 40 M adjustment.

BFO Comments

I chose to put the BFO on the low side of the IF filter peak. When this is done, the signals will be louder on the high side of zero beat on 80M while on 40M they will be heard on the low side of zero beat. In a commercial receiver, this shortcoming could be handled by adding another section to the bandswitch

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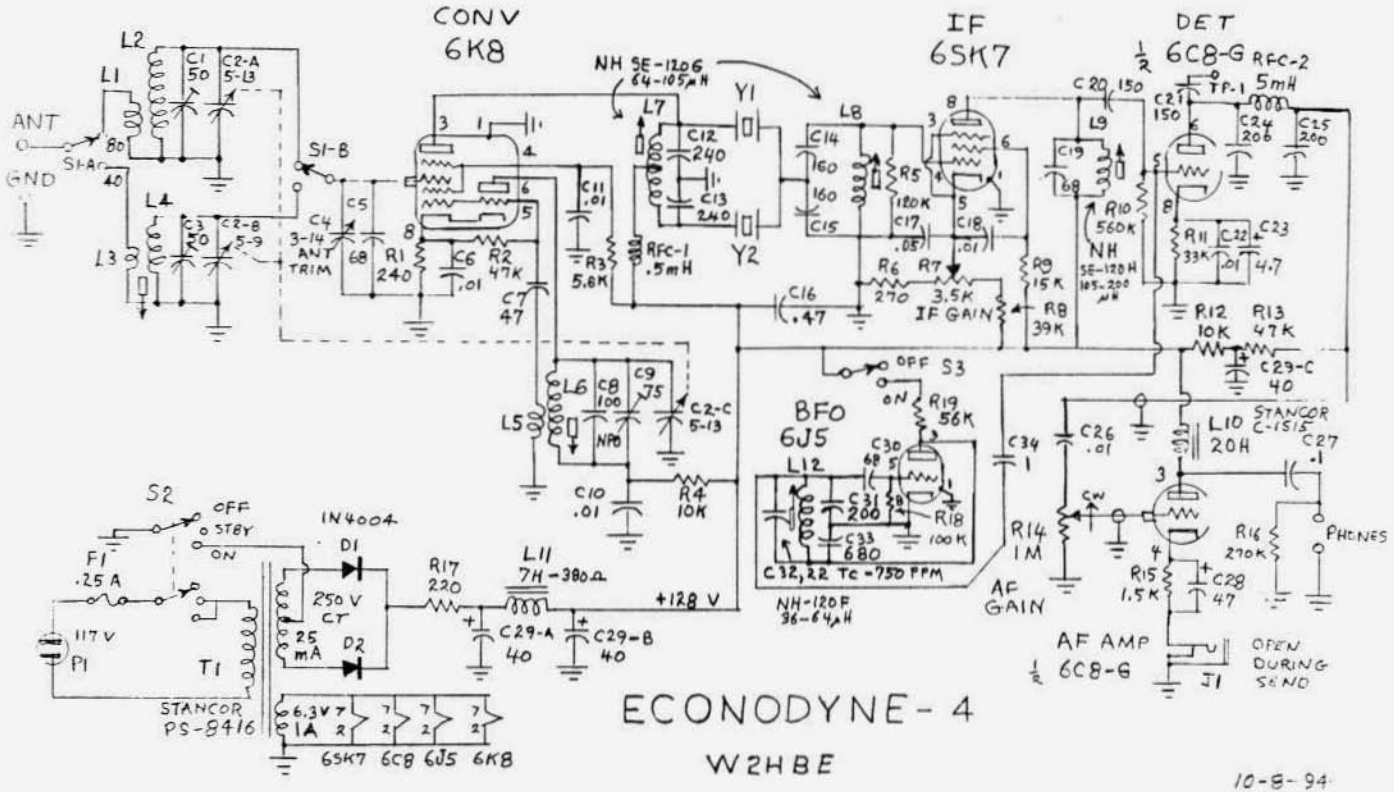


Fig. 1. Wiring diagram of the Econodyne 4-tube superhet.

The Econodyne from page 13

and using it to switch in a trimmer condenser to retune the BFO. Or, better yet, one could employ a crystal controlled BFO and use the bandswitch to select the proper crystal. I didn't feel that this refinement was necessary in a receiver that will be used only a few days each year. But I mention it because it helps to understand the proper procedure for dial calibration.

Dial Calibration

Based on the foregoing information, the dial may be calibrated as follows: Connect the frequency counter to TP-1 and set the BFO to 1750 kc or the actual peak of the IF filter. Connect the signal generator to the ANT-GND terminals and set it to 3500 kc. Turn the receiver bandswitch to 80M and tune in the signal to zero beat. Make a mark on the dial - this is the 3500 kc mark. Continue this procedure until marks have been made every 5 kc up to 3625 kc. These can now be inked in and labelled. Mark the 10 kc multiples as 0, 10, 20, 30, etc. Thus 10 will represent 3510 kc on 80M and 7010 kc on 40M. Now the BFO can be retuned to a frequency about 800 Hz below the 1750 kc peak.

Conclusion

The overall receiver sensitivity is such that a signal of .5 uV can be heard and a 2 uV signal is copied easily. I expect this receiver will be an immense improvement over my old 2-tube (57 Det, 56 AF) regenerative receiver and should help me improve my AWA contest score. I hope we have good band conditions! ER

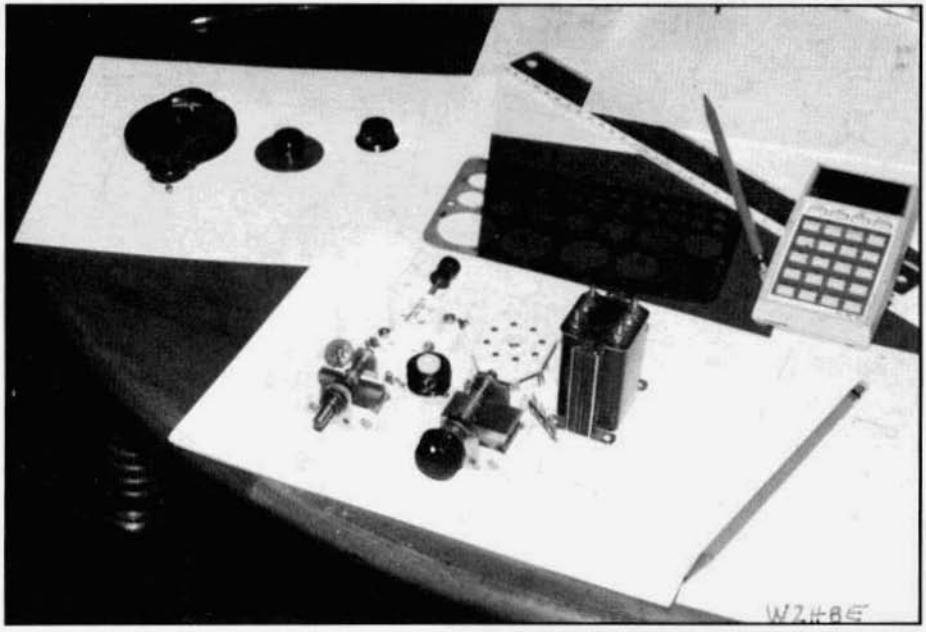
References:

1. A Superhet for 160 and 80 Meters. W2HBE, ER#55, Nov. 1993.

2. ARRL Handbook, 1964, pp. 116-124.

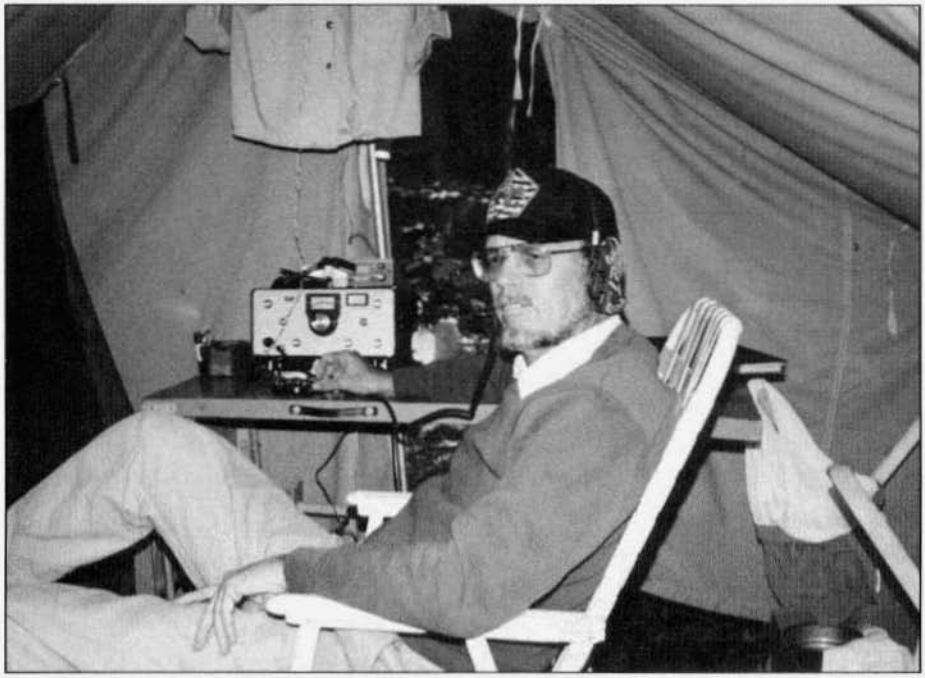
3. R-8040 - A Homebrew 80 and 40 Meter Receiver, ER#47 & 48.

4. Dri-Transfer Lettering, p.18, ER#40, Aug. 1992.

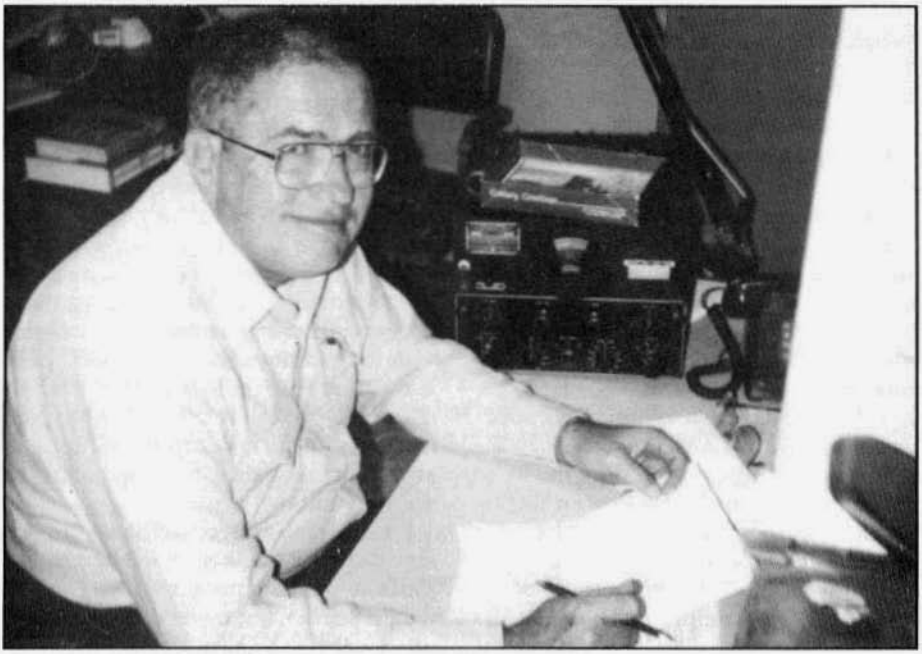


Another receiver in the planning stages at W2HBE. This one is an improved Twinplex shortwave receiver where 1 tube does the work of two.

A recent photo of some of the Northwest AM'ers. Left to right: WM7A, W6PKW, WA7EHE, K7NCG, K7QMF, K7YIR, K7IEY, WAØLEU, KA7NGT.



John Hartman, NM1H, "In the bush at Hidden Valley Boy Scout Camp". Rig is a Ten Tec Century 21 using car batteries and a Windom antenna.



Ray Mote, W6RIC, well-known military collector, with his latest acquisition, an RBM, 200 kc to 2 Mc WW II receiver.

Randy Best, WA7CPA, author of the article on the T-368 transmitter that appears in this issue.

Electric Radio Worked All States Award Information

After considerable deliberation and discussion we have decided upon the following rules for our AM WAS program:

1) The award will be given with an endorsement for the first 20 states and thereafter in increments of at least ten states.

2) Proof of having worked the states will be in the form of QSL cards that must be dated after January 1, 1995.

3) All contacts must be on AM; both stations must use AM.

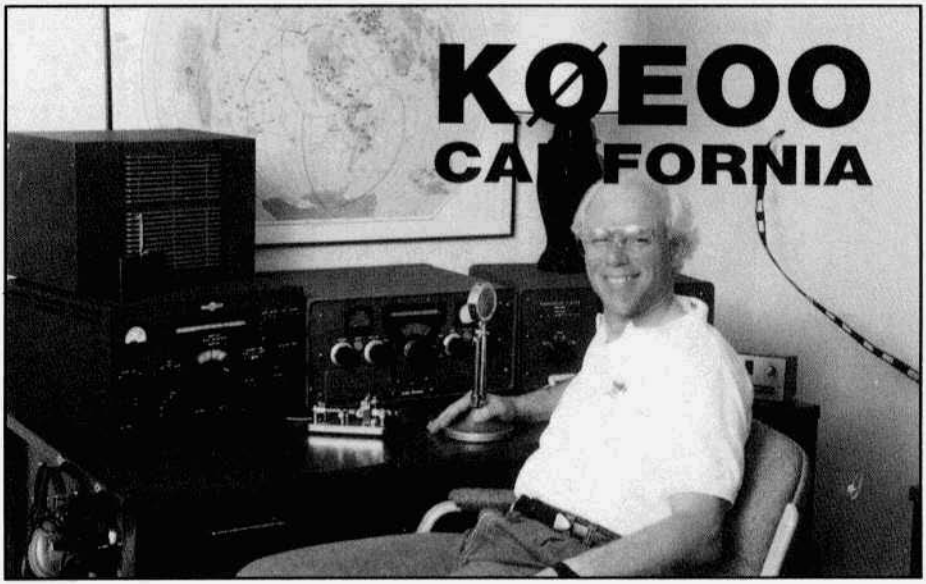
4) All endorsements, including the first one must be accompanied by an SASE for the return of the cards and $2 to cover our expenses.

At this point I feel there will be a great deal of participation in the WAS program. Another side benefit I see is that once again we will all get back into the tradition of QSL'ing. It's going to be fun to get back into papering our shacks with 'meaningful' QSL cards.

A number of AM'ers that I've talked to since announcing the WAS program have told me that they're planning to order some QSL cards after not bothering with them for years. Most of the guys are talking in terms of unique, one-of-a-kind cards like the ones that were popular years ago when a QSL card had more meaning than it generally does today.

In the old days there were QSL card makers like the renowned C. Fritz, that many of you will remember. For years he made his living producing unique and colorful cards - he was the first to do the 'rainbow' card.

I'm still deciding on what I want my new card to look like. On the one hand I think a photo-type card like Dennis' would be nice, but then I'd have to clean up my shack to have the photo taken. Another possibility that I've pondered is a line drawing, cartoon-like card. I'll make my decision soon , get the cards ordered and be ready to QSL. **N6CSW/Ø**



From time to time we're going to print some of the more interesting, artful or unusual QSL cards we receive. This one from Dennis, KØEOO, demonstrates how effective using a photograph can be.

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Wednesday nights at 8 PM PT on 3835.
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: Recently started by Pat, K7YIR, this net is on 3875, Mondays and Fridays at 9:30 PT. 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.
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. Net control is Les, K6HQI.
Arizona AM Net: Meets Sundays at 3 PM MT on 3860. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3875 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Westcoast Military Radio Collectors Net: Meets Sat. at 2300 local on 3885 and Sun. at 1600 local on 3885. Night net control is Andy, KD6TKX, and daytime net control is Tom, WA6OPE. AM is the mode used at present. It is not necessary to check in with military gear.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
Vintage CW Net: For CW ops who enjoy using vintage equipment.This is not a traffic net; speed is not important. The net meets on 14.050, Saturdays at 1 PM PT. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Chuck, N5SWO. The group meets on 14.293 at 1 PM CT, Sunday afternoons.
Collins Users Net: The oldest of the 'users nets'. It meets on 14.263 Sunday afternoons at 2 PM CT. The net control revolves. This group also gets together for an informal ragchew on 3805 Tuesday evenings at 7 PM CT.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Heath Users Net: A new net started by Marty, WB2FOU/5. Net control is shared by Fred, AA5LW. It meets on 14.275 at 4 PM CT Sundays. Check in on either AM or SSB.
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 has been meeting since 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.
Westcoast Broadcast Equipment Net: Tuesdays on 1959 at 9 PM PT. Anybody is invited to join the group, but the emphasis will be on broadcast equipment. Moderator is Mike, W6THW.

