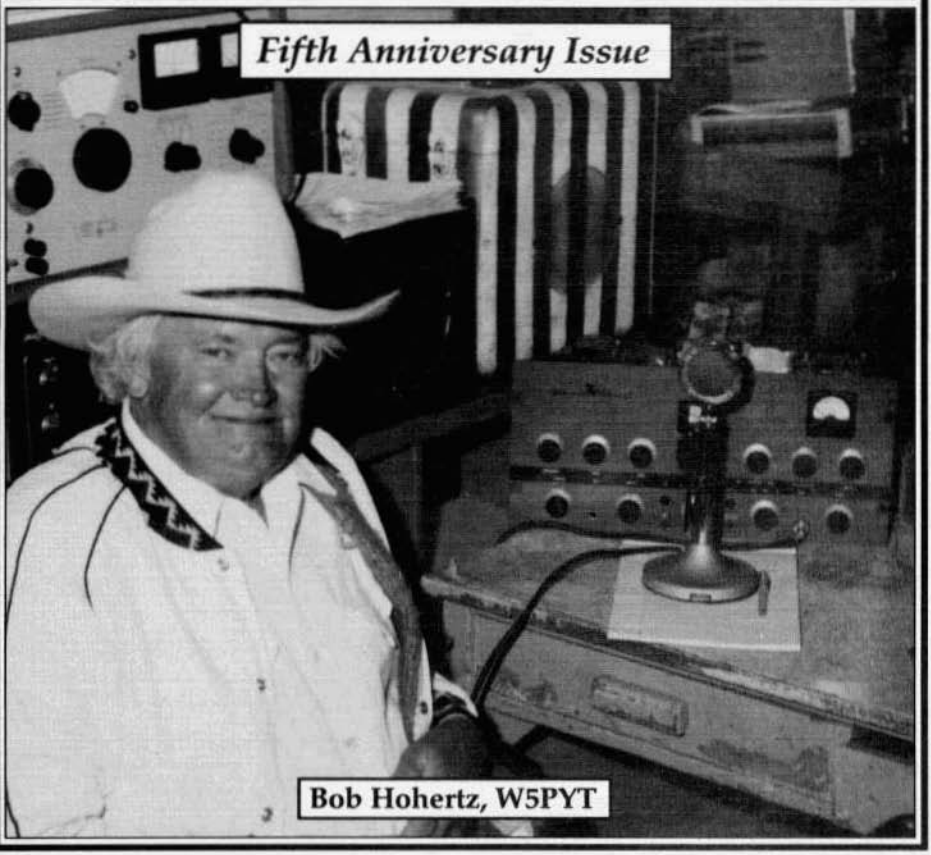
$2.50

ELECTRIC RADIO

celebrating a bygone era

Number 60 April 1994



Fifth Anniversary Issue

Bob Hohertz, W5PYT

ELECTRIC RADIO

published monthly by Barry R. Wiseman and Shirley A. Wiseman

at 4 Aspen Place, Durango, CO 81301

Second Class postage paid at Durango, CO. and additional offices

Authorization no. 004611

ISSN 1048-3020

Postmaster send address changes to: Electric Radio
Box 57
Hesperus, CO 81326

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; George Maier, KU1R; Albert Roehm, W2OBJ; Mike O'Brien, NØNLQ, Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

It seems like it was just yesterday that I was putting issue #1 together. Here it is five years later and I'm just finishing up #60. Time goes by very quickly; maybe increasingly so as we grow older.

The success of ER - and there is some success in surviving five years - is mostly due to the support of our readers; it has been a group effort. From the beginning we've been in awe that so many people would lend us so much support by writing articles, supplying photos and drumming up new subscribers for us. I'm sure that most main-stream magazines do not have the kind of reader support that ER has.

The first five years have been a wonderful experience for Shirley and me. We send our deepest thanks to everyone for their support.

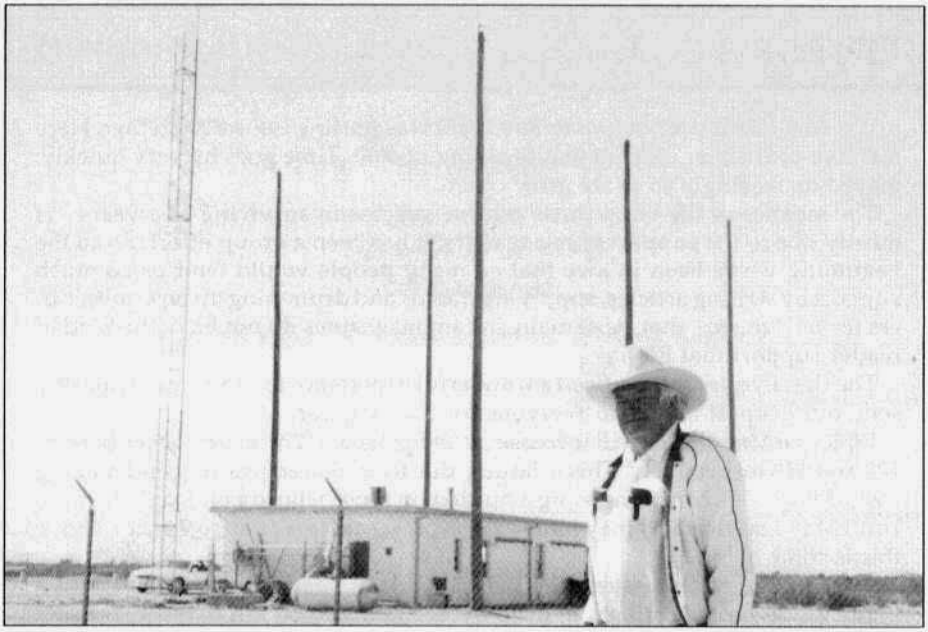
Effective May 1 rates will increase by $4 for 1st and 2nd class subscribers, to $28 and $38 respectively. This is largely due to increased printing and mailing costs. I hope this is not imposing a burden on those who are on fixed incomes. Until May 1 subscribers may renew at the present rates for up to 3 years. I hope this is some help.

As I mentioned last issue, ER will be at Dayton this year, in booth #316. We invite all of our subscribers to drop by. It's going to be fun to meet so many people that we just know from the telephone or radio contact.

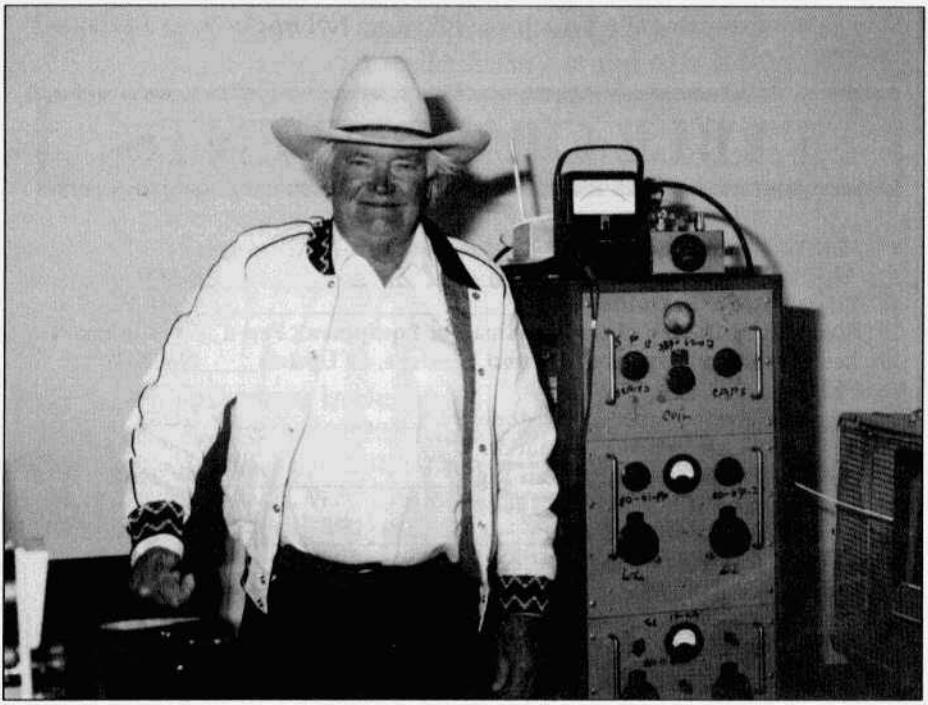
We're going to be away from the office for about ten days, from April 25 thru May 3. The answering/FAX machine will be on; feel free to leave messages.

TABLE OF CONTENTS

Cover: Bob Hohertz, W5PYT, better known as "Ozona Bob", at his operating position. No other AM'er (other than perhaps "Ashtabula Bill", W8VYZ) is more well known than Bob. See page 2 for more photos.



W5PYT with his radio building and antennas in the background.



Bob with his Techrad transmitter. This transmitter, along with a Viking I and a BC-610 are the rigs he uses mostly.

AMI Update

by Dale Gagnon, KW1I, President

AM International celebrates its first anniversary at the end of this month. Membership continues to grow. At the beginning of April AMI had 588 members. It looks like we will end our first year with over 600.

AM Forum at the Dayton Hamvention

The Forum is scheduled for 1:15 PM in Meeting Room 7 of the Hara Arena on Saturday, April 30. The pictorial segment of the program will cover selected radio museums including the Western Heritage Museum in Omaha, Nebraska, the Wireless and Steam Museum in Rhode Island, the Historical Electronics Museum in Baltimore, the Gray Museum in Ohio and the Colorado Bighorn Museum of Amateur Radio. Plan to get together for pizza Saturday evening to more leisurely meet your fellow AM'ers. Restaurant directions will be available at the Forum. For more information at Dayton, KK1K, KW1I, and N1HHG can be found at flea market location #1738.

Armed Forces Day Operating Event

This one day event on May 21 promises to be fun for military radio operators and classic radio operators in general who will be scanning the bands for military radio contacts. To make this task easier the following is recommended.

Event Commencement, 1100Z May 21
Event Conclusion, 0300Z May 22

CW Freq. (kHz +/-) 3665, 7045, 14045
Phone Freq. (kHz +/-) 3880, 7290, 14286

Cover CW frequencies at quarter past each hour and phone frequencies at quarter to each hour.

Call CQ Armed Forces Day (AF on CW).

The object of the event is to have fun! You do not need to have a military radio or contact someone who does to participate. Event exchange should include radios in use as well as location. See how many military rigs and locations of military significance turn up in your log, then send a copy to AMI Headquarters. We'll publish the results, pass along your anecdotes and print some of your pictures if you'll send them.

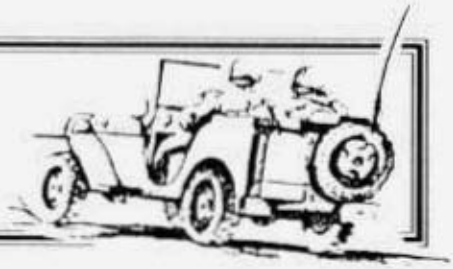
Fort Burnside in Rhode Island is expected to anchor the East Coast under the call WA1NZR (Brown Beezer) and Treasure Island Naval Base will anchor the West Coast under the call N6CC (Tim Sammons). Paul Thekan, N6FEG, writes that the USS Pampanito, a WW II sub docked at Fisherman's Wharf, may have their TBL up and running by Armed Forces Day.

Late breaking bulletins of key military radio significant stations to look for during the event will be included in an announcement on the daily 14286 kHz AM net on May 12, 15 and 19 at approximately 0030Z (May 13, 16, 20). Information will be relayed from both coasts.

By the way, it is not necessary to be a ham to be a member of AMI. We welcome the support of shortwave listeners and others who would like to see AM preserved.
CQ AF!

Are you a member of AMI? If not send $2 to AMI, Box 1500, Merrimack, NH 03054-1500. AMI promotes and protects AM; we should all be members.

ELECTRIC RADIO IN UNIFORM



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

"The BC-654 Transmitter/Receiver"

As we go through the many remembrances of D-day and the rest of WW II it is to be hoped that one thing that won't be missed is how poorly prepared we were for the war. This month we'll look at one of the radios that illustrates the point.

Overview

The BC-654 is the HF transmitter and receiver unit of SCR-284. The set operates on either CW or AM and covers 3800 to 5800 kcs in a single band. The receiver is directly calibrated in increments of 20 kcs; the transmitter is arbitrarily calibrated with an individually prepared calibration chart under plastic in the lid of the set case. Crystal check points are provided every 200 kcs. Rated sensitivity is 3.5 microvolts on voice, 0.5 microvolts CW and the bandwidth is 5 kcs at the 6 dB points.

The rated output of the MO-IPA-PA transmitter is 11 watts on AM or 25 watts on CW. A low power setting reduces output to roughly half these figures. The transmitter is continuously tuned only, with no provision for crystal control. Push to talk operation is provided and by using remote control unit RM-29 the BC-654 can be operated remotely from an EE-8 field telephone.

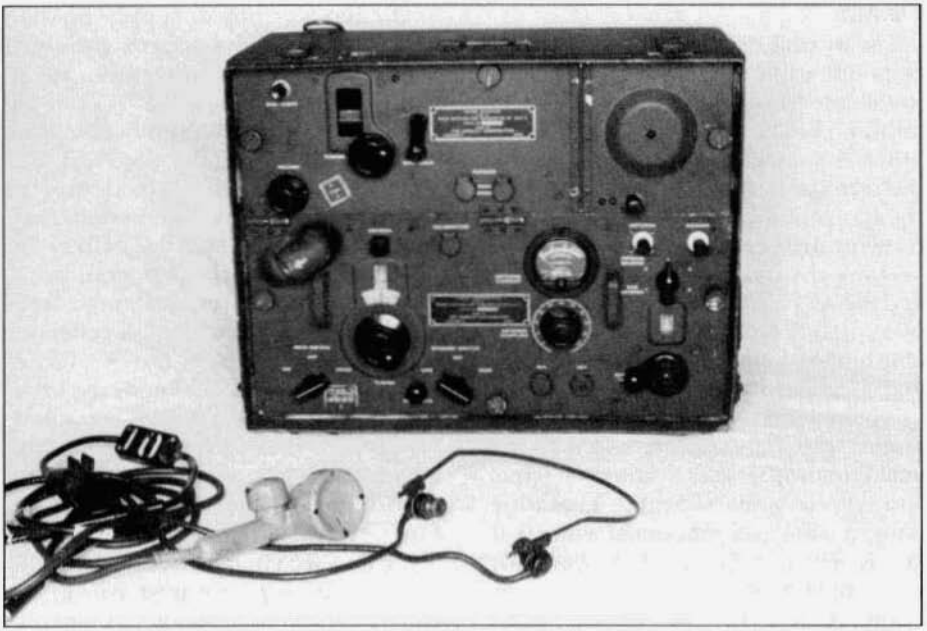
The set can operate on 6, 12 or in some configurations 24 VDC using the PE-103 dynamotor -- yes, this is the radio for which the most famous of all dynamotors (among hams, anyhow) was built. For portable applications the GN-45 hand cranked generator can be used. The receiver can be run either from the main source using the PE-104 vibrator pack or from a BA-43 dry battery. Other accessories include the T-17 microphone, HS-30 or P-19 headphones, the J-48 hand key and LS-7 loudspeaker.

The BC-654 measures 14" x 18" x 10" (H x W x D) and weighs 45 pounds; the cabinet is splash proof. There are two basic configurations: a vehicular one with the radio on an angle iron stand and a portable one with removable legs. For portable use the entire equipment including headphones, key, mic, antennas, bags, hand generator and smaller accessories makes up as three loads totalling 110 pounds. The antenna is either a sectional whip or a Windom with a counterpoise.

History

Some historical info on the BC-654 appears in the standard Signal Corps history, The United States Army In WW II, The Signal Corps, Volume II, The Test (December 1941 to July 1943). The set seems to have been designed beginning about 1937 but like most other WW II gear, peacetime budgets caused by pacifism and willful ignorance caused development to go very slowly.

(In the spring of 1941, old timers may recall, the Congress came within one vote of repealing the draft that had been passed the previous year! As late as the beginning of December, 1941, most Americans felt that the war in Europe was not our business and that our problems with Japan could be solved by determined negotiation.)



The BC-654. Because the receiver shares the transmitter function switches it has only two controls of its own.

The first BC-654 delivery was of 31 sets during the week ending June 8, 1942; by that time there were 17,681 contracted. The set first saw combat during the invasion of North Africa, Operation Torch, November 8, 1942. Although the troops had trained with the BC-474 (ER, June, 1991), when they went down the nets into landing craft it was with the BC-654. As we approach the 50th anniversary of the invasion of Normandy (June 6, 1944), the largest and perhaps best organized amphibious operation in history, reading about Torch gives perspective: many Signal Corps units landed far from their radio gear and many had as few as 25% of their vehicles; sets and batteries were not waterproof and for some sets there were no spare batteries; some men had never seen their radios until they reached the shore; and so on. Fortunately the landings were almost unopposed and the BC-654 worked as well as any of the gear, being the set over which the first ship to landing party contact was made. It was used for control of naval gunfire in support of the troops and Army beach to beach nets as well as other jobs.

By about 1944 the BC-1306, a similar electrical design but using miniature tubes and a fraction of the size and weight, was phasing into service. The TRC-2 is almost identical to the '1306 but covers 2000-3300 kcs. 1945 brought the GRC-9, similar to the BC-1306 but covering 2-12 Mcs in 3 bands; probably too late to see combat.

Once the legal tangles surrounding surplus radio gear were cleared away after the war, the '654 was dumped; by 1947 Belmont Radio Corporation ("Agents for War Assets Administration") was selling them for $15 each new, with all accessories."Offered to you, in the original crates at a small percentage of the $874 cost price". Recall that in the early 40's, $874 was a respectable year's pay! Total production can only be guessed -- maybe 150,000?

continued next page

ER in Uniform from previous page

Design

The overall design of this set would be familiar to most hams building gear in the late 30's and early '40's: two aluminum chassis stacked one above the other. A ham would probably have put the receiver on the bottom chassis and the transmitter on the top to minimize receiver drift but in a set for field use, keeping the receiver dry took priority and the '654 has the receiver on top. The two units are held together by demountable hinges on the panel and snap posts and a cable to a screw terminal strip. The combined receiver and transmitter mount in the aluminum case with the usual rotating fingers on the front panel and rubber gaskets on the mounting flanges reduce the amount of water that gets in when a wave splashes over your LCVP landing craft.

The receiver is a seven-tube superhet using 1.5 volt octal tubes. There's a 1N5 RF amplifier, a 1A7 pentagrid converter, two 1N5 IF amps, a 1H5 diode detector/triode first audio and a 3Q5 audio output stage.

AVC is provided on VOICE; when operating on CW the receiver gain is controlled by adjustable bias on the RF and IF stages. A second 3Q5 is used as a BFO. Except for the provisions for CW and 3800-5800 kcs coverage, this is in every respect a 1940 vintage "Let's have some fun at the beach" portable radio.

The transmitter consists of a 3Q5 triode-connected Colpitts oscillator circuit operating on the carrier frequency. This stage drives a 3Q5 class 'C' buffer that drives a pair of VT-225 (307A) pentodes connected in parallel. The driver and final are neutralized. Suppressor grid modulation is supplied by a 3Q5 driven by a carbon mic.

The antenna coupling scheme consists of a rotating link in the final amp tank coil feeding a series roller inductor with various series and parallel caps that can be switched in or out to match different types of antennas.

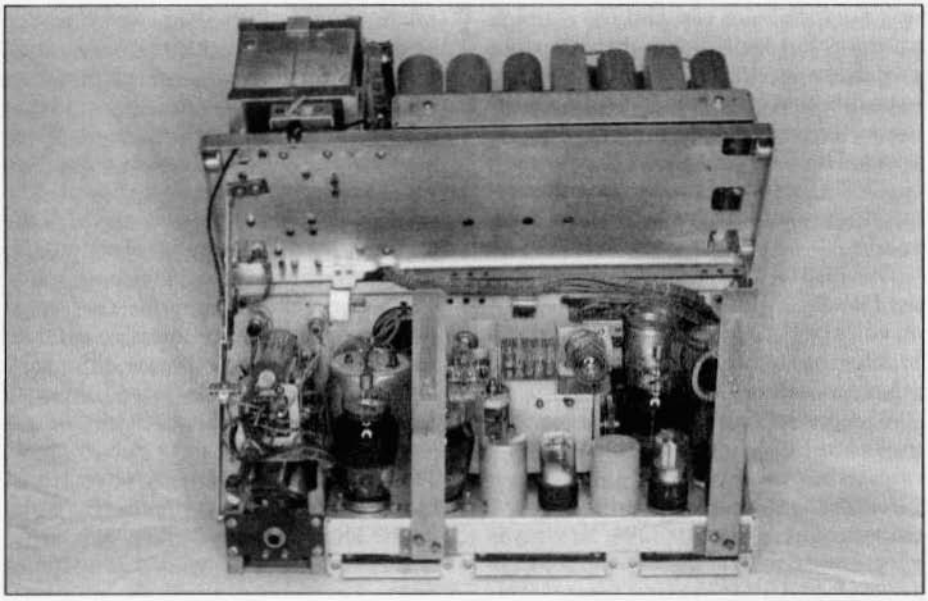
The receiver power supply fits in a compartment at the upper right of the front panel. You can use either a BA-43 dry battery (+1.5V, +90V, -51V) or the PE-104 vibrapack that supplies the same voltages but takes either 6 or 12 VDC as input. Normally you would use the vibrapack in vehicular and established field installations and the battery for emergency and portable operation.

