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ELECTRIC RADIO

celebrating a bygone era

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ELECTRIC RADIO

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Editor - Barry R. Wiseman, N6CSW
Office Manager - Shirley A. Wiseman

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; Albert Roehm, W2OBJ; Steve Thomason, WB4IJN; Don Meadows, N6DM; Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS

Recently a newcomer to AM/vintage operating asked me why there was no daytime AM activity on 20 meters. I really didn't have an answer for him. I don't know why we haven't operated on 14.286 during the day. Why have we limited our operation there to the early evenings?

I'd like to propose that we start using 14.286 during the day and anytime the band is open. Let's start by calling and listening on the hour. It would probably be best if we called CQ for any AM stations rather than a general CQ. This way we're going establish 14.286 as another daytime AM window.

When 10 meters went dead a few years ago we proposed that 15 meters would be a good alternative band. We suggested that we operate above 21.400. For some reason AM never got established on 15. Maybe it's time to promote that band again. Although there have been some great openings on ten, it will be a while until that band will be as dependable as 15. Why not try calling and listening here too.

The ER 7th Annual 160 Meter Contest/Jamboree takes place on December 26, from 12:01 Pacific time until 11:59 PM. This year there should be more participation than ever because of the increased interest in 160 meter operation. All contacts must be AM station to AM station, with an extra point for stations with AMI numbers. All logs must contain the following information: time of contact, callsigns, AMI numbers, signal report, receiver/transmitter used and type of antennas. Prizes will be T-shirts & certificates for First, Second and Third place. Merry Christmas and a Happy New Year to everyone. N6CSW

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Cover: Cartoonist Bob Beasley, K6BJH, sends greetings with his 7th ER Christmas cover.

LETTERS

Dear ER

Thanks for running another fine article by Jim Hanlon, "The National NC-100 Family Tree." Thought I could take a minute to clear up the "mystery" set pictured on pages 24 and 25. This is a model RCP. The RCP started out in life as a model RCK or RCL (NC-100 variants), made for the CAA by National. Apparently, the CAA needed a receiver with some different features than the RCK and RCL, so they had these receivers modified and renamed the RCP. These modifications included: HFO made to be crystal controlled or tuneable; AVC circuit changed to respond to average carrier input; CONS circuit changed to relay type; sharp-broad control deleted; second detector changed from triode to diode operation.

The modifications were not done by the National Company, but rather by Shuttig and Company located in Washington, DC. In fact, the receiver's ID tag says, "Manufactured by National Company, Inc." and "Modified by Shuttig and Company." My speculation is that the RCL and RCK receivers were modified, rather than building a new receiver, to save resources, since the contract date shows October 30, 1945. Since this is near the end of the war, this might also explain why Shuttig did the mods, rather than National. (All RCP information comes from 'The Instruction Book for the RCP Airways Communications Receiver manual.)

Wayne Childress, KC7KUE

Dear ER

I had a great time participating in the Thanksgiving weekend AM Jamboree..I was very pleased at all the activity on 15 and 160 meters. Many times I was hearing no AM signals, but when I called CQ I would have several answers. Every time I signed with a station, someone else would call me! Several times on 15 meters there where so many stations calling at once it was hard to pick someone out! Just like the '50's. . . AM pileups. ..what a kick!

I called CQ on 20 meters but had no replies. 10 meters was completely dead here and during my hours of operation I heard no AM signals on 40 or 75.

I was using my Johnson Valiant II transmitter which I have modified as per W6BM's article [ER #24] and a NC-303 receiver. Antennas were a 4-element quad at 100 feet on 15 and a quarter wave sloper on 160. About half of the stations contacted during the jamboree were using solid state transceivers and many of those stations said that I was their first AM contact! I helped a lot of the new AM operators to adjust their rigs for best performance. I also explained to many of them what AMI is all about and some of them asked how to obtain more information.

More than a few operators admitted that they were surprised at just how good AM radio sounded. I really feel that we made some new converts to AM and vintage operating. And I learned that we should call CQ on 15 meters instead of just listening for other AM activity.

All in all it was a great experience. I can't wait for the next one!

Jeff Bishop, W7ID

To join AMI send $2 to:
AMI
Box 1500
Merrimack, NH 03054

Second Annual AMI Thanksgiving Bash in Colorado

The Second Annual AMI Thanksgiving Bash was a great success again this year. From 6:30 AM when it started with Marty, KGØKO checking in, until it ended in the late afternoon, over 60 stations checked in on 3875. Most of the stations were in Colorado but there were also stations from Arizona, New Mexico and one from as far away as Montana (K7TNJ in Miles City).

"OJ" Orlin Jenkins, KØOJ, did a great job as net control again this year. All contacts were logged using a form developed by Scott,KGØMR.Larry McClelland, KGØPJ, is making up certificates for all those that checked in.

Plans are already underway for next year's Bash. Because there was some interference on 3875 this year - from SSB stations claiming this frequency as theirs - OJ has made arrangements with the Arizona AM'ers to use their net frequency of 3855.

Ed, NØAUB, is planning a similar "Bash" on New Years Day. It will also be on 3875 and starts at 7 AM. AM is alive and well in Colorado. N6CSW

Classic Radio Featured in New Video

Several prominent East Coast AMers are producing a video showcasing the vintage radio activity we've all come to know and love. This broadcast-quality presentation was filmed at the Gaithersburg, Maryland, hamfest in September, and features interviews with the buyers, sellers, restoration experts and enthusiasts who turn out *en force* at this event.

Some preliminary footage has already played to rave review as Gary, N2INR, aired a tape before an audience of more than two dozen Amateur Fast-Scan Television buffs around Syracuse, New York.

Paul Courson, WA3VJB, narrates a scene in an upcoming video that showcases vintage radio activity.

But the finished product won't be available for general distribution until about the time you read this (early 1996). The ARRL is among the mainstream organizations that will help bring this videotape to the broadest possible audience.

The show is designed to not only appeal to those of us already in the vintage radio part of the hobby, but also to introduce this facet to new hams and those in the general ham community who haven't yet rediscovered the vacuum-tube era. It will play well as a feature during club meetings, or on local access cable channels where a ham club could superimpose a contact phone number for a public response.

The tape includes many of the AMers behind the Dobbins Island AM Expedition of 1993, and the inaugural AM Special Event station at the 1994 Gaithersburg Hamfest. The producer is Paul Courson, WA3VJB. Title and pricing are not yet announced. An SASE to Paul at Box 73, West Friendship, MD 21794, will get you more information as available.

The SB-34 Transceiver

by Walt Hutchens, KJ4KV
3123 N. Military Rd.
Arlington, VA 22207

Introduction

As amazing as it sounds, the radio that introduced the compact medium power SSB transceiver to the U.S. ham was built by a U.S. company. When we studied Sideband Engineers' SB-33, (ER #69, January '95), we noted that like many innovative radios, it had more than its share of design problems and that many of them were fixed by its successor. This month we'll look at the SB-34 to see what was fixed and what wasn't, and consider again the reasons these remarkable radios didn't sweep the ham marketplace of the 1960's.

The SB-34 is in many ways similar to the -33; information on some areas that were covered in detail in the earlier article will be summarized here.

Overview

The Sideband Engineers SB-34 is an amateur transceiver covering 200 or 250 kcs segments of the 80, 40, 20 and 15 meter bands. At 5-1/4" x 11-1/4" x 9-1/4" (H x W x D) it is slightly smaller than the earlier set but it includes both performance improvements and important new features.

By connecting the proper power cord the SB-34 operates from either 120 VAC or 12-14.6 VDC at 3.6 amps receive/14 amps transmit; when operating on DC, the transmitter may be disabled by a panel switch to cut the drain to about 3/4 amp. A consequence of the AC/DC operation is greater weight: 18 pounds to the SB-33's 15. The SB-34 operates on USB/LSB only (no AM or CW) and is rated at a minimum of 60 watts PEP output on 80, 40, and 20 and 50 watts on 15 meters.

The pi network matches 40 to 100 ohm antennas. There are 14 front panel controls and a built-in loudspeaker. The rear has the carrier balance pot and connections for an external speaker, control of a linear amplifier, and VOX and calibrator accessories as well as the antenna connector. There's no headphone jack. A panel meter reads either PA plate current or relative antenna voltage; there is no S-meter.

The backlit dial is calibrated in 5 kc increments; a Jackson Brothers two-speed planetary ball bearing drive gives tuning rates of about 15 kc/revolution for 3/4 turn of the knob and 90 kcs per revolution thereafter. The set uses three tubes and 23 transistors. Optional accessories included a 100 kcs calibrator, a VOX unit and the SB2-LA linear amplifier.

Sideband Engineers was started by Faust Gonset in 1962. The SB-33 was introduced in January, 1963 and the SB-34 replaced it in December, 1964. The SB-34 continued production until about 1972. Perhaps 70,000 were made.

Design

The mechanical design of the SB-34 does 'more with less' than the -33. The chassis is essentially a steel frame with circuit boards mounted by self-tapping screws. The rear panel is a 1/8" aluminum plate and serves as the heat sink for the audio output and inverter power transistors; the beautiful engraved stainless steel front panel of the -33 is replaced with an attractive (but not beautiful) brushed black anodized aluminum sheet. The cabinet is spot welded steel and with the set inside, it is plenty stiff.

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The front panel of the SB-34 does a lot in very little room. The center knob is the bandswitch and also peaks the RF and driver circuits.

Early SB-33's have socketed transistors on a conventional chassis; later ones got paper-base phenolic circuit boards. The SB-34 has fiberglass epoxy circuit boards with most transistors soldered in place. Because most wiring is on these boards, the -34 is a less expensive radio to assemble.

The circuit design of the SB-34 resembles no other ham set of the time except the SB-33. As many stages as possible are 'bilateral', meaning that transistors are connected in both directions between the interstage coupling circuits so signal flow can be reversed just by switching DC voltages.

The SB-33 does this T/R switching with a relay; the SB-34 however has a unique 'no relay' scheme. The finals and driver are normally biased beyond cut-off. Two +12 VDC supply lines furnish bias and other low-current requirements for the bilateral stages; one line is high for receive, the other on transmit. The mic (or TUNE) switch shorts the -70 volt bias on the driver and reduces that on the finals from cutoff to a preset value for class AB1 operation. The driver cathode current is used to cause a transistor to conduct , reversing the states of the two +12 volt lines and thus switching all the other stages. The receiver input is connected to the transmitter tank coil by a small coupling capacitor; a pair of diode limiters short circuit the front end for large signals.

As on the SB-33, the input and output circuits of the receiver RF amplifier and the output of the driver are tuned by a three-gang capacitor. The knob which tunes the capacitor also drives a Geneva mechanism (think of how the tenths digit on your car odometer drives the units wheel) which operates the bandswitch and steps the slugs in the three coils in and out. Thus one knob both operates the bandswitch and peaks the driver and receiver RF and mixer circuits on all bands with less than 360 degrees rotation.

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The conversion scheme is more complicated than in most moderate-price rigs. On receive the RF amplifier feeds a mixer which converts the signal to 3175-3425 kcs. The mixing signals (7200, 10.475, 17.525, and 24.625 kcs for the four bands) are produced by a crystal oscillator using conventional switching. The slight changes in these frequencies needed to accommodate the increased tuning range (while dodging the resulting new in-band 'birdies') ended the SB-33's scheme of using the 3rd and 5th overtones of a single crystal to handle the middle two bands.

A three gang capacitor (the usual aluminum plate fugitive from an FM receiver) tunes the first IF and also the VFO/local oscillator which now covers 5456.9 kcs to 5706.9 kcs. This oscillator is a modified Colpitts using a silicon transistor with a single buffer stage. The fixed caps are dipped silver micas and the coil is wound on a surplus Navy standoff insulator. There's a 15 mmF N1500 temperature compensating capacitor to reduce the drift.

A reverse-biased silicon transistor junction is used as a varactor across the oscillator tank circuit. The bias voltage comes from a voltage divider with the DIAL CORRECT pot in one leg. The other leg contains a fixed resistor when transmitting and either the PITCH (RIT) pot or a screwdriver adjust pot under the chassis, depending on the setting of the PITCH ON/OFF switch on the panel.

The local oscillator signal is mixed with the tunable IF to yield a 2281.9 kcs upper or lower sideband signal.

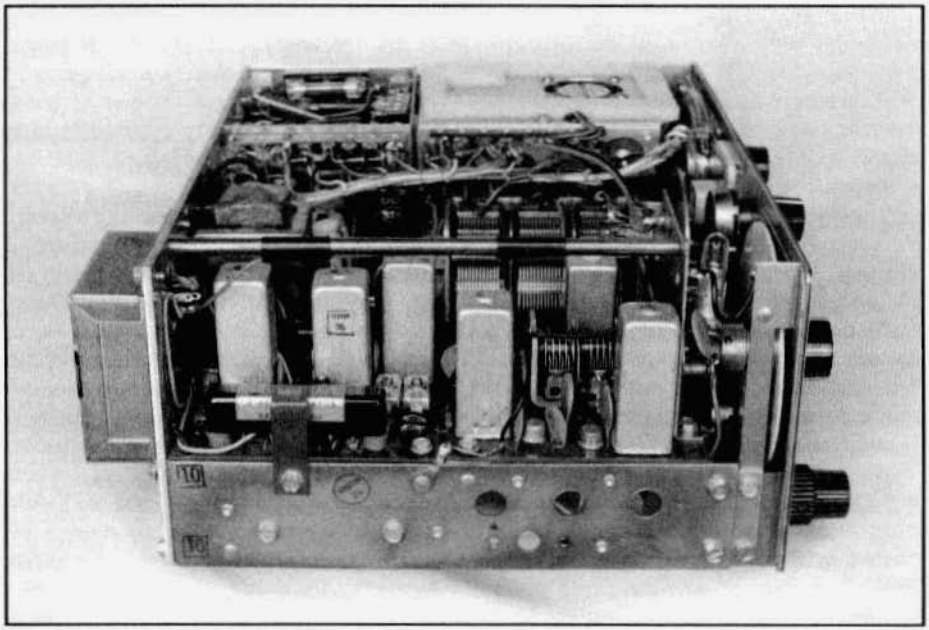
The third mixing begins with a 456.38 kcs crystal oscillator. This is multiplied by four or six to give a signal at either 1825.52 or 2738.28 kcs for lower or upper sideband operation, respectively. When mixed with the 2281.9 kcs IF the result is always a 456.38 kcs lower sideband signal which is filtered by a Collins mechanical filter passing 453.95 kcs to 456.05 kcs (corresponding to audio frequencies of 2.43 to 0.33 kcs) and amplified in a single stage. A diode ring is used as a product detector (mixing with the 456.38 kcs oscillator) to deliver the audio.

Switching between 4x and 6x multiplication is done by changing a doubler to a tripler. The USB/LSB switch is connected by shielded cables to a pair of trimmers which pad the output transformer for this stage down to the LSB frequency. Unlike the usual scheme of adding a capacitor across the VFO, this switches sidebands exactly, with no need to retune or recalibrate. Moreover, because the signal always goes through the mechanical filter as a lower sideband signal, there's no change of voice 'coloring' when switching sidebands.

The receiver gain control scheme is similar to that of the SB-33. The VOLUME control varies the gain (forward bias) of the first mixer and the first audio amplifier stage; the idea is to protect the later stages from high signal levels with the manual control. Audio from the speaker terminal is rectified and fed back to reduce the gain (forward bias) of the RF amplifier and the 456 kcs IF stage; this AVC has a high threshold and it is turned off at a high volume setting so it is effective only around the middle of the volume control range.

On transmit, the diode ring mixes the 456.38 kcs oscillator with the mic amp output to give a DSB signal. The rest of the signal flow is reversed (the bilateral design) up to the output of the transmit signal mixer where a 12BY7 driver takes over, feeding a pair of 6GB5 sweep tubes. A conventional pi network matches the antenna.

The power supply consists of a transformer delivering 120 VAC to a silicon diode tripler to provide around 410 volts to the finals and driver; unlike the SB-33, this circuit is designed so the voltage under TUNE conditions falls con-



Top left view of the SB-34. The new cooling fan is at the right rear. The VFO and second mixer stages are at the right front with the IF and audio sections at the left. The power transformer is in the compartment at the top left.

siderably to protect the finals. A conventional 'magnetic multivibrator' switching supply using husky TO-36 power transistors excites this transformer when operating from DC input.

On AC service, the windings and power transistors of the switching supply are reconnected by jumpers in the power plug to provide the low voltage. The collector-base junctions of the transistors are used as rectifiers and the tube filaments operate from the 12 VDC line. A simple regulator circuit supplies about 7 VDC to the VFO and buffer.

On The Air With The SB-34

I had two SB-34's sitting in the closet but neither was restorable without parts. Then the Ft. Tuthill (AZ) hamfest this year turned up two more; better yet, one was in clean, "worked the last time I tried it" condition and included the rare crystal calibrator accessory! While the other had evidently suffered a serious melt-down and then been extensively modified, it looked like the needed parts set. And the package deal price was right. There was, as usual, no choice. After a moment of panic when I got caught in another conversation as an *undeserving* (non-ER reader) shopper looked the sets over, I thinned the wallet and loaded the car (slightly for each) and Barry lost the chance for a military article this time.

Golly - this radio actually did work the last time he tried it - I could hear the calibrator. But back at the home QTH, reality set in. The SB-34 has the right basic features. But design problems make it not very usable. Was it going to be *mods* or another nice looking radio on the shelf? Did Faust Gonset start Sideband Engineers? I got to work.

Repairs came first. The original high voltage electrolytics were 'about a quart low', so they were replaced. Transmitter power output was low but a careful alignment fixed that - this was more of

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a challenge than it might have been since my 'repo' manual is missing the page showing test point locations and part numbers and values on the circuit diagram are mostly unreadable. As usual in older sets the meter readings were far from reality -- those authentic vintage molded carbon composition resistors are terrible meter multipliers!

These sets can be made to work by aligning everything for maximum in the usual ham fashion, but doing so will deliver a small Audubon of 'birdies'. For good performance, use an RF voltmeter or scope and tune for the specified signal levels.

My set had been improved by hacking a hole in the rear so the RCA phono plug antenna connector could be replaced with an SO-239; I installed a BNC connector on an aluminum plate. The two-wire line cord got replaced. As usual on these sets, the original rubber feet had been removed (does anyone remember why we did this?) so I installed 5/8" rubber feet to restore the normal cooling air flow.

Then it was time to tackle the hard stuff. Like the SB-33, the -34 is a lot worse than *noticeably drifty* - the local oscillator in the Ft. Tuthill set went up more than a kilocycle in the first half hour and then back down, stablizing more than two kcs below the starting frequency after a few hours. Since a sideband signal is hard to understand when you get more than 100 cps or so off frequency that's really intolerable, especially in portable or mobile operation where operating periods are usually short.

The sets were similar so the steps which fixed the drift of the SB-33 would do it here, right? The oscillator transistor was okay but the most of the tank circuit parts got changed - five silver mica caps became NPO ceramics and the coil was replaced (after several tries) with a self-compensating plastic coil. The *huge* compensating cap was now way too much so it was removed.

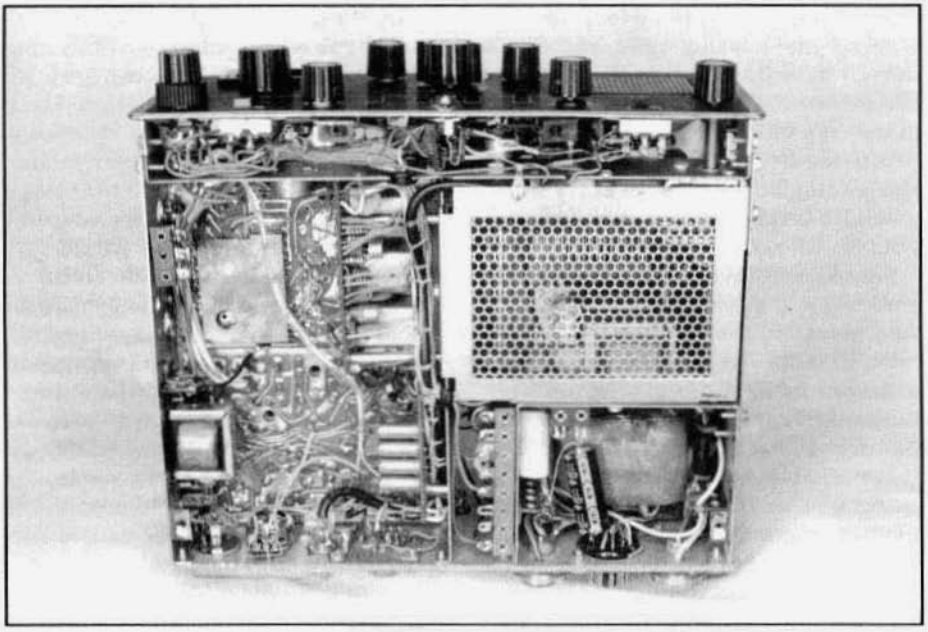
The steps that fixed the -33 *didn't* do it. Things were better but the drift was still very high, and it was irregular as well.

Irregular drift always means bad parts and I always put off as long as possible the chore of finding them. Eventually however I discovered that the voltage regulator compensating pot had a bad spot. I put in an LM-317LZ (TO-92 package, since the current is only about 10 mA) in place of the original regulator circuit. (When installing one of these in a transmitter, don't cut corners on bypassing or you'll have interesting new problems!) The irregularity vanished but the drift was still around a kilocycle upward over a couple of hours.

