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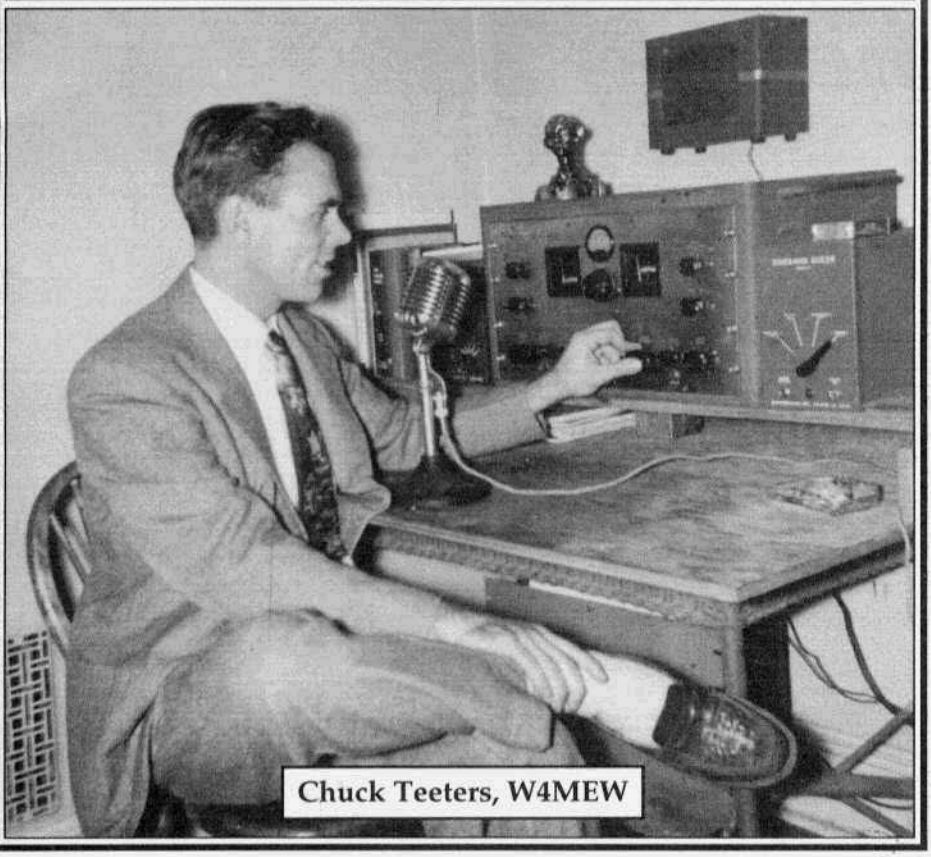
ELECTRIC RADIO

celebrating a bygone era

Number 117 January 1999



Chuck Teeters, W4MEW

ELECTRIC RADIO

published monthly by Electric Radio Press, Inc.
14643 County Road G, Cortez, CO 81321-9575
Second Class postage paid at Cortez, CO and additional offices

Authorization no. 004611
ISSN 1048-3020

Postmaster send address changes to: **Electric Radio**
14643 County Road G
Cortez, CO 81321-9575

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

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

Regular contributors include:

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

Editor's Comments

The N2KSZ Memorial 160-Meter Contest was well attended. I managed to work 18 stations (I could have worked double that if I would have been more aggressive) using a DX-100 and a half-wave dipole at about 50 feet. I've always felt that my dipole was not very effective from here in the canyon where we live but on contest night it worked admirably. And I think conditions were about as good as they get on 160. So far I've only received 2 logs; the first from Paul Johnston, W9PJ (my best DX during the contest) who scored 80 points. The second log is from Larry, Szendrei, NE1S who scored a total of 40 points. Larry has been participating in the contest for the last few years. In the February issue we'll have a complete report on the logs we receive and the winners will be announced.

It's really hard to believe that Shirley and I have been at this for almost 10 years. It just seems like yesterday that we were starting out. Time flies. One of things that occurred to me is that we've all aged 10 years. Those of you who sent in photos back near the beginning are invited to send in something current. I'm sure that all of us will enjoy seeing how each of us has aged and how our shacks have changed. Our photo requirements are still the same—sharp, 3x5 color or B&W snapshots work out just fine but no polaroids please.

The ER Parts Unit Directory is in need of more parts units. If you have a parts rig please get your information to me so I can add it to the list. The first advantage of getting your parts units into the directory is that your parts rig can bring another boatanchor to life. The second advantage is that you can make a few dollars. For those of you that are unfamiliar with the ER Parts Unit Directory, here's a rundown: The PUD is a database that I maintain in my computer. It consists of all the parts units list alphabetically by manufacturer followed my the owner's name, call, address and phone no. A printout of the list is available for $2 plus a LSASE.

Again, all the best to everyone in 1999. My hope is that everyone will enjoy a healthy and happy New Year. N6CSW

TABLE OF CONTENTS

Cover: Frequent ER contributor, Chuck Teeters, W4MEW, (then W8JWK/2) at his operating position back in 1953. The receiver is a BC-1004 with a Central Electronics slicer.

Looking Back

by Lew McCoy, W1ICP
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Reading last month's Electric Radio brought back some memories about the technical department I have never related and the readers may find them interesting. Jim Hanlon, W8KGI, recounts some of the problems with the HQ-129, RME-45, and other receivers (and I might add, does an excellent job!).

Working in the ARRL Technical Department, during that era of receivers and even later, exposed one to some very interesting occurrences. One point at the outset here, nearly all the receivers of that time blocked up in the presence of strong signals.

I remember one day when the Sales Manager of Hammarlund brought down a late model of the HQ- series and bragged about how it would handle strong signals. I don't have any idea of how many of the readers ever visited the Headquarters at Newington, Connecticut but let me describe it. Originally, Headquarters was an office in Hartford and then for many years in West Hartford and finally the Headquarters building was built in Newington on the grounds of W1AW.

W1AW ran a kilowatt input on all bands, 80 through 10 meters. On 20 meters there was a large rhombic, about 700 feet on a side (or leg as some call it). The Headquarters building was right in the center of this rhombic while in front of the building was a 40 meter dipole. Beams were used on the other bands.

Getting back to our receiver happenings this Sales Manager was really proud of this HQ- model and he said it would really perform. We had our own dipole in our lab, not related to W1AW. I had the job of hooking up the receiver to the antenna. When we turned it on, it was hotter than the proverbial pistol. All of us were impressed with the sensitivity. But just when we were getting to enjoy listening to 20 meters, W1AW came on with their bulletins. The receiver completely blocked up and 20 meters disappeared (and all the other bands for that matter). I don't think I ever so a guy so embarrassed as that sales manager. I recall that he apologized and took his receiver and left. But truthfully, we didn't find any receivers in those days that could handle the strong RF field generated by 1AW. By Goodman, W1DX, was our receiver expert. I clearly remember him stating that one day he was going to design a receiver using an 807 for a mixer. (I know Hanlon will appreciate that.)

A little later, Ed Harrington, who some readers will remember worked for National and designed the NC-300, consulted with Goodman. The result was a receiver that at least would handle very strong signals. Ed finally left National and joined Radio Free Europe but he never got to carry through on an updated design of the mixer circuit of the 300—the later models were not his.

Collins came in with good receivers. They had the reputation and their name to uphold with the military. The RME-45 (I had one but not for long) was really unstable. Hallicrafters, when Bill Halligan (Hallicrafters' founder) took an active interest, had some good receivers but then they went through a cheapy period and produced some poor quality.

Which brings us up to solid state and the Japanese. I recall very well when the Kenwood representatives came to Headquarters with their first receiver which was mostly solid state. What was amazing was that these solid state receivers could actually hear signals within about 20 kc of the W1AW 20 meter signal.

Modern equipment is a dream compared to those early days.

You readers hang in there. I hope you enjoy reading about these olden but golden days. **W1ICP**

AMI Update—January 1999

by Dale Gagnon, KW1I, President
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FCC NPRM Emergency Mailing

Early in November it was decided that the pending Notice of Proposed Rule Making, WT Docket 98-143, was serious enough to warrant the unprecedented move of alerting the entire AM International US membership by mail. This NPRM proposed simplifying the amateur licensing structure, but more importantly broadly hinted at the possibility of reduced or eliminated CW testing requirements. Approximately 1100 postcards were mailed notifying AMI members of the FCC deadline for comments and reviewing some of the most important concerns about the NPRM. Over 2000 total comments were received by the FCC on this NPRM by December 1, 1998. It is not known how many members sent in their comments, but many copies of member comments were sent to AMI headquarters. Though the NPRM comments are publicly available from the FCC over the Internet, it takes quite a bit of time to load and read each comment. For this reason it has not been possible yet to develop a clear picture from the comments. The FCC will be digesting this data as they rework their license simplification ideas. I appreciate the great response and the encouraging letters. One sidenote: The mailing stimulated a lot of address and callsign corrections for AMI records. About 10% of the postcards sent to members were returned with address problems. Even though this is a relatively small percentage for a list accumulated over the last several years, it does represent a significant number of AMers who are no longer on our rolls. If you did not receive the Emergency AMI mailing in November, your address has probably changed since you joined. Please send AMI Headquarters your new address so we can update our records!

Thanksgiving AM Jamboree Results

Conditions were good over the Thanksgiving weekend and a record number of logs were submitted to AMI Headquarters for recognition certificates.

Here are some of the best and brightest:

KB6BKN, Walter Schivo, 74 points; K7POF, Bob Sitterley, 57; NAØY, Ken Fattmann, 43; K1GUP, Jerry Burns, 43; K6QY, Gerald Morris, 41; KØEOO, Dennis Petrich, 32; K6AD, Thomas Bonomo, 27; KI5DT, Don Markl, 26; K1EYY, Carl Lavnikevich, 23; WA5UEK, Brian Harris, 23; KB5WWD, George Folse III, 22; K5LYN, Lynn Fisk, 21.

Operating AM

Now that ten meters is opening more and 75 meters is lengthening out at night, it is important to think about the possible unintended effect of your AM operations on other stations. Skip conditions on ten meters in most cases allow us to hear only one side of QSOs in progress. And many of us have the habit of tuning up on 29.000 mHz or a frequency nearby that is a multiple of 10kHz and mistake the quietness we hear on frequency as inactivity. Several times I have heard only two or three active AM frequencies on the band. All near 29.0 mHz, with more than one QSO trying to take place on each frequency. We should spread out before we call and we should make several calls to determine if the frequency is in

continued on page 42

Your CW "Voice"

by Rob Brownstein, K6RB
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With the rebirth of interest in vintage equipment and AM mode operation, it isn't unusual to hear operators talking about the great lengths to which they've gone in order to have great sounding audio. For example, on the west coast, there are more than a handful of stations whose audio sounds indistinguishable from commercial AM stations.

But one doesn't hear many vintage transmitters on the CW sub-bands. And I suspect the reason is these transmitters can't cut it on CW. It's not that these transmitters are so bad, but rather that modern transceivers sound very good on CW. In Chapter 8 of the 1961 ARRL Handbook, the section on keying and break-in, they write "...a properly shaped chirp-free signal is a pleasure to copy and is likely to attract attention by its rarity." That may have indeed been true in 1961, but it isn't true in 1998.

Modern transceivers are designed for chirp-free and click-free operation. Today it is a rarity to hear a chirpy or clicky signal. And when you look at the envelope of a modern transceiver on a monitorscope, it is perfectly shaped.

The challenge, then, is to put a transmitter designed and built 40 years ago on the air, using CW, and have it be indistinguishable from a Kenwood, Icom or Yaesu. And, it can be done.

What's the payoff? Pride, for one. There's no way to value those unsolicited comments about how good one's Ranger, Valiant or Globe King 500 sounds on CW. Let's just say it is the equivalent of those "great sounding audio" comments one gets on AM. And the challenge can be more demanding than achieving outstanding audio.

Frequency Stability Is Critical

On today's CW bands, frequency stability is critical. Most operators are using 500 Hz or narrower filters, routinely. With a signal that drifts 200 Hz, you will zip right out of someone's passband. I have found the stability of VFO's in the Valiant and Ranger to be good enough for modern CW operation – after a suitable warm-up period (e.g. 30 minutes). I suspect the older Heath vfo's – the VF-1 and the internal vfo in the DX-100 and 100B – cannot be relied upon for CW operation – without significant modification. External vfo's, such as the Globe 755 and EICO 722, have been up to the CW task. If your transmitter's vfo cannot achieve well under 200 Hz of drift after a half-hour's warm up, then consider operating CW using crystal control, instead.

How You Key Is Key

Chirp – the bane of operators in the 1950s – has all but disappeared on today's CW bands. In a nutshell, chirp is the rapid shift in frequency one can hear when a key is first closed or opened. There are several causes for chirp. Oscillator frequency "pulling" by later stages will cause chirp. And rapid changes in oscillator screen or plate voltages will cause chirp.

One very quick way to mitigate or eliminate chirp is to leave the VFO "on," while keying successive stages, only. This creates a problem for break-in operation, so I do not operate vintage CW with break-in. With the three transmitters I have that use external vfo's (the Globe King 500, Viking Adventurer, and Eico 720), when I switch the Dow-Key antenna relay to transmit mode, the

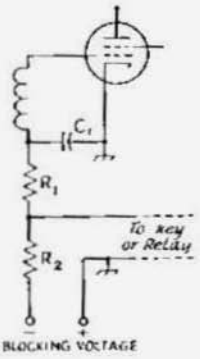

Figure 1. Grid-block keying

VFOs are keyed "on," the receivers are muted, and the keying is monitored. I have yet to get a chirp report with any of these stations.

My Viking Valiant and Ranger have internal vfo's. And both of these transmitters use grid-block and differential keying. With grid-block, the keyed stages are biased "off" with a sufficiently high negative voltage, and keyed "on" by essentially taking the blocking voltage to ground through a resistor (see figure 1).

Differential keying turns on the VFO before the rest of the keying chain on key down and turns the VFO off after the other stages on key up. The idea is to have any chirp occur before and after the rest of the stages are keyed. And it works.

One convenient way to check your signal for chirp is to short out the antenna terminals on your receiver, run the transmitter into a dummy load, and lower the RF gain to a point where there is no receiver front-end overload. Then tune in your signal at a low-frequency beat "point". Send a succession of dashes and listen for any change in beat frequency. If you hear none, probably no one else will.

Don't be a Click Monster

The first time I ever used my Viking Ranger on CW, I was pounced on by an operator in Texas who said I was clicking up a storm. And that with only 50 watts of signal output! That's when I decided I need a good monitorscope. And, with the monitorscope I saw that the CW envelopes of both my Valiant and Ranger were less than ideal. Both had fairly fast rise and fall times—a definite prescription for transmitted key clicks. When I looked at the pattern on my Icom IC-761, it was perfect. A bit rounded on key down, and also on key up.

I found that the differential circuits for both the Ranger (see figure 2) and Valiant (see figure 3) could be used to adjust those rise and fall times. By playing with the values of the timing capacitors (C57 and C89 respectively) and resistors (R43 and R42 respectively), I was able to slow down both rise and fall of both the Ranger and Valiant.

This is one of those procedures, however, that is cut-and-try. If you don't

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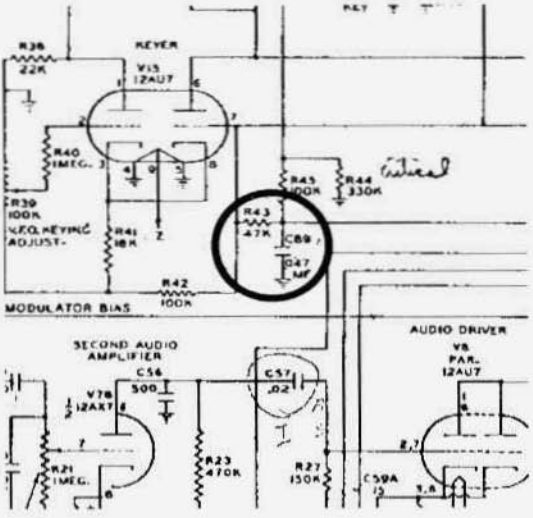

Figure 2. Viking Ranger differential keying timing circuit. Increasing C89 softens the "make" and increasing R43 softens the "break."

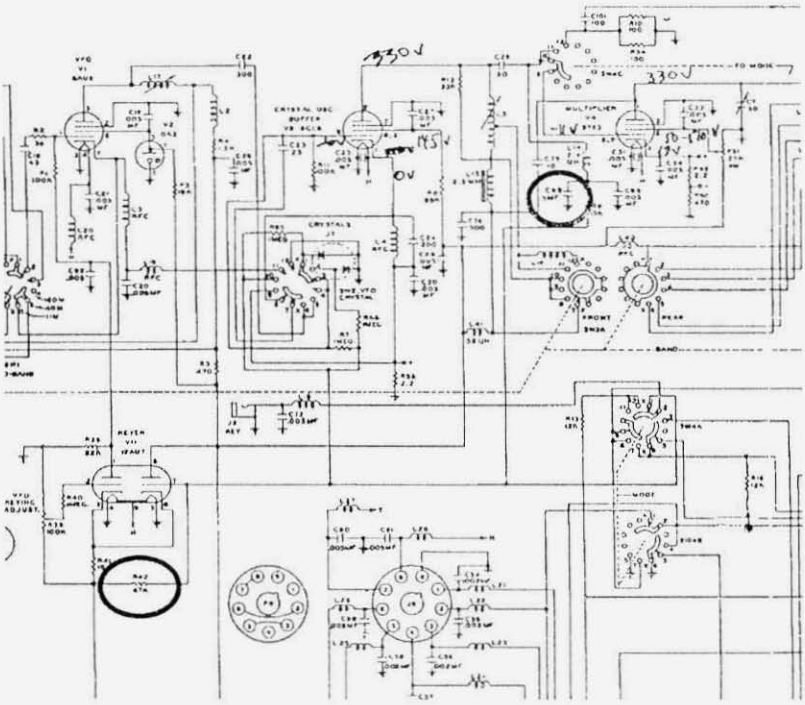

Figure 3. Viking Valiant differential keying circuit. Increasing C89 softens the "make" and increasing R42 softens the "break."

have a monitorscope, it will be a more trying process. I'd try increasing both the resistor and capacitor values until the CW note begins sounding a little mushy. Then back off the values just until it begins to sound more crisp. The potentiometer for adjusting the VFO switching times will also affect the CW envelope. With a monitorscope, adjust that pot until you see a good looking envelope as you key a series of dots. Without a monitorscope, you'll have to judge the adjustment "by ear."