Transmitter power can come from either the GN-45 hand crank generator (portable operation) or the PE-103 dynamotor (vehicles). The hand crank generator will also drive the receiver vibrator supply so in an emergency you need only a set (better, *several* sets) of strong arms.

On The Air With The BC-654

My first acquaintance with the BC-654 was as a high school freshman in the early 1950's. At age about 14 this radio was much larger than it is today (remembered sizes really are in proportion to body dimensions) and it was *magic* -- though I can't recall that we ever got it to work. Needless to say, this was one of the first radios I went after when I 'reactivated' and started looking for military sets in 1985. And after a few months, it arrived, from the estate of W6QZ.

If I had been looking for a comprehensive review and final exam for the WW II military collector/restorer, BC-654 s/n 54,903 would have been hard to beat. The spring binding post antenna terminals had been replaced with an SO-239 connector; it took about a year to find the right item in a hamfest junkbox. The unique spinner-type knob on the antenna loading coil was broken but all the pieces were in the case so a bit of epoxy glue put things right. There was no vibrapack but at the time Fair Radio Sales still had them new in the military sealed packages. Of course like 98% of all 'new in original ...' WW II vibrators I still had to make the saw cuts around the bottom of the can, pull out the guts and clean the contacts - but



BC-654 rear view with the receiver tipped up. Left to right: PTT relay above loading coil, PA tubes, driver stage, modulation transformer and modulator tube, calibrator tube. The tube to the right of the spare lamps is a spare 1N5.

hey, we're talking the *classic* military radio restoration experience here.

The 1H5 first audio tube was dead-gassy. A few flea markets later I had two or three 'new' ones but - you guesed it - all those were gassy too! Eventually I made an adapter and plugged in a 1S5 miniature tube; I have since collected more 1H5's but haven't yet tried them out. I suspect you could substitute miniatures for any of the octal receiving tubes you can't find easily.

Then I started on 'those darn black plastic capacitors'. A week later, I was still working on 'TDBPC' -- only the words were becoming more colorful. I got through most of the shorted ones in a few days, but after that, there were still many that were sick enough to upset bias by leaking B+ onto the following control grid or drag down a screen by pulling current through the dropping resistor. Even when the set began to play, at first it rarely did so for more than an hour without another trouble-shooting exercise. It took about three weeks of evening work before things settled down. Although I have stayed in the 'replace parts only as needed' camp, I wound up with a lot more sympathy for the school of restoration that says 'Replace all TDBPC at the start'.

I discovered an interesting trouble-shooting method while working on this set. If you measure the voltage across the various capacitors with a DVM before you apply power you will find many TDBPC that act as *batteries* -- there will be from five or 10 mV to as much as 100 mV across them. My guess is that internal corrosion is causing dissimilar metals to do this; all such caps are more or less shorted. If you replace them before you put power on the set you are sure to reduce the number of other parts which will be taken out in testing.

Working on the receiver isn't easy because it bolts to a platform behind the panel and even when you are inside, many are hard to change.

The transmitter was a lot less trouble, in fact not one of TDBPC was bad, There

continued next page

ER in Uniform from previous page
was an open mica cap and the contacts on the roller inductor and the various switches were dirty. The dynamotor had to be lubed. And it started to put out the watts. *Impressive*, after more than 40 years. The PA tubes (VT-225, commercial 307A) are *rare* (used in no other set that I know of); if you have the set, get spares.

The PE-103 worked fine, except that the HV circuit breaker often kicked out on voice peaks. I knew I had heard of this problem but it took a few days to find the reference: Hints and Kinks, Vol. 5, pgs. 92-93. Connecting a 47 ohm resistor across the control winding of the breaker took care of the problem.

Actual transmitter output was 15 watts phone, 33 watts CW. Keying is very good, with a barely perceptible downward drift in the first second after key down (you can't really call it a chirp) caused by the dynamotor slowing down.

After four minutes warmup, drift of the transmitter of my '654 at 3885 kcs was -100 cps during 30 minutes of four minutes receive/one minute transmit cycling. During 10 more minutes key down, drift was an additional -420 cps with about 300 cps of the drift in the first five minutes. These are about the best figures I've ever measured; the famed command transmitters, for example, drift more than twice this amount.

The HS-30 headphones deliver crisp clear audio; they are miserably uncomfortable with hard old rubber ear inserts but I was lucky enough to find new ones. Even the T-17 works well -- if you get a good one, which mostly you don't.

This is one of the best military sets for the enthusiast with (or wanting to develop) restoration skills and if you have lots of bad caps, you will get some authentic vocabulary building as well. Most '654s require much more work than a GRC-9 or 'command' setup, but once you get all the bad caps replaced and all the dirty contacts cleaned, you have a solid rig with enough power to make real contacts -- about double what the GRC-9 gives you, for example. Even the selectivity is okay for any situation where fifteen watts can be heard. The voice quality is fine and the flexible antenna loading arrangements will let you feed a ham antenna without using a tuner or making any mods. Building a power supply is more complicated than for many WW II sets because the various voltages must be isolated from each other but you can use the dynamotor -- just feed it 13 volts at about 15 amps. This is one of the quietest dynamotors I have ever seen, so it is practical to use it in the shack. Check before you apply power that the supply voltage switches on the dynamotor and vibrapack are set correctly and that both the set and the dynamotor have a yellow arrow on the power cable connectors; this mark identifies sets that were modified to put the high voltage wire at the center position and the mod must be done on both ends unless you want the set to 'pass' its smoke test!

Conclusions

There's a lot to like about the BC-654. For a late 30's design it is light, puts out considerable power, and is reasonably compact. The power supply arrangements are a good combination of simple and flexible.

Serviceability is very good, for example there's a spare of each type tube and dial lamp mounted inside the set. The hinge between the receiver and transmitter sections means that if you lift the set from the case you can tip the receiver up and change any tube in the transmitter. There is enough slack in the cable between the units to let you operate the receiver when it is demounted and sitting beside the transmitter.

There is a bare minimum of controls and they work as you'd expect them to.

The use of several different styles makes the knobs look funny -- but once you've used the set for an hour you can do everything but change frequencies without using a light. The pointer and scale on the antenna current meter are marked with (radioactive) glow-in-the-dark paint. (Don't open the meter on this radio!) The dial lights illuminate only the frequency dials. Remember that when controlling naval gunfire you are making someone *really* unhappy and a flashlight can be seen for a mile or more.

Number one in the shortcomings department is the splash proof construction. However, it wasn't until about 1939 that the U.S. Army really faced the need to fight on the run and in the rain and mud and to make amphibious landings; the 1939-designed BC-611 handy-talky was the first Army radio to reflect the new understanding by trying to be 'watertight'. And the 'splash proof' of the BC-654 is as good as that gets -- there are felt washers behind all the knobs, the case is welded, and the lid overlaps the case flange by more than half an inch: I'd expect it to take more than a single wave to knock this radio out on the way to the shore.

Inside the set, non-absorbent materials are everywhere: ceramic sockets, Micalex insulation on the tuning cap and those molded black plastic caps, which for the first couple of years after they were made were the best thing going.

One of the annoying problems of the GRC-9 is that the 'instant heating' 2E22 final isn't -- in fact it takes two very long seconds before you can talk, so breaking a round table is only for the quick and lucky. Eat your hearts out GRC-9 users: the VT-225's in the '654 final are on continuously when the standby switch is in either LOW or HIGH power. To operate just the receiver, you set the switch of OFF.

The manual is a mess. It looks like several revisions were made with none allowed to take over two hours and for a radio delivered in mid-1942 that may actually have been the case. With production schedules increasing tenfold every few months and material shortages on every side while experienced people were being moved out of production jobs into management or military service, Signal Corps procurement was class 'A' chaos. However, the manual is adequate, with everything you need in there somewhere.

You might think crystal control should at least have been allowed but in 1939-40 the outlook for quartz crystals was *grim*. The entire supply of raw quartz came by sea from Brazil and the Army was having fits trying to imagine a way to meet the projected wartime essential requirements; crystal 'options' would have been a waste of resources. By 1943 the quartz problem had been solved (mostly by making the crystals for new sets a fraction of the size of older ones) and the BC-1306 and GRC-9 both allow crystal control.

There's not a lot else wrong here. For an early WW II set, this is a fine piece of work. ER

THAT OLD WWII MILITARY SURPLUS RADIO GEAR IS HOLDING UP BETTER THAN SOME OF OUR NEW GEAR--- WE WANT IT BACK!

Mechanical Design of Collins Amateur Equipment

by Fred Johnson
6202 Hilltop Trail
Sachse, TX 75048
Part 3

Concurrent with amateur equipment development, others in our group were working on new broadcast transmitters, consoles, etc. I found amusing the generally accepted belief that the new broadcast transmitters had to be physically large, even though technology allowed them to shrink to the size of a file drawer. Conventional logic seemed to be that. . ."What broadcast engineer would like to bring in a wife or friends and show them what he was the engineer of -- if it was a breadbox!". I guess it makes marketing sense if not engineering sense. In any event we made some broadcast equipment larger than necessary. Some "refrigerators" could have been the size of amateur units.

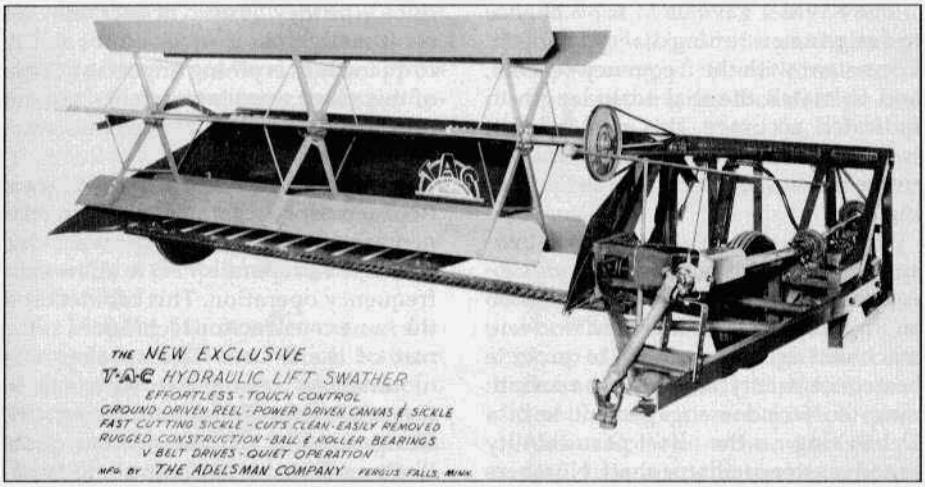
In 1956 SSB technology had progressed to the point that a portable transceiver could be built in a relatively small box. Gene Senti originated the concept and first demonstrated its possibility, if I recall correctly. Often it's hard to precisely pinpoint the origination of new concepts when like-minded people are all working together on the same set of opportunities. The type number assigned to this first transceiver of its kind was the KWM-1 (M for mobile). The KW identification was used to capitalize on the success of the KWS-1, though the new "M" was not a KW in either input or output. A salient feature: it was "small". We designed it in a gray-painted monochrome aluminum case with very slightly rounded corners, and few styling features.

The KWM-1, being small and "mobile", made it possible to design a mount that would accept the unit as a plug-in on the transmission hump of an automobile. It's interesting to recall that our M.E. group was short handed at that time. As a result, Ernie Pappenfus requested Arlo Meyer to survey all the new cars at local dealerships on his own time. Purpose was to define the dimensions of the radio's mount on the transmission hump. Arlo was working other assignments outside the ham group at the time. Because Arlo was a ham, and an M.E., he took the challenge for some side "consideration" that a ham would surely appreciate!

It's interesting to see today that valuable auto radio components are treated similarly. They, too, unplug for removal of a unit from the car. There's a size difference, but our principle was the same as you see used today.

For convenience in changing frequency, the KWM-1 had a specially designed plug-in crystal/turret switch assembly on the front panel. It allowed multiple crystals to be inserted as a gang for pre-set frequency selection. Considering today's synthesizers, I guess this looks pretty crude. But, it served well.

I also remember the design of spring loaded gears in this unit. They were used to forestall backlash in the tuning mechanisms. However, it became a never ending source of annoyance to me that the unit went to production with a dial that contra-rotated with its knob. Even though it met the other criteria for dials -- such as accuracy and fidelity to resolution -- this backwards rotation was a problem we couldn't solve within the constraints we had. I vowed not to do that again.



Mechanical Engineers at Collins sometimes had strange beginnings. This swather was designed in 1947 by Bob Griswold (who later designed the R-390) and the author.

The KWM-1 apparently stimulated Arthur Collins' recognition that the old black wrinkle and plain gray boxes weren't going to cut it stylewise into the future. He made it known that something more modern or professional was needed. We had an internal Industrial Designer whom we taxed with coming up with something better. The KWM-2 was an initial trial. The perforated case, extruded aluminum front rim, and two-tone gray paint job were the starting point.

The KWM-2 was introduced in 1959, on the downhill side of amateur equipment development at Collins. Its development carried forward many proven features. It introduced a few that were evolutionary, if not revolutionary. Maybe the first to be noticed was the front styling rim on a perforated case for ventilation and thermal control. Of special note is the surface "texture" of the front panel.

As time had gone along, Arthur Collins made it known that, in his opinion, the front panels of this new style needed a surface texture of some kind. After we had experimented unsuccessfully with several processes that we had the capability to do, Arthur brought in his Hasselblad camera and said that something like the nubby leather grain it had would be nice. I can't tell you how many trials were made to duplicate that effect. But, the final solution was an actual photograph of the camera surface with negatives spliced and retouched to make a composite the size of the panel. It was used to expose phototresist on the aluminum panels which were then chemically etched. When painted, the surface was a reasonable duplicate of the camera. This panel finish was used throughout the S-Line.

Another sidelight is that the formed trim ring around the panel was designed to be an aluminum die casting. But, because extrusion dies are relatively cheap, early production used extruded and formed rings. Piecewise this was more expensive. Over the life of the S-Line equipments however, thousands more formed rings were used than were needed to justify the cost of casting dies. But, production releases were never for an individual run of sufficient size to justify die tooling. Marketing timidity, I guess!

continued next page

The KWM-2 gave us M.E.'s a chance to design a new tuning dial mechanism. Consistent with the frequency scheme, and to match the dial scale length to indicated accuracy, this demanded a two revolution dial. We made this one rotate in the same direction as the tuning knob!

The final design employed a low-spring-rate set of tempered beryllium-copper friction discs riveted to the knob shaft. After solid staking, the discs were machined as an assembly to provide best concentricity, and to make a smooth ramp surface for engagement with a Delrin ring on the offset permeability tuned master oscillator shaft. Numbers up to two hundred were silk-screened on a single backlit translucent dial. A tooth-shaped white masking pattern was silk screened over every other numeral on a transparent overlay dial. The two dials had different numbers of external gear teeth on the same pitch radius engaging a common idler gear. Thus, they rotated at slightly different rates. The net result is that the proper number is presented on each of the two rotations of a common scale. This is harder to describe than it is to recognize when you see it. I like to think of it as an example of deliberate mechanical slow motion aliasing.

This dial was as close as possible to backlashless. It felt good. Its costs were reasonable and its accuracy matched performance.

Another tuning mechanism designed into the KWM-2 was a 2:1 ball-planetary reduction slug rack drive. It made the knob easier to turn, and was a nearly effortless, toothless positioner. A band drive was combined with the planetary to eliminate backlash and to ensure linearity. To measure minute motions in cases like this, we glued tiny mirrors on the shaft or device being driven. Then an intense light reflected on the wall, or on a sheet of cardboard a suitable distance away, indicated the actual motions -- be they desired or backlash. We continually tried to improve our ability to quantify everything important. Some of this effort went into detents, but not much of that found its way into amateur equipment.

Along with the KWM-2 there were two accessory cabinets for miscellaneous items and a loudspeaker. One contained a separate VFO to allow split frequency operation. This cabinet used the same construction techniques as the rest of the S-Line. The speaker was mounted on a panel part way back in the cabinet to allow controls in front. Designing this cabinet led to a quote I've mentioned before, and will probably never forget.

Due to my interest in quality audio, I was concerned about having a speaker in a metal box. I expected it to sound "tinny". Being always interested in quantitative data, I took sample speakers outside into the back lot, faced them up in a free field, and placed a flat response microphone above them about three feet. I made several frequency response plots for variations in distance of the speaker's recess in the cabinet, and for different speakers, some with, some without fiberglass damping. Anyone who has ever done this kind of measurement knows that the method has some inherent, unavoidable flaws. It can also flood you with data that isn't easily interpreted. It's like a foreign language. Until you spend a lot time with it, you can't be fluent in it.

Anyhow, as usual, I had documented the experiment in my Engineering Notebook. I had response graph sheets on my desk when the chief engineer came into my office. He put one foot up on my desk, looked at the charts and data upside down for less than a minute. He said: "I don't think your data is worth a damn!". Knowing well that this kind of measurement isn't like checking the voltage of a dry cell, I decided not to argue. I let discretion be the better part

of valor. Today, one could apply a unit pulse to the speaker, do a time to frequency domain conversion, then plot a "waterfall" chart exposing the entire frequency vs. amplitude signature for a time following the pulse. This technology has advanced to the point it has credentials. It would have been nice to have had it then. When your boss' boss gives you a compliment like I got, it's memorable!

In 1960 the 51S receiver carried forward many of the mechanical features of its predecessors. The addition of a "speedometer-type" digital frequency dial was a precursor of yet to come additional digitalization of tuning. Spinner knob developments are too long a story to tell completely. That whole scenario is reminiscent of the analogous situation where a famous quote originated, that is: "Everyone with an ass is a seating expert". The knob shape, radius of indent, overall diameter etc., etc. were endless sources of opinions. What went to market was determined as much by a schedule deadline as it was due to unanimity of opinion.

Emphasis on amateur equipment design diminished in the '60's as Arthur Collins focussed on computer developments. In the mid '60's the 651S was developed. The 651S employed mechanical styling that had been brought into the company for new computer products. Ultimately, all Collins products adapted this new "look". One distinguishing feature of the look is a terra cotta color stripe across the top front of each unit. Outside consultants were the source of this new style. They also brought us a new corporate logo which lovingly became known as the "meatball". Some thought it appropriate for Hotpoint stoves. The M.E.'s worked with the consultants over a period of years as they gave us what has turned out to be a relatively timeless style for all products. They taught us to think about such things as how something would look when it's dirty. We mechanical types had to learn that screw heads were ugly! ! Sometimes, one has to do something for looks rather than just function.

The KWM-380 was the last real amateur product. It employed frequency synthesis for 10 Hz step tuning, plus other features which diminish the mechanical engineer's inputs to a design. Its large "motherboard" backplane made it a bear to test with techniques in general use at the time. Though it had continuous coverage, and many features, it did not have the personal involvement of Arthur Collins. Arthur was fully occupied with introduction of computer technology to communications. Arlo Meyer was involved with this last program of its type, and worked to get the KWM-380 into production in the Collins El Paso plant.

As time goes on, most of the need for mechanical engineering in electronics converges on thermal matters, board layout and design, and a few structural and vibration concerns. The days of complex mechanisms are over. Probably the epitome of mechanical tuning ingenuity and complexity was the R-390, designed for the Signal corps. My lifelong associate, Bob Griswold was the M.E. on that design. ER

Part 4 next month.

The Leo Meyerson and Fellow Amateurs Exhibit at Western Heritage Museum
An Update

by Barry Wiseman, N6CSW

Back in 1989 Leo Meyerson, WØGFQ, the founder of World Radio Labs, moved his collection of radio gear to the Western Heritage Museum in Omaha, Nebraska. That gear became the nucleus of what is now know as the Leo Meyerson and Fellow Amateurs Exhibit, at the Western Heritage Museum.

Since 1990 the collection has grown considerably through the efforts of Leo and the support of amateurs everywhere. It now occupies 3,500 square feet of space and will be enlarging as time goes by. Already it is the largest exhibit of amateur radio equipment anywhere.