Studying the mechanical design revealed the problem. To improve safety (and perhaps to reduce TVI) a perforated metal shield had been put over the tubes and the vent holes in the case made much smaller. The full size cover plate inside the top of the set which tends to pull cold air through the low level stages of the -33, was eliminated. There are more parts and a larger power transformer in the -34, yet the set is *smaller* than the -33. It simply gets hotter inside than the -33.

Short of an ugly and major redesign, improving the natural ventilation of the SB-34 is impossible. I replaced the perforated plate over the tubes with a solid one having a Radio Shack 1-9/16" 12 volt fan aimed upward. It was necessary to lengthen the slots in the top of the case somewhat to match the fan location (the fan must be placed to clear parts in the driver/PA compartment) and to put foam strips in the space between the plate and the case so the hot air would *leave* rather than circulating inside the radio. Drift fell to less than 200 cps in half an hour, followed by next to nothing. That's good enough.

This mod can't be seen unless you know what to look for and it has the added benefit that the tubes stay cool enough to touch.



The RF and first mixer stages are on the vertical board at top center; the first oscillator stage and crystals are just below it. Because of the tight space, changing panel controls is likely to require loosening or at least partly disconnecting the front panel - not the most fun thing you'll do that day!

Next on the list was the AVC; my set had none until the volume was blasting and the signals badly distorted. There did not seem to be any bad parts.

The SB-33 and -34 generate AVC voltage by feeding speaker audio back through a voltage divider to the base of a transistor. When the collector draws current it charges a 250 mFd capacitor which reduces forward bias on the controlled stages to reduce their gain. This transistor has no forward bias, so its conduction point sets the AVC delay. In the SB-33, a germanium alloy transistor is used; these sets have functioning AVC. The SB-34 has a silicon transistor with two or three times the conduction bias voltage, but a nearly identical voltage divider circuit. Later, when I repaired one of my 'closet' SB-34's I substituted a germanium transistor for the AVC amplifier and sure enough, got working AVC. Since the only variables that matter are the audio voltage at the speaker and the type of transistor, I'm unable to see how this is anything but a mind-boggling design error. It doesn't bother you that much in a two-station QSO, but in most round tables, it will make you crazy with twisting the volume control.

And even when the AVC works on these sets, it isn't very good. Because it comes from audio taken after the volume control, it tends to cancel out the volume control setting. If the AVC works well enough to handle wide variations in signal strength (mobile work, a round table), the volume control won't have much effect, and conversely.

But that wasn't all. The AVC time constant of about 1/2 second is so short that the noise comes up between syllables, giving the effect of a higher noise level. Everyone knows that S-meters

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don't mean a thing but everyone - including me - wants one. The SB-34 doesn't have one because the AVC circuit makes it very hard to do. At the end of the -34's life, SBE changed the circuit to provide an instantaneous audio voltage reading but did you ever try using an audio level meter to peak up a set with AVC?

I had been thinking about these problems since I started using the SB-33. And at last all that staring at the schematic paid off. The modified circuit adds a conventional audio gain control between the first audio stage and the audio driver. Audio voltage for AVC is taken off ahead of this control. The existing AVC amplifier is forward biased to raise its gain for small voltages and a voltage doubler rectifier circuit in its collector provides the threshold function. A 47 mFd cap and 56k resistor give an effective time constant of more than a second; applying this voltage to an emitter follower gives ample AVC current and the follower collector current provides an S-meter current referenced to ground to drive the existing meter. The existing mixer/AF bias manual gain control circuit is retained; a home-made concentric shaft dual pot is used for both this and the audio gain control.

The modification isn't trivial, but it works well. The independent volume control lets you handle quiet or noisy rooms, headphones, etc. The AVC is good enough to handle ordinary fading and station to station signal variations. At full manual gain, the threshold is about 1.5 uV and there's only about a 12 dB increase of output to 500 uV (S9+20 dB).

The S-meter is fine for relative signal readings and receiver peaking. It operates only when the meter switch is in the ANT position but in practice, if you peak the receiver you can skip dipping the final and just peak the transmitter controls on antenna voltage, so the switch mostly stays on ANT.

My set shifted frequency by as much as 200 cps when going to transmit. In addition, the transmit frequency varied about 100 cps with modulation. These effects are the result of too little isolation between the VFO and the mixer - just one bipolar transistor buffer stage. Reducing the VFO-to-buffer coupling cap to the minimum that would give enough output helped and careful attention to the mic gain setting made the problem tolerable.

Since transistorized sets are generally poor in strong signal handling, I measured the third order intermodulation distortion (IMD) dynamic range. In this test, two equal signals 20 kcs apart are increased until distortion in the receiver causes new signals to show up 20 kcs above the higher and below the lower; the greater the ratio of the test signal to the minimum signal that can be detected, the better. Some numbers for comparison; my Collins 51S has a range of 65 dB and the little R-8040 receiver project (ER #'s 47-48, March-April '93), better than 80 dB. A spare-no-cost transistorized military receiver from the 60's checked at 80 dB. The SB-34 measures 59 dB - a good performance for a cost-controlled early 60's transistorized radio.

(A receiver with a poor IMD dynamic range does not work well on a band like 75 meters which has many very strong signals. Even though these signals are outside the mechanical filter bandwidth, IMD causes them to combine in the earlier stages to produce signals which are *within* the bandwidth and thus interfere with the desired signal. This is the reason that a cheap receiver often sounds 'cleaner' if you use a short antenna or add an attenuator in the antenna lead when the band is crowded).

Having dodged the 'hot' metering switch and blown a meter in an SB-33, I really hate the plate circuit metering of these sets. Late in the SB-34 production

run, SBE converted to cathode metering, publishing the new circuit as a modification. This is a difficult change because it is very hard to get to the PA tube sockets but I installed it.

Like most others I've seen, my SB-34 had considerable backlash in the dial. This was caused mainly by mounting the Jackson Brothers dial drive on one side only and with a rubber grommet instead of rigidly. Here too, SBE fixed the problem on the last few sets. My parts radio had the improved dial drive mounting so I did a 'transplant'.

With these improvements the SB-34 becomes a fine set for 'vintage portable' or occasional mobile use. Some of those I've seen in flea markets suffer from problems similar to those of the command sets, namely that the radio worked well enough that they were used until worn out or hacked to death. But one that has a good dial and drive, a working bandswitch/driver tuning mechanism and circuit boards that haven't been attacked with a 250 watt soldering iron is a good bet for the patient restorer. As the first modern SSB transceiver, an SB-33 or SB-34 is worth saving if you have some time.

The SBE project continues at KJ4KV; I'd like to find an SB2-LA linear, a clear circuit diagram, and any of the later sets or accessories such as mics and carrying cases.

Conclusions

We noted in reviewing the SB-33 that it was an outstanding design for the day, not only full of useful innovation but right in overall concept. While other makers were experimenting with separate SSB receivers and transmitters, high power in one package, staying with AM, etc, SBE went 'all the way in one play' to a compact, moderate power transceiver.

The SB-34 is a major improvement. All the sound basics were kept but most of the important missing features were added. Unlike the SB-33, the dial can be calibrated, there's RIT, and an accessory calibrator can be controlled from the panel. The built-in mobile power supply is nifty. Many little electronic glitches are gone - no more audio hum, the CLACK from the speaker when keying the transmitter is much reduced, there's no transmit audio distortion. There's enough reserve gain that transmitter alignment and tune-up are uncritical. And so on. Sideband Engineers listened to their customers when they designed the -34.

The good strong signal performance is commendable. Clearly a lot of effort went into this area of the design.

What To Make Of The Drift?

When the automobile was new (say until 1920 or so) it was rare to go more than a few tens of miles without a breakdown of some kind. In theory cars could have been better designed but none of them was. Early TV sets ('40's, '50's) needed lots of service. All of them. And that, I think, is the key to the SB-33 and 34's drift. Customers for a new kind of product buy things that have unnecessary problems because they don't know that they are unnecessary. What they're getting is better than what went before and anyhow, every other buyer has the same trouble!

By the standards of the '60's (that is, AM and CW operation) one or two kilocycles of drift wasn't that bad. For that matter, are you sure it wasn't your set that was doing the drifting, rather than mine? Collins, of course, was better but at those prices ... why a fellow could buy a new car for that kind of money.

Holding a 1960's set to the standards of the 1990's - even when those standards could have been met - is interesting, but our standards evolved along with our use of the radios.

The notion that by making AVC that was just good enough but not too good (so it wouldn't completely cancel the manual volume control), one could get by with just one control is a loser from the start. A conventional audio gain

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The Fiebich Papers: News Insights into Heathkit

by Chuck Penson, WA7ZZE
Box 2414
St. Paul, MN 55102

Gene Fiebich worked with Heathkit for 23 years. For the last 19 of those years he served as head of engineering for all product lines. It was Gene who guided the course of Heath's product development through all of the company's best years. I met Gene only once - in 1994 at a reunion dinner for former Heath employees - but we spoke many times on the phone.

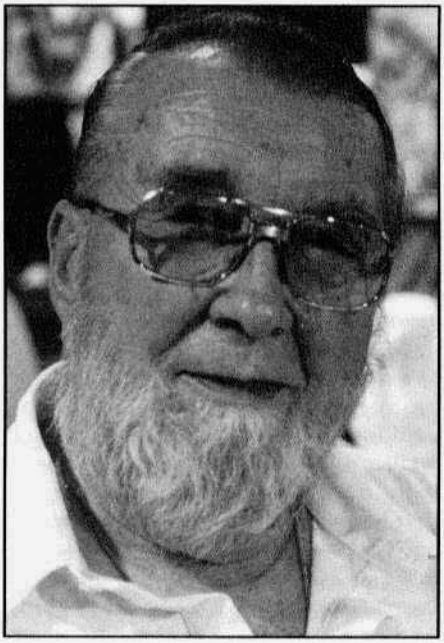
Though Gene passed away in February, 1995, his story does not end there.

A couple of months after his death, Gene's wife Ruth called me and asked if I would be interested in having a look at "a bunch of stuff" he had in his shop. That's "shop", not "shack." Gene had not been a ham since he let his license expire in 1934. Ruth said she had no idea what all was down there but that I was welcome to come and have a look.

Two days later I found myself in Benton Harbor.

The idea of sifting through the shop of the former head of engineering for the Heath Company was irresistible. Yet I wasn't interested in what equipment I might find, I was hoping to find documentation - letters, notes, notebooks, memos, photographs - anything that would help fill in the details of Heath's history. I was not disappointed.

Over the years Gene had taken hundreds of photographs at company picnics, Christmas parties, and gatherings of all sorts, including a number of pictures that appeared to have been taken over a series of years at some kind of annual engineering meeting. Photographs are valuable because they provide a glimpse into the day-to-day operations of the Heath Company and provide a level of detail not otherwise possible to achieve. Several photos were particularly intriguing because they included shots of flip charts being used to illustrate various points. With a magnifying glass it was possible to read these charts. For example, photograph number 1, dated March 1963, shows that engineers were able to reduce the number of parts in a kit by 38. Fiebich was tireless in his efforts to use the same parts in as many kits as possible, thus reducing the number of different parts in inventory, and he left no stone unturned in an effort to save money and keep the cost of kits as low as possible. Clearly visible at the far right of this same photo is the HX-11 transmitter. This is a bit curious since the HX-11 was pulled from production in 1963 - two years before this photo was taken.



Gene Fiebich was head of engineering at Heathkit for 19 years. He passed away in February of this year.

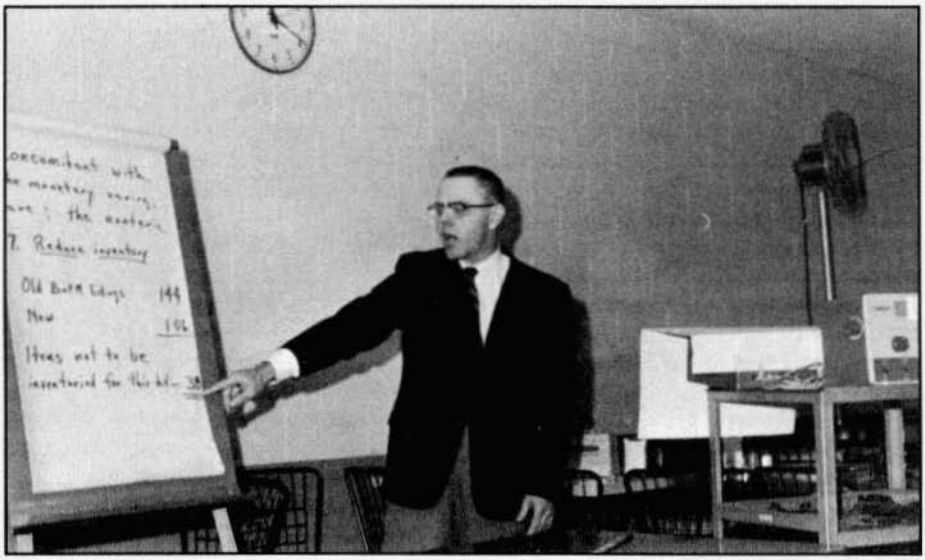


Photo #1. This photo dated March 1963, shows that engineers were able to reduce the number of parts in a kit by 38.

As of this writing I have not been able to identify the kit being discussed but it is probably not the HX-11 since that rig used many more than the 106 parts shown in the chart. Photograph number 2, dated March 1965, shows 1963 sales figures for the IM-13 VTVM - 8700 units. The chart indicates that engineers had been able to shave $1.494 from the the unit's bill of materials, resulting in a savings of nearly $13,000 annually. This photo is exceptionally valuable for the unit-sales point it establishes for the IM-13 in that year.

Photograph 3 provides a rare glimpse of a Heathkit in the prototype stage, in this case the HO-10 monitor scope, visible on the bench just left of center. The photograph is dated September 1961 - about a year before the scope was released. While it may be difficult to see in the photo as reproduced here, the prototype on the bench is different from the model ultimately released in two significant ways - it sports a slightly different front panel layout and uses the same white and gold plastic emblem found on the Lunch Box series.

In addition to photographs, a number of official engineering memos were found in Gene's shop. Like the photographs, these documents provide rich detail. The papers included progress reports on various products, kit development reports, summaries of negotiations with various suppliers, and more. I found a one-page report dated August, 1954 on twenty-three new products being considered. Of particular interest here is item number 1, a 50 watt transmitter. This almost certainly refers to what we now know to be the DX-35, which was released in 1956, ran 65 watts on CW and 50 watts on 'phone'. Of course, the DX-35 obviated the need for item number 2 - a proposed AT-1 modulator, and in the end the modulator was never produced. It is also interesting to note that of the 23 products being considered, only two were amateur related. This reflects both the fledgling state of Heath's amateur product line and the company's primary interest at the time - test equipment.

The most significant discovery to come from Gene's shop was not made

continued next page

The Fiebich Papers from previous page

until about two weeks later when I began the process of logging the various artifacts recovered. I had found a number of Heath catalogs in a box under Gene's workbench. I didn't think much of them at the time, but after I had returned home and started going through them, I found a catalog from 1972, in which Gene had handwritten the number of each kit sold that year! To my knowledge this is the only accurate sales data known to exist. There were 29 amateur radio products in the catalog that year and an examination of their sales figures provides some extremely interesting information. Space does not permit a complete listing, but Table 1 details a few of the products (ham and otherwise) sold in 1972.

The figures that really jump out at you are those for the Cantenna and the VTVM. Bear in mind that by 1972 the Cantenna had been on the market for more than 11 years, and that the VTVM had been on the market - in one way or another - for 24 years. Assuming that sales of VTVMs had been flat over the years, Heath would have sold nearly 300,000 by the time Gene wrote his sale report for 1972. There is compelling evidence from other sources, however, which suggests that Heath had sold at least that many units by 1958. The

Table 1

Model No.	Product	Units Sold
Amateur Products		
HW-101	HF Transceiver	2,031
SB-102	HF Transceiver	1,324
SB-200	HF Amplifier	1,159
SB-220	HF Amplifier	1,341
HN-21	Cantenna	7,608
Test Equipment		
IM-18	VTVM	11,984
IO-102	Scope	6,137
IG-102	RF Generator	4,550
IT-12	Signal Tracer	4,402
Others		
AR-1500	Stereo Receiver	8,305
GR-900	Color TV	2,000
GD-29	Microwave Oven	1,601

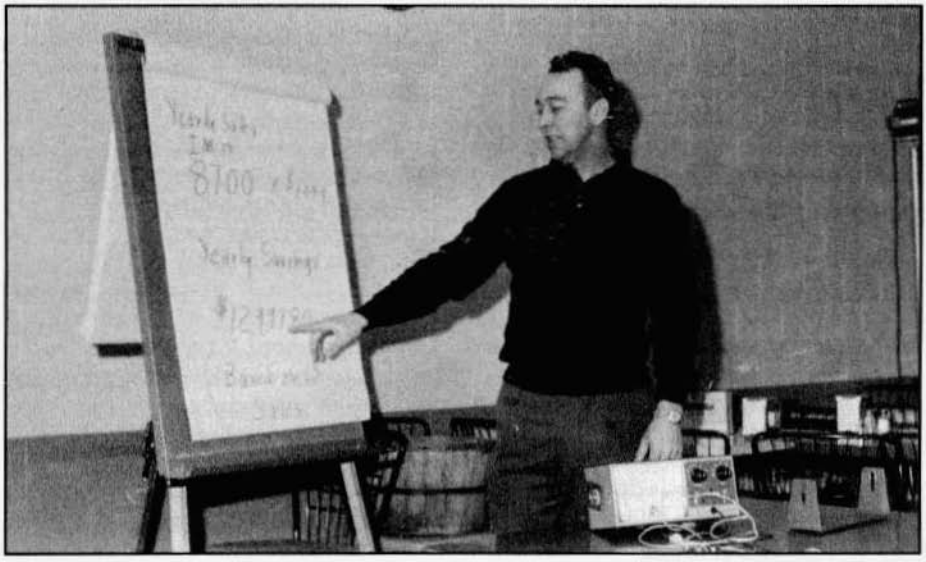
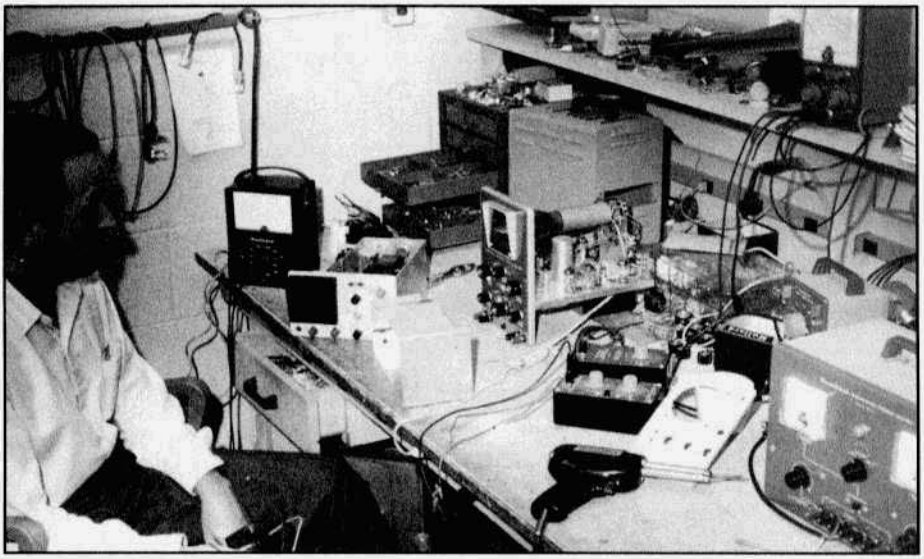


Photo #2. This photo dated March 1965, shows 1963 sales figures for the IM-13 VTVM - 8700 units. The chart indicates that engineers had been able to shave $1,494 from the cost of unit's the bill of materials, resulting in a savings of nearly $13,000 annually.



Photograph 3 provides a rare glimpse of a Heathkit in the prototype stage, in this case the HO-10 monitor scope, visible on the bench just left of center.

evidence, combined with the 1972 sales data, leads us to believe that the total number of VTVMs sold must have numbered well over a million.

Gene's 1972 catalog represents a find of dead-sea-scroll-like significance because it provides rock-solid sales data we could previously only guess about. The data embodies a complete set of product lines, allows us to compare the popularity of various products, and gives us some understanding about how and why products did or did not sell. We can also see where the real money was coming from, and we can draw some tentative conclusions about the buying patterns of the community of the time. We now also have a sense of how few units Heath would sell of a particular product before pulling it from production. With a spreadsheet and a little CPU time, it may also be possible, by extrapolation, to determine how many units of a particular product were sold during the product's total life span. With enough study, this data will focus a bright beam into the twilight that is beginning to settle over the Heath company's past.