With a cathode keyed transmitter, such as the Globe King 500, Viking Adventurer, and Eico 720, you can adjust rise and fall times using a series inductor and shunt capacitor (see figure 3).

The inductor slows down the rise time, and the capacitor slows down the fall time. Inductor values can vary from millihenrys to several henrys and capacitor values can vary from 0.5 to about 4 microfarads. You'll see, for example, that the stock Globe King 500 has essentially no CW shaping components (see figure 5) and qualifies as a serious click generator.

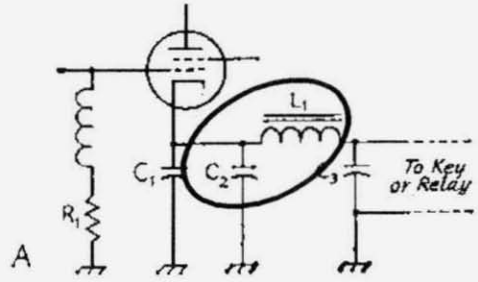

Figure 4. Cathode keyed key shaping. Increasing L1 softens the "make", increasing C2 softens the "break."

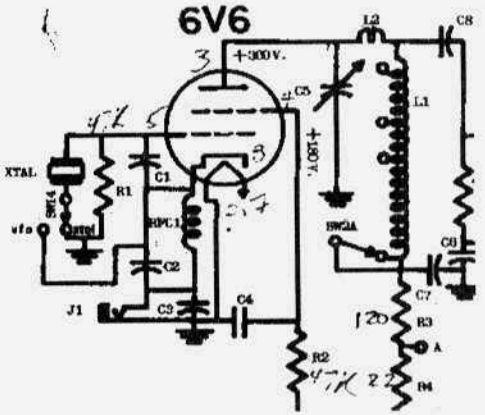

Figure 5. Globe King 500 cathode keying circuit. Capacitor C3 is an RF bypass capacitor and RFC 1 is simply an RF choke. There are no key shaping components in the circuit.

The Globe King 500 was tamed down using a 15 Henry inductor and a 2 microfarad capacitor. As before, this is a cut-and-try process. With a monitorscope, adjust these values until you achieve a good envelope pattern while sending a series of dots. Without a monitorscope, you'll have to trust your ears again. Use values that get a mushy-sounding signal, then back off until it begins to sound crisp.

The True Test

Once you're ready to put your vintage "beauty" on the air, on CW, it is interesting to wait until a few exchanges before telling the other operator what kind of equipment you are using. That way, the other operator will assume you're using modern gear, and be more likely to tell you if something sounds strange. I've found that once I do disclose my station setup, some operators have taken the time to check for both clicks and chirps. They'll ask me to send a series of dashes and then tune close to zero beat to listen for chirps. Then they'll ask me to send a series of dots, while they tune off frequency to listen for any clicks. It is very gratifying to get a clean bill of health on both scores. Trust me, you'll like it. ER

K6RB SANTA CRUZ, CALIFORNIA

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3881 Winkle Avenue
Santa Cruz, CA 95065

Santa Cruz County

Ex-NS6V,
Ex-K2UMU

73 es tnx fer the QSO!

CALL	DATE	TIME (UTC)	BAND	MODE	RS(T)	QSL
			160 80 40 20 15 10	CW AM SSB		PSE TNX

QSL by K6RB

The author's QSL card.

The Million Dollar Radio

or a Capsule History of the Electronic Assistance Corporation

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While doing some research into the history of the R-390A, I ran into the most interesting gentleman. His name is Robert Edwards, W2KKC, and he is the former chairman of the Electronic Assistance Corporation (EAC). In this brief article, I want to share with ER readers a capsule history of EAC, and the story of the Million Dollar Radio shown in the photo.

The readers who may have been following Les Locklear's R-390A history articles in this publication know that EAC made about 15,000 R-390A's under two different orders for the US Army. It is well known that the R-390A was designed by Collins, and we're familiar with the other Collins products, but what the heck was this EAC company anyway?

The Electronics Assistance Corporation was founded in June of 1958, as a former electronics division of Mack Trucks, Inc. The company grew through many acquisitions too numerous to name here. Some of the more interesting products made by EAC, other than R-390A's, were radio altimeters (for the Navy helicopters used to retrieve spacecraft from the ocean), spook type recording equipment for the CIA's first U-2 spy planes, a pari-mutuel betting machine, field telephones, dummy load watt meters, TACAN alignment equipment, and air eliminators for use in bottling beer (now we're talkin'!). They also provided equipment and maintenance services to NATO. Operations were handled out of EAC's 41,000 sq. ft. plant at Red Bank, New Jersey and its 22,000 sq. ft. engineering and development facility at Dexter, Michigan.

EAC's first order for R-390A's came from the US Army in 1960 for a quantity of at least 4255 receivers. Naturally, there were a few start-up problems. Some of the earliest 1960 EAC radios were reportedly made with Clevite ceramic filters instead of mechanical filters (oops!). N1MAA reported to me that his 1960 EAC s.n. 24 is equipped this way.

EAC's second order for R-390A's came in 1967. The plant at Red Bank, New Jersey was working two shifts to produce over 10,000 units for the Army in this second order. Exact production figures are a bit sketchy, but I have seen serial numbers from this second order as high as 10,717. The company learned that it could improve the R-390A assembly time by redesigning certain aspects of its modules. They worked with the Signal Corps at Fort Monmouth to modify the design to make the modules easier to assemble. This is best illustrated by close comparison of a Collins IF deck with an EAC IF deck. The EAC deck was made in two pieces, designed to be wired while open. One will find designed-in wire splices in the EAC IF decks and behind the front panel. These modifications were made to ease assembly and are reflected in the R-390A drawings.

EAC also provided at least 215 sets to the Dittmore-Freimuth Company of Milwaukee to fulfill their Army order

"The Boss Rig", 1967 EAC radio presented to Robert Edwards by EAC.

"The Million Dollar Radio" brass tag.

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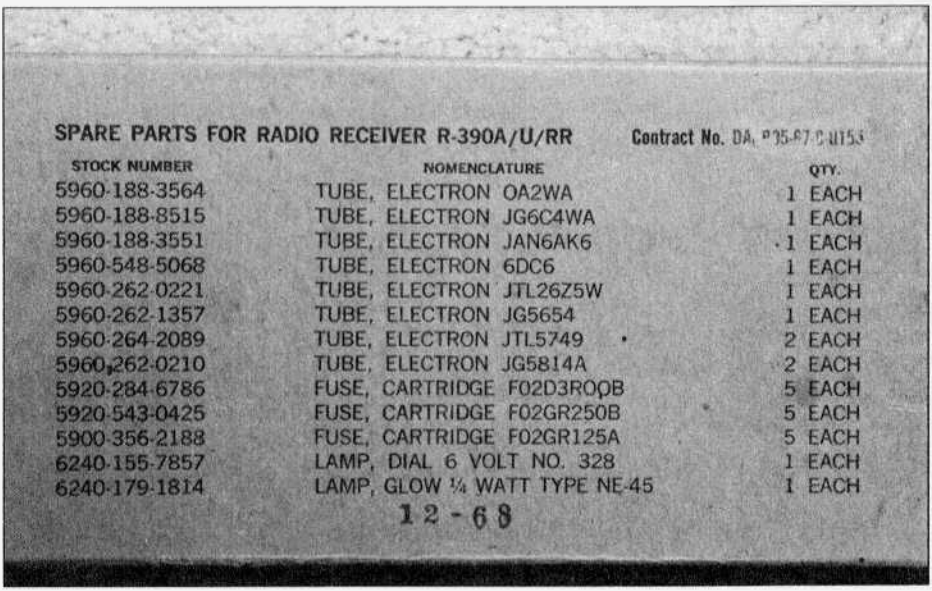


SPARE PARTS FOR RADIO RECEIVER R-390A/U/RR Contract No. DA-[illegible]

STOCK NUMBER	NOMENCLATURE	QTY.
5960-188-3564	TUBE, ELECTRON OA2WA	1 EACH
5960-188-8515	TUBE, ELECTRON JG6C4WA	1 EACH
5960-188-3551	TUBE, ELECTRON JAN6AK6	1 EACH
5960-548-5068	TUBE, ELECTRON 6DC6	1 EACH
5960-262-0221	TUBE, ELECTRON JTL26Z5W	1 EACH
5960-262-1357	TUBE, ELECTRON JG5654	1 EACH
5960-264-2089	TUBE, ELECTRON JTL5749	2 EACH
5960-262-0210	TUBE, ELECTRON JG5814A	2 EACH
5920-284-6786	FUSE, CARTRIDGE F02D3R0QB	5 EACH
5920-543-0425	FUSE, CARTRIDGE F02GR250B	5 EACH
5900-356-2188	FUSE, CARTRIDGE F02GR125A	5 EACH
6240-155-7857	LAMP, DIAL 6 VOLT NO. 328	1 EACH
6240-179-1814	LAMP, GLOW ¼ WATT TYPE NE-45	1 EACH

12-68

NOS spare parts set for EAC R-390A.

of 1968. Examples of the late model EAC radios are regarded as some of the highest quality sets made.

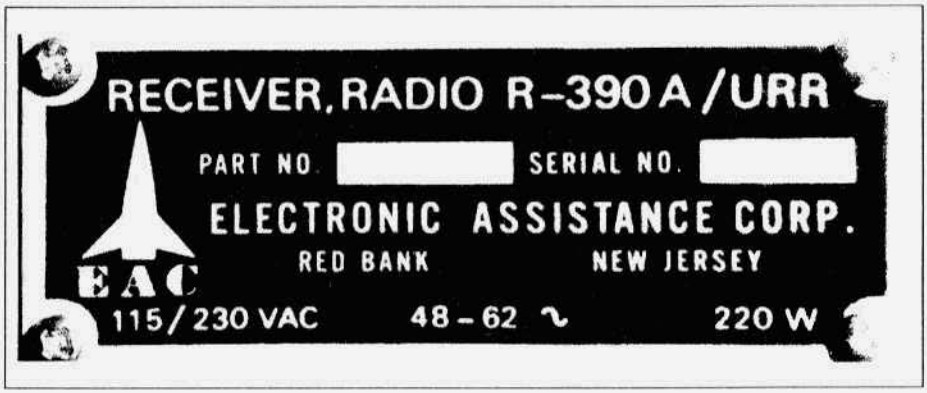
Among EAC's many corporate acquisitions, in 1968 it acquired The Hammarlund Manufacturing Co. for about 1 million dollars and Radiomarine for about $2.4 million. A little more than 100 left over R-390A's from the government production run were sold commercially by EAC/Hammarlund for $1700. These sets can be identified by their ID plate with the rocket ship logo. Ads for these sets were run in national ham magazines under the EAC Industries label, but data sheets were mailed out under the Hammarlund name in May of 1970. EAC also released an unknown number of radios with a 6U8A factory product detector and mode switch modification for USB and LSB.

After production ceased, the R-390A parts, remnants and the Hammarlund name were acquired by the company today known as Cardwell Condenser (which also acquired partial or total rights in National, Fowler, Lionel, Decitron, Clavier, Capehart, E F Johnson, about 40 companies altogether). Some unfinished modules found their way into hamfests. Wally Chambers, K5OP, stumbled upon many of these parts whilst rummaging through boxes under hamfest tables.

EAC's management and R-390A production were performed under the watchful eye of Robert Edwards. He left EAC in 1969, and went on to form the familiar Radiofone Corporation. He is today a recognized leader in the cellular and paging business, and holds several patents for paging technology including components of the numeric pager. Mr. Edwards still resides in New Jersey, working as a telecommunications consultant. His ham radio activity is limited to VHF, but he mentioned to me that his HF equipment of choice was the KWM-2.

The Million Dollar Radio

During my discussions with Bob about EAC, he mentioned that he was changing residences and had to lighten the load. He asked if I would be interested in acquiring his personal R-390A.



A little more than 100 left over R-390A's from the government production run were sold commercially by EAC/Hammarlund for $1700. These sets can be identified by their ID plate with the rocket ship logo

As it turns out, this unique radio was presented to Mr. Edwards by EAC, and has a special brass tag on the front which reads:

THE MILLION DOLLAR RADIO MANUFACTURED EXCLUSIVELY FOR ROBERT EDWARDS

The radio has no other nameplate, but the modules are all 1967 EAC production with the Army contract and order numbers. According to Bob, the significance of the million dollar figure is that is what it cost in 1960 to set up the first EAC R-390A production line and produce the first radio.

I was able to acquire the radio at a substantial discount off of the $1 million it cost Bob to build it. Bob shipped the radio to me, and to my surprise, it came with an original cabinet, two sets of military running spares (one of which Mac McCullough liberated in short order), and all of the Army manuals. One of the sets of spares was from the Dittmore-Freimuth contract (now how did those D-F parts get into the EAC plant?).

The radio was virtually unused. I'd never seen one before that still had every screw and lock washer in place, but this one certainly did. It needed a complete alignment as many of the component values had drifted, but needed no cleaning to speak of. All of the original JAN tubes were still good. I found only one bad capacitor. Careful analysis on the part of the author (and the copious amounts of smoke to follow) led straight to the problem. I noted that the Cosmos PTO was 8 kcs off of endpoint alignment, or about .27 kcs per year, assuming that the rig EAC presented to the boss in 1968 was aligned in the first place (it better have been!).

Interestingly enough, the company is still in business today. It is doing business as EAC Industries, headquartered at 282 Prospect St., New Haven, CT, and is still traded as a public company. They no longer make radios of any sort. Their principal lines of business are fabricated metal products, signs, and advertising specialties.

So now the MILLION DOLLAR RADIO has a new home where it is used daily, and ER readers know a bit more of the mysterious Electronics Assistance Corporation. As always, additional information on the topic is welcome.

Now, a question to the readership. Has anyone ever heard of Courter Products being involved in R-390A production? ER

A 1949 AM Transmitter

by Chuck Teeters, W4MEW
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Thumbing through the 1949 handbook reminded me that I had never built a big AM transmitter. All my home brew AM transmitters back then were low power. I built an SSB transmitter in 1950 and from then on I built SSB stuff. At the Greenville, SC Hamfest I ran across a used 13 by 17 chassis with 80 and 40 meter B & W 500 watt plug-in coils and a swinging link base for $15. Here was the start of that big AM transmitter that I had never built. I had a Johnson split stator variable with .175 spacing and some 50 watt plug-in coils at home so I plunked out $15. It would be fun to cut metal again.

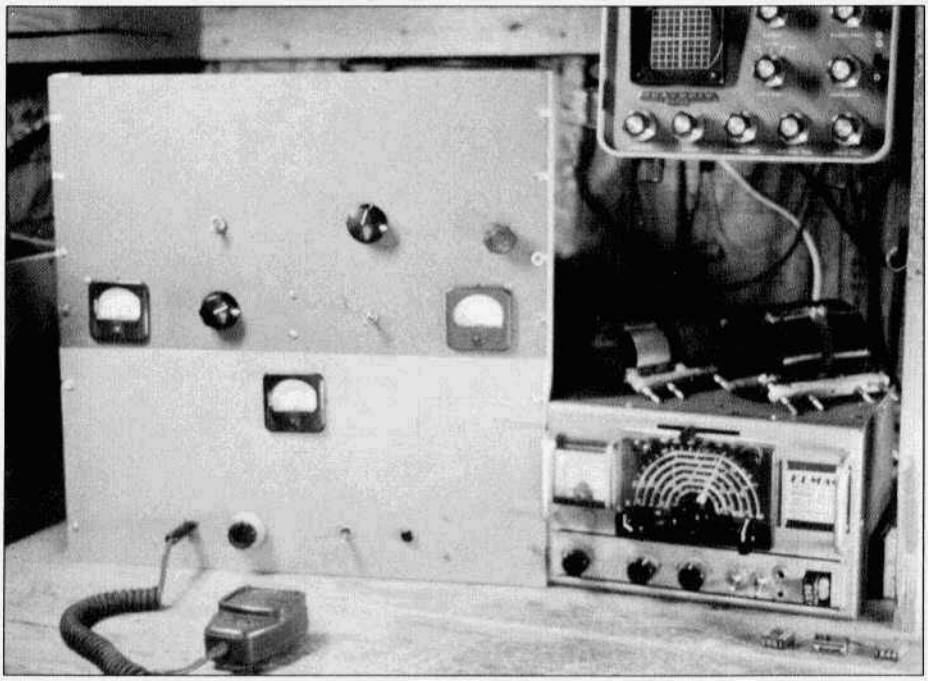
At home I went through the junk box and pulled out stuff to build something around the 400 watt level. I had 811As, and 572Bs so I went for, to quote the '49 handbook, "a push pull, plug-in coil, medium power, triode amplifier". The circuit was simple, a grid tank, a plate tank, and two neutralizing capacitors. I would use the 811As and could plug in the 572Bs if I needed more plate dissipation. With either I could provide protective bias with a C battery and operating bias from the grid leak.

Parts fell into place except for meters and neutralization caps. I wanted matching meters for the PA grid, plate and modulator plate. I remounted a round meter in a square case, and made shunts to get three matching meters. A 6 volt 10 amp filament transformer fit nicely on the chassis. I still had not found neutralizing caps but as a last resort I could make a pair. I had a rack panel that had most of the holes in the right places. Bondo took care of the extra ones and I had my push pull, plug-in coil final looking almost like the one in the '49 handbook.

With 811As in the final, 811A modulators were a must. My good friend W1SUJ came up with a surplus FAA modulation transformer that had the right ratio and looked big enough for 811s. I had a 1938 Philco audio transformer that had driven P-P 42s from a triode connected 42. I used a triode connected 6L6 to drive the 811s with the Philco transformer. I love carbon mikes, especially the F1, so the speech amp was easy. Half a 6SN7 grounded grid pushing the other half and RC coupled to the 6L6. I built a power supply on the modulator chassis to power the speech amp and a 24 volt DC supply for the surplus T/R relays. The bias supply for the modulator was easy, a four and a half volt C battery.