Barker & Williamson T-368C/URT

Departments of the Army and the Air Force

by Randy Best, WA7CPA
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Phoenix, AZ 85012

My first encounter with 'Angel Modulation' (AM) was in 1963, high in the Wasatch mountain range in Utah, in a small coed college prep school known as Wasatch Academy. My wasp-nest-encrusted NC-98 National receiver with it's random length "short wire" recovered some robust AM signals on the crystal clear winter evenings. My novice license, KN7UZF, restricted me to thumping away on a HeathKit DX-20 but I strayed often to listen to the "big boys" on their Collins KW-1s, Johnson Desks and '500s. I tried to imagine the engineering extensions required to modify the desks that I was familiar with at school to enable such wireless transmissions but failed all attempts to form a suitable mental picture.

I've recently renewed my interest in electron valve radios by restoring a number of Collins transmitters and receivers. The arrival of a Collins 32V-2 AM transmitter (complete with a mouse nest) from W8LXJ in Ohio rekindled my latent AM fascination. After a considerable 74A-1 and 32V-2 electronic and cosmetic restoration orgy I discovered a local Arizona AM gathering on 3855. The restorations had been extremely trying.

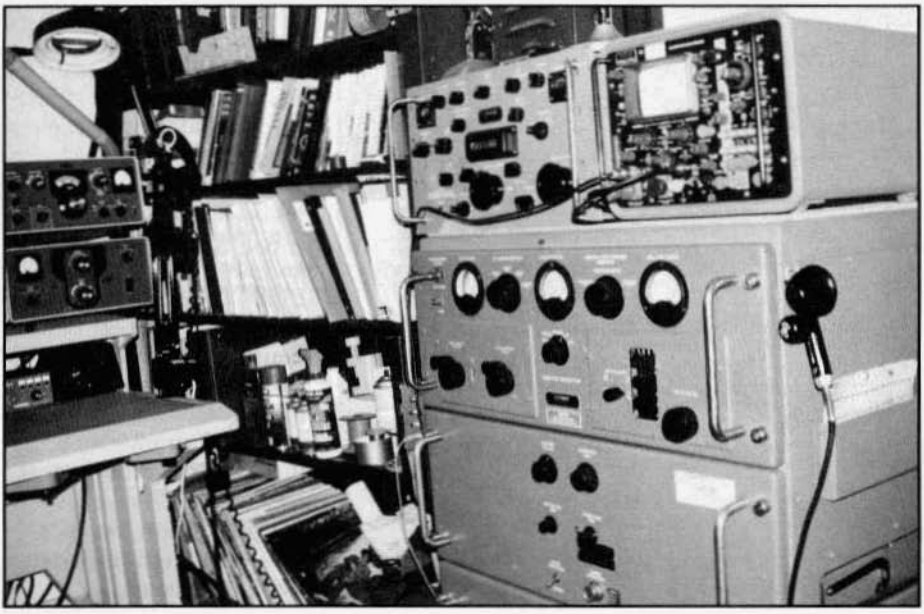
The 32V-2 is one of the worst mechanical assemblies I have ever worked on. This beast must have been designed before Art Collins hired the splendid mechanical engineering staff the rest of the models reflect. I even had to machine new plastic light bars behind the dial assemblies due to severe damage (Warning - many inexpensive electronic cleaning sprays like Radio Shack's offering can fuse old plastics together !!).

My newly discovered AM friends in Arizona like WC7O, N7WEK, K7BDY, N7IOK, K7VZP and KB7LOG made it all worthwhile. It soon became obvious that more spark power was required to get through the summer static and those weird duck-like sounds in the background.

The Quest

Entering from stage left, an *Electric Radio* picture of a robust looking military transmitter model T-368, weighing in at 700 lbs. - hell, you can't beat that - I must have one. I viewed a "Halliscratchers" BC-610 up close and personal at WØOGH's shack and was not impressed with the lack of modularity. The -610 always sounds superb on the air but I'm too easily impressed with DOD overkill engineering. A friend of mine owns serial number 00002 KW-1 and my current first right of refusal position is tenuous at best so I was keen to find a poor man's substitute. The T-368 appeared to be right on the money.

To make a long story short (not a common AM phenomenon) I located one with a single check-in to the Collins Users Net on 14.263. A military radio aficionado, Brown Bezier, WA1NZR agreed to part with one of his collection. I was ecstatic. I initiated operation "Desert Spark". I flew to Redwood City, rented a mini-van for the trek home, and retrieved the monster with the help of Paul Thekan, N6FEG, Brown's partner in military collection adventures (his backyard was filled with mil-spec vehicles and communications vans!). I cleaned up the decks and repainted the cabinet. The next task was to get the monster down my basement steps and begin the electronic restoration.



T-368 transmitter in the author's shack.

The Big Warning

In my enthusiasm I managed to tear something loose in my left knee. Let this be a warning to heavy metal newcomers - use proper lifting and moving techniques or you will damage you body! I am 6'8" and 280 lbs. and still had problems. Microscopic surgery through a fiber optic probe, various specialty lenses, a charged coupled device (CCD) 30,000 pixel camera, and special high tech instruments saved the day.

The T-368 was designed and manufactured for the US Army and Air Force by Barker & Williamson, Inc. as a replacement for the BC-610. As usual, other manufactures like TRW were involved in later models to meet volume demands and provide multiple sourcing. Its design goals were to improve modularity/maintenance and power output, and to support new modes of operation like FSK. 500 watts output (continuous) is provided by a single 4-400 which is plate modulated by a pair of 4-125s. A matching antenna coupler was used to tune a 135' long wire or a 35' mast with one or more counterpoises on the ground. It is very similar to the BC-610 version. See ER #53 for a nice full frontal photo of the unit.

Modifications

Since the transmitter was designed primarily for Teletype duty, a carbon mushroom-button microphone was used for emergency voice and slow CW as far as I can tell. One's first inclination is to march head first into "broadcast quality" audio by ripping out all of the clippers and filters. My advice is DON'T, been there, done that, not worth it (unless you have a professional external audio chain complete with limiting and 8 octave equalizer).

I strongly suggest the following restoration steps:

1. Clean throughly and check all connections, use DEOXIT (now available from Antique Electronic Supply) on switch contacts etc. Check operation against nominal operational parameters listed in the manual. Pay special attention to open plate resistors in the speech amplifier. 500 watts, 100% modulation,

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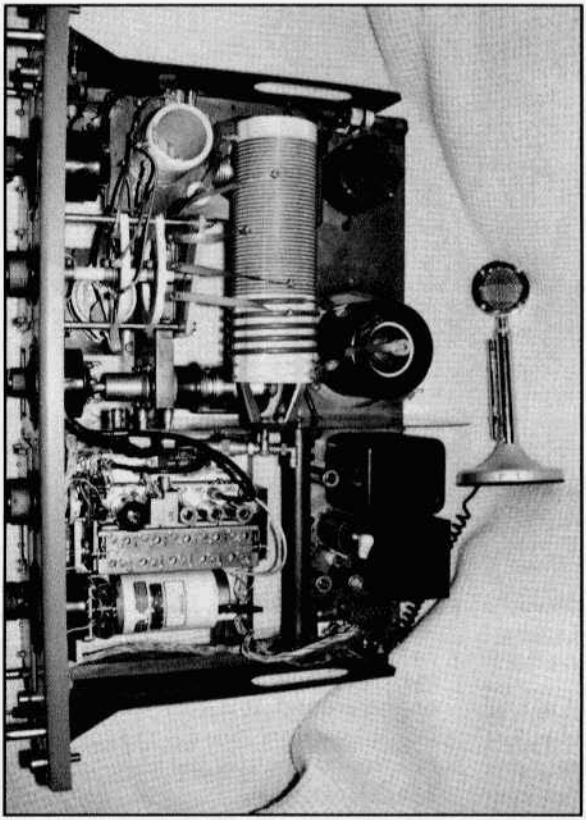

T-368 RF deck with a D-104 mic for size comparison.

300-3400 Hz relatively flat audio is typical.

2. Modify the carbon mic input stage on the speech amplifier to support a D-104 crystal input. This still leaves a low impedance line input for future fun with a minor caveat.

3. Reduce the screen voltage on the negative cycle 4-125 by 150 VDC.

This is easy to do, nonevasive, and most cool!

4. Reduce the B+ bypass and coupling capacitance per the ER #53 modifications. Some units experience heavy audio roll off from 2000 Hz and up - not a desired feature unless you enjoy "muffled" audio reports.

5. Optionally remove the high pass filter FL1 if you DON'T have a full and robust voice, otherwise leave it alone.

6. Optionally modify the AC mains configuration to run the plate transformer on one leg of a 220 VAC line and the rest of the transmitter on leg 2.

7. Rig your coaxial cables and antenna for full 1500+ PEP watt capability. My son observed an angel of brilliant light speaking to him from our garage roof one night (carbon arc light and speaker formed with a roofing nail lightly touching the flashing)!

Modification Details

D-104 High Impedance Modifications:

- supports high impedance input;

- downside is that when you feed line level audio in the rear remote control receptacle J12, you must short out the new mike jack since there will no longer be a carbon mic gain control that can be shut down.

Figure 1 illustrates the D-104 mods. I used ARRL handbook circuits as a model although many other variations are possible to expunge the carbon demon. I installed a PL 68 jack next to the carbon mic gain pot on the front panel and replaced the 25k carbon gain pot with a 47k. If you attempt to run a high impedance mic though the rear panel auxiliary jack you will enjoy some swell hum due to the long runs and the cable used! The vent holes on the speech amp are the correct size for 2 RCA phono jacks. Use high quality audio or RG-58 cable to make the run to the new front panel 47k gain control. Do not remove the RF choke or the 10k RF blocking components on V12. They are definitely there for a reason (RF feedback pro-

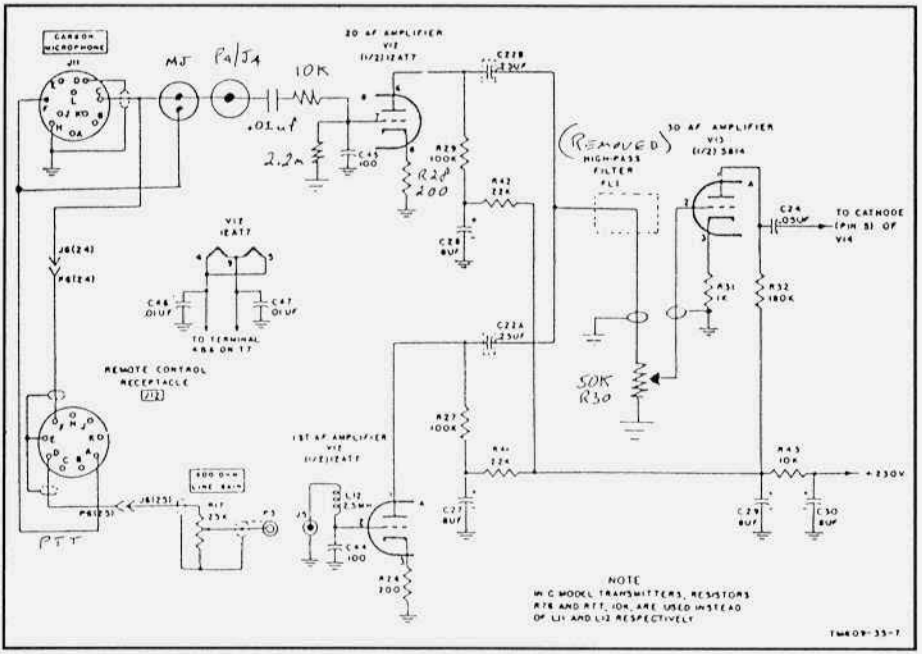

Figure 1.

duces a pretty good cat fight simulation).

V10 Screen Supply Modification:

- negative cycle unloading improves talk power quite nicely
- reduces screen voltage on V10 by 150 VDC
- no downside other than minor distortion which is not audible.

Modulator deck modifications. Remove the short jumper between the 4-125 tubes V9 (2,4) and V10 (2,4). Connect a new jumper between pin 1,5 of V7 and pin 2,4 of V10.

ER #53 Excessive Bypass and Coupling Capacitance Modifications:

- opens up the high end - crisp, clear audio
- see ER #53
- use 20KV high current RF type capacitors only.

In case you don't have ER #53 here's what you do: In the RF deck change C10 from 2200 pF to 500 pF. If 2 chokes are present add another 500 pF to ground on the incoming B+ side. Thus, the first RF choke is bypassed to ground on each side with 500 pF. Next replace the big bucket mica or the 3 parallel caps C41, C7, and C42 with a 1000 pF capacitor. I series'd a 1000 pF parallel array between 2 flattened 1/4" copper tubes with the bucket mica (located under the band switch).

Optional High Pass Filter Removal

In the speech amplifier, the high pass filter FL1 rolls off the normally useless audio below 300 Hz. Remove it by shorting it out with a jumper and removing the ground run. If you persist, you can also remove the clipper tube V15 and short pins 1 to 5 and remove FL2 but you will have to provide proper impedance and level matching for best results. My experience is that the original design is quite acceptable if you use a D-104 crystal element.

Optional Use of a 220 VAC Line to eliminate the Light Show:

- places plate transformer on one leg
- places the rest of the transmitter on the other leg

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A Homebrew Transmitter of Childhood Dreams

by Gary Gompf, W7FG
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Bartlesville, OK 74006

I built the transmitter after several years of searching for a commercial broadcast unit. One was never found, so off to home brewing we went. Yes, we - the XYL had to second as a mechanical vise to hold metal sheets, etc. while I drilled and cut holes, plus to assist in moving heavy iron into position.

Requirements of the homebrew transmitter were simple:

1. Big Tubes (physically) with windows.
2. Capable of 375 watts out on AM, plate modulated and 1500 watts out, when used in linear service for SSB.
3. A lot of meters but only if they were serving a useful purpose.
4. A lot of controls, again only if they were really needed. (I don't like getting in to a unit to change operating parameters).
5. NO BLOWERS!
6. 160 through 20 meter operation.
7. Cost to be the absolute minimum.

Off to the drawing board we went with our simple requirements. First we selected the tubes for the RF section. 450TH's were chosen because of their size and capabilities. I found 3 new-in-the-box in Spokane, Washington for $50 apiece, only after spending a lot of time on the air and on the telephone searching for them. The modulator came next. We would have liked to have used 450TH's but we could not locate anymore. Second choice was 833A's and luckily they were gathered without much trouble.

At this point I thought I was home free - oh! how we can mislead ourselves on such a project as this. Filament transformers were the next items to find after realizing the transformers I remembered being in the garage were not to be found. Do all of us suffer from swapping or giving away junk and discovering we need it the next day? The filament transformer problem was resolved by using transformers made for 12 volt DC supplies, and using a 4 amp Variac on the '450's and a large power rheostat on the primary side for the 833's. By the way, I have a dozen or more of these power rheostats still in the junk box (crate) if anyone needs one.

Power supplies were not a problem as the components had all been gathered up previously for another contest sized supply. The modulation transformer I was planning on using proved to be open on the secondary side. Jay, KA5DGH came to the rescue with not one but two, he had gotten from Don, K4KYV years ago. When Jay was telling me about their size, I thought he was letting his imagination get the better of him; turned out he was being conservative. Both transformers took two people to move, one of which a forklift would have been more appropriate. I chose the smaller one, it only weighed 120 pounds.

The metal equipment cabinet I had for the project was bigger than I thought was necessary, its inside dimensions for placing components are 21" wide, 18" deep by 69"high, more space than I could possibly fill-up. Again this proved to be an incorrect assumption.

Metal for the chassis and front panels is easy to obtain. I bought a bunch of 3/16" thick aluminum but, after cutting only three meter holes in 5 hours, I went to thinner stock that I could work with. By the way, my availability of metal

The author with his "Childhood Dream" transmitter. The rig consists of 450TH finals, 833A modulators and a DX-100 exciter.

working tools is limited to ones more suited for household chores but I do have a nice set of Greenlee punches that were worn out by their previous owner, or owners.

As construction moved on, problems cropped up daily ; like I don't have this or that. As an example I ended up using Radio Shack 24 volt transformers for bias supplies. My first grid circuit built melted down in final RF section testing. I miscalculated drive requirements, originally thinking 50 watts would be sufficient for Class C. It actually took 100 watts, and thanks to Bob, W5PYT, who came up with the DX-100.This is the only transmitter I know of that can be rack mounted and that covers 160-20 meters. I gave the last DX-100 I had to Dick, WØBVT a month before.

Gosh - how was I to know/remember, that my #22 magnet wire was going to heat up and melt the plexiglass coil forms with only 100 watts of drive in Class C. The second attempt at the grid circuit used RF coil forms from Viking II's, with #18 wire, and coupling loops made from #14 Romex. By the way the grid circuit was patterned after Bill, KDØHG's, 304TH article in *ER* several years ago.

Another major problem that took a fair amount of time to resolve was the neutralizing capacitor. I ended up making one out of two single sided PC boards about 4 inches per side, driven with threaded rod and square brass tube stock from the hardware store to stabilize the mess. I used grid neutralization but as we all know it must be changed from band to band, so I ended up using a turns counter for resetability.

I must admit much time was wasted calming the 450's down until I started using little tricks recommended by WØZUS, WØPW, KDØHG and WAØZHH.