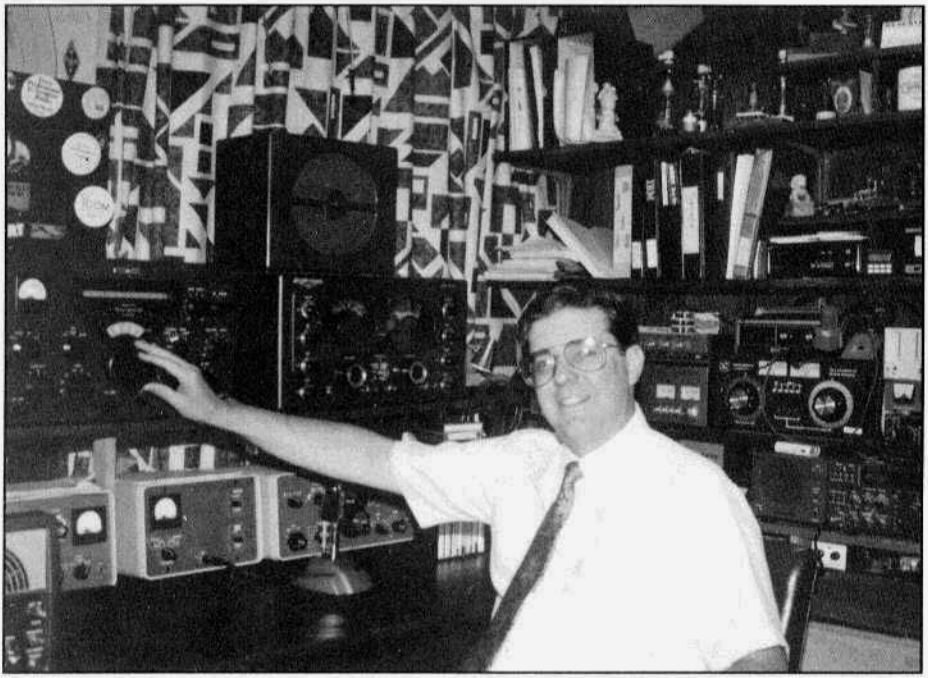
The Fiebich Papers are an exceptional discovery because of the detail they have provided and the detail they have yet to yield. Detail is extremely valuable because it is in very short supply. People's memories fade, and often as not, they can't remember the subtleties that turn a story from shades of gray into a rainbow of color. That is why more than interviews, more than equipment found at a flea market, more than anything else, documentation is like gold. Wrinkled, yellow with age and dusty with time, documents live on.

I have only begun to study the Fiebich Papers and already they have yielded a wealth of information. Who know what else they will reveal? Winter has come to this, the coldest state in the lower 48 - a perfect time to stay indoors and cozy up to a little research.

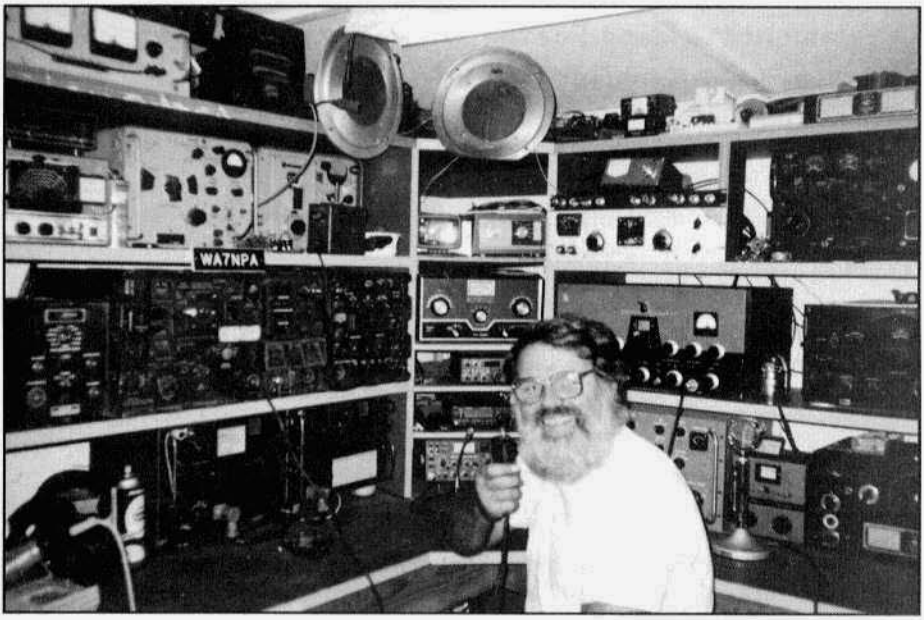
I would like to thank Ruth Fiebich and her son Carl for their hospitality, and for their cooperation in my continuing research of the Heath Company. ER

Chuck Penson, WA7VVE, is the author of "Heathkit A Guide to the Amateur Products" published by Electric Radio.

Wade Sick, with part of his Galaxy/WRL Globe collection. To his right is a very rare Galaxy 6/2 meter rig. Only two of these are known to exist.



Brian Davis, W9HLQ, in his hamshack. The receiver he's tuning is a Collins 75A-4. The receiver to the right is a National NC-183D. Below those two receiver is a Collins S-Line.



Mike Heltborg, WA7NPA, operating a T-195/R-392 station in his vintage hamshack. He also operated this station mobile for the AMI Discovery Weekend.

Mark Burton, WB4TGB, (another AM voice of Knoxville) with his son Timmy.
Photo by W2IQ.

A Filament Winding For the Microwave Transformer

by Berk Berkemeyer, WØREP
402 Kingridge Dr.
Ballwin, MO 63011-2729

Several of us have been working with the microwave transformer supplies described in ER #79. Many of the transformers have a considerable amount of open space over the primary winding, where the magnetron filament winding is wound. After very carefully removing that winding, there is space to wind a number of turns of heavy wire. The transformers are wound so that one turn is approximately one volt (one turn/volt).

To operate the 3-500Z in my linear, I wound five turns of insulated #12 wire, with a tap at two and a half turns. I get a little over five volts at 15 amps load, so that when the current is passed through the filament choke, the terminal voltage at the tube is 4.97 volts - close enough for government work. The tube will give good performance and long life at any voltage between about four and three quarters and five and one quarter volts, but the closer to five, the better.

While this works fine on my transformer, you need to determine the turns/volt ratio on the actual transformer you plan to use. After removing the old filament winding and examining the overwinding insulation, wind two or three turns of hookup wire over the primary winding and connect a 1 ohm power resistor across it. Measure the AC voltage across this resistor. This voltage, divided by the number to turns will give you your turns/volt ratio. Use this ratio to determine the number of turns of heavy wire you need for your actual tube or tubes. (Example: If the turns ratio is 1.1 and you need 6.3 volts for a pair of 811 tubes, you will need 6.93 or 7 turns). Wind 7 turns of #14 (or #12) over the primary winding, tapping the winding at 3-1/2 turns, and you're there. Secure the wire ends with cable ties or tape and terminate them (I use crimp lugs, which I solder after crimping). Install the transformer and support the leads to reduce strain on the winding.

I use double insulated wire purchased at a local hardware store. KØGOS is using single conductor #12 stripped out of a scrap of Romex cable. You can use enamel wire, but be careful not to damage it while threading it through the transformer core.

Some transformers have the magnetron winding wound between the primary and HV winding. I recommend great care in replacing these windings due to the close proximity with the HV winding.

One other warning, do not use this method of supplying filament power to tubes which have separate cathodes, as the cathode can be damaged if the filament and plate/screen voltages are applied before the cathode is hot.

Another possible permutation of this idea would be to wind a screen voltage winding for use with tetrode and pentode tubes. It would be a job to put in 300 or so turns of small wire, but with patience it should be possible. Be innovative, CAREFUL and above all HAVE FUN! **ER**

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: AM activity daily 4 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
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 3808 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 Fri. at 2200 local on 3990 and Sat. at 0800 local on 3990 + or - QRM. Net control is Tom, WA6OPE or Andy, KD6TKX.
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.
Southern California Sunday Night 6 Meter AM Net: 8 PM Sundays on 50.4. Net controls are Dan, KV6I and Scott, K6PYP. Informal, supports restoring old gear and using it on the air. Loan gear available for those wanting to join in.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.

Mad Dog's TCK-4

by Andrew Miller, KD6TKX
22702 Picador Dr
Salinas, CA 93908

The TCK series of transmitter is unlike any other WW II era set with respect to its electrical and mechanical complexity and refinement. The only possible exception the amazing ART-13. This transmitter was produced by General Electric and it appears that the first contracts were made as early as 1941. Most of the TCKs that I have seen were "accepted by the Navy" in 1943-1944. The TCK series is divided into two groups, the TCK-4 and 6, and the TCK-1 through 7. The TCK 4 and 6 were designed for shore installations and came equipped with an AC rectifier unit for 120 or 220 volts. The other TCK's were intended for shipboard use and came with a motor-generator supply. The AC rectifier unit is the same dimensions as the transmitter (5' high and 2' wide) and has become very hard to find.

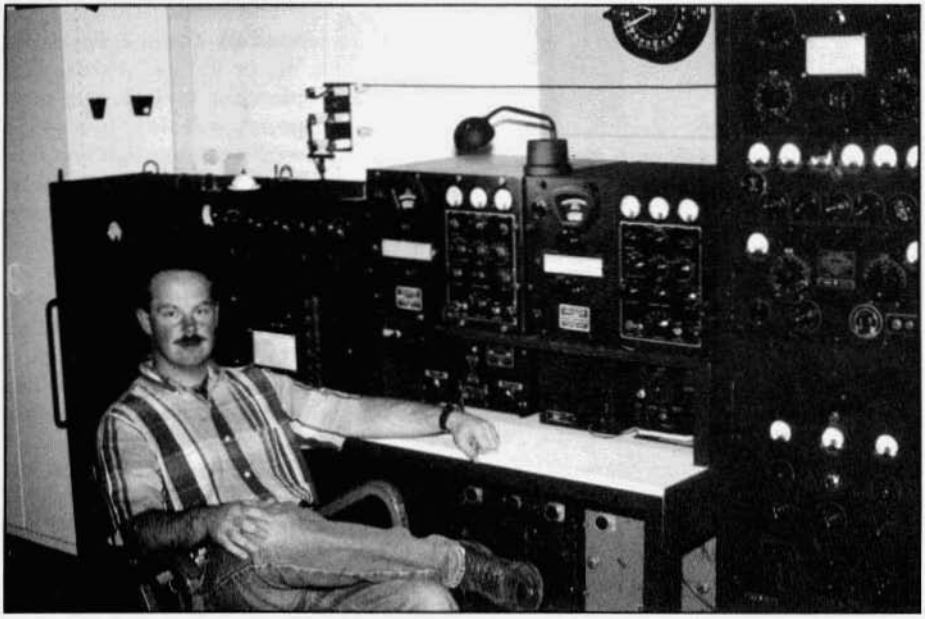
The TCK-4 operates between 2 and 20 MHz (built-in master oscillator) with 400 watts output on CW and 100 on phone (grid modulated). The finals are 813's.

This is some of the history of the TCK and while the TCK has a well deserved place in WW II radio/naval history, it also has a place on the present day amateur bands! Recently, an article appeared in ER about a gentleman operating a TCK-7, and at least one other is being operated on a regular basis by Tom Horsfall, WA6OPE, here on the west coast.

The only type of transmitter that I was actively looking for after I got my BC-610 going was a large Navy one from the WW II era. In this category there are any number of candidates, but fate had determined that I was to end up with a TCK.

Several months ago, a friend told me about a TCK-4 and power supply for sale in Berkeley, which is only an hour away from my home. I wasted no time in contacting the owner. He described the set as being somewhere between an ambitious restoration to a parts set. The story of this particular transmitter is really very interesting. The owner, Bill, bought the TCK-4 and matching power supply at the Standard Iron and Metal scrap yard in San Francisco in 1946. In the manual that I ultimately got with this transmitter, I found a faded business card from this scrap yard with TCK-4 transmitter written on the back. He and his brother then hauled it to his brother's home in Berkeley. Bill fully intended to restore the transmitter and he told me of lengthy scavenger hunts through the radio shops looking for various resistors and even the thermometers for the master oscillator unit. The front panel of the transmitter was in poor condition so he painstakingly removed the front panels and had them redone in the original black wrinkle. I only wish I knew someone who could do this today.

Bill got as far as reinstalling the front panels before family responsibilities took priority and work on his TCK stalled. For the next 49 years, the transmitter remained at this brother's home taking up what might have been permanent residence in a corner of the garage. I decided that although I was interested in a TCK, I did not want to get involved with a transmitter that was so far gone electrically. The power supply was somewhat better off



The author at his operating position. Equipment from the left: TCK-4 power supply; TCK-4 transmitter; RBB receivr; RBC receiver and a TCM transmitter.

but was missing its side and back panels and the high voltage transformer. I determined that for my purposes this was not a feasible candidate for restoration and walked away from it.

But several months later, fate had another card to play. During a 75 meter AM QSO with John, KA6GQE, he informed me that a WW II navy transmitter was being offered for free on one of the sideband nets. He did not get the model of the transmitter but said that it ran a pair of 813's in the final. He also gave me the phone number of the guy who had advertised it. I called him but got no answer. I figured it was probably gone anyway.

The next day, Saturday, I checked into the West Coast Military Radio Net that meets on 3990 at 0800 AM every Saturday. Ken, KD6B, in Oregon, had also heard the listing for the free navy radio. Ken got the model number. You guessed it, it was a TCK-4. I called again while the net was talking about this deal and made contact with the owner, Lonnie Neal, N6TNS. He told me that it was still available. I asked him where he was located and he told me he was in Yucca Valley, California, which is near Palm Springs and about a sixteen hour round trip from my home. I told him that I would be there next Saturday.

The Yucca Valley TCK was described as totally original and complete but less power supply or any accessories. Apparently a neighbor of Neal had had the transmitter for many years but was moving and planned to haul it to the dump. Neal saved it and figured that someone would want to restore it.

Now my mental machinery went into high gear. Remembering the TCK in Berkeley I called Bill to see if he still had it. He did and we struck a deal for the transmitter, power supply and all the parts he had accumulated. I figured that since the Yucca Valley TCK was electrically complete, that would make the restoration of the power supply the main

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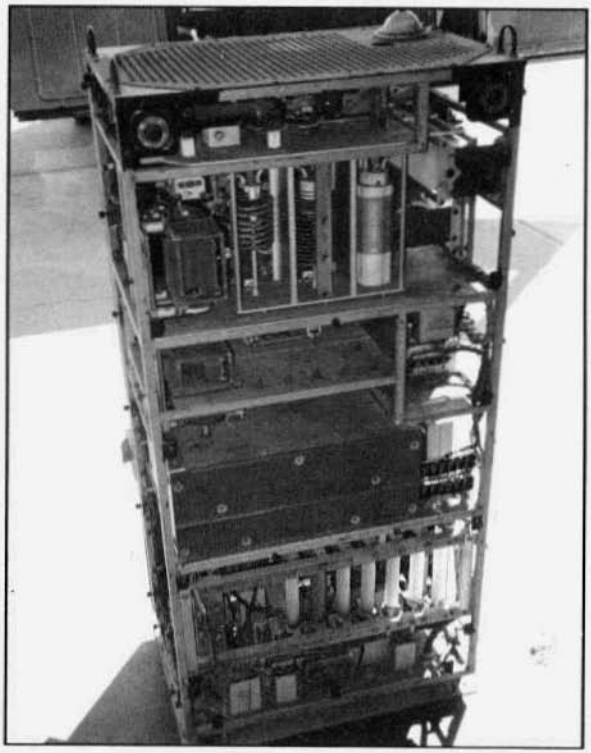
Mad Dog's TCK-4 from previous page



Yucca Valley TCK rear panel removed.

hurdle. Plus I would have an extra parts source from the other transmitter. My TCK project was beginning to show signs of life!

The next Saturday, I borrowed my friend's trusty mini-van, loaded my 2x6 boards for loading heavy-metal transmitters, and headed off into the California desert. This trip was to be made solo since I was unable to recruit a copilot. And now we come to how I acquired the nickname of "Mad Dog" when it comes to radio restorations. I seem to have more enthusiasm than patience when it comes to getting an old radio going. So I decided that this would be a one day speed run. I left at 7:30 AM, arrived in Yucca Valley at 4:00 PM, spent 40 minutes loading and thanking Neal, arrived back home at midnight. Mad Dog.

Sunday morning, I unloaded the TCK-4 from Yucca Valley. It was complete and intact but the front panel was in poor shape with peeling paint and sun-bleached knobs and meters. This transmitter was suffering from its long years of desert heat and neglect. Inspecting the inside of this radio, I was happy to find that it was going to be restorable. The main task would be a total disassembly and cleaning.

The next day, Monday, my wife Cassie and I headed for Berkeley to pick up the second transmitter. Both the transmitter and the power supply were as described. There was a thriving snail and mouse community in and around the transmitter. However, both the transmitter and power supply had been covered and the front panels were still beautiful. The only problem with the transmitter front panel was a small area that appears to have served as a toilet for a neighborhood dog at some point. An additional strong point was the presence of the special antenna tuning unit that was used only on TCK-4's and 6's.

And so, after 49 years of waiting, this gear was taken to its new home near Salinas to meet its brother from Yucca Valley. I felt a little like Doctor Frankenstein assembling carcasses to bring one back to life.

The enormity of the project I was facing finally hit me when I looked at the 1200 pounds of radio I had assembled in a two day period. This was, by far, the most complex project Mad Dog had ever attempted. So I took a deep breath, plugged my nose, and jumped in. Sink or swim and all that.

I decided to start with the power supply. After a thorough disassembly and cleaning I had two of the three decks put back together and ready to go. The high voltage deck was another story. I had a replacement plate transformer that I used to check this part of the supply but found that there was a short in the high voltage circuit. You learn the most about electronics when you have to fix a problem you have not run across before. After long hours on the phone with Tom we found that the problem was a shorted filament transformer.

Tom used to work on ships that had been laid up for long periods of time and he told me that the first step was to bring a bunch of heat lamps on board to dry out all the motors and generators. Tom assured me that it was possible that my shorted transformer could be brought back to life if the problem was accumulated condensation inside the windings. I was a little skeptical of such a simple cure but what the hey. After three days under the heat lamp the megger confirmed that under a 1000 volt test the windings were no longer shorting out. Always listen to the elders!

The clean-up of the Yucca Valley transmitter went smoothly. I really enjoy the cleaning part of a radio restoration because you get a chance to really evaluate and scrutinize every inch of a radio during this process. I have discovered many small problems this way that would have been very difficult to find later on. I decided to swap the nice front panels from the Berkeley transmitter and put all my effort into getting the Yucca Valley rig on the air. I was taking lots of pictures and even video taping the restoration for future reference. The before and after pictures began showing noticeable improvements.

Some minor stumbling blocks along the way came in the form of having to rebuild the roller inductor, locate (during the clean-up phase) two severed wires in the harness, and an assortment of other details that had to be done before initial tests could be conducted. I was able to modify the back and side panels from the extra transmitter to fit on the power supply and this solved the last remaining major problem.

As it turned out, I completed the transmitter several days before I got the power supply put back together. The final hurdle was the installation of replacement filament transformers in the high voltage circuit to get it going while I waited for the old one to dry out. After I got the high voltage going I was ready to begin operational checks. The transmitter came to life without any additional repairs. This is not uncommon with military radio gear, clean it, replace or repair the obvious problems, and fire it up. Most of the individual components such as resistors and capacitors were rated much higher than the actual working voltages to insure dependable service in combat conditions.

It was very gratifying to see this functioning useful transmitter come to life after so many years of sitting idle. I made the first contact with my TCK on the military net. Reports were all favorable with the exception of the restricted audio. This was due to the fact that I was using a carbon mic and also the fact that it took some experimenting to get the TCK's audio level and limiting adjustments set correctly.

The audio problems were solved by using a Radio Shack electret microphone and a circuit I found in a back issue of ER. I found it necessary to increase the values of several of the capacitors in the modulator as well as the microphone to bring up the low end response. I am now getting very good reports and most people say that they would never have guessed that the rig is running grid modulation.

The TCK is a lot of fun to operate. The direct reading frequency read-out, the

continued on page 36

Heathkit Manuals, Part 2

by John Hruza, KBØOKU
2521 S. Holly St.
Denver, CO 80222

First, many thanks to all of you who contacted me about my earlier Heathkit manuals article (ER #78, October '95). I was pleased to hear from so many people who are so knowledgeable on this subject. This was a very educational experience, especially useful to me, as I have several of the items listed below but either don't have manuals for them or the manual copies I bought didn't show the manual number. So please keep the correspondence coming; we will all benefit.