I had two 750 volt, 400 mA power transformers but they weren't exactly the same voltage. I connected one to the anodes of a pair of 4 KV 1 amp diodes and the other to the cathodes. By taking the output from the center taps of the two plate transformers, I had a full wave 1500 volt plate supply. I would like to have used 866s, but with the two transformer arrangement it would take two well insulated 2.5 volt filament transformers which I didn't have. A BC-610 choke and a pair of 10 mFd oil caps finished the supply. By switching off one plate transformer primary I would have half voltage for tune up. A check confirmed that it was working as advertised, no arcs, sparks, or smoke, and a good honest 1500+ volts.

I decided to test the modulator first, but what do you do with 200 watts of audio. I needed a 200 watt 5000 ohm resistor for a load. The junk box yielded some wire wounds that connected in series parallel provided 5K at about 100 watts. The signal generator and distortion analyzer were connected for a test. It is amazing how quickly overloaded resistors get hot, but by working fast, I



The author's 1949 AM transmitter has 811As in the final and is modulated by 811As. The AF-67 (right) is used as the exciter.

ran power, frequency, and distortion tests. It wouldn't meet a BC proof of performance but was better than I expected. Under 7% at 150 watts and within 4 dB from 250 to 4100 Hz. Good enough, I quit while I was ahead.

I connected a command set 80 meter transmitter to the input of the 811 PA and made two neutralizing caps from sheet copper and ceramic pillars. It seemed to cancel out the feed through. I connected a Heath Cantenna to the output and applied HV. Presto, I had 80 meter RF, 2 meter RF, and smoke. After my success with the power supply and modulator, it was a surprise that all was not quite right with the final.

The unknown RFC in the plate was burnt to a crisp. I had a National R-154 so I tried it. No more smoke, just arcs, and random, wandering RF. My neutralizing caps would arc if I got the plates close enough to eliminate feed through. I cut larger plates, which worked until I modulatd the PA then they and the plate tuning capacitor arced. I gave up on home made when I found a Bud neutralizing cap in Atlanta and Larry, W3VU sent me an Army surplus one. The amplifier neutralized the way it should. Now all I had was VHF parasitics, and an arc in the final tank with modulation.

A la Terman, I lengthened the plate leads so they grid dipped lower in frequency than the grids. I floated the plate tuning capacitor rotors as the '49 Handbook said I should have in the first place with .175 spacing. I was in business. I had 320 watts showing on the Bird, with 300 mA plate current, and the smoke detector in the shack was quiet. One 811A was running a bit hotter, but a balancing plate on the rear of the chassis evened things up.

On-the-air checks proved the audio

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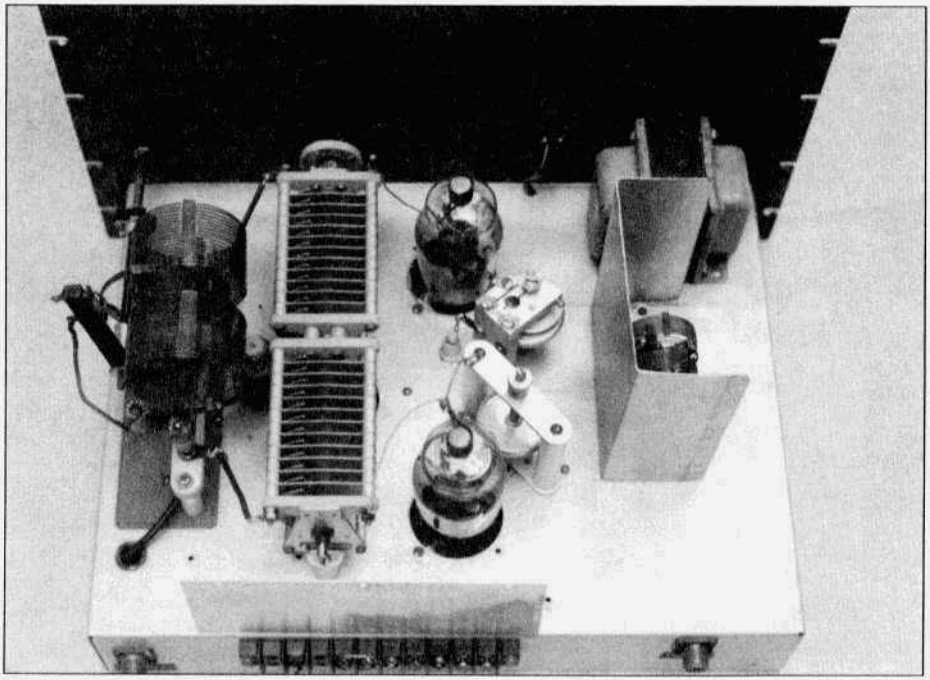


Rear view of the RF deck.

quality was acceptable to everyone on 3885. Most didn't think it was a carbon mic. My monitor scope said I could modulate 100% and then some. The HP334 said at 75% the distortion was under 10%. I was ready to go except I could only work 75 meters, and it was dead on week days. W1SUJ had his eye on my Drake TR-4, and he had an Elmac AF-67 he was not using since he got a Johnson Ranger. A trade was negotiated, and my exciter problem was solved. The AF-67 worked 160 through 10 and had NBFM capability, which expanded my possibilities. The AF-67 keying would need some work I found after my first CW contact. I got a 5-9 "what in the world is that" report from W4PMJ.

My first excursion onto 40 meters demonstrated that old corroded coils don't handle much RF these days. I got into the coil building business. Using BC-610 coils and airdux, I built up some workable coils for 160, 40, and 20 meters. They don't look as nice as the B & W but they work. The transmitter now was working nicely on 160 through 20. I never made coils for 10 meters as the Elmac's 40 watts seems to do just fine when the band is open and when it is not nothing seems to work.

Now that I had my transmitter operating I remembered why everyone changed to band switching. It takes time to change coils, and the shack gets cluttered up with coils lying around. It makes you think twice about switching bands. The transmitter brought back another old time goodie. I got my first BCI complaint in 48 years. I probably bothered neighbors' broadcast sets with SSB but they couldn't tell who or what. Now the neighbors ask who I was talking to in Ohio last night. When the local ball games are on I switch to NBFM and carry on. I've had QSOs where the other station had a NBFM receiving capability (SX-71) but slope detection seems to work as well as it used to for most.

Rear view of the modulator deck.

Another bugaboo of old, link coupling leaves a bit to be desired. A change of frequency of a few percent from the antenna's resonant frequency usually results in poor loading. Even with a tuner careful readjustment is necessary with every frequency change. It sure makes you appreciate pi section output. The only thing from 1949 I don't seem to have is TVI. Hoo-ray for cable.

The satisfaction of operating my home brew '49 transmitter far exceeds the inconveniences however. Also, since my SSB transmitter is a 1950 home brew it is nice to operate an AM transmitter that is older than my SSB. Running AM with a "new" Viking seemed inconsistent. My 1949 AM transmitter cost under $70 to build thanks to the junk box and friends. The time required to build it exceeded what I planned on, but looking for parts these days takes time. Thanks to my friends however it was not difficult, and was really fun. As soon as I find 2 filament transformers to get 866As in the power supply, I will call it quits for 1949 and move on. ER

Updating The Hammarlund SP-600JX
by William Orr, W6SAI

The SP-600JX is a rugged, 1954-design receiver covering 0.54 to 54 MHz. As-is it is a good performer but with a few minor modifications it can be made even better and more reliable. These are the modifications:

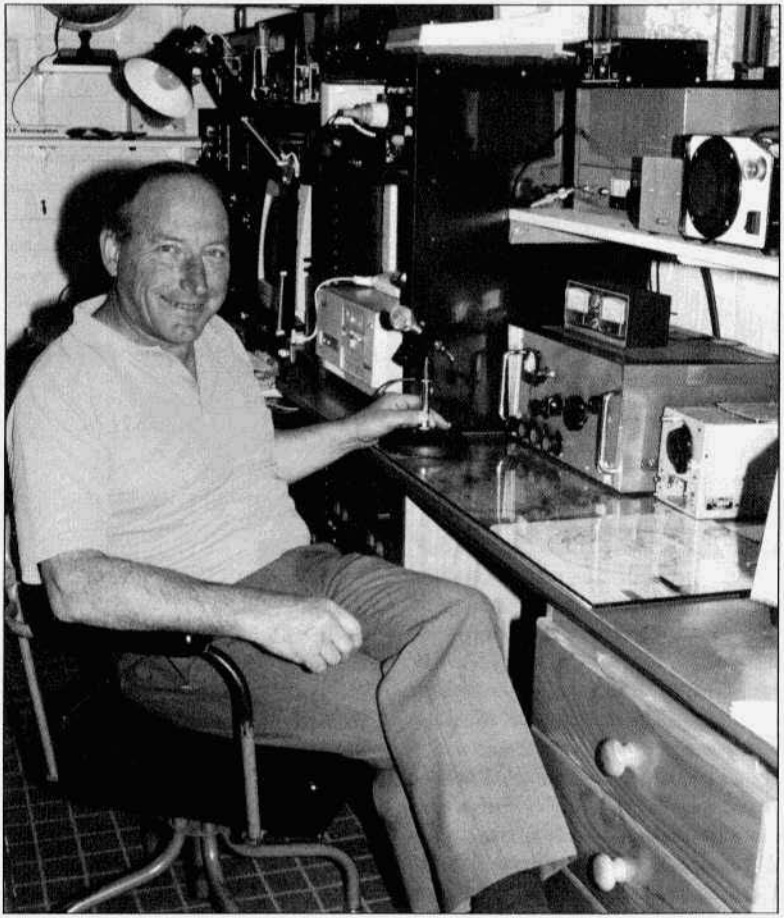
1- Set the tap on the power transformer to a voltage that is slightly higher than your line voltage. Mine runs about 124 volts, so I use the 130 volt tap.

2- Replace the 5R4GY rectifier with an indirectly heated 5V4-G. This tube has a warm-up time compatible with the other tubes in the receiver. This eliminates the voltage surge which is hard on capacitors (some of which are difficult to replace.)

3- Finally, replace the 6BA6 first RF amplifier (V1) with a 6BZ6. You will be amazed at the improvement in weak signal reception, particularly above 25 MHz.

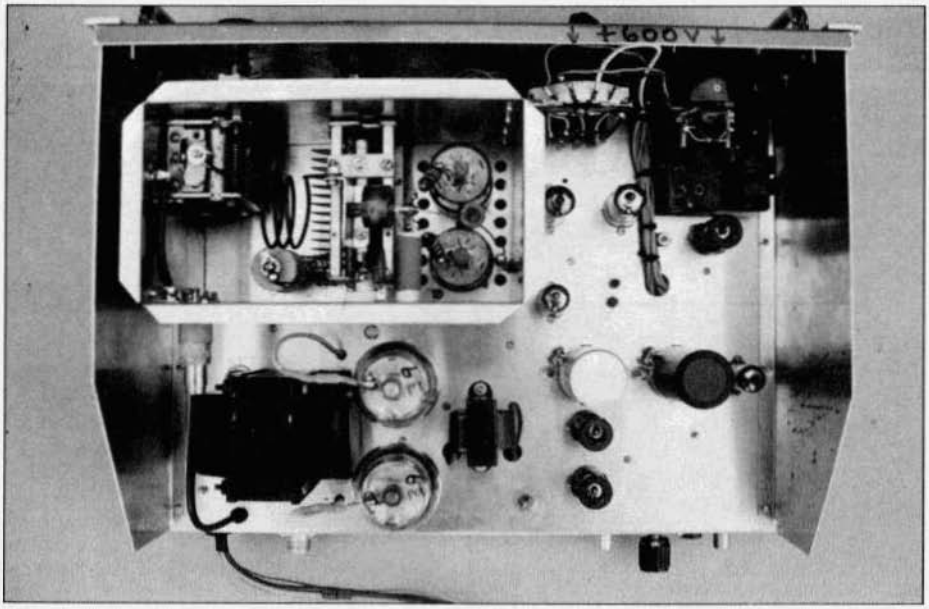
That's all there is to it. A few minutes making these changes will result in a receiver that has the sensitive ears of an Iroquois scouting party! ER

VK2BA, AMer and Homebrewer

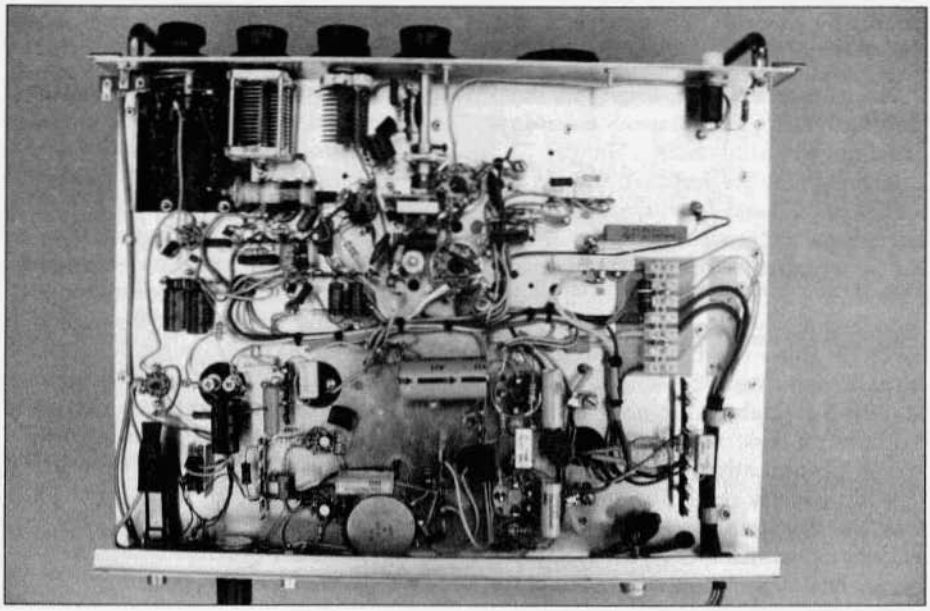


Many of the AMers operating in the 10M AM window (29.0-29.2) have worked David McNaughton, VK2BA. He has been very active and puts a tremendous signal up into the U.S. Bill Smitherman, KD4AF, has come to know David and supplied me with the photos and information here. Ed.

"David has worked about 30 states from downunder during the last few months with a homebrew transmitter and receiver. The transmitter is a pair of 6146s modulated by a pair of 807s. He uses an old Command set as a VFO. The modulation and audio driver transformers are from a Viking II parts unit I had. I sent them down to David to encourage him to build up the transmitter. David is a very accomplished builder and a very serious 6M SSB operator." KD4AF

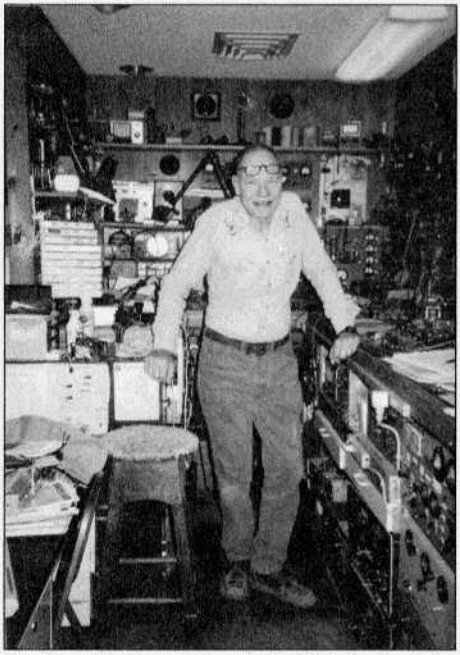


Looking down on the top of the chassis. The 6146 finals are in the compartment toward the top of the picture.



Underchassis view.

Bob Hosea, KB8GU, Silent Key



In the photo on the left Bob is in his workshop and on the right he is at his operating position. He operated mostly on 160 meters. *Photos courtesy of Dewey Angerhofer, WØZUS.*

Bob Hosea, KB8GU, of Grand Junction, Colorado, passed away Saturday, December 19 at his home. He was 73.

KB8GU was well-known for his big signal on 160 and for his prowess as a homebrewer. He was on-the-air almost daily, usually in QSO with his good friend Dewey, WØZUS. Other 160 ops who frequently worked Bob were Fred, KFØOW (his neighbor in Grand Junction); Chuck, WAØZHH (another outstanding homebrewer, now living in Midland, Texas; Arnie, KØAS, Deadwood, SD and others.

What I really remember most about Bob was his great ability to innovate. He was never stuck for a part or component—he just took something out of his junkbox and made what he needed. He used microwave oven transformers for power transformers in his transmitters. Once when he was stuck for a modulation transformer he just adapted a filament transformer he had on hand. It seemed to work just fine. Fred, KFØOW, recently told me a story of Bob using coax to make a neutralizing capacitor.

Bob worked at the Voice of America before being drafted by the Army in 1944. After basic training, he was assigned to the Signal Corps. In January 1945, he was assigned to the 1st Army, 69th Division and fought the last weeks of the Battle of the Bulge in Belgium. In 1950, he received his Engineering Degree from the University of Cincinnati at Cincinnati, Ohio. Bob retired in 1980. He moved to Grand Junction in 1990.

We're all going to miss Bob; 160 out here in Colorado will never be the same. N6CSW

VINTAGE NETS

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. 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 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: 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.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the first Sunday of every month on 14.165 at 1900Z and 3760 at 2000Z. Net control is Dave, VA3ORP.
Beer Town Traders Net: On 3885, 5:30 Central Daylight Time on Saturdays.
Westcoast 40M AM Net: Sunday afternoons from 3-4 PM westcoast local time until 4-5 PM on 7160 +or- QRM.

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

A 1941 Beginner's Receiver

by Niel Wiegand, WA5VLZ
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Introduction

I built this receiver as a companion to my 6L6 transmitter (see ER issue 62, June, 1994). The basis for it originally appeared in the February 1941 issue of QST. As the project progressed, substitutions and additions were made to fit the parts available. While the original design covered 1.7MHz - 14.5MHz, I built my version for just 80 and 40 meters. 160, 30 and 20 meters can be covered by winding additional coils. I've included the original general coverage coil winding data for reference.