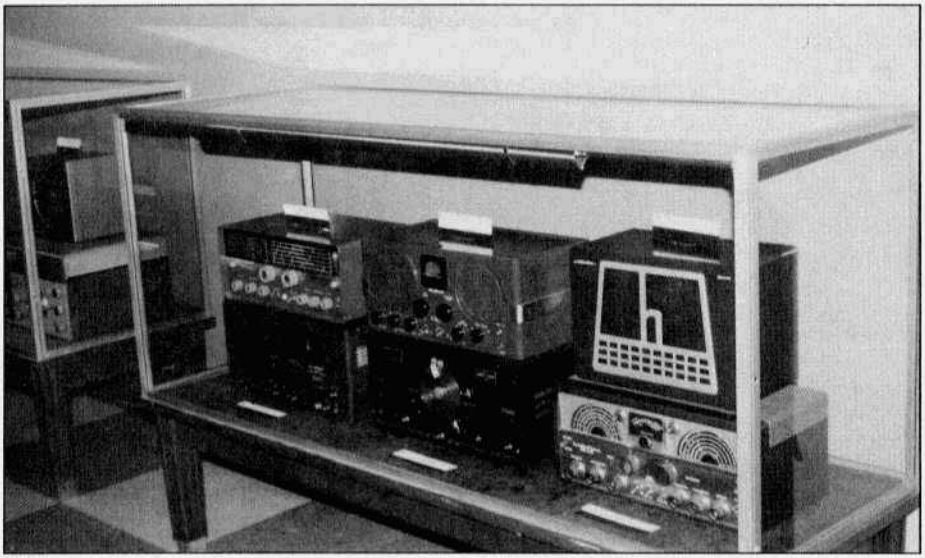
I've supported Leo from the beginning because I think that the history of amateur radio needs to be preserved in the environment of a museum as well as in the hamshacks of us vintage enthusiasts. And at Western Heritage Museum we have the assurance that the equipment we donate will be preserved and protected for future generations to see and appreciate. This year the museum anticipates over a hundred thousand visitors.

A few days ago when I talked to Leo at his winter home in California, he was very excited about getting back to Omaha and getting back to work at the museum. His plans for this summer include installing an antenna on the museum roof so that vintage equipment can be put on the air from a permanent station at the museum.

Leo asked me to thank all those who have contributed to the display so far and to invite others to do so as well. Any donation is tax deductible and the names of all those who donate wil be listed on a plaque that will be on permanent display in the museum.

This summer Leo will be at the museum and available to guide visitors through the exhibit. ER

Sara McFarland, Western Heritage curator, hold 1st QST, December, 1915. In the background is part of the complete QST library.



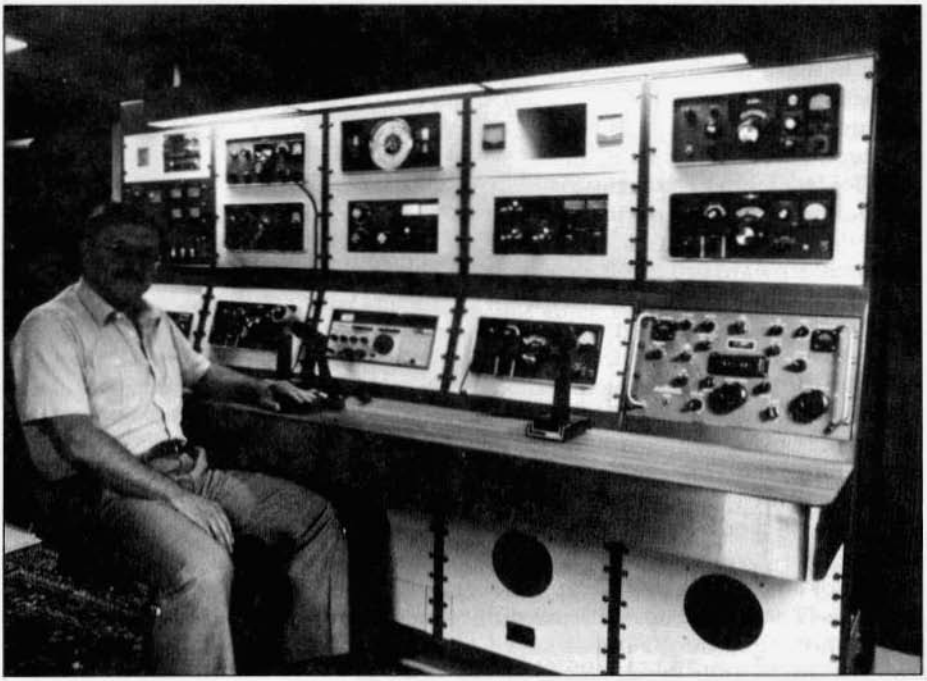
Display cases with Hallicrafters equipment on the right and National to the left.

A display case containing some of the miscellaneous items in the exhibit.

Mike Showman, KE8QG, at his operating position. The gear shown is mostly Heathkit.

Don Hilliard, WØPW, at one of his three vintage operating positions. Photo by W7FG.

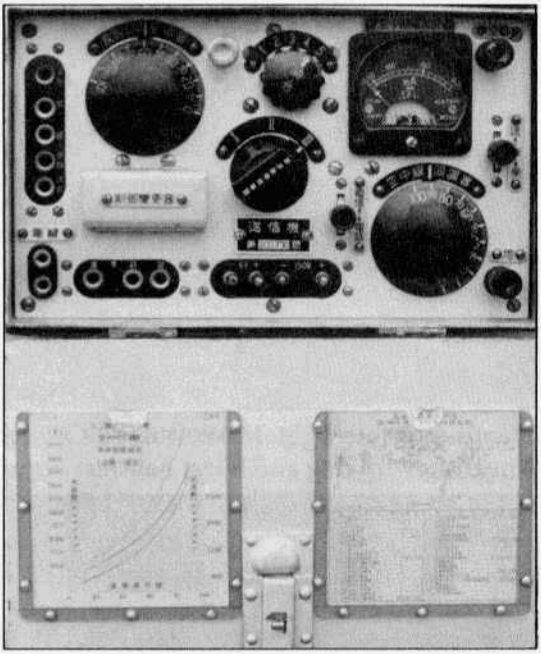
Standing, left to right: Mike, WB3CTC; Tim, N3DRB and Dennis, WA3YXN. Kneeling with dog and latest hamfest acquisition is Walt, KJ4KV.



Paul Hrivnak, VE3UP/W8, at his operating position which consists of mostly Collins gear.

Japanese Army Transmitter: Model 94-5

by Ken Lakin, KD6B
701 SE Salmon
Redmond, OR 97756



For a number of years I have been looking for a WW II Japanese radio set to put on the air during the fiftieth anniversary years of WW II. In particular I have been looking for a transmitter of the power that would make the long haul to Japan on a band such as 40 or 20 meters. Such a transmitter would fall in the power and frequency range of a liaison set. It was quite by accident that I acquired a set known officially as a Mark 32 Transmitter, part of the Model 94 Mark 5 Wireless Set but usually referred to simply as a 94-5 transmitter. A quick glance at the set revealed that it was a low-power reconnaissance type set and not likely to make any long distance contacts. It was then placed carefully on a shelf.

After the set (TX) had set on the shelf for an month or so curiosity got the best of me and I decided to see if it would at least squeak a little bit. A call to Bill Howard produced an instant over-the-phone identification of the set and a follow-up of more extensive data in the form of a US War Department Technical Bulletin describing the whole 94-5 set in some operational detail. A makeshift power supply was pressed into service and connected to the set with a handful of clip leads.

Using a US type 19 tube (with the A+ adjusted for 2 volts on the filament), instead of an original UZ12C Japanese tube, the TX was fired up. With painful howls and chirps the VFO was keyed over the three bands ranging from 800 KHz to 5200 KHz. However, when using my only Japanese crystal (5488 KHz) I was surprised to hear a perfectly clear note on CW. A quick trip to the storage shed produced an FT-243 crystal on 80 meters which operated in the TX with a slight chirp. So at a half watt output to an external tuner and with a slight accent the TX went on the air. Next it was time to try a lower band. Three hours and five soggy sheets of 320 grit emery paper later, an FT-171 crystal was moved from 1700 KHz to 1811 KHz and most of the subsequent operation was conducted on 160 meters.

Close to 70 contacts have been made on 80 and 160 over a period of a few months with one half watt output to a 160 meter dipole 15 feet off the ground. Many stations contacted were amazed that QRP at one half watt could be used

continued on page 36

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Wednesday nights at 8 PM PT on 3835.
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: Recently started by Pat, K7YIR, this net is on 3875, Mondays and Fridays at 9:30 PT. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT.
Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control is Les, K6HQI.
Arizona AM Net: Meets Sundays at 3 PM MT on 3860. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3875 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Military Radio Collectors Net: Meets Sundays at 4 PT on 3905. Net control is Tom, WA6OPE. It is not necessary to check in with military gear.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
Vintage CW Net: For CW ops who enjoy using vintage equipment.This is not a traffic net; speed is not important. The net meets on 14.062, Saturdays at 3 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.
NBFM Net: 3885 at 10.30 PT, Thursdays. Net control is Dennis Petrich, KØEOO.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Westcoast Broadcast Equipment Net: Tuesdays on 1959 at 9 PM PT. Anybody is invited to join the group, but the emphasis will be on broadcast equipment. Moderator is Mike, W6THW.

The T-807, A Compact 50 Watt Rig

by Bob Dennison, W2HBE
82 Virginia Ave.
Westmont, NJ 08108

In November 1936, just two months after I became amateur radio W9YRQ, RCA introduced an exciting new beam-power transmitting tube - the 807. It was the most beautiful tube ever conceived but at $3.90 it was too expensive for a poor kid like me. I was a freshman in high school and earned $3.50 a week working after school in a radio repair shop. A few years later I bought a used RK-39 (Raytheon's version of the 807) for $1. It convinced me that "beam-power" is not just an empty sales slogan but a real breakthrough in vacuum tube technology. After WW II, surplus 807s became available at very reasonable prices and even today they continue to show up at hamfests at bargain prices.

Over the years I've built many rigs using the 807 either in the final amplifier or in the modulator. Recently, I decided to build a new transmitter for use in the Antique Wireless Association's Old Timer's Contest and it seemed only natural that it should employ an 807 in the final. I would have liked to build the transmitter on a breadboard as was customary in the pre-war days but I knew this would result in too much TVI. So I accepted the fact that a shielded enclosure was mandatory. And once you enclose everything inside a shield you have to give up plug-in coils and resort to a bandswitch. Now if this were a commercial design, it would be necessary to somehow gang the oscillator and final amplifier bandswitches. But in an amateur rig we can use separate switches and substantially simplify the mechanical design.

Next I considered whether to use crystals or a VFO. I decided to make provision for both, using an external VFO that would be built at a later date. By omitting phone operation, size, weight and cost are minimized. While the original intent was to build a totally pre-war type rig, it seemed a shame to forego the advantages of such modern advances as the silicon diode, LED or zener diode. They offered advantages too good to resist. Then, one-by-one, I adopted other post Pearl Harbor developments - miniature VR tubes, ceramic feedthru condensers, discaps and capacitance-bridge neutralization. The final result is a compact CW transmitter measuring 12.5 x 8.87 x 8.75 inches, weighing only 14.75 pounds, exhibiting good keying with no chirp and putting out 50 watts on 80, 40 and 20; 40 watts on 15 and 20 watts on 10.

Many readers on *ER* have asked me "where do you buy your parts?" That's a good question and deserves an answer. I go to all the hamfests and AWA meets that are reasonably close. At each one I find a few parts that I think will come in handy for the projects I plan on doing in the future. I buy items that I may not use for several years simply because they are scarce and may not be seen again. Some items are more common and you soon will have more than you need so you might end up selling these or trading them for the items you haven't been able to find. Check your friends - they often have just what you're looking for. Don't forget the flea markets, yard sales and church or school bazaars. I avoid auctions because prices are invariably bid up too high for me. And don't forget to advertise in *ER*.

The oscillator uses 80 and 40 meter FT-243 type crystals since they are widely available. The quartz plates in these compact units are considerably smaller than the old pre-war crystals so

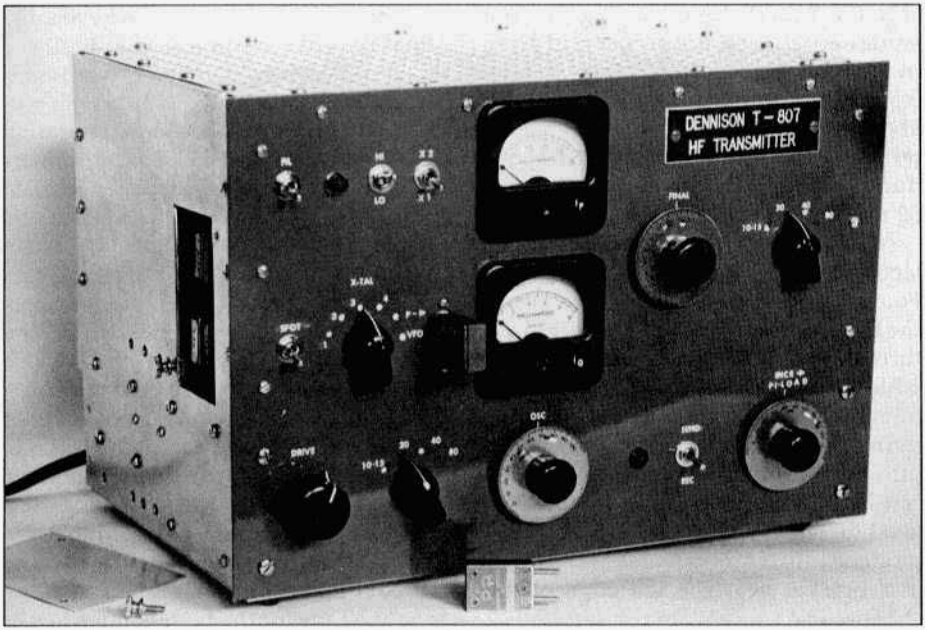


Fig. 1. Front View. This 50 watt transmitter weighs less than 15 pounds. Four crystals are located in the cavity at left, while a fifth plugs into panel socket.

they are more likely to heat up and cause frequency drift. Thus it is good engineering practice to use an oscillator circuit and tube known to result in low crystal current.(1) The 6AG7 (a 1939 TV tube) has very high transconductance and very low grid-plate capacitance so it excels in this respect. I chose the Jones (a.k.a. grid-plate) oscillator circuit rather than the tri-tet as it is easier to implement although the tri-tet would give more drive on 10 M. Because of its very high power sensitivity, the 6AG7 should have a parasitic stopper in its grid circuit. The item marked FB at the grid of the 6AG7 (see Fig.4) is a small ferrite bead slipped onto the wire connecting to pin 4 of the tube socket. If you don't have a bead in your junk box, a 27 ohm, 1/2 watt resistor will do.

Keying is done in the B- lead of the oscillator. Note that the bottom end of the grid leak, R1, does not go to ground but instead connects to the 6AG7 cathode. This gives the cleanest keying but results in +45 to +145 volts at the cathode when the key is open depending on the setting of the drive control. I didn't want this much voltage across the key so I incorporated a keying relay. Fortunately, my junk box had a C.P. Clare mercury-wetted relay that can easily follow keying. The values for the relay contact protection circuit, R4 and C16, are those given by Clare for the average current and voltage levels expected in the 6AG7 cathode circuit. The mercury relay must remain in a vertical position +/-30 degrees to function properly. Thus if it becomes necessary to position the transmitter on its left side to make tests under the chassis, remove the relay from its socket. The oscillator can then be keyed on and off by means of the SPOT switch, S2.

Mr. Chambers, in the article cited, mentions that regulated screen voltage should be used if good keying is desired. I use an OA2 regulator, V4, to ensure nearly constant screen voltage during keying. The DRIVE control, R3,

continued next page

T-807 from previous page
sets the actual screen voltage to the value needed to secure proper grid drive to the final. Normally this is set to give 3.5 mA but on the 10 meter band only about 1.5 mA is available. The transmitter must therefore be operated at reduced input on this band (Ip limited to 80 mA).

A switch on the front panel, S1, selects one of five crystals or the VFO. Four of the crystals are located inside the transmitter cabinet and are accessed through an opening in the left side which is normally covered by an aluminum plate held in place by two knurled thumbscrews. The fifth crystal plugs into a socket on the front panel and thus can be quickly and easily changed as need dictates. The internal crystals are plugged into two octal sockets mounted in a bracket near the left edge of the chassis. The sockets are rotated 22-1/2 degrees from vertical so that the crystals lie in a vertical plane.

The 6AG7 plate tank circuit (see coil data) is designed to have high Q to maximize drive to the 807. The tuning condenser, C5, is an APC type mounted on a bracket. Its rotor must be insulated from ground so it is provided with a Bakelite shaft extender which passes through the panel to the dial.

Final Amplifier. A pi-network output circuit was chosen because it reduces harmonic radiation and facilitates optimum adjustment of loading. The pi-loading condenser, C13, is a small, dual 450 pF broadcast receiver tuning condenser. An additional 1200 pF, C14, is switched in on 80 M. Capacitive-bridge neutralization is ideally suited for pi-net stages. A Millen 15003 piston type neutralizing condenser, C9, is mounted above the chassis near the 807. Note that C6 is also part of the neutralizing circuit so use a good quality mica condenser. The parasitic stopper, Z1, consists of 4 turns of plastic covered wire wound on a 47 ohm, 2 watt carbon resistor.

Since only the oscillator is keyed, the final requires enough bias to limit the plate and screen currents. Zener diodes D6, D7 and D8 provide this bias in economical fashion. Additional operating bias is provided by R5. Separate meters are used to indicate grid drive and plate current. They require little more panel space than one meter plus an adequately insulated rotary switch. I prefer a plate meter over one that reads cathode current, which includes grid and screen current. The terminals on the back of the plate meter as well as the terminals on switches S5, S6 and S7 are covered with tape as a safety measure. NOTE: The voltages used in this transmitter are potentially lethal and one should keep this in mind when working inside the cabinet or under the chassis. The bleeder current is fairly small so allow enough time for the filter condensers to discharge to a safe level.

The main tank coil, L4, is supported by two National type GS-2 steatite stand-off insulators while L3 (see coil data) is supported by its leads. The tank tuning condenser, C12, is mounted on the panel by means of its bushing. The HV lead passes through a cone shaped steatite insulator and thence to the bottom end of RFC 4. A shield 3 inches high is inserted between the 807 and the other components in the amplifier compartment. This shield is bolted to the rear wall.

Screen voltage for the 807 is taken from the VR tubes V3 and V4. Switch S5 marked HI-LO allows the use of lower screen voltage during initial tune-up. When the transmitter is in standby mode, both plate and screen voltages are removed by relay K2. Thus in standby, the SPOT switch, S2, turns on only the oscillator. Switch S7, marked X1/X2, puts a shunt across the plate meter to double its scale to 300 mA. This was done with the thought of limiting excessive swinging of the meter pointer during routine operation. After

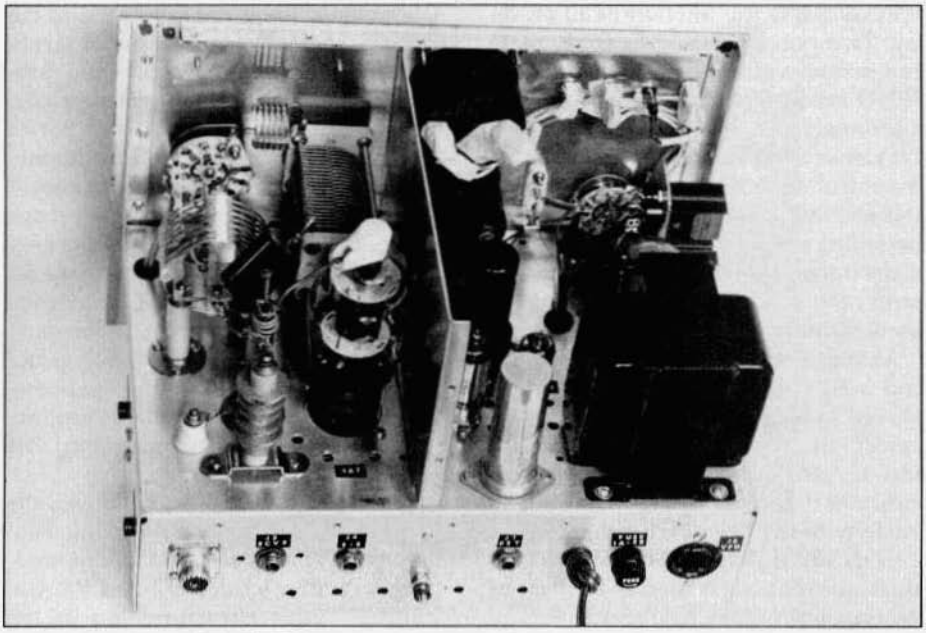


Fig. 2. Rear view with shields removed. Exposed terminals on plate meter and switches to its right are covered with tape for safety.

the transmitter was completed, it was discovered that the Simpson meter is highly damped so there was no problem. This switch and R17 could therefore be eliminated.

Under the chassis, there is a shield between the oscillator and final. Several ceramic feedthrough condensers are used to filter the power leads that pass through this shield. These capacitors are C18, C19, C24, C26 and C27. Only two other leads pass through this shield - the wire from C5 stator to the grid of the 807 and the wire from C5 rotor to C6.