Special thanks must go to N2TLV, WH6CWG, K8WPI and KA9NPT for contributing the following additions to the list of Heathkit communications products manuals given in the previous article:

Model	Manual	Equipment
100-139	5-314	RX-1 Tuner Assy
309C	5-96	R.F. Probe
336	5-490	HV Probe
AM-2	5-176	Ref. Pwr Meter
B-1	5-173	R.F.Balun
CA-1	5-166	Conelrad Alarm
CG-1A	5-355	"Mohican" SWL Receiver
DX-20	5-144	Transmitter
DX-40	6-180A	Xmtr Spec Sheet
GH-12A	5-105	Handheld Mic
GR-54	6-740	SWL Receiver Spec Sheet
GR-64	6-702	SW Receiver Spec Sheet
HD-15	5-771	Hybrid Phone Patch
HD-1982	5-1880	"Micoder" Mic
HDP-21A	7-358	Mic
HM-2103	5-1518	RF Wattmeter/ Dummy Load
HM-2140	5-205	HF Dual Wattmeter
HO-10	6-M578	Monitor Scope Spec Sheet
HO-13	6-M681	"HamScan" Panadapt Spec Sheet
HP-23B	5-1416	AC Power Supply
HP-1144	5-1599	AC Power Supply
HP-1175	5-184	Acc. Pwr Supply
HR-10	5-500	Receiver
HW-16	5-863	CW Transceiver
HW-20	5-358	"Pawnee" 2M Amateur Xcvr
HW-47	5-956	2M Transceiver
HW-100	5-904	SSB Transceiver
HW-202	5-1522	2M FM Xcvr
HWA-2036-3	5-1943	Xcvr Pwr Sply
MP-10	5-328	Mobile 110V Inverter
MR-1	5-239	"Comanche" Mobile Rcvr
SA-2040	5-2327	Antenna Tuner
SB-102	5-1058	SSB Transceiver
SB-104	5-1652	SSB Xcvr Assemb.
SB-104	5-1770	SSB Xcvr Oper.
SB-230	5-1596	1KW Linear Amp
SB-300	6-639	SSB Rcvr Spec Sheet
SB-310	6-896	SW Rcvr Spec Sheet
SB-600	5-815	Comm. Spkr
SB-604	5-1600	Accessory Spkr
SB-610	5-949	Monitor Scope
SB-614	5-1686	Station Monitor
SB-620	5-827	"Scanalyser"
SSB-634	5-1667	Station Console
SB-644	5-1656	Remote VFO
SBA-104-1	5-1616	Noise Blanker

Again, all manual numbers given above (or below) must be preceded by "59"; e.g., the complete number for the SBA-104-1 Noise Blanker manual is 595-1616. The exception to this is the early test equipment manual numbers that don't begin with a digit; e.g., G51A and O89B below. These have no prefix; they are complete as shown.

Thanks to K8WPI and KA9NPT for their contributions to the following list of Heathkit test equipment manuals.

The Heathkit Manual Cross-reference List

Test Equipment Products

Model	Manual	Equipment
AF-1	5-23	Audio Freq. Mtr
AG-10	5-182	Sine-Square Wave Generator
AV-2	5-33	A.C. Voltmeter
BE-4	5-59	Bat. Eliminator
BE-5	5-157	Bat. Eliminator
CO-1015	5-1433	Auto Ign. Scope
CS-1	5-78	Condensor Sub. Box
CT-1	5-161	Capaci-Tester
G-2	G51A	Sine & Square Wave Audio Gen.
GD-973A	5-748	SCR Motor Speed Control
IB-28	5-995	Impedance Bridge
IB-1100	5-1491	Freq. Counter
IB-1103	5-1475	Freq. Counter
IB-5281	5-1958	RLC Bridge
ID-29	5-1095	Automotive Tune Up Meter
ID-4101	5-1954	Electronic Switch
IG-18	5-981	Audio Generator
IG-42	5-1139	Laboratory Type Signal Gen.
IG-52	5-566	TV Alignment Gen.
IG-102	5-565	R.F. Generator
IG-5240	5-1875	Color Generator
IG-5280	5-1957	RF Oscillator
IG-5282	5-1959	Audio Generator
IM-11	5-486	VTVM
IM-13	5-629	Service Bench VTVM
IM-16	5-889	Solid-State Bench Voltmeter
IM-18	5-1154	VTVM
IM-28	5-989	VTVM
IM-28	5-1149	VTVM
IM-38	5-990	VTVM
IM-58	5-1003	Harmonic Distortion Meter
IM-1210	5-187	Dig. Multimeter
IM-5284	5-1961	Multimeter
IMW-11	5-489	VTVM
IO-12	5-561	Lab. 5" scope
IO-18	5-992	Lab. 5" scope
IO-30	5-395	Lab 5" scope
IO-101	5-1242	Vectorscope
IO-102	5-1285	Solid-State 5" scope
IO-4560	5-1728	5 MHz scope
IP-12	5-563	Bat. Eliminator
IP-18	5-983	1-15VDC Reg. Pwr Supply
IP-27	5-859	Regulated LV Pwr Sply
IP-32	5-579	Reg. Pwr Sply
IP-2728	5-1955	1-15 VDC Reg Pwr Sply
IR-5207	5-2196	X-Y Recorder
IT-5220	5-1773	Isolated AC Pwr Sply
IT-12	5-570	Visual-Aural Signal Tracer
IT-17/21/3117	7-1442	Tube Checker Tube Data
IT-18	5-982	In-/Out-of-Circuit Xstr Tester
IT-21	5-537	Tube Checker
IT-27	5-876	Trans. Checker
IT-28	5-991	Cap.Checker
IT-3127	5-1985	Trans.-Diode Checker
IT-5230	5-1808	CRT Tester and Rejuvenator
IT-5283	5-1960	Signal Tracer
MM-1	5-80	VOM
O-5	089B	5" Oscilloscope
OL-1	5-93	Oscilloscope
OR-1	5-255	DC Oscilloscope
PK-3	5-413	R.F. Probe
SG-8	5-73	Signal Generator
SG-1271	5-1613	Function Gen.
SM-600	5-1602	Dig. Multimeter
T-4	5-189	Visual-Aural Signal Tracer
TC-2	5-63	Tube Checker
TT-1	5-292	Tube Tester
TT-1	5-330	Tube Tester
TT-1A	5-553	Tube Tester
TTA-1-1	6-553	TT-1A Tube Tester Socket Adapter
TT-1/1A	7-10	TT-1/1A Sup
Tube Data Sheets (var dates)		
V-7A	5-110	VTVM

2AP1 2" Monitor Scope

by David Ishmael, WA6VVL
P.O. Box 3611
Costa Mesa, CA 92628

My "love affair" with oscilloscopes started about the same time I became interested in radio. The owner of a Radio-TV repair shop in downtown Laguna Beach, California, pulled a 2AP1 out of a piece of WW II surplus equipment and gave it to me in the summer of '58. It was two more years before I used it to build my first homebrew oscilloscope - right out of the pages of the ARRL Handbook(s). I can remember how excited I was as I unpacked the Millen 80072 2" bezel and the blue coil of push-back hook-up wire that I ordered from Allied Radio to build it. That first scope was built using a 12" x 7" x 3" aluminum chassis base as an enclosure and later rebuilt on a 5-1/4" x 19" black-wrinkle rack panel. The rebuilt scope used an 884 triode thyratron as the sweep tube. My last homebrew (non SSTV) scope was built in '64 using a 3FP7A for my 2nd year project at Orange Coast College where I was enrolled in the Electronics Technology program.

This project is another of those that I have wanted to build for quite some time. I was lucky enough to stumble over most of the major parts to build this scope a couple of years ago at the General Dynamics amateur swapmeet. So it was more a matter of finding the time than finding the parts.

This monitor scope was built as a matching accessory to my 6AG7/1625 100W CW transmitter (ER#61). I was primarily interested in observing the keyed CW waveform and designed the scope accordingly. There is plenty of room in the enclosure to expand the scope's capabilities if the need arises.

The scope is built using an Easy Tech E3120B rack mount cabinet that is distributed by Alltronics. The front panel uses a standard 3-1/2" x 19" aluminum rack panel and the enclosure measures 3.25"H x 16.625"W x 9.625"D. The rear panel is 0.062" painted aluminum. The top, bottom and side panels are painted 0.036" stamped steel. The color is a dark charcoal. The cabinet is $45+ shipping so it was significantly cheaper than the TES line of enclosures that I used for the 6AG7/1625 transmitter and other projects. I like the TES enclosures better, but the >$60 saving using the Easy Tech enclosure was awfully hard to ignore.

The following are some of the highlights and comments about the completed monitor scope:

* The basic scope circuit is very close to the circuit described in the (say) 1961 ARRL Handbook. The values were selected to correspond with the 2AP1A data sheet and values on hand.

* The INTENSITY and FOCUS controls are AB type J and Ohmite type AB 2W linear pots. The HORIZONTAL and VERTICAL centering controls are Clarostat 2M w/insulated shafts, a reasonable precaution since they are connected directly to the 755V supply. If you use AB type J and/or Ohmite type AB pots, check them for noise BEFORE you mount them and wire the scope. Three out of four of mine were "noisy". I pulled the backs off all four and cleaned them with contact cleaner before putting them back together.

* A Millen 80072 2" bezel is used to support the CRT at the front panel. Don't use the supplied template to locate the

Front view of the 2AP1A 2" monitor scope.

holes for the bezel - it's not accurate enough. The 2-9/32" hole for the bezel was initially punched with a Greenlee 2-1/4" chassis punch and then enlarged with a file.

* A JAN 2" magnetic shield is used to minimize the effects of the power transformer's magnetic field. The clamp for the CRT's base was removed from the rear of the shield because the 2AP1 was too short for this particular shield. Without the shield, the power transformer would have to be moved as far away from the CRT as possible and then oriented for minimum distortion of the trace. My layout requires the shield. Some designs have successfully (?) mounted the transformer behind the CRT's socket without using a shield. If you decide to use a 2AP1 in your monitor, early, metal-based 2AP1's with their 1.7" base dia., will NOT fit through the smaller 1.5" dia. at the rear of the JAN shield. What a surprise!

* The 2AP1's 11-pin small shell magnal steatite socket is mounted on an L-shaped aluminum bracket. The 1-19/32" hole for the CRT's socket was initially punched with a Greenlee 1-1/2" chassis punch and then enlarged with a file. Since the overall lengths of 2AP1/2AP1 CRT's are different (0.25" between four of mine), I slotted the mounting holes in the bracket. The socket is an Amphenol 49-SS11L. Don't rigidly mount the socket - let it "float". Install the socket with the keyway slightly offset, pin #1 at the bottom. The final alignment of the trace is done by rotating the CRT in its socket.

* I used the same technique finishing the front panel as my 6AG7/1625 transmitter. The front panel was painted a bright yellow over the dark charcoal gray. Black dri-transfer lettering was used to label the front panel.

* Most of the front panel hardware is from Radio Shack. The SPST and SPDT toggle switches came from their 275-322 assortment. The knobs are four 274-415 black hexagonal 3/4" dia. with aluminum inserts and two of the larger 274-416 1" dia. The incandescent pilot light uses a 272-340 holder with a 272-1142 6V 100 mA bulb (E-5 base). I reduced the bulb's current a bit with a 22Ω 1W series resistor - it was too bright without it. An added advantage of the 22Ω series resistor is that it increases the life of the bulb by limiting the in-rush current when the bulb is first turned on.

* The power supply uses a standard full-wave voltage quadrupler. The

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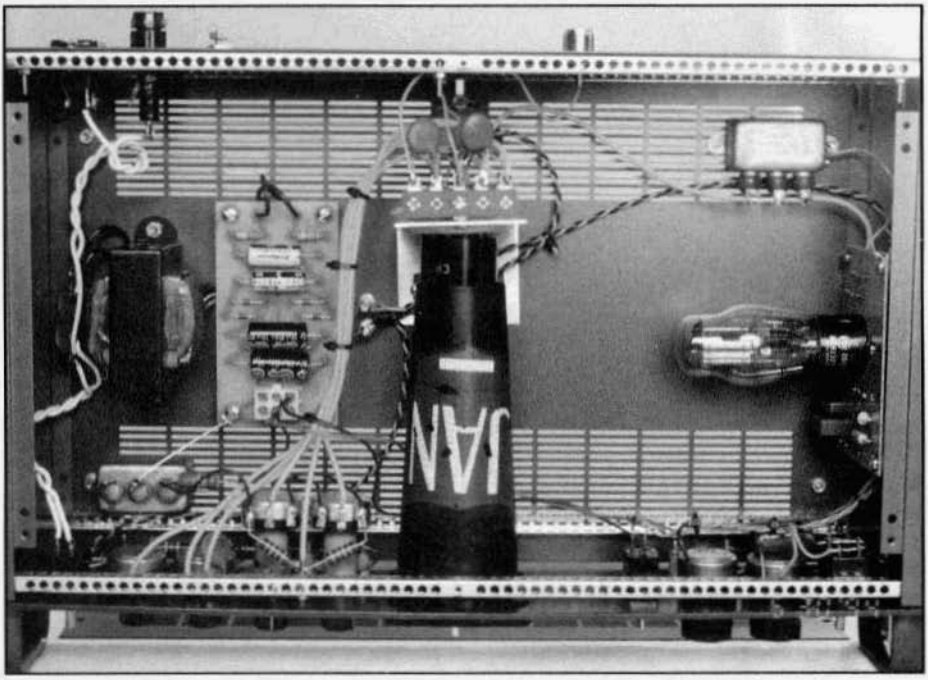


Top view. A JAN 2" magnetic shield is used to protect the 2AP1A from the power transformer's magnetic field. The mounting holes for the CRT's mounting bracket are slotted to accomodate different length CRTs. The 884 sweep tube is to the right of the CRT.

power transformer is a Thordarson 26R38 with 125V @ 50 mA and 6.3V @ 2A secondaries. The secondaries almost 19W capacity should be sufficient to handle future circuit expansions. The LV and HV measures 373V and 755V respectively at nominal 120 VAC line voltage. The power supply components are mounted on a single-sided 2-1/4" x 4-1/4" PCB.

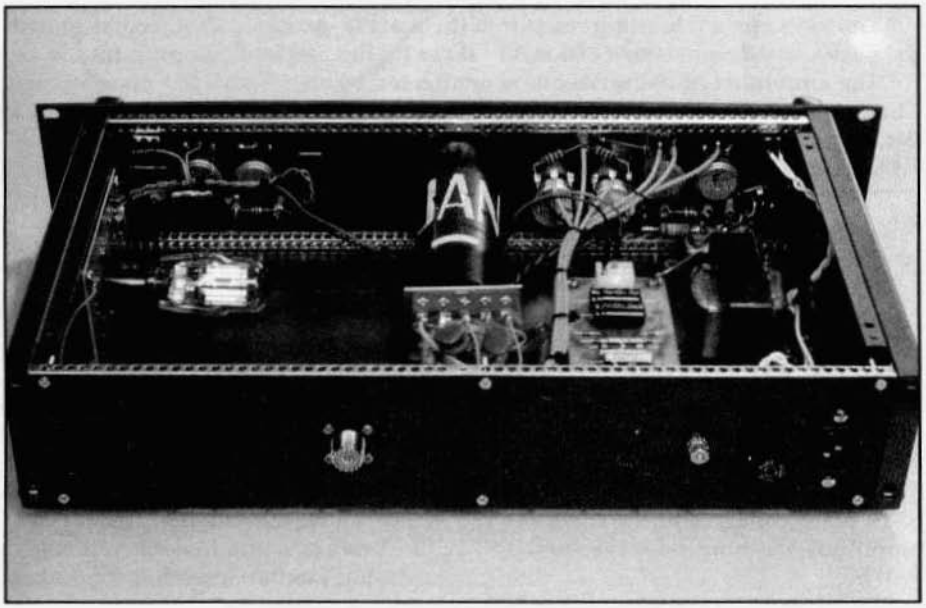
* The HV divider resistors are 1W and mounted to the front panel on 6-32 phenolic standoffs. The 180K and 0.1 uF capacitor at the "top" of the HV divider filters out the ripple from the power supply - there is significant trace ripple without this RC.

* The horizontal sweep uses a type 884 triode thyratron. This was a very popular sweep tube in early oscilloscopes. I spent a few weeks looking at alternative sweep circuits before (again) selecting the 884.

* Keeping the design as simple as possible, I originally connected the transmitter through a low value fixed capacitor. After using the monitor for a few days with the 100W transmitter, it was clear that a fixed value wasn't going to cut it. I installed a Hammarlund type MC 75 uuF variable on the rear panel and insulated it from the chassis with a scrap piece of PC board. A 3/4" hole provides clearance for the variable's shaft and hardware. This value is just about right for 100W class transmitters. The vertical height of the transmitter's envelope is adjustable from about 0.4" to 2".

* The monitor is connected to the transmitter using a T connector in the RF line.

The following are some comments about the 884 horizontal sweep:



Rear view of the monitor.

* I have used the 884 as a stand-alone sweep circuit - no additional horizontal amplifier stage is required. I wanted a very simple horizontal sweep that would still sync to an external signal.

* The horizontal sweep can be synced to an internal 60 Hz (6.3 VAC) source or an EXTERNAL INPUT can be selected with a front panel toggle switch.

* The sawtooth amplitude vs grid voltage can be determined from the table below or the following formula can be used to estimate the sawtooth amplitudes for grid voltages more negative than -5V:

E-sawtooth P-P = (E-grid x -11.9) - 40

E-grid	E-sawtooth	E-grid	E-sawtooth	E-grid	E-sawtooth
-3V	5V	-9V	66V	-15V	136V
-4V	12V	-10V	76V	-16V	150V
-5V	21V	-11V	88V	-17V	160V
-6V	32V	-12V	100V	-18V	175V
-7V	42V	-13V	112V	-19V	185V
-8V	53V	-14V	126V	-20V	196V

* A grid voltage of -18V was selected. A 1N4746B 1W 18V zener diode is used in the 884's cathode with a 130K 2W resistor returned to the LV supply. The zener diode guarantees a stable grid voltage, which guarantees a stable sawtooth waveform. The sawtooth's amplitude is very sensitive to changes in grid voltage. The standard resistive divider to the unregulated LV or HV supply is not stable enough.

* The output of the 884 provides a 175V sawtooth to the 2AP1's horizontal deflection plate and provides a horizontal trace width of 1.4" at an A2 voltage of 600V. Trace widths vary from 1.2" to 1.7" in four 2AP1/2AP1A's tested.

continued next page

* The 884's current limiting resistor in the plate is increased to 820 ohms to limit the peak-cathode currents < 300 mA at these higher sawtooth amplitudes.

* The amplitude of the sawtooth is unaffected by changes in 884 plate voltage. Changes in plate voltage will change the sawtooth's period. The following table demonstrates how the sawtooth's period changes vs plate voltage with a fixed RC (1M, 0.1 uF):

HV	E-grid	E-sawtooth	Period
150V	-10V	76V	98mS
200V	-10V	76V	62mS
250V	-10V	76V	45mS
300V	-10V	76V	34mS
350V	-10V	76V	29mS

The larger the difference between the 884's plate voltage and the sawtooth's amplitude, the more linear the sawtooth will be.

* The 884's timing resistor and SWEEP control is returned to the HV 55VDC supply to improve the linearity of the sawtooth. The SWEEP control is an AB type J 2W linear pot insulated from the front panel using a fiber shoulder and flat washer. The RC timing components have been selected to provide two overlapping sweep ranges: 10-100 Hz (LO) and 50-500 Hz (HI).

* The sawtooth's linearity is slightly degraded by the 0.2 uF'd horizontal coupling capacitor at low sweep speeds. The coupling cap is a dual-section bathtub type capacitor that is wired in parallel.

* A 1N5956B 200V 1.5W zener diode is connected from the plate to the cathode to clamp the 884's plate voltage to approximately 218V when the power is first turned on. Once the 884 warms up, the selected 175V firing point is well below the zeners knee. Without the zener, the timing capacitor would charge to the value of the HV supply before the 884 had a chance to warm-up.

* The sweep circuitry components are mounted on a single-sided 3" x 4" PCB.

I had a particular goal in the design of this monitor - to work nearly as well as my Kenwood SM-220 as a CW monitor scope. I have used the SM-220 for nearly five years now and find it invaluable as an in-line monitor in evaluating the keying characteristics and envelopes of CW and AM transmitters. Not all my expectations were met with this monitor:

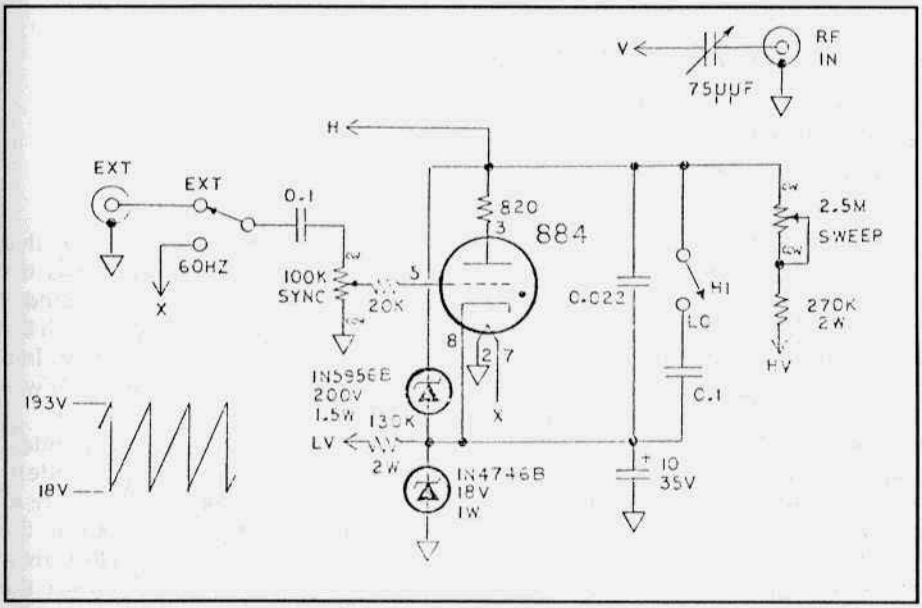
* The biggest problem is that I couldn't set the monitor on top of the transmitter as planned. The magnetic field from the transmitter's plate transformer caused objectionable trace ripple during transmit. It appears that the JAN shield isn't "bullet proof".