Most testing of the RF section was done with 800 volts on the 450TH's which calmed them down considerably. I had fears of using higher voltage for original testing by recalling childhood

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Audio Patching the Professional Way

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9549 N. 17th St.
Kalamazoo, MI 49004

Making the necessary (or desired) audio interconnections between various pieces of radio equipment has always been a real chore. Most of us have far too much equipment, and we insist on using any and all combinations of receivers, transmitters, demodulators, processors and anything else we have lying around. I have read articles concerning such interconnects, and the various solutions people have concocted to deal with the situation. This is another such article, which, considering the technical abilities of typical vintage gear, and the apparently widespread interest in making your vintage station work and act like a broadcast studio and transmitter location, may be especially well suited to the *ER* audience.

Studios, whether broadcast, production or recording, have always had a number of technical aspects in their favor, which have allowed getting away with the proverbial murder. All equipment has been designed with input and output impedances which are compatible. Without ranting of the old 50 ohm microphones, the 900 ohm telco lines and a few other deviants, the traditional piece of studio gear has 600 ohm input and output impedances. Auxiliary "bridging inputs" which traditionally exhibit 10,000 ohm impedance allow some other neat tricks. Circuits are always balanced to ground to prevent the introduction of hum in low level circuits, proper wiring techniques will prevent ground loops, and since only three signal levels are generally considered, the situation just couldn't get any easier.

The typical studio would have many pieces of equipment which are required to complete the "audio chain" from source of load. The placement of the equipment in the chain would be dictated by logical progression of signal and function of the equipment. Wiring between various pieces of gear would be aided by the use of a jack field or patch bay, which would allow changes in equipment choices, or its electrical location, without the need to rewire anything. The infamous jack field is the key to versatility in your shack. There are some precautions which must be taken however, so pay attention to the fine points, and refer to diagrams 1 & 2.

You probably have seen patch bays. They are frequently available at swaps, and the most common manufacturers are Altec Lansing, Switchcraft, and ADC. The original standard was two parallel tip/sleeve plugs, each plug being 1/4" diameter and spaced 5/8" apart. The dual plugs would carry the signal on the two tips, while the sleeve was for the shield. Shield, not ground, refer to diagram 1. More recently, single-hole three-conductor patch bays have replaced the older style dual plugs to provide higher density fields. Single hole bays are tip, ring, sleeve. Audio is applied to tip and ring, with the sleeve for the shield, (drain). If you find a patch bay to pick up, be sure you acquire the same style patch cord, three conductor plugs will not fit into two conductor bays. Although standard 1/4" phone plugs will properly fit into the older style dual jacks, and yes, you will double the number of connections available if you wire the jacks unbalanced, which I assume you will do, you will not have the quality of plug, and the physical toughness of the original cloth

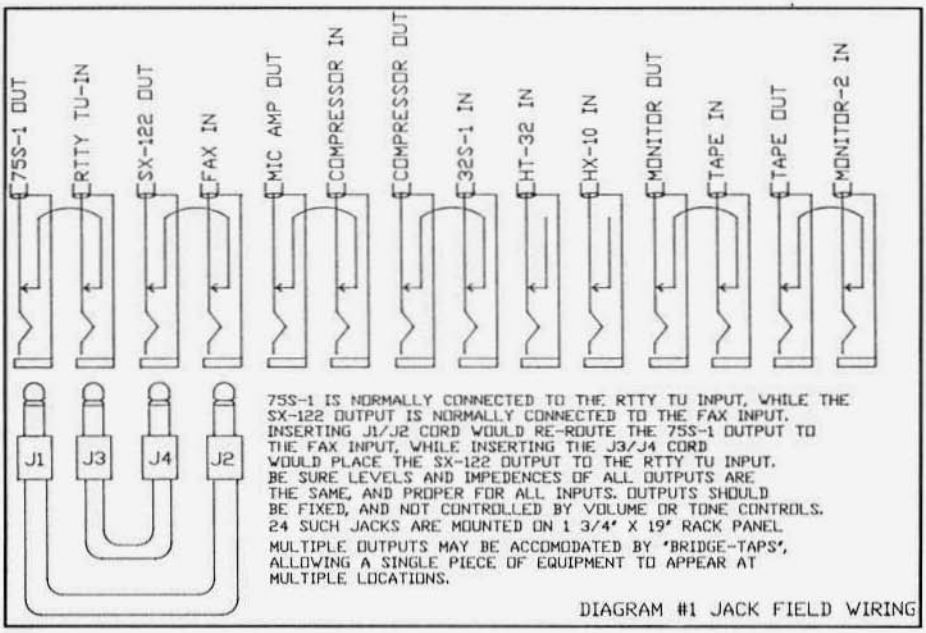

DIAGRAM #1 JACK FIELD WIRING

covered cord. Additionally, the little labeling strip on the field barely has room for two device legends. It can be done, as shown in the diagram. You may really luck out and find dual plug patch panels, and single jack cords of 1/4" diameter. If you want to run unbalanced, this is the way to do it.

Jack fields are always wired keeping two critical points in mind, phase and shield connection. Phase of an audio signal is important, not in itself (unless you are an absolute purest), but it must be considered when running the signal through various pieces of equipment. If you start with a signal, split it by heading off in two directions, ie: through a processor, and then remix the "dry" signal with the processed signal and if there is a phase reversal (which would be 180 degrees), you will have no signal! Commercial equipment never has a phase reversal within the equipment, even if a phase inverter needs to be added to put things back together after the required number of signal amplification/processing stages, it will be added internally. The older dual plug patch cords will have ribs on one side. These ribs are polarity indicators. When inserting a patch, the ribs should always face the same direction, so the phase of the signal is not reversed. Newer T/R/S three conductor plugs do not need this protection, provided you wire the patch bay correctly, and all signal outputs are phase relative.

The great advantage of using a jack field is that most (but not all, so look closely before you buy) jack fields consist of a "jack" and a normally closed set of switch contacts, referred to as "normals". Normals are nothing more than a normally closed set of switch contacts. Inserting a patch cord into a jack opens the normally closed switch, and places the "source" signal onto the patch cord. Plugging in the other end of the cord opens that jack's respective normally closed contact and places the signal onto the "load" input. A properly laid out system would consist of the input and output of each piece of equipment being wired to the jack field. Additionally, the NORMAL operating position of each piece of equipment would

continued next page

be wired through the normals, meaning the whole system would operate without any patch cords in the bay.

Specific pieces of equipment in a chain would frequently be expected to provide an output to multiple locations simultaneously. An example of this would be a tape recorder. It would not be uncommon for the output of a recorder to feed into the board for mixing, and also to an "audition amp" for headphone use in a booth. Also when dubbing (copying) from a master tape, it may be desirable to make a number of copies simultaneously. This would be done by using "mult-N" outputs from a device. These outputs would never connect to the normals, but would be available at the jack field through splitting pads or bridge taps. The splitters or taps would provide multiple outputs from the same source, while providing isolation between the various loads. In order to accomplish isolation without signal loss, you must change the impedance of the load, you can't get something for nothing, Ohm's law prevails! This is where the "bridging inputs" of equipment would come into play. Remember the bridging inputs, about 10K ohm? Selected bridging inputs will also appear at the jack field. Now, you can have a source with MULTiple outputs, which are still at reference level, but at a higher impedance. Patching from the MULTiple outputs into BRIDGing inputs of various loads, will provide the same signal going to several loads simultaneously, at the same level, neat trick.

To accommodate the complexity of wiring, and to provide for the possibility of changing hardware in the future, the equipment is not wired directly to the jack field. Wiring from each piece of equipment would be terminated in a mass termination device, typically a Christmas tree terminal block. The Christmas tree would be a phenolic block with rows of terminal strips for soldering to the wires from each piece of equipment. One side of the block connects to the equipment in the "outside" world. The other side of the block would wire to the jack field.

The block would typically have three or six terminals in a row. This would facilitate the three wires required for each audio circuit, (signal +, signal- and drain) or two complete circuits on one row. Each successive terminal toward the rear of the block would be longer to facilitate wiring, hence the shape and name, Christmas tree. A properly wired 'tree will always have clear tubing over the drain (shield) wire, as it is uninsulated within the jacket, and it is imperative that it not contact any signal wires or terminals. The tubing would offer protection against this error in such a high density area.

The wires to the jack field (located in the same rack with the 'tree) would connect to the other side of the 'tree terminals. Again, due to the high density of the wiring, to keep things easy to service, figure out, and just make it look neat, the jack field wiring would have its own personality. If all wires were to dress across a jack field from left to right let's say, there would be a big rat nest of wires attached to the patch bay. To alleviate this condition, all inputs and outputs would be routed to the right, while the normals would be routed to the left. This would mean each jack had one wire leaving to the left, and one to the right. When properly done, the wire bundle will always be exactly the same diameter across the width of the bay. Lacing (no ty-wraps, please!) along the wires, between each pair of jacks, will provide a neat installation, and you can always find a wire by the direction it heads. Generally, the jack field is wired on the bench, using a wiring jig for wire layout. The wires leaving each jack are cut long, identified, and laced into neat round bundles. When the jack field is mounted in the

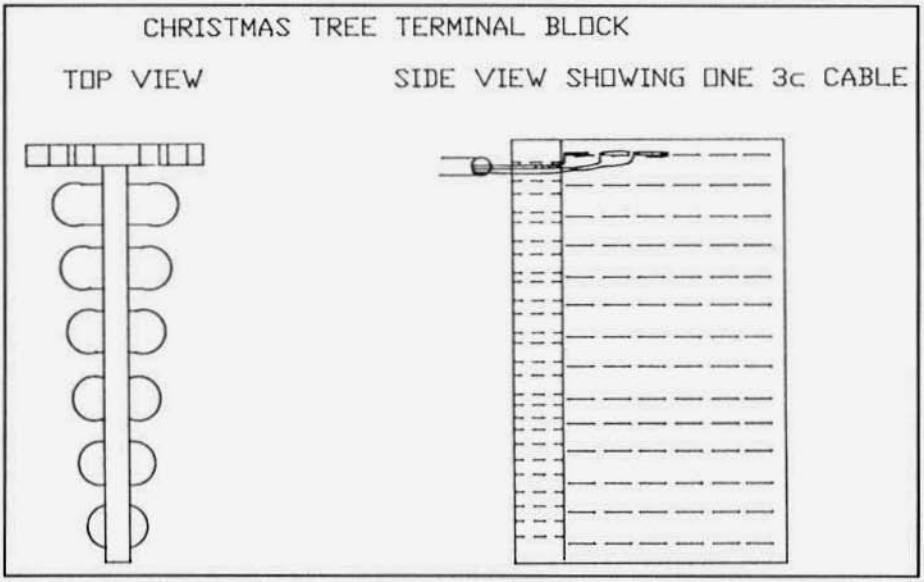

Diagram #2

rack, the two bundles are dressed down the side of the rack and head toward the 'tree. Wiring the 'tree in the bottom of the rack is a very tedious process, but since it only needs to be done once, it is worth the effort.

Practical application in your shack may not be quite as easy as in the studio. Although today's equipment seems to have forgotten about standard input and output impedances and levels, the older gear seems to be more standardized. Most older receivers have 500 or 600 ohm audio outputs, even the levels were about the same, and frequently not affected by the front panel volume control. If you are using broadcast or studio gear, you should have no problems. If your commercial gear uses terminal strips for connection, generally terminal 1 is shield, 2 is audio + and 3 is audio -. Some terminals have dual windings brought out, for impedance selection. In this case, you will need to refer to the equipment manual for proper termination. The known exception is equipment made by Rauland-Borg, which used terminal strip screw 1 as Audio +, screw 2 as shield, and screw 3 as audio -. Three-pin connectors, referred to as "Cannon" from the original manufacturer of this device, or more likely in today's world known as XLR, after the Switchcraft part number assigned to this body style, should have pin 1 as shield, pin 2 as audio + and pin 3 as audio -. The audio + and - designations refer to the phase of the signal, not level or anything else.

In a proper phase maintained system, a positive sound pressure on the element of a microphone will provide a positive voltage on the conductor indicated as audio +. If you are using various amateur gear, you will need to check the input requirements for level and impedance. Although fairly rare, UTC and Peerless transformers are also occasionally seen at swaps, and can be permanently attached to equipment to provide the proper matching.

I have been using patch bays for many years, as has a friend of mine, and we always chuckle when we hear comments like...."just give me five minutes to connect the XXX into the line and let me know how it sounds". Keep your eye open for patch bays, take your time in

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My BC-610 Story

by Andy Millen, KD6TKX
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Salinas, CA 93908

Almost all of my radio equipment is military gear from the WW II era. I've been using an ART-13/BC-348 combo on CW for some time now and I also have a 1944 Navy TCM transmitter plus a variety of other sets. With this in mind, you might think that I would have set my sights on a BC-610 from the beginning. After all, the -610 was one of the most famous transmitters of WW II. It also enjoyed great popularity with hams after the war. The BC-610 in its later form was used by the military at least as late as the 1960's and probably longer in some reserve units. But for some reason I had never really been that crazy about hauling one of these monsters home. Maybe I was guilty of believing all the negative write-ups in the "Surplus Radio Conversion Manual" and other popular books and articles written in the '50's which seem to try to compare WW II military radios to 1950's commercial ham gear. In retrospect this seems to be like comparing apples and oranges. Whatever the reason, I had never actively pursued acquiring a BC-610. However, after reading some articles on the transmitter and seeing one in my friend's garage, I decided that it was time to look for one.

The BC-610 is really a classic looking piece of gear. It shares the art-deco look of other Hallicrafters products of the same era - like the SX-28 and others. It has clean purposeful lines and the design is purely functional. It is no wonder that the military was able to transition this commercial transmitter into military service with only a few alterations.

Deciding that you want to own a 50 year old piece of equipment is the easy part. Getting your hands on it is the tough part. I was a little casual about finding a -610 at first. I thought that since so many had been made I would have little or no problem finding one. Wrong! The attrition rate among -610's is very high. I have now heard so many horror stories about the BC-610 genocide that I can't believe any are left. They were pushed off the decks of ships returning to the U.S. They were used in the Philippines to make a breakwater for a harbor. Brand new transmitters were stripped of transformers and hauled away to the dump as garbage. And on and on.

I began touching bases with all my military radio friends and nobody had or knew of any available -610's. So I waited and began listening in the hopes that I might hear of one for sale. I was also listening on the air to hear a -610 operating. I talked with one person in Colorado who was using one and it sounded great. I was surprised at how uncommon it was to hear a -610 operating.

One winter night in 1993, I was participating in a roundtable on 3870 with several other west-coast AM'ers. I was using my TCM transmitter and RAS-3 receiver. At some point during one of my transmissions I mentioned that I was looking for a -610. Luckily for me, one of the people in the roundtable was Jim Wilson, NU6H. Jim casually mentioned that he had a BC-610-E sitting in his garage. Jim said that he had been thinking about selling it and had even advertised it several months back and got no response. Jim had then decided

The author in his hamshack. The BC-610-E is in the corner with a BC-939 tuner sitting on top. The BC-614 speech amp is on the left end of the desk with an SX-28 receiver next to it.

to hold on to it at least until he got it on the air to see what it was like. The -610 Jim was telling me about was exactly what I was looking for. It was an E model, it was basically stock, and it had the original speech amp and antenna tuner. Jim told me that if he did decide to part with the transmitter he would let me know.

I talked with Jim on the phone about his -610 and he described it as being in reasonably good shape. Jim had replaced several capacitors in the speech amp and had run the transmitter into a dummy load. It appeared to be in working order but he had not put it on the air. Also Jim had had the foresight to turn on the filaments from time to time while the radio was being stored in his garage.

I decided to send Jim a letter to let him know that I was serious about buying his transmitter and to make sure that he had my phone number and address should he decide to sell. After sending the letter I figured that was that and got on with exploring other possibilities.

My lucky break came in the form of a Johnson 500. It seems that about two weeks after I talked to Jim he bought a Johnson 500. Jim decided to cushion the financial blow of buying the '500 by selling me the BC-610.

Checking the answer machine is not a top priority for me after a hard days work; wife, children and chores being first on the list. That day however I did check the machine and I was thrilled to hear Jim saying that he was ready to sell the -610. I called Jim that night and we agreed on a price and made arrangements for me to pick up the transmitter the following Sunday.

My good friend Tom Horsfal, WA6OPE, offered to go with me and

continued next page

My BC-610 Story from previous page
help evaluate the -610. I had met Tom a little over a year ago at a swap meet and we soon found that we had a common interest in military radio gear. At that time I still had no license. After meeting Tom and hearing that WW II radio gear could be used on the ham bands, I decided to get my license. Tom and Rob Brownstein, NS6V, became driving forces in helping me get my license and six months later I received the call KD6TKX.

I decided to use a friend's minivan for the trip south. I also bought two six foot lengths of 2 x 6 lumber to help load the -610 into the van. This later proved to be a wise purchase. We would leave Saturday morning, make a few stops to pick up some gear for Tom, and arrive in the L.A. area Saturday night. The meeting with Jim was set for Sunday morning.