The power supply uses a combination of a full-wave rectifier which gives 330 volts for the oscillator and a bridge rectifier to secure 680 volts for the final. The VR tubes ensure pure DC on the screen grids and lots of filter capacitance helps to keep the hum modulation of the signal down to less than 2.5%. The power transformer is rated at 120 mA with a full-wave rectifier so normally it should be loaded to no more than 60 mA with a bridge rectifier. But the 5 volt winding is not used (15 W) and the 6.3 volt winding is underloaded by 12.3 watts so we can safely increase the load on the HV winding another 40 mA. I estimate that in normal CW operation, the average input to the transformer is just about equal to its rated input. During standby the transformer input is about 40% of rating so it runs lukewarm in normal use.

Overlooked by many designers is the fact that the tube manufacturer often specifies a maximum heater-cathode voltage. For the 6AG7 tube, RCA sets a limit of +/- 90 volts. The cathode of the 6AG7 oscillator swings from near zero volts, key down, to somewhere between +45 volts and +145 volts, key up. Resistors R13 and R14 serve to bias the heaters of V1 and V2 to +75 volts thus protecting V1. The H-K rating of the 807 is given as +/-150 volts so it is well within limits.

continued next page

T-807 from previous page

Relay K2 is the SEND-RECEIVE relay. Two poles are used to apply plate and screen voltages to the 807 in the SEND mode. The third pole is used to disconnect the receiver headphones. Provision is made, via J4, to transfer S - R control to a remote switch. In my station, this switch also takes care of switching the antenna from the receiver to the transmitter. A red LED connected across the coil of K2 indicates that the transmitter is in the send mode.

A small Radio Shack transformer, T2, and a 50 volt bridge rectifier are employed in a circuit similar to the main power supply to give 9/6* volts for K2 and 15/10* volts for K1. The asterisk indicates the actual voltage in the SEND mode with the key down.

CONSTRUCTION. An 8 x 12 x 3 inch aluminum chassis is used as the base of the transmitter. The front panel, of .062 inch aluminum, measures 12 -1/2 x 8 - 1/2 inches. It is fastened to the chassis by four 6-32 screws and by the threaded shanks of R3, S3 and S8 and by the three mounting screws supporting C13. The back and side shields are made of .062 aluminum with 1/2" flanges. Three pieces of 1/2" aluminum angle are attached to the front panel along the top edge and each side - see Fig 2. The RF shield between the 6AG7 and the 807 is also .062 aluminum. Four rubber feet, 5/16" thick by 5/8" diameter, are attached to the bottom cover which is .05 aluminum. Sheet aluminum in various thicknesses can be purchased from Chas. Byers, 5120 Harmony Grove Rd., Dover, PA 17315. The top of the transmitter is covered with perforated sheet aluminum. All these shields are fastened by means of 3/8" No. 6 self-tapping sheet metal screws. An electric screw driver speeds assembly and is recommended. The screws that secure the bottom edges of the cabinet to the chassis enter a region where cabled wiring exists. To avoid damaging these cables, pieces of phenolic tubing, 5/16" Dia. X 3/8" long, are cemented to the chassis, enclosing each screw. A terminal is provided on the back of the chassis to permit grounding the transmitter. This consists of an 8-32 screw, nut, two flat washers and a knurled thumbnut.

The front panel was given one coat of Krylon No. 1346 green primer and one coat of Pep Boy's No. 1105 medium gray enamel. Each coat was allowed to air dry overnight then baked in the kitchen oven for two hours at 150 degrees F. Lettering was done using Dri-Transfer Letters - see *ER* #40, pg. 18. The nameplate was engraved by Fallert's Engraving, 27 Verlynn Ave., Hamilton, OH 45013.

INITIAL ADJUSTING. Loosen the locking nut on the neutralizing condenser, C9, and set it at about mid-range. Plug in V1, V2, V3 and V4. Unplug K1. Turn transmitter on its left side so that bottom wiring is accessible. Turn SPOT switch off, S5 to LO, S6 to off, S7 to X1, S8 to REC. Plug P1 into a 117 volt outlet. Turn FIL switch, S6, on. The VR tubes should glow, the green neon indicator and the 807 filament should light up. Measure the voltages indicated on the schematic. Thus the high voltage indicated as 760/680 should measure close to 760 volts. The second number is the voltage in SEND with the key down. If all voltages check OK, turn S1 off.

It is convenient to make a tuning chart to facilitate rapid tune-up when changing bands. Fig 5 shows the chart for my transmitter. The dials on C5 and C12 read 0-100 with 100 corresponding to minimum capacitance. The dial on C13 also reads 0-100 but 100 indicates maximum capacitance. Turning this dial clockwise reduces the capacitance and increases the load on the amplifier. Before beginning tune-up, it would be well to ascertain the approximate settings of C5 and C12 for the various bands by means of a grid-dip oscillator coupled to L1/L2 or L3/L4. Now reattach the

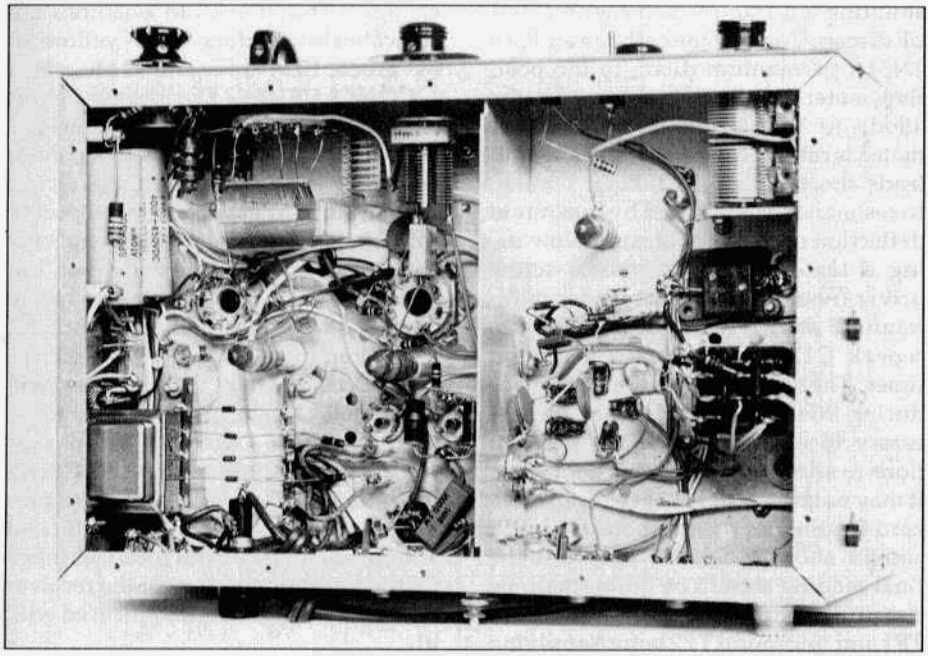


Fig. 3. Bottom view with cover plate removed. Relay K2 is mounted on right side of chassis by means of two 3/4 inch threaded pillars. The oscillator tuning condenser is supported by a bracket.

bottom shield and turn the transmitter upright. Remember that installing the bottom shield will slightly alter the dial settings found for C5.

Plug the key into J1, connect a 50 ohm dummy load to J2 and install relay K1. Lay the top shield in place and put a few small weights on it to hold it in place. Turn on the FIL switch, S6, and allow the tubes to warm up. Switch in an 80 meter crystal and set S3 and S4 to 80 M. Set the dials on C5 and C12 to the approximate settings found with the grid-dipper. Depress the key and adjust C5, OSC TUNE, for maximum grid current as indicated on M1. Adjust the DRIVE control, R3, for 3.5 mA drive. Turn S8 to SEND, depress the key and quickly tune C12 for a dip in plate current as read on M2. It is helpful to use an SWR meter that also reads power output. Now S5 can be thrown to HI and by alternately adjusting C13, LOAD, and retuning C12 for minimum, increase the power output until the 807 plate current reaches 100 mA. Power output should be about 50 watts. During this procedure you may have to readjust the DRIVE control to maintain 3.5 mA grid current. Turn off S8.

With a 40 M crystal in place, set S3 successively to the 40, 20, 15 and 10 M positions. At each position determine and record the settings of C5 for maximum grid current. These should be nearly the same settings found with the grid-dipper. If not, check with an absorption wavemeter to make sure. Now you can neutralize the final.

NEUTRALIZATION. If the transmitter is neutralized on 15 M it should hold for the other bands. Ground TP2. Select a 40 M crystal, turn S3 and S4 to 15 M and close the SPOT switch. Adjust C5, OSC Tune, for maximum grid current and then set the DRIVE control for 5 mA. Connect a sensitive RF detector to TP1. A suitable detector can be made by

continued next page

T-807 from previous page

shunting a 0-100 uA meter with a .001 uF discap. Connect the cathode end of a 1N34A germanium diode to the positive meter terminal and connect the anode to TP1. Connect the negative meter terminal to the chassis. Keep all leads short. Adjust C12, Final Tuning, to resonance as indicated by maximum deflection of the RF indicator. Now using a low-capacitance plastic screw driver (neut stick), adjust C9 for minimum RF at TP1. It will be necessary to repeak C12 and readjust C9 several times. The top shield should be in place during this adjustment. It may be necessary to enlarge one of the perforations to allow passage of the neut stick. It may not be possible to get an absolute zero reading on the RF indicator but it should show a definite null and the final reading should be quite small. Be sure to disconnect the RF indicator from TP1 and unground TP2 before applying plate voltage. Tighten the lock nut on C9.

FINAL ADJUSTMENT. Now you can tuneup the other bands and complete the tuning chart. Less drive is available on the higher bands so it is necessary to lower the plate current in order to avoid excessive plate dissipation. NOTE: Plate dissipation equals E(pk) x Ip - P out and this should not exceed 35 watts. It will be about 15 watts on 80 and 40 but will slowly increase as the frequency increases.

Both bandswitches and all the dials are color-coded to facilitate rapid band changes. Thus the 80 M positions are indicated by red dots, 40 M - yellow, 20 M - green, 15 M - blue and 10 M - white.

CONCLUSION. During the February 1994 AWA Old Timer's Contest, I made 87 valid contacts. In this contest we don't exchange RST or QTH, yet several stations gave me a 599 report or said I had 'vy gud sigs'. Since the contest band is only 20 Kc wide, you can imagine the congestion. We also had to contend with simultaneous contests sponsored by QCWA and the QRP fellows. On top of that, there were several traffic nets and the usual RTTY signals. And not to be forgotten, the S9 plus signals from W1AW sending code practice lessons. My receiver was a two tube regenerative set using a 57 detector and a 56 audio amplifier. But the T-807 made up for any shortcomings of the receiver and did a fine job. I'm well pleased with it!

1. "Crystal-Controlled Oscillators", C. Vernon Chambers, W1JEQ, QST, March 1950.

If anyone wants to build a copy of the T-807, the author has prepared a set of drawings, parts list and color photos which are available for $4 postpaid. ER

COIL DATA:

L1 - 7-1/2 turns No. 18, 8 tpi, 5/8" dia., B&W 3006.
L2 - 40 turns No. 24, 32 tpi, 1" dia., B&W 3016, tapped 7 t and 15 t from L1 end.
L3 - 51/2 turns No. 16, 8 tpi, 1" dia., B&W 3014.
L4 - 15 turns No. 16, 12 tpi, 2" dia., Air Dux, tapped 3.35 t and 8.4 t from J2 end.

Band	xtal	osc	final	load	Ip	Po	Ig	Pdiss
80	80	48	24	47	100	50	3.5	15
40	40	48	75	73	100	50	3.5	15
20	40	75	91	40	100	50	3.5	15
15	40	45	81	83	100	40	3.5	25
10	40	82	92	63	82	20	1.5	33

Fig. 5. Representative tuning chart for the T-807

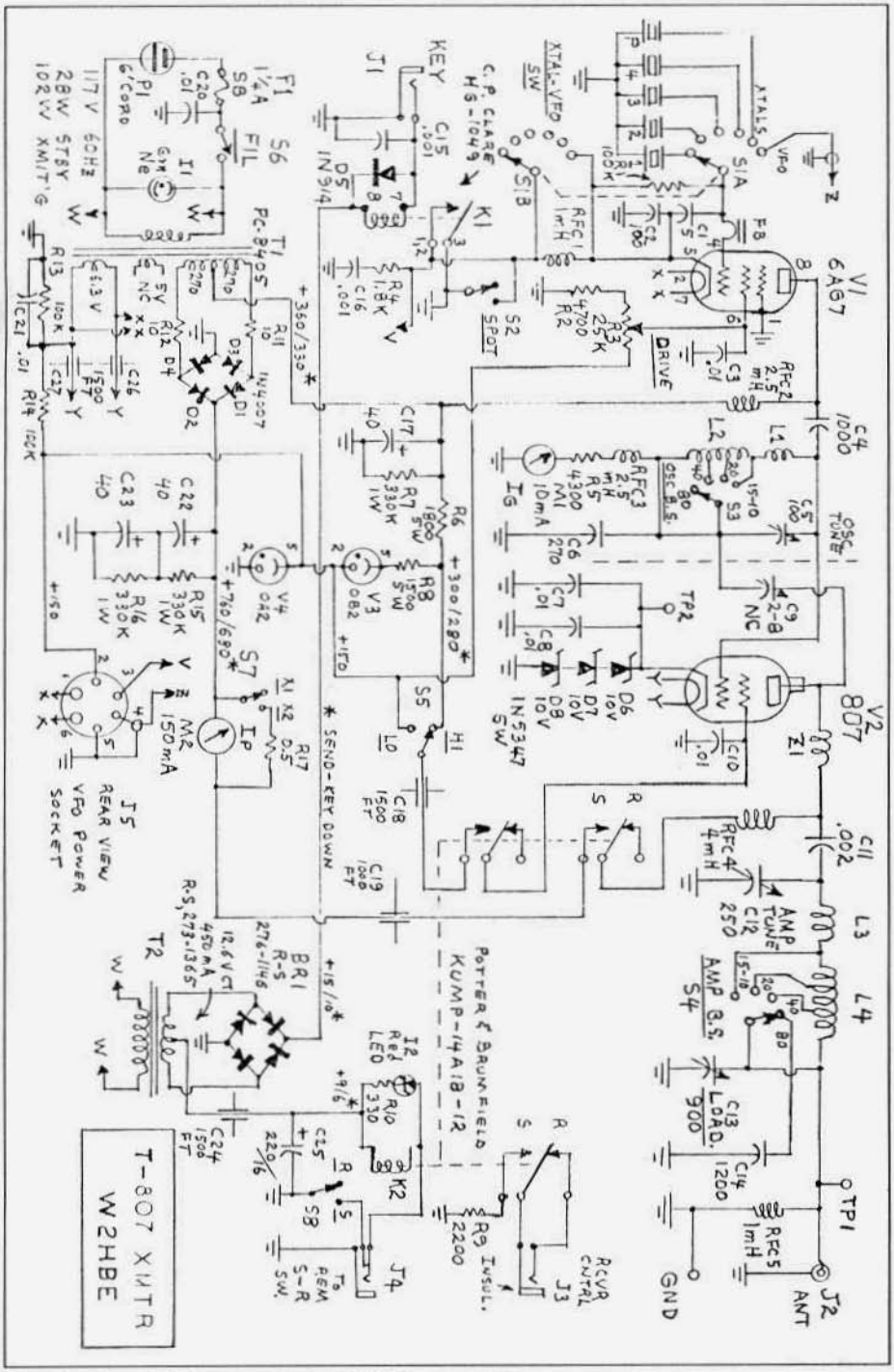


Fig. 4. Circuit diagram of the T-807 transmitter.

Index to the Fifth Year of ER, #49-#60

Modifications

NBFM

Receivers

Single Sideband

Transmitters, Transceivers and Amplifiers

Photographs of Hams

District #1: AJ1G - #51, KA1GON - #51, WB1GCM - #57, KK1K - #51, WA1NZR - #51,

District #2: NY2H - #54, N2INR - #52/54, W2IPI - #54, W2IQ - #54/57, N2QEI - #54, WA2VMO - #54,

District #3: W3BYM - #51, WB3CTC - #60, N3DRB - #54/60, K3EWZ - #54, WB3FAU - #54, N3GWE - #56, WB3HUZ - #52/#54, W3ONE - #52, WA3VJB - #52/54, WA3WBC - #54, WA3YXN - #60, K3ZRF - #54,

District #4: KD4AS - #55, WD4AYS - #50, K4JBJ - #54, WA4KCY - #54, KJ4KV- #60, W4MDY - #52, W4PNM - #54, KB4VR - #51,

District #5: W5LUT - #56, K5MZH - #50, NO5N - #49, W5PYT - #60, K5SWK - #50,

District #6: W6BM - #49, N6CC - #59, WA6GBJ - #55, NU6H- #50/57, W6HFZ - #57, N6HL - #58, K6HQI - #51, WA6IPD - #57, K6JAD - #51, ex-K6LXT - #57, KD6OS - #55, K6PFW - #50/57, W6RIQ - #56, W6RNC - #49/56, WB6TMY - #51, W6UBM - #53, KU6X - #50/57, WA6VVL - #57, AB6XK - #59,

District #7: WA7DAX - #58, K7DU - #51,WB7EOB - #49, KL7HDY - #57, K7INK - #53, W7MBR - #53, AJ7O - #57, W7US - #58, KF7VA - #58,

District #8: AA8AD - #59, WD8AZD - #57, N8BFD - #57, KE8QG - #60, W8GNV - #52, KB8IZX - #50, WA9JIW - #52, W8LHP - #57,

District #9:WA9AZK - #49, KA9BGS - #52, W9BZ - #52, W9CN - #58, KA9CWK - #52, WA9EEC - #52, WB9GKZ - #59, N9GT - #57, W9INP - #58, VE3UP/W8, K9OVP - #52, W9PSD - #52, K9RJ - #56,

District #0: WØAEE - #51, WØARZ - #50, KØBKA - #59, NØCFF - #51, N6CSW/Ø - #53, WØIWV - #51, KØOJ 0 #51, K8MLV/Ø - #51, WØPW - #60, WØSCU - #50, WB7VON/Ø - #53, WAØVRC - #55,

Other Districts: HB9AQS - #52, HB9LCI - #50, F1HSH - #53, JA1EIA - #55, VE3WKW - $58

The Antenna Null Meter

A Well Known But Seldom Used System

by Al Roehm, W2OBJ
22 Brookdale Rd.
Cranford, NJ 07016

I suspect that most readers of *ER* use hollow-state transmitters that require tuning of the output stage. If a tuner is also employed to obtain multiband operation, then the Antenna Null Meter described here should prove to be very interesting and useful.

Background And Circuit Description

There are many ways to realize multiband operation from an antenna system. For example, we can use separate antennas for each band, or several dipoles fed from one coaxial feeder. Another common method employs traps, such as in a five-band dipole or tri-band beam. The use of a tuner is another popular solution and very efficient if an open-wire feeder is used. The only disadvantage of using a tuner is the need to include an indicator to tell when a 50-Ohm resistive match has been achieved for a given frequency. Of course, an automatic tuning unit (ATU) overcomes this disadvantage. However, the presently available ATU's have a narrow matching range (usually under a 3 to 1 SWR) and are very expensive (around $500).

Some common indicators and their characteristics for use with a tuner include:

Wattmeter
- not frequency sensitive (uses a toroidal coil to detect RF across all HF bands.
- tune for minimum reflected power.
- some newer transceivers have FWD/REF wattmeter circuits built-in.

VSWR Bridge
- strip line or other sensor designs are frequency sensitive.
- requires sensitivity control to calibrate the bridge on each band.
- tune for minimum SWR.

Ammeter, thermocouple, lamp, etc.
- used in or on the transmission line to sense rf power.

Resistive Bridge
- uses carbon resistors, and therefore is not frequency sensitive.
- tune for null (bridge balance.)
- reduces QRM during tune-up.
- CANNOT REMAIN IN FEEDLINE during normal operation.

The idea of using a Wheatstone bridge for adjusting an antenna tuner is not new. Two of the more recent articles on this subject are listed in the references. However, because this technique is so well suited to hollow-state rigs, I want to recommend it to the ER fraternity.

Let's look at the simple DC Wheatstone bridge shown in Figure 1. The bridge is balanced when $R_1/R_2 = R_3/R_4$. Then, the voltage at point A is equal to the voltage at point B. A simple way to prove this is to consider the amount of current in the left side (I_L) compared to the current in the right side (I_R). Using the numerical values shown in Figure 1 we have.