* I wanted to restrict the size of the scope to a 3-1/2" panel height and that pretty well dictated the use of a 2" CRT, bezel, and shield. The 2AP1 is certainly adequate, but the differences between the 2" and SM-220's 3" CRT lean toward the 3" CRT. If panel height isn't a problem, use the 3" CRT.

* The end-to-end fine-line focusing of the 2AP1 leaves a bit to be desired, although the overall focus of the keyed waveform is acceptable. The end-to-end focusing "problem" is probably a geometry "problem" with the 2AP1 - remember, this CRT is 50 years old.

Other than these objections, the monitor works pretty well. At low sweep speeds, you can easily evaluate the rise and fall times of the keyed waveform. At higher sweep speeds, you can use

continued on page 36


V
75UUF
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60HZ
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100K SYNC
20K
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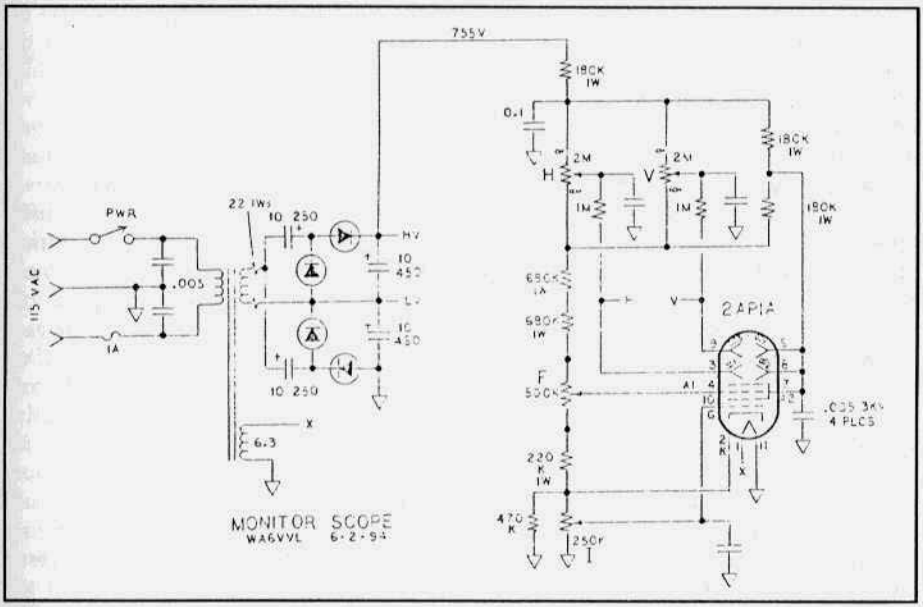
H1
LC
270K 2W
HV
IN595EE 200V 1.5W
130K
2W
LV
C.1
193V
18V
IN4746B 18V 1W
10 35V


755V
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HV
10 450
LV
10 450
10 250
X
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MONITOR SCOPE
WA6VVL 6-2-94
680K 1W
680K 1W
V
2API
F
500K
220 K 1W
470 K
250
I
.035 3KV 4 PLCS

The Taylor Special (Nostalgia '35)

by Jim Taylor, W4PNM
2721 Marschalk Rd.
Augusta, GA 30904

This story started long ago, it is in some respects a continuation of Nostalgia 28 (Aug. 90 cover of ER). The rig described in this story is a replica of a transmitter built by W8DFV, Chick Taylor, for his friend of the time, Harry Eldridge, W8AZH. Harry was the guy who got my Dad started in ham radio back in 1927. The original rig was used by Harry until 1948. The unique twist to the story is that as a young ham, old Harry asked me to come and fix his transmitter, which I did on several occasions. It was not for a year or so that I found out my Dad had built that transmitter in 1935.

One day Dad and I were sitting around talking old-time radio and struck on the idea of building a replica of Harry's old rig.

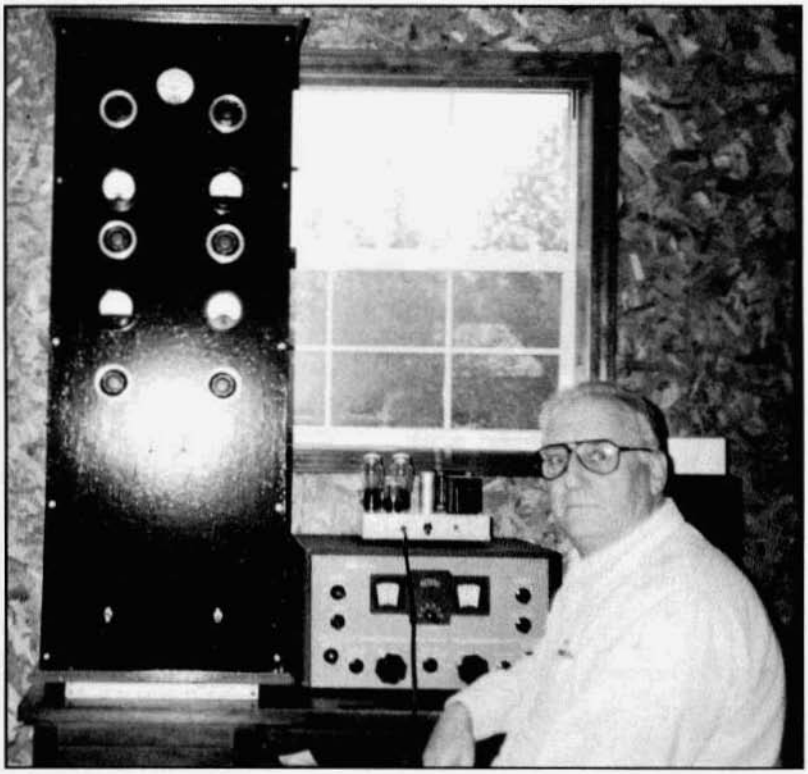
The project started with months of digging out parts suitable for the time. After fussing and fuming for some time the construction finally started.

The original rig was built in a wooden rack built by my grandfather of quartered oak. Since its not available today at a reasonable price, I chose poplar, and stained it oak, finishing it with several coats of Polyurethane. It's nice and shiny! The finished rack is 18" x 18" x 4 feet tall. It includes five shelves including the bottom. The shelves seem to be an interesting feature to some guys, since they very ingeniously slide in and out of the rack (predecessor of the sliding shelves of today?) The rack is trimmed out top and bottom with a molding to make it look like the old-time furniture.

Because of the wood shelves, like the original its construction is all breadboard. The rack is separated in five shelves 9" apart; the bottom has the power supplies, second shelf the modulator, third shelf, the exciter, fourth the final and fifth, the antenna tuner. In a lot of the old rigs the antenna tuner was an intergal part of the transmitter.

The Taylor Special, no pun intended, is all TAYLOR tubes. A T-21 tetrode in the crystal oscillator, a T-20 triode in the buffer, and a pair of T-40's in the push-pull final. The modulators are a pair of TZ-40's and even the 866s in the power supply are TAYLOR made! So maybe a pun is in order since our last name is Taylor!

The circuit the same as then uses the T-21 in a modified Pierce oscillator, with a shunt fed plate circuit to keep B+ off the knobs, condenser coupled to the grid of the T-20 through a .0002 mica (yes an old Sangamo screwed down again). As before, W8DFVs memory went to work with placement and circuits. We tried to make it as near as possible to the original. The T-20 buffer is operating straight through so it must be neutralized. The old National disks condensers served well. The plate circuit of the T-20 is unique, it uses a single-ended plate coil with a pick up winding, much like a push-pull coil, except only the plate half of the coil is tuned. The other half is used only for neutralizing energy. Old but very good, it works perfectly; who said the old timers didn't know what they were doing? The center of the coil is bypassed with a .01, therefore the rotor of the tuning condenser can be grounded as well, again no B+ on the knob. The buffer is link coupled to the grid coil of



The author with the "Taylor Special"

the final with the old twisted drop cord. The final on the next shelf up is interconnected through a terminal strip to the center of the grid coil. The T-40s being in push-pull, require cross neutralization, again with the National disk condensers. All the tubes except the T-21 are mounted in the small twist lock sockets (25 or 5 watt socket - I've heard both). All the coils are hand wound on forms of the time, some ceramic, some bakelite. The final plate coil is mounted on top of the split stator condenser, wound of #12 enameled wire, and link coupled to the center of the antenna tuner coil again with drop cord. The tuner being on the top shelf is interconnected again through a terminal strip.

The tuner's a little unique, since it is wound as a two-section coil with the two center taps coming out to an RF current meter. That way the meter is always in the current portion of the circuit, and always reads very up scale. The other unique thing is the link around the center of the coil has an antenna changeover relay and a 1000 uuF variable in series with the link. Therefore the receiver gets the benefit of the tuner, and the condenser is used for loading to correct plate current with fixed links on both the final and tuner coils. When tuning up the antenna the tuning condenser is adjusted for maximum antenna current, then the loading condenser is adjusted for 230 mA of plate current. Of course, the plate has been in resonance all this time. When adjusting the loading up or down, the resonant point on the final does not change, kinda neat and pretty smart for 1935.

The power supply is sorta neat too.

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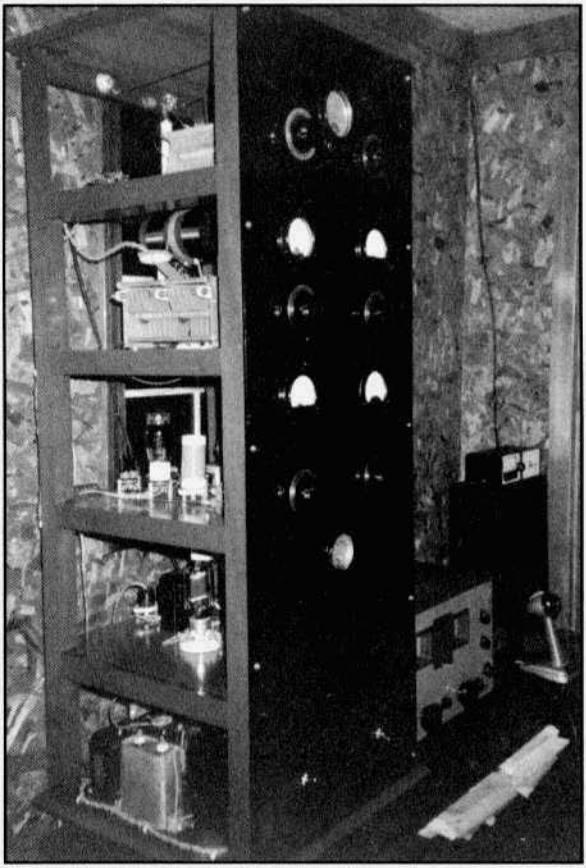
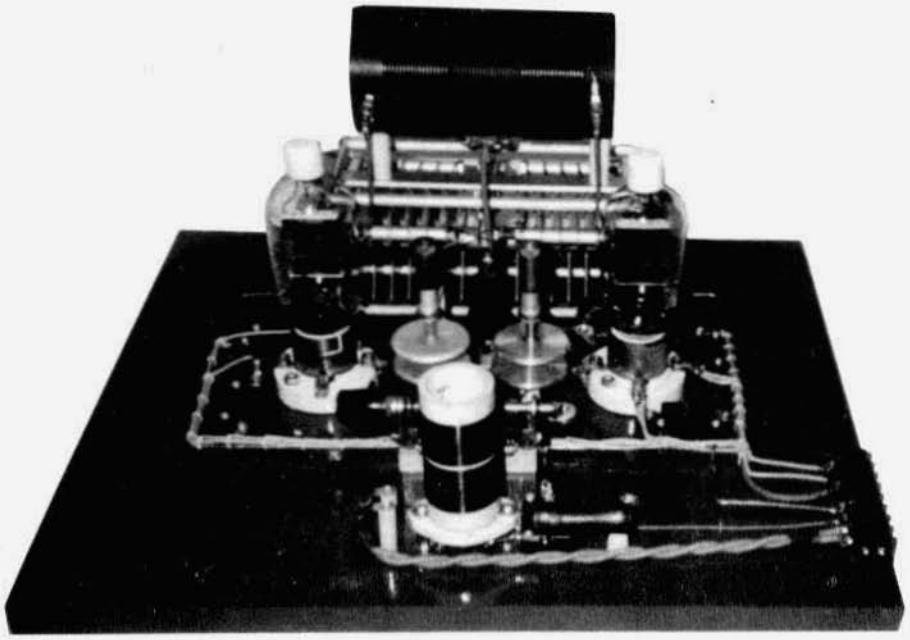


The "Taylor Special" sitting on the author's operating desk, side panel removed. The decks from the top down are: antenna tuner, final, exciter, modulator and power supply. Each deck slides out for repair or maintenance.

Rather than having three power supplies, (final, modulator and exciter) we used two 1250 volt @ 200 mA power transformers, with taps on the secondary at 700 volts. The primary and secondary are in parallel, and use only one of the 700 volt taps. We therefore have 1250 volts at 400 mA and 700 at 150 mA. The low voltage feeds the exciter and the high voltage serves the final and modulators. Each has its own 10 mF filters and 10 Hy chokes so space was saved by not using all those power transformers. The only non-Taylor tube is a 5Z3 for the low voltage. High voltage is the 866s with that nice blue green look flashing when you modulate.

The modulator shelf is rather simple because it has few parts. The TZ-40 driver transformer, the tubes, and the modulation transformer is all there is. The modulator drivers, a pair of 2A3s are on the speech amplifier chassis with the plate leads run through a cable to the modulator shelf. Long plate leads but who cares, length doesn't mean too much with audio.

The filament transformer is rather unique too! There was a requirement for 7.5 volts for the T-40s, TZ-40s and T-20, 6.3 for the T-21, and 2.5 volts for the 866s with 5 volts for the 5Z3. That's a lot of transformers, and 7.5 volts are hard to find. With limited room, it became necessary to do something drastic! The solution was one transformer, with all the voltages. No such beast existed, so the next best thing was to make it. So, I took an old burned out power transformer, tore it apart while counting the windings, and rewound the primary, then put a 7.5 volt CT winding with #12 wire, a 6.3 volt winding with #16 wire, a 5 volt winding of #12 for the 866s (filaments in series), and a 5 volt winding of #14 for the 5Z3. All windings have center taps. The power consumed in the filament windings is about half what it was when used as a power transformer, so the core is safe! Believe it or not I had only to rewind one winding to correct a small under voltage. The transformer is a combination of RF filaments and high volt-



The RF amplifier deck.

age, so the insulation is beefed up with high voltage tape and fish paper. It looks very good and the room saved was well worth the effort. One filament transformer powers the whole transmitter.

The rig works very nicely. I have had it on the air many times. Everyone says it sounds beautiful.

As you might guess it already has a nick name. The old 1928 rig is nick named the "Tea Cart" transmitter. This one Andy, WA4KCY, has started calling the "Whatnot Shelf Transmitter"! Shades of the good old days. The thing works so well you wouldn't believe it, no sign of bad side products like TVI. It's so nice to see those old Taylor tubes lit up so bright!

The speech amplifier is kinda old fashioned too. It uses a 6SL7 speech input, 6SN7 phase inverter, driving a pair of 2A3s. It's very simple, not much in the 7" x 10" x 2" chassis. The use of low mu triodes offers ample gain, but very low noise. The TA-40s seem to take very little drive.

The voltages are 1250V on the T-40s @ 230 mA approximately 280 watts input, while the 1250 on the TZ-40 modulators permits zero bias with static plate current at 50 mA kicking up to 200 mA on peaks. The low voltage is fed to the T-20 600 volts @ 90 mA, then a voltage divider to the T-21 400 volts @ 20 mA.

The transmitter is being used with a pair of half waves in phase with 600-ohm open wire line. The line runs right to the back of the transmitter to the big old feed through insulators.

Looks like 1935, works like 1991. . . . Our standard tests on the transmitter indicates it is spurious and harmonic free.

If you hear me on the air the rig I will be using will be the Taylor Special (Nostalgia '35). ER

Editor's Note: To receive a schematic of this transmitter send a LSASE to ER.

Mad Dog's TCK-4 from page 23

four colored lamps, the master oscillator heating compartment fan, all make up an entertaining and functional package that is light years ahead of most transmitters of its era.

I have built a Navy operating position using the TCK as the high power transmitter. I am using the RBB/RBC radio receivers built by RCA as the associated receivers. These are outstanding receivers that are on a par with such greats as the AR-88 but not as popular and harder to find. This combination is working very well.

An exact replacement for the plate transformer was built by Peter Dahl in Texas. I was very impressed with the professional service I encountered during my correspondence with this company. The transformer arrived in less than a month and was exactly what I had ordered. My power supply is now working exactly as original with both a high and low power position.

The whole project took me exactly three weeks. Mad Dog. **ER**

2AP1 2" Monitor Scope from page 30

the 60 Hz sync to verify the presence of 60 Hz or 120 Hz ripple on the envelope. The poorer linearity of the sweep at low speeds is noticeable, but not objectionable. **ER**

Selected References:

1. RCA 2AP1A Characteristics, July 1, 1945.
2. RCA 884 Characteristics, December 15, 1944 & January 4, 1945.
3. "Encyclopedia on Cathode-Ray Oscilloscopes & Their Uses", John F. Rider and Seymour D. Uslan, 1950.
4. "Voltage Multipliers", Jack Althouse, K6NY, QST, October '71, pgs. 29-33.
5. "Design of Cathode-Ray Tube Circuits", Walter Knoop, ex-W9KHG, QST, December '46, pgs. 45-50, 160.
6. "A Scope For the Ham Shack", Robert Weitbrecht, W6NRM, QST, February '48, pgs. 51-57, 126.
7. "How's My Modulation?", J.L. Hollis, WØJET, QST, September '48, pgs. 49-51.
8. "Electronic Instrumentation - Cathode-Ray Tubes as Metering Devices", M.H. Dunbrack, W1BHD, and R.A. Bradbury, W1NUQ, QST, February '51, pgs. 16-17.
9. "Cheaper and Better Phone Monitoring", Basil C. Barbee, W5FPJ, QST, August '52 QST, pgs. 31-33, 118.
10. "What's the Percentage", William I. Orr, W6SAI, CQ Magazine, April '53, pgs. 33-37.
11. "The Hamscope - Monitors Your AM or SSB Transmitter", GE Ham News, September-October '56 (part of the 1st Edition GE Ham News Sideband Handbook, pgs. VI-5 thru VI-13).
12. "Oscilloscope Circuit", Hints and Kinks, QST, January '60, pg. 55.
13. "The Radio Handbook", William I. Orr, W6SAI, Sixteenth Edition, '62, pgs. 750-751.
14. "Sawtooth Sweep For Modulation Monitor Scope", Vernon Trexler, CQ Magazine, February '61, pgs. 34-35.
15. "An Oscilloscope Monitoring Adaptor", David T. Geiser, WA2ANU, CQ Magazine, November '63, pgs. 76-77, 119.
16. "The Radio Communication Handbook", Radio Society of Great Britain, Fourth Edition, '68, pgs. 19.37-19.42.
17. "Test Equipment For the Radio Amateur", Radio Society of Great Britain, Second Edition, '78, pgs. 9.1-9.8.
18. "Watch Your Modulation! Use a Scope", John Staples, W6BM, Electric Radio, March '90, Issue 11, pgs. 12-16.

The SB-34 from page 11

control, a standard AVC circuit, and a slide switch to cut in a 20 or 39 dB attenuator would have cost at most $1 and been ten times better.

There is a definite pattern to what got fixed in the -34 and what did not. Improvements were either fairly easy (getting rid of the hum and keying 'clack'); major features expected to open a new market (the 12 VDC supply); or significant cost reductions (eliminating the relay). More difficult changes that would have made this a better radio (reducing drift, improving the AVC, adding an S-meter) didn't get done. It would be interesting to know exactly when Faust Gonset and others who designed the SB-33 left the company.

So why did the company fail? First, the SB-33 and -34 were ahead of their time. As noted in the SB-33 review, the ham radio market of the '60's was split between those still running AM, those who were going to sideband but who wanted separate receivers and transmitters, and those who wanted high power in a single package. The idea of buying a small transceiver and then adding a linear took a while to catch on. Second, though innovative for 1964, the SB-34 was by the end of the decade badly in need of a face lift and another round of improvements.

The late '60's were unkind to all U.S. ham radio manufacturers as Japanese companies with cheaper parts and much lower assembly costs began to figure out what we wanted and deliver it to our stores for a fraction of what our makers could - Yaesu's FT-101 arrived in 1968. Large, well established companies like Collins, National and Hallicrafters got by with the help of military contracts but none of them did well.

But the story is more complicated than that. During the late '60's, SBE was owned by Raytheon Company. The money to introduce (say) an 'SB-70' in late 1969 surely was available. A 'makeover' of an existing set is much cheaper than developing a new one and the necessary changes could have reduced the set's cost. With 600 volts on the plate a pair of 6146's would have reached the magic 100 watt mark or a single 6883 (12 volt version) would have delivered about the same power at a lower cost. That Collins mechanical filter - perhaps $35? - could have been replaced by a Japanese unit. Four circuit boards could have become two. New features like an S-meter and 10 meter band could have added value at little cost. I don't know the details, but I believe the failure of SBE's ham products is more like our loss of the U.S. VCR industry - that is, a failure of vision and nerve - than what happened to the TV, Hi-Fi and similar businesses in which our higher cost manufacturers lost out as these products came to sell mainly on price.