Description

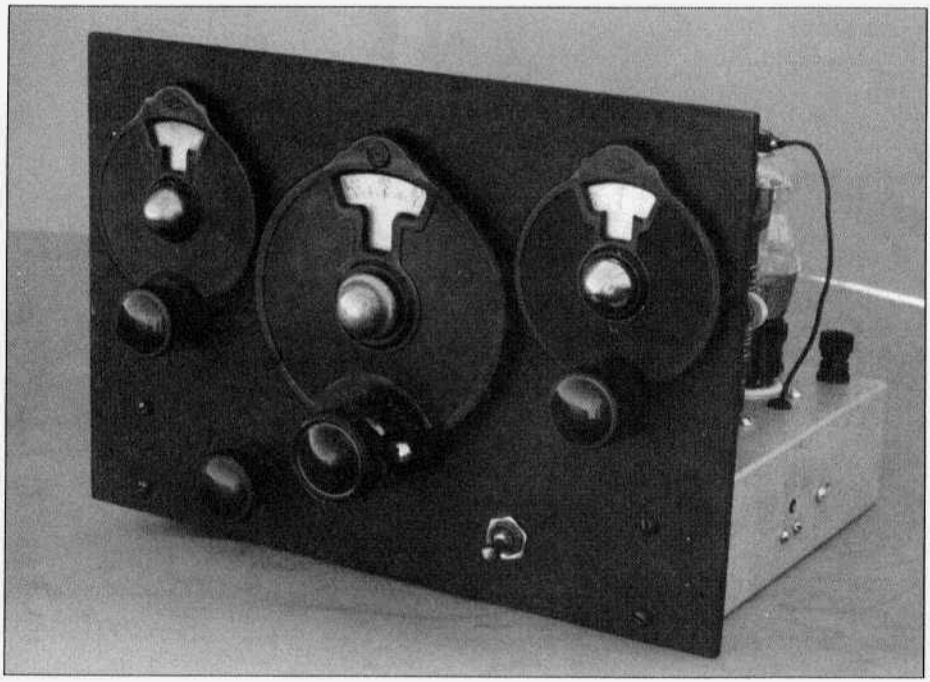
Long-established custom in 1941 dictated that a beginner's receiver, if he built it himself, would be a two-tube regenerative. The two tube regen was inexpensive to construct and represented perhaps the simplest practical receiver that could be built. It had definite disadvantages, even in 1941.

Making the two tube regen a two tube superhet resulted in a worthwhile improvement. Because the regenerative detector now works on a fixed low frequency it can be designed for stability rather than operation over a wide tuning range. The regeneration control is independent of tuning so it may be set to its most sensitive spot and left alone. The low IF also means that selectivity is enhanced over a typical regenerative receiver. Because the regenerative detector is not coupled directly to the antenna, dead spots and instability because of the antenna are eliminated. This receiver approximates the ideal regenerative set simply because utilization of the superhet principle permits the thorough isolation of the regenerative detector from the antenna and allows working the detector on a fixed low frequency.

Two tubes, though, still forces the receiver to rely on a regenerative detector. Even a stable detector overloads easily on today's ham bands. A few minutes of playing with the two tube superhet on 40 meters convinced me that a BFO was needed for reasonable CW and SSB reception. The two tube superhet became a three tuber. The regenerative IF remained. It is not typically run into regeneration but just below to improve IF gain and selectivity.

The set does not give loudspeaker volume -- the input to the audio amplifier is only a little more than a hundredth of a watt, so it would be hard to find the power to drive a speaker. Headset volume is satisfactory. As a modern safety measure, transformer couple the receiver output into either headphones or a external stage of audio amplification. Do not connect headphones directly into the plate circuit of V2/6C8G.

A word about images. The receiver will, of course, respond to signals either 1700 KHz lower or 1700 KHz higher than the oscillator frequency (depending on the exact IF frequency). The unwanted response, or image, is discriminated against by the tuning of the RF input circuit. By tuning the oscillator from 5.2MHz to 5.7MHz, then, both the 80 and 40 meter ham bands can be tuned by merely retuning the RF input circuit. Besides eliminating the winding of a coil, this has the added significant advantage of minimizing warm-up drift when changing between bands.



Front view of the 1941 Beginner's Receiver.

The heater requirements of the set are 1.0 amp at 6.3 volts. Either AC or DC may be used. 90 Volts at about 15 mA is all that is required for B+.

Circuit Description

V3/6K8 serves as a HF oscillator/mixer to convert the incoming signal to a fixed IF between 1600 and 1700KHz. L1-C1 tunes the RF input to the received frequency. L2 is the antenna coupling coil. The HF oscillator tank circuit is made up of L3, C3 and C4. C4 is the bandspread capacitor and C3 is the bandset capacitor. The IF output from V3 feeds half of V2/6C8G which acts as a regenerative detector. L5 together with C5 form the IF tuned circuit. The high capacitance of C5 helps stability. C2 is the regeneration control. The output of the regenerative detector is transformer coupled to the second half of V2 which provides a single stage of audio. An flashlight battery provides 1.5 volts of bias for both V2 and V3. This saved a few resistors and capacitors in the original design. Half of V1/6C8G is the BFO. Its tank circuit consists of L7, C12 and C11. C12 is adjusted and then left alone. A switch is provided that turns the BFO on/off.

Construction

From the front, the RF or input circuit tuning is on the left with IF regeneration below it, bandspread tuning is in the middle and bandset on the right with BFO on/off below it. Three 0-100 calibrated dials/knobs are required. The bandspread dial should be a vernier drive such as a National type B. The RF Input and the Bandset need just to be resetable to a few divisions out of a hundred. A couple of knobs with 0-100 calibrated flanges will work for these two positions. I used two National type BM dials.

This receiver is built on a 7" x 9" x 2" chassis. From the top/back, the shielded V3/6K8G converter tube is centered on

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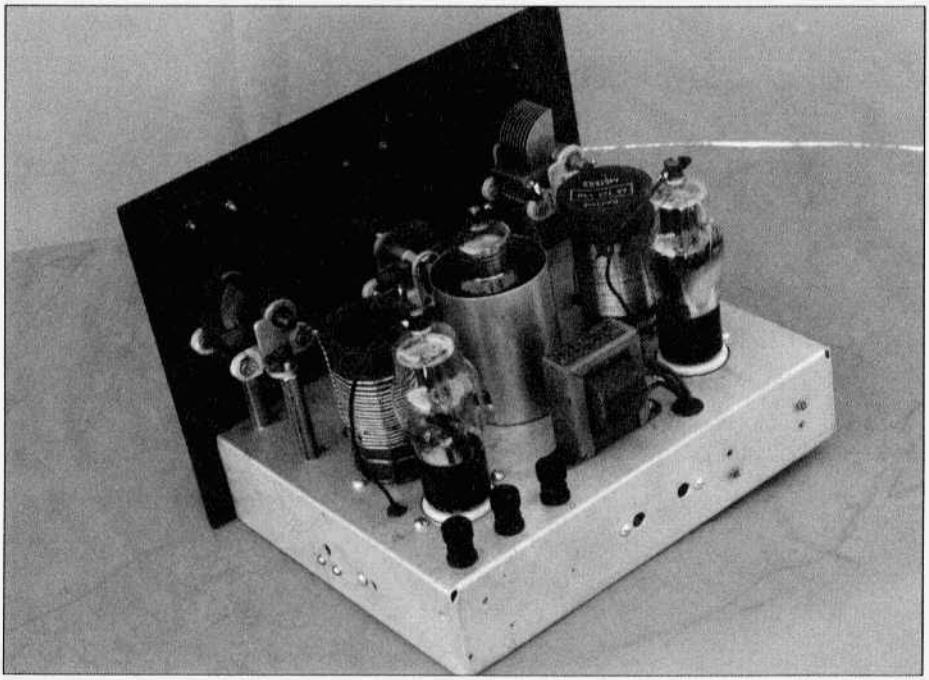


Rear view.

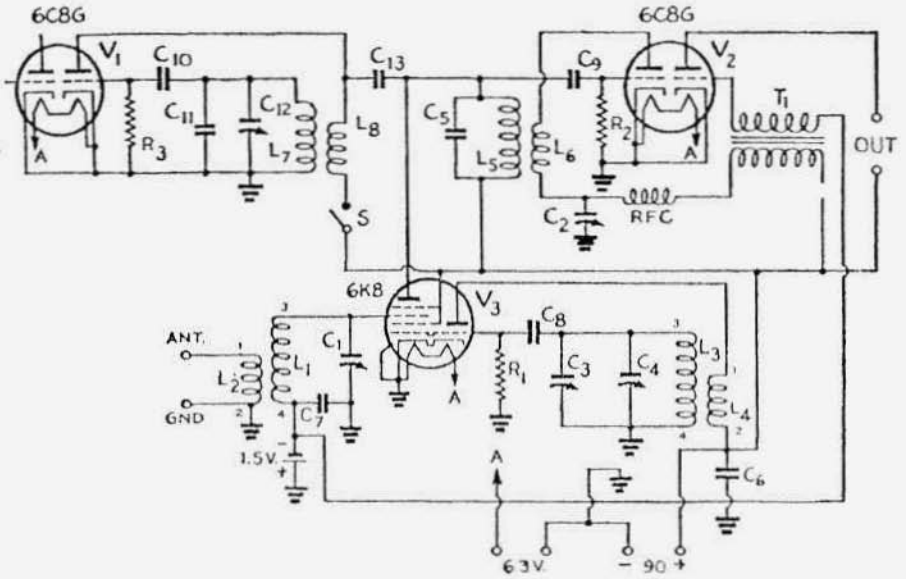
the chassis, the input coil L1-L2 is on the right and the oscillator coil L3-L4 is on the left. The detector/AF amp V2/6C8G is on the right next to the input coil and the BFO V1/6C8G is next to the oscillator coil. BFO tuning is via a set-and-forget adjustment on the left side of the chassis. The three binding posts are for power. Centered on the chassis rear are two pin-tip connectors for the audio output. These can be either transformer coupled to headphones or to an extra stage of audio and a speaker.

Underneath the chassis the IF coil L5-L6 is half way between the 6K8 and IF/AF 6C8G sockets. The antenna-ground terminals are on the left. The BFO coil L7-L8 is on the right fastened to the side of the chassis.

To eliminate hand capacity effects some sort of shield must be provided between the controls and the bandset/bandspread capacitors. A metal front panel or subpanel is ideal. I found the internal metal construction of the National verniers to be sufficient. A larger chassis would also be helpful. Ordinarily the BFO tube should not be right next to the oscillator coil. (For me the BFO tube was a last minute addition and that corner of the chassis was the only place available for it.) Warm-up drift would be minimized if a larger chassis is used that allows the BFO tube and the oscillator coil to be separated.

The IF frequency can be anywhere between 1600 KHz and 1700 KHz. The main thing to avoid is the frequencies of any local broadcast stations and any subharmonics of the ham bands. You'll hear a harmonic of the BFO otherwise. The IF frequency is fixed and the BFO frequency adjusted to match it.

The BFO circuit is optional. My receiver picks up AM foreign broadcast stations fine without it. As mentioned already, copying CW and SSB is much easier with the BFO. C13, the BFO coupling capacitor, is merely a wire running to the vicinity of V2.



Parts List

C1, C2, C3 - 100 pF variable (Hammarlund SM-100)
C4 - 15 pF. variable (Hammarlund SM-15)
C5 - 250 pf. silvered mica (Dubilier Type 5-R)
C6 - 0.01 mFd paper
C7 - 0.005 mFd mica
C8, C9, C10 - 100 pF mica
C11 - 200 pF silvered mica (Dubilier Type 5-R)
C12 - 10-90pF (approximately) trimmer/variable
C13 - see text
R1, R3 - 47K ohms, 1/2 watt
R2 - 1 megohm, 1/2 watt
RFC - 2.5 mH RF choke
T1 - audio transformer, interstage type, 3:1 ratio (Thordarson T13A34)
L1-L4 - See coil table
L5, L7 - 55 turns No. 30 d.s.c., close-wound on 3/4 inch diameter form (National PRF-2); inductance 40 microhenrys
L6, L8 - 18 turns No. 30 d.s.c., close-wound on 3/4 inch diameter form (National PRF-2); inductance 40 microhenrys
SW - SPST toggle switch

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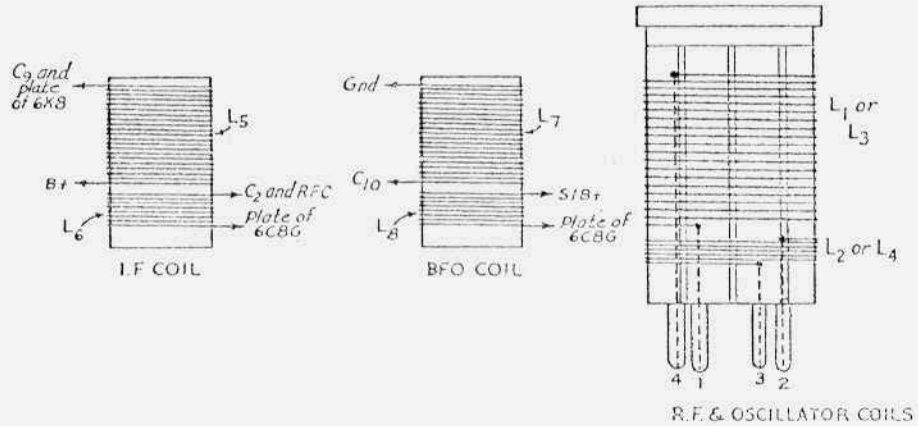


80 / 40 Meter Coil Configurations

Frequency Range	Coil at L1-L2	Coil at L2-L4
3500 to 4000KHz	B	BB
7000 to 7300KHz	C	BB

General Coverage Coil Configurations

Frequency Range	Coil at L1-L2	Coil at L2-L4
1700 to 3200 KHz	A	B
3000 to 5700 KHz	B	C
5400 to 10,000 KHz	C	D
9500 to 14,500 KHz	E	D

Coil Grid Winding (L1 and L3)

A	56 turns No. 22 enamelled
B	32 turns " "
C	18 turns " "
D	12 turns " "
E	10 turns " "
BB	20 turns " "

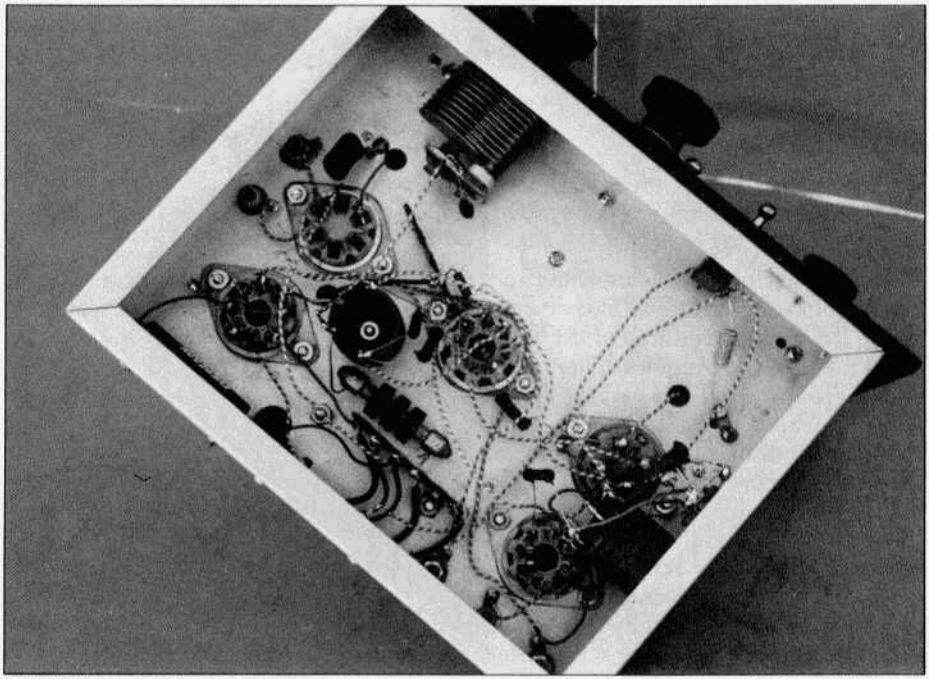
Antenna (L2) or Tickler (L4)

A	10 turns No. 24 enamelled
B	8 turns " "
C	7 turns " "
D	7 turns " "
E	8 turns " "
BB	8 turns " "

Most of these parts or reasonable substitutes (except for the Hammarlund caps and the vernier dials) are available from Antique Electronic Supply, Tempe, AZ. AES even carries a suitable power supply kit (K101A) and a chassis.

Coil Construction

Both coils on each form should be wound in the same direction. If the connections to the circuit are made as shown there should be no trouble in obtaining the necessary oscillation. If the IF won't approach or go into oscillation or the HF or BFO circuits won't oscillate, reverse the plate winding / tickler leads on the suspect coil. L6 of the IF coil and L8 of the BFO coil are mounted towards the chassis.



Underchassis view.

All plug-in coils are wound on 1 1/2 inch diameter forms (Hammarlund SWF-4 or similar). Grid windings on coils B through E are spaced to occupy a length of 1 1/2 inches. The grid winding on coil A is close-wound. Antenna/tickler coils all close-wound, spaced 1/8 inch from bottom of the grid winding.

The number of general coverage coils may be minimized by using the same coil in both the antenna and oscillator positions. It should be noted that the same oscillator coils, D and BB, are used for two frequency ranges. This is possible because the oscillator frequency is placed on the low-frequency side of the signal on the higher range.

Alignment/Calibration

Alignment of this receiver is a lot easier if you have a well calibrated general coverage receiver (or frequency counter) and a crystal controlled oscillator in the frequency range of interest. Repeat the steps below for each band of interest.

1) Adjust the HF oscillator coil: With the 80 or 40 meter coils installed and the BFO off, first determine that the HF oscillator is working by listening for it on your general coverage receiver. Try to adjust coil BB so that the HF oscillator oscillates on about 4.5 - 5.0 MHz when the Bandset capacitor and Bandspread capacitors are near maximum capacity.