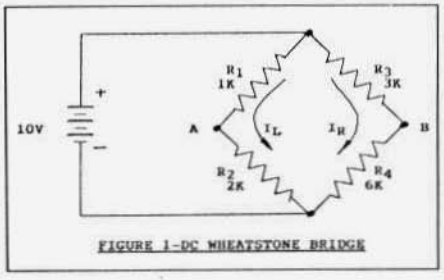


FIGURE 1-DC WHEATSTONE BRIDGE

$$I_L = \frac{V}{R_1 + R_2} = \frac{10}{3K} = 3.33mA$$

$$I_R = \frac{V}{R_3 + R_4} = \frac{10}{9K} = 1.11mA$$

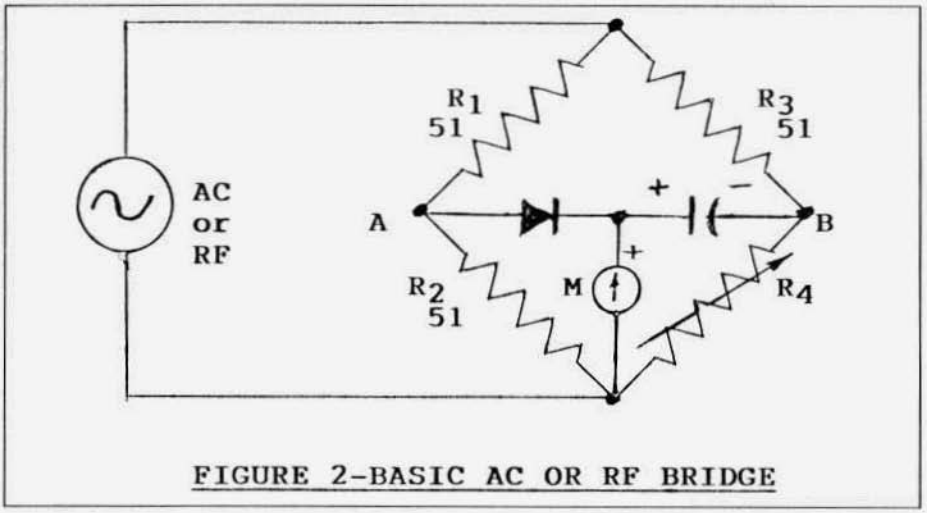


FIGURE 2–BASIC AC OR RF BRIDGE

Then, the voltage at point A = I_L x R_2 = 3.33mA x 2K = 6.66V

Similarly, the voltage at point B = I_R x R_4 = 1.11mA x 6K = 6.66V

The exact same relationship exists when the DC source is changed to AC or RF. The calculations can then be based either on ^{V}RMS, ^{V}PEAK or ^{V}P-P.

If you make one of the resistors (such as R_4 Figure 1) variable, you can detect the condition of bridge balance by measuring the difference in voltage between points A and B using a mA meter having a center-zero scale. If point A is greater than point B with a DC source, the meter's pointer will deflect to the right of center. If A is less than B, the pointer will deflect to the left of zero. A balanced bridge condition, where the voltage at point A equals the voltage at point B, will be indicated by a zero (mid-scale) reading. Note that no calibration of the system is required since we are not interested in actual meter readings. We merely desire to sense pointer direction and to know when the bridge is balanced.

When we have an AC (RF) source, the handiest method of sensing a balanced bridge condition is to rectify the current resulting from a difference in voltage between points A and B. You can use a conventional DC mA meter with zero at the left end of the scale, as shown in Figure 2. Circuit operation, based on positive to negative current flow, is as follows: When the voltage drop across R_2 exceeds the drop across R_4, the diode will conduct on the positive half of each cycle and charge the capacitor to the polarity shown. During the negative part of each cycle, conduction is blocked because the diode is reverse biased. Conversely, when the voltage drop across R_2 is less than that across R_4, the diode conducts only on the negative part of the cycle. However, the polarity of the charge on the capacitor plates remains the same and a center-zero meter is not required.

Note that when the null meter circuit is used with an antenna tuner, R_4 is replaced by the input impedance of the tuner. However, it's not good enough to simply adjust the tuner so its input impedance is equal to R_2. The reactance also needs to be cancelled by the tuner to eliminate phase shift.

Figures 3, 4, 5 and 6 show one version of a practical null meter for use with typical 100-Wtransmitters. It is based

continued next page

Antenna Null Meter from previous page

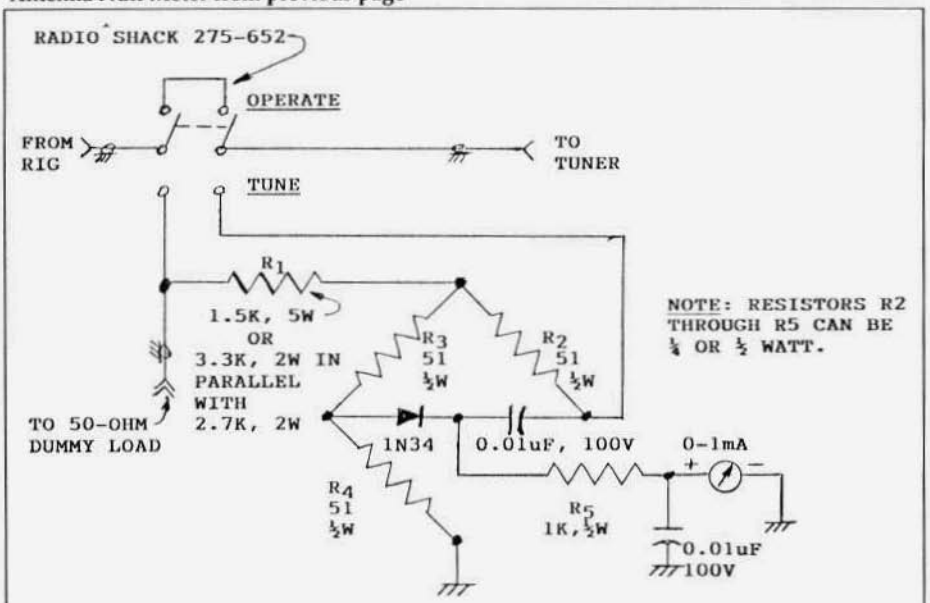


FIGURE 3-NULL METER CIRCUIT

on the information given in Reference 2. Some errors in resistor wattage ratings in that article have been corrected here. A 0-1 mA meter can be used with input powers as low as 8 to 10 watts. For QRP rigs, a more sensitive meter movement is recommended and the value of R5 adjusted accordingly.

Operation

Using the NULL METER is very simple. Move the TUNE/OPERATE switch to the TUNE position. This places the dummy load into the circuit and the rig can be tuned up in the normal manner. Usually, it's only necessary to tune for maximum deflection on the NULL METER. However, use only enough drive power to move the meter to 1/4 or 1/3 of full scale to limit QRM. Now, without touching the rig's plate or load controls, adjust the tuner for a zero reading on the Null Meter. In the TUNE position a small amount of power is extracted from the dummy load to drive the bridge, tuner and antenna., For example, when a 100W power level is used to drive the Null Meter, only 25mW is radiated by the antenna. And, with 10W of drive the emitted power is reduced to only 2.5mW. This relative reduction in power reduces QRM by 36dB.

Increase the rig's output to the normal level. Then, return the TUNE/OPERATE switch to the OPERATE position and enjoy QSO's knowing that you DID NOT establish a National tune-up frequency. To receive extremely strong signals, switch back to the TUNE position to insert 36dB of attenuation. **ER**

References:

1. ARRL Solid State Design Manual, page 152.
2. Jerry Volpe, KB8ZO, CQ, August 1983, page 56.

Editor's Note:

I built the Antenna Null Meter and I would encourage everyone who uses a multi-band antenna and tuner to do the same. It's a station accessory I wouldn't be without.

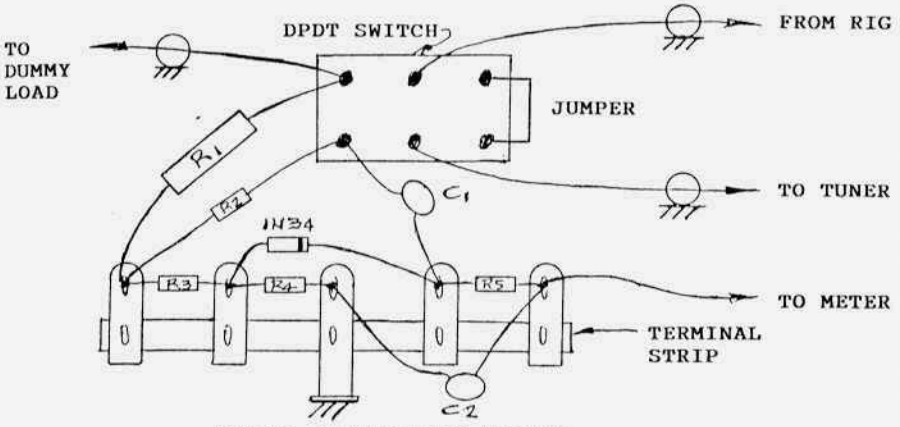


FIGURE 4-SUGGESTED WIRING

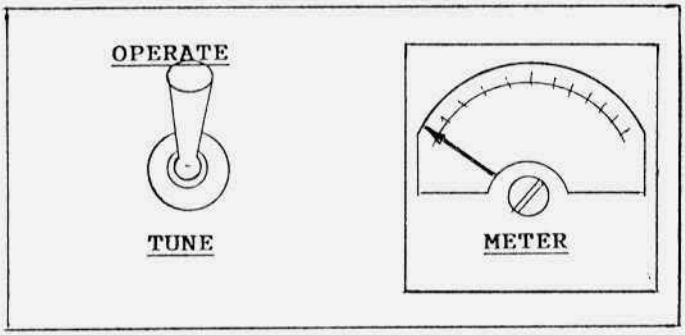


FIGURE 5-FRONT VIEW

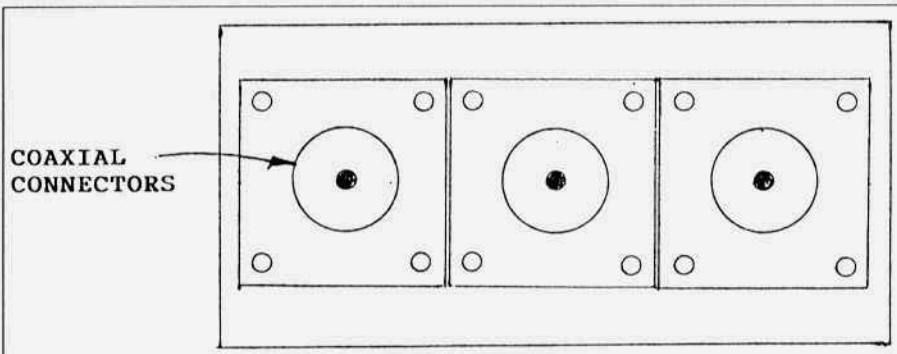


FIGURE 6-REAR VIEW

---The E.F. Johnson Viking Challenger---

by Dave Ishmael, WA6VVL
1118 Paularino Ave.
Costa Mesa, CA

Although my first homebrew CW transmitter used a 6AG7 on 80/40M, most of my early CW xmtr designs revolved around the 6DQ6 sweep tube (Lewis G. McCoy/W1ICP, A Three-Band One Tube Novice Transmitter, QST, December 1957, pgs. 34-37 or 1961 ARRL Handbook pgs. 171-173).

Junk B&W TVs were plentiful in the early '60's so there was no shortage of power supply components AND sweep tubes. I'm sure I had some access to "real" RF tubes, but the 6DQ6 became my tube of choice for several years. I may have been more than a bit biased after using WA6AWD's DX-20 (ER #55), which used a 6DQ6A in the final, for many of my novice and conditional QSOs. In any event, I used 6DQ6s in most of my homebrew xmtrs from '60-'62.

It was this background that made me curious about the E.F. Johnson Viking Challenger. TheChallenger is the epitome of a sweep tube rig - 2 6DQ6Bs in the final driven by a single 6DQ6B. The Challenger is a 120W CW, 70W AM, xtal controlled, CW/AM xmtr with single-knob bandswitching on 80-6M. The pi-network will accommodate output impedances in the range of 40-600 ohms using a coarse/fine loading network. The balance of the Challenger's tube line-up consists of a 6DS5 crystal oscillator, 12AX7 speech amplifier, 6AQ5 clamp/screen modulator, and a 5U4GB rectifier. The power supply uses a choke input filter that delivers 580 VDC key-down at 220 mA. The power transformer is "huge" - Johnson did not skimp on iron in the xfmr.

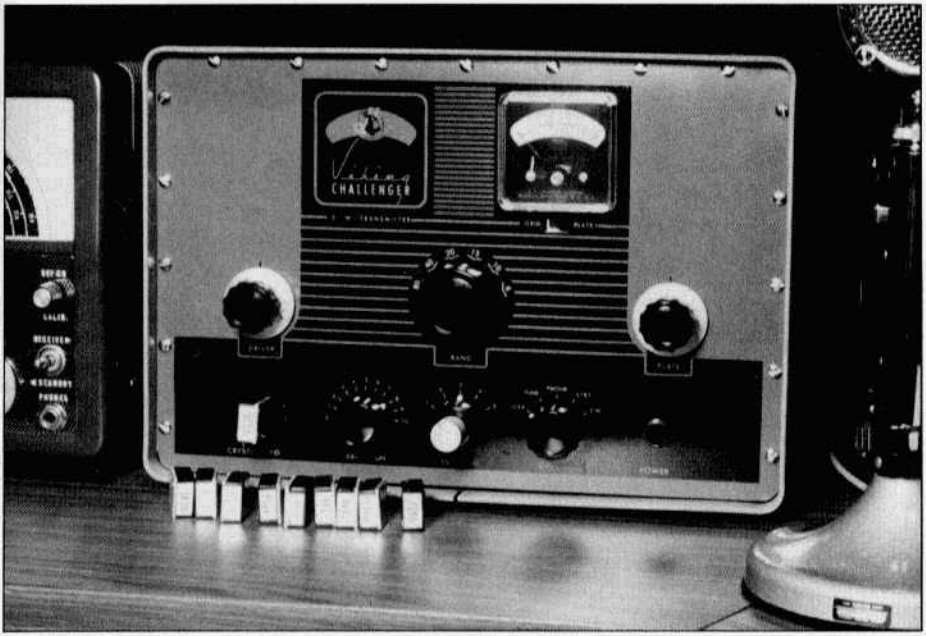
The Challenger was first sold in 1958 and was sold through 1966 when E.F. Johnson ceased production. A total of 3,836 were built (ER #27, pg. 11). The tubes in my Challenger were original, and based on the 63-03 date codes of the 6DQ6Bs, this rig was sold as early as 1963. The Challenger sold for $114.75 in kit-form or $154.75 wired and tested.

My Challenger arrived via UPS with considerable "shipping damage". The front panel was badly bent, both 6DQ6B finals were broken, and the internal aluminum shield was very loose. The damage was caused by poor packaging and NOT UPS! I spent several hours repairing the shipping damage before turning my attention to the Challenger's operation.

Before powering up the Challenger, I checked the leakage of the original 80 uFd 450V filter caps. Both were leaky and needed replacement. When I replaced the filter caps, I ended up completely rewiring the power supply, from the line cord to the filter caps - one thing just led to another.

While the Challenger's layout above the chassis appears to be pretty reasonable, the wiring below can best be described as "cluttered". Many of my vintage xmtr kits are pretty good examples of clean, well thought out, point-to-point wiring. The Challenger, however, is NOT one of them. In addition, I didn't need the 240-182-1 P/N on the S/N tag to figure out that it wasn't factory wired. I didn't rewire it but I spent several hours cleaning up the "rough spots".

Bringing the Challenger up on a Variac revealed no obvious problems but something under the chassis sure was hot. Both R28 (10K 10W) and R25 (40K 15W) ran unreasonably hot. R28's calculated power dissipation in the CW mode, key-up, is 10.9W, and 19.8W in AM. R25 dissipates 10.2W. I replaced two of the power transformer's mounting screws with 10-32 x 2-1/2" screws and used these screws to vertically mount R25 and R29 (30K 20W). The 10-32 screws act as a heat sink for R25/R29. I replaced R28 with a 10K 25W. The Challenger's power supply wiring is no longer "stock" but it no longer smells like it is "burning".



The Challenger is a 120W CW, 70W AM , xtal controlled, CW/AM xmtr with single-knob bandswitching on 80-6M.

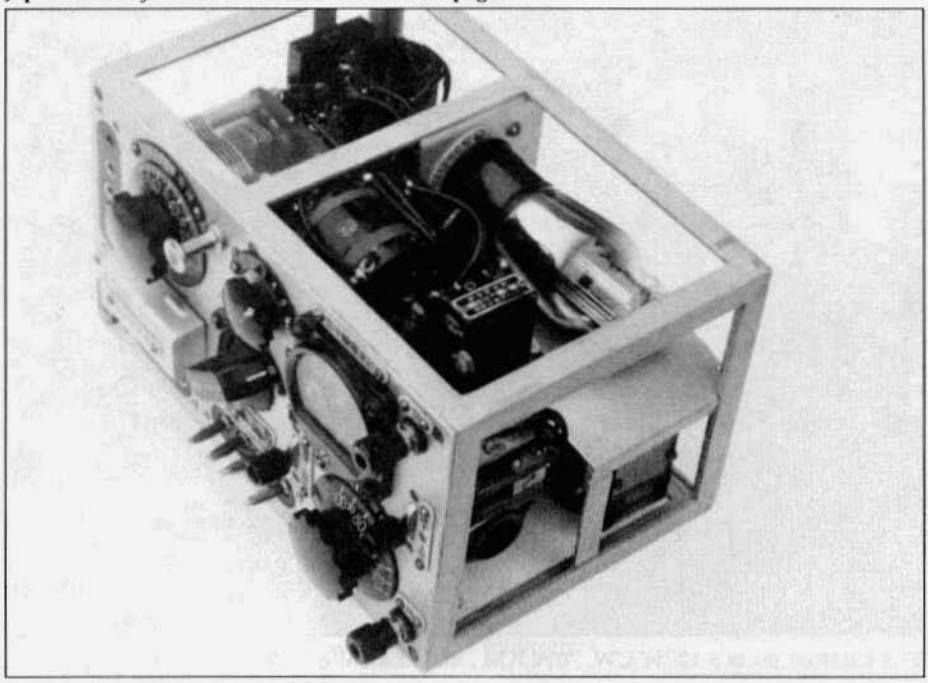
One of the first things I did was to get a signal report on 80M CW from Dave Mills, AJ7O. Dave is about 7 miles away and he gave me good tone reports but said that the Challenger "keyed a bit soft". At 100W output, Dave could just hear the xtal oscillator being keyed but said that it wasn't bad. My first CW QSO with Millard, KN7NYB, also received a good signal report. The keyed waveform on my Kenwood SM-220 monitor scope looked OK. Since only the 6DS5 crystal oscillator and 6DQ6B driver are keyed (approx. 33 mA key-down), I had no problems keying the Challenger with my solid-state HK5A keyer.

The original audio input RCA phono jack had already been replaced with a 1/4" phone jack so I made the hole a tad larger and installed a standard 4-pin microphone connector to fit my amplified-base D-104. Switching to AM, Dave said the audio sounded "restricted". I changed the 0.001 uFd coupling caps to 0.015 uFd and replaced the two 10 uFd cathode bypass caps. Dave now gave me a good audio report and said that I sounded more natural. I also received good audio reports from a round-table AM QSO later in the week.

The maroon cabinet was beyond just touching-up so I repainted it grey wrinkle to semi-match my SX-100.

The Challenger is now sitting beside my SX-100 and is used primarily for CW. I'm keeping the Viking I for my AM QSOs. The Challenger is relatively fast and easy to tune and input power easily exceeds 120W on CW. The off-resonance plate current is almost 400 mA so you don't want to spend too much time in an off resonance condition. I suspect that the power transformer has more than enough capacity to cause a "meltdown" of the finals in an off resonance condition. ER

For additional reading, try the Challenger review in the December, 1959 QST, pgs. 46-47.



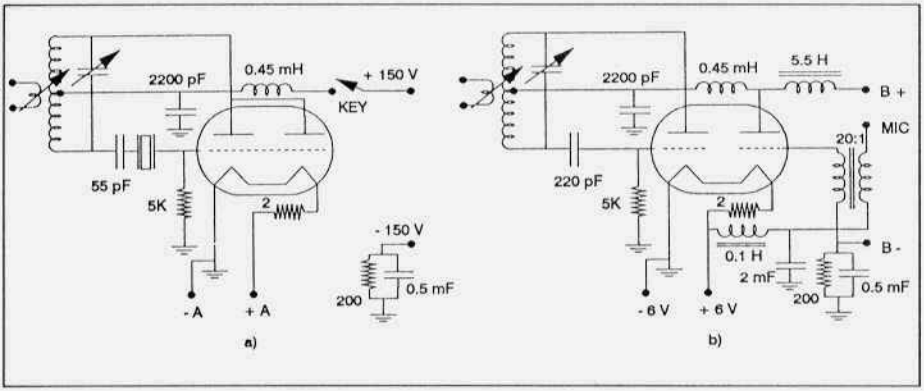
Model 94-5 with case removed.

so effectively on 160. I even enjoyed a number of QRP contacts with VE7CK (about 400 miles away, with an antenna 150 feet high!) even after he occasionally reduced his power to 100 mW. All contacts were unsolicited except one. During one contact, a station in the San Francisco area, KK6H, put me on the 2 meter DX packet cluster as a rare station or something, After my contact with him all heck broke loose and I was on the receiving end of a small pile up! Of course I picked a 5 station who I thought would be "DX" but only turned out to be a transplant to the Northwest like myself. DXer's have limited patience so only one contact was made that way. The longest contacts have been 900 miles on 80 meters and 600 miles on 160. Reports of RST 589 were common out to 300 miles distance.