Saturday morning was beautiful and we actually left my house ahead of our planned schedule. We stopped at two locations on the way to L.A. and picked up the gear for Tom. We arrived in the City of Seal Beach around 7 PM after hitting a major traffic snarl near L.A. I called Jim to let him know we had made it and Tom and I checked into a motel. One of the items we picked up on the way down was a stack of Fair Radio catalogs from the early '60's. Tom and I spent the evening going through these catalogs and lamenting over the gear that could have been so easily obtained in those days.

We arrived at Jim's house the next morning and got a tour of his very well equipped vintage station. Then we went down to the garage and I got my first glimpse of a transmitter that was to become as familiar to me as the back of my hand.

It was a BC-610-E built in 1944 by the Detrola Company. It was in stock condition with the exception of a few missing and incorrect items. The plate tuning knob was not proper, all of the high voltage interlocks were defeated, and the 100TH modulator sockets had been replaced and were sitting on top of the deck instead of being recessed. However, there were no extra holes and the cabinet was in good enough shape to use after a clean-up job. Of interest was a depot service tag indicating that this transmitter was overhauled by the military in 1959.

Also included was a stock BC-939A antenna tuner and the BC-314 speech amp. The original cable for connecting the speech amp to the -610 was sitting in a box with several tuning units and some plate coils. The original military tech manual was also present. All things considered, this was a very complete set that could be returned to original condition with minimal effort.

With the help of the two pieces of wood I had brought, Tom and I were able to load the -610 easily into the van. I should mention that Tom is a veteran BC-610 mover, having purchased and moved three at one time in the past. Being able to benefit from Tom's experience made the transportation and later the restoration process of this transmitter much easier. Our deal was consummated with a handshake and I assured Jim that this -610 was going to lead a pampered life from now on. I could tell that he was a little sad to see the transmitter leave but I was grateful that he chose to sell the -610 to a person who would restore and use it rather than letting it collect dust in his garage.

Tom and I drove home without hitting any traffic at all and made great time. Back at home, just outside of Salinas, those two boards came into use again to get the -610 out of the van and into my home. I figured that I would just load the transmitter into the radio room and work on it there instead of doing the work in the garage and having to move it in later.

The first thing I do with a new piece of gear is a complete cleaning and in-

spection. For those of you who have never worked on a -610-E, let me tell you that it is very difficult to work on or clean unless you remove the decks from the cabinet. There are a lot of bolts that have no captive nuts to remove, and you have to get someone with a strong back to assist you, but the removal of the decks makes working on the -610-E much easier. As I blew away the accumulated dust and grime, I could see that this transmitter was complete and in good electrical condition. The next day I was ready to begin operational testing of the -610. I carefully plugged in the tuning unit for 80 meters, inserted the plate tuning coil, and fired it up. To my surprise it worked just fine. That is to say that it was loading up to full plate current and not blowing up. That night, I made my first on the air contact with the -610 using the original tuning units. There were several people in the QSO I broke into to get a report but my good friend Charlie, N6JAX, gave me the definitive report. He said, "Andy, you're a wreck!" He went on to say that there was a loud hum on the signal and that it sounded like it might be going into FM. Well, I shut the thing off and cursed it a few times before settling down to take a good look at what was happening. One problem was easy to find. The grid connector to one of the 100TH modulator tubes was hanging in space having separated from its socket while I was reinstalling the modulator deck. This problem was easy to fix.

Next night I was ready to try it again. I now had a good strong carrier with no FM'ing, but the modulated hum on the carrier was still present. I checked all the likely suspects like filter capacitors, etc. Everything seemed to be fine but the hum was still there. Then it occurred to me that the -610 tuning units have always had a bad reputation for instability and other problems. Perhaps this was my problem. I had received an FT-171 crystal for 3870 several days prior so I tried plugging this into the crystal socket of the tuning unit. Guess what! No more hum and the transmitter was getting good reports even using a carbon microphone! If you have a -610 and want to use it, get yourself some crystals or use a VFO because the tuning units are unusable. Another friend Doug, KM6OR, has also recently put a 610-E on the air and he had the exact same problem with his tuning units.

The next morning I did a few other minor repairs to the -610. When I tried to test it I found that I was getting no drive from the oscillator to the first IPA stage. I also noticed that I was having a problem with the interlock circuit which had been bypassed. It seemed that I had an intermittent contact somewhere. No easy fix this time!

I removed the RF deck again and put it up on the work bench. I found the interlock problem was a cracked terminal plug going to a terminal strip. I then traced out the oscillator circuit and found that a small RF choke was open. I was able to repair the choke and replace it in the circuit. I didn't even have to buy a new part to fix this old transmitter! Since I am new to radio and my technical skills are still quite basic, the location and repair of these simple problems took several late night sessions. Still I was proud to be able to fix this transmitter, which is much larger and more complex than anything I have worked on before.

After I put the RF deck back in place the -610 was ready to begin regular operation. I matched a pair of 100TH modulator tubes by finding two that glowed the same color of pink under load. This is the first time I had been around TH tubes and it took some reassuring that they were supposed to be glowing! Another problem I ran into was the fact that unless you are using the original JB-70 junction box, there is no way to key the transmitter. To do

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My BC-610 Story from previous page

this I made up a small 12 volt relay box that keyed the oscillator and B+ of the 610 as well as grounding the receiver antenna and audio. After this was done I had full break-in operation. I later wired up a D-104 and I am now getting great audio reports. The fact that the 614 speech amp has a dynamic and carbon microphone input makes using a microphone such as the D-104 very easy. This is not the case with most WW II radios.

Tom had a large amount of -610 parts on hand and he was able to supply the odds and ends to get my -610 back into stock condition. If you find a -610 with bypassed high voltage interlocks, I would recommend fixing them. This transmitter will kill you dead if you are not using your head while you are working on it!

I used the -610 for about four months with my SX-28 receiver. This is my favorite receiver because of its outstanding audio characteristics. The SX-28 is also a good looking companion to the 610 since it was designed by the same company in the same era.

Several months back I acquired a BC-342 receiver which was used with the 610 in WW II. I also recently picked up an original JB-70 junction box from Doug, KM6OR. Doug had obtained a number of these units when he bought his -610 and since he had no interest in using them let me have one for free. I had been thinking about using the -610 with all the original components that were intended for it but I was too busy having fun operating to get around to that project. After a while I had all the cables needed to connect the JB-70 and BC-342 so I did. This is now my main operating set up and I love it.

And so that is my BC-610 story. I am sure there are many others since the BC-610 seems to have touched a part of almost all hams who were around in the forties and fifties. Since I am too young to have been around during the time that BC-610's were considered electrical buffalo, to be disposed of by the thousands, I find it hard to understand why such a reliable and great sounding transmitter is now only rarely heard on the airwaves. I am glad to report that my BC-610 will be on the air as long as there are people on AM to talk with. **ER**

James Millen Special Event from page 3

torians, the restorers elected to leave the old can filters in place and wire in the modern stuff under the chassis, out of sight.

Jim Millen's personal HRO came with the station. The serial number was L-248, suggesting a manufacturing date of Feb.-Mar., 1936, not a first production run HRO, but nevertheless an early one. He had retubed it with the 6-volt equivalents.

The restoration process started out with the usual C and R-check and replacement procedure, but soon enough it was discovered that someone in the distant past had spilled a corrosive liquid (Coke, coffee?) inside, with the result that a number of the coil spring contacts in the chassis and even the rivets in the 75 meter coil drawer were destroyed and unusable. These had to be replaced. While all the caps were bad, the early resistors were surprisingly all good.

A rebuilt National #697 power supply was used with the receiver, which now works quite well. SSB as well as AM can be received readily and conveniently, although the absence of an SSB detector does tend to make more work for the operator.

The first day of on-the-air testing was March 19th, and generated considerable excitement among the AMers who responded. Reports included BC-quality audio and signal levels of S9 to 40 dB over.

The Millen Memorial Station, the transmitter with the HRO, is used frequently on AM, usually on Sundays at

4 PM on 3867 kHz on one of the AWA nets. To accommodate the West Coast stations who were able to hear the station but unable to break through the QRM, another special event will be held on March 11, with the transmitter reconfigured for 20 meters.

References

1. The AWA Old Timer's Bulletin, Vol. 35, No. 4, Nov. 1994.

2. Notes on Amateur Radio Transmitter Design, complied by James Millen, 1938.

3. Dating the early HRO, by Charles Fisher, The AWA Review, Vol. 4, 1989.

Next transmission: SATURDAY, MARCH 11, 1 to 5 PM EST.

W2AN will work AM-SSB-CW stations on 14286 kc. All QSL cards received will be acknowledged with a special Millen memorial card. QSL to: W2AN, 59 Main St. Bloomfield, NY 14469. ER

T-368 from page 23

- still uses the front panel high voltage breaker, handy for zero beating and improved safety vs the externally provided plate transformer input on J13, which requires an external breaker.

If you don't have an extremely stiff 120 VAC 25-30 amp service in your shack, you can't run the transmitter at full power or at all in many cases. There is no optional 220 VAC support in any of the transformers and I already had the shack wired for 220. I installed a nice heavy duty 4-conductor mains cable through a strain relief on the back panel next to J14 to begin with. I then installed a new run from one leg of the incoming 220 through unused pins 24 and 25 on P7 in the power supply deck to CB2. I removed the original run from J13 and insulated the terminal lug. P11 remains stock with pins 2 and 3 jumpered. I also provided for a proper chassis ground to a copper water pipe. If you get neutral and one of the legs reversed you will have to take a trip to the breaker panel. **Be extremely careful.**

Assorted Notes

If you are about to begin a T-368 restoration, I highly recommend that you take time to install four ball bearing wheels on the bottom of the cabinet. You have two choices: a) cheap ($5 ea) 4 inch wheels from Home Depot which require drilling 4 holes or b) W.W. Grainger's 3/8" single stud $94 variety - I opted for the cheap route with good results.

I've heard that the 6000 driver tube can not be replaced with any other tube in any practical sense due to excessive plate dissipation. Just for grins, I verified that a 25AV5 ($7.50) tube will work for at least 6 months as a backup for the hard to find 6000. A 6146 is an optimal candidate for replacement, however, the required socket changes are located in an extremely tight space.

My next experiment is to add a 15 henry choke between the screen dropping resistor and the 4-400 screen to see if it would be possible to improve the self modulation of the screen.

Conclusion

The T-368C/URT is truly a heavy metal project and well worth the effort. Models E and F were the latest editions and contained solid state antenna relays in lieu of the mechanical ones in the earlier models (the only significant change I've found). I recommend models C-F only based on the manuals I reviewed and my experiences.

Thanks again to *Electric Radio* for providing a forum for those of us who enjoy restoring these elderly masterpieces. Thanks also to those of you in the *ER* collective conscience for all of your assistance on this T-368 project. ER

LETTERS

Dear ER

I enjoyed the December issue, particularly the picture of KØAS's Raytheon "monster". I am thinking of blowing up the picture and using it to mollify my wife. When she complains about all of the other equipment I have, I can drag the picture out and say, "I could be going after one of these!" On second thought, maybe I will go after one of those.

Joe, KE6LFT

Dear ER

I have a few FYI's to add to Dale Gagnon's excellent article "WW II Liberty Ship Radio Set FT-102" that appeared in ER#67.

There is another! The S.S. Lane Victory, a WW II Victory ship built in 1945, is one of about 700 built after the Liberty ships were built. It has been "restored", and can be visited at Berth 53, San Pedro. The Lane Victory was also supposed to participate in the 50th anniversary D-Day ceremonies but ran into mechanical difficulties off the coast of Mexico and was forced to turn back.

This ship cruises from San Pedro to Catalina and back a couple of weekends a year and includes a simulated air-attack by Luftwaffe fighters that gets driven off by American fighters - quite a show! ! My wife Judy and I went on the cruise in May '93 and had a great time. The cruises are $100 per person which includes a continental breakfast and a very good buffet lunch. Tours are available below decks and the S.S. Lane Victory Memorial Ship Museum is located in one of the cargo holds. We had a great time and I would highly recommend it.

Amateur radio station W6MWO is operated on board and guest operators get a certificate. I didn't. Every time I went below decks, I started turning "green". As a result, I spent very little time in the "radio room". There were 20 hams on board for the group picture that day. Like the John Brown, the Lane Victory's original radio room was roped off. The radio equipment appeared to be original but I don't know enough about this equipment to know for sure.

The following day, I had a SSB QSO with W6MWO on 40M while it was on its Sunday cruise AND W6MMG on 20 M on the S.S. Jeremiah O'Brien during its cruise of San Francisco Bay. Both QSL'd.

The original W6MWO QSL card shows the Lane Victory before it was "restored". The volunteers have done just an incredible job in restoring the ship to its nearly original condition. The Lane Victory has been designated a National Historic Landmark. For more information contact:

United States Merchant Marine Veterans Of World War II
Owners and Operators of the S.S. Lane Victory
A National Historic Landmark
P.O. Box 629
San Pedro, CA 90733
(310) 519-9545 FAX (310) 519-0265

Dave Ishmael, WA6VVL

I KEEP MY TRANSMISSIONS LONG BECAUSE I'M SO INTERESTING

Homebrew Transmitter of Childhood Dreams from page 25

experiences, of watching PA's go into oscillation and meter movements trying to rotate 360 degrees. I didn't want to watch meter pointers with right angle bends when the project was finally in operation, thus the low voltage testing.

The transmitter still has a few problems after being in operation for 6 months but they are minor.

About final operation: On AM with 1300 volts on the plates 375 watts out is easy, with 2800 volts, all seems to hold up, but the FCC doesn't allow 1600 watts out. In linear service with 4000 volts on the plates, in Class B, 25 watts of drive is required for 1500 watts out. A little more drive from my Japanese rig and the house GROANs!

Remember requirement 5, NO BLOWERS. After watching the house cat jump up on top of the cabinet while I was in an SSB QSO, and then jump off with a eery screeching yell, I have since installed 4 small blowers. They are the silent type like you see advertised - nice and quiet to someone who is totally deaf. A friend commented a couple months ago when I fired the transmitter up for him, "This reminds me of a B-52 feathering power up to head for the runway".

Construction of the transmitter didn't take very long, I couldn't have spent more than 6 months working on it every single free moment I had. Time could have been shortened tremendously if I would have had the proper tools and had spent a few bucks buying components instead of fabricating them, such as the neutralizing capacitor and sockets for the 833's.

The final accomplishment is worth the time and frustrations, but if I ever homebrew another high power AM transmitter it's not going to use big power triodes from yesteryear; 4-400's or similar valves would be a much more practical approach. Power requirements are totally ridiculous (380 watts of filament power + 300 watts to power the exciter + 100 watts in bleeders and regulated bias supplies + 40 watts for fans + 125 watts lost in the RF section). 375 watts output of real plate modulated RF = about 39 percent efficient. ALL-IN-ALL playing with the 32 switchs/controls and operating late at night with the only light in the shack coming from the transmitter is a kick, and certainly can't be matched by the solid state rigs we have become accustomed to seeing today.

So if you're still interested in homebrewing that high power AM transmitter, good luck, and my hat is off to those who build one a year for the excitement of it all!

My thanks to the following for their help and encouragement:

WØZUS, WAØZHH, KDØHG, WØPW, KA5DGH, K4KYV, KF7VA, the XYL and her chiropractor (Ms. Bone Crusher with the big pockets to me) for seeing her one late night last March. **ER**

Audio Patching from page 29

thinking about how you want your station to operate in a normal configuration. Make measurements of input level required for each piece of equipment, and typical output levels of the equipment you have.

Make isolation pads, attenuators, impedance conversion networks and stick in a transformer when necessary. When everything in your shack is running at the appropriate impedance and level, then start wiring things together. You can plug and play 'til your heart's content, or the guy on the other end of the conversation calls it quits! **ER**

The SBE-33 Transceiver from page 9

set requires great caution. The 'transformerless' design makes a chassis ground essential so a new three-wire cord should be installed. **Never use the set without checking that the third prong of the outlet is actually grounded.** Traveling this summer I found several motel rooms with three-prong outlets but nothing connected to the third prong.

There's no noise limiter or S-meter; a true 'S' reading would have been impossible with the gain control and AVC method used. There's no excuse for the one to two kcs of warm up drift.

This is almost a perfect front panel - logical, symmetrical, easy to use and beautiful. The one small flaw is that the bandswitch/exciter tune knob goes the wrong way - counterclockwise for increasing frequency. Problems like this can always be fixed; I wish the designer had worked on it a bit longer.

There is no calibrator and no way to correct the dial even if you have one; when the set is aligned by the instructions the error will be nil on 20 meters and up to 4 kcs on the other bands. There's no RIT.

To the credit of Sideband Engineers, nearly all of the SB-33's problems were eventually fixed. By the final SB-33 series (SF-1) all the fixes that could be applied without changes on the panel had been done and most of the rest - the need for calibration, RIT, and band-to-band calibration errors - were taken care of in the SB-34. SB-34's built after 1969 even got an audio output meter: this works like an S-meter except that the reading is affected by the volume control. Electrical safety was improved by providing a cover over the PA. The 'backward' tuning of the exciter was fixed by making the main tuning also backward - at least a consistent pattern is easier to learn!