Around 1972 Linear Systems Inc. became the fourth owner of SBE and turned the company's attention to the marine and CB markets. There were two more ham HF sets, namely the SB-35 and SB-36, but I have never seen the -35 and have only heard of two -36's, so I suspect very few were delivered. Like the reorganized company's other products, these were made in Japan. I believe the Sideband Engineers logo continued into the 80's but it is Faust Gonset's 1963-64 company that deserves to be remembered as the first in the world to figure out what the ham set of the 1970's, '80's and even '90's would look like. ER

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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

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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.

FOR SALE: Antenna tune-up kit; Palomar RX noise bridge w/Waters DPDT coax switch, works great - $55. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (617) 934-5043

FOR SALE: Mint Collins 75S3, 32S3, 516F-2 - $850; immaculate WE 30L-1 - $525; Collins 75S-1 - $275. **WANTED:** Collins 5M-3 & pre-1940 xmtr's. Stu, NY, (914) 691-7957.

FOR SALE: Tubes, RCA, 807, new - $10 ea; 201A, 71A, 112A, 26 - $10 ea; 6KD6, GE, new - $24; 12JB6 - $12 ea; 4CX250B, new - $45; 1625 - $3; 5R4GY - $6; 5U4 - $1.50; Crosley model 52 radio, 3 tube - $145. John Kakstys, 18 Hillcrest Terr., Linden, NJ 07036. (908) 486-6917

FOR SALE/TRADE: Millen NOS 90801 TX, Millen 90881 amp. **WANTED:** Millen 90711 variarm VFO; Stancor 10P. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 (h) 957-6420 (w).

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: 540B works, average - $60; orig. TM 4057 F/BC610 - $22 ppd; parts unit SX 28, restorable - $100; NC 183D, works great but needs pwr xfmr; S38C VGC - $75; 520R, modified, works - $35; Riders #15 - $26, ppd. **WANTED:** Riders #22, offering $60 ppd. Prices firm + shpg. Dave Metz, VA, (540) 885-8864 (d) 8-5 EST.

FOR SALE: Many radio tubes. **WANTED:** telegraph keys. Premium paid for "bugs" & rare, unusual, or unique straight keys or related telegraph items. Vince, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013. (800) 840-KEYS

FOR SALE: Large accumulation of xmtr's, rcvr's, xcvr's, test equipment, manuals, etc. Virtually everything AM & military (some avionics), & hollow state. Large (55¢) SASE. Military Marketing, Inc, Box 741, Norcross, GA 30091-0741. Attn: Gene, KD4YIZ

FOR SALE: Swan 500C, poor non-working, w/ AC & DC pwr sply's - $75. John Nelson, AA7W, 13428 29th Ave. SE, Bothell, WA 98012. (206) 261-7334

TRADE: Good Johnson Valiant for clean R-390 (not 'A'). **WANTED:** Globe Champion 300/350. Sue, (616) 229-4318, till 10 PM EST.

WANTED: Collins KWM-380 late model high serial number, must have speech processor, noise blanker & accessory filters. Kerry, N5CET, (800) 776-4976 (d), (214) 271-0017 eves.

WANTED: Old meters & any aircraft stuff. Chris Cross, Box 94, McConnell, Il 61050.

WANTED: HRO plug-in xtal for HRO variation two (only xtal). Tajima, JA1DNQ, c/o The Nakagawa's, 22942 Cedarspring, Lake Forest, CA 92630.

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: Johnson gear, all models, any condition. Please state asking price. Wen Turner, AD7Z, Box 451, Cal-Nev-Ari, NV 89039-0402.

WANTED: National coil forms, plugs, & sockets - XR13, PB-5, XB-5; consider other types. Wayne, N8TE, 1212 17th Rd, NW, New Strawn, KS 66839. (316) 364-5353

WANTED: Unbuilt HW101 & ps. I'll pay your price plus UPS. Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078

WANTED: Weston 431, 0-200 mA, KS-6184 meter; meters in quantity, cheap; strange or unusual meters; flight instruments; meter books & pamphlets. Chris Cross, Box 94, McConnell, IL 61050.

WANTED: Riders radio manual #23 or borrow yours for two weeks, your rules. Joseph R. Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003. (304) 277-3154

WANTED: Gonset 913A 6 meter amp., working or not; manual &/or 6 meter coil for Knight T-175 amplifier. Donzil Worthington, WS0F, 9842 Juniper Cir., Prescott Valley, AZ 86314. (520) 772-1297

WANTED: 6 kc AM & 600 cycle CW filter for Swan 600R custom rcvr. Bill, KO4XF, GA, (770) 887-7567, leave message.

WANTED: Any info, modifications for Viking Challenger; VFO Johnson #122. C. Roger Hulse, 56834 Whiskey Run, Quaker City, OH 43773.

WANTED: Hallicrafters HT-9 xmtr & spare parts. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

WANTED: Heathkit, Eico, Fisher, Dynaco or similar tube audio amplifier in any condition or manuals for same. Mike Nowlen, WB4UKB, POB 1941, Herndon, VA 22070. (703) 716-1363

WANTED: Military sets, US GRC-13, ABK, APX-1; British WS No.21, Canadian WS No. 29 A & B sets. Leroy E. Sparks, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

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: Collins mech filters for S-line; F455FA-05-500 Hz, X455Q200-200 Hz, F455FA-31-3.1 kHz, F455FA-60-6.1 kHz. Kerry, N5CET, (800) 776-4976 (d), (214) 271-0017 eves.

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 13280, Maumelle, AR 72113. (501) 851-8783, FAX 851-8784.

WANTED: HI-FI spkr's & enclosure by Altec, Electrovoice, Jensen, JBL; tube components. Tim Phelan, 845 Lilybud, Ballwin, MO 63011. (314) 227-9264.

WANTED: Deluxe Signa-Tone #4300 CW oscillator/monitor. W6UBI, RR2, Box 114, Gillespie, IL 62033.

WANTED: Clean HR-10 rcvr, orig., no mods, all knobs, no dents please. Tom Jurgens, KY8I, 3920 Jim Dr., Bridgeport, MI 48722. (517) 777-2257

WANTED: Heath Warrior linear amplifier, need not work. Gary, AA5QJT, TX, (713) 355-6153

WANTED: Drake R4B or R4C. Bob Becker, W7OD, 17020 16th SW, Normandy Park, WA 98166.

WANTED: Circuit description & diagram for Heath HW29A 6 meter xcvr. Harry Davey, VE7AIJ, 847 Glencoe Dr., Port Moody, BC V3H 1G7, Canada. (604) 936-5428

WANTED: Tuning knob Drake TR-4; Mohican CC-1A bandswitch knob chrome; main tuning knob HW-101; cabinet for Hallicrafters PS-150-120; Amateur Handbook, years-1961-62-65-68 & all of the '50s. Need all in great condx. Robert Mitchum, N9WEZ, IN, (317) 881-9083.

WANTED: Hallicrafter HT33A/B linear amp. w/ or without final; 8236 tubes; restorable Collins 30L. Joe Curry, KE6LFT, CA, (415) 968-0198.

WANTED: SX-100 or similar; Heath items - mic for "Sixer", VF-1 & HG-10 VFO, ps HP-13/13A. Will confirm purchase in 24 hours if price is right. Fred Hoofer, WØBMT, 205 E. 4th St., Neligh, NE 68756. (402) 887-5201

WANTED: Signal Tracer; what do you have to fix my boat anchors, (radios). John G. Kummell, 6605 Altamont Ave., Baltimore, MD 21228. (410) 747-2469

FOR SALE: New Collins PJ-068 mic plugs for S-line/KWM-2 - $8 each. Clint Hancock, KM6UJ, 6567 Ashfield Ct., San Jose, CA 95120-4502.

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

FOR SALE: Hammarlund ART deco Super Pro SP-400 w/ps, nice - $275. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331.

FOR SALE: NOS 4CX1000A, tested - $185; Clegg Venus w/ps, near mint - $300. Cory, N2AQS/AFA4TZ, 1000 E. 14th St., Bldg 178, Plano, TX 75074-6249. (214) 751-7535, 24 hours hinec@cegate.dl.nec.com

FOR SALE: Heath fans: Electronic Workshop JR36, model JK1033, in box from the early '70's, needs a collectors home. No offer refused. Tom Mackie, WB2ILA, 14 Washington St., Jamestown, RI 02835. (401) 423-2474

FOR SALE: Heath catalogs 1955, 1956, 1957, 1958; Tektronic 505, 555, 531A, 535, 535A, CA RCA tube manual RC-21 - $10 ea ppd. Brown, CA, (805) 943-2027.

FOR SALE: Hallicrafters SX-42, looks great, untested - $150; Heath Mohawk, working, looks great except 1 small knob wrong & chipped dial drum - $150; military RBM-4 200 kc-2 Mc rcvr, nice, untested - $99; RBM-4 orig. manual - $39 ppd. Don Merz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST weekdays.

TRADE: National R-115 spkr; NC-183D orig. manual; NC-173 orig. manual; 1 pair of SW-3 coils; SCR-274N FT-220A black 3-rcvr rack; military RBZ orig. manual. **WANTED:** TM 11-805 (SCR-197); Jefferson Travis 350A manual; Gonset Communicator IV (6 meters) manual; Gonset Communicator IV (220 MHz) manual; SX-62B manual; matching spkr for National NC-101 or NC-100; BD-77 dyno for BC-191. Don Merz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST weekdays.

FOR SALE: Collins HF RF amp. model 208U-3, 1.6 to 30 MHz, operates on 208 VAC, 60 Hz, 3 PH, very good condx. - $4000, shpg weight, 1200 lbs. Ask for Mike, CA, (619) 588-7817, call or FAX

FOR SALE: RE Collins 515-1 s/n 5879, exc condx., RE spkr, avg - $2000; Collins 75A-4 s/n 4420, exc condx. - $850; Collins spkr - $50; NC-300, good condx w/HB calibrator - $225; Palamor solid state FC-40 freq. counter - $75; Hy gain SWR/pwr meter, (0-500W) - $50; Johnson KW matchbox, exc condx. - $250; Lampkin 105B freq. meter s/n 7286 - $125; KWS-1, exc condx. - $1600. **WANTED:** HRO-60; Viking 500; trade? Mike, W6ILTL, AZ, (520) 749-3575, FAX 749-3536.

TRADE: NC-300 for Heath HX10 Marauder xmtr or HA-20 amp. F.W. Nicholas, AZ, (602) 864-9987.

FOR SALE: Precision generators: E200 signal, E200C signal, E400 sweep - $25 ea or $65/3. + shpg. Henry Mohr, W3NCX, 1005 W. Wyoming St., Allentown, PA 18103.

FOR SALE: HQ180, VGC - $250; HQ129X, restored - $200, both w/manual & matching spkr; Allied SX190 w/manual, exc. - $100, SASE for photos. Ron Hankins, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150

FOR SALE: Hallicrafters HT-37, orig. manual, front clean, cabinet has scratches - $75, + shpg; James Millen scope model 90905, 5" rack mount, front looks like new, chassis dirty, but it works! - $80 + shpg; Panormic Panadaptor model SA-8B, complete w/sply & xfmr, set-up for 500 kc IF (51J-4) - $100, local PU please; Tuner model 211 HI-Z studio mic - $60 shpd; Sonar MR-12 meter rcvr w/spkr & ps - $75 shpd; Signal Corps tube tester model I-177B, looks new - $80 shpd; Echophone EC-1 general coverage rcvr - $60 + shpg; homebrew amp uses a 4-1000A final in a 3' rack on wheels, metered, large variac, needs new plate xfmr, tube tested full output - $350, local PU please; spare RCA 4-1000A, tested full output - $235, shpd; Collins F 455-J 08, 800 cycle CW filter for the 75A-4 - $135 shpd; Cesco Tel-O-Patch, circa 1955, NIB - $35 shpd. **WANTED:** Copy of instruction manual for a Precision Apparatus E-200C signal generator. Steve, NY, (914) 693-3669.

FOR SALE: Geleso xmtr G212-TR w/orig. manual, see ER, Nov '92, pg. 14, untested - $150; B &W model 370 SSB rcvr adapter, untested - $40; Heath HD1416 code oscillator in box - $40; Heath ER-3701 in sealed box - $100. **WANTED:** Prewar HRO's: coils, racks & spkr/coil unit for HRO 50'/60', any condx on above. John Orahood, N5SPQ, 5819 Miller Valley Dr., Houston, TX 77066. (713) 440-5598

FOR SALE: Collins R390A w/meters & covers - $425; 618T (3) HF aircraft xcvr w/mobile mount system, cables, antenna tuner, control head - $800; PP4763A 28 VDC, 50A, ps - $150; AN/USM 207, 550 MHz, counter - $125. All + shpg. David Sipe, KD6QFZ, 9099 Thilow Dr., Sacramento, CA 95826. (916) 361-3960, internet dsipe@calweb.com

FOR SALE: Hallicrafters FPM-200 - BO; National NC-183D - $300; Collins 75A-3 - $300; Eico 720 - $65; Knight VFO - $40; Heath SB-104A, VFO, ps, mint - $350. + shpg. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

FOR SALE: Radio parts, old & new, tubes, galena crystals, etc., very low prices. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: Vintage equipment: Johnson; National; Hallicrafters; Hammarlund; GPR-90; Racal 17C12; Scott; RCA. Ozona Bob, W5IPYT, POB 1105, Ozona, TX 76943. (915) 392-2585

FOR SALE/TRADE: NOS 2E24 tubes; orig. Collins Radio Co. 58B handbook - offers. Eddy Swynar, VE3CUI, 3773 Concession Rd. 3 RR 8, Newcastle, Ont. L1B 1L9. Canada.

FOR SALE: Jane's Military Communications Handbook; Collins 390, 390A, 391 manuals/blueprints. **WANTED:** Theremin Fisher Spacexpander reverb; tube CB's. Charles, N1FRX, ME, (207) 834-6273.

FOR SALE: Collins 75A-4, exc - $575; 312B-4 (R), exc - $225; CP-1 - $150; Drake T4XB - $140; T4XC - $165; SL-500 - $45. Bill, WA1APX/8, MI, (810) 781-9717, phone/Fax

FOR SALE: Restorable 500W AM xmtr, circa 1945 w/6 ft. cabinet - $300. Chris Horne, AC4RM, 110 Kimberley Dr., Greenville, NC 27858. (919) 756-6067

FOR SALE: Heath AM-2 SWR meter - $30; Heath SB-10 - $75; TX-1-RX-1 case - $40; DX-100 - $125; TX-1 xfmrs - $30 ea; tube data books - $5 ea; Hammarlund HX-500 manuals - $15 ea. Marty, WB2FOU, NJ, (609) 466-4519.

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

FOR SALE: QST, CQ & 73 collections (sell as sets, prefer PU); 2B/2BQ - $150; SX-28 w/spkr - $200 PU; HT-37, nice - $225 PU. Joe Eide, KB9R, 2623 Clare St., Eau Claire, WI 54703-1002. (715) 834-4582

FOR SALE: Heath Ham Radio Collector Guide - $22. Marty Drift, WB2FOU, POB 21, Blawenburg, NJ 08504.

FOR SALE: Collins 75S-3 rcvr, exc condx - $300; Collins KWM-380, exc condx, all mods w/options - $2400. **WANTED:** ElectroVoice 636 slimair mic. Ron, GA, (770) 664-6931

FOR SALE: R392 & T195 xmtr, manuals, exc - $360 both, or $225 ea. Vin, WN1S, 506 Metacom Ave, Bristol, RI 02809-5145.

FOR SALE: Collins 62S-1, exc condx - $1950; KWM2, MP-1, 516F2 & mobile mount - $800; 312B-4 - $150; 30L-1 - $550. Larry, IL, (708) 658-7328.

FOR SALE: Variac 8.5A, 110V - $25; mod xfmr CVM-1 - $40. Joe, NM1V, MA, (508) 658-6186.

FOR SALE: Collins 75A-4, serial 4107, 3 filters, matching spkr, no shipping. Jon, K0DTA, MN, (612) 881-9037.

FOR SALE: Collins 20V-2 commerical 1000W xmtr. Bob, K2LGO, NY, (516) 722-5737 before 9PM EST

WANTED: Very early Hallicrafters and Hallicrafters/Silver Marshall equipment including Skyriders with entire front panel dull aluminum color, S-30 radio compass, S-33 Skytrainer, S-35 panadaptor, wood console speakers - R-8 & R-12, HT-2, HT-3, BC-939 antenna tuner, parts, advertising signs, paper memorabilia of Hallicrafters. Also want RCA model AVR-11 airport tower receiver. Chuck Dachis, WD5EOG, "The Hallicrafters Collector", 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

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

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

WANTED: For Johnson Challenger - the pwr xfmr, 550V @275 mA, 6.3V @5A, 5V@3A, & manual. W3BPZ, 1039 N. 21st St., Allentown, PA 18104. (610) 437-1608

WANTED: R390A parts - two 16 kHz & one 2 kHz mech filters, one Z503 AGC coil. Mike Bohn, KG7TR, 903 N. Shannon Cir., Mesa, AZ 85205. (602) 981-3781

WANTED: BC 923 rcvr & manual; ARC 5 R 28 rcvr; BC 639 rcvr; new BC 603 or BC 683. Frank Moorman, POB 3423, S. Padre, TX 78597. (210) 761-7454

WANTED: 1980 ARRL Handbook; E.F. Johnson 100D70, 100DD90 capacitors. Martin Piepenburg, W9OLD, RR1 Box 56B, Monterey, IN 46960. (219) 542-2591

WANTED: Technical correspondence getting Collins URG-1 system running. Have 310V-1, 548L-4A, 490T-3, 914H-1 remote for trade. Need 671B-1 rack, 618Z-4, 789X-1 units. Have many manuals. Byron, WA5THJ, 1215 Fresa, Pasadena, TX 77502. (713) 941-3631

WANTED: Swan Mark II amp w/or w/out tubes; Drake W4 wattmeter. Bill smitherman, KD4AF, 9301 Hwy 67, E. Bend, NC 27018. (910) 699-8699

WANTED: Always collecting WW II vintage radar sets; tube-type television cameras. Allan H. Weiner, 97 High St., Kennebuck, ME 04043. (207) 985-7547

WANTED: Gates SA 39A/B, Sta-level, Level-devil, etc. Langevin Progar, any Langevin, Siemans, Klangfilm audio or broadcast gear, any condx. Richard P. Robinson, POB 5055, Woodbridge, CT 06525. (203) 397-5420, FAX (203) 294-1745.

WANTED: Globe HG-602, HG-303; Hallicrafters SR-46A; schematic Eico 585 battery tester. Al Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Collecting early Heath gear 1940's - 1950'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: Magazines: pre 1936 'Radio', pre 1934 'R/9'. Have some duplicate 'Radio' for trade. Wayne, NØTE, 1212 17th Rd. NW, New Strawn, KS 66839. (316) 364-5353

WANTED: BC-611 and/or parts & accessories. Andy, WA4KCY, 105 Sweet Bay Ln., Carrollton, GA 30116-8519.

WANTED: S-76 & Ranger in good to VG condx & working; info on Gonset 20M Bow Tie beam. Bill Bowes, N7MOB, WA, (206) 839-8591.

WANTED: 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: Manuals for TS-452 E/U signal generator; Boonton Electronics 91H RF voltmeter. Pete Hamersma, WB2JWO, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Documentation & sales literature for Philips PM 3262 or any 3200 series oscilloscopes. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

WANTED: Military TS-164/AR manual; RBH-2 manual; Electrocom FSC-250 manual; BC-191 accessories, BC-306A, FT-142; BC-309, BD-77, FT-107; Navy Bureau of Ships WW II Radio & Sound Bulletins. Don Merz, N3RHT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819 EST weekdays.

WANTED: Manual/schematic Collins T-730/TRC-75 xmtr (amplifier?). John Bipes, KØYQX, 906 Adams St., Mankato, MN 56001. (507) 345-7169, (d), 387-3840 (n)

WANTED: Military/civilian spark-gap xmtr/rcvr; Fleming valve; Baird scanning-disk "Televisor". Jim Chisman, POB 1111, Clemson, SC 29633. (803) 639-2939

WANTED: Manual copies for Sprague TO-6A capacitor checker & Dynaco FM-1 tuner. Alan Johnson, N4LUS, 2490 Sharon Way, Reno, NV 89509. (702) 826-8167

WANTED: Drake 2B rcvr & 2BQ. Jerry Boles, N5KYE, 14857 Redbud Ln., Piedmont, OK 73078. (405) 373-2228

WANTED: National Co. catalogs, brochures, & manuals (military, government or consumer) from any era. Wayne Childress, KC7KUE, 1903 Jerome Pl. #3, Helena, MT 59601. (406) 443-7255

WANTED: Barker & Williamson LPA-1 linear w/ps & input matching units; Gonset 913 6M linear. K8GHL, OH, (614) 998-4140.