2) Determine/Adjust the IF frequency: Tightly couple your crystal controlled oscillator to the antenna connection and then tune the bandset oscillator listening for the crystal oscillator. While decreasing coupling, tune RF Input and Bandspread for maximum signal. Using your general coverage receiver or frequency counter determine the HF oscillator frequency. It should be about 1600 KHz above (for 80 meters) or below (for 40 metrs) your crystal frequency. Once you've found it, take the difference between the HF oscillator frequency and the crystal frequency

continued on page 42

Saga of a Collins KWS-1 Restoration

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It was an early Saturday morning and I was strolling down the walkways separating the various vendors of the TRW swap meet in Los Angeles. Then from afar, there appeared on a vendor's table what appeared to be a Collins 75A-4 receiver. Nothing new here I thought, there were more than 5,000 of these made. But upon closer inspection, it turned out to be a Collins KWS-1 transmitter of which only 1600 were made!

All of a sudden, my entire existence as a ham began to flash by my mind. When I was in my early teens, I remember seeing this example of Collins excellence in the advertisement sections of the mid-50's ARRL handbooks. I always wondered if I would ever become so privileged to see one some day. And here it was, staring at me in the eye, a very sick specimen with its major components dismembered and missing, the entire RF power amplifier stage was missing, and there was no top, bottom, and side covers. In fact, it seemed like it would fall apart if one lifted it off the desk. One would literally need a basket to carry this thing home. The vendor inspired me with an offer that it was a parts unit with a good front panel. But it was a parts unit with not much parts left except for the front panel! The power supply also had missing covers and was a hopeless cadaver with burned out transformers and loose wires flailing about. It was a rusty sickening sight, and I figured that this specimen was completely beyond resurrection. I still do not understand to this day how this KWS-1 eventually ended up in my home.

The KWS-1 is made up of two major components. One component is the desktop unit which houses the SSB/CW/AM exciter and 4CX250 finals PA. The other component is the power supply unit, which is the size of a small (?) pedestal and sits on the floor. Both units weighed a total of 210 pounds and were described by 1957 advertisements as having "unprecedented compactness"!

Upon closer inspection, it turns out that the exciter was in worse shape than it looked. In addition to the entire 4CX250 stage missing, the 250 kc SSB mechanical filter, which was unique to this model only, was also missing. Since there was no back cover, there was no power connector. The cable harness that connected the entire system electronics to the rear connector had been cut clean by a big wire cutter. On the other hand, the power supply was a hopeless mess. It seemed that the power supply was once configured to 115 VAC and someone plugged it to 220 VAC and left the room. In addition, the power supply deck was a Swiss cheese of holes made by past repairs in an effort to mount several different replacement transformers and capacitors on the deck.

Initially, I thought of building my own linear amplifier and installing it in the space where the original PA module was. I started dreaming about installing a 4CX800 or some such tube from Svetlana. But a sinking feeling slowly sank in when I realized that the KWS-1 power amplifier stage did not have a band switch!! There are only two knobs labeled "PA TUNING" and "PA LOADING" on the front panel to which

This is the set as it looked when I brought it home from the swapmeet.

the PA was controlled. There are no other shafts or extensions that would control the tank coils. After securing a service manual and schematic, it became apparent that there is a gear transmission that linked the PA TUNE and LOAD capacitors to individual roller inductors. There began to flash in my mind the complex Collins R-390 gearing mechanisms which was manufactured by Collins in about the same era. Right there seemed the doom of this project. How on earth's name will one ever find all those missing gears? There were two roller inductors and three variable capacitors all geared in synch to just two knobs.

Looking back at this restoration project, there is one thing I had learned. The most important tool that one would need in order to perform a successful restoration is not a good work bench, good set of tools or the best test equipment. The most important tool is a computer with an internet connection. The internet allowed an interface to meet other people who had parts and information for the KWS1. I began to realize that there are a lot of KWS1's out there that are in similar shape as this one and that their owners had no intention of restoring them anymore. Those KWS1's are out there and one merely had to look for them. If you have a broken rig you are trying to fix, the chances are very high that someone else out there has a similar broken rig that has been condemned for parts.

I had originally budgeted two years to complete this project. The turning point came when I met a ham via the Internet who discovered that he had the original KWS1 gearbox in his attic, all in pieces inside a plastic bag! After meeting some more people who had the vital parts I needed, I started to realize that the project could be completed as fast as I could put the parts together. Since it was too time consuming to find every single missing part, I only focused on the important parts. I would then fabricate or substitute for the rest such as the unique PA knobs which I had custom made by a knob maker. These knobs were then mounted to modern 20:1 black DuoDials from Allied. Since the power supply had virtually no useful parts, everything inside it was removed and discarded. The steel deck was cut off and a new blank aluminum sheet was cut and chem-filmed then mounted in place of the original deck. This allowed me to punch fresh new holes only where needed and its finish actually matched the yellow finish of the exciter aluminum deck. Since I was building a new

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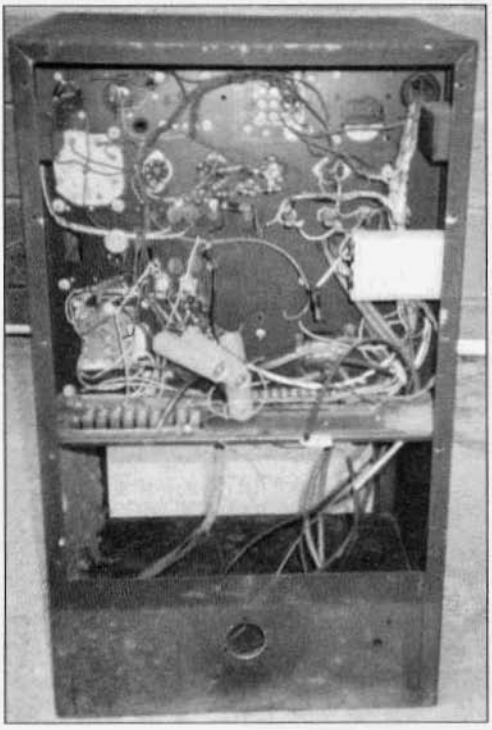
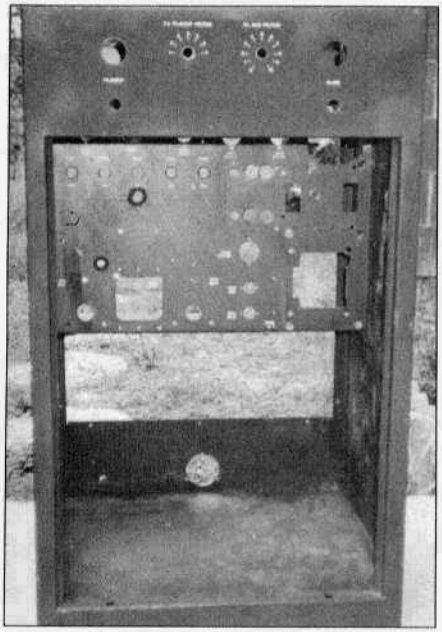


A rear view of the power supply deck—a real mess!

power supply from scratch, I decided to build my own design based on modern readily available parts thereby making the restoration easier and more economical. However, I retained the original Collins screen regulator circuit which I thought was extremely rugged with the 6AS7 and 2D21 Thyratron. The 2 KV supply was based on a UTC 1500-0-1500 500 mA transformer. A broadcast transmitter rectifier stack was used for the HV full-wave rectifier and the usual step-start relay scheme was employed to control primary AC using op-amps and comparator chips assembled in a small circuit board. This circuit was wired to monitor the 2 KV current flow and would immediately shut off the AC relays the instant a pre-set current flow of more than 1 amp were to flow on the 2 KV lines. This concession to modern technology would later prove to be extremely useful during flashovers that occurred during testing. Voltage test points were installed on the deck to allow easy measurement of voltages. This included a resistor divider that divided the 2 KV voltage by 100. This allowed a normal DVM to measure the 2 KV voltage via a test point on the power supply deck that would produce 22.1 volts when the 2 KV supply was 2210 volts. High voltage areas were covered up to prevent accidental contact whenever the front cover was removed and this proved its worth when I once dropped a CRO probe after measuring a voltage inside the power supply while it was in operation.

Since the original blower was not easy to find, I used a common 50 CFM centrifugal blower like those commonly used in linears today but this was one substitute I wished I had not done. The modern blower spins at 3000 RPM and it generated a soft high-pitched whistle which the original larger but slower speed blower did not have. The blower is mounted inside the power supply which was completely soundproofed with fiberglass insulation. This soundproofing must have been remarkable foresight during its time but it could not fully dampen the whistle of the modern blower. The blower air outlet was connected to the exciter unit using a 6-foot length of vacuum cleaner hose and PVC pipe angle fittings. The blower motor was mounted on automotive fuel pump rubber mounts in order to prevent the motor rumble and vibrations from getting into the cabinet. A bicycle inner tube was used to funnel the blower air outlet to the back flange of the power supply cabinet.

The KWS1 had a long history of AC hum in its transmit signal. Therefore in this power supply, I used a DC source for the filaments. Using a 30-amp 8-0-8 VAC transformer, this was converted



The power supply deck after removing all parts and before cutting off the original vertical chassis,

to DC and a voltage regulator using 4 P-Fets with a heatsink were used to regulate the voltage down to a variable 6V. The original filament voltage selector rotary switch was replaced with a potentiometer to allow adjustment of the 6 VDC filament voltage supply. In order to preserve tube life in a time when tubes are no longer being produced, the 6V regulator outputs 1.5V upon power up and slowly ramps up to 6V in about 20 seconds time. It is fun to watch the KWS1 lamps and filaments slowly increase in brilliance during a power-up. A shutdown circuit had to be installed so that in case of an overvoltage from malfunction, the filament supply cannot assassinate all the KWS1 tubes. A 36-pin Centronics printer connector was used for the power supply connector plus a ground post and a Millen HV connector. A 3M Hepa filter was fitted at the air intake of the power supply to ensure that dust accumulation inside the equipment would be minimized. The high point of the power supply restoration was when I was soldering to the pins of the tube sockets. Soldering the hookup wires to the brand new tube sockets was an experience of years gone by.

The exciter restoration was not as difficult as the power supply but some non-original modifications were made in order to make it more pleasant to use on a regular basis. The original method of switching between TX and RX for the KWS1 when in CW mode was that it shuts down the HV supply when going to standby RX position. This was accomplished by operating the large and noisy AC contactor of the HV transformer. Since I was a CW junky, this method clearly had to be changed. The antenna relay-switching scheme of the KWS1 was also changed. I rubber-mounted a faster and quieter 24 VDC RJ1A vacuum relay inside the PA enclosure to switch the antenna between the KWS1 and the receiver. I installed a BNC connector at the back panel to connect to the receiver antenna. This was an early KWS1, which used the earlier type RF-derived ALC circuit. In this scheme, a 6X4 was used to derive ALC voltage from a sample of RF energy on the PA tank. In the later scheme, a 6AL5 was used to derive ALC from the 4CX250 grid current variation and this circuit generated ALC voltage whenever the 4CX250's start drawing grid current when operating in SSB. I converted to the later KWS1 ALC by installing two 1N4007 diodes to simulate the circuit of a 6AL5. The original 6X4 was then merely removed. Since the early KWS1 had an ALC adjust pot on the front panel, I wired this to become like a volume control for the new ALC circuit thereby allowing the PA tubes to be driven a little harder when desired depending on the ALC setting. I also changed the "CALIBRATE" posi-

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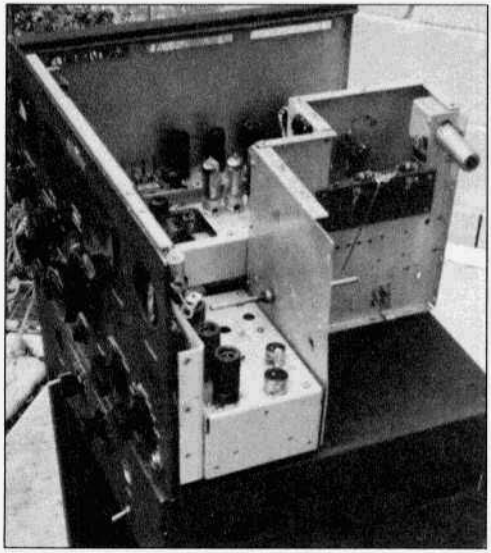
This is the power supply with the new aluminum deck installed. Deck has been alodined with the familiar military yellow color. Some parts have been laid out on the base just for checking dimensions. The Dayton blower can be seen at the bottom center.

tions of the emission switch to behave like a SPOT function and I converted the Dial Drag knob into a potentiometer to function as a SPOT LEVEL control. I had also thought of installing 4CX400 tubes instead of 4CX250's for the finals but the fact that 4CX250's are so much more readily available and cheaper made it clear that staying with the 4CX250's was the better choice. I also put special attention to careful preparation of the output roller inductor. This particular roller inductor seems to be a common fail item on KWS1's since the component is located at the very bottom of the PA enclosure where it can accumulate dust blown over from the cooling system. When the shaft contacts become dirty, the contacts foul up and the resulting localized heat destroys the contact tension. The small idler roller will also heat up if the coil is dirty and the heat

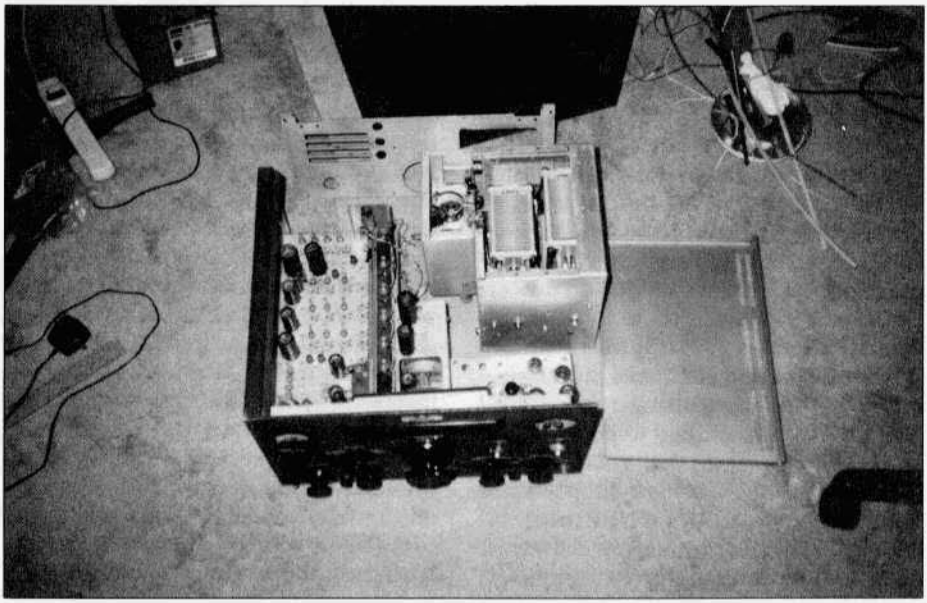
As more components are mounted the transmitter starts to come together.



The KWS-1 exciter before project began.

will destroy the idler spring tensioner as well.

Bench testing showed the need for more work. The most difficult problem I encountered was fabricating the plate choke, which I had to rewind about 30 different ways until I got the optimum performance. The problem was series resonances. Since the KWS1 tunes on individual bands each with a span of 1 MHz, it was difficult to wind the plate choke to prevent a series resonance from appearing on or close to any covered span. As a consequence, there were many "incidents" that resulted during tune up but they were also good tests for the non-original HV shutdown circuit! The choke was wound with #28 AWG wire and in some cases, the wire would fuse open and unspool after a loud "Bang"! The 2 KV supply line had a high voltage 2 amp quick acting fuse, which never blew after all the "incidents" despite the fact that the AC trip relays had a slow 20 ms response time. A problem with the winding of the plate choke was that because of the ceramic coil form at hand (a not-original B&W 800), there was



Exciter is readied for installation. Note gold colored side cover which was also alodined before outer portion was painted the familiar Saint James Gray.

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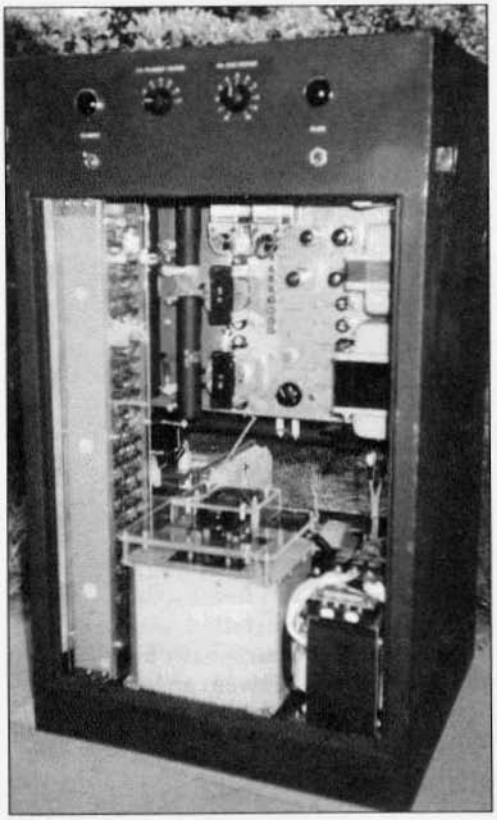

Front view of finished power supply. Notice plexiglass covers over RV plate xformer terminals. Plexiglass also covers the diode stack "tower".

often an in-band series resonance somewhere down the coil winding and a grid dip meter would not readily detect it because the dip is so tiny. The results would sometimes become that upon testing on each hand, a plate dip on one band could not be found when adjusting the plate tuning since the RFC inductance was in effect too small. Or in some cases, the PA would tune up well but power output efficiency was lower than expected. Since the choke was located in a very tight compartment in the PA enclosure, it was not easy to get the grid dip meter near it and it was easier to simply try it out. Taking a dip reading before installing the choke proved impractical because the dip frequencies changed after installation. The close proximity of the metal surroundings to the choke in the tight compartment detuned the resonances.