Overall, the SB-33 is an outstanding set for the time. Its overall good performance (in spite of poor AVC and excessive drift and distortion), modest price, and compact design should have swept the market. Why didn't it happen?

The answer is in the ham marketplace of the early '60's. The KWM-2 had brought full coverage HF transceiver operation in mid-1959 and by '63, many companies were offering competing SSB sets. But three battles were raging. First, SSB was only beginning to push AM out of the picture. In addition, the contest between transceivers and separate transmitter/receiver stations was in full swing, with most manufactures offering both choices - for example the Collins 75S/32S pair and the KWM-2. And finally, the switch from a 'complete' transmitter or transceiver with all the power you could afford, to a moderate power exciter with a linear was just beginning.

Sideband Engineers' SB-33 got all three choices right: like all of today's ham HF sets it is a moderate power SSB transceiver - and SBE even sold the linear! But it was too soon. Not only did the set have to compete with those from other companies, many hams still preferred the other approaches: many were still running AM, others bought separate SSB transmitters and receivers as they had for AM, and many of the rest were looking first at PEP when making their choices. Next to the others, the 75-watt SB-33 looked like the 98-pound weakling. Too bad, because the -33 was five years ahead of the foreign competition. But when the sand box is full of big kids, you have to be strong and have determination and stamina as well - being the smartest just isn't enough. **ER**

Question: Does anyone know what the material was that tube manufacturers used to secure the bases and plate caps to tubes? What is a good modern-day substitute? If you can answer these questions please call or write ER. N6CSW/Ø

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FOR SALE: Repair and restoration on all vintage equipment; 35 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

FOR SALE: Tubes, NOS - (3) 2E24 JAN and (2) 2E26 Sylvania - $5 each plus postage. Joseph R. Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003.

FOR SALE: BC-348R - $125; ART-13 - $110; Hallicrafters S-41G Sky Buddy - $55; Heath GR-81 regen. rcvr - $39; Knight Spacespanner - $39; ARC-1 VHF - $45; spare DM for ARC-1 - $15; AN/URR-44 rcvr - $95; HW-7 - $77; Hallicrafters HT-40 parts unit - $25; HP-400C VTVM - $10; BC-221 w/AC sply & cal. book - $20; junk ARC-5 units - $5 each; DX-60B/HB-10B/HR-10B, untested - $150; GRC-9 w/cables - $42; Heath HW-29A, 6M xcvr w/mic - $35; Harvey-Wells Bandmaster TBS-50D - $55. **WANTED:** Mic for TS-520 John Devon, KI6DQ, Pasadena, Calif., (818) 441-5523

FOR SALE: Collins R-388 w/TM (copy) - $240. **WANTED:** Hammarlund HC-10. Mike, AC5P, POB 33, Bartlesville, OK 74005. (918) 333-2795

FOR SALE: TCS-12 xmtr, rcvr, mating connectors. Good condx w/no mods. These units were built by Collins Radio and have matching serial no's - $225 + shpg. James Owens, NW0O, 1363 Tipperary St., Boulder, CO 80303. (303) 673-9019

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 22075. (703) 822-5643

FOR SALE: Johnson Pacemaker SSB/AM/CW xmtr. All orig., good condx, w/manual. Non-smoker - $175, U-ship. Paul, KC4BWG, (615) 986-8664

FOR SALE: HP-400LR AC VTVM, 12 ranges .001 to 300 VAC, like new w/manual - $25 shpd; HP-411A RF VTVM millivolt meter, 10 mV to 10 V, 500 kc to 1 GHz, missing probe tip, w/manual - $15 shpd. Both work. Dave Sundheimer, WØNBZ, 13020 Lakeview, Burnsville, MN 55337. (612) 890-1844

FOR SALE: Collins KWM-2A, surplus, very good, reconditioned - $575; Collins 30L-1, mint - $1975; Collins KWM-2A, perfect - $2500; Heath SB-200, exc., reconditioned, re-tubed - $375; Drake TR4CW, exc. plus, MS4, AC/PS, mic, manual, reconditioned - $573; used (2) 572B's - $25; Clegg 99'er, VG - $75; SBE Sidebander 6, AM/SSB mobile, VG plus - $250. All plus shpg. Cory, N2AQS, 1000 E. 14th St., Bldg 178, Plano, TX 75074-6249. (214) 751-7535 (24 hrs.)

FOR SALE or TRADE: Elmac AF-67, AF-68, PMR-7 & 1070 sply - $200. **WANTED:** 6M SSB rig. Clem, W8VO, (810) 795-4670

WANTED: Cosmophone and/or info for registry; B&W coils #2175 thru 2179; Johnson 500 pwr sply/mod.; **FOR SALE**: PMR7. Brian Harris, WA5UEK, 3521 Teakwood Ln., Plano, TX 75075. (214) 596-2914

WANTED: All types of military electronics, especially RDF and radar items, manuals too. Also need URD2 antenna. William Van Lennep, POB 211 Pepperell, MA 01463. (508) 433-6031

WANTED: Old QSL cards; Drake ham radio equipment; General Radio publications; tube books/manuals; early callbooks. Joe Holstein, N8EA, 1515 Sashabaw, Ortonville, MI 48462.

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

WANTED: Front panel from Globe King 500 modulator deck. Jim Roseman, W9UD, 2716 West 3rd St., Coal Valley, IL 61240. (309) 799-7447

WANTED: Drake L-7 linear amplifier and Hallicrafters HT-33 linear. Jay Spivack, N7JDT, 325 S. Washington Ave., Kent, WA 98032. (206) 859-2680

WANTED: Galaxy R530 rcvr; Swan 160X; Swan 1210 FM 2M; Swan or Galaxy parts rigs. Eric, KBØXP, Box 98, Stanton, IA 51573. (712) 829-2446

WANTED: Assembly manual for DX-100. Photo copy OK. Jim, (206) 337-0567

WANTED: Suggestions, comments and source of suitable military xmtr/xcvr for 30M use on submarine restoration project. Brian Roberts, 3068 Evergreen, Pittsburgh, PA 15237. (412) 931-4646

WANTED: Round-edged DX-100 cabinet in good condx. Will swap for square-edged style. Cal Eustaquio, N6KYR, 1313 D Foothill Blvd., SLO, CA 93405. (805) 594-0302

WANTED: 500 ohm line to PP 805 grids. I sell & buy tubes - trade for above. J.N. Meade, W9TDX, 12711 Pinebrook Ln., Hudson, FL 34667.

WANTED: Panel meter for Elmac AF-67. Also interested in a clean Viking II in good operating condx. Ron, W8KYD, 5410 Alber Ave., Parma, OH 44129. (216) 888-1904

WANTED: Schematics/manuals for Ballantine 300H; Hickock 188X; RCA WV-77C, WV-49B; Eric 821; Johnson Messenger 223; Wintronix Sweep Circuit Analyzer. Jack, WA4CSM, 8109 N.W. 58 Ct., Tamarac, FL 33321.

WANTED: SP-600 VLF and/or R-389/URR rcvr. Must be in good condx and working. Willing to pay top dollar for a good one. Gordon W. Hullin, K2ZBU, 3666 Cold Springs Rd., Baldwinsville, NY 13027. (315) 622-0141

WANTED: J.W. Miller I.F. coils p/n 1725, 1726 & 1770. Jack Iverson, N9KYT, 1110 Old Mill Dr., Palatine, IL 60067. (708) 359-0941

WANTED: Clock face cover for Hammarlund HQ-100C. Also need knobs for Heath DX-35 and DX-40. Jim Berry, WA3JAT, 2512 Sixteenth St., Cuyahoga Falls, OH 44223-2048. (216) 922-0158

WANTED: Paying $50 for new or good used Western Electric 300-B tubes. Jeffrey Viola, 784 Eltone Rd., Jackson, NY 08527. (908) 928-0666

WANTED: For daily commuting (not for any "... collection"!) a Conset G66 mobile rcvr. PMR6's, PMR7's, KE-93's, etc. also welcomed. Eddy Swynar, VE3CUI, 3773 Concession Road 3, R.R. #8, Newcastle, Ont. L1B 1L9, Canada.

WANTED: Any information on RACAL 6830 UD HF DF rcvr; any wireless items (pre-1920) for collection. Will Jensby, WØEOM, 645 Giannine Dr., Santa Clara, CA 95051. (408) 296-6071

WANTED: Tech manual for WW II telegraphers "Mill". US Navy Underwood, standard model. John Elwood, WW7P, 5716 North 34th Dr., Phoenix, AZ 85017-1911.

FOR SALE: 160M tank coils for BC-610, swinging link style. Not junk - $75 each. Missouri, (816) 524-1541, lve msge.

FOR SALE: Receiving tubes, new and used; multi-section twistlock electrolytic caps to 500-VDC; SAMS photofacts. Send stamp for lists. Turner Electronics, 16701 Main St., Ste. 121, Hesperia, CA 92345.

FOR SALE: Schematics and conversions. BC-348, BC-342, BC-312, BC-645, BC-946, more available. $15 each ppd. Allen Carnon, K9ZQO, 848 Inverrary Ln., Deerfield, IL 60015. (708) 459-5942

FOR SALE: Crystal radio kits, complete with face panel, base board, variable capacitor, prewound coil and many parts for old style radio. Remit $22.50. Carl & Grace Ent., 5636 Romeyn, Detroit, MI 48209.

FOR SALE: Electro-Voice desk mic, midel 619, wired for Collins and Drake - $50; new, latest editions of S-line and KWM-2/2A series instructions books, call/write for pricing and availability; KWM-380 compatible keypad, complete with cable and connector - $75. Jerry Brouwer, AB8U, 3041 Rising Spring Ct., Bellbrook, OH 45305.

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FOR SALE: National NC-300, clean, works good - $200; Hammarlund HQ-170, works good - $100. Chuck, KC6ARU, 1143 Shawnee Dr., Santa Ana, CA 92704. (714) 557-5181

FOR SALE: Swan - 500CX - $275, 500C - $250, 350A - $250, 406 VFO, 510X, VX-1, FP-1, 14C. All VG. **WANTED:** 8950's, 6KD6's, 6LB6's. KO6IJ, (714) 643-7930

FOR SALE: KWM-2 with Waters Q-Multiplier; RAL-7; Doghouse pwr sply for military National; Drake DC-4; RCA RC rcvr. Joel, WB2BMH, (516) 757-7641

FOR SALE: Collins F455J15 filter - $99; Drake 2B xtal calibrator - $29. K1BW, (508) 537-7195

FOR SALE: 455 kHz Collins mech. filters, available in 1.5 kHz and 400 Hz bandwidths. Fits S-line (not 75A-series). Supplied with data sheet and plot of measured performance. $75. each plus $4 per order postage in USA. James Owens, NW0O, 1363 Tipperary St.,Boulder, CO 80303. (303) 673-9019

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FOR SALE: ART-13 parts & other interesting stuff. SASE for "The Bone Yard List." eLKay electronics, 231 Shenandoah Trail, Warner Robins, GA 31088-6289.

FOR SALE: Navy RBC rcvr with 110V pwr sply, works well - $175. Ron Skipper, AA8AD, (518) 643-2089

FOR SALE: Homemade galena crystal radios, detectors and galena crystals. $1 regular, $2 super. Radio parts. What do you need? L. Gardner, 458 Two Mile Creek Rd., Tanawanda, NY 14150.

FOR SALE: ARC 2/2A manual (orig.) service, overhaul, parts (620 pages) - $60 ppd. Dave Metz, (703) 885-7914 (eves)

FOR SALE or TRADE: CN-514/GRC voltage regulator. Great for hamfest, field days, wind generator freaks, computer gurus and hot dog vendors. Input 95-135 VAC, 60 cps... output 115 VAC @ 5 KVA (42 amps!). Uses buck-boost circuit. Appears brand new. Asking 5 cents/watt. U-ship. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (602) 624-8029

FOR SALE: Collins S-line, 32S-1, 75S-1, 312B-4 and 516F-2, exc. condx and fully operational. Sell as package only - $825; Navy model TDQ 45 watt 2-M AM xmtr - $250 PU only. Jim DiMauro, WA2MER, Vernon, NJ (201) 764-5203

FOR SALE: Hallicrafters SX-11, nice - $319; S-53, knob missing, otherwise nice - $55; Geloso G-209-R, unworking - $209; Palco "Bantam" 1956 mobile HF, w/modulator, nice - $259; Gonset Communicator IV VFO for 6M, 2M and 220 MHz, near-mint - $89; 2M Communicator III, worn, fair - $33; WRL Galaxy 300 SSB w/matching PSA-300 console/pwr sply, nice - $159; 73 Magazine, 1962-1980, complete, mint - $150; ARRL Handbooks-1927 (cover loose) - $66; 1932 (water damage) - $33. Don, N3HRT, (412) 234-8819

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FOR SALE: G-66B w/pwr sply & manual, very nice condx - $50 plus shpg. **WANTED:** Top cabinet lid for SX-100. Merle Crowley, W1GZS, POB 476, Sumterville, FL 33585. (904) 568-1676

FOR SALE: Vintage parts. Send stamp and request "Vintage Flyer". USA only. 40 years of mail order electronics. Bigelow Electronics, P.O. Box 125, Bluffton, OH 45817.

FOR SALE: "The Signal Corps" has purchased the entire remaining assets of a 1950's WW II electronics surplus dealer, including WW II aircraft, vehicle, infantry radios, radars, etc. Brand new catalog #9, $2 U.S., $5 foreign. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: Gonset GSB-100 xmtr, GSB-101 linear; Hallicrafters HT-37; Heath AT-1, AR-3; Johnson Invader 2000; National NC-300; Collins red label plug-in mech. filter, F-455-Q-6. Steve, correct number, (803) 873-2499 ex. 200, day or nite.

FOR SALE: TBS-50D, VFO, not working but cosmetically near mint condx - $140; HQ-129X, works fine - $100; Ranger, VG condx - $175. Marc, WC1X, 641 East Main Rd., Middletown, RI 02842. (401) 846-6325

FOR SALE: Hallicrafters CRX-3 aircraft rcvr, 108-135 MHz, mint, w/manual - $150. K.A. Norvell, 6015 Norway Rd., Dallas, TX 75230. (214) 373-3973

FOR SALE: HP 410-B VTVM, w/manual - $75; Hallicrafters S-38E, like new (no manual) - $60. Ken, Waco TX, (817) 772-7307

FOR SALE: Military - TCS-12 or TCS-5 TX, RX, remote, cables, loading coil, noise limiter (NIB), spares kit (NIB), dynamotor (NIB), exc. + - $399 each; Navy RBZ HF rcvr, tiny, w/AC sply, battery case, antenna, headset - $239; other RBZ stuff - call; DAG-1 WW II HF RDF set, both antennas, headset, exc. - $279; also DAG and DAG-2 - call; 2 position ATR rcvr rack, good - $79; CY-1218 control box from GRC-38, controls BC-610 and 2 rcvrs, equiv. to JB-70 in SCR-399, nice - $179; RM-13J remote for BC-191, fine - $39; BC-611 crystal/coil set in BX-49, mint - $139. Don, N3RHT, (412) 234-8819

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), POB 697, North Cove, WA 98547. (360) 267-4011

TRADE: 75A-4, mint, 2.1, 3.2, 6 kc filters, vernier knob, spkr, s/n 4173. Trade for Johnson 500 in exc. condx. Ray, WD2AFJ, New Jersey, (908) 859-2613

FOR SALE: HS-30 headsets, new, in sealed overseas (waxed) packaging dated 1944. With extra earpieces, dessicant, cord & instructions - $20; VT-158 Zahl tube, Eimac manufacture, NIB - $150 ppd. **WANTED:** Manual (s) for USMC AN/PRR-15; whip assembley for AN/PRC-74; any military (& related) manuals; H-33 handsets in quantity. Thanks! Gene, KD4YIZ, (800) 619-0900

FOR SALE: SX-96 - $100; S-40 - $75. **WANTED:** Main tuning knob for National RAO-7; xtal lattice filter for SR-150. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

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WANTED: All items in WW II B-26 radio compartment, BC-461 antenna control box, clock lamps, oxygen, chair, etc. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. Msg. (707) 523-9122

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WANTED: Collins 312B-5; 75S3B; 3253; Drake L-75 amp & 4NB noise blanker. K2OA, (914) 691-7957

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

WANTED: Urgently, desperately, a Johnson KW Matchbox, with or without directional coupler and meter. Have you got one? Ed Sieb, VA3ES, POB 8377, Ottawa Terminal, Ottawa, Ont. K1G 3H8, Canada. (613) 738-8924

WANTED: Collins 310B3; 70E8A with dial as stand-alone unit with dial. Interest in KW-1 group? Jerry, W8EGD, (303) 979-2323

WANTED: QST's. All issues before 1930. Feb., July 1951; July 1952; Sept. 1956; Feb. 1958; Jan. thru May 1960; Aug., Dec., 1961. Howard Weinstein, 15 Lakeside Dr., Malton, NJ 08053. (609) 596-3304

WANTED: Looking for CE-100V in good condx w/manual. W2IQ, (615) 397-9796

WANTED: Big Navy xmtrs. Low freq./high freq., I don't care. Sad looking junkers welcome. William Donzelli, 304 South Chester, Park Ridge, IL 60068. (708) 825-2630

WANTED: Swan 500 xcvr, reasonable. Hoover, Pineland, SC, (803) 726-5762

WANTED: G and H coils for HRO-60; also need dial strips for same. Al Feder, W1EOX, POB 640, Killingworth, CT 06419. (203) 663-1811 or FAX anytime 663-3092

WANTED: Collins KWS-1 or RF deck only; A-line cabinet for 75A-2. Good plus condx. Bill, N6LKA, 873 So. 10th St., San Jose, CA 95112. (408) 280-7172 eves PST

WANTED: 75A-4 and 51J series rcvr. Ward Rehkopf, 116 Fairway Dr., Belmond, IA 50421. (515) 444-4396

WANTED: CW, AM filters for 75A-4; bottom cover for R-388; operator/repair manual for Systron-Donner 6152A freq. counter. Robert Harding, 1321 Monte Largo Dr., NE, Albuquerque, NM 87112. (505) 291-0950

WANTED: RME 4300. Gerry Higgins, W9INP, Box 5345, Carefree, AZ 85377. (602) 488-2650

WANTED: 160M & SWL xtals for R4B; BC-669 rear door & orig. pwr sply; #19 Mark II antenna variometer; nice BC-342 rcvr. Don Merz, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819

WANTED: Johnson gear, all models, any condition. Also parts and literature. Please state condition and shipped price. Wen Turner, AD7Z, Box 451ER, Cal-Nev-Ari, NV 89039.