From a technical perspective I am impressed by the almost elegant simplicity of the TX, particularly in the context of its original wartime operating environment. The simplified circuits, shown in Figure 1, are those of a triode Hartley type oscillator. For clarity, one schematic shows crystal with CW and the other VFO with AM. Likewise, the three band coils, antenna tuner, CW/AM, and TX/RX switching arrangements are not shown.

AM operation, which has not been evaluated in detail, is at approximately half the CW power level, uses Heising modulation, and a single button carbon mike biased from the filament circuit. When in AM the modulator portion of the dual triode obtains bias from the network in the negative lead of the power source. Since the type 19 does not draw enough current, the bias produced is inadequate and heavy distortion was observed on the oscilloscope for sine wave input.

Using the type 19 tube, I measured an open-loop gain of 3, which helps explain the undetectable chirp on crystal control using the lower impedance FT-



171 crystals on 1811 and 3570 KHz. Further, the correct phase relationship for oscillation coincided with the peak in feedback through the crystal, which is a good sign. Open-loop measurement of the transient response showed that keying the B+ line rings the tuned circuit including the crystal. The large open-loop gain, and possibly the keying transient initiation, produces a rapid exponential rise in oscillation and accordingly saturation is reached in a time too short to detect any chirp by ear.

On closed-loop VFO operation the large excess gain produces hard saturation, a very rough note on almost all frequencies, and lots of spurs. However, on crystal control the series connected crystal filters the signal to produce a clean note. Without the internal antenna tuner, the variable link was able to match resistive loads from 30 to 150 ohms with approximately 1 watt output and oscillator efficiency of 20% (not including filament power). The conduction angle was measured at 116 degrees, well within the class C range.

All measurement results must be qualified somewhat because the use of a type 19 tube does not necessarily reflect on operation (better or worse) with a UZ12C, which reportedly produces 1.6 watts output. I have not found any information on the transconductance of the UZ12C for comparison with the 19. The circuit implies that the UZ12C has a 5 volt, 500 mA filament, suggesting a considerably more powerful tube than the type 19.

Mechanically the TX is ruggedly built with a strong angle iron frame supporting a number of plates to which circuit elements are bolted. The set is very clean containing no MFP, or for that matter LSNFT, coatings. The internal circuitry has very little protection from the environment and reportedly did poorly in hot, humid, fungus and insect infested environments as might be found in the jungle. The variable capacitors are protected from dust with celluloid covers. The antenna tuner capacitor contained a surprising feature; dielectric spacers between the plates just like those found in small transistor radios today. Banana plugs and jacks are used for all I/O connections. Leather flaps covering the front of the unit (top and bottom flaps are missing on this unit) were used for further protection and a leather shoulder strap was used for transporting the unit.

Future plans are to produce a breadboard version of the CW TX to further explore crystal control and VFO operation under chirp free conditions. Hopefully I will find the companion three tube receiver, proper UZ12C tube for the TX, and do a complete modern technical and operational review of the set.

Perhaps this short article will stimulate some more experimental work on low power tube RX/TX equipment for on-the-air operation. ER

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 25 word- ad per month. **Extra words are .15.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word**. Your name, call, address and telephone number count as **6 words**. Hyphenated words count as **2 words**. **Please count the words in your ad and if you're over 25 words send payment for the extra words.**

Non-subscribers: $3 minimum for each ad (up to 20 words). Each additional word is .20. **Please call or write for display rates.**

VINTAGE EQUIPMENT ONLY

ER
P.O. Box 57
Hesperus, CO 81326 **Phone/FAX 303-247-4935**

DEADLINE FOR THE MAY ISSUE: MAY 3

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

FOR SALE: Forest Service radios (Type SPF, U.S. Army-Signal Corps) Spokane Radio Corporation 500A - Radio and Transmitter self-contained in grey wooden carry-cases stamped "SC 486 A". Complete pair with matching crystals. Best offer. John Bittner, WR3C, 1618 Pinna Ct., Raleigh, NC 27606. (919) 851-5897

WANTED: Lafayette Explor-Air schematic or complete manual. Jim Kearman, KR1S, (203) 667-2568 or c/o ARRL.

WANTED: WRL SS3 Q-Multiplier (1965); Brown Brothers straight key; Knight DX'er transistor regen. rcvr. Gary Wagner, K3OMI, 11124 Oak Hollow Rd., Knoxville, TN 37932. (615) 690-4217

FOR SALE: Transmitting parts, Hammarlund, National, Johnson and Cardwell variable condensers of all sizes; vacuum condensers; B&W coils, w/swinging links from 100 watts to over 1 KW; xmting tubes from 2E26's to 4-1000A, w/air flow sockets and chimneys. Send wnt list with SASE for mine. Roland V. Matson, RFD #1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

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

NOTICE: General Radio Company collectors. Exchange information, catalogs and instruments. SASE for list and information. Bill Springer, K5CGR, 923 Nelda, Houston, TX 77088. Thank you.

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

TRADE: Tube Bank Exchange. Swap your new-in-box tubes for our NIB tubes. SASE for info. TBE, POB 806, Lake City, MI 49651.

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

WANTED: Tec manual and selectivity knob for SP-600-VLF. **FOR SALE:** NC #NPW-0 (HRO style) gear drive with micrometer dial - $75. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (602) 624-8029

Collins
Restoration/Repairs/Painting
S-Line etc. and St. James boxes. Also have KHZ dials and hoods for SC101 and 312A-1. Butch, KØBS, (507) 288-0044.

FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. List $1 (stamps ok); vacuum tubes list SASE. Softwave, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

WANTED: Hallicrafters HT-18 variable freq. oscillator (7-tube version). Hank, W6SKC, (602) 281-1681, FAX (602) 281-1684

FOR SALE: Collins 30S-1 plus 2 spare 4CX-1000's, very nice condx - $1895 OBO; Collins 212S-1 broadcast console - $395; RCA CR-88A rcvr, operational - $350. Gary, KE6MS, (310) 696-0177

FOR SALE: Hi-Fi tubes. **WANTED:** Collins Collectors Magazine, Aug., '92; Radiotron Designers Handbook, Ed. 1, 2, 3 and 4; rcvr regenerative homebrew w/tubes, working; Eico 730 modulator and 722 VFO working. Send offers, I reply to all. Andrea Moretti, Via Colle Bisenzio 31, 50040 Usella FI, Italy.

FOR SALE: National HRO-60 - $425; 1931 National SW-3 (S-101), 3-tube set - $275; w/ matching National Velvet A-B mod 5880 - $125; Hallicrafters SX-62A rcvr - $475; Hallicrafts S-38C - $200; Hallicrafters R46A spkr - $125; Hallicrafters S-120 - $150; Jensen 12" spkr - $110; Hammarlund 100-C - $125; Hallicrafters SR "Sky Rider Jr." - $75. Larry Drago, 383 Lincoln Dr., Cheshire, CT 06410. (203) 272-6030

TRADE: Measurements model 65B, clean, for HF gear. Brian, KA9EGW, (708) 487-5424

WANTED: The following for BC-342 - RA-20 pwr sply, audio output xfmr, shock mount; R-390A modules and top and bottom covers. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

FOR SALE: NOS Johnson xtal sockets, for Viking II, hold 10 xtals - $5.50 each. **WANTED:** Johnson 122 VFO; Heath VF-1. Jack C. Shutt, N9GT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

WANTED: Trying to find "Radiotron Designer's Handbook" for personal use. Thanks! Ward Shrake, POB 4699, Covina, CA 91723. (818) 919-0499

Lafayette Radio and Vintage Manuals Available. Over 2000 manuals in stock. Satisfaction Guaranteed. List, low price quote, write or call, Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

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

FOR SALE: They're beautiful! Replacement VFO dial numeral bezels for Collins 51J, 75A and B&W 5100 units. Easy to install - not an adhesive decal. $10 postpaid. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803.

WANTED: Manuals or copies for Navy RBA rcvr and Heath HG-10B VFO. **FOR SALE:** RBB/C pwr sply. Bill Strangfeld, WB8YUW, 254 Elm Ave., Cincinnati, OH 45215. (513) 948-1071

FOR SALE: W.J. log periodic antennas, VHF to UHF, 26 elements, AZ-EL mount, like new - $125. Orig. cost $1650. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

WANTED: RF compartment dust cover for 75A-4; AM filter for SB-303. Jim, KK3H, 119 Hampton Ct., Butler, PA 16001. (412) 285-8564

FOR SALE: RME MC-55 mobile converter, 80-10 meter - $30; Pierson KE-93 - $35; Multi-Elmac A-54 - $40. + UPS. Dan Mason, R. RT. 1, Box 204F, Santa Fe, NM 87501. (505) 455-3416

WANTED: Clean National NC-98 and Eico 730 modulator, w/cover. George, (805) 682-3094

FOR SALE: Hallicrafters SX-24, matching spkr, additional tuner, audio oscillator - $175 + UPS. Will trade for tube mono/stereo power amps. Bob Burleson, 1731 Naudain St., Phila., PA 19146. (215) 545-5726

FOR SALE: WRL Galaxy V MK 2, remote VFO, deluxe accessory console, model 2000 amplifier, AC/DC pwr supplies, manuals, exc. condx - $1200. Harry Ober, WB6CGZ, POB 174, Palmdale, CA 93590. (805) 285-9700

WANTED: Hallicrafters SX-88 and HT-20 for personal use. Need not work but should be reasonably clean. Colin Lamb, K7FM, 29830 NE Mt. Top Rd., Newberg, OR 97132. (503) 538-4301

FOR SALE: R-390A service: Module repair and alignment to complete remanufacture, new front panels, knob sets, VFO calibration,expert service, reasonable, any condition accepted. Rick Mish, (419) 726-2249

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

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

FOR SALE: Allied AX190 ham rcvr - $45; Collins, Drake, etc. mic plugs (.206"), new - $2.75; Drake 2-series tuning knob, new - $8. Bill, KE7KK, 6712 Lake Dr., Grank Forks, ND 58201. (701) 772-6531

WANTED: Check those basements for WW II radar equipment. Also searching for early RCA electron microscopes. Allen H. Weiner, 507 Violet Ave., Hyde Park, NY 12538. (914) 471-9500

FOR SALE: Hallicrafters HT-18 exciter and S-53A rcvr - $125; Mosley CM-1 rcvr - a great AM rcvr. Jerry Boles, N5KYE, 14857 Redbud Ln., Piedmont, OK 73078. (405) 373-2228

WANTED: Electro-Voice 676 mic to use with my rig. I'm a user, not a collector. Bill, KA4GAV, 7205 Highcrest, Washington, MI 48094. (810) 781-6246

FOR SALE: Hallicrafters S-119 Sky Buddy II - $75; Vocaline Radio xcvr model JRC 400 (AM phone) - $50; Comdel speech processor model CSP 11 - $40; new Jennings vacuum condensors VC50, VC25, VC6 - $100 for all three or $35 each; Collins pwr xfmrs P/N 672N228 - $45; tubes NIB - 2C26 & 7193 - $7 each; Collins 310B-1 amateur exciter, w/orig. manual & spare tube set & case (perfect front panel/this unit has been modified but can be returned to orig. condx) - $200; Hammarlund HQ-140X (mint) w/manual - $175; National NC-120/Navy model RAO-2, w/orig. Navships manual - $175; Hallicrafters S-36A - $130. All shpg charges to be paid by purchaser. Clint Hancock, KM6UJ, 6567 Ashfield Ct., San Jose, CA 95120-4502. (408) 742-4582

WANTED: Cosmophone transceiver.Any model considered. Colin Lamb, K7FM, 29830 NE Mt. Top Rd., Newberg, OR 97132. (503) 538-4301

ELECTRON TUBES FREE 1994 Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 311, Essex, VT 05451. (802) 879-0611, FAX (802) 879-7764

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. (714) 658-3444

WANTED: Collins literature, manuals, catalogs, SM2, SM3, MM2 mic's, TD1, 647T dipole ant, 35C low pass filter, 55G1. Rick Coyne, KD6CPE, POB 2000-200, Mission Viejo, CA 92692. (714) 855-4689

FOR SALE/TRADE: Kenwood Twins R599/T599; DX-60B; GRC-9, w/hand crank generator. **WANTED:** Manual for Ameco AC-1 TX or spec sheets. Joe, K2QPR, 1341 SW Evergreen Ln., Palm City, FL 34990. (407) 220-7362

WANTED: Set of knobs for Hallicrafters SX-110. Bill, KC5SB, 3317 E. 67 Pl., Tulsa, OK 74136. (918) 496-3195

FOR SALE: Tektronix sale: Type 564 storage scope ('92 cal. date), w/type 3A72 dual-trace, 2A63 differential, 2B67 timebase - $200; type 180A time mark generator - $30. Assorted plug-ins: 26 Tektronix, 2 HP, 2 Hickok, Fairchild spectrum analyzer - $10 per unit or $200 for lot. Would prefer to sell as lot. SASE for list. Altec 342B mono mixing amp - $30; CE 100V - $250; 600L linear - $350; 32V-2 - $500. Ray, NØDMS, (303) 987-3836

WANTED: Gates manual/schematic for MO 2639 modulation monitor; Gates SA-39B limiter; large emblem for early Gates xmtr; Drake 2A rcvr. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 (h), 957-6420 (w)

FOR SALE: Two GE 575A's, appear NOS, orig. boxes - $40 for both includes UPS surface in continental US. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212. (316) 722-7669

FOR SALE: Makere's classic radios revisited six times a year by Kevin Reeves, former boy genius. Send $6 to 2325 Waddy Ave., Dallas, TX 75208.

WANTED: Service manual/schematic for JFD model 7200 field strength meter. Marvin Moss, Box 28601, Atlanta, GA 30358.

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

FOR SALE: Zenith Transocean 7G605 with bomber, complete; NOS 1943 Lionel J-38 in mint box w/ Lionel logo; Wireless Set #19 telegraph key w/straps; Heath AT-1 xmtr; Heath CB-1 tube lunchbox CB; orig. AT-1 and CB-1 Heath manuals; WW II German headphones; BC-939 antenna tuner for BC-610; BC-306 antenna tuner for BC-375. Everything BO. Sam Hevener, W8KBF, "The Signal Corps" 3835 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: TBY xcvr - $25; BC-348R, modified - $75; R-19D/TRC-1 rcvr - $40; parting out R-388 rcvr, TBX, HA-10 amp; several KW xmtrs - call. U-ship. Lotsa tubes - SASE for list. WA7HDL, Rt 1, Box 178-A6, Salmon, ID 83467. (208) 756-4147 after 1730 MST

FOR SALE: 3 Cunningham #300A tubes - $50 each; 2 glass tube socket bases - $60 each; 3 DeForrest #50 tubes - $100 each; 2 WD 11's - $65 each; Radiothon amber color #201 tube w/ brass base - $85. All filaments check good, all globe shaped. Larry Drago, 383 Lincoln Dr., Cheshire, CT 06410. (203) 272-6030

WANTED: E coil for HRO-60; Collins 312A-1 spkr; 6 kHz filter for 75A-3. Call collect. Butch, KØBS, (507) 288-0044

FOR SALE: Meissner 150B xmtr. 1941 vintage, 150-W, plate modulated, AM xmtr. Covers 1500 kHz (upper 100 kHz of AM BC band) through 12 MHz. Uses Meissner Signal Shifter as VFO/exciter. Includes 2 Signal Shifters and 1 complete set of coils. W/manual. A genuine, working museum piece. Slight mods. 250 lbs, PU only in Pittsburgh, PA. BO over $450 or equal trade. Don, (412) 234-8819

FOR SALE: Six foot relay racks, one black wrinkle, one gray hammartone - $35 each, PU only; several rack panels, aluminum and steel, SASE for list. Some Bud cabinets, used, on same list. Our 1994 catalog now available for $3 ppd. James Fred, R1, Cutler, IN 46920.

WANTED: Rockbound Eico 723 seeks matching VFO for travel on bands. Prefer Eico 722. John, KA3SDO, 44 Leisure Lands, East Stroudsburg, PA 18301. (717) 223-8615

Western Heritage Museum Omaha, Nebraska
"a magnificent home for your equipment"

Leo Meyerson, WØGFQ, (founder of WRL) needs donations of gear and related materials for the amateur radio exhibit at Western Heritage Museum in Omaha, Nebr.

This permanent display is the only one of its kind in the country and is something that all hams can be proud of. We expect 50,000 visitors annually.

Your tax deductible donation will be permanently noted on a plaque that will be prominently displayed.

For more information contact Leo at (402) 392-1708, May-Nov.; 619) 321-1138, Nov.-May.

FOR SALE: HQ-180 w/new front panel; Gonset Twins, Valiant I (needs work); TX-1 Apache. **WANTED:** Horn spkr; CX-7 and CX-11 manuals. Gary, W7FG, (918) 333-7893

WANTED: 1625 medium-base 7-pin sockets, molded or ceramic OK; 1957 or '58's Allied catalog - will pay your asking $ for vg '57; current meter and manual for Heath IP-32 P/S; meter for Navigator; manual for Millen 90651 GDO; Collins brochures on S-3, S-Line and KWM-2; Collins logbook. David Ishmael, WA6VVL, 1118 Paularino Ave., Costa Mesa, CA 92626. (714) 979-5858

WANTED: HRO coils - D,E,F,G,H,J, table spkr, meter, junker or cheap HRO rcvr; TCS xtals; 75A-3 filters; ARB rcvr; GRC-9/RT-77 & acc.; ARRL Handbook 1948-'52; Allied and Lafayette catalog 1962-'64; 6-9 Mc command rcvr; Gonset monitor-CPO. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. (707) 523-9122 (msg#)

FOR SALE: Make offer. Remote tuning control for Model RU-19 type CW-23012; Signal Corps mic T-35. C.J. Pantazi, 200 No. Morrison Rd., Vancouver, WA 98664. (206) 699-0038

FOR SALE: Old ARRL Handbooks - 1927, 1929, 1930, 1933 and the 1942 Special Defence Issue. Ted Bracco, Quincy University, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

FOR SALE: National vernier dial - $15; Miller radio interference filter 5A-115V - $10; new, multi-scale meter 0-4/10, AC/DC, 0-1000 ohms - $8. Joe, W6CAS, (916) 731-8261

WANTED: Collins KW-1. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

FOR SALE: We rebuild twist-loc, wet style, rectangular, can capacitors. Mail your can to us, typical in shop time is 10 days. We custom build tubular & can capacitors & rebuild your capacitor. Inquire. Frontier Electronics/Everett Hoard, NØNVQ, Lehr, ND 58460. (701) 378-2341

WANTED: Navy xmtrs, any condx, even navigation and low freq. types; BC-640 rack and correspondence with any BC-640 owners. William Donzelli, 304 South Chester, Park Ridge, IL 60038. (708) 825-2630

WANTED: Tubes - 2A3, paying $10 new, $5 used; want Sprague Vitamin Q and Aerovox Aerolite metal capacitors, values like .22, .47, .01, .1 mFd etc.; old tube type audio amps. Jeffrey Viola, 784 Eltone Rd., Jackson, NJ 08527. (908) 928-0666

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

FOR SALE: The following meters, all in good condx - Weston model 269, mA-DC; Weston model 269, degrees centigrade; Simpson PS MA - 1523; Weston model 269, plain face; Weston model 269 plainface; Shurite model 850, rectifier type; Weston model 528, volts AC; Weston model 528, amps; ITC USL 9704, 5K, 43 mA; ITC USL 9669, LK 95 mA; GE model ATM 67.1, RF amps. Call early for best selection. Larry Drago, 383 Lincoln Dr., Cheshire, CT 06410. (203) 272-6030

FOR SALE: Echophone EC-1, good - $90; AN/GRC-9, needs work - $49; RT-70/AM65, w/connectors, good - $89. Don, (412) 234-8819

WANTED: WW II Japanese military radio equipment of any kind; wireless sets like spark xmtrs, loose coupler rcvrs; tube type pocket/portable radios; crystal sets, toy crystal radios. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, Japan.