The exciter alignment procedure was straightforward but since the neutralizing and negative feedback of the circuit was unique, I had to spend some time understanding the object of the alignment process. After all, when was the last time one adjusted an exciter and 1 KW PA with 2-stage negative feedback and 3 different neutralizing adjustments that interacted with each other? I discovered that an easy way to neutralize the driver was by using a common 20 MHz CRO with an X10 probe on the 6CL6 grids. The service manual describes a general alignment approach but does not elaborate on details therefore implementation can be tricky and one is left to ingenuity. I also discovered that most of the trimmer capacitors of the exciter were defective because it was impossible to get the correct level of drive on several bands. When adjusting the capacitors, I would suddenly see a peak, then suddenly a null. What was happening was that the stators of the trimmers were frozen solid to the rotors after who knows how many years this thing has been out of operation. The stators would actually move with the rotors as I turned the trimmers. Luckily, there was no damage done and the trimmer rotors could be popped off the trimmers without having to physically unsolder and remove the whole trimmer. Then the rotors are carefully pried apart from the stators and cleaned, then assembled back into the trimmer unit.

Finally, after all the bench testing with a dummy load, the time came for a live test on the air. Since the antenna had a high SWR, the tests proved to be a di-

The completed KWS-1. Note the power supply steel deck which was cut off and replaced by the aluminum deck. The metal deck was cut by a jigsaw cutter and is shown here with its "swiss cheese" look of holes made by past owners.

saster. There was RF in the shack and it was getting into all the power supply circuits causing repeated tripping from the electronic trip circuits. After all, this is a 1 KW transmitter! In addition, since the operating position was in a remote part of the house and a 117 VAC outlet was used for power, the drop in AC outlet voltage during 1 KW transmit was causing the 6V regulator to lose regulation. After extensive RFI hardening and some circuit adjustments to compensate for the AC line drops, the first contacts could be made. Single-sideband proved good but CW and AM showed some hum. That was strange considering that all the circuits in the exciter had no AC because the filaments were all DC. It turns out that RF was getting into the 4CX250 screen regulator circuit modulating the 350V supply by an irregular square edged 60-cycle rate that almost looked like a video signal due to the RF content! The problem was cured by 470 pF capacitors between grid and cathode of both the 6AS7 and 12AX7 inside the power supply. Also, several 0.01uF capacitors were installed at various points of the 350V bus. After all the RFI frustration had been resolved, I just realized that the high antenna SWR and fluctuating AC actually provided a good environment for testing by causing the problems to appear and be diagnosed. Otherwise these problems would have remained lurking in the circuit to suddenly appear one day.

Today, the set is in daily use and is a lot of fun to use. There is some VFO drift (about 300 Hz or so) within the first 30 minutes and drift becomes minimal after that. This is a very pleasant 1 KW transmitter to use because the controls are spaciously laid out and easy to manipulate not to mention the visual delight of sitting besides a 75A-4. The AM signal is actually SSB with carrier and is very interesting to compare with regular plate modulated AM signals. If anything breaks, it would be very easy to fix. All the parts are big and easy to find! This setup provides several distinct advantages over a modern combo of a 100-watt transmitter and a 1 KW linear. The KWS1 incorporation of integral ALC and negative feedback between PA and exciter to produce a good clean signal in the traditional way has no modern day equivalent. ER

Robyn's Old Radio

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On November 17th I wrote my daughter, Robyn: "I've been playing with the guts of your Zenith radio from the garage and am already listening to music on it! Not that it was anywhere near an easy route from what it was to what it's become! @#$%^! And, I'm not finished yet but I like to think I'm beyond the half-way mark."

She bought the Zenith console for a couple of bucks at a garage sale. The wooden cabinet, badly in need of a loving restorer's touch, must've captured her in a weak moment! It looked like pure headache! A closer look reveals that it's a 6-tube broadcast/short-wave radio, "Model 6-8-362," which transports some of us pre-boomers to the first short-wave radio with which we eavesdropped on the world. The RCA I had probably allured me to both ham radio and a career in electronics. This receiver has bands marked "B'CAST," "POLICE" and "FOREIGN" cover the AM broadcast band of 550-1700 "KILOCYCLES," 1.8-5.5, and 5.5-18 "MEGACYCLES" respectively.

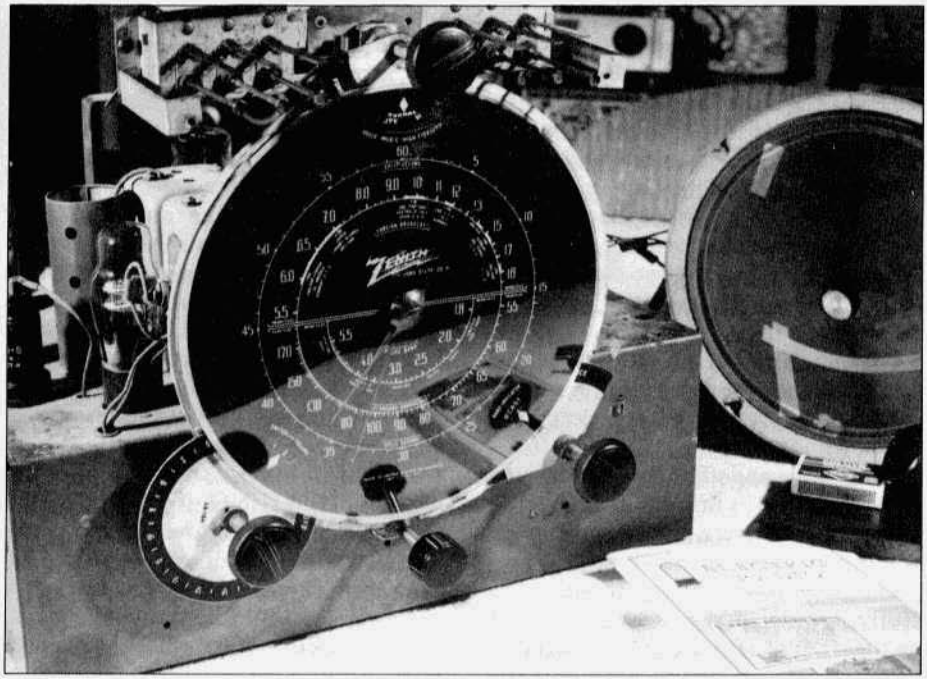
Later research by Robyn would turn up an advertisement for this 1938 relic. Price, about $85. Features: "Squared-circle black backlighted dial with tell-tale controls." The heavy flywheel tuner got referenced as the "Lightning Station Finder...twirl the control and the pointer speeds to the station you want."

The Tuner

Upon pulling the chassis from the wooden case I'd expected to find it dirty but not the the dual-section variable capacitor and tuning apparatus in such mechanical disrepair. It was not only filthy but also the drive mechanism, the tuning control...the bottom-center of the 4 control knobs which protrude through the front panel of the cabinet...was physically disconnected from the capacitor itself. Apparently the fabric belt which connects the two shafts had long-since rotted away. And that was the small part of it; the drive mechanism is quite complex and was a dirty mess as well. It's a whole 'transmission' of meshing gears, concentric shafts, a huge flywheel (on the tuning knob shaft) to give a velvety-inertial feel (as such, you should be able to spin the tuning knob and the thing will coast nearly from one end of the dial to the other!). Major surgery was required!

With much care the convex glass was removed from the dinner-plate sized dial, the squiggly-bent brass and red pointers were removed, the pair of pilot lamps and the back-plate were detached, and finally the tuning capacitor itself came into view. It would only rotate half way! Some physical abuse had bent the rotor plates so they'd not mesh with the stator plates! (I'd guess someone stuffed something into the backside of the radio not knowing the delicate plates were exposed.) It meant completely removing the capacitor from the chassis.

Bottom-side the stator connections were unsoldered as fumes of solder not melted since the '30's graced the nostrils with odors from antiquity. The air-hose helped remove gobs of dust. A tiny socket loosened the 3 hex-nuts and the unit was lifted from the disintegrating live-rubber grommets, which insu-



"Robyn's old radio" on the workbench.

late it from the metal chassis. In the house it got boiled in hot dishwater with soap, and scrubbed with a toothbrush. NEVER have I had to clean a variable capacitor in such crummy condition THIS way. Finally, looking bright and shiny with the fragrance of Ivory liquid, dry compressed air in the lab removed the inaccessible moisture from between the plates. Under a magnifier, the plates were straightened with a knife blade, WD-40 re-lubed the end bearings, 180 degree smooth rotation was restored, and a digital capacitor bridge verified what experienced eye-balling estimated as correct...30-350 pF/section. (Err, uuF to be historically correct!) ...and no electrical shorting. WHEW! But FUN too...to have accomplished so much with this component.

Sporting 3 new plastic grommets around its feet, the tuning 'condenser' went back into place and the connections were resoldered. Carburetor cleaner had solved the gunk on the brass gears. They were in good shape. Good! But with dirt gone, a broken anti-backlash spring was discovered. An alternative extension coil spring was fixed in place...grabbing one of the pair of setscrews on one end and fixed under a new 6-32 screw to the stator body at the other end. As such, when the capacitor shaft rotates, it winds the spring 1/2 way round extending it and, as such, gentle tension on the messing gears does the job. The 'transmission' restored and WD-40'd, now what to do about a drive-belt?

Calculations gave us 11" long x 1/8" wide. Drawing a compassed circle of diameter 11" on a shopping note, neither VCR repair shop in town could produce a drive belt from their various assortments. But while getting some other Saturday morning supplies from a farm supply store, dangling from a hook before my eyes was a neoprene O-ring JUST THE SIZE NEEDED! Fortuitous or what?? Though it fit well, the

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radio's bottom-side drive shaft with flywheel needed some attention. What appeared to be a kluge-repair for stripped setscrew threads on the belt's lower drive pulley turned out to be...once dirt was removed and when disassembled...a factory-designed friction-clutch mechanism. Apparently it's to prevent the inertial energy of the flywheel from damaging the topside 'transmission' at the ends of the tuning range!

The belt in place, we couldn't resist a spin on the yet knob-less shaft and the thrill of restored velvety action. Just like new!

The double ended brass pointer with the relief "Z" on its hub yielded to gentle finger-massage for a sufficient number of minutes to become factory-straight. And though it'd probably Brasso beautifully, we decided to leave the aged lacquer in place for the time being. The black acetate and more-fragile-than-glass dial bezel took well to a gentle shaving-soap wash...under the soft touch of shaving brush bristles. It's the plate-sized disk behind the brass pointer, with transparent areas forming words like "Zenith," "Kilocycles," and faraway places like "Canary Islands." It was a moment only before it re-admitted diffused-light from the polished globes of the pair of #51 lamps to once more dazzle our eyes.

Electrolytics

On a previous evening we'd made the glass envelopes of the 5Y4, 6A8 and other tubes glisten. And, we'd done a wholesale changeup of the P/S electrolytics. The original chassis mounted 'cans' had been left in-place, their function superseded by axially-leaded substitutes which were, themselves, now long-aged "Aerovox" items...the handiwork of some tech probably 40-to-50 years ago. Our new ones were tie-wrapped to the inside of the chassis. Together, the pair yielded up 10 times the number of uF of the originals at a fraction of the volume. While the capacitance we retrofitted is excessive, they're what we have on-hand. And, with the slow start-up of the vacuum rectifier, we theorized that in-rush current should not be a problem. Besides, they'll filter well! So, our 1st powering-up of the aged set to simply light the restored dial at least offered some assurance of forward progress and little likelihood of catastrophe.

Once the initial thrill of the new and lighted dial mechanism gave way to curiosity beyond fondly seeing a satisfyingly dim red glow in each of the tubes, we chanced turning up the volume and spinning the dial. Hearing nothing, NOTHING, it gave opportunity to consciously downscale our expectations. After all, real life has its limitations founded upon realities of a physical world and its erosions with time! "Hmmm....+350, +300 VDC...good sign." A trip to the water softener closet's top shelf produced a now unbound version of the "RCA Tube Manual." This, of course, is a godsend with no schematic on hand.

The Output Transformer (and Calculations)

Working backwards from the huge and dusty electrodynamic speaker to the 6F6, we were saddened to discover the beam power tube suffering from screen voltage but nothing on the plate because of an open primary on the speaker's transformer. While we'd hoped to find simply a bad plug or a broken wire, even intricate surgery under the finish tape of the output transformer could not restore winding continuity. The black burned spot where the leadwires had been attached had apparently come from the heart of the intricate winding. And it apparently not being 'our day;' the junkbox yielded up a near identical transformer but it too turned out to have the same difficulty!!! As a less than fully satisfactory substitute, an old (too small) "A-3900"

universal output transformer originally purchased from Allied Radio in the mid-50's for a QST code oscillator project...a transformer that's had a number of 'careers' each of which have progressively shortened its leads to a mere stubs these decades later...restored B+ to the 6F6. Dangling from one screw holding its frame to the speaker, it gave the Zenith at least promising crackles of sound...but nothing more. Well, at least much slight progress finding that the AF amp is trying to work.

Some evenings later...with restoration nearly finished...we dug the output transformer from the recycle bin in the garage and made some physical and electrical measurements. Made some real and reactive and 4-wire DCR measurements on the lo-Z winding at both 1000 and 200 Hz. and determined that its Z fell by 20% with DC current at 550 mA. Then counting the winding's 80 turns mic'd. at AWG 25 allowed us to make some pretty accurate predictions about the 625-EI x 3/4" core, butt-stacked with its 0.002" gap spacer. To our surprise, an impedance measurement on the electrodynamic speaker's voice coil (radio on) showed 18 +27o...we'd expected 1/4th that value of ohms, but perhaps some of this is the hum-bucking winding in series with the speaker itself. Then armed with a Z-Load of 7000 ohms suggested for the 6F6 by RCA, we calculated that the defunct primary probably had around 1600 turns of the damaged AWG 36 wire. Taking into account the predicted DCR of the new primary winding and the core loss of over 100k (as seen by the input winding) we arrive at a precise turn count of 1580 which, with a DCR of about 900, should place us at precisely 7000 with the speaker load. An e-mail to friend Dave, NØDL, chief scientific officer of a prominent transformer manufacturer, results in his too willingly offering not only to spin me a pair of coil samples but his offer, "Would it be ok if we'd just stack them with laminations for you as well? The computer shows we have a couple of hundred pounds of them in stock which we probably won't use!"

RF Input / Mixer

Warming up the URM-25D signal generator and setting its output to approximately "456 kc." marked in faded letters on top the IF cans produced the 1st evidence of "radio" reception when clipped to the 6K7 IF's grid. In fact, even back at the 6A8's plate! Good signs, these. "So let's go for broke and see if the LO is running," I whisper while resetting the generator to about 1 MHz., and advance the generator level while relocating the clip to the unshorted "Ant." screw terminal on the radio's back apron. Spinning the huge "Z" pointer to near "1000 kcs.," EUREKA, we hear 400 Hz. with its 30% AM. But we did have to re-swage the "Ant." term. to the phenolic board...and resolder the pair of leadwires dangling near and presumably destined for soldering to that terminal.

Radio Servicing by Milton S. Kiver...a dusty old text amongst the linear feet of old amateur radio journals on the basement bookshelf...takes on resurrected significance now in a number of ways. 1st, it reveals that the goofy-looking compression mica trimmer/L combo near the "Ant." terminal strip is actually an IF trap, "...As there are numerous powerful ship-to-shore stations near 455 kcs." "Ahhh...no wonder the adjustment didn't peak anything at 1 MHz."

After not that many hours: a longish leadwire is giving us plenty of local KYSM-AM at "12-3-0." And their format of oldies like Johnny Mathis are warmth themselves as refinements are happening; little not insignificant things like replacement of questionable paper capacitors, out-of-spec "body-end-dot" resistors and postage stamp micas.

Gassy Tubes!

By now, sufficient 'on' time has also

continued next page

allowed us to languishingly watch the 1st AF's control grid go positive with grid emission as it began to rectify and distort the audio. The last time I can remember having to replace a 1st audio tube because of grid emission was when it happened to the radio in my '53 Chevy...in 1966...a much newer tube in that car radio than a grid-capped 6F5 in the Zenith, and 32 years closer to the time when tubes were still being made!@#$%! To our delight, we were successful in finding one "used" 6F5 hi-mu triode in the junkbox. But upon subbing it, it appears to have a pedigree of other problems..." Before finishing, we'd find the 6K7 doing the same thing.

Alignment

By the time we'd been able to create a map showing what the various compression mica trimmers and padders were for, we were ready for a complete alignment. The IFs were easy; and the "B'CAST" L.O. was as well. Some iterative swings over the "B'CAST" band with a digital counter sniffing the local oscillator allowed us to spot the dial as close as it probably ever was when new (or closer). And the radio worked well. There seem to be no RF alignments, the tracking apparently designed for within the specialty of the shielded RF input transformer and the (re-straightened) plates of the main tuning capacitor. But curiosity caused us to just check the RF tracking of the L.O....with a spectrum analyzer/tracking generator...and digitally counting the offset between the observed RF peak and the L.O. see if it faithfully remained the IF. It didn't, at least as well as we thought it should. But even following minor adjustments of the serrated end plates of the tuning capacitor, we finally had to live with the fact that the RF did not track the dial indication as well as we'd been able to set the L.O. tracking. As final compromise, we iteratively reset the L.O. trimmers and ("B'CAST" only) padder for best RF/L.O. tracking, now quite respectable, and put up with the far ends of the dial being off by as much as 5 degrees out of 180 degrees rotation. In terms of overall sensitivity and image rejection, the spectrum analyzer check was worth the revelation after all.

Those Station Pre-Settable Buttons

Finally, no small effort was spent figuring out and restoring operation of the 6 presettable pushbuttons. It turned out that the each button is paired with a uniquely color-coded inductor...more correctly, each of the items a pair of inductors with ganged sliding cores! Individual micrometer adjustments position the core(s) with respect to their winding(s) to preselect the RF and L.O. within the approximate 6th of the "B'CAST" band. Cores in fragile paper tubes were all stuck as were the brass micrometer 'tweakers.' And the silver-plated leaf contacts required scrubbing with Brasso on a pipecleaner...and miniscule application of granular silver "Conducto-Lube" before they'd work. But work they did...5 of the 6. The 6th's core just could not be made to move its full length within the paper core and we quit with it while still ahead!... and finally, SWL'ing

With Dad's contribution largely complete, Robyn now can concentrate on renewing the wooden cabinet. Meanwhile, she's already learned how to pitch the 50' antenna wire from her 7th floor apartment window when settling down for her new interest BC and SW DX'ing. The thrill of eavesdropping on the world is renewed for another generation! And, thankfully she'll hear at least a few hams that don't sound like ducks, and already recognizes the 'whaa-whaa' of AM-detected Morse! **ER**

A complete index of the entire 9+ years of ER is available for viewing or downloading at the following website:
http://www.qsl.net/n9oo

Restoring a Collins 310C-2

by Chuck Banta, N6FX
4121 Tenango Rd.
Claremont, CA 91711

For any classic equipment to sit on my "Shelves of Fame", two criteria must be met; the exterior must be in original condition with the proper knobs, hardware, etc., and units must function properly. In other words, it is not just there to look at!