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FOR SALE: Synchronous detector for 455 kHz IF rcvrs. Dramatically improves AM: Reduces fading distortion, selectable sideband cuts interference. Kit - $139, Built/Tested - $199, Info - $3. Steve Johnston, POB 3420, York, PA 17402-0420.

FOR SALE: 1964 Allied Radio Lincoln model L-201 (post Knightkit?) 500W motor speed/light control, w/manual, 3x4x1-1/2 inches - $14 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (708) 679-8641

FOR SALE: Collins manuals (copies) - R390 Maintenance - $25; R390A Operators - $25; R390A Maintenance (196 pages!) - $69; R391 Maintenance - $45; Gonset G66B rcvr w/sply - $65. N1FRX, (207) 834-6273

FOR SALE: Crystal radio set kits and parts. Send SASE for brochure. Carl & Grace ent. 5636 Romeyn, Detroit, MI 48209.

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

Photofacts and Parts for Collectors
Electrolytics, high voltage capacitors, power resistors, plugs, switches and more. Free catalog. **A.G. Tannenbaum, WA2BTB, P.O.Box 110, East Rockaway, NY 11518. (516) 887-0057, FAX 599-6523**

FOR SALE: Tubes, capacitors, sockets, NOS and reproduction parts for antique radios and TV's. Large SASE for tube list or $2 for 20 page catalog refundable with 1st order. Vintage TV-Radio, 3498 West 105 St., Cleveland, OH 44111.

FOR SALE: Hammarlund HX-50, exc. condx - $200; Drake R4A, T4X and MS4 spkr/pwr sply, exc. condx - $325 plus shpg. **WANTED:** Collins 312B-4 or 312B-5. Would consider trade. Robert Mitchum, N9WEZ, (317) 881-9083 anytime.

FOR SALE: Service manual copies. Most $5, shpg $1 each. Hallicrafters, Hammarlund, Heath, Johnson, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Repair & restoration of all classic & vintage radio equipment, reasonable rates, prompt turn around, 25 yrs experience. Mike McKean, N3HJQ, 726 McClellan St., Philadelphia, PA 19148. (215) 336-6111

BUY/SELL/TRADE: Misc issues of U.S. Amateur Callbooks, 1914 thru 1980. SASE for list. Bob Arrowsmith, W4JNN, POB 166, Annandale, VA 22003. (703) 560-7161

BOOKS FROM ER

McElroy, world's champion radio telegrapher by Tom French $19.95

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by Raymond S. Moore.....3rd Edition $19.95

Don C. Wallace, W6AM, Amateur Radio's Pioneer by Jan D. Perkins....$29.95

Oscilloscopes, Selecting and Restoring a Classic by Stan Griffiths.....$19.95

The 1994 Amateur Radio Mail Order Catalog and Resource Directory.....$16.95

Please add $3 per book for shipping. Colorado residents please add sales tax. Money back guarantee!

Electric Radio, P.O. Box 57, Hesperus, CO 81326

WANTED

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

WANTED: Hallicrafters HT-9 and HT-20 any condx. Bob Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

WANTED: Panadaptor BC-1031C (455 kc IF) & manual. John, Colo., (719) 481-4564

WANTED: 1951 North American Callbook. Richard Pann, 2447 Yates Dr., Augusta, GA 30906.

WANTED: Collins 312B-5, 30S-1, late RE. Condx more important than price. Pwr cords; trim rings; TV-2 tube tester. Scott, WA5CVL (800) 513-8378

WANTED: 80M, 1st RF xfmr (tunable coil) for 75A-4 or phone number of source. Bill, WC3K, Bowie, MD (301) 286-9507

WANTED: Old novice 1 tube 40M xmtr w/pwr sply. Joseph Falcone, 3000 Town Center, Suite 2370, Southfield, MI 48075. (800) 436-7026. Leave message, mention transmitter.

WANTED: Johnson Desk Kilowatt; Collins 51J-4; main tuning knobs for SX-101A/HT-32B; black spkr for HRO-5. Ben Deovlet, W6FDU, 933 Robin Ln., Campbell, CA 95008. (408) 374-0372

WANTED: Hallicrafters spkrs - R-44 for SX-43; R-42 for SX-42; PM-23 for SX-28; black cabinet with wooden letter 'h' on grill for SX-17. Charles Furtak, 241 Oak St., Elmhurst, IL 60126.

WANTED: TCS xmtr; TCS plugs, etc; cables or connectors for GP-7 and GF xmtrs; connectors P1 & P2 for PP 2352/TRC75 400 Hz inverter. John Freeman, POB 1773, Pinehurst, NC 28374.

WANTED: 19" rack panels for homebrewing (especially 7", 8-3/4", 10-1/2"). **FOR SALE:** RTTY 32KSR, 33ASR, accessories and manuals as package. Tom Hoitenga, K8NGV, 3170 Kennesaw View, Marietta, GA 30064. (404) 426-8682

WANTED: Collins 75A-1 rcvr. Complete and in good condx. Henry Rogers, WA7YBS, POB 511, Virginia City, NV 89440. (702) 847-9047

WANTED: Suitable military HF xmtr for USS Requin restoration project; Collins radio items. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

WANTED: Book, schematic and plug-in coils for National FB-7XA, need plug-in coils for National RC-105 (HRO). K1MBI, 21 Freestone Ave., Portland, CT 06480.

WANTED: Johnson Matchbox, 275W, defunct. Need working bandswitch. David Lipson, N9IVF, Meadow Ave., Shoreview, MN 55126. (612) 482-9226

WANTED: McIntosh and Thordarson amplifiers any condx. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. (414) 545-5237

WANTED: Intelligence museum wants German, Japanese, Italian, Russian and Chinese communication equipment and any British or U.S. spy radios. LTC William Howard, 219 Harborview Lane, Largo, FL 34640. (813) 585-7756

WANTED: 51J-4; 75S-2; 32S-2; 75S-3A; R-7A. Tye, KB8FJ, 777 Brightridge, Bridgeport, WV 26330. (304) 623-8113 days or lve msge

WANTED: Brown Brothers bug; Astataic 10DA head; blue Arturus tube w/box, dud OK. Pete, AA6ZE, 5140 Gates Rd., Santa Rosa, CA 95404. (707) 537-1120

WANTED: 1930-1950 Popular Mechanics magazines for radio projects; G-410 or G-415 or G-521 Temple brand portable radio. Harry L. McCall, KB4CSY, RT 1, Box 244, Ennice, NC 28623-9641. (910) 657-8248

WANTED: Coils for Knight Ocean Hopper rcvr; air-variable capacitor, 1000 pF or similar. Norm Hegyi, KC9D, 9200 Henry St., Dyer, IN 46311. (219) 365-4089

WANTED: TMC GSB-1, GPT-750; National VX-501 remote VFO; Collins 516F1/312B2. Bob Nickels, KE0T, 1444 S. Rotzler, Freeport, IL 61032. (815) 232-7142

WANTED: Telegraphic apparatus and keys by collector, not a dealer. Will pay top dollar. Pete, WB2BYQ, (201) 818-4311

WANTED: W.S. (Canadian) no. 29, A&B sets; Soviet R (P) 112 xcvr; U.S. RT-136/GRC-13. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Western Electric radios 20A, 20B, 9A, 9B, 27A control, 8B xmtr; wind generators; RCA sets AR594, AR1496, AR60. James Treherne, 11909 Chapel Rd., Clifton, VA 22024. (703) 830-6272

WANTED: Bandswitch knob for Hallicrafters SX-25 "Super Defiant" and tech. info for Heath model 10-4560 scope and model WA-P2 audio preamp. John Micsak, W2PRR, 1549 Shoecraft Rd., Penfield, NY 14526.

ELECTRIC RADIO PARTS UNIT DIRECTORY

If you need a part for a vintage restoration send $2 and an SASE (.52 postage) for a 7 page list of parts units. If you have a parts unit, consider putting it on the list. Your dead unit can help bring others to life!

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

WANTED: Beginning collector needs anything Vibroplex. Send me your bug and key list. Mitch, WA4OSR, 11 Midtown Park, E., Mobile, AL 36606. (205) 476-4100, 342-7259

WANTED: Teletypes, Teletypes, Teletypes and any other teleprinter machines, parts, literature or information from the 1940's to the '70's. Gary Ashbaugh, POB 2008, Corvallis, OR 97339. (503) 758-8006

WANTED: Hallicrafters HT-33 linear amp parts, coupler for Johnson Matchbox; old Hallicrafters catalogs or manuals; aluminum (louvered) top dust cover and orig. manual for R-390; Hammarlund SP-200 (or BC-779) parts. Lee Shumway, WB8ZEY, 2820 Yankee Springs Rd., Middleville, MI 49333. (616) 795-3255

WANTED: Highest quality, early-mid '30's commercial (Collins/National) or homemade exciter or transmitter, 10W-100W CW, 160, 80, 40, 20 meter capable, as companion to HRO. John Petrich, W7HQJ, 8301-161 Ave., N.E., Ste. 300, Redmond, WA 98052-3858. (206) 868-1256

WANTED: Have pre-1931 Weston 301 30-0-30 DC ammeter marked "Bijur System". What does "Bijur System" mean? Also want BC-191, BC-375, BC-461, BC-434, APN-1 or parts in any condx; correspondence with others who served or remember 826th Tank Battalion in Ft. Benning, GA; also GRC-4 as used then, in 1957. Chris Cross, Box 94, McConnell, IL 61050.

WANTED: WW II Japanese TX/RX sets (and parts) for restoration to operating condx and ER articles (now restoring 94-5 three tube rcvr); manuals (or copies) for GF-11/12, PRC-14 and RA-34F. Ken Lakin, KD6B, 701 SE Salmon, Redmond, OR 97756. (503) 923-1013

WANTED: Copy of manual for Hallicrafters HT-46. Happy New Year. Bill, KA9CWK, 4146 S. Golf Rd., Hillsboro, IN 47949.

WANTED: Johnson Viking Mobile xmtr, any condx. Ted Bracco, WØNZW, Quincy University, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

WANTED: D, B and AA (or A) coils for an HRO-50T. Greg Gore, 11528 Watermoss Ln., Charlotte, NC 28262. (704) 549-4719

Notice: The Manual Man's 1995 catalog will be out soon. Watch for it. Also, sell us your excess manuals. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: A GR audio oscillator that matches the 1932A dist. meter; manual for the GR 1932A distortion meter. Cecil A. Palmer, W5NWX, 4500 Timbercrest Ln., Waco, TX 76705. (817) 799-5931

WANTED: WRL-70 xmtr; HB xmtrs for display, must be museum quality; thousands of QSL cards to paper walls of Amateur display. Call Leo, (402) 392-1708, Western Heritage Museum, Omaha.

WANTED: Collins 32G xmtr, CC-3 suitcase, MM-1 mobile mic and TD-1 dipole antenna. Paul Mezzapelle, WA6NLJ, POB 883, Carmichael, CA 95609. (916) 481-0145 eves.

WANTED: Manuals for Heath AA-100 amp and AJ-41 rcvr; also a mint HX-20 face plate. Marty Drift, POB 21, Blawenburg, NJ 08504.

WANTED: E&E Radio Handbook 21st Edition; ARRL Hints & Kinks Vol. II. TRADE: CQ, mostly '50's, '60's, early '70's. Lynn Stolz, N8AJ, 2461 Bean Oller Rd., Delaware, OH 43015. (614) 369-9777

WANTED: CQ magazine issues May 1945, Sept. 1945 & Feb. 1946; ARRL Antenna Handbook, 6th or 8th edition; Editors and Engineers Radio Handbook from 1950's. (800) 225-0256 ext. 14733

WANTED: Hammarlund manuals, parts, parts units, from the series Comet, HQ, SP. Also accessories, catalogs, spec sheets, memorabilia. Robert, Amateur Radio Surplus, (517) 789-6721

WANTED: Collins 30J, 30FXB/C, other pre-1940 Collins amateur gear for my collection. John Firey, WB5HRI, 14818 Delbarton, Houston, TX 77083. (713) 5615-KW1

WANTED: Vintage tube CB's; pwr sply/modulator for Johnson 500. Send card or call with model you may have. Steve White, WB5UGT, Box 1086, Clute, TX 77531. 800-374-6477 - 9008 (leave message)

WANTED: Hallicrafters S20R & SX-42, only in very good condx. Jose Cangas, EA4JL. Contact in the States Kurt Keller, (203) 431-6850

WANTED: Pre-war "Pearl Button HRO's"; WW II German, Australian, Japanese HRO's; manual or copy for McMurdo Silver 5B and 5C; dial assembly for 5B. Thanks. John Orahood, N5SPQ, 5819 Miller Valley Dr., Houston, TX 77066. (713) 440-5598

WANTED: Test equipment (IE-17E) for WW II walkie-talkies (BC-611); test unit I-135E and artificial antenna A-82A. Richard Mollberg, K6PWF, 2340 Almond Ave., Concord, CA 94520.(510) 283-6786 (n), 827-4056 (d)

WANTED: Drake R4C rcvr; (Hickok, etc.) mutual conductance tube tester; Kenwood T-599 xmtr; Radio Shack DX-400; Uniden CR 2021; RCA model CRM R6A; Heath SB-610 monitor scope. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

WANTED: Any AN/GRC-14 components to complete a museum showpiece. AN/PRC-74 antenna and mounts, W.H.U? Nice 1.3 to 2.1 MHz ARC-5 Tx. S.C. Signal Corps Museum, 5 Rollingwood Dr., Taylors, SC 29687. (803) 244-0324

FOR SALE: R-390A (Amelco), exc. working condx, w/op. manual - $275 firm, U-ship. W8PAL, (602) 814-6387 days

FOR SALE: NOS TV and radio tubes, parts, SAMS, mostly from '60's and '70's. Send large SASE for list. Charles Preston, K4LJH, 48 N. Ivandale St., Hamilton, VA 22068. (703) 338-4152

FOR SALE: New Ranger I, Valiant I and Navigator plastic dials, 160-10, freq. numbers in green, w/all holes, like original - $17.50 ppd. Bruce Kryder, 4003 Laurawood Ln., Franklin, TN 37064. (615) 794-9692

FOR SALE: Heath manuals (Xerox): DX-20 - $8, HW-29 (Sixer) - $10, HR-10B - $9, QF-1 - $5 ppd. Send long SASE for list of hundreds more. **WANTED:** GC-1A, AA-100, AJ-30, AJ-41 manuals. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805.

TRADE: Have Heath SB-604 spkr (matches SB-104 line). Want Kenwood spkr such as SP-520 or SP-230 or similar to match TS-530S xcvr. Or will trade for SB-104 noise blanker. Wayne Arnett, AI7C, 2699 Mazatlan Dr., Grand Junction, CO 81506. (303) 241-9422

FOR SALE: Original manuals - Hallicrafters SX-101A, S-40B, National NCX-3 - $10.50 each or trade. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

FOR SALE: Hammarlund HQ-180 - $170. Prefer pick up but will consider shpg. Bob Braeger, WA6KER, 6634 Navel Ct., Riverside, CA 92506. (909) 682-5084

FOR SALE: Used technical books - radio, electronics, mathematics, military, magazines, catalogs, handbooks, etc. $1 for big list (stamps ok). Software, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: Restoration of vintage radios; 25 years experience. Phil Goodman, K4FXB, 217 Millbrook Farm Rd., Marietta, GA 30068. (404) 509-9493

FOR SALE: PJ-068 mic plugs for Collins S-line/KWM-2, new gov't surplus - $8 each shpd in USA. Clint, KM6UJ, (408) 742-4582

FOR SALE: Auxillary VOX unit for KW-Atlanta, NIB - $25 + shpg. Dave Campbell, VE3ZZY, (519) 672-4163

FOR SALE: A-83 dummy load for SCR-608 - $18; PRC-6 & PRC-10 homing antenna AT-339/PRC in canvas case - $40; National AVD-250 Velvet Vernier 5:1 drive - $10. All unused surplus. Shpg included. Abe, POB 4118, Jersey City, NJ 07304.