FOR SALE: Heath low freq. coils & paperwork for GD-1 - $25; Hickock cards (for Card-o-matic tube tester, complete set - $75; Collins 75A-4 & 32V-1 - $650; R-392 w/LS-166 spkr & pwr connector -$225; HB xmtr in 6' rack, pr. 810's modulated by 805's, Millen exciter 90800, Millen 90281 pwr sply & 90711 VFO - $500; C.E. kit to modify BC-458 as VFO, includes 10 meters - $50. George Rancort, K1ANX, MA, (413) 527-4304

FOR SALE: R1051G, checked - $600. Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457-1312. (804) 721-7129, FAX 426-6454

FOR SALE: Navy HF ECM radio, R1451/WLR6, 500 Khz to 32 Mhz continuous coverage, 120V/60Hz pwr, can be used on 12VDC, 1 uV sensitivity, 1-16 Khz selectivity, small nixie display, AM/USB/LSB/CW and either FM or ISB. Rugged submarine construction, 6x9x12, checked - $300. Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457-1312. (804) 721-7129, FAX 426-6454

FOR SALE: Atlas 350XL, DD, (2) VFOs, 350XL pwr sply, VG+ - $450. **WANTED:** Junker CX-7A, manual, filter. KO6IJ, CA, (714) 643-7930

Please remember to count the words in your ad. If you are over 20 words, please send 20 cents for each extra word.

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

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

FOR SALE: Heathkit, RCA, Regency, parts, manuals, much more. SASE for list. John Hruza, KB0OKU, 2521 S. Holly St., Denver, CO 80222. (303) 758-4377

FOR SALE: Collins service: A-Line, S-Line & 380. Central & E. Coast locations. Cory, N2AQS/AFA4TZ, 1000 E. 14th St., Bldg. 178, Plano, TX 75074-6249. (214) 751-7535 (24 hrs) hinec@ccgate.dl.nec.com

FOR SALE: 4-1000 socket & tube. **WANTED:** Book or schematic for Scott Marine Radio, SLMR. Bob Kerby, POB 991, Waynesboro, VA 22980. (540) 942-4356

FOR SALE: HQ-180-AC; KWM-2A/PM-2 (WE); Valiant; Ranger; T-368-F; Globe Chief Deluxe; Drake 2A/2AQ; Central 100-V; Heath SB-10. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/FAX 313-454-1890

FOR SALE: KAAR Engr KE-23A (c. 1945) 0.5-42 MHz, 9-tube rcvr w/manual - $135; Nat'l HFS, fair - $60. John Hurst, KV6X, CA, (909) 981-6759.

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: McIntosh and Thordarson amplifiers any condx. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. (414) 297-9310

WANTED: Benton Harbor lunch boxes & related items. I'll pay shpg. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752. (717) 547-2674

WANTED: Help Vibroplex build its Company collection of Vibroplex bugs, keys and memorabilia. Call Mitch, WA4OSR, at The Vibroplex Co., (800) 478-8873

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard, KD6CPE, POB 992, El Toro, CA 92630-0992. (714) 855-4689

WANTED: Collecting: Pre-1950 commercially built amateur gear; xmtrs, rcvrs & accessories. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

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

WANTED: TMC GPR-92 HF Rcvr. Hank, W6SKC. (602) 281-1681 FAX: 281-1684

WANTED: Cabinet for a Collins 32V-2. Mark Rauber, POB 1077, Minden, NV 89423. (702) 782-3596

WANTED: GPT750; solid state ps modules from T195B xmtr's; T368 mod xfmr & PA RF choke. Freeman, POB 1773, Pinehurst, NC 28374. (910) 215-0599

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: Interesting Navy stuff, xmtrs, rcvrs, radar, etc. Bigger is better! Surprise me! William Donzelli, 304 S. Chester, Park Ridge, IL 60068. (708) 825-2630 integrat@usr.com

WANTED: Plastic dial escutcheon for RCA 816K; Hallicrafters SX-11 dial plate; National SW-3, model 1, versions 6 & 2 volt; RCA communications rcvr's model 60, 111, & 175; Collins 310B xmtr; James Millen, 90711 VFO, 90801 exciter & pwr sply's. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: Circular dial for Heath SB310, part #100-449. Jim, MO, (816) 524-1541

WANTED: Top dollar for ARC-5 control boxes C-26, C-29, C-42, C-43; any Command Set shock mount or racks; manual for Lampkin 205A deviation meter. Tom Horsfall, WA6OPE, 1862 Tulare Ave., Richmond, CA 94805. (510) 237-9535

WANTED: WW II Japanese military radios of any kind. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, Japan. FAX: 011-8145-301-8069

WANTED: Meissner Traffic master, Traffic Scout, Communications Rcvr, circa 1936-40 kits, any condx. Bruce C.E. Russell, VE7HH, Canada, (604) 299-1116, collect.

WANTED: Mics-EV605, 619, 638, 641, 719; Shure 707A, 440, 545; Turner BX, CX, VT-73, working or not. Send your list of others for sale. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. FAX 328-4217

WANTED: Surplus conversion manual #3 (blue one); 1939 ARRL Handbook; ARC R-23/BC-453 rcvr; ARC T-17, 1.3-2.1 mc xmtr. Wayne Letourneau, WB0CTE, Box 62, Wannaska, MN 56761. (218) 425-7826

WANTED: Schematic service manual Raytheon Navimatic RDF rcvr; Squires Sanders SSIBS. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: Manual or circuit diagram of a James Millen modulator mod 90831, exciter 90811, pwr sply 90281. Fenton Wood, 109 Shoreline Dr. SH, Malakoff, TX 75148.

WANTED: Collins 302C-1 wattmeter; 353C-60 mech filter adapter for 75A-1; 2B calibrator; RCA AR-88S-meter. Thanks! Joe Eide, KB9R, 2623 Clare St., Eau Claire, WI 54703-1002. (715) 834-4582

WANTED: LF osc unit 0-17/ART-13A for ART-13; XCU-303 crystal calibrator for NC-303 rcvr. Al Kaiser, W2ZVR, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

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: 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: Data on Stancor 55CA328 mod xfmr, 2-STC-45 stamped on end bell, 300-400W. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

WANTED: Paying immediate cash for old Fender and VOX guitar amplifiers. Frank Czaja, AF9T, 8968 W. Forest Home #4, Greenfield, WI 53228

WANTED: WW II Japanese xmtrs & rcvrs (and parts) for restoration and ER articles, information on T1083 30's vintage British aircraft xmtr. Ken Lakin, KD6B, POB 310, 701 SE Salmon Ave., Redmond, OR 97756. (503) 923-1013, e-mail klakin@aol.com

WANTED: Parts radio for SBE-33 & Heath Mohican. Don Morris, N6IDY, (818) 368-7374

WANTED: Info on Nemst Clarke type D306A special purpose rcvr, tunes 30-260 MHz. Walt Michener, 150 Orion, Golden, CO 80401. (303) 279-5494

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

WANTED: RME45 or 45B, preferably cosmetically OK. Richard N. Pann, 2447 Yates Dr., Augusta, GA 30906.

WANTED: Desire local ham to handle sales, through ER, on percentage, misc. radio parts, tube audio amps, Heath kit and other test equipment, Tektronix 543 B oscilloscope, meters, tubes, etc. No xmtr equipment. Telephone conversations are difficult for me. Write: G.M. Stockwell, 1411 Memorial Dr. SE, Cedar Rapids, IA 52403.

WANTED: NC-183D tuning capacitor cover plate & filter choke; Heath AR-1 schematic. Doug Jorgensen, K9PFA, 601 N. Main, Mt. Pleasant, IA 52641. (319) 385-6330

WANTED: HELP, I need the following tubes to get my BC-610 on the air, 1 to 4 ea 100TH tubes, 1 to 2 ea 250TH tubes, 1 to 2 ea 2A3 tubes. Joe, AB5LL, AR, (501) 257-2567, call collect if you wish.

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

FOR SALE: Collins S-line lined deerskin covers w/logo, other brands considered; also custom work to your specs. Eagle Flight Leathers, 1007 Bay View, Round Lake Beach, IL 60073. (708) 740-2120

FOR SALE: Homebrewers, custom chassis & panel fabrication, 15 years prototype tech experience, vacuum tube literate. Brian, KA9EGW, IL, (708) 487-5359/FAX 487-5424.

FOR SALE: E.F. Johnson matchbox 250-23-3 w/ 250-37 coupler, exc condx - $100 + shpg. Harry Blesy, N9CQX, 95740 Clarendon Hills Rd, Hinsdale, IL 60521. (708) 789-1793

FOR SALE: Globe King 400 w/two set of coils, PU only - $425. Jim Roseman, W9UD, 2716 W. 3rd St., Coal Valley, IL 61240. (309) 799-7447

FOR SALE: SX-42, good condx - $180; FRR-59A - $350; RFF-59B - $350; APR-4 - $80. Will consider trades for military rcvr. **WANTED:** Manual for RBA, RBB, RBC; pwr sply & pwr sply connector for RBA. John Richardson, 1163 Highland Pl., Dubuque, IA 52001. (319) 556-5504

FOR SALE: Collins 180S-1 (WE), VG - $145 + UPS. **WANTED:** Various knobs for R388, SR400, Valiant II. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

FOR SALE: Tubetester's, Eico 635, Superior TV-11, both exc - $40 ea; Hallicrafters S-108, w/manual, exc - $80. Burt Osby, 2424 F-30, Mikado, MI 48745. (517) 736-8020

FOR SALE/TRADE: SX101, SX101A, HT32, HT37, S-38, S-120, RME45, spkr, conv. **WANTED:** Ten-Tec? Ray, MO, (314) 428-1963.

FOR SALE: Two modified BC-348's - $90 & $75. Ken Kolthoff, K8AXH, 5753 David Pl., Fairfield, OH 45014. (513) 858-2161

FOR SALE: National NCX-1000, factory incomplete unit, w/meter, hardware, RF components, etc. - $75 shpd. George, K1ANX, MA, (413) 527-4304.

FOR SALE: Repair of TV-7 tube testers w/ calibration: I will fix & then verify calibration of your TV-7 tube tester for $45 + all shpg or return at no charge. Daniel Nelson, 1025 E. Desert Ln., Phoenix, AZ 85040. (602) 243-7421 eves. djn@indirect.com

FOR SALE: New guide for old xmtr's, 1922 to 1970, includes xmtr's, xcvr's, linears & more. 146 pages, including 4 great indexes, in which you can look up by model, make, year or final tube type. 500 pictures, 105 manufacturers. "Tube Type Transmitter Guide" - $17.95, including postage, add $2 for Canada, other countries add proper air postage. (21 ounces) Calif. residents add tax. Sound Values, POB 9, Auburn, CA 95604.

FOR SALE: HM-102 Heath wattmeter - $40; FC102 ant. tuner - $200. **WANTED:** Hammarlund rcvr: HQ120, HQ129X & HQ88. Bob Braeger, WA6KER, 6634 Navel Ct., Riverside, CA 92506. (909) 682-5084

FOR SALE: Collins S-line clones - Eldico S-119 complete w/T-102, R-114, ps, P-109, CU M-135, near mint, factory fresh but tested, w/manuals - $800 + UPS. Pete, WOEWQ, PA, (215) 898-1787 (d), 849-5830 (n).

FOR SALE: Hallicrafter manuals. Most photocopies - $5 + $1 shpg; Johnson, Heath, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Hammarlund SP-210-LX, pwr sply, has switch added to panel, plays good - $120 UPU; HyGain 153BA 3 element, 10, 12 or 15 meters - $150, prefer PU; National NC98, VG - $120; Hallicrafters S86, plays, top & sides repainted - $70. +shpg. Eugene Rippen, WB6SZS, 105 Donnington, Auburn, CA 95603. (916) 885-6147

FOR SALE: Tubes: (several available of most) used tubes: 2A3 - $22; 872A - $18; UV872 - $15; 808 - $20; 6L6 - $5; OA4 - $5; 6HF5 - $5; 807 - $4; 4C21 - $20; 715B - $25; 813 - $12; 12DQ6 - $2.25. New tubes: Eimac 7034/4X150A - $85; 3B24 - $6; Western Electric 5D21 - $18; new 6K7, 6SQ7, 6SJ7's - $2.50. Minimum $10, + $3 shpg, US. Eugene Rippen, WB6SZS, 105 Donnington, Auburn, CA 95603. (916) 885-6147

FOR SALE: B&W 5100B, exc - $375; SX101 MK3, VGC - $225; Realistic DX150, exc - $75; Globe Scout Deluxe, VGC - $100; AF68A xmtr, PMR8 rcvr, AC/DC sply, VGC - $225; Millen transmatch, 2 KW, exc - $250; many others, request list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (201) 728-2454

FOR SALE: Manuals, Collins 204-H1, AN/URT-18, 204F1, R-391/URR, TM-11-481 electronic comp systems, TM-11-264B AN/GRC-260, TM-11-809-10, T368/URT, all quality reproductions - $10 ea. Pete, WØEWQ, PA, (215) 898-1787 (d), 849-5830 (n).

Repair & refurbishment of older tube-type amateur equipment. Fully FCC licensed; 35 years experience. Chuck Banta, N6FX, Claremont, Calif. (LA area) (909) 593-1861

FOR SALE: Used tube list, good selection and quality, SASE. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: R-390A carrier meters, NIB - $30. **WANTED:** SX-96; HRO-50T1 w/coils & spkr; knobs for HRO-5.Clark, WØBT, KS, (913) 235-2721.

FOR SALE: Drake Hi-Patch phone patch w/ manual & cables, like new - $40, shpd. R.J. Moraine, N5UX, 3700 Cliffwood Dr., Bedford, TX 76021. (817) 281-1128

FOR SALE: Hallicrafters SX-110 w/spkr - $100; National HRO-7 w/4 coils, ps - $150; Heath SB-630 station console - $40; ask about BC-779, (SP-200). Joe, NY5Z, UT, (801) 393-6840 after 5 PM MST.

FOR SALE: AT OA 4514/GR-12 5 KW+ antenna tune, works but missing some cabinet panels - $100 + UPS (heavy); Panalyzor SB-3 panadapter - $35 + UPS; Empire noise & field intensity meter w/3 TU's, 1.5-30 MHz, 65-200 MHz, 700-1000 MHz - $150 + UPS; Johnson KW Matchbox, w/VSWR - $150 + UPS. Pete, WØEWQ, PA, (215) 898-1787 (d), 849-5830 (n).

FOR SALE: RF generators: NIB Heath IG-1275, LIN/LOG sweep, 3 Hz-3 MHz, partially assembled - $89; HP606A 50 kHz-65 MHz, manual - $95; HP8614A 800-2400 MHz, manual - $245; RCA WR-99 19-260 MHz - $38; TV7D/U tube tester - $100; VTVM's: RCA WV-98C, manual, HV probe - $48; HP400L, manual - $25; HP412A - $25; Fluke 8375A 5-1/2 digit DMM - $25; Heath ET-3400A microprocessor trainer - $78; Millen 90651 grid dip meter - $98. More, list-LSASE. Kirk Ellis, KK4YP, 203 Edgebrook Dr., Pikeville, NC 27863. (919) 242-6000, eves

FOR SALE: "Teletype" T-shirts. The Teletype Corporation's "T" symbol in black on a yellow (what else?) Hanes shirt - $15 ppd. Sizes L or XL only. Jack, WA2HWI, NJ (201) 927-7784.

FOR SALE: (2) Navy MAR scvr's, CRV-50248 modulator-dynamotor, CLG-20379 AC/DC pwr sply, cables & covers, very heavy - $100 ea; type CME 50055 Navy Speech amplifier (bitch box w/ hand set) P-P 2A3 output - $75. Earl Russell, WR1Y, 98 Skyfields Dr, Groton, MA 01450. (508) 448-5822

FOR SALE: Collins 51J4. **WANTED:** Viking VFO; manuals - Valiant II, Heath TC-3; 50A1 tube. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383.

WANTED: Any condition, Hallicrafters S-35 panoramic adaptor and S-33 Sky Trainer as shown. Chuck Dachis, 'The Hallicrafter Collector', 4500 Russell Dr., Austin, Texas 78745. (512) 443-5027

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: PRC47 LSB/USB kit - $40; new machined coax antenna panel - $9. All restorable. Jay Craswell, WB0VNE, 321 West 4th St., Jordan, MN 55352-1313. (612) 492-3913.

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: SX-110, exc - $125. **WANTED:** Junker SX-62 w/dial glass intact. Ed Sauer, KC9SP, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483.

FOR SALE: Nat'l SRR19 all tube, mfg for Bushps 1960s, 0-350 Hz, AM/CW/SSB, 130 lbs, super sensitive precision w/5 metered circuits, gov't cost 14K, very scarce, listen to submarines other VLF signals, 7 units @$425 ea + truck frt 200 lbs. Ed Browder, KB0LTC, Box 271834, Ft. Collins, CO 80527. (970) 484-2764 ,X318.

FOR SALE/TRADE: SX25/28/42/43, S40A, National 1-10. **WANTED:** NC100X, 30's Skyriders; RCA ACR111; AR/CR88. Jim, WL7CMQ, 201 Seward, Juneau, AK 99801. (907) 586-3223, 10-6 PST.

FOR SALE: Gibson Girl xmtr - $75; ARC-R-23 rcvr 190-550 kc - $30; BC-458A xmtr - $30; PRC-47 - $125. Barry Fairwood, 371 Woodford Ave, Apt 28, Plainville, CT 06062.

FOR SALE: Very nice RME converter or preselecter (I do not know which) dial says HF 10-20, for cash or exchange for a pair of Hallicrafters SX-28 style main tuning knobs. Joe, AB5LL, AR, (501) 257-2567.

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

FOR SALE: Radio tubes; repair and restoration of all vintage amateur and commercial radios, 25 years experience. Herbert Stark, 321 N. Thompson St., Hemet, CA 92543. (909) 658-3444.

FOR SALE: Ameco TX-62 6 & 2 meter xmtr w/ matching VFO - $75 + shpg. Will consider trade. John, WB9OVV, IL, (708) 964-3020.

FOR SALE: R-390A manual set (repro), 400 pgs, spiral bound - $58, limited quantity, call first. **Message:** SP-600-JX-17 & R-648/ARR-41 handbooks are sold out. **WANTED:** Amperite #11-20 (2-pin) ballast tube. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (520) 624-8029.

FOR SALE: Heath Apache TX1, exc working & cosmetic condx - $180 U-shp. Warren Davis, AB4GE, Rt1 Box 671-12, Macclenny, FL 32063. (904) 259-5446, after 6 PM, east.

FOR SALE: Heath AT1, VG, Collins style knobs & orig. meter - taking offers; Polycomm 6, fair - $50; Johnson 6N2, VG - $100; Heath HW12, like new - $120; Heath Mohican, VG - $90. All units U-shp. **WANTED:** Globe Scout 680, VGC; Heath AR3. Trades considered. Don, K9TWO, IN, (317) 788-7810.

FOR SALE: NC300 - $195; National 6, 2, 1-1/4 converter unit - $55; HQ170A - $160; Drake 2-NT - $75; Jerold field strength meter 704B - $35; Ameco TX86 - $55; Marconi universal bridge TF2700 - $35; National 2 meter converter - $25. Ron, K1VYU, 179 Malabar Dr., Westbrook, CT 06498. (203) 399-5634, after 7 PM EST.

FOR SALE: NOS 3B28 - $15; 4CX250B - $45; 841 - $15; 6BN8 - $4.50. List SASE. Joseph Pinner, KC5IJD, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766. josephwp@aol.com

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

FOR SALE: Fan bracket for KWM-2/325-? lowers the internal temp 20° C using two 60mm micro-mover fans (ER#71). Drop-in, no mods - $15; replica Ocean Hopper front panel - $20. All ppd. DWI Engineering, POB 3611, Costa Mesa, CA 92628-3611.

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: ARRL Handbook 1945 (back taped) - $10; QST 1955, 1956 - $10/yr; CQ 1950 - $15; WRL catalogs, old callbooks, etc., LSASE list. Patrick Marineau, K9HF, 5055 1/2 Lakewood Ave., St. Louis, MO 63123.

FOR SALE: HW16/HG10; Globe Scout 680-A; NC183; Thunderbolt amp. Joe, K2QPR, FL, (407) 220-7362, anytime.

FOR SALE: Globe 400B appears complete - $350 UPU; Heathkits, complete & VG appearance; Apache - $150, UPU; Marauder - $125 UPU; three piece set DX60B/HR10B/HG10B & coax switch - $140; Hickock 533 tube tester, VG - $45. Shpg extra. Eugene Rippen, WB6SZS, 105 Donnington, Auburn, CA 95603. (916) 885-6147

FOR SALE or TRADE: SX111, Elmac PMR6A, Antique Radio & 73 magazines. Les Mathews, 8908 Tar Hill Ln., Orlando, FL 32836.

FOR SALE: Drake 2C - $50. **WANTED:** F coil for HRO7; RME79; 14.8 xtal for 75S3; Hammarlund SPC10 or HC10. Doug, WA, (206) 472-3478.

FOR SALE: Knight R100A - $95; complete set bound Ham Radios - $300; Hammarlund S200 - $80. George Huston, AA0WP, 515 17th St. SW, Rochester, MN 55902. (507) 288-0242

FOR SALE: Hammarlund HQ-170AC, w/manual, very nice - $200 +UPS. Jim Davey, WA8NLC, 4664 Jefferson Twp. Pl., Marietta, GA 30066. (770) 998-6971

FREE: Need antique radio/transmitter parts, tubes, schematics, repairs? For flyer send 2-stamp LSASE to Olde Tyme Radio Co., 2445 Lyttonsville Rd., Site 317, Silver Springs, MD 20910. Phone/Fax (301) 587-5280

FOR SALE: Tons of parts for homebrewing, too much to list. Send your list w/SASE. Chuck, WØIUH, 9917 Irving Ave. S, Bloomington, MN 55431.