My love affair with Collins equipment started about 40 years ago after meeting Roger Corey, W1AX, and using his modified 75A-4 for serious DX chasing from the east coast. Through the years I've owned several S-lines, KWM-2s and most other Collins gear including my present favorite receiver, a much modified 75A-2A which I'll stack up against any present-day Japanese rig. After all this I find that I enjoy the older "Black boxes" the most and have concentrated most of my effort on these products. Having finished restoring a 310B-3 (including adding a turret bandswitching arrangement), I needed a new challenge. Enter the monthly Southern California swapmeet.

I spotted a very dirty black cabinet on a vendor's table with a $10 price tag. Upon examination I found it had a Collins logo silk screened in red on the front panel. The inside of the cabinet was empty except for a wafer switch but the complete dial mechanism was intact including the correct knob. I had no idea what I had purchased until I opened the lid and saw to my amazement the tube data/complement and designation 310C-1/2. I had found my next restoration project!

Collins marketed this unit as an ex-

continued next page

The restored Collins 310C-2

ternal vfo to be used with crystal controlled transmitters of the 50s era hence the 80 meter output which was to be doubled, tripled etc to the higher bands by the transmitter oscillator stages. The only difference between the 310C1 & 2 was that C1 was furnished with an outboard power supply and the C2 power supply was built-in.

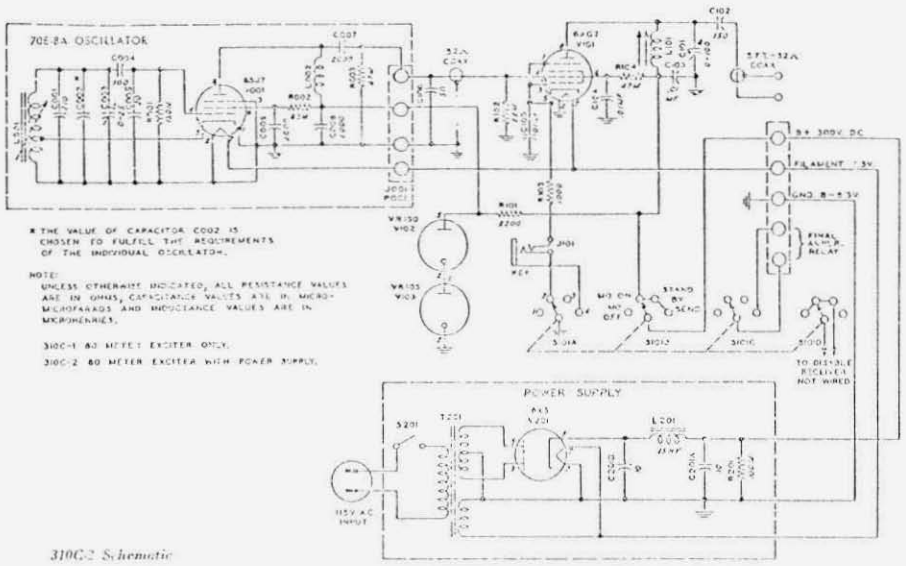
When I got home I found that both the front panel and cabinet were in excellent condition with very few scratches and no dents. The panel glass was cracked and most of the frequency nomenclature was missing from the megacycle window. There was nothing inside except the 4-pole/4-position wafer switch which is probably nonexistent so I at least had something to build on. I removed the switch and dial mechanism and turned the hose on the cabinet and front panel to remove twenty years accumulation of dirt and grime. I let both pieces dry in the sun and found they were in perfect condition. The cabinet was given a dusting of St.James Grey paint from R&R Designs and let dry in the sun. The front panel , except for some wear marks around the controls, required no further work.

After obtaining a manual on the unit as well as on the 70E8A PTO, I started to gather parts. A PTO was purchased from Leo, KJ6HI locally. It also included the flexible coupling. The proper red jeweled indicator light was found and a 100pf variable capacitor was donated by my old Dxing buddy, W1HH. Bob also was able to generate the megahertz frequency info by digitizing his 310B dial by computer and sent me a copy as well as better internal views of the original unit. This information was needed as I had to lay out three sheet metal pieces which , of course, I didn't have. The PTO mounting bracket was scaled from the 310B transmitter as they both use the same PTO and dial assembly. This was fabricated from .092 aluminum. The pictures showed that the VR tubes and 6AG7 doubler were mounted on a vertically oriented plate but I could not determine how it was physically held together with the PTO assembly. I decided to use a piece of .062 aluminum, make a cutout the width and height of the PTO and fasten to the PTO bracket with sheet metal screws. This allowed a plate 5x7 to be used which ended up a perfect fit for all tubes and associated components.

The cabinet had four mounting holes in the rear bottom right side which were used to mount the power supply components. I formed a U-channel with flanges to match these holes and made it 4 inches high. I used this height so enough room would be available to mount my power transformer on top and the choke, filter capacitors, resistors and diodes underneath. This was the way Collins had designed it, my only concession being I was not going to use a 6X5 rectifier. Remember, I said in the beginning "the exterior had to be original" not the interior. The 4 inch high dimension will vary depending on the transformer used. I had an old Stancor 650VCT available which worked fine. Small transfomers are difficult to find today, the only ones currently available I found were from the Allied and Antique Electronic Supply catalogs.

The power supply wiring is straightforward using a short cable to bring the voltages to the vertical mounting plate through a five screw terminal strip a la Collins. The balance of the wiring was done in colored teflon hookup wire with enough service loop allowed from the mode switch to vertical plate so all subassemblies could be wired and screwed together easily.

Several items need to be clarified at this time. If you have a copy of the 70E8A manual a very descriptive overview of the 310C1/2 is given, probably better than the actual 310 manual. It gives more information on the doubler stage including the output coil. It calls



310C-2 Schematic

for approximately 15 uhy for the output coil to resonate with a 100pf variable to double the PTO frequency to 80 meters. Using the old ARRL Lightning Calculator I used the size copper wire and slug tuned coil form I had available, wound the number of turns called for and found it resonated at 3.6 MCS according to my Millen GDO, another swap-meet $40 special. You can use about any B+ voltage from 325 to 400 volts depending upon what size transformer you have. Using diodes in the power supply my voltage was closer to 400 volts which is a little on the high side for a 6AG7 but no problems so far. You must also recalculate the VR tube dropping resistor based on this voltage. I ended up using a 4K 5W resistor to get proper firing and regulated 255 volts on the plate of the 6SJ7 PTO oscillator tube. The other item, which is not shown in any schematic I could find, was the wiring of the dial lights and red jeweled indicator light. The dial lights operate directly off the 6.3 filament line and I wired the indicator lamp directly across the off/on switch (120V) which is mounted on the power supply chassis.

The tune up was quite easy seeing we have things called frequency counters which we never had 40 odd years ago when I got into the hobby. Once you determine the proper voltages are present and the VR tubes are firing measure the frequency at the output of the PTO; it should be somewhere in the 1.6 to 2.0 MCS range. Loosen the flexible coupling at the dial end and turn the dial to 3.5 MCS. Turn the PTO shaft so that a frequency of 1.750 MCS shows on the counter. Tighten both ends of the flexible coupling and the dial calibration is complete. Move the counter the output of the 6AG7 doubler stage and 3.5 MCS should be measured. Using my HP 410C with RF probe I peaked the coil and tuned the variable capacitor for maximum output which is about .5 volts RF. This equates to approximately 5 milliwatts output power which is adequate to drive a xtal oscillator stage.

My thanks to Bob Wallace, W1HH for his assistance and also to John Bess, WA5VVT for an extra dial overlay. The photographs were taken by Eddie Preijers, a work associate at Power Paragon. ER

A 1941 Receiver from page 25

as the IF frequency. Adjust L5 until the IF frequency is between 1600KHz and 1700Khz.

3) Set the BFO frequency: Turn on the BFO and using your general coverage receiver or frequency counter set the BFO frequency to the IF frequency.

4) Calibrate the dials: To calibrate the receiver, first calculate the HF oscillator frequency for either 3.5 MHz or 7.0 MHz. (3.5 + IF frequency = HF oscillator frequency or 7.0 - IF frequency = HF oscillator frequency.) Set the bandspread dial to maximum capacity and then tune the Bandset dial until the HF oscillator is on the right frequency. Record the Bandset dial setting. Calculate the HF oscillator frequencies for calibration points up the band. Tune the HF oscillator using the Bandspread control and record the Bandspread dial settings for each calibration point. Once you've calibrated the Bandspread/Bandset dials, peak the input RF circuit on noise or signals and record that Input RF dial setting.

Operation

Operation is a matter of plugging in the coils for the band of interest, setting the bandset capacitor, peaking the Input RF circuit on the proper input frequency and tuning with the Bandspread dial. The Input RF dial may be used as an RF gain control. If you included the BFO in your receiver, run the regen control at just below IF oscillation (indicated by a "plop" and a soft hiss) for maximum sensitivity and selectivity. I've found that setting the bandset dial usually requires a calibrated signal source such as a crystal calibrator or other crystal controlled oscillator. Set the Bandspread dial to the frequency of your calibrated signal source and tune in the signal using only the Bandset dial. Warm-up drift is a problem with this simple design. I found that mine drifts about 10KHz in 15 to 20 minutes before settling down.

This receiver was a fun project, it's a good match for my 6L6 transmitter and, since it is homebrew, I don't have to worry about spoiling a piece of history by fiddling with the circuit. Let's see now, what can that unused half of a 6C8G be used for.... ER

AMI Update from page 3

use. We should also make transmissions of reasonable length and be sensitive to changing band conditions. As more AMers arrive on ten meters we should feel free to slide down below 29 and above 29.1 mHz. I don't think we need to feel that we must tune up near 29.0 mHz. Most of our older receivers can scan 100 kHz or more of ten meters with a turn or two of the dial.

As more AM signals appear in the AM window on 75 meters in the evening we should also be thinking about better ways to share that band space. Usually it is difficult to spread QSOs out because of increased traffic across the band caused by stations coming in on longer skip in addition to the local traffic. For local contacts, one idea is to use antennas that radiate most of their RF energy straight up. Near Vertical Incidence Skywave (NVIS) antennas have such a high angle of radiation that very little RF energy is radiated low enough for significant skip propagation. Ideally, the NVIS antenna improves your signal in the local area a few hundred miles in diameter and it allows multiple QSOs on the same frequency if the QSOs are separated by more than several hundred miles. Many of us think of putting our dipoles as high as possible, but low dipoles, even 10-15 ft high on the lower HF bands are pretty good NVIS antennas, sending most of the radiated RF almost straight up. ER

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FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hifi, parts. Send 2 stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805. aq253@osfn.org

FOR SALE: KWM-2 fan bracket - $12 ppd. Dave Ishmael, WA6VVL, 2222 Sycamore Ave., Tustin CA 92780. (714) 573-0901.

FOR SALE: Small parts, transformers for projects and repairs of tube gear. Let me know your needs. Van Field, W2OQI, 17 Inwood Rd. Center, Moriches, NY 11934. (516) 878-1591 or wreck_and_rescue@juno.com

FOR SALE: LS-166/U original, NOS, matching xfmr (600-8 ohms), UTC#F-7101 - $12 each ppd/dom/USA. Aben, POB 4118, Jersey City, NJ 07304-0118. avidov@aol.com

FOR SALE: Drake SW-4A-$170; Dentron MT-2000A - $145; 6 RAS coils - $80; Zenith 6G601 - $20. Carter Elliott, 1460 Pinedale Rd. Charlottesville, VA 22901. (804) 979-7383.

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 20176. (540) 822-5643

FOR SALE: Hallicrafters, RME, Gonset, others. Also some military, test equipment, VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

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FOR SALE: Hallicrafters, Drake, Heathkit, Military, etc. Send e-mail request or SASE for list #2. Fenton Wood, 109 Shoreline Dr., Star Harbor, Malakoff, TX 75148. fenton@tvec.net

FOR SALE: Scott 310D and 350B rcvrs, 222C amplifier; 2 Heath 25W spkrs. Harry Mills, K4HU (828) 693-7519, millsjr@bigfoot.com

FOR SALE: Old QST/73/CQ - $1 each plus shpg. **WANTED:** Info on HBR receivers and parts. Mike, KE3OQ. (610) 759-9257

FOR SALE: Manuals (75+) to highest bid, SASE for list. ARC-5's, BC-348-L, Heathkit "Sixer" Marvin, 2957 Gaffney Rd., Richmond, VA 23237. (804)275-1252. wa4toj@juno.com

WANTED: QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard Coyne, POB 2000-200, Mission Viejo, CA 92690.

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 105 Sweet Bay Ln, Carrollton, GA 30116. wa4kcy@usa.net

WANTED: E. F. Johnson Co. HAMALOGs, unusual photos and information 1923-70. Bruce Hering, 41120 State Highway 13, Waseca, MN 56093. (507) 835-5619. bhering@efjohnson.com

WANTED: Top dollar paid for Winchester Radios and Winchester related items. Donald Daggett, 122 Hall Rd., Grahamsville, NY 12740. (914) 985-7249, wc2e@webtv.com

WANTED: Owners of the John Leary, W9WHM, re-engineered Hammarlund SP-600 rcvr, seeking info and serial number of rcvr. Bill Mills, KC4AA, (912) 452-2957, wmills@gmc.cc.ga.us.

WANTED: Galaxy V accessories (F-3, DAC-35, SC-1, RV-1, etc); cabinet for 600L. Tom Hoitenga, K8NGV, GA, (770) 426-8682, hoitenga@bellsouth.net

WANTED: HRO-5 coil wanted to buy/trade. Need J (50-100 KC), will trade for G (180-430 KC). Don, MI, (616) 451-9874.

WANTED: Manual for B&W model 370 SSB receiving adapter, must be run two (2). John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

WANTED: A metal cabinet, panel meter and pwr xfmr for the WRL Globe Chief, Model 90 xmtr. James T Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 748-5968, imq@bellsouth.net

WANTED: R392 Orig. Tech. Manual, TM11-5820-334-34/35. Tubes: 26FZ6, 26A6, 26C6, 26D6. Peter, VE3URO, Canada, (416) 694-4652. pslower@interlog.com

WANTED: 100 kHz IF xfmrs; any xtal filters. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: Heath HR10, SB10, VHF1, HS1661; EICO 720, 730, 723, 753, 751. Bill Tipton, 1332 Pinewood Rd., Jacksonville Beach, FL 32250. (904) 241-0134, AD4UY@aol.com

WANTED: Pair of 572-B tubes; PE73-C dynamotor. **FOR SALE:** GPR-90 rcvr - $550. W7RBF, AZ, (602) 864-9987.

WANTED: Mode knob for National NC-303 rcvr. Also Millen VFO # 90711. Rich, W9LDB, 1122 Via La Cuesta, Escondido, CA 92029. (760) 739-1835

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

WANTED: Collins 310A-1 &/or 310A-3, any condx; 30J, 30K-(any); 302C-1, 312A-1. **FOR SALE:** SC-101 lamp hoods & grills. Butch, KØBS, MN, (507) 282-2141

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

WANTED: Historical info on development of 12AT7, 12AU7 and 12AX7. Which of these was first, when, production info, etc. Tech info not needed. Kurt Miska, 3488 Wagner Woods Ct., Ann Arbor, MI 48103. (248) 641-0044 (w). Fax 641-1718, khm@tir.com

WANTED: Collins KWM 1, RE 75S3B/C, KWM380/HF380. Any condx considered. Schaaf, (740) 965 5331.

WANTED: Swan 160X and any accessories. 160 meter monobander. Richard San Antonio, K1MD, RI, (401) 738-2601 days, (401) 732-4026 eves.

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

WANTED: Swan 210 6m VFO, SS-208 HF VFO, xlnt condition. Jan Robbins, NØJR, 1120 Walnut St., Cedar Falls, IA 50613. (319) 277-1499, swanman@cfu.net

WANTED: Original manual for TBX-2; manual for Hallicrafters SBT-100. Joseph W. Pinner, KC5IJD, 201 Ruthwood Dr., Lafaytte, LA 70503. kc5ijd@sprintmail.com

WANTED: Sockets for 803 tubes; Bliley VF1 xtals; Temco 75GA xmtr. Robert Perlstein, W1IV, POB 642 Old Orchard Beach, ME 04064. (207) 934 9206, Perls@compuserve.com

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WANTED: Military R392 rcvr, clean & working w/117 AC pwr sply. CR Filer, 1163 Hawksbill Ln., Summerland Key, FL 33042. (305) 745-1801, lve message

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FOR SALE: Link Radio Corp.2051B wood case frequency meter w/batteries. David Boardman, 10 Lemaistre, Sainte-Foy, Québec G2G 1B4, Canada (418) 877-1316. davidboardman@sprint.ca

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

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FOR SALE: Cleaning part of shack. SASE or email for equip & parts list. Earl, K6GPB, 5319 Sierra Vista Rd., Murphys, CA 95247. earlw@goldrush.com

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

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

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FOR SALE: New Ranger I, Valiant I & Navigator plaster dials, 160-10 frequency no's in green, with all holes like original - $17.50 ppd. Bruce Kryder, 336 Sliders Knob, Franklin, TN 37067. (615) 794-9692

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

FOR SALE: Drake 2C rcvr w/2-CQ Q multiplier, Drake xmtr 2-NT. Bill, TN, (931) 433-7453.

FOR SALE: Hallicrafters 51C1A tabletop clock radio - $45. Chuck Brumley, KB2E, 32 Glenwood Rd., Saranac Lake, NY 12983. brumloff@capital.net

FOR SALE: RME rcvr w/orig manual, restored - BO. **WANTED:** Parts for Hallicrafters SX-100 rcvr; LV xfmr for Johnson Valiant xmtr. Burt, KC8FRR, 2424 F-30, Mikado, MI 48745. (517) 736-8020

FOR SALE: EF Johnson ceramic sockets (new); octal to "50 watters" sizes. SASE for list. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405-2375. (541) 345-2169

FOR SALE: Hallicrafters S120, good - $40; SR1OA, needs work - $25; pwr xfmrs, filter chokes from salvaged Seeburg, Wurlitzer tube juke boxes, great for low pwr tube xmtrs. All + shpg. SASE for list. **WANTED:** Schematic manual for HH Scott 357. Onerio Sabetto, 1717 Burgess Rd., Cleveland, OH 44112. (216) 481-1036

FOR SALE: Magazines, manuals, surplus books, some surplus xfmrs, & other parts. Call your needs. Vic Edmondson, W4MYF, RT 1 Box 2599, Lee, FL, 32059. (904) 971-5580

FOR SALE: Collins 516F-2 bias mod, parts/instr - $12, ppd/US. Cory,N2AQS, 1000 E 14th/178, Plano, TX 75074-6249. hinec@ecgate.dl.nec.com

FOR SALE: Sell/Buy/Wanted/Trade: Vintage equip at the "K8CX Ham Gallery." http://paradox2010.com/ham/ a free service.

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

FOR SALE: 7 & 9-pin tubes, my choice, untested - 10/$1; Xmtg tube sale, list free. L. Gardner, 458 Two Mile Crk Rd., Tonawanda, NY 14150.

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

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), 998 Whipple, Grayland, WA 98547-0697. (360) 267-4011

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

FOR SALE: Collins repair: FCC Licensed Technician, we repair the Collins Gray Line i.e. S-Line, KWM-2/2A etc. & other select models. Merle, W1GZS, FL, (352) 568-1676

FOR SALE: R-390A Repro nameplates - $9 shpd. N5OFF, 242 Chestnut Oak Dr., Mandeville, LA 70448. marcotte@iamerica.net, (318) 989-3430

FOR SALE: ARC-5-BC-274N xmtr. Ken Kolthoff, 8967 Scott Dr., Desoto, KS 66018. (913) 492-0400, kolthoff@gvi.net

FOR SALE: Send $1 shpg & handling for our booklet "Restore Your Radiola III, IIIA, & Balanced Amplifier"; we can replace the open winding in your Radiola audio xfmr for - $17 + shpg. James Fred, 5355 S. 275 W., Cutler, IN 46920. (765) 268-2214

FOR SALE: Ham equip: Hallicrafters, National, Heath & others. Robert Braza, N1FRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

FOR SALE: VFOs; Globe 2-6 meters high output; Ameco 621 6/2/1-1/4 meters, internal pwr both - $35 ea + shpg. H. Mohr, 1005 Wyoming, Allentown, PA 18103.

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

WANTED: Japanese WW2 Chi 4 radio plugin coils. Yes, Chi 4 not Chi Ichi. Stan, JA1DNQ fwgf8431@mb.infoweb.or.jp

WANTED: Command sets ART-13's; Collins radios & all accessories top $ paid; most radios repaired reasonable. FCC licensed. W1DEJ, MA, (781) 485-1414 eves, hobfact@tiac.net

WANTED: E.H. Scott Philharmonic rcvr. EA4JL, Contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: Central Electronics 20A w/458 vfo in excellent shape; Frank, W4FMS, (954) 472-9474, w4fms@aol.com

WANTED: Globe Scout 680A, Globe Scout Deluxe, Globe Scout 66. Looking for factory wired units. Richard, K1MD, (H) (401) 732-4026, rich@ids.net

WANTED: Variometers. Steve Gross, W9OJI, 602 W. First St., Mt. Morris, IL 61054. (815) 734-4255

WANTED: 803, RK20 tubes; Temco 75GA xmtr or Supreme AF100. Robert Perlstein, W1IV, POB 642, Old Orchard Beach, ME 04064. (207) 934-9206 perls@compuserve.com

WANTED: Navy equipment with SE-series datatags, any condx, any size. Also, manual for BC-365-A. William Donzelli, 15 Gen. MacArthur Dr., Carmel, NY 10512. (914) 225-2547, william@ans.net

WANTED: 8-pin coils marked SATO, top has silver label indicating ant# or OSC#. Harry Blesy, N9CQX, 95740 Clarendon Hills Rd., Hinsdale, IL 60521. (630) 789-1793

WANTED: TMC 1758/URR SSB adapters, need (2) unmodified, working condx or complete, reasonable. John, WI, (715) 378-2466 after 8pm

WANTED: AT-200 Kenwood antenna tuner to match TS-520-S xcvr. Wes Chatellier, W5DPM, 1950 Chevelle Dr., Baton Rouge, LA 70806. (225) 927-2199, eves.

WANTED: JRC wired keypad NCM515 for NRD515 rcvr in exc condx. Wies, Steinstr. 12, D-48465 Schuettorf, Germany. Fax +49.5923.5761

WANTED: Military signal gen SG299B/U audio square wave to 1 MHz, tube/type boat anchor. Ellsworth O. Johnson, 364 S. Coeur Dalene St., Spokane, WA 99204. (509) 838-2161, eojohnsonww2@worldnet.att.net

WANTED: HRO 5 coil sets. I have A, B, C, D, F, looking for all others; looking for reasonable repair on S-77 & NC-54. Fred, POB 3, Kent, AL 36045. (334) 541-3914

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

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

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

WANTED: Any military entertainment radio (Morale rcvr), manuals, accessories, or data plates. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. ph/fx (707) 544-5179

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

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

WANTED: Copy of MIL-T-27A spec, RCA, Gates, Langevin B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763, richmix@erols.com

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

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

WANTED: National HRO 500 & LF10; Hammarlund SP600-JX21A; Johnson AN/FRT-505. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Knight T150/T150A in original kit form. Bob, K6GKU, AZ, (602) 770-7829, ctxp98a@Prodigy.com

WANTED: Looking for homebrew AM and/or CW xmtr. RF output should be in the 500-1KW range. I would prefer rack type construction, but will consider all. Interested in top quality build, would prefer 833 mod/finals, but others OK. Can pick-up or arrange shpg. Thank you. Bruce, KG2IC, (716) 689-6727, kgic@amsat.org

WANTED: Reward for lead on Drake 1A spkr; 5x7 spkr vertical black case 7x10, chrome strip across middle. K5YY, AR, (501) 756-5010.

NEW RELEASE: Flyer 199. For details send 2-stamp LSASE to: Olde Tyme Radio Co., 2445 Lyttonsville Rd. Suite 317, Silver Spring, MD 20910.

FOR SALE: Johnson Matchbox #250-23-3 w/ instructions Dir/coupler blt-in reads SWR & RF out. exc cond - $100. + shpg; B&W VS200A transmatch match any rcvr, xmtr or xcvr coax, balanced of wire line, 250W w/instructions + shpg. Al, W8PAL, AZ, (602) 814-6387 (wkdy am)

FOR SALE: Tooltender/tube caddy, like new - $20 + shpg. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405-2375. (541) 345-2169

FOR SALE: Collins 75S-3, 32S-1, 516F2, cabinet w/Heath HP23A, very nice - $725. Mike, WA6NGF, CA, (559) 568-0345, Mon-Fri before 10 AM Calif time.

FOR SALE: Transformers & chokes for: BC-610, 32V3 & HT9. Roland Matson, POB 956, Lake Panasoffkee, FL 33538.

FOR SALE: SX100 Good, works great, $225 plus shipping but prefer pickup. Larry, K6LXT,CA, (310) 860-3131

FOR SALE: Collins KWM-1 xcvr, AC ps, DC ps, orig manual - $1240 + shpg. Gary Wagner, K3OMI, TN, (423) 690-4217 work days.

FOR SALE: HQ120X -$135; GPR90 & spkr - $550. **WANTED:** 811 + 572B tubes; PE73-C dyamotor. W7RBF, AZ, (602) 864-9987.

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

FOR SALE: Japanese Radio Communications Equipment Technical Manual (enemy) TM E-11-227A, 12/1944 cover-to-cover professional reprint, great graphics, profusely illustrated - $24 incldS bookrate postage for insured, tracked (via UPS) - $4.42 additional. Visa/Mastercard accepted, mail or telephone. **WANTED:** US military TMs, any subject, will trade. Military Marketing, Inc, POB 741, Norcross, GA 30091-0741. (770) 729-9315

FOR SALE: Lafayette HE-50A, 10 meters - $125; Johnson SWR bridge & coupler - $65 & $75; Heath HO-10 monitorscope - $95; Galaxy audio filter - $15; Gonset VFO, collector grade - $85. Free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (973) 728-2454

FOR SALE: Adjust-A-Volt variable auto xmfr 7.5 amps, neat compact case - $25. Mervyn Ellsworth, 2309 N. 25th St., Boise, ID 83702. (208) 345-6878

FOR SALE: BC604 xmtr, no dynamotor - $35. **WANTED:** Schematic or any info on RCA F R430B VHF radio. Robert Martin, 111 Bancroft, Rochester, NY 14616. (716) 663-4182

FOR SALE: Hallicrafters HT-5B speech amp - $75 + shpg. John, AA7W, 13428 29th Ave. SE, Bothell, WA 98012. john.nelson@telops.gte.com

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Collins R389, 308-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WAØAKG, NE, (402) 464-8682.

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

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

WANTED: Collector/builder seeks lge & small vacuum tubes & vacuum tube collections, sockets, etc. Will pay good prices. Please call Marc, OR, (800) 330-2004.

WANTED: Keys - keys - keys - keys - keys - keys - keys - keys - keys - Jim, KØYLW, KS, (785) 364-3989

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

WANTED: Late issue of International (foreign) call book, will pay reasonable cost & postage. G. Liccione, W2TPL, 118 Hiawatha Trail, Liverpool, NY 13088.

WANTED: Manual or other info for WW2 British R-1155 aircraft rcvr. Robert Haus, POB 231321, Anchorage, AK 99523. (907) 338-0057, airspy3945@aol.com

WANTED: BFO unit for Hammarlund HQ120X or HQ129. John, KF7OM, NV, (702) 727-8171.

WANTED: Power xfmr & VFO knob for a HT-32B xmtr. Jeff Bishop, W7ID, ID, (208) 459-7502, jbishop@2online.com

WANTED: Manual for B&W model 370 single sideband rcvg adapter, run two. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

WANTED: Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135

WANTED: Hallicrafters HT-1, HT-9, HT-31, 5-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attws.com

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

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

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265

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

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

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

WANTED: Limpanders or other equip by ESECO. Richard P. Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

WANTED: Bandcoil sets for HRO-50 & HRO-60. Tom Bonomo, K6AD, CA, (650) 578-1897.

WANTED: TU-5-B tuning unit, 1.5-3 MHz for BC-375. Charles Lackey, W4QBE, 1252 Worley Creek Rd., Lakemont, GA 30557. (706) 782-3670

WANTED: HT-31 or Johnson Viking Courier. W8JKS, 1344 McDonald Hill Rd., Frankfort, OH 45628. (740) 998-4518

WANTED: Maintenance manual for Electronic Research Assosiates DC pwr sply model 110DMC. Jerome Roebuck, 1003 Melrose Ave., Chula Vista, CA 91911-2325.

WANTED: Collecting military electronics including radio, radar, RDF and test, manuals & literature. William Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6031

WANTED: Miller AM tuner model 595; RCA Radiomarine Direction Finder model AR8712 & RCA rcvr model 18T service manuals. Al Kaiser, W3LEQ, 713 Marlowe Rd, Cherry Hill, NJ 08003-1551. (609) 424-5387

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

FOR SALE: Galena xtal radios & parts; Heath AT-1 xmtr w/manual, it works - BO. L. Gardner, 458 Two Mile Crk Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: MRC HF linear amp, 10-80M, 500W, xtra finals - $285; Cushcraft AR-10 Ringo, NIB - $50; Yaesu YD148 desk mic, VG - $45; Swan WM-2000 swr/pwr meter, NIB - $50. **WANTED:** Icom H16, 4GAT, Kenwood TR-851, FM430, TS780; need chassis for TS680 or TS140. G. Richardson, KF6LRV, CA, (619) 670-7590.

FOR SALE: CQ magazines 47 thru 55, 107 issues - $50 + shpg. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

FOR SALE: RME-69 with matching speaker, both fully restored and in fine condition, copy of manual, unrestored DB-20 preselector, all for $375; unrestored Collins KWM-1, restored 516F-1 and 312B-2, original manuals for all $1100; MFJ-989C Versa Tuner V, "3 KW series with roller inductor" with manual - $240; B&K 4040 deluxe function generator, 10 months old, paid $450, sell for $200. Heath IM-2410 frequency counter - $50; Heath IG-1271 function generator - $40; AEA HF Antenna Analyst model HF-121, paid $350, sell for $190; Hewlett-Packard 608-F, 10 to 450 MHz signal generator with manual - $100. I have many new & used tubes I want to sell. Mike Palmer W5MP, 16707 Creeksouth Road, Houston, Texas 77068. (281) 893-0088

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

FOR SALE: Watkins-Johnson 235-1000 mc rcvr - $250; BC-342-N 1.5-18 mc rcvr - $250. Gary, WA9IYF, 169 North Ridge Rd., Versailles, IN 47042.

FOR SALE: Heath HD1481 antenna switch; handles 4 antennas, 2 kw PEP, manual - $45 + UPS. RJ Eastwick, 400 N. Haddon Ave. Unit 109, Haddonfield, NJ 08033. (609) 429-2477

FREE: Encyclopedia of Amateur Radio Equipment. Hundreds of photos & descriptions spanning over 80 yrs. http://www.aade.com/hampedia/hampedia.htm

FOR SALE/TRADE: Transmitting/Rcvg tubes, new & used - 55¢. LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR TRADE: (2) good RCA 833A's for one Taylor 833A. Also looking for Taylor 803, 813, 875A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

TRADE: My AN/PPN-2 Eureka Paratroop beacon for your wireless set (Canadian) 29A set. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

FOR SALE/TRADE: Numerous equip manuals including many Johnson, National, WRL/Globe, Hallicrafters, B&W, Lafayette, Allied/Knight, National, Heath, McMurdo Silver, Howard, RCA, Millen, Polycomm, Clegg, Hammarlund, Ameco, Drake, Morrow, Gonset, EICO, Elmac, B&K, Collins, Harvey Wells, Conar, RME, Swan & others. List available. NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536, ni4q@juno.com

FOR SALE: Waterman Pocket Scope # S 10 A, not tested. **WANTED:** Reel to Reel tape recorders. Hoover, SC, (843) 726-5762.

FOR SALE: Sprague Electrolytics 150mF-200 VDC - 10¢ ea; Collins rack AC control panel; 2 Grundig wooden wall spkrs; wooden juke box cabinet, fix up or parts. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933.

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

FOR SALE: Merchant Marine rcvrs, Mackay 128AY, Radiomarine/RCA AR8506B, AR8510, EH Scott SLRM, any rcvr - $250. Carl Bloom, CA, (714) 639-1679 or 3778111@mcimail.com

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FOR SALE: Galena xtal radios, homemade, or parts to make your own; 304TL, unused - make offer. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: SW-3 replacement plug-in coil forms - $7.50 ea; 19 pg SW-3 data pkg, includes coil winding data - $5; 4, 5 & 6-pin generic coil forms - $6 ea; Pilot Super Wasp plug-in coil forms - $6.50 ea. All above + shpg. James Fred, 5355 S. 275 W., Cutler, IN 46920.

FOR SALE/TRADE: NC-100, NC-300, Viking Mobile, R-1051. **WANTED:** T-4XB, GRC-109/xmtr, 100TH, 3885-7290/FT-243. Sam Timberlake, KF4TXQ, POB 161, Dadeville, AL 36853. (256) 825-7305, stimber@lakemartin.net

FOR SALE: Classic gear - SASE for list. **WANTED:** Vintage rigs. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (313) 454-1890

FOR SALE: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: Books, all electronics related; 200 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. wøtok@email.msn.com

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

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

FOR SALE: Our new 1999 54 pg. catalog of WWII communications items - $3. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

FOR SALE: Boatanchor paints; Heathkit Tech Journal Subscriptions; phone filters - call or write for free catalog. R&R Designs, 202 Midvale, Marshall, WI 53559. (800) 372-4287

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Receivers: SP-600JX-21, R-390A, R-390, CV-157 URR ISB adaptor, R-388 w/prod detector & hang AGC, HQ-145A w/prod detector, HQ-100 w/spkr, S-36A 28-144 mc, Rycom 2170 3 kc-200 kc, Collins RUQ, fixed frequency receiver.

Test equipment: General Radio 434B audio oscillator, 667A inductance bridge, 1142A freq. meter, 1390A random noise generator, 1432-K decade resistor, 1652A resistance limit bridge. Boonton 91C RF voltmeter, 160A Q meter. Measurements Corp 80 HF signal generator, 79B pulse generator. TEK 512 scope, 321 portable scope, 545 scope, 555 dual beam scope, 561A scope. HP signal generators—2071A, 606A, and others, Empire Devices LP-105 Field Strength Meters.

Misc: blank rack panels, rack cabinets, power supplies, large xfmrs, chokes, capacitors, towers, masting, cable, coax, multi-conductor cable and much more.

Chuck Felton, PO Box 187,
Wheatland, WY 82201.
(307) 322-5858
feltoned@coffey.com

FOR SALE: Naval rcvrs RAL, RBA, RBB, RBC, RBL, RBM, some checked, pwr splys available, prices from $75 to $350 depending type, condx. Carl Bloom, CA, (714) 639-1679, 3778111@mcimail.com

FOR SALE: EFJ Parts. Tie Bolts - Ranger x3- $8, Valiant x4- $9.50; 9-pin plug-$6; 2 pin mic connector-$6; ELEMENCO fused plug-$8; PTT relay, 3PDT-$5.50. All prices shpd. Cal, N6KYR, 1964 11th St, Los Osos, CA 93402. cal.j.eustaquio@lmco.com

FOR SALE: Tubes, send SASE for new list X. **WANTED:** Connectors, MS (military olive drab) unused, quantities. Typetronics, Fred Schmidt, N4TT, POB 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, fx 583-0777

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WANTED: WW-2 Japanese military radio of any kind. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069, takadoi@a2.ctktv.ne.jp

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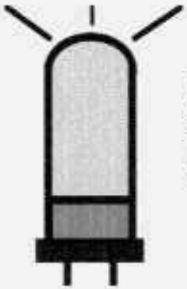

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