FOR SALE: Rycom R-1307/A rcvr, 3 to 810 kHz, AM/CW/MCW/SSB/FM/PSK, 4 xtal IF filters, 19" rackmount w/built-in spkr, voltmeter and analog tuning dial. Used, checked w/copy of manual - $150 plus $20 S&H. Haney Electronic Co., 7225 Greenlee, Fort Worth, TX 76112. Call Steve at (817) 496-3346

FOR SALE: 1950's military telephones removed from destroyers. Handset snaps onto stainless front. Great in vintage hamshacks - $39.95 plus shpg. Bill Hanks, Box 1004, Salome, AZ 85348. (602) 859-3797

FOR SALE: Most items (except equipment) still available from my many ads in recent ER issues. List sent with orders, or send large SASE with 3 stamps. New (but old) in orig. boxes, perfect condx, round General Radio knobs, black center knob with metal dial, some with 0-100 over 1/2, and others 3/4 of the dial; Type 712-A, 3-1/2" dial and indicators, w/friction drive (optional use); Type 710-B and 710-G, 2-3/4"; Type 710-A, 2-3/4"; Type 717-B, 4", all types - $20/each; new (but old) in orig. box, perfect condx, round General Radio Type 705-A, 3-1/4" Vernier dial and indicator (one only) - $35; new (but old) Parkin Manufacturing Company in orig. boxes, perfection condx (two only) 3-3/4" direct reading channel dials for Atwater Kent Radios "locates those distant stations", replaces the orig. Vernier knob - $25/each. Derek, KI6O, callbook address, (916) 965-4904

FOR SALE: RCA SAMV-4 remote 4-channel audio mixer - $40; TMC C.B.E. 1 sideband exciter - $35; UTC 5/25H @ 550 mA swinging choke (NIB) - $20; B&W low pass filter, 72 ohm, NIB - $20. All plus UPS. Ron, KC6TWG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR TRADE: Navy TCS-14 setup, xmtr, rcvr, tuner, cables, mic, earphones, control box & orig. dynamotor. Looks and works good. For newer 2-M rig or older ham gear or Zeniths, non-working OK. Fred Watson, KB8NRF, 581 W. Summit St., McClure, OH 43534. (419) 748-8798

FOR SALE: Panadapter, Navy general purpose IF 206/URR, (late 1960 mfg); Johnson Viking II, VFO, manuals; Collins PM2 pwr sply; Mirage MI"1 peak reading wattmeter; RCA 7094 xmtg tubes; coax antenna relays, Dowkey - $10 - $20 each; Eimac VS2 high pwr vacuum relay w/coil - $30; RCA mic MI436K; set of solid state tubesters for Collins 75S1, w/data - $70; Collins HV xfmr and filter chokes from 1 KW broadcast xmtr, CCS rated for your big, big AM xmtr; vacuum caps, variable & fixed - $10 - $50; Laport's Radio Antenna Engineering - $15; Bill Orr's Radio Handbook, 1962 - $10; Handbooks and tech. info, Collins, NBS, military, antennas, broadcast, VLF, HF and xmtg equipment. Roger Faulstick, KD4AS, 210 Mariah Ct., Merritt Island, FL 32953. (407) 453-3312, FAX 453-2258

FOR SALE: Johnson Courier amp - $325; Heath SB-220 - $475. **WANTED:** McMurdo Silver 801, 802 rcvr. John Hurst, KU6X, 2512 Euclid Crescent, East, Upland, CA 91784. (909) 981-6759

FOR SALE: Hallicrafters SX-16 - $125; S20R - $75; SX-24 - $95; SX-25 - $125; SX-28 - $250; SX-42 - $250; SX-43 - $135; SX-62A, needs dial cord - $175; SX-101 MK III - $175; SX-110, w/Johnson xtal cal. - $90; SX-115, cabinet only - $45. Pete, (610) 847-2214 eves.

FOR SALE: NOS tubes, list - SASE; Seneca - $100; 75A-4 filter, 1.5 kc - $130; 51S-1 AM filter - $45. **WANTED:** Manual for ARC-58. Joseph Pinner, KC5IJD, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766

FOR SALE: AM sig. gens. w/manuals, VGC - Marconi TF144H/4, 10 kHz - 72 MHz; military URM-25E, 10 kHz - 50 MHz - $100. Chase Hearn, 104 Glenwood Dr., Williamsburg, VA 23185. (804) 229-7263

FOR SALE: Hallicrafter S38C - $50; Drake MN4C - $150; Heath HW101/pwr sply - $175; new S-line spinner knob - $60; Collins parts. Ron Follmar, K5GJT, 332 Camino Real, Kerrville, TX 78028. (210) 896-8830

FOR SALE: Collins 75S3, WE - $350; 30L-1, WE - $450; Swan 700CX, SS-16, 117XC - $325; 500C, 117XC - $250; 406VFO, 510X, VX-1, FP-1, 14C. KO6IJ, (714) 643-7930

FOR SALE: HT-37 - $175; SB-200 amp - $375; SB-101 w/pwr sply spkr - $200. Shpg xtra. James Maxwell, K4KTP, 1233 Leawood St., Memphis, TN 38122. (901) 327-4902

WANTED: Any condition, Hallicrafters S-30 radio compass and S-35 panoramic adaptor as shown. Chuck Dachis, 'The Hallicrafter Collector', 4500 Russell Dr., Austin, Texas 78745. (512) 443-5027

FOR SALE: Tubes/semiconductors/parts/meters/phono needles/radios - LSASE for 20 page list. W.F. Horn, 13110 Marsh Rd., Bealeton, VA 22712. (703) 439-9781

FOR SALE: Hallicrafters SX-99 - $100; National NCX-3, spkr/sply - $100; Hallicrafters S-120 - $35; Gonset G-76, AC sply - $150. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

FOR SALE: SX-71, clean - $100; ID 226/APR9 (NIB) - $50; TS497 sig. gen., 2-400 Mc, good/working - $50; R109/GRC, 27-38 Mc - $25; R105/ARR15 (poor) - $50; TV8/USM31 - $100; R-390A IF deck w/filters and 3TF7, gov't reconditioned - $100. Mel, K2AOQ, (716) 671-0776

FOR SALE: Eldico 100F xmtr - $250, PU only. Steve, K6PFW, 848 N. Silverwood, Upland, CA 91786. (909) 985-1062

FOR SALE: National NC-303, matching spkr, xtal calibrator, exc. condx - $395, includes professional packing and UPS within lower 48. Michael H. Wilke, WB4AQL, 215 Dale St., Rossville, GA 30741. (706) 861-3070

FOR SALE: Weston 785 multimeter, VG condx - $25 + shpg. **WANTED:** Schematic, service data for Conelrad monitoradio CM3; good clean TCS-12 xmtr (prefer west coast); vertical mounting brackets for USN TCS-12. Thanks! Carl Gottsmann, KN6AL, POB 5670, Chico, CA 95927. (916) 899-8675, Internet kn6al@ecst.csuchico.edu

FOR SALE: Dovetron TU 1000CR - $300; Hal 2010 Morse/RTTY kbd - $200. Plus shpg, manuals included. W7MN, (503) 397-1046

FOR SALE: Ramko DC5RA mixers - $50; Gates Solidstatesmans - $75; CBS 4000's - $75; much more. P. Travis, KA4NNN, RT 4, Box 36-B, Louisa, VA 23093. (703) 894-0406

FOR SALE: Hallicrafters SX-115 in near-mint condx - $500 or will consider partial trade for Johnson Ranger or Drake 2-B in like condx. Dick Lucas, WD4PMT, (407) 626-0136

FOR SALE: Knight T-50 xmtr with I.B. - $60; Thor-6 xmtr/rcvr, AM w/pwr sply - $75. Cliff, W3LVC, Elridge, MD (410) 796-1070

FOR SALE: Webster Bandspanner - $85; TS-382, TS-452C - $25 each; BC-610 plugin set - $80; tubes - 4E27, 802, 804 - $12 each; 4-65 - $8; parting out TMC GPT-750D2, BC-610E, R-388, BC-348R. U-ship. WA7HDL, (208) 756-4147 after 1730 MST.

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

FOR SALE: National PB-16 plugs - $.75; Mallory 3-gang inductor 54-216 MHz - $8. All items ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: National NC-173 - $85; pristine Drake SPR4; orig. manuals - Collins 51S1 (11th Ed.) - $35, 51J3 (Parts only) - $5, RME 4350 - $15, Hallicrafters SX-100 MKII - $15, Hammarlund SP-600JX (Service and Overhaul) - $15, SP600JX17 (Operating, Service, Overhaul, Parts) - $35, SP600JX21 (Operating, Service, Overhaul, Parts) - $35, Hammarlund HQ-100A (copy) - $10; parting NC-183. **WANTED:** Mint dials for National NC-183; QST mags, Jan., Oct., Nov., 1964. Doug, (206) 472-3478

FOR SALE/TRADE: Vibroplex bugs including Blue Racer, Lightning Bug, Champion, Original, Presentation, Lionel J-36, other bugs/keys. Randy Cole, KN6W, 1216 Alvira St., Los Angeles, CA 90035. (213) 939-9847

FOR SALE: "Introduction to Key Collecting" 64 page softcover illustrated guide, $11.95 ppd USA. Start now in this fascinating hobby. Artifax Books, Box 88-E, Maynard, MA 01754.

TRADE: SX-100, Viking Challenger or DX-60 plus for Kenwood VFO-230. Also trade YK-88C for YG-455C. Need Kenwood SP-230. (619) 462-3857

FOR SALE: PRC47 LSB/USB kit - $40; new machined coax antenna panel - $9. All restorable. Jay Craswell, WBØVNE, 321 West 4th St., Jordan, MN 55352-1313. (612) 492-3913

FOR SALE: R-390A carrier level meters - $30 each; overhauled R-390A Cosmos PTOs - $30 each. Plus shpg. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

FOR SALE/TRADE: Zenith Transoceanic 600L. Ray, (314) 428-1963

FOR SALE: Hallicrafters SX-71, nice condx, orig. manual - $85; MARS SWR bridge, 50-70 ohms - $15. **WANTED:** D-104 mics and parts. Dave Roscoe, W1DWZ, 49 Cedar St., East Bridgewater, MA 02333. (508) 378-3619

FOR SALE: Wireless Set No. 19 MK II w/spare valves set, canvas cover, supply unit #1, shock mount, crash cover, variometer and cables. Dean, KK1K, 20 Jackson Hts., Essex, VT 05452. (802) 878-8293

FOR SALE: Collector quality S-Line, 32S3, 75S3, 516F-2, DL1, WE; Drake C-Line R4C, T4XC, MS4, PS-4 sythesizer, Etek digital readout & counter; Morrow Twins MBR5, MB560A, spkr/sply, cables, mic. All with manuals. Tubes - (1) 813, (2) 866, (3) 4D32, (2) 8930. Gene, W7MXM, (208) 522-5854

FOR SALE: R1051 rcvrs, exc. condx, cleaned, completely checked, various models to choose from. Shawn Daniels, (314) 343-5263

FOR SALE: First user friendly circuit for early BC-348's. Send $2 + (3) $.29 stamps. Ray Larson, 1224-1/2 Gorham Ave., W. Los Angeles, CA 90049-5214

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: ARC-5 VHF xmtr - $10; coils for Knight GDO - $5; Morrow converter - $10; Heath Tunnel Dipper, no coils - $5; Navy beam filter - $7; Viking 500, as-is - BO over $600; ART-13 - BO; parting SX-28 & Viking II; 110 VAC, 1-3/4 amp Variac - $10. **WANTED:** SX-96 front panel. Joe Sloss, K7MKS, (206) 747-5349

FOR SALE: Swan 350 w/pwr sply - $150; National NC-173D, no xfmr - $35. U-ship. **WANTED:** Electrovoice 911 mic. Rick, 9031 Troulon, Houston, TX 77036. (713) 774-5102.

FOR SALE: Thordarson plate xfmr mounted in 19" panel w/866's, 115/230V, 2330V sec., 1770V tap. Perfect for linear - $95, PU only. Al, AI4U, (407) 222-0007 days best, 298-3493 till 2300.

FOR SALE: RBS-2 ship rcvr and pwr sply - $125; Heath SB-200 linear, needs new filter caps - $100; Hickok 533A tube tester, needs minor work - $20; dynamotors - DM-64, DY-102, DM-36 - $20 for all 3; RME 45, complete, rough - $20; 810's - $70; Bird Termaline, 500W continuous - $40; Radiotron Designers Handbook, 4th ed. - $30; SASE for list of ARRL Handbooks, xmtg tubes, misc. items. Mark Hovda, N0JWI, POB 10091, Cedar Rapids, IA 52410. (319) 364-4048, 7-9 PM CST.

MESSAGE: Thanks for your response to my Nov./Dec. tube tester ads! I should obtain several TV-7 ( )/U testers in Jan. Best time to call for info is 10 AM - 2 PM CST, wkdys only. Joe Bunyard, 1601 Lexington St., Waco, TX 76711-1701. (817) 753-1605.

FOR SALE: TCS rcvr/xmtr, matching serial numbers, w/homebrew pwr sply (housed in TCS rcvr cabinet), orig. xmtr-rcvr pwr cables, remote spkr-control box (no cable) and antenna tuner, PU only - $250; WRL6 VLF rcvr, 10 - 610 kHz - $200; USM-207 550 MHz freq. counters, will pay UPS to lower 48 US - $150; Collins 618T(3) w/copy of manual (no mounts or control heads) - $325; Collins 488-2A DC/AC 400 Hz inverters w/schematic - $75; ARC-12 VHF rcvr, 138 - 148 MHz AM w/schematic and conversion data, w/o dynamotor - $35; 5 MHz ovenized sources, new - $50; J-37 leg key - $30. Bob Miller, KE6F, 9655 Appalachian Dr., Sacramento, CA 95827. (916) 362-5481 (eves), 369-6277 (FAX), internet rmmiller@netcom.com.

FOR SALE: Used Jennings vacuum variables: .65 pF to 7.5 pF and 4 pF to 30 pF, both at 17.5 KV, small size with 1/4" drive shafts - $15 ea, 7 pF to 1,000 pF at 5 KV, 1/2" drive shaft - $40 ea, 2 pF to 50 pF at 10 KV - $25; beautiful, like new, precision Hewlett Packard Model 33300 Programmable Attenuators, 0 to 70 dB in 10 dB steps, and Model 33304, 0 to 11 dB in 1 dB steps, DC to 18 GHz, 2 watts RF, 50-ohm, gold female in/out SMA connectors, requires 12-15 VDC for the magnetic latching solenoids, 8" long by 1-1/4" high by 1-1/2" deep, specs/instructions on units, (1984 HP cat. price $1 200.) - $150 ea; set of one each in case for chassis mounting with gold in/out female bulkhead connectors, like new - $300 ea; like new gold male-male SMA barrel, "L" and bulkhead mount connectors - $10 ea; Other SMA gold connectors - $5-$10 ea. Derek, KI6O, callbook address, (916) 965-4904.

FOR SALE: Collins - 75A-3, 1 filter - $375; 32V, green - $300; complete 75S-1, 32S-1, 312B-4, 516F-2 - $750; complete 51M-8, 242F-5 RF unit, 242F-S pwr sply - $125; Hammarlund Comet Pro - $175; SP-600J-3 - $250. Pete, (610) 847-2214 eves.

FOR SALE: L.T.V. GI75CL surveillance rcvr, 30 - 260 MHz, operational, exc. condx, shpg additional. Joe Bunyard, 1601 Lexington St., Waco, TX 76711-1701. (817) 753-1605

FOR SALE/TRADE: Transmitting/Receiving tubes, new and used. LSASE for list. I collect old and unique tubes of any type. **WANTED:** Taylor and Heintz-Kaufman types and large tubes from the old Eimac line, 152T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE: USSR issue radio sets for collecting (not to be operated) models R-105M, exc. condx, w/acc. in transmit case. $280 ea., 3 for $750. Mike Murphy, (619) 561-2726, FAX 390-8611

FOR SALE: Level meters for Collins R-392/URR rcvrs, new - $35, UPS prepaid. Dennis, WA0WAB, (316) 225-3737 (d), 225-2961 (n).