FOR SALE: Collins manuals: mechanical filter plug-in adapter; mechanical filter bulletin 209, 210, 200; HF 80 exciters, rcvr's & controls; HF 80 solid state 1 KW pwr amp-pwr sply; HF 8050 rcvr; HF 8054 rcvr part 1 & 2; HF 2050 rcvr; GRC-153 antenna; 651S-1 bulletins; 651S-1 freq. control cards; 671U-11 rcvr-exciter; amateur single SSB; HF 9000 HF comm. system; SSB xcvr 618-1, -2, -3; other paper work & manuals. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: Datong FL-3 multi-mode audio filter, as new - $165; Collins replacement feet for S-line, etc, cannot over torque or pull through - $1.50 ea; Collins cabinet front leg elevators, aluminum (no plastic) - $7 ea; Mallory electrolytic 40-40-40 MFD, 250-250-250 VDC for all 75S Collins rcvr's, direct replacements - $25; RCA 813, never used - $25 ea; FAA type Crouse-Hinds tower, clearance lamp - $25; Collins 516E-2 pwr sply, perfect - $135. Ed, W3WDF, 8245 Garden Oaks Dr., San Antonio, TX 78266. (210) 651-9348

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: Collins 30L1 project, needs metal covers, meter - $150; Army BC-973-B RDF - $325; HP test gear, send for list. Fred Honnold, W6YKM, 17890 Sharon Ct., Pine Grove, CA 95665. (209) 296-5990

FOR SALE: Audio trans, Rauland-Lyric, type R-500 in good condx. - $15 + $3 shpg; 2 instock, GE model UV712, rebuilt w/Stancor A53C winding - $20 + $3 shpg; Federal 22 6W, rebuilt w/Stancor A53C winding - $20 + $3 shpg; watch case meters, 50V, 40A, some rust - $5; Tiffany Mfg. Co. 50 VDC, no rust - $7.50, 35 amperes, no rust - $7.50; Precision Mohawk voltammeter 50-50, very nice - $10; Motor Car Supply Co., 30 amperes, some rust - $7.50; good orig. box, type 21, reads 8V, 30A, near mint condx - $25; poor orig. box, Sterling, paf'd 1916, no rust, 50V - $17.50. Include $2 ea shpg. James Fred, RR1, Cutler, IN 46920. (317) 268-2214

FOR SALE: ART-13 xmtr's; Hallicrafters S38C poor, WR600, fair. Looking for good S-53A, IIT-17, IIT-18. Sandy, W5TVW, LA, (504) 836-2134.

FOR SALE: Book, reference data for radio engineers, ITT, 5th edition, 1969 - $35 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE/TRADE: SX16; NC190; HQ170; NC240C, rack; HRO5R w/mods; SX140; NC240D w/matching spkr. Prefer PU. **WANTED:** Pre-war National items, especially FB7, SW-3, AGS coils - cash or trade. Larry, CA, (310) 860-3131.

FOR SALE: C-2172/GRC-14 control box - $15; Drake QXer, 1-tube, good - $12.50; Heath GD-1A dip meter, no coils - $15; asst. xtals, FT-171B, FT-243, et.al. - $1.50 & up; No.19 MK II mike & headphone rig - $20; asst. small pwr xfmr - $10 & up; Shure, Johnson, Regency desk mic's - $10 ea; BC-454/ARC-5, 3-6 Mc Rx, unaltered - $20; Midland 13-520 2M HT w/manual, condx unk - $15; Zenith 5L41 battery BCB - $35; 3,000+ mostly receiving tubes, checked & guaranteed - $2 & up; Heath TC-2 emissions checker, w/all papers - $50; Knight-kit R-100 rcvr, needs TLC - $40. All items postpaid. Eric Jones, AL, (205) 764-0675.

FOR SALE: Gonset super 6 & Gonset 3 band converter - $15 for pair; QST on microfilm 1915-1991 w/fish reader - $180; Hallicrafter SX-73, R-274/FRR manuals, 100 pgs, NOS - $13 w/postage. Dan Mason, R.RT1 Box 204F, Santa Fe, NM 87501. (505) 455-3416

FOR SALE: Drake 2NT xmtr 2C, 2CQ w/noise blanker, calib., orig. books all mint. Dusty Rhodes, 1324 N. Dorset Rd., Troy, OH 45373. (513) 339-1546

FOR SALE: DX-100, DX-100B, Johnson Pacemaker, Drake TR-4 & sply, NB R-390A, HQ-140XA. Gary, POB 310783, Newington, CT 06131. (203) 665-6056

WANTED: Heathkit, Eico, Fisher, Dynaco or similar tube audio amplifier in any condx. Mike Nowlen, WB4UKB, POB 1941, Herndon, VA 22070. (703) 716-1363

WANTED: Western Electric pre 1940; RCA AVR5 Tombstone; Navy GP6; Telephonics RS76 throat mic. James Treherne, 11909 Chapel Rd., Clifton, VA 22024. (703) 830-6272

WANTED: Johnson Desk Kilowatt; Collins 55G-1; 62S-1; TMC GPT-10K; GPR-92. Hank, WD5JFR, (800) 364-4265.

WANTED: Johnson T/R switch; Johnson Viking 6N2 VFO. Ed, N5BFW, TX, (210) 684-9754, eves or hve msg.

WANTED: Western Electric 9A xmtr; 1A tuning unit; 2A pwr rectifier; 251A tube; manuals. James Treherne, 11909 Chapel Rd., Clifton, VA 22024. (703) 830-6272

WANTED: Hallicrafter HT-1, HT-4 and HT-9 series xmtr's; any James Millen modules/components. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439. e-mail: ken.seymour@attws.com

WANTED: Navy speech amplifier units: 50055, 50064 & 50254; modulator units: CRV-50193 & CAY-50065 for TBL, TBK & TBM xmtr's, any condx. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: SX-42; SP400; EH Scott rcvr; only in very good condx. Jose Cangas, EA4JL. Contact in States Kurt Keller, CT, (203) 431-6850.

WANTED: For the SCR-522, two plugs designated PL-169 (12 pin); crystal calibrator accessory for National NCX-5. Skipp Tullen, K2PXQ, NJ, (201) 539-8120.

WANTED: Heath SB620 Scanalyzer wired for 455 kHz IF. Art Delibert, MD, (302) 270-6775, eves.

WANTED: Collins S-line in nice condx w/CW filter. George, KG6GA, VA, (703) 757-2810.

WANTED: 8005, 6550 tubes, new or used; Ampex 350 deck. George Schwarz, 18504 Arrowhead, Cleveland, OH 44119. (216) 486-6489

WANTED: Meters for RT-834/GRC-106, AM-3349/GRC-106 & MD-522A/GRC, part of AN/GRC-142-C Hut. Edward J. White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121. (302) 322-1313

WANTED: In nice & operating condx, RCA Channelyst, BC669 rcvr/xmtr w/AC sply; 60 micro AFS DC for 1-1/2" mount hole. Mike McDermott, WØBVA, Box 121, Scammon, KS 66773. (316) 479-2756

WANTED: 1950 ARRL Handbook; Cinch S-404-CCT connector; Millen GDO coils 46702, 46704, 46706. Lynn Stolz, N8AJ, 2461 Bean Oller Rd., Delware, OH 43015. (614) 369-9777.

WANTED: Photographer is looking for collections of American ham gear made between 1930 & 1980 to illustrate book. I will travel to your location. Joe Veras, N4QB, POB 1041, Birmingham, AL 35201. (205) 328-2661 (d), 967-0639 eves & wknds

WANTED: Hammarlund HQ-180A or C; HQ-180AX in exc condx. David S. Richards, WB8RAV, 334 N. Magnolia St., Lansing, MI 48912. (517) 482-8484 after 7 PM.

WANTED: Back issues of ER; manual for Drake W-4 wattmeter. Dave, KF8ID, 41537 Sunnydale, Northville, MI 48167. (313) 420-2612

WANTED: SX-28, VGC, compensate handsomely for collector quality. Christopher Pezzutti, N8FWY, 11866 Kennington, Pickerington, OH 43147. (614) 292-6990

WANTED: TMC SBE-2; TMC VOX-5; TMC model PMO; SBE-2 can be non-working. Bill Marvin, KA2VJV, 2 Venice Rd., Patterson, NY 12563. (914) 279-5035

WANTED: Heath KS-1 kilowatt pwr sply for a KL-1 Chippewa amplifier. Bill Gross, WB6WCW, 106 Verona Ave., Goleta, CA 93117. (805) 968-4227

WANTED: Info on winding small modulation xfmr's from vertical output xfmr's, gap sizes, etc. Dave Dameron, KG6BP, CA, (310) 318-5311.

WANTED: Globe Scout 65A or B; Oceanhopper plug-in coils. Norm Hegyi, KG9D, 9200 Henry St., Dyer, IN 46311. (219) 365-4089.

WANTED: Coils & dial scale E & F for the National HRO-60. Please help, will pay your price. Richard J. LaMark, N2TXL, 6822 Tuckahoe Rd., Williamson, NY 14589-9589. (315) 589-2552

WANTED: PL-172 xmt'g tube for Hallicrafters HT-33 amp. Joseph Falcone, AA8HV, 3000 Town Center, Ste 2370, Southfield, MI 48075. (810) 357-6610

WANTED: Hammarlund Pro-310 & 1 or 2 tube xmtr, condx not important. Colin Lamb, K7FM, 29830 NE Mt. Top Rd., Newberg, OR 97132. (503) 538-4301

WANTED: Instruction manual or copy for RCA WR-39-C calibrator. Ken, 2309 N 51st, Waco, TX 76710. (817) 772-7307

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

WANTED: Service manual for Navy rcvr; AN/WRR-2 not (A). Joe Erickson, N8PMF, 8880 N. Turnerville Rd., Lake City, MI 49651. (616) 229-4812 eves.

WANTED: Collins mics SM-1, SM-2, SM-3; Electrovoice 664 w/desk stand only. Kerry, N5CET, (800) 776-4976 (d), (214) 271-0017 eves.

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FOR SALE: Collins embroidered grey baseball caps, winged or meatball - $15 ea or both for $27. Mail check to Ridinger's Enterprise, 3487 Bayberry Dr., Chino Hills, CA 91709-2817.

FOR SALE: Collins 32V, w/spare 4D32 - $450; 75A2 - $300; HRO, 6V glass tubes w/5 sets coils, HB p/s - $400; S38 - $80; SW3 w/4 sets coils - $250; Heath Q-multiplier, unbuilt in box - $50; 2 each BC221 w/books - $25 ea; General Radio wavemeters: GR558 & GR358, both complete - $95 ea; Eico 720 NIB - $100; Harvey Wells Bandmaster Deluxe w/ps- $125. Will consider reasonable offers. Berk Berkemeyer, WØREP, MO, (314) 394-0441

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FOR SALE: Military for sale: 2 good R28/ARC5 plus 2 6-9 black, fair but undrilled adaptor, ARC4 w/dyn, shock mount - $36; BC1206 LN plus junker plus BC341 on shockmont - $20; clean canvas bag (only), holds LM plus AC - $15; converter section form BN, 3/2C40 tubes - $11; GI portable cabinet, only, carries LM plus batts - $15; BC229 rec, black w/ARR1 mounted, dirty - $29; 2 ARC1, fair - $??; Manuals: R-108/GRC - $7; Drake 2NT - $10; MN4C - $10; Stancor ST203A - $10; RME43 copy - $4; Ashe catalog, 1964 - $4; History of QPP, Weiss - $4. I pay shpg. Trade or BO: USA only: TBY complete except wetcell, TBX8 (minus small relay). **WANTED: WW** II German, Italian, Japanese radio items; U.S. Forest Service pre 1950; Civilian MFHF equip & manuals any years. Inquiries, orders, include SASE. Hue Miller, 250 S. 900 E #4C, Salt Lake City, UT 84102-2341

FOR SALE: Fluke lab/Bench model 803, precision differential VTVM, mfg for USAF, unused since new, exc., 32 lbs- $350 + UPS or trade for good 390/390A. Ed Browder, KBØLTC, Box 271834, Ft. Collins, CO 80527. (970) 484-2764 x 318

FOR SALE: Thordarsen xfmr's & pwr sply parts for your next KW project, good shape, cheap, trades? PU only. AL, AI4U, FL, (407) 222-0007 (d) 298-3493 eves

FOR SALE: New Amperite time-delay relays for the 30S-1 amplifier, part number 115NO120 - $20; Motorola R390A, exc - $295. Steve, WB4IJN, SC, (803) 873-2499 x 200 (d), 871-7749 eves.

FOR SALE: Gonset 75, 20, 10M converter - $20 ppd. Gus Enquist, VE3MAL, 534 Songis Rd., Redbridge, ONT. P0H 2A0, Canada. (705) 663-2387

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FOR SALE: Heath Collectors. Celebrate your collection with a Heath coffee mug. This attractive 12 ounce ceramic mug is screened with Heath's early script logo as well as the classic oval logo. Perfect for the shack and it makes a great gift. $7 each plus $2 shpg, or two for $12 plus $2 shpg. Chuck Penson, WA7ZZE, Box 2414, St. Paul, MN 55102.

FOR SALE: National NC-109 general coverage AM/SSB rcvr w/orig. manual exc condx. - $150; Hallicrafters SX-110 (for parts) - $25; Dynaco stereo 70 amplifier (factory wired) FM-3 tuner & PAS preamp w/manuals, all - $225; Amphenol 8-pin octal tube sockets NOS, 10 for - $15; orig. manuals: W.J. 8617B-17 rcvr - $35; military TM 11-2241 CV-116 URR FSK converter - $10; TM 11-866 SCR-244A (Hammarlund Super Pro) - $20; TM 11-2601 AN/TRC-1 - $10; T-158C/FRT & PP-219A FRT (Wilcox xmtr) - $20; HP -412A VTVM - $15; HP-410A HF VTVM - $15; HP-8445B automatic preselector - $20; HP-8620A sweep oscillator - $25; HP-8405 vector voltmeter - $20; HP-8558B spectrum analyzer - $25; HP-8565A spectrum analyzer - $35; HP -8601A sweep generator - $20; HP -180C/D oscilloscope - $20; HP -8350A sweep oscillator (operating) - $15; HP-432A pwr meter - $20; HP-436A pwr meter - $20; HP-8444A tracking generator - $20; HP -8556A spectrum analyzer, PU in - $25; HP -141T display - $25. All plus UPS. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR SALE: Heath "poor man's S-line", SB401 xmtr, SB303 rcvr w/AM, SSB, & CW filters, Shure 638 mike, manuals, all xtra clean - $385; near perfect Hammarlund HQ100 rcvr - $175; Heath HW12A 75 meter monobander w/AC or DC sply, very clean w/manual - $125; Meissner freq. standard, 100 kc, 50 kc, 10 kc, collector item - $50. Dick, W4NFN, WI, (715) 866-8704.

FOR SALE: AM mobile collection - $650 for all or individuallay for $1,275/BO; Johnson Viking mobile - $200; Morrow MB-560 xmtr, MBR-5 rcvr, pair - $240; Multi-Elmac AF-67 xmtr, PMR-6A rcvr, 12/6V rec ps, set - $170; Morrow FTR rcvr, rare, 5-BRF ham converter, HB AC ps, set - $150 <prrpw 5-BRS ham converter, cracked glass dial - $30; Harvey Wells TBS 50 dynamic - $125; 12V complete AM mobile station, AF-67, MBR-5, Morrow 12V VIB LO B+, dynamotor HI B+, all relays, filters, rack, and all docs - $275; RA-Fred motorized mobile ant, no control box - $85. All nice w/manuals, most work, but as-is + UPS. Write or leave week-end phone. Larry, Box 1139, Occidental, CA 95465. (707) 874-1000.

FOR SALE: Cheap Heath SSB - $500 for all - or individually - $900 firm; SB-303 beauty, Lmo squawk, spare Lmo - $120; SB-300 rcvr, works & looks great but lost 20M drive - $85; SB-401 xmtr mate w/above, near perfect - $100; SB-400 xmtr, untested, nice - $70; SB-101, untested, dial apart, av case - $60; HW-101, clean, untested, less 1 knob - $65; HW-12 rcvr works, xmtr mixer doesn't - $35; HO-10 needs 1 HV cap to work, HO-14 parts unit, good tubes, no xfmr, cap, pair - $60; PS-23C, very nice, w/radio only - $65; PS-23 chipped paint, w/radio only - $45; HET osc xtal set (15M missing) - $70; Service data (exerpts) - $10 ea, all $90. Radios as described, as-is + UPS. Write or leave week-end phone. Larry, Box 1139, Occidental, CA 95645. (707) 874-1000

FOR SALE: Heath Apache TX1, mint - $250; DX100 - $150; Johnson Valiant - $325 + shpg; Hallicrafters S38's w/manual & shpg; USA - $85; many AM rcvr's & xmtr's; ARRL Handbooks. LSASE for list. WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149

FOR SALE: Hallicrafters S-53, good-possible trade; SX-62, good condx, documentation. PU only. Possible trade. Fred Clinger, OH, (419) 468-6117, after 6 PM EST

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

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FOR SALE/TRADE: National Select-O-Ject; RAA-2; RAB-4; #19 Mk. 2 (British); ARR-41; DP-2. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

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FOR SALE: Super Pro SP200 - $200; Heath HW32, w/DCPS - $50; Harvey Wells Bandmaster Deluxe, w/ps - $125; Johnson T/R switch - $40; Select-O-Ject - $50; (2) Drake 1A's, VG/G - offer; Galaxy SSB comm. military - offer. Berk Berkemeyer, WØREP, MO, (314) 394-0441.

FOR SALE: NC57 - $75; Andrew Dehydrator model 1930 - $150. Jim, OH, (614) 927-2592.

FOR SALE: CRC-1EP1 tube, NOS - $25; two 931A's, NOS - $30 pr; Lear radio pilots beacon & broadcast rcvr, model APR-1, portable, Rooseveltfield, NY - $125; JT30 mic - $35; 675 at 4.5 kv Caldwell variable - $45; Palomar VLF converter - $45; Hallicrafters HA-10 LF/MF tuner, exc - $50; MFJ 941-B tuner - $45; D-104 xtal mic w/grip to talk amplified desk stand, orig. box - $50; TV-12 tube tester, oak case, no manual, VG - $45; Stromberg Carlson mic, model MD27, wrong base - $20. Donald Moth, W2MPK, POB 73, Chittenango, NY 13037. (315) 687-6453

FOR SALE: Gonset G-50 6 mtr AM xcvr - $115; Dentron, super, super tuner, 3 kw - $150. Both clean + UPS; 73 & CQ mags. SASE for list. Bob Zimmer, NV1X, 205 Brigham Hill Rd., Milton, VT 05468. (802) 879-7235

FOR SALE: New Command xmtr's: T-19/ARC-5, BC-457A, T-21/ARC-5, CBY-52232, CBB-52210 - $40 ea; DX-40 - $50; GSB-100 - $135; SW-54 - $40; Estate sale. Walter Treftz, N4GL, 3840 Laguna Loop, Hernando, FL 34442. (904) 637-1755

FOR SALE: Collins, MBF - $65; 180S1 - $175; 60H mixer - $85; 212Y amp - $85; 678Z1 tester - $??; 637K1 HF ant, new - $150; R729 rcvr, 400 MHz - $125; Magnum six speech Proc - $150; SB610 - $95; HA1 - $55; C3 cap tester - $30; Johnson patch - $35; Drake DC3 ps - $40; Galaxy GT550 ps spkr, manual, mic - $?? Richard, CA, (714) 855-4689.

FOR SALE: R390, R390A, R391 manuals, blueprints; Jane's Military Communications manuals. **WANTED:** Tube CB radios. C. Zafonte, N1FRX, RFD 1 Box 75, Ft. Kent, ME 04743. (207) 834-6273 eves.

FOR SALE: Rare bird. National NC-101-X, hamband only rcvr, w/10" spkr, all orig., exc condx, good inst. man., copy - taking offers. Jim, K7BTB, AZ, (520) 635-2117.

FOR SALE: General Radio capacitor decade box, 3 decade, nice - $50; GR impedance bridge, 20-20,000 Hz - $60; Hewlett Packard oscilloscope probe, 10X, 50 MHz, good - $25; large & heavy Federal Radio VLF rcvr, 1940 vintage - $50, U PU; Tek 6013 HV scope probe/case, 1000X, 12 kv, approx 80 MHz - $90; Tek FG501 function generator - $80; Bird 300 watt, 50 ohm coaxial dummy load - $65; HP-410C VTVM w/AC probe, nice & working - $85; HP-606A sig. gen., 50 kHz-65 MHz, xtal calibrator, CW & AM, percentage modulation, calibrated output attenuator, good working order - $145; Triplett #630 VOM, nice - $30. Add UPS to all items. **WANTED:** HP-4800 vector impedance meter; tubes: 75th, 4-400A, 6B4, 6000, 7591A, 1920's vintage 245, 226, 227 or others? Would consider trade. Stan, KC6YB, CA, (714) 841-5866.

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FOR SALE: Knight model TR-108, 2 mtr xcvr manual - $5 + shpg. Roy Cameron, 114 E. 2nd St., Pana, IL 62557.

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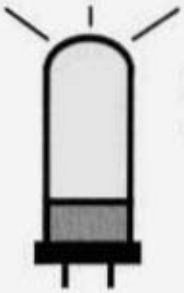

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