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

FOR SALE: Subscribe to "The Amateur Market Place". A Canadian newsletter, listing new/wanted Amateur/Computer equipment. 10 issues per year $16.50 US. Benefit from $ exchange. P.O. Box 8180, Ottawa, Canada K1G 3H7

FOR SALE: Westinghouse H204 - $50; Philco 50-922 - $50; Philco PT44 - $75; Philco 39-7 - $50; Emerson Port 523 - $35; Federal 101 - $40; RCA 6BX63 - $40; Truetone D2919 - $25; Bulova 350 - $30; Bulova clock 190 - $20; Truetone D1002 - $100; RCA 2X62 - $40; Dunlop 500 - $50; Philco 46-250 - $40; Zenith H723 - $30; Philco 53-560 - $25; Zenith 4K035 - $45; Lafayette HE51 - $50; RCA 4X641 - $35; Stromberg Carlson 1101H - $100; RCA 95T5 - $75; GE123 - $60; Motorola 63L1 - $45; Meteor 7001 - $35; Emerson 587- $40; Silvertone -25 - $15; Belknap - $40. Polaroids - $1 plus SASE. Bud Santoro, 3715 Bower Rd., Roanoke, VA 24018. (703) 774-9153

WANTED: Operators manual and schematic for Thor 6. Will pay copy/postage. John Anderson, KA7QKB, 572 S. Deer Trail, Maricopa, AZ 85239.

WANTED

Collins promotional literature, catalogs and manuals for the period 1933-1983. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011. FAX (805) 259-3830

FOR SALE: Collins 75A-4 filters: 6 pole ceramic for high quality AM, 6 Khz - $83.50 ea.10% discount for two filters. Money back guarantee. Calif. residents please add sales tax. Vector Control Systems, 1655 No. Mountain, Ste. 104-45, Upland, CA 91786. (909) 985-6250

FOR SALE: Morrow Twins, MBR-5, MB560, pwr sply, w/spkr - $295; Drake T4X, R4, pwr sply - $325. All wkg & very clean; Heath wattmeter HM-102 - $25; Messenger 123A - $35. **WANTED:** Very clean R-390A, w/audio mods & product detector, in cabinet, professionally done. W7MXM, (208) 522-5854

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

WANTED: Type E (900 - 2050 kc) plug in coil set for National HRO or HRO-5. John Zitzelberger, WB6JJE, 5257 Lewis Rd., Agoura, CA 91301. (818) 991-8358

FOR SALE: PRC 47 LSB conversion - $55. Send your ampl, mod unit. I replace filter, test, return. Roger, K6XQ, 136 Delta Circle, Vallejo, CA 94589. (707) 552-6659

WANTED: Coils for Collins 310B-3; meter for Collins R-388/51J3/51J4; Eico 723 & Drake 1A manuals (Xerox OK). Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

FOR SALE: Signal Shifter - $75; SB2 Vox - $30; SB2 XC Cal - $30; 4CX-300's - $75 pair; R-390A meters - $50 pair. Don, K5DUT, 6080 Anahuac Ave., Fort Worth, TX 76114. (817) 732-3976

FOR SALE: Meter newsletter which contains an article on Weston meters by Mr. John Weyer, classifieds, free ads, and more. $2 appreciated. **WANTED:** Writers & artists for my newsletter. Someone interested in building custom electrical projects. Chris Cross, Box 94, McConnell, IL 61050.

WANTED: Buy and sell all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Rd., Hugo, MN 55038. (800) 421-9397, FAX (612) 429-0292

FOR SALE: B&W SB51 - $95; Eico 723 and 722 - $60; Globe Scout 680A - $55; Globe Scout Deluxe - $75; Chief - $50. Ron Follmar, 1409 W. Willis, Alvin, TX 77511. (713) 331-1074

FOR SALE: Drake T-4XC & AC-4 - $200; Johnson SSB adapter - $125; BW RF clipper for Heath SB series, new - $40; Hallicrafters SX-140 - $45; Heath DX-60 - $45; Hal DS2000-KSR keyboard - $75; Ameco 78 & 45 RPM code records. See you at Dayton (space 2413). Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (708) 852-4704.

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

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

WANTED: Speaker for Collins 75A-2. David A. Clark, K5PHF, 9225 Lait Dr., El Paso, TX 79925. (915) 591-4184

FOR SALE: Hallicrafters SX-111 rcvr w/ manual. Unit is in very good condx and works great - $130. W3LVC, Elkridge, MD, (410) 796-1070

FOR SALE: Early Standard Mac-Key bug SN 6727. Best offer over $500. Peter Harband, 5140 Gates Rd., Santa Rosa, CA 95404. (707) 537-1120

FOR SALE: DX Engineering speech processor model LA-2-T4X, no manual. Buyer needs to check it out - $60, money back guarantee. Dick Prester, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454

WANTED: Main tuning knob for Hallicrafters SX-101 or 101A. Joe Falcone, (800) 436-7026.

WANTED: Tech manuals or repro for Navy rcvrs FRR59B/WRR2 and R1134B/WRR3B. Please note B versions. Wayne, N8MS, Rt 2, Box 1500, Fairmont, WV 26554.

ELECTRIC RADIO PARTS UNIT DIRECTORY

If you need a part for a vintage restoration send $2 and an SASE (.52 postage) for a 6 page list of parts units. If you have a parts unit, consider putting it on the list. Your dead unit can help bring others to life!

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

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

FOR SALE or TRADE: Heath HW-17A; HW-18; HP-23B; DX-100; HQ-110; Ham III and control NIB; TR 44 and control. Ray, (314) 428-1963

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

FOR SALE: Dual variable capacitor, 13-41 mmF at 6 KV.Removed from 250W xmtr - $20 plus UPS. Joseph R. Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003. (304) 277-3154

FOR SALE: Hallicrafters manuals. Copies $5 postpaid for most models. Some Johnson, Hammarlund and others. SASE for list. Miller Radio, 909 Walnut St., Erie, PA 16502.

FOR SALE: TR4/NB/AC-4/MS-4 - $275; R4B, w/WARC, T4XC, w/WARC, AC-4, MS-4 - $450. U-ship. Gary Elliott, NO5H, 808 Clarice St., Delhi, LA 71232. (318) 878-8032

WANTED: Collins 70E8A, any condx, or parts; 310B-3; CMS-2 500W mod. xfmr and 810's for KW-1. Jerry, W8EGD, (303) 979-2323

FOR SALE: Electro Voice 668 studio mic to Hi-Fi your AM. John, K6UU, POB 687, Ashland, OR 97520. (503) 488-1506

WANTED: Two 837 tubes; manual for Eddystone 770R rcvr; knobs for SX-101A; 6A28 tube. F.W. Nicholas, (602) 864-9987

FOR SALE: LTV G-186B panoramic adaptor, 500 kHz IF for G-133/51S-1 rcvr - $275; equipment, parts, manuals, books, list - $1. Joe Orgnero, VE6RST, Box 32, Site 7, SS 1, Calgary, AB T2M 4N3, Canada. (403) 239-0489

FOR SALE: Johnson KW; NC-303 rcvr; Ranger, D-104 mic; SX-101, w/spkr; HT-32A; R-390; HQ-170; SX-111; Ranger 2. PU only. Paul, WA5PCJ, RR #1, Box 16, Gustine, TX 76455. (915) 885-2593

WANTED: British and Canadian military radio equipment, WW II and later. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

FOR SALE: My beautiful 75A-4, SN 33, 2 filters - $525; T4XB - $125 & matching SPR-4 - $300, both immaculate and fully crystalled. Mac, WK7U, 429 Albert St., Helena, MT 59601. (406) 443-7956

FOR SALE: Collins 30L-1 amps, clean condx - $350 each, 3 for $1000. 200+ in stock. Mike, (619) 444-7717

WANTED: Collins 51J4, w/spkr, in good operating condx. J. Thomas, 1130 Pleasant View Ln., RR3, Colorado Springs, CO 80921-2234. (719) 481-4564

WANTED: E.H. Scott Navy RCH (AN/SRR-3) rcvr; Collins 32V-2/3 or 32S-1/516F-2 xmtr. Robert Harding, 1321 Monte Largo Dr., NE, Albuquerque, NM 87112. (505) 291-0950 (n)

WANTED: Manual or copy for Eldico SSB-100M mobile xmtr. Bruce Walther, W9QAH, 3000 McCulloch St., Stevens Point, WI 54481. (715) 344-9099

FOR SALE: Hallicrafters SX-24, Skyrider Defiant, excellent, working, all orig. knobs, new caps, manual - $150, matching spkr - $60; Hallicrafters S 22R, Skyrider Marine, VG, working, manual - $90; Hammarlund HQ-170A, mint, manual - $180, matching spkr - $35. Gus Stellwag, 117 Edgewood Dr., Orangeburg, NY 10962. (914) 359-0769

WANTED: Panoramic Radio Products P.R. 1 panadapter; Johnson KW Matchbox, w/SWR meter. Jay Spivack, 325 S. Washington Ave., Kent, WA 98031. (206) 859-2680

FOR SALE: Collins 651S-1 rcvr, professionally realigned - asking $1350. Bill Levy, WA2RUD, 91 Old Roaring Brook Rd., Mt. Kisco, NY 10549. (914) 241-0251 or FAX 0267

WANTED: Collins 312B-2 console for KWM-1; 302C-1 wattmeter; 310B- exciter; 75A-1 filter adaptor; speech processor; NB; SM-3 mic; 32V-3; tubes (NIB only) - 4-400, 8122, 6LQ6 (4) matched, 810's. Rick, WA1DEJ, (800) 462-2972

WANTED: 2A3 tubes. Paying $10 new/$5 used. Jeffrey Viola, 784 Eltone Rd., Jackson, NJ 08527. (908) 928-0666

FOR SALE: Brand new, boxed, Westinghouse 2E24 xmting tubes - $3.50 each ppd. Eddy Swynar, VE3CUI, 3773 Concession Road 3, RR #8, Newcastle, Ont. L1B 1L9, Canada.

FOR SALE: Hallicrafters ARR-7 rcvr - $75; Navy TBW xmtrs, unused - $75; GR 1114A freq. divider - $35; sale list of military, ham, test, misc items - LSASE. **WANTED:** Depot manuals for R-1051B, R-390A, correspondence with others overhauling R-1051's. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

FOR SALE: RME 126 converter - $40; GPR-90, like new - $395; Ranger I - $150. Bud, (208) 466-2803 after 8 PM MDT.

WANTED: WW II military radios and parts, any condx. Ed Guzick, 916 Lenox Rd., Glen Ellyn, IL 60137. (708) 469-3183

TRADE: Mint SX-115 w/manual and/or excellent SX-73, w/manual for excellent to mint SP-600 or GPR-90. Call collect. Ray, (407) 676-4952

FOR SALE: Tested tubes w/warranty! Xmit and Rcv tubes: Recent acquisition has increased my stock. Buy those spare tubes for your tube radio, audio and electronic gear. Prices are about 35% of new for tubes with a warranty. I have bunches of octal, older, 7 and 9-pin tubes. All tested on TV/7 tester and boxed. I give a 30 day warranty. Send wants or SASE with two stamps for list. Daniel Nelson, 1025 E. Desert Lane, Phoenix, AZ 85040. (602) 243-7421

Please remember to count the words in your ad. If you are over 25 words, please send 15 cents for each extra word.

FOR SALE: Radio History. Don't miss Lee DeForest explaining his Audio in illuminating technical detail. He describes the vacuum tube development from 1903 to its 1920 applications. The 40 page 1920 Franklin Institute printing (copy) is available for $15 ppd. It's a rarely seen and key piece of radio history! Gil Arroyo, 2766 SW 167 St., Seattle, WA 98166.

WANTED: For the PB2Y-5R Coronado Restoration Project: BC-348 rcvrs - 2 ea.; ART-13 xmtrs - 2 ea.; LM freq. meters - 1 ea.; BC-433 radio compass (Bendix) - 2 ea.; ARC-4 VHF xcvr - 1 ea.; APN-4 Loran RX, scope and indicator - 1 ea.; CRV-RCA rcvr, 1.25 - 8.0 MHz - 1 ea.; direction finder (Bendix probably) - 1 ea.; radar system (??) - 1 ea.; radioman's table & key - 1 ea. Anyone with any of the above equip. for sale (or to donate if you wish) contact "JB", WA5PCU or Jack, N8TWE or myself and I'll forward info. Bud Johnson, K9IDB, 603 Killarney, Greenville, IL 62246-1350.

WANTED: Heath HW-8 or HW-9. Ros Hawks, 355 Animosa Dr., Durango, CO 81301. (303) 259-0785

FOR SALE: HQ-180AC w/manual - $225 plus shpg. Vern Snyder, (404) 381-6636 between 5 and 6PM EST.

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

WANTED: A source for electrolytics over 450 volts; AC sply for Gonset G-76; Omnigraph and Teleplex code trainers; RDZ VLF rcvr; orig. PP-308 sply (for GRR-5). Don, (412) 234-8819.

FOR SALE: Collins (WE) 30L-1, VGC - $500; 312B-4, exc. - $175; CP-1 xtal pack, complete - $175. Mike Kennedy, WA6AAJ, 3417 W. Magill Ave., Fresno, CA 93711. (209) 435-3159

WANTED: AA-18/GRC-9 Alimentiation pwr sply; PP327/GRC-9 AC pwr sply; antenna mounts MT 652/GR; vibrator VB-16; 7 & 9-pin tube pin straightener; BC-348 pwr connector plug, PL-103 or PLQ-103; mounting FT-154 w/pwr plug for BC-348; key 116/U; cables CX2585/U, CX1852/U, CX1599/U all for T-195; xmtr control C822/GRC-19; air exhaust port duct covers T-195; reverse current cutoff relay for PP/1104C/G. Rich Burke, 348 N. Main St., Stonington, CT 06378.

WANTED: Meissner rcvrs, any condx or tube complement; also Sparton cabinet console (Ersconne I believe) for complete 109 chassis. Bruce, VE7HII, (604) 299-1116 (collect).

WANTED: Info on sets using 5-pin, 6-volt tubes, 36-37-38, 39 in AC-DC and car radios. Ray Larson, 12241-1/2 Gorham Ave., W. Los Angeles, CA 90049-5214.

WANTED: McMurdo Silver rcvrs model 5D (1935-36) and model 14-15 (1938). Hardy Trolander, 1475 President St., Yellow Springs, OH 45387. (513) 767-4551

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.

FOR SALE: Drake classics still in factory boxes. R4B, T-4XB, MS-4, AC-4, L-4B, MN-2000. Used ten hours, in boxes ever since. New condx. $1800 + shpg. W6OLD, 1044 Wisteria Dr., Minden, NV 89423.

WANTED: SX-42, w/spkr, manual for B&K tubetester model 500. George Watson, KØLOB, 13546 Omega Dr., Littleton, CO 80124. (303) 790-2410

WANTED: AN/PRC-74B for MARS use. Will pay market price and shpg. Harlan, K6JFW/NNNØBDF, (408) 996-2126

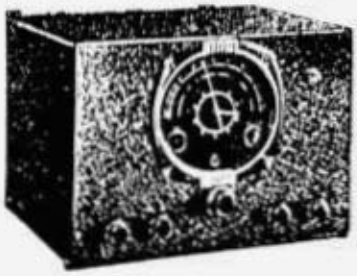
FOR SALE: Collins rcvr 75S3, mint - $275; Amperex tube, 833A, new - market price; Shure mic model 444 - $35. Frank, W8SET, (304) 343-0415

WANTED: AM/CW filters for 75A-4, tuning knob and gear assembly for 75A-4; clean 51J4 and KWS-1. Don Gies, K4GIT, Box 2790, RR#2, Melrose, FL 32666. (904) 475-3306

FOR SALE: Vintage WW II. BC-375-E, as new, w/NIB 6 tuning units all matching serial numbers. New in box BC-306-A antenna tuning unit and PE-73-CM dynamotor for BC-375-E. Shpg extra. Make offer for all as a lot. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194

WANTED: Operating manual for Millen scope model 90932 or copy. J.J. DeSousa, Jr., 29 Whiting St., Plymouth, MA 02360. (508) 746-6533

WANTED: Collins 312B-3 spkr for S-Line. Prefer exc. or better condx. K7LCT, 1642 Cody Dr., Billings, MT 59105.



WANTED: Any condition, Hallicrafters Sky Master and EP-132 as shown. Also want SX-46, S-48 and S-49. Chuck Dachis, 'The Hallicrafter Collector', 4500 Russell Dr., Austin, Texas 78745. (512) 443-5027

FOR SALE: National manuals; BC-611 parts; military radios & manuals, LSASE for lists; DY-17A/ART-13 NOSB - $45; BA-38 - $42.50. Robert W. Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043. (713) 467-5614

TRADE: 1) Collins 75A-1 in very good condx for mint Yaesu FT-530 w/acc. 2) Collins 75A-3 orig. manual for other orig, any one of, Gonset-G-76, military TBX or TBY. 3) Vibroplex Standard bug w/4 25918 (New York, gray base) for Timewave DSP-9A. 4) Very nice BC-1306 w/working DY-88 sply for either Racal RA-17 or AN/WRR-2 (FFR-59A) rcvrs. 2-stamp LSASE for big list. Don Merz, N3HRT, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819

WANTED: 2 KW antenna tuner, need split-stator variable, 250 pF per section, plate spacing .077 inch or more, E.F. Johnson or Millen. Randy Carson, K7RBR, 5310 Camelot Dr., SW, Olympia, WA 98512. (206) 352-2296

FOR SALE: Viking Valiant - $325; Dow-Key ant. relay for KWS-1 - $20; Collins rack panel for S-Line - $75; Collins manuals - 51S-1 - $25, 75A-2 - $20, 75S3B/C - $20; ARRL Handbooks - 1942, '45, '47 - $20, 1982 - $5; Ham M rotor control box - $45; Heath antenna noise bridge - $25; Vibroplex brass Racer iambic (keyer circuit in base) - $120. Mike Palmer, K5FZ, 16707 Creeksouth, Houston, TX 77068. (713) 444-7737

WANTED: Pre-1930's panel meters, preferably Weston or Jewell; Jewell 574 VOM in decent condx. Mack Lester, POB 149, Lewisville, AR 71845. (501) 921-5874

FOR SALE: Electro Voice 668 mic with bail. Just retired from TV biz - $125. John, POB 687, Ashland, OR 97520. (503) 488-1506

WANTED: Tubes for Tube exchange bank. Receiving tubes, all American, new-in-box. Help us make this zero tube cost system work. SASE for info. Tube Exchange Bank, POB 806, Lake City, MI 49651

FOR SALE: 75A-4 spkr, 4 small holes in cabinet - $BO; DX-20 - $45; Knight Impedance Bridge - $10; NC-300 converter cabinet, w/2 meters - $40; Multi-Elmac Citi-Fone 99 - $35; SX-101 cabinet - $18; Millen 90913 scope - $18; parting SX-43. Joe Sloss, K7MKS, (206) 747-5349

Electric Radio T-Shirts

The front displays the logo from the cover of ER (the tube outline, Electric Radio, and celebrating a bygone era). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio).

The T-shirts are U.S. made by Haynes and come in S-M-L-XL and XXL($1 extra).

The color is just a little lighter than the cover of ER.

$15 delivered.

Money back guarantee.

ER, Box 57, Hesperus, CO 81326

WANTED: Galaxy gear - bandswitch or parts unit GT-550, spkrs, pwr splys, accessories, xcvrs, wkg or parts units. Byron Tatum, WA5THJ, 1920 Maxwell, Alvin, TX 77511. (713) 331-2854

FOR SALE: HF/KWM-380 compatable key pad unit complete with low profile weighted housing; and cable/connector. $99 shpd US. Jerry Brouwer, AB8U, (513) 429-5457.

FOR SALE: Hallicrafters manuals. Copies - $5 postpaid for most models. Some Johnson, Hammarlund, others. SASE for list. Miller Radio, 909 Walnut St., Erie, PA 16502.