FOR SALE: Hammarlund HQ-180-AX, very good/exc. - $325; Tapetone XC-50, exc. - $50. **WANTED:** R-390A cabinet. Tony Stalls, K4KYO, (703) 522-1568, rstalls@access.digex.net

FOR SALE: 75A-4 SN 5XXX, exc. - $600; HW-101, like new - $300; Eico 720, great - $75; Heath AT-1, exc. - $125; HQ-110, good - $100; RME VHF converter - $60; Ranger I, restorable - $75; Johnson 6N2, good - $125. All equipment in good working order. Don, K9TWO, (317) 788-7810

FOR SALE: National NC-109 w/spkr & manual, VGC - $175; NC-270 w/spkr & manual, exc. - $235; Heath HW16, w/manual, exc. - $125; vintage equipment manuals - request free list. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454

FOR SALE: Heathkit lives on in historical anecdotes by employees. Quality 124-page illustrated book. $9.95 postpaid. Heath Nostalgia, 4320 196th S.W., Suite B-111, Lynnwood, WA 98036-6754

FOR SALE: Collins KWM-2 w/516F-2 pwr sply - $750; Collins 75S1 & 32S1 - $550; Drake TR4 w/AC4 - $320; Gonset G-50 yellow CD mod - $85; CE MM2 monitor scope w/RM 455 adapter - $95; Drake RV6 VFO - $120; RV4C VFO - $130; Hammarlund HX-50 w/160M mod kit - $330; parting out CE 10A, 10B, 20B - call; Heath DX-60 - $75. All equip. w/manuals and all ex. condx except G-50 has minor paint chips. Steve, WA8GLE, (216) 644-7804

FOR SALE: Xmtrs - R.F. Communications SB6-FA - $100; Globe Chief 90A w/manual - $75; Viking 6N2 - $65; Millen 90800 - $85; Heath DX-35 - $65; Hallicrafters HT-30, no pwr xfmr, w/manual - $75; much Dumont, Motorola, GE Municipal gear, '40's - '60's - call. Pete, (610) 847-2214

Collins 75A-4 Modification Compendium- all the factory modification bulletins from Collins Radio Company, all the articles printed in CQ, Ham Radio, QST and ER, 85 pages - $18
Service Modification Compendium for the S-Line, KWM-1/2/2A series - 260 pages - $40
Service Modification Compendium for the KWS-1, 32V and 75A series - 42 pages - $12
Prices include shipping. Money Back Guarantee.

ER, Box 57, Hesperus, CO 81326

FOR SALE: Military - R237B/VR, 15 tubes - $30; Scott RCH - $150; RBO - $150; R592 - $35; R-390A - $250; BC-221, Zenith - $25; National HRO-50T-1 - $250; NC-183 - $135; HPS, w/pwr sply - $145; RME 45 w/spkr - $75. Pete, (610) 847-2214 eves

FOR SALE: New 60" military test-lead sets - $2.50 set; new, flat 5/8" wide by 6" long by 1/8" thick fiberglass insulators/spreaders, 1/8" holes, use as light-weight antenna insulators (mountain topping?) or as 5" open-wire spreaders - $.75 ea; new round fiberglass insulators/spreaders, 3/4" by 12", cut for more, shorter insulators - $2.50 ea; new cloth (glass?) military adhesive tape in sealed packages, great for winding baluns, or wherever superior HV insulation is required, 1-1/2" by 36 yards -$4/roll; new, heavy duty Fluke black plastic carrying cases, interior moulding for handheld multimeters (Fluke Model 73, etc), and accessories, or 2-meter etc handhelds and accessories, approximately 4"H x 13" W x 10" D, with handle - $10 ea; new military 4' RG-58C/U jumpers, male BNC's - $3 ea, 4" long - $2 ea; new 6' patch cords, heavy duty 1/4" key plugs (similar to PL-55 but heavier) on ends, red heavy duty cloth-covered cable, 5 dB pad in round plastic housing in center of cord - $3.50 ea; coaxial SPDT relays, unused pulls, Dow-Key relay size but with silver plated female in-line "N" connectors, works on 115 VAC and 28 VDC - $15 ea; unused grey 19" aluminum rack panels, 2" to 2' high - $3 to $20 ea, depending on size. Derek, KI6O, callbook address, (916) 965-4904.

FOR SALE: Exc. Drake T4XC, R4B, AC4, MS4 - $400; TR4, AC4, MS4 - $250. U-ship. Gary Elliott, NO5H, 202 Clarice St., Delhi, LA 71232. (318) 878-8032

FOR SALE: Hammarlund HQ-170A VHF, 160-2M, w/clock & manual in VG condx - $290 or trade for SP-600JX-21 or '26. **WANTED:** Code practice keyer. Victor, (805) 581-5317

FOR SALE: Service. Collins radio equipment repair and insurance appraisals. Clint Hancock, KM6UJ, 6567 Ashfield Ct., Room A, San Jose, CA 95120-4502. (408) 742-4582

FOR SALE: RAL 6 rcvr. **WANTED:** Non-working amps and Drake TR4CW, TR4C xcvrs. F.W. Nicholas, W7RBF, (602) 864-9987

FOR SALE: Drake MN2000 tuner - $160; Heath HD-1040 keyer - $40; Heath HO-13 HamScan - $70; MFJ 931 artificial ground - $40; Bencher XZ-2 audio filter - $40. Frank, WB4AYJ, 11780 NW 24th St., Plantation, FL 33323. (305) 472-9474

FOR SALE: 75A-4 - $875; Atlas 210X, digital read-out, bad finals, QRP OK - $195; Mosley RV-4 HF vertical (40-20-15) - $65; SX-100, R46B, needs work - $185; 3-500Z plate xfmr, dual sec. - $85; Realistic DX-120 - $125. Lane, KM3G, (619) 462-3857

TRADE: KWS-1 #1271 for Johnson Desk KW. **FOR SALE or TRADE:** NC-300, SX-71, HQ-140X. **WANTED:** HT-20, SX-88, SX-71, GPR-92. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

FOR SALE: SX-23 rcvr - $275; 75A-4 rcvr, S/N 5515 - $650; SX-42 rcvr - $275. All plus shpg & handling from Seattle, Wash. Pat, phone/FAX (206) 487-1230

FOR SALE: RCA (1930's vintage) remote mic mixer w/pwr sply, needs minor restoration - $350; Gates mic preamp (tube type), clean - $50; Apelco, AE31MA, AM mobile xcvr, single 6146 RF final, cracked bezel, otherwise complete - $40; PRM 10 GDO (ER in Uniform #63), new - $80. **WANTED:** Eico, Fisher, etc. tube type audio amps and audio output xfmrs by Acro, Peerless, Triad, etc. Offers accepted on sales items + shpg. Franklin Albanese, 1610 Prince St., #6, Berkeley, CA 94703. (510) 845-2625

FOR SALE: Tested tubes w/warranty: Buy those spare tubes for your tube radio, audio, ham and electronic gear. Prices are about 30% of new for tubes with a warranty, many about $1. Most are used. I have bunches of octal, older, 7 and 9 pin tubes. All tested on TV/7 tester and boxed. I give a 30 day warranty. Send wants or SASE with TWO stamps for list. Daniel Nelson, 1025 E. Desert Ln., Phoenix, AZ 85040. (602) 243-7421 eves

FOR SALE: Hallicrafters, Drake, Hammarlund, RME, Gonset, Echophone, others. For list send LSASE w/new 1st class postage. Don Jeffrey, POB 1164, Monrovia, CA 91017.

FOR SALE: BC-375E, near exc., complete - $350 plus shpg. Mike Nichols, KF9VM, (303) 431-7298

R-390A Sales-Service-Parts
SASE for info
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Toledo, OH 43608

FOR SALE: Cover BG-153 for BC-620, 659, light green - $35; BG-67-A for MP-37, 57 - $15; BG-173 for BC-1306, light green - $45; BG-96 for SCR-508, 608, 808 - $45; A-28 Phantom antenna - $10; CD-515 - $25; bag for M-209-B - $45; CH-264 - $55; BC-605-D - $90; Y209D shock mount base plate for TCS - $25; DY-17A/ART-13 - $45; C-87/ART-13 - $27.50; DY-88/GRC-9 - $90; GC-6 crank, GC-7 crank, LG-3, LG-3-B - $7.50; LG-2-B - $15; MC-284 clamp - $5; MC-423 clamp - $3; MP-50 - $45; PL-114 for BC-312, 342 - $25; SA-35 cord for Super-Pro - $25; NT-50159 TCS noise limiter kit - $10, all NOS or NOSB; DY-88/GRC-9 - $75; DY-105/GRC-9 - $65; CD-501-A - $35; all used/good. Plus UPS. Vibrators for military sets, including VB-16, some NOS, some used. Several TCS rcvrs, xmtrs, dynamotors, cables and accessories, BC-611 parts, other military radio parts, manuals, plugs, etc. Label and 3 stamps for large list or send wants. Mostly WW II but some Korea and Vietnam. I also buy & trade. Looking for BC-683, BC-684, BC-721 & accessories, IE-37, manuals and other items. Send your list. Robert W. Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043. (713) 467-5614

FOR SALE: Octal base, glass envelope, 100 kc xtal for calibrator - $10 each, limited quantity. Evan Haydon, 4308 N. 15, Lincoln, NE 68521. (402) 435-4083

FOR SALE: NIB Monarch panel meters, 0 - 5 microamp F.S., 1-3/4" x 1-3/4" face. 1-1/2" hole. $3 each, 4 for $10, I ship. Gary Reiss, WA6JRM, Rt. 1, Box 141, Wilcox, NE 68982.

FOR TRADE: BC-322, BC-655, AVQ-9, Warzawpact army sets, Swiss 4 wheel cryptomachine. **WANTED:** WW II German military radios. Rag Otterstad, OZ8RO, Hosterkobvej 10, DK-3460 Birkerod, Tel. 011-45-4281-5205, FAX 011-45-4468-1514, e-mail c/o DANMEC.EINET.UNI-C.DK

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FOR SALE: Globe King 500C w/mil. spec. xfmrs - $800; B&W 5100B, exc. - $350; Hallicrafters S-120 and Globe HG-303, both mint - $150/pr. Bill, N2WXJ, (914) 356-6553

FOR SALE: CRR 47206 ATD LF antenna tuner - $75; RME VHF152 converter - $50. **WANTED:** BC-610 within reasonable distance of my QTH; FT-247 shockmount; 1954, 1980 & 1985 ARRL Handbooks; BC-683 rcvr. Steve Davis, KD2NX, 705 13th Ave., Belmar, NJ 07719. (908) 280-9760 before 9 PM EST weekdays

FOR SALE: Drake RV4C remote VFO, exc. condx - $90; Swan 117XC pwr sply/spkr, exc. condx - $90. Would consider trades for either. **WANTED:** Swan WM-3000 wattmeter; Kenwood BS-8 module for SM220 monitor. Have BS-5 (will sell reasonably). Craig, WA9HRN, (708) 367-1599

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FOR SALE: New original tapes for Hy-Gain MD-1, Collins TD-1, adjustable dipoles - $25 ea, two for $40; new Military IL-4/GRA4 center insulators, female "N" connectors - $10 ea; new, aluminum guy stakes, used in military antenna pole kits, 5/8" diameter by 18" long - $2 ea; new, army-green guy ropes from same kits, UV protected, brown egg insulator and hook near one end, length adjustor other end, 3/16" by 33' long - $4 ea, 42' long - $4.50 ea, 52' long - $5 ea; 140 halyard with hook and small pulley on one end, egg insulator, eye hook, and antenna clamp on other end - $15 ea; new guy rings, MX-378U, 3" diameter, 1-3/8" diameter hole, 5 each 3/8" holes for guy ropes - $1 ea; new military guy cables, about 3/32" diameter, 62' long, stainless steel, with hook and tightener fixture for bottom end - $10 ea; same, but 98' long - $15 ea; new toggle switches, various configurations - $1 ea; new toggle switches, black plastic body and wide, flat tapered black plastic switching arm, requires 11/16" hole, nice for automobile installations or modern look in power supplies, etc - $1 ea; new (but old) slide on/off etc switches used in old radios, various configurations, - most $1 ea; new, 7-pin, 9-pin miniature bakelite tube sockets, without provision for tube shields - 2 for $1, with provision for tube shields - 2 for $1.50; various new (but old) ceramic and bakelite tube/coil sockets - $2 ea; new bakelite chassis mount crystal sockets for larger military crystals, pins 3/4" apart - $2 ea, new, black bakelite two wire plug for these sockets - $1 ea; new (but old) ceramic crystal sockets for metal case crystals (like crystals in Collins S-Line) - $1 ea; new, 72" audio cable, male RCA phono plug one end, miniature male audio other end - $2 ea; new, sturdy small five-section chrome telescoping antennas, bottom section 1/4" diameter, 4-1/4" nested, 16" extended, 1/4" top hat (for eye protection), bottom tapped for screw, use wherever a small telescoping antenna is needed (portable beam antennas, etc.) - $1 ea. Derek, KI6O, callbook address, (916) 965-4904.

FOR SALE: Repair of TV-7 tube testers and calibration: I will fix and then verify calibration of your TV-7 tube tester for $45 plus shpg or return it no charge. Unit must be repairable and not a basket case. Daniel Nelson, 1025 E. Desert Lane, Phoenix, AZ 85040. (602) 243-7421 eves

FOR SALE: Realistic DX-120, shortwave, BFO, bandspread, AM/CW - $125; Viking Challenger - $195; DX-60 - $90; SX-100, needs TLC - $185; 3-500Z plate xfmr - $75; Eimac 4-400's - $45 each; Yaesu FV-101B VFO - $165; Heath SB-630 console - $60; thrust bearing - $65; (3) 4CX300's - $120; (2) HM-102's - $50. Trades considered. (619) 462-3857

FOR SALE: Classified Collins Final Engineering Report R-390( )/R-389, 154 pps, Cost Reduction R-390( )/R-391, 60 pps - both for $20 postpaid. Terry O'Laughlin, WB9GVB, 306 Van Deusen St., Madison, WI 53715. (608) 258-1810

FOR SALE: Eldico SSB 1000 amp, SSB 100F, 100M; Gonset GSB 101 amp; Gooney Box 1, 6M; Heath HX-1681 xmtr, w/ps; Johnson 6N2 rcvr converter; CRR-10111 freq. meter. **WANTED:** TMC GPT, 1K; GPR-90, 91, 92's, etc. Don, W6TVW, (702) 475-0211

FOR SALE: Very rare Heath AT-1 xmtr - $100; rare Heath Model SB1000 HF linear amp, new kit in unopened box - $800; Eico Model 722 VFO, near new condx - $75; National NC-300 rcvr - $125; 6-M converter for NC-300 - $50; five Hallicrafters S-38B and two S-38C receivers, mostly complete & suitable for restoration - $35 ea, all for $225; new dial assemblies for Collins KWM-2/S-Line - $50 ea; used Collins MP-1 mobile supplies - $50 ea; used Collins directional coupler (looks identical to coupler in Collins 312B-4 wattmeter), with square wattmeter 0-100W and 0-1000W scales, use DPDT switch to read forward/reverse - $40 ea; used Collins coaxial relays, similar to Dow-Key, 28 VDC coil, "N" input and transmit, BNC receive - $10 ea; new Bird 43 directional couplers with connector/cables for meter, without quick-change connectors - $35 ea; same, but with Bird surface mount - $40 ea; new Bird 43 Quick-Change connectors, male/female "N", BNC, TNC - $7 ea; used 4D32 tubes, exc. - $25 ea; two unused Eimac 8188 (4PR400A) heavy duty 4-400A's - $65 ea; like new Eimac 4-400A - $50; used 3B28 tubes and 1N2637 diode replacements - $4 ea; new in boxes, J-45 knee keys, cord/PL-55 plug - $30 ea. Derek, KI6O, callbook address, (916) 965-4904.

WANTED: Early National TRF rcvr. Paul Dennis, Box 5158, Tucson, AZ 85703. (602) 743-7755, FAX 734-3967

WANTED: 807/1625 ceramic plate caps. Dave Ishmael, WA6VVL, 1118 Paularino Ave., Costa Mesa, CA 92626. (714) 979-5858

WANTED: DowKey relays; Collins 75A-1. Jim, N6IFO, (404) 429-8189

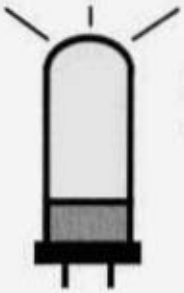
WANTED: Info on use of DSI freq. counter. I have no manual. Kurt Miska, N8WGW, (810) 641-0044 (d), (313) 663-1642 eves

WANTED: R-389; RCA ACR 111; ACR 155; ACR 175; spkr for Patterson PR-15; SW xtals for Drake R-4; pwr xfmrs for SX-43, NC-200, RCA 10T; pwr sply & spkr for McMurdo Silver Masterpiece II. Will trade. Pete Grave, Box 175, Ottsville, PA 18942-0175. (610) 847-2214

WANTED: Spinner for Viking II tuning knob; GPR-90 cabinet and spkr; SX-101 thru MK III; Globe King 500; S1S1 meter (white). Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

WANTED: Collecting early Heathkit gear 1940's-50's; early Heath catalogs and literature; Heath mics, spkrs, supplies, access.; any parts units. Byron, WA5THJ, 1215 Fresa Rd., Pasadena, TX 77502-5017. (713) 941-3631

WANTED: National HRO-500TS spkr in mint condx; National NCL-2000. Sam Macy, N9WAF, 486 Glenwood Trail, Elgin, IL 60120. (708) 695-0218



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