FOR SALE: Literature - ARRL Handbooks: 1932, 34, 38, 40, 48, 50, 52, 66 - $50 - $9; Radio Handbooks: 38, 39, 40, 42, 46,47, 58,59, 62, 78 - $49 - $16; early Sams (Radio) photofacts: 1-40 - $39 - $6.50; catalogs: Lafayette, Allied, WRL, Radio Shack - $31 - $12; magazines: VHF Amateur, 1961-63 (incomplete) - $49; QST, 1924-29 - $7-$2 by condx; QST 1931-94,whole years - $36-$15; 73 Magazine, whole years, 1962-80 - $20-$12; Manuals: S-40B - $21; NC-183 (not for the 'D') - $24. Don, (412) 234-8819

FOR SALE: Jackson model 648A tube tester - $45; RT-68 w/PP112A pwr sply - $100; BC-603DM rcvr w/dynamotor - $55; General Radio 516-C cap. bridge - $80. **WANTED:** Manual for SRR-19 & FRR-59A. John Richardson, 1163 Highland Pl., Debuque, IA 52001. (319) 556-5504

WANTED: Amateur related manuals. See me at Dayton, space 2208, next to rear food tent. Bring your old manuals. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: ARRL Handbooks from the '30's; QST's from '20's & '30's. Pse send price and phone # in first letter or call. Mack Lester, POB 149, Lewisville, AR 71845. (501) 921-5874

HEATHKIT FANS: Don't mourn their passing; enjoy learning more about their past in historic pictures and personal insights from many company oldtimers in 124 page book - $9.95 pp. Heath Nostalgia, 4320 196th S.W., Suite B-111, Lynnwood, WA 98036-6754

FOR SALE: Tubes - NOS, US mfg, 100TH, Eimac - $50; 250TH, Eimac - $195; 807 - $7; 809 - $29; 814 - $22; 816 - $22; 829 - $10; 832A - $7; 833A - $100; 3B28 - $19; 6528 - $55; 8121 - $95; 8950 - $18; 4-65A - $65; 4-125A - $100; 4-250A - $100;4-400A -$150;4CX1000A -$300;4CX3000A - $700; WE 416B - $30; 2E24, 2E26 - $4; 12BH7A - $8; 6AL5, 6AQ6, 6AS6, 6CB6, 6J6, 6U8A/6KD8, 6350 - all $2 each. Sockets - used, exc. for 100 and 250 type and similar tubes - $8 each. Shpg additional. Joe Bunyard, 1601 Lexington St., Waco, TX 76711-1701. (817) 753-1605

FOR SALE: Military manuals: MIL-HDBK-161A (Army TM 11-487A-1) dated 12 Mar 1964, 235 page illustrated listing of military communications equipment, also AFM 100-14, dated 1 Mar 1971, a lengthy listing (168 pages) of communications and electronics equipment used by the Air Force. Bound reproductions of originals - $25 each plus $2 postage in USA. James Owens, NWØO, 1363 Tipperary St., Boulder, CO 80303. (303) 673-9019

WANTED: Eico, Fisher, etc. tube-type audio amps. Franklin Albanese, 1610 Prince St., #7, Berkeley, CA 94703. (510) 845-2625

FOR SALE: BC-746 tuning units; BC-230/430 coil sets; T-45 lip mic, strap, plug; DY-10/ARC-4 dynamotor; T-30R. Gus Enquist, VE3MAL, RR 1, Redbridge, Ont., P0H 2A0, Canada (705) 663-2387

FOR SALE: Collins 75S3, missing CW filter - $250. **WANTED:** Clegg FM-27. Steve, K6PFW, 848 S. Silverwood, Upland, CA 91786. (909) 985-1062

FOR SALE: Limited quantity of new blue with white stitching handles for Tektronix 545A etc. scopes, complete with new chrome mounting hardware - $7.50; also replacement rolls of special silver bearing solder (3 feet) for Tek scopes - $.50 each. Add $5 S&H. Stan Griffiths, W7NI, 18955 S.W. Blanton, Aloha, OR 97007. (503) 649-0837

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

FOR SALE: Attention 75A-4 owners: I have 3 new RCA 7360 tubes used in the mixer modifications - $20 each or all 3 for $50. Jerry Brouwer, AB8U, (513) 429-5457

FOR SALE: Heath TX-1 Apache, very good - $160; RX-1 Mohawk, exc. - $195; National NC-188, w/scarce matching spkr, great - $129; Hallicrafters S-40A parts set - $33; Johnson Invader 2000, factory-built, very good - $1050. Offers and trades welcome. Don, (412) 234-8819.

WANTED: LF oscillator for ART-13, type 016-ART-13, (200-1500kHz). Bill, KDØHG, (303) 823-6438.

FOR SALE: Heath DX-60B - $60; HG-10B - $40. Both in mint condx. KØOCC, (404) 396-1312

FOR SALE: 75S1, w/Waters rejection, 500 Hz CW filter, 32S1, 516F2, 51S1. **FOR TRADE:** National type 697 6-V pwr sply. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

WANTED: RA-34 AC sply (any model) for BC-191; FT-151, 172, 178, 185 shock mounts; PE-135 dynamotor; PE-162, PE-162-A gasoline generator for SCR-284, SCR-694, AN/GRC-9; NOS test lead sets for multimeters (pin or banana jack types, must have rubber insulated wires, not thermoplastic) and short pin-jack jumpers; following manuals - TM 11-200, 201, 227, 230 (not 230C), 231, 232, 280, 311 any TM 11-2700 series, most of 11-4002 through 11-4920, many others, including TB's, MWO's, T.O.'s, NAVSHIPS, etc. **FOR SALE:** National manuals; BC-611 parts; military radios & manuals. LSASE for lists. PE-110-D - $65; PE-157-A - $45; DY-17A/ART-13 NOSB - $45; BA-38, new - $42.50. Plus UPS. Robert W. Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043. (713) 467-5614

WANTED: Tuning dial, coils and any info on National SSR. See ER #56, p. 23. Richard Oliver, KC9GQ, Box 1872, Flagstaff, AZ 86002. (602) 774-7527

WANTED: Pair of 7027A or EL-34 tubes. Trade new UTC mod xfmrs or other tubes. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Military manuals covering radio direction finding and signal intercept equipment, WW II to date. Walter Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

FOR SALE: 50 page illustrated catalog of WW II military radio sets - $2 US, $5 foreign. Sam Hevener, W8KBF, "The Signal Corps" 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: Repair! All makes and models, homebrew, maximum labor per unit - $96. Dan Rupe, W7HBF, Telo Technology, 1302 S. Uplands, Camano, WA 98292. (206) 387-3558

WANTED: HRO-7, w/pwr sply, matching spkr and coils; power xfmr for HT-32. Clark, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

WANTED: All-Star, Inca, Stancor or UTC xmtrs; AC sply for Gonset G-76; CQ Magazine, '50's and '60's issues; Radio Magazine '34 and earlier or '42-46; ARRL Handbooks,'26, '28, '30, '31, '39 and '59. Don, (412) 234-8819.

WANTED: Heathkit, Eico,or similar audio amplifier in any condx, or manual for same. Mike Nowlen,WB4UKB, POB 1941, Herndon, VA 22070. (703) 481-9614

FOR SALE: Hallicrafters SR-2000, w/pwr sply - $450; Ranger I - $175; Challenger - $50; National NC-109 - $75. Jeff Garrett, KEØMT, 4622 W. 33rd Ave., Denver, CO 80212. (303) 455-5658

WANTED: 828 tubes, new/used; RF plate choke 4 mH, .500 mA; block mica cap .001, 5 KV. Steve Dewey, N8JRJ, 1581 Force Rd., Attica, MI 48412. (810) 664-0624

FOR SALE: RF wattmeters - Sierra 164B, exc. condx, w/o plug-in elements - $35 each. Some elements available - $35 each. Gary Gleicher, Box 427, Little Neck, NY 11363. (718) 423-1911 (n)

FOR SALE: KWS-1; 75A-4; HRO-5; HRO-50T-1; HRO-500; SP-600JX-17; BC-348Q; Thunderbolt; AT-1. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

WANTED: Hallicrafters DD1 Skyrider Diversity, only in VG condx. Jose Cangas, EA4JL. Contact in the States Kurt Keller, (203) 431-6850

FOR SALE: R-390A orig. service manual - $50; Krohn-Hite 310-CR vacuum tube bandpass filter - $40; Browning Labs RH-10 WWV standard freq. calibrator, near mint - $175 OBO; E.F. Johnson 145-201-2 broadcast style ant. switch - $29; similar, but smaller switch - $19; Collins filter choke 4.0 H, .03 amp - $20; same, but 0.5 amp - $30. Used capacitors - 1500 mFd x 450V - $8; new caps - 4.0 mFd x 4KV - $30; mica caps, used - .001 x 8KV - $10, same but x 5KV - $5; freq. meter BC-221B/book/AC pwr sply - $20; large military balloons - $10. Shpg additional. Joe Bunyard, 1601 Lexington St., Waco, TX 76711-1701. (817) 753-1605

WANTED: Heath Apache TX-1. UPS will now handle up to 150 lbs. Ron Brewer, WA6ALM, 1394 Nissen Pl., Broomfield, CO 80020. (303) 469-4653

WANTED: Command set rcvr, rack; photos/drawings of B-17 interior radio layout; Radio Surplus Conversion manual, Vol.1. Warren Davis, AB4GE, Rt 1, Box 671-12, Macclenny, FL 32063. (904) 259-5446, FAX 259-7606

FOR SALE: Orig. Collins manuals - KWS-1 - $23; 30S-1 - $11 ppd. Harry Blesy, N9CQX, 2409 Northgate, No. Riverside, IL 60546. (708) 442-8855

WANTED: Manual for Johnson Valiant; also fused AC plug for same. George A. Flanagan, W2KRM, 42 Cygnet Dr., Smithtown, NY 11787. (516) 360-1321

FOR SALE: Johnson KW Matchbox, w/meter, no coupler - $200; Heath HW-101, SB-600, HP-23A, CW filter - $180; Unique wire tuner, w/roller - $75; old Mackay Radio and Western Electric headphones - $10 each. Plus shpg. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

WANTED: Straight keys, Mac keys (bugs),empty key boxes, Chart of Codes and other McElroy artifacts. Tom French, W1IMQ, "The McElroy Collector", 120 Great Rd., Maynard, MA 01754.

WANTED: Globe King 500 or Johnson 500 within 50 miles of my QTH. Jim Schnecker, N3JUH, Bethlehem, PA (610) 868-4159

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.

WANTED: Collecting early Heathkit gear, accessories and literature. Any condx or parts units. Thanks. Byron Tatum, WA5THJ, 1920 Maxwell, Alvin, TX 77511. (713) 331-2854

FOR SALE: Knight Spanmaster - $40; Globe Chief 90A, w/SM-90 modulator & manuals - $75. Herman Gibbs, KD8PD, (216) 263-2212 leave message.

FOR SALE: Very good photo copies of manual and schematics for AT-1, VF1, DX-60A, Navigator, Viking II, CE-20A, BC-458, 1A, R4B, National 270, BC-348Q - $10 each. HQ-170 - $15. Write Craig, KB6XV, 14 Governors Ct., Sacramento, CA 95817. Call (916) 736-1133 between 6 & 9 PM PT

WANTED: Any Collins bakelite panel units, such as antenna units, exciters, etc; Collins labeled xmtg tubes; 1"x3" plug-in final coils for Collins 32RA; Collins Signals; WE audio mixers, such as 22 or 23 series and accys. **FOR SALE:** Patterson PR-15; Wilcox multimatch mod xfmr; Johnson KW RF deck; RCA BW-66 mod mon; Collins 310B-3; Collins SC-101 (not factory). All best cash or swap offers. Gary, WA9MZU, 1751 Michon Dr., San Jose, CA 95124. (408) 266-2218

FOR SALE: '50's amateur radio equipment, B&W, Collins, National. SASE for list. Charles Lukas, W1DOH, 24 Durkee Lane, Acton, MA 01720. (508) 263-3743

FOR SALE: ARB - $60; RBL - $70; CV-89 - $60; RBC - $75; 80-10 HB xmtr, 75W - $100. Prefer PU. **WANTED:** BC-375 shock mount; RBA manual and RAX dynamotor. Steve Davis, KD2NX, 705 13th Ave., Belmar, NJ 07719. (908) 280-9760.

WANTED: S-meter and tuning dials for NC-183; matching spkr for HQ-180. Clark Thompson, KD9QI, 418 Marston Ave., Madison, WI 53703. (608) 251-0273

FOR SALE: HB 500-W linear w/(2) 811A's in grounded grid. Amplifier is complete w/pwr sply and control circuitry in 36" Bud rack cabinet, w/3" casters (39" overall), very heavy - $125; converted ARC-5 rcvr in 12"x19" cabinet, complete w/VHF converters - $60; ARC-5 xmtr set up as VFO (no finals or tank circuit) - $20; Aerotron 600 VHF/FM xcvr, w/mic - $50. Equipment is as bought, prices plus shpg. **WANTED:** Data on Sansui stereo amp AU2200; very old RCA test equipment; cable operated car radios. B.A. Hodgson, 14 Evergreen Dr., Voorhees, NJ 08043. (609) 424-0312

WANTED: HRO-7 coils, any freq., one or more or complete set. Will pay your price and shpg. Arnie Chick, WK1H, POB 385, Auburn, ME 04212. (207) 786-4267

WANTED: Cabinet for Hammarlund SP-600JX; complete kit manual for Heath DX-100 and Mohawk RX-1. Roger Quickel, K8MSS, 5511 S. Ridge W., Geneva, OH 44041. (216) 466-6808

WANTED: Hammarlund HQ-105TR, working condx. Hoover, (803) 726-5762

FOR SALE: Catalog of Naval Radio Equipment, catalog SHIP5275. A 228 page publication incorporating over 100 photographs and details of Navy gear used in WW II-1944. This is a quality reprint, bound with plastic spiral. Price is $22 ppd. Also: "The High Frequency War" - A survey of German electronic development during WW II by Lt. E.S. Hessing, June 1946. 184 pages with photographs. A quality reprint, bound with plastic spiral. Price is $22 ppd. Order from: New Wireless Pioneers, Box 398, Elma, NY 14059. phone/FAX (716) 681-3186

WANTED: HQ-129X S-meter or a 2" round 100 or 200 mA meter. Bill Allen, W7US, 11720 E. Twin Hills, Tucson, AZ 85748. (602) 721-1842

FOR SALE: Philips AM/FM (tube) rcvr model #7851 - $200; Skyrider Marine - $250; National model 173, w/spkr - $250; Hammarlund SuperPro, w/pwr sply - $350; Gonset Commander III - $100; Heath DX-40 - $100; Hallicrafters S-94 - $200; National 57 - $125; Hallicrafters SX-130 - $150; SX-111, w/spkr - $200; Hallicrafters S-38, 38A, 38C - $150 each; Hallicrafters S-40 - $125. Larry Drago, 383 Lincoln Dr., Cheshire, CT 06410. (203) 272-6030

WANTED: Galaxy GT550 cabinet, parts, acc. Tnx. Gary Reiss, WAØJRM, Rt 1, Box 141, Wilcox, NE 68982. (308) 995-5541 (d), 263-3231 (n).

FOR SALE: Hallicrafters SX-99 w/R-46B spkr and S38E, both w/manual; Gemtronics GTX3000 CB. **WANTED:** J.H. Bunnell single earpiece headset and telegraph items. J.H. Jacobs, 60 Seaview Terr., Northport, NY 11768. (516) 261-1576, FAX 361-2173

FOR SALE/TRADE/WANTED: Tube CB's, list - SASE. **WANTED:** 600 ohm spkr or military headset. **FOR SALE:** Fisher 90R tuner. Charles Zafonte, RFD 1, Box 75, Fort Kent, ME 04743. (207) 834-6273 (n)

WANTED: These items for my personal vintage museum: Eico 723 xmtr, Astatic JT-30 mic, Hallicrafters S-20R. Dick Lucas, WD4PMT, (407) 626-0136

WANTED: Knight-Kit 3235C PA amplifier. Victor, 7224 NE 8, Portand, OR 97211. (503) 289-6373

FOR SALE or TRADE: Hammarlund HQ-110A, looks great but 160 dead, trade for AR6 or RAX or? or green stamps; manual SRT14 - $15; manual CV1758/MSR4 for FFR - $5; FT151 and 40M TU for BC-375. **WANTED:** I need rack for RAX, GF xmtr, ARR15 or BC-348, Gonset G-76, AC or clandestine sets RS6 or MK128, trade for USN TCH. I am always interested in German, Italian, Japanese radio items of WW II, related TME and TB SIG. Also USA mobile equip. including ARQ1, ARQ8, BC-310, BC-1209, DAG, DAV, MBM, PRC1, PRC5, RBD, TCX, TRC10. Forest Service equipment. Canadian AR6, ATR11, knobs for RAK, RCA gray HF aircraft rcvr to match my AVT23. Thank you! Hugh Miller, 6400 Maltby Rd., Woodinville, WA 98072-8375.

FOR SALE: Johnson Courier Amp - $325; Breting 9 rcvr - $160. John, KU6X, 2512 Euclid Crescent East, Upland, CA 91784. (909) 981-6759

WANTED: Swan - need 160, 600T/R, 300, ST3 tuner, parts, accessories. Anything considered. Thanks for all responses! Eric, KBØXP, 407 Eastern Ave., Stanton, IA 51573. (712) 829-2446

WANTED: Schematics/manuals Tektronix 130LC, Ballantine 300H, HP-425A meters, Allied Knight R55A rcvr; Heath TS-3, RCA WR49B sig. gen. Jack Bertholf, WA4CSM, 8109 NW 58 Ct., Tamarac, FL 33321. (305) 721-2337

FOR SALE: Eimac SK-510 socket (fits 3-1000Z & 4-1000A) new - $50; Eimac SK-406 (2) chimney (fits 3-500Z & 4-400A), new - $35 each; Jennings vacuum variable cap UCSX 700, 25-700 pF @ 7.5 KV, new - $65; tubes - 24G/3C24 NIB - $8 each; R-390 Military Maintenance manual (orig.) TM11-5820-357 - $35; R-390 modules - IF, RF, PS, PTO (Collins) checked w/tubes - $25 each; receiving tube manuals RCA, GE, Sylvania - $15 each. All plus UPS. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

WANTED: Eico model 730 modulator, w/ manual, in operating condx. Thanks. Don Chesley, WA1HVS, 240 Hope St., Mansfield, MA 02048. (508) 339-8264

FOR SALE: HQ-180, near perfect - $275. **WANTED:** Eico modulator; Ranger pwr and mod xfmrs; Dow-Key relays; NC-300. Rob, NS6V, 3881 Winkle Ave., Santa Cruz, CA 95065. (408) 464-0505

FOR SALE: ART-13 w/xtal osc., used - $125; PRC-75, complete, used, exc. - $400; PRC-47 set, used - $150; PRC-47 accessories, used, whip - $15, H-233 headset - $15, "Y" cord - $7.50, DC or AC cables - $8, wire ant. - $12, legs - $8, FSK adapter - $5, chest - $35; parts radio - $45; PRC-25 modules - $8; AT-271 - $8; NOS - $10; LS-166 NOS - $20; AS-2851 30-76 MHz Hi-Gain log-periodic, NOS - $115; C-7673 120V sply for PRC-25/77, used - $30; "Power-UP" Dave Strom's book on military battery adapters - $15 ppd; Sig. generators - scratch & dent, URM-25D - $25; 2 or more - $20; HP-608C - $45, 2 or more - $40; Polarad 1108A, no output - $50, 2 or more - $40 each; HP cabinets from HP-606 type equip. 19x10-1/2" panel, 13" deep chassis, side handles, used - $25; URM-120 wattmeter - $120; VT-4C boxed - $32. Add shpg. (UPS now 150 lbs) Tartan Electronics, Inc., POB 36841, Tucson, AZ 85740-6841. (602) 577-1022

FOR SALE: Available this spring, Hallicrafters SX-88 rcvr w/R-46 spkr; Collins 75A-4 rcvr (SN 5XXX); Collins 75A-4/KWS-1 combination w/spkr; Johnson Viking II xmtr & 122 VFO; Drake WV-4 VHF wattmeter. Complete info on all via #10 SASE only to Michael J. Scanlan, WAØEPW/6, 13428 Maxella Ave., #347, Marina del Rey, CA 90292.

WANTED: Copy or orig. manual for E.F. Johnson Challenger xmtr. Charlie Svoboda, 1501 West 'S' St., Lincoln, NE 68528. (402) 474-4272.

Going to Dayton? Don't forget to stop by our booth, #316.

Uncle Dave's Wireless World

27665 Forbes Rd., Ste. 102, Laguna Niguel, CA 92677
Tel: (714) 367-1012 FAX (714) 367-1009

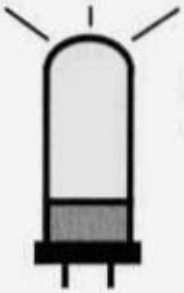
We accept good, clean rigs for consignment. Please call or write for details before sending rigs. We can assist you in locating those hard -to-find parts for homebrewing, transformers, ceramic sockets, old tubes, coils (air inductor) NOS, etc.

As of press time we have the following: Hallicrafters S-107; Hammarlunds - HQ-110A, HQ-129X, HQ-140X, HQ-145X, HQ-170X, HQ-180C, SP-600-JX-17(rack mount); Collins 75S3B and C (RE), 75S3B and C (WE), 32S3 (WE), a number of 75S1/32S1 combos, 312B4 (RE) and (WE), several 312B5 (RE) and (WE), speakers for 75A-3 and -A4; Swan 500C and a set of Kenwood Twins T-599/R-599 w/manuals. We also received two Johnson Ranger I's, a 6N2 and a large shipment of Collins parts, cabinets and hardware, power cords, etc.

We have a large quantity of air variables (ranging in size from large to huge); electrolytics (some twist lock), many, many tubes, wirewound resistors, variable and tapped resistors, axial lead capacitors all NOS; have three NOS 100TH's, several 4CX1000 (good used), 829B's and 6146's all checked good.
2 brand new Collins plate transformers dual primary 110/220, secondary 2400-0-2400 @ 1.0 amp.
Several large vacuum variables.

Hours: 8:30 to 5 PM - Pacific Time, Monday thru Friday
Noon to 5 on Saturday, Closed Sundays

Uncle Dave's Wireless World



SECOND
CLASS

ELECTRIC RADIO
145 CR 123
Hesperus, CO 81326

TO: