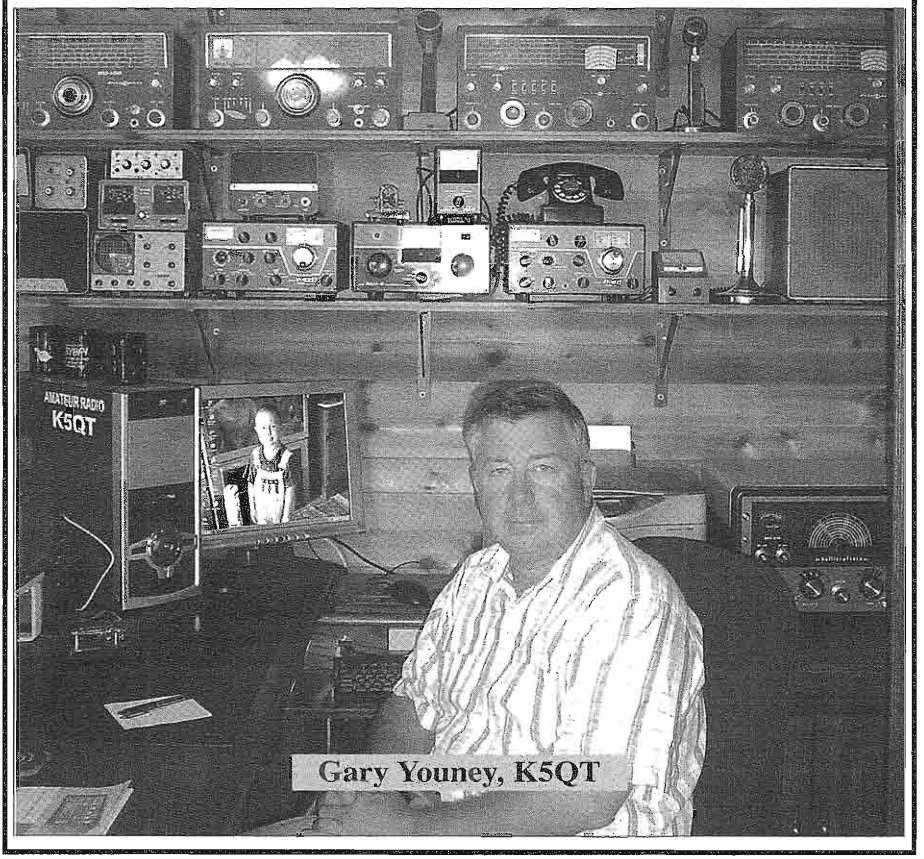
$3.75

ELECTRIC RADIO

celebrating a bygone era

Number 186 November 2004



Gary Youney, K5QT

ELECTRIC RADIO

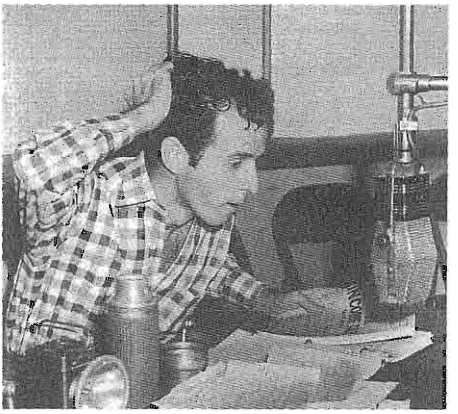
published monthly by Symbolic Publishing Company
PO Box 242, Bailey, Colorado 80421-0242
Periodicals postage paid at Cortez, CO
Printed by Southwest Printing, Cortez, CO
USPS no. 004-611
ISSN 1048-3020

Postmaster send address changes to:
Electric Radio
PO Box 242
Bailey, CO 80421-0242

Electric Radio is dedicated to the generations of radio amateurs, experimenters, and engineers who have preceeded us, without whom many features of life, now taken for granted, would not be possible. Founded in May of 1989 by Barry Wiseman (N6CSW), the magazine continues publication for those who appreciate the value of operating vintage equipment and the rich 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 and operating with a primary emphasis on AM, but articles on CW, SSB, and shortwave listening are also needed. Photos of Hams in their radio shacks are always appreciated. We invite those interested in writing for ER to write, email, or call.

Editor's Comments

Electric Radio Annual Heavy Metal Rally



Electric Radio Magazine is again sponsoring the annual Heavy Metal Rally. This year, it will be held on Saturday, January 8th so as to not interfere with holiday activities during December. The rally will begin at 2400 UTC, or 7:00 PM Eastern Standard Time.

As in years past, this is not a traditional Ham radio call sign echo contest. Although the Heavy Metal Rally was originally intended to include only big tube-type equipment, it should now be seen as a night for friendly AM QSO's and is open to anyone using restored broadcast, military, homebrew, any commercial Ham gear meeting the requirements, i.e. Johnson Invader 2000, Viking Desk KW, Globe King 500, Collins KW-1, etc. and big solid state Class-E equipment. This includes using a solid-state exciter as long as the PA is Heavy Metal, such as a 300 pound Henry 8K! I want as much participation in the rally as possible. Obviously, we would all like to work as much tube-type Heavy Metal as possible.

The rules for this year's Heavy Metal Rally are as follows:

Suggested Frequencies: 1885 Kc east of Mississippi, 1900 Kc West; 3830 Kc, 3870-3890 Kc, nationwide, 7290 Kc.

[Continued on page 13...]

TABLE OF CONTENTS

Cover: Gary Youney (K5QT) is at one of his vintage operating positions at his home QTH of Bluff Dale, Texas. The top shelf behind Gary holds the entire line of National's "Cosmic Blue" receivers, although not all could be completely shown in this photo.

The Restoration of my BC-610E Part 2

By Bill Feldmann N6PY
n6py@arrl.net

Curing the Internal Oscillator Hum Problem

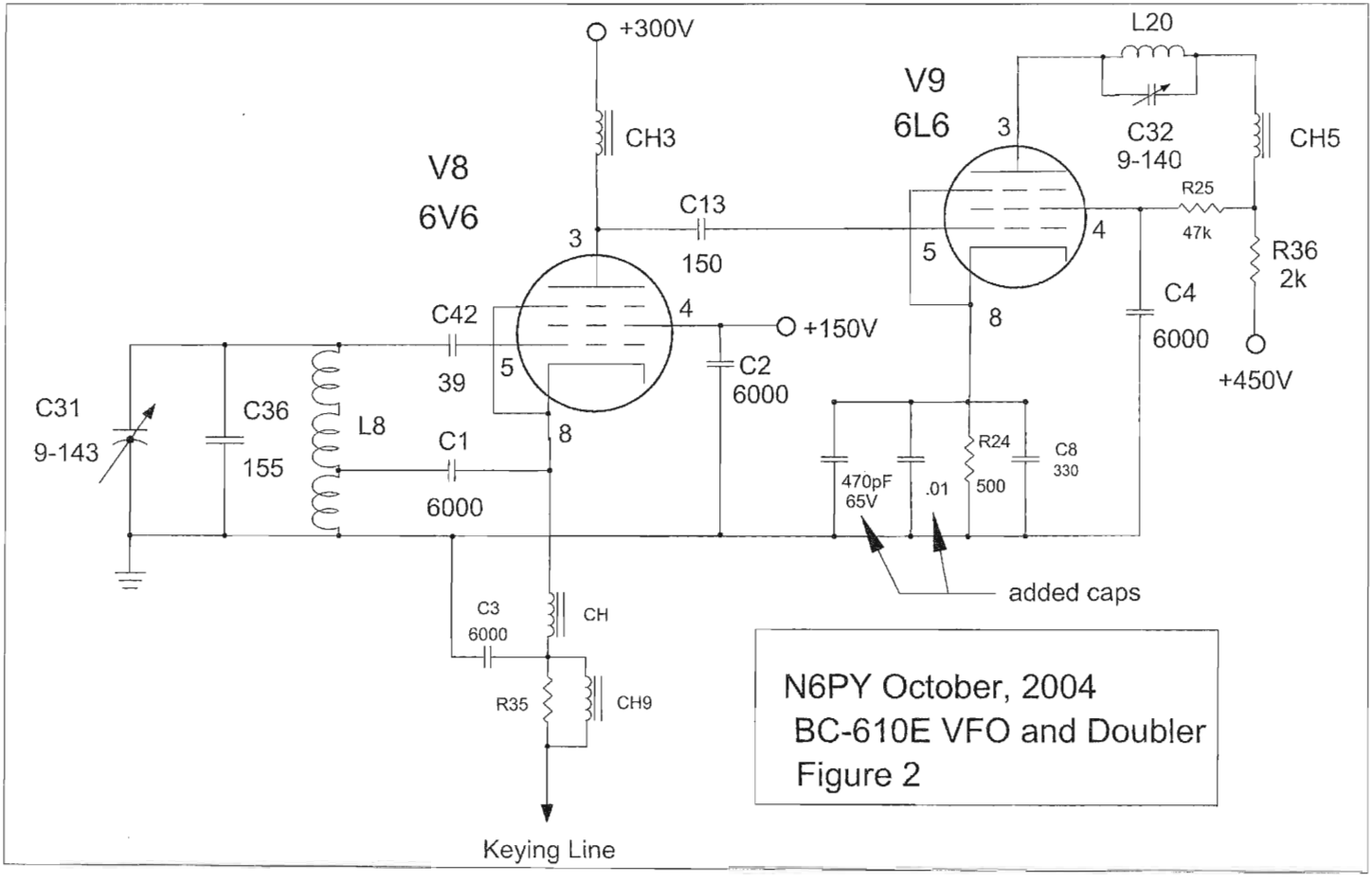
I repeated the testing and listening to my carrier when on the internal oscillator using the product detector in my 75A-4. I identified 60-cycle sidebands and additional harmonic sidebands as described in my previous article. However, there was no ripple showing on my HO-10 scope from the transmitter's output. In my F model I blamed these on microphonic vibration of the exciter modules by hum from its power transformer. However, my BC-610E has hardly any hum from its power transformer, which shot down that theory.

Those having more experience with the BC-610 say they all have hum if you use the internal oscillator, and don't waste your time trying to fix the problem, it's the nature of the beast, and to just use an external VFO. Additionally, the internal oscillator drifts and chirps on CW. I still wanted to find the source of the problem, and maybe solve it so the internal oscillator could be used on phone at least.

Just looking at the carrier on the transmitter's output and not seeing any ripple, and hearing the hum on a receiver tuned for slope detection, suggested the hum was not AM modulation of the carrier, but must be phase or frequency modulation of the carrier generated somehow in the exciter. However, using an external VFO and the internal oscillator's 6V6 tube as a buffer resulted in no hum, which I discussed in my previous article. If the hum was caused by phase modulation of the doubler or IPA amplifier it would be there when using an external VFO, but it wasn't. I suspected 60 cycles must be somehow getting into the VFO tank circuit. I tried different exciter modules, different oscillator and doubler tubes, and still had the same hum, so it must have been caused by something internal to the exciter chassis.

I closely studied the schematic for the oscillator circuit. A simplified schematic of the BC-610 oscillator stages is shown in **Figure 2**. The oscillator appeared to have its tank circuit well isolated by an electron-coupled Hartley oscillator design, V8 (pentode), L8, C32 and C36. However, I noticed considerable pulling of its frequency when tuning the doubler tank capacitor, C32, in the stage just following the oscillator while listening to the oscillator with my 75A-4, fed from a pick-up link around the oscillator tube. I felt that an electron-coupled design should have better isolation. Further study of the schematic showed the 6V6 oscillator tube to have its suppressor grid internally connected to its cathode, destroying much of the isolation. Capacitive coupling between the tube's plate and suppressor grid will go right to the tank coil tap, L8.

I next installed the 6L6 doubler tube on a tube extender to look for any cathode hum with a scope, since the tube has a 500-ohm cathode resistor, R24, to control tube current and only a 330-pf RF bypass capacitor, C8. These certainly wouldn't bypass low hum frequencies. I noticed a small amount of AC on the tube's cathode, so I added a 470-µf, 65-V capacitor between the cathode tab on the extender and ground then listened


+300V
CH3
V8
6V6
C13
150
C42
39
C31
9-143
C36
155
L8
C1
6000
C2
6000
+150V
V9
6L6
L20
C32
9-140
CH5
R25
47k
R36
2k
C4
6000
+450V
R24
500
C8
330
470pF
65V
.01
added caps
C3
6000
CH
R35
CH9
Keying Line
N6PY October, 2004
BC-610E VFO and Doubler
Figure 2

on my 75A-4. The hum sidebands appeared to be gone. That evening I got on the air using the internal oscillator and worked many stations. No one mentioned any hum and when I asked about hum they all said there was none. This was great news, so the next day I installed the 470-µf capacitor across the 6L6 cathode resistor with a .01-µf disk capacitor, which I found increased the grid drive somewhat on 160 meters. The added 470-µf and .01-µf capacitors are shown on the cathode of V9 in **Figure 2.**

Further testing indicated the capacitor fix worked for my BC-610E on all bands, 160 through 20 meters. But, possibly this was a fluke that would just work only on one transmitter. So, I tried this modification on my BC-610F. I removed its exciter chassis by removing its top cover, side and back panels and gained access to the exciter's mounting capacitor screws and wiring terminals. While doing this modification I also replaced all its paper capacitors and any out of spec resistors. The added 6L6 cathode resistors worked like a charm on the BC-610F. What must have been happening was somehow 60-cycle hum got onto the cathode of the 6L6 from induction into the wire-wound, 500-ohm cathode resistor, or other sources, and modulated the capacitance between the 6L6 grid and cathode. This modulated capacitance, a few fractions of a picofarad, got into the oscillator's tank through the doubler's grid-coupling capacitor, C13, to the plate of V8 and into the suppressor grid coupling and then directly into VFO tank coil L8. This must have been phase modulating the VFO at 60 cycles and its harmonics.

This modification will not cure VFO drift or chirp on CW, but it makes the internal VFO usable on phone up through 40 meters after about a half-hour warm-up. I occasionally zero-beat the oscillator on a receiver during this time. I found my BC-610E drift to be about 600 cycles on 40 meters during the first half hour, and then it will stay within 150 cycles, which is OK for AM phone. However, on 20 meters the drift is more excessive, so I usually use my external VFO up there.

The BC-614 Speech Amplifier

When I restored my BC-610F, I used a BC-614 speech amplifier for initial testing but did not like the quality of audio from it as described in my previous article. Under full modulation it seemed to have some distortion. Since it was loaned to me and I could not find one for myself, I ended up building a home brew speech amplifier, which I described in my previous article. I blamed the distortion on the limiter circuit in the BC-614.

Since I got a really clean speech amplifier with my BC-610E and had observed that my friend Brian (NI6Q) was using the same amplifier with excellent audio, I decided to see what I could do with mine. After opening it up and checking all its tubes, along with a visual check for any damage, I plugged it into the audio cable from my BC-610E and gave it a try. The tubes lit up fine and there was no smoke, so I plugged a T-17 carbon mike and tried it with the transmitter hooked into my dummy load and HO-10 monitor scope. I found that when I talked into the mike I had to use full mike gain to just get 40% modulation. It also sounded much distorted on my receiver.

Since the speech amplifier was out of its cabinet and was powered up when the transmitter was in standby, I conducted a voltage check of all the amplifier's tubes. I found many of the tubes had the same voltage on their cathodes as the plates, and their grid voltages were positive. Looking at the schematic and parts list in my BC-614 manual, I found most of the plate-to-grid coupling capacitors in the amplifier were .01-µf paper capacitors and were obviously leaking badly. After talking to Brian, I decided to improve the low frequency response of the amplifier. I ordered .047-µf capacitors to replace the .01-µf ones originally used for the plate-to-grid coupling capacitors. I left any capacitors in the limiter feedback

circuit the original values so as to not affect the time constants. I used Orange Drop® capacitors, but the yellow film ones sold by Antique Electronic Supply should work fine. Just be sure to use film, and not disk ceramic capacitors in audio circuits.

After replacing these capacitors my BC-614 worked great. It required only 30% mike gain for full audio modulation. Also, all the tube voltages were in spec. If you are going to use a BC-614 speech amplifier, replace those paper capacitors as they are sure to fail after 60 years.

With a carbon mike the audio was OK but not real good, so I decided to use my un-amplified D-104 mike on the dynamic input of the BC-614. These mikes typically work best into very high resistive impedance for good frequency response. Initial testing of my D-104 on the speech amplifier resulted in too many highs and a lack of lows in the audio. Since the first audio stage of the BC-614 has a cathode resistor to control bias it's safe to use a very high grid resistor value. I changed R103 to 4.7 Meg and disconnected it from the telephone input circuit and grounded it. I also removed R101, which would also load the mike, and replaced it with a 47-pf capacitor to bypass RF from the mike input. I added a second 47-pf capacitor between pin 2 of V101 and ground for further RF bypassing without affecting the audio. I left R102 in place, which is 3 Meg and is in series with the mike input. Now I had excellent audio with good lows and lots of highs and a mike gain setting of about 40% for full modulation.

Next I carefully set the limiter control pot. This setting is very important to protect the BC-610's modulation transformer. If its gain is set too high it will degrade the audio and prevent full modulation of the BC-610's carrier. If set too low it will allow the BC-610 to over modulate and cause splatter on the air, but worse, if the downward modulation of the carrier exceeds 100% it could cause excessive negative voltage swings on the modulation transformer when the BC-610's final amplifier cuts off and ruin the transformer. I adjusted it by first backing off the limiter gain, and setting my mike gain for slightly over 100% upward modulation by watching the BC-610's output on my HO-10 scope. I then advanced the limiter control to where the upward modulation was just 100%. Because most male voices have more upward than downward modulation on a properly designed AM audio system, my downward modulation now will never exceed 100% with this setting. I then ran some tests on my BC-614 speech amplifier by feeding it with an audio oscillator and looking at its output to the BC-610, but with the BC-610's plate power off to prevent damage at high audio levels. I set the audio oscillator to 1 kc and advanced its output until I had a sine wave on my scope that would correspond to about 80% modulation. This wave was very clean and symmetrical so I further advanced the audio signal until I noticed some flattening of the peaks of the sine wave where the limiter was starting to work. Further advancing of the audio just flattened the peaks more but resulted in almost no increase of amplitude. This indicated the limiter was working the way it should and doing its job of protecting the transmitter's modulation transformer.

Since the limiter circuit has a very high loop gain it doesn't work like a compressor, which would introduce a lot of third-harmonic distortion by controlling only the gain of a single tube. Since its gain is so high, it only starts to change the operating point of the controlled tube when it starts to limit, so it introduces practically no distortion until it starts to limit at near 100% modulation. Therefore, my opinion of the performance of the BC-614 amplifier was in error in my previous article. Leaking capacitors in the amplifier I used most likely caused the distortion during testing of my BC-610F. Up to

now I have only used my BC-610E with the BC-614 speech amplifier and a D104 mike with excellent audio reports.

Also, I don't have to run over to my BC-610 to turn on the plate power because I've added a push-to-talk relay to my BC-614. The stock BC-614 was wired for push-to-talk, but the control relays were in the JB-70 junction box, which is impossible to find today. I found it was very easy to add a small bridge supply across the 6-VAC filament transformer and a 5-V dc relay across the final amplifier relay control line and have its coil grounded by the mike push-to-talk line. I also didn't want to have a shorted plug or key in the key jack for keying the exciter to transmit on phone. Upon examination of the key jack receptacle, I found it was the kind that would short to ground if a plug wasn't installed. The shorting contact, for some reason, wasn't hooked up. Soldering a ground wire to the shorting contact fixed this problem. If your BC-614 doesn't have a shorting contact on its key receptacle, try installing one that does.

Using the BC-939 as an Harmonic Filter and Ham-Band Antenna Tuner

When I obtained my BC-610E I got a very clean BC-939 antenna tuner with it. Later, at the West Coast Military Collector's Meet last May, I purchased a second BC-939, so I had one for each of my BC-610s. In my previous article I discussed the need for a harmonic filter when using a BC-610 because I had measured second harmonic emissions down only 25db from my BC-610F. I had made a home brew filter using parts from a scrap BC-939 that did a great job of filtering and could do some feed line impedance matching, but it looked ugly on top of my BC-610F. I thought it would be great if a BC-939 could do this job.

For lower frequencies the BC-939 receives RF from the BC-610's final link and sends it to a roller coil coupler, then to a RF current meter and finally through a large roller coil, L6, to tune a short whip antenna. The antenna as used on the SCR-299 system is usually very short, much less than ¼ wave on frequencies below 8 Mc, so the resistive component of impedance below 7 Mc is very low. The roller coil coupler has very few turns, but works fine for adjusting the impedance into the transmitter's link if its input impedance is very low, as it will be the case with short antennas. I found that on a 50-ohm (or higher) antenna system below 4 Mc the coupler coil impedance is much too low, so I removed it from both of my tuners.

The tuner also has a switch to add a fixed 55-pf capacitor, C22, in series with the large roller coil so it can be used as a series tuned circuit for long wire antennas. This circuit then looks very much like the series-tuned filter circuit of my home brew tuner, which was described in my previous article. The problem is that the capacitor is fixed, allowing no control of circuit Q. On 40 meters, feeding a 50-ohm antenna line with low SWR, the Q is about 5, which is perfect to get the second harmonic down below 40 db, according to tests I described in my previous article. So, I tried my tuner without the coupler coil. In the long wire switch position on 40 meters the transmitter worked fine with the large coil, L6, adjusted to resonance on 7290 kc. As I moved down the band, I could correct for small reactive changes in the feed line by readjusting the coil just like my home brew tuner.

On 75 meters, the Q would be around 10, which is a little high and may lead to coil heating, but I decided to give it a try. With the 55-pf series capacitor the filter worked just fine on 3900 kc. After some long old buzzard transmissions at 350 watts of carrier I noticed practically no heating of the large roller coil. It appears the higher-than-needed Q was causing no problems.

But the real question was what would happen on 160 meters where the Q would

be a very high value of 20. Would there be arcing or a very hot roller coil, if it would even tune that low? I tried it on 1900 kc into my coax line that feeds my parallel inverted V's for 40 through 160 meters. On "high voltage protect" it tuned up fine but took nearly all the roller coil to resonate. But, if I moved too far one way off of the resonant frequency of the antenna, I ran out of roller coil adjustment. That night I tried it on 1925 kc for a long rag chew QSO under full power. It worked fine, but I noticed some heating of the roller coil on one end, indicating high RF current. A week later a friend gave me a 100-pf fixed vacuum capacitor that would fit the clips in my BC-939, so I decided to try it on 160 meters. Now, with a Q of 10 for that band, I had a lot more roller coil adjustment and the coil ran much cooler.

I had a spare set of clips and standoffs for that type of capacitor in my junk box, so I modified one tuner to have the 100-pf capacitor in the circuit when in the whip antenna switch setting, and still the 50-pf capacitor in the long wire setting. This antenna tuner works great for 160 through 40 meter operation with good efficiency. The modified circuit for my BC-939 is shown in **Figure 3**. It did require some minor rewiring on SW9.1.

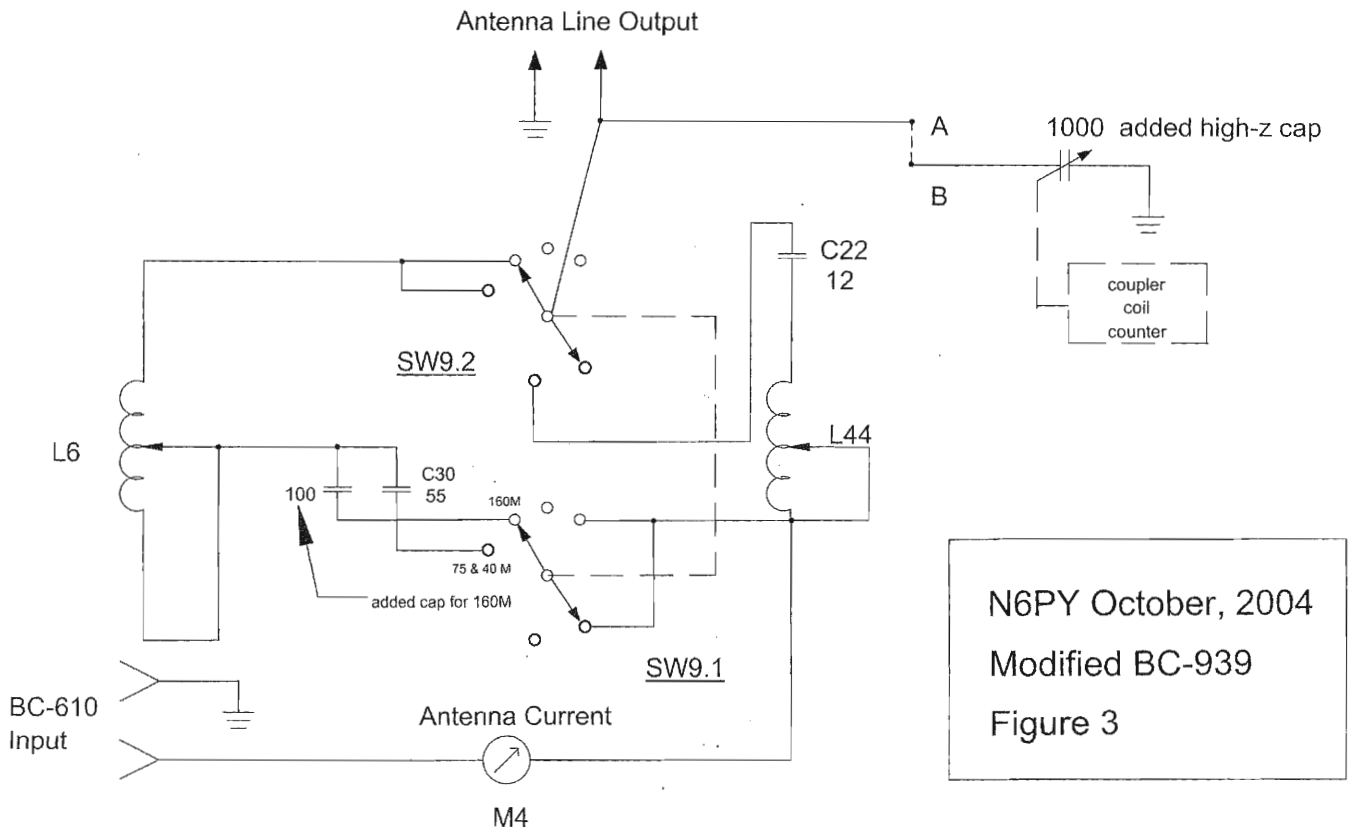
I found that on 20 meters the high-frequency smaller roller coil and its series capacitor results in a Q of nearly 5. This is perfect, so it needed no modification for 20-meter use. On the BC-939 that has the added 100-pf capacitor for 160 meter use, I completely removed the coupling coil. In its place I mounted an adjustable 1000-pf vacuum variable capacitor driven by the original coupling-coil counter knob. This capacitor, for now, is connected between ground and a wire with an alligator clip. This comes out the back of the tuner near the antenna terminal. The added 1000-pf variable capacitor is also shown in **Figure 3**; the clip wire is between terminals A and B. If I connect the clip lead to the antenna output, the modified BC-939 will tune resistive component impedances from just over 50-ohms to 5k ohms, 75 through 40 meters, making it a very useful long wire tuner. On 160 meters, it will tune around 50 ohms without the capacitor. With the capacitor switched in, the impedance has to be over 300 ohms. When the capacitor reaches maximum capacitance, I find that I need a larger capacitor for that band. Any reasonable reactive component of the feed impedance is tuned by adjustment of the coil windings.

Using the added output capacitor, the tuner now looks like the series-tuned filter network with part of the coil and capacitor to ground forming an L network on its output, as described in my previous article. It may even be possible to float the ground of the tuner and feed it with the BC-610's link coil floating above ground to feed balanced ladder line. Or, the BC-610E link output could be grounded on one end for use with a standard T/R relay for a receiver. Then, the floating tuner circuit could be fed through a balun for loading balanced loads. The BC-939 tuner modifications may be something you may want to experiment with.

Conclusion

Now that I have two BC-610s, an E model and an F model, it's interesting to compare the differences between them. I use the F with my homebrew speech amplifier and a Symetrics 528 audio system. With that system, I get the best audio reports of the two, but with the same system into the E the audio reports are also excellent. However, the E's transmit audio using the modified military speech amplifier and D104 is very close, you really have to do a rapid switch between transmitters on the air to tell the difference.

For some reason, the internal VFO is a little better in the E than in the F. Both now have no hum and a good stable carrier for phone on all bands except on 75 meters. The F model will jump fre-


Antenna Line Output
A
B
1000 added high-z cap
C22
12
coupler
coil
counter
SW9.2
L6
L44
C30
55
100
160M
75 & 40 M
added cap for 160M
SW9.1
BC-610
Input
Antenna Current
M4
N6PY October, 2004
Modified BC-939
Figure 3

quency up and down about 10 to 30 cycles every few seconds, whereas E is much more stable for some reason that I can't find. Both have the same hum reduction modifications and have had their paper capacitors replaced. The frequency jump is only on 75 meters and I suspect there is some subtle difference in the wiring harness or wire routing of the oscillator circuit in the F that causes the frequency jump. So, my E gets the vote for the better internal oscillator and I almost always use it. I generally use the HP-3586B as an external VFO with the F model. Because of the better fidelity audio system, and the external VFO's stability, I usually use the F for AM net control duties and CW contacts.

My E also gets the vote for less noise during transmitting. It has practically no HV transformer hum. The F, like most of the later BC-610s develop noisy HV transformers as they age. For that reason, I keep the condenser mike I use with my Symetrics audio system at least 8 feet from the BC-610F. The E is also a lot easier to tune up, especially on 40 and 20 meters because of the gear reduction drive on its final tuning capacitor.

I feel the E model is much better looking with the two control panels in the center of the front surface. The F model looks like an uninteresting black box. Additionally, my E looks better than stock with the extra D Model-type meters for monitoring plate voltage and modulator current as you can see in **Figure 1** [ER # 184, October, 2004]. The current meter is especially nice for setting modulator bias because I don't have to look away from the transmitter and glance at the speech amplifier's meter. Also, the way I have my station set up with the E model next to a desk containing the speech amplifier and a BC-312 receiver, I get the feel of operating a WW2 military station.

I'll admit that the BC-610E is my favorite, but not to take away for the later F model, it's a real workhorse. I certainly enjoy the excellent reports I get that say my BC-610F sounds like a broadcast station.

ER

From QST, March, 1943

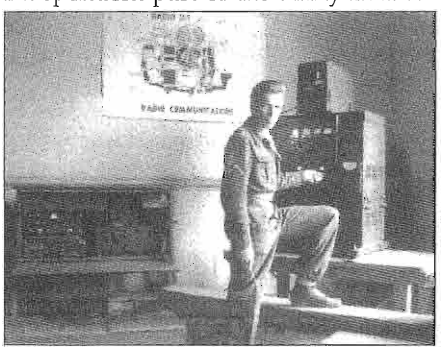
From Radio Magazine, December, 1938

Instructing the SCR-399/BC-610E in the Dutch Signal Corps

By John Van Egmond, KI6ZS
20439 Oxnard St.
Woodland Hills, CA 91367

In my recent involvement on several AM nets using my Collins 32V-1 AM transmitter & 75A-1 receiver combination, I noticed that the Hallicrafters BC-610 transmitter is still very popular with the AM amateur community, and considered one of the preeminent AM transmitters. I never owned one, but hearing about it reminded me of the time during the early fifties that I was an instructor in the Dutch Army Signal Corps, teaching the operation of the SCR-399 mobile HF station. This system had just arrived in the inventory of the Dutch Army, and because of my radio amateur background I was picked to receive training from the Hallicrafters field engineer to become the first instructor in the Dutch Signal Corps on the SCR-399, which included the BC-610E transmitter. The pictures below show the sheltered SCR-399 mobile HF station and me explaining the operation of the BC-610E transmitter to a class of future military radio operators and maintenance technicians.

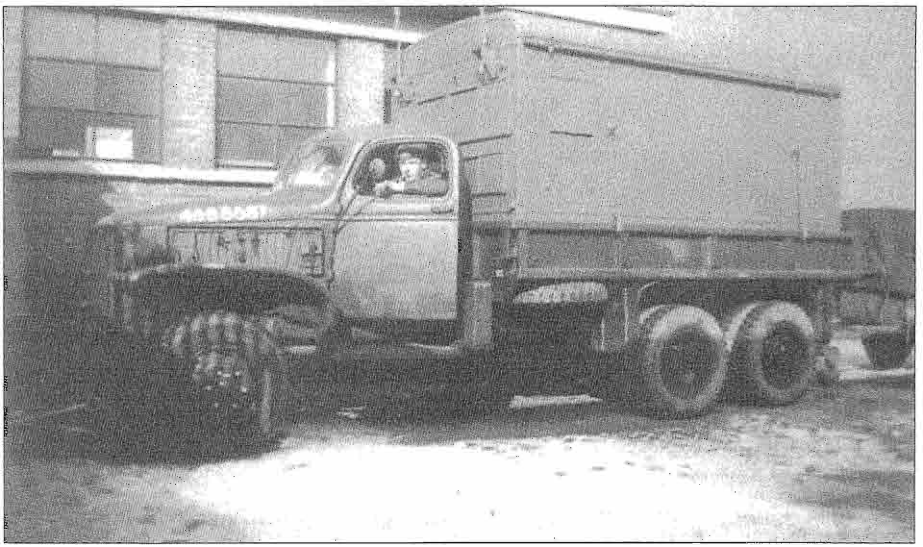
The Dutch Signal Corps became an independent part of the Army in 1949.



John Van Egmond instructing the operation of a BC-610E.

When the Dutch forces returned from Indonesia in 1950, an Army Corps for NATO had to be formed. Initially, most of the modern communication equipment was provided out of British and Canadian supply depots. Officers and NCOs were trained at the School of Signals in Catterick, England, and other ranks were trained at the Signal School at The Hague. Although the SCR-399/BC-610 had been in the inventory of the American Army since 1939, it only became an item in the Dutch Signal Corps in 1953. The SCR-399 stayed in the Dutch Army's inventory until the early seventies.

The SCR-399 Mobile HF Station covers a frequency range of 2-18 MHz. The BC-610E transmitter provides an output power of 400 watts CW or 300 watts on AM from a single Eimac 250TH triode final stage. The BC-610 design is based on Hallicrafters HT-4 amateur transmitter, which started life as early as 1938. The operating band is covered with a set of plug-in tuning units and tank coils and can either be crystal or MO controlled. The mobile HF station consists of two BC-342 receivers, which can operate in either frequency diversity or a single-channel mode, each having a separate half wave doublet antenna, a BC-614 speech amplifier and a BC-939 antenna tuning unit all located in a HO-17 shelter mounted on a 2½ ton 6X6 truck. The system is powered in the field by a PE-95, 10-KW generator mounted on a K-52 trailer. For the classroom setting, all units located in the shelter were removed and placed in the room. The remotely controllable PE-95 can be placed up to a



SCR-399 mounted in the HO-17 shelter

distance of 100 feet from the radio set.

The mobile HF station uses two half-wave doublets for receiving antennas. These antennas have to be spaced apart 3 wavelengths or 1,000 feet maximum for satisfactory space diversity reception. Three wire-guided 35 feet high masts support each antenna. The dipole length is determined from a chart for the chosen frequency. A rhombic or a doublet antenna is available for the transmitter. The rhombic antenna provides directional gain and is used where a doublet antenna does not provide sufficient signal strength. Though the original Signal Corps requirements were for communication points up to 100 miles, under favorable conditions these SCR-399 Mobile HF Stations made and maintained contact over 2,300 miles of land and sea.

The classroom instruction covered the overall system block diagram, power-up procedure which included starting the PE-95 power unit, initial adjustments and the tune-up procedure of the transmitter and antenna unit. A light bulb dummy load was used for classroom instruction. The frequency meter BC-221 was used for calibrating the desired transmitter frequency when in the master oscillator (MO) mode. Routine maintenance of the PE-95 power unit was also included in the instruction. The class instruction on mobile HF Station operation and minor maintenance was spread across several weeks with 4 hours per week. The last week of the training course was dedicated to operating the mobile HF Station in the field, which included setting up the radio set and power generator trailer and installing the antenna system. With the equipment properly installed in the shelter, the mobile HF Station was ready for initial adjustments.

Before starting the PE-95, all switches on the transmitter had to be in the OFF position so that high voltage could not be applied accidentally. Application of the voltage before warm up and tune up of the set could lead to breakdown of components. If not crystal controlled, the first step in the tune up sequence was to check the frequency using the BC-221 frequency meter. Before this check, however, the proper tuning unit and PA plate coil had to be installed in the BC-610 transmitter. This selection was made using tables that indicating the frequency

range of each plate coil. Tuning the transmitter is basically standard procedure using the tuning charts for given values in grid and plate currents, and loading up the transmitter for maximum power using the antenna tuning unit. The whole process was repeated several times to give the radio operators and field technician confidence to set up the overall system in less than two hours during field practice. From my early experience with SCR-399 mobile HF Station, I found that the BC 610E was a very reliable and good performing part of the overall SCR-399 system. Fifty years later, this Hallicrafters transmitter is still used by many radio amateurs who like to work AM.

ER

[...Comments from page 1]

Scoring: You get 1 point per contact on each different band. If you work the same station on both 80 and 160 it counts for two points. 1 point for each different state worked. 1 point for each letter or e-mail received from Hams or SWLs with positive comments about a station's signal or sound quality. So, if someone works 20 stations in 10 different states, the score is:

20 contacts + 10 states = 30.

If two emails are received complaining that "KØXYZ" broke their S-meters but sounded darn good doing it, that's 32 points total.

The winner should be running a rig weighing 250 pounds or running at least 250 watts. This includes big homebrew, vintage commercial Ham gear, and Class E solid state rigs as long as they meet the qualifications. For example, some vintage Navy rigs weighed in at over 300 pounds, but only produced 100 watts of carrier—that's Heavy Metal! (The "or" statement is intended as an illustration, and should not be misread as an intent to keep someone out.)

You can't win unless you're running a Heavy Metal rig—NO exceptions!

This is Heavy Metal night! Everyone is welcome to participate with smaller rigs, but the winner needs to be using Heavy Metal: Restored broadcast, military, homebrew, and big solid state Class E equipment, and all of the great high-power commercially-made AM Ham equipment from years past.

Completed logs should be sent by email to 1editor2@indra.com. Please have your point totals calculated when you send in your log, and be sure to mention the equipment used during the rally.

The winning top scorer this year will receive a 1-year First Class subscription to Electric Radio Magazine or a 1-year extension if the winner is already a subscriber. All participants sending in their logs will receive a nice participation certificate from Electric Radio which will be similar to the certificate sent out in 2002.

KØOJ Annual Thanksgiving Bash

KØOJ, or "OJ" as he is known, will be hosting the annual Thanksgiving Day AM Bash from Greeley, CO. The event starts at 6:00 AM MST on 3875 kc and runs until no more stations check in. The event grows in popularity each year, and at this time of the morning there should be good coverage nearly nationwide on 75 meters. I hope a lot of AM'ers will check in with OJ this year.

ER

The Liberty Receiver

By Bruce Vaughan, NR5Q
504 Maple Drive
Springdale, AR 72764
nr5q@aol.com

A home built receiver for those would-be builders who desire an easy-to-build, inexpensive radio that works well enough to impress friends and acquaintances.

This little receiver gets its name from the fact that I took certain liberties in its construction—such liberties that may make old timers gag and spit. Before you write angry letters to our suffering Editor, or to me, let me explain how this receiver came into being.

It all started when the Librarian of the Shiloh Museum asked me if I would 'teach' her how radio worked, and help her build a working radio. Of course it was understood that such activity would take place in my always over crowded workshop. A warning flag went up immediately. It is my custom to always have at least one project under construction. Normally there are two or more. I looked for a polite way to get out of such an arrangement, but as I am a 'Life Member' of the institution I felt an obligation to grant her request. Little did I know how many hours this simple project would take.

It was agreed that we would meet for three hours every Saturday. Of course I understood that it would be necessary for me to clean up the shop, put away any projects I had under construction, and more or less suspend my work until we had completed her radio. Oh well, how long can it take to build a crystal receiver?

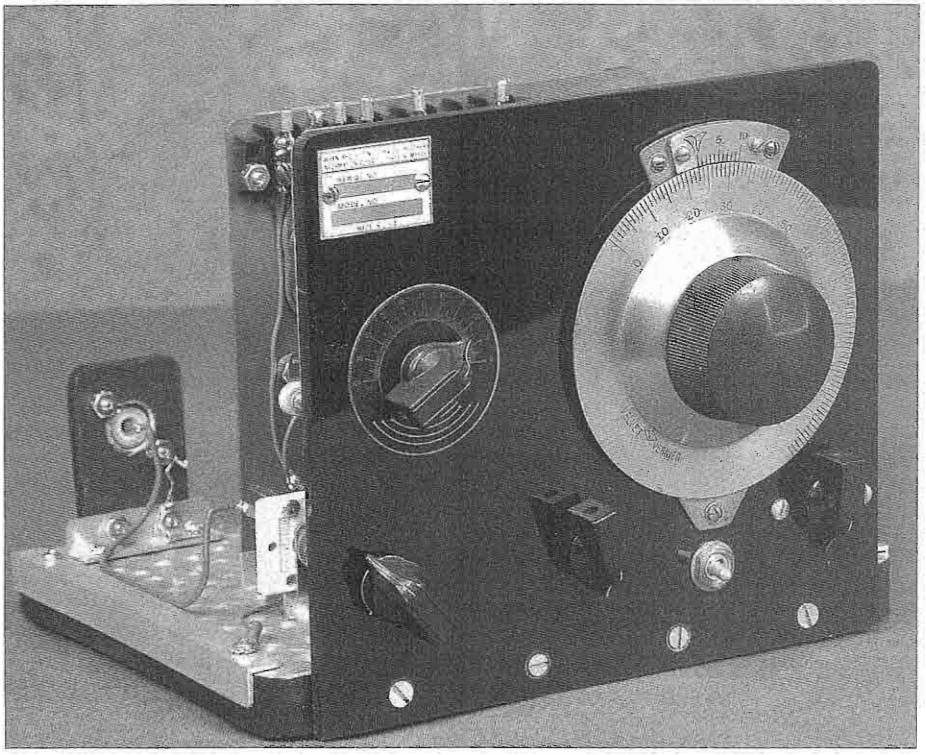
My first step was to search the net for suitable circuits—good, clear instructions were highly desirable. Everything I could get off the net would save me time and effort. I was rewarded with more crystal radio information than I really needed. I picked two circuits from the dozens that were available.

At our first meeting I was presented, by the Librarian with a set of rules—her rules—which I was to adhere to. (1) Under no conditions was I to touch her project. (2) The radio was to be her work 100% without any assistance from me other than verbal. These seemed like reasonable requests. I soon found out how difficult it was to teach someone to build a crystal radio while obeying the 'hands off' policy.

Eureka—there might be a way. I would construct an identical unit. I could demonstrate such things as using a VOM, mounting parts, and the fine art of soldering.

Soldering never seemed like a terribly difficult thing to learn—but then again I never tried to teach anyone to solder before. My student had an inclination to pick up the soldering iron by the tip rather than the handle. This happened three times during a three- week period. It would seem that once would be enough to impress upon ones mind which end of the iron is hot.

I explained that soldering was very easy. Just be sure the connection to be soldered is clean, heat the iron, apply iron to the connection, and when the material is hot enough, apply a bit of solder and wait for the connection to turn a beautiful shiny silver color before moving the wires or components being



This is the unamplified version of the Liberty receiver. Note the large National Velvet Vernier dial.

soldered. I cautioned her that if a connection took on a dull, satin-like appearance, to try again.

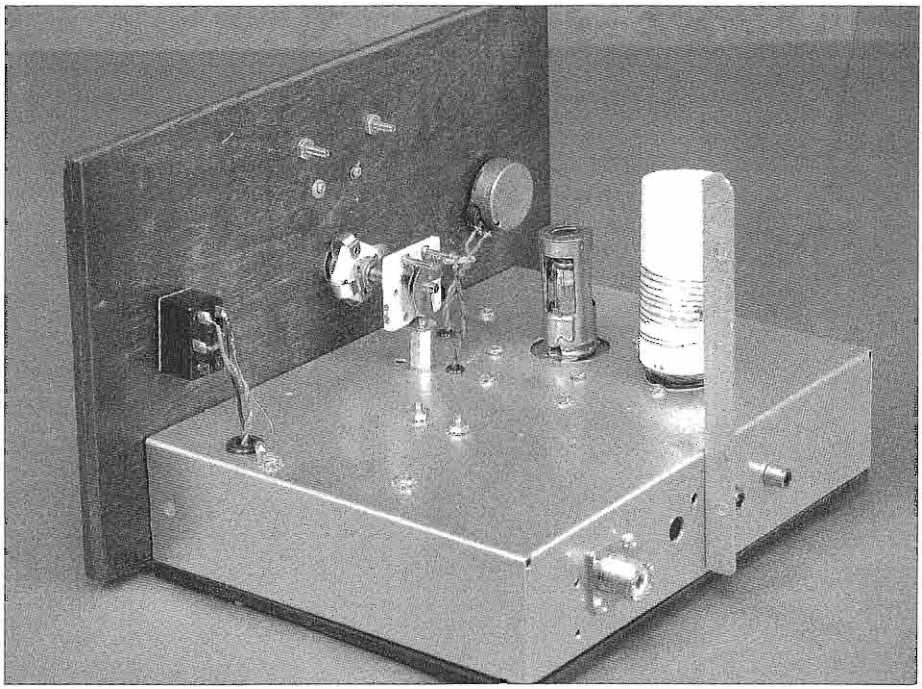
After three months she was still 'dabbing' solder to the iron tip until a big glob of solder melted into a ball on top of whatever she was trying to solder. It would seem difficult to solder five connections, and have six cold solder joints. My lady student could do it with ease.

We also found early on that all razor blades, knives, awls, anything sharp, had to be removed from the area if you did not enjoy seeing bloodshed.

About two months into the project, her crystal radio was complete and ready for testing on the air. I will admit that she wound a beautiful coil—much more perfect than mine. I dug out a pair of Brandes high-impedance headphones, connected the set to the antenna, and tuned in three local stations with nice headphone volume. I handed her the phones and waited for a smile. Instead the Librarian looked disappointed. "Is that it," she asked? "I don't want something that you have to wear those things to hear the radio. I want a radio that I can tune in to music and listen to while I do my work. I want one that when a group of school children visit our museum I can demonstrate to the entire class. This will not do at all."

I could see that this was going to take months—and at 83 years of age, I don't have a lot of months left. I would prefer to spend my time building projects I enjoy. If I wanted music on a radio I'd go out to Wal-Mart and buy one for much less than it would cost to build.

However, I was committed to this project. Now the thing I needed was a radio that was extremely easy to build,



This is the rear-chassis view of the amplified version of the Liberty receiver.

inexpensive, and would not require months under construction. I promised we would start such a project the following week. This is when I decided to take whatever liberties necessary to speed up the project.

The average regenerative detector and one step audio would still not drive a speaker to satisfactory loudness. It appeared I would have to build a detector-two step at the very least. Even then, the volume would be marginal.

This much receiver would obviously require a well-filtered power supply. Yes, I could see my Saturdays going down the tube for many months ahead. I must come up with an alternative.

My favorite regenerative detector tube is the 6C4. It is cheap, almost totally free of microphonics, and works best with about 16 volts on the plate. I decided to build a 6C4 detector with a coil wound for one of the foreign BC bands—probably 19 meters. This is where simple 'regens' really 'strut their stuff.' Two 9-volt batteries could furnish plate power. While the 6C4 circuit normally likes slightly less on the plate, I knew the set would work fine with the full 18 volts. Plus, operation would improve as the batteries lost voltage—up to a point.

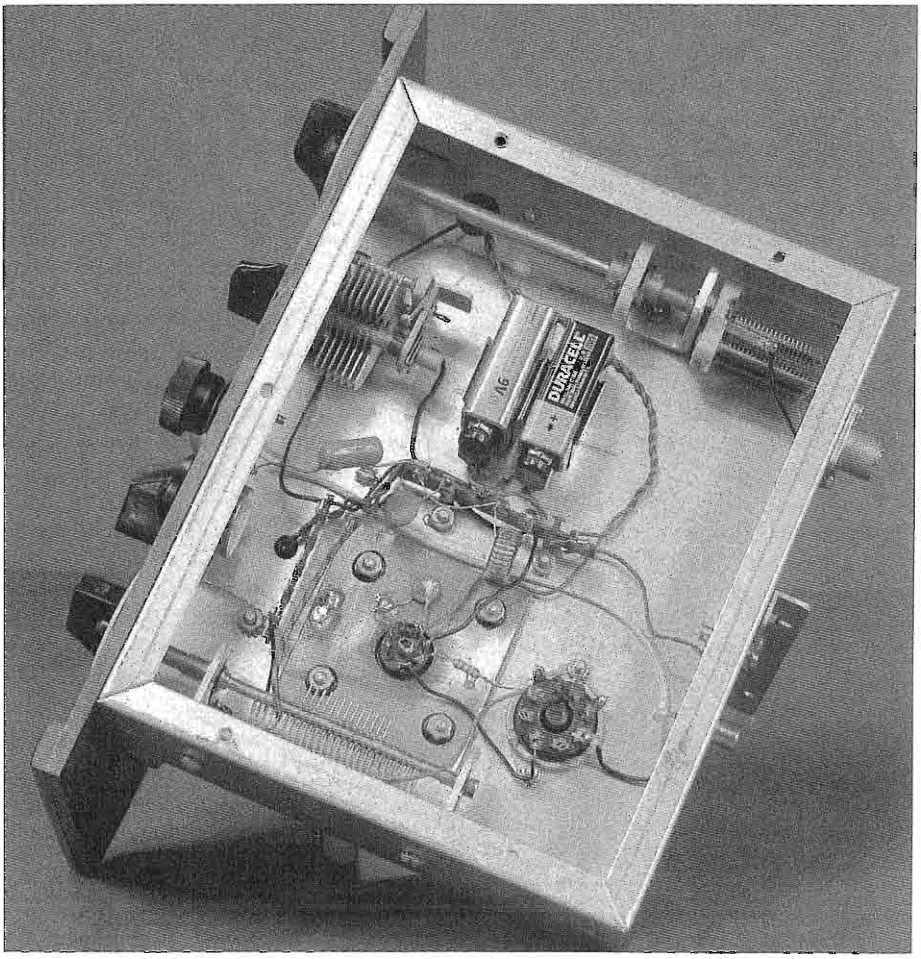
What to use for the filament supply was the next question. 'D' cells would do the job but that involves a lot of soldering, extra wires, more cost, and more chance for things to go awry. Then, in a flash it came to me. Every household has a supply of 'wall warts' left over from long forgotten radios and small appliances. I decided to power the filament with a wall transformer. Either AC or DC would do fine. It was my opinion that a DC supply might be better, but in actual use I cannot tell any difference in the hum level.

"But what about the loudspeaker vol-

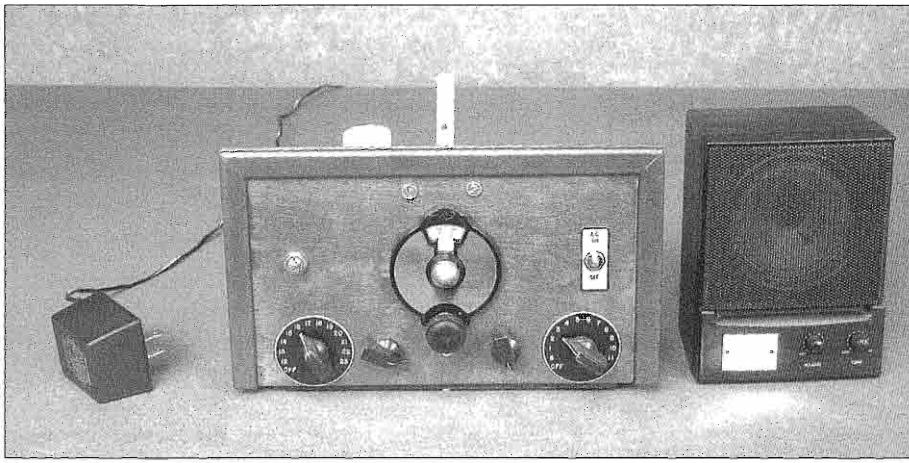
ume from a one tube radio," you ask? Here is where I really took liberties. I used an amplified speaker from Radio Shack. The cost of the little amplified speaker was $19.95. I paid 12.92 for the last output transformer I bought and over $7.00 for my last 'cheap' speaker. The amplified speaker is cost effective and at the same time a beginning builder can feel that he is listening to a radio he built with his own hands.

I realize that 99% of our readers are far too advanced to get interested in building this radio for their own use, but what about getting your grandkids interested? A radio that is easy to build and one that works as well as this one does, would make a wonderful project for Science Fairs, Boy Scouts, Church Groups, or for someone in your family.

I am enclosing pictures of two different approaches to this set. Both work equally well. I think the pictures are self-explanatory. You may need to adjust the coil tap either up or down half a turn to get regeneration smooth. If the regen-



Peeking underneath the amplified version shows the bias cells and the shock-mounted tube socket.



The final version of the Liberty receiver uses vintage parts and construction techniques and a modern amplified speaker from Radio Shack.

eration goes in with a noticeable 'thud,' 'squawk,' 'squeal,' or 'whistle,' you need to move the turn downward—you are feeding too much signal back into the tube. On the other hand, it the set refuses to go into regeneration, move the turn upward.

What can you expect from this set? It will tune in the megawatt religious and propaganda stations with a short antenna—less than five feet. With a good antenna you can tune in an amazing variety of stations.

Will you encounter any problems? Not if you use common sense, and a little care in construction. My first one drove me nuts trying to get it to work. I rewired the set completely, and still it refused to work. Why? My own stupidity got in the way. I reached in a drawer, and pulled out a nice 'orange drop' capacitor for the coupling capacitor. It is one of the new and improved unmarked capacitors. It looked like a bunch I have on hand with a .01 capacity. As it was new stock I assumed it was good. After fighting the inoperative receiver for hours, I finally cut it from the circuit, and put it on my capacity analyzer. It was a .001. When I put one of sufficient size in the circuit it came alive.

This set can be built many different ways—breadboard, chassis pan, and vertical chassis, whatever. I do strongly recommend that the panel be shielded. Use either a metal panel or fiberboard with a sheet of thin aluminum glued to the back.

If you don't have a RF choke, you may wind your own. I tried it and it works fine. I used a 28 enamel wire and wound a mess of it on a ¼ inch fiber rod. I did not count the turns but I am sure it was at least 200 turns. It looked pretty bad but worked OK.

I have not indicated the type of female socket needed for the filament supply. That will depend upon whatever type "wall-wart" you have in the junk box.

Strange looking and almost too simple to operate—yet it serves its purpose. The Librarian can now tune it to the BBC and wow her friends with a 'home-built' radio that gets London.

ER

The Story Behind the KWM-1

By Gary Halverson, WA9MZU
503 Jessica Ct.
Mokelumme Hill, CA 95245
ghal@ix.netcom.com

This story is presented as it appeared in the May, 1957 issue of the Collins Column, the company employee magazine.

Gene Senti, WØROW, recently turned 87 and lives in Cedar Rapids.

– WA9MZU

At Collins and other electronic companies, engineers usually bring ideas home and work on them; however, in the case of *Gene Senti* and the new KWM-1 Transceiver, the situation is reversed.

Research and development work in the basement of the Senti home coupled with ideas contributed by *Arthur Collins* led to the development of the world's first Amateur transceiver.

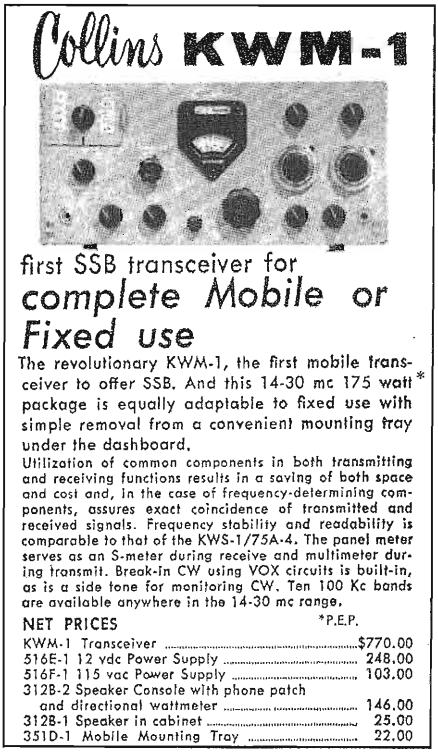
About a year ago, at his home, Senti hit on an idea and tried something new with a Collins 75A-4 Amateur Radio Receiver.

Using a portion of the Receiver as an exciter in conjunction with a linear amplifier, he developed a transceiver. Using this equipment, he contacted a number of hams over a fairly long period of time to check his homemade device.

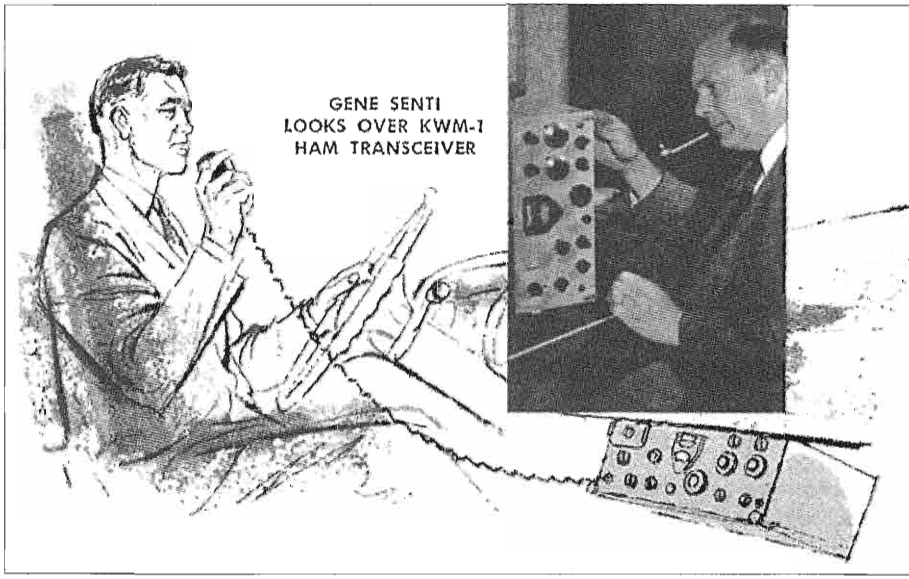
Later, when Senti's home work came to the attention of Mr. Collins, the Company president suggested utilization of his development ideas for a mobile transceiver, thus the KWM-1 project was born.

In a matter of months, the first engineering model was designed and built by Senti and his fellow co-workers. The first models have been both lab and road tested successfully by Senti. Mr. Collins made contacts with both the North and South Poles with one of the first three models, and numerous other ham contacts have been made with the first transceivers by both Mr. Collins and Senti. Recently, one of the transceivers was installed aboard Mr. Collins' boat in Florida, and the maritime operation of the radio was reported as being very favorable.

Fifty of the new transceivers, which are on an MJO (Manufacturing Job Order), are to be finished this month. Some of these are scheduled for consignment to people within the Collins organization for road tests. In addition to the MJO



QST, February, 1958



This illustration was included in the original Collins article.

order, there are 2,000 of the new transceivers on an SPO (Special Production Order), and deliveries of these to customers are expected to begin in August.

It is interesting to note that more than 500 orders for the KWM-1 were placed with Collins by phone during the first week they were offered for sale. Collins Amateur Sales personnel point out they consider this quite an endorsement of the Company and its products because when the orders were placed the customers had not seen the equipment nor did they know the price or delivery time.

The new Collins Transceiver is unique in many ways. The fact that it is mobile and especially designed for passenger car mounting (it will be bracket mounted on the floor in the center of the front compartment) in itself is a unique invocation. The light, compact transceiver is so constructed that it can be easily slipped

Collins KWM-1 SSB Transceiver

The KWM-1 covers the 20, 15, 11 and 10 meter bands with an input of 175 watts PEP on SSB. In addition to SSB emission, it also utilizes the VOX circuits for break-in CW operation with a built-in monitor.

The bands are covered in 100 kc segments with a total of 10 such segments. For MARS or commercial use, injector oscillator crystals can be changed for coverage of any 10 100 kc segments in the frequency range of 14-30 mc. The front panel meter acts as an S-meter on receive and as the tuning meter on transmit.

Frequency stability is comparable to that of the KWS-1/75A-4. Receiver sensitivity and selectivity are outstanding. Maximum convenience in changing between mobile and fixed station is built in. For mobile installation the unit plugs into the mounting rack. The power plug and the antenna coax connector connect automatically. Two knobs tighten to hold the unit securely in place.

An ac power supply is all that is necessary for fixed station installation. A 100 kc crystal calibrator is included.

The KWM-1 at WA9MZU is pictured above with the 516F-1 115 VAC power supply and the matching 312B-1 speaker cabinet. A traditional Astatic 10-D microphone completes this late 1950s SSB station.

in and out of the mounts and be used with either ac or dc power giving a customer the advantage of using it either as a fixed station or mobile unit.

Operating ease of the new transceiver almost amazes hams according to the Amateur Sales people. The transmitted and received signals are always on the same frequency due to common oscillators.

Due to the fact that the crystals can easily be changed in the KWM-1, many possible commercial applications are forseen for the equipment. The armed forces have also expressed an interest in the new transceiver.

Senti, who has nursed the KWM-1 from infancy, will receive his 15-Year Service Pin from the company in August. He was employed by the Interstate Power Company in Dubuque before his employment at Collins, and received his EE degree from Iowa State College, Ames, in '39.

The Collins Engineer played a leading role in the design work on the 75A-2 and 75A-4 Receivers, the KWS-1 Transmitter, R392 Signal Corps Receiver, and has assisted in the development of many engineering projects including the permeability tuned type oscillator and others.

ER

Enhanced Performance for the National NC-183D, or "Cure That Distorted Audio."

By T. "Abe" Levy, W3DA
PO Box 714
Bridgeville, DE 19933

There's a lot to like about the National receivers of the early 1950s. Today's selling prices are reasonable, and you get band-cruising frequency coverage, Ham bandspread, high sensitivity, good stability, and hi-fi audio—lots of it! That pair of 6V6s in push-pull furnishing 10 watts of audio is like having a guitar amplifier built in. Furthermore, two RF amplifier stages and three IFs deliver beaucoup gain—but that's not all good.

With stock circuitry, very strong AM signals overload the radio, resulting in moderate to severe audio peak distortion. National's manual suggests reducing the RF gain when that happens. It's OK until you tune off of that station and onto a weaker one. Then, you have to turn the RF gain back up, and then down again—phooey! Shoot, why have "AVC" if it doesn't work any better than that?

Well, thanks to a technical tip from "The Timtron" (Tim Smith, WA1HLR); there are some simple circuit changes that will tame the beast[1]! No holes are needed and the only parts required are common capacitors, resistors, and wire. The modifications are totally reversible. A calibrated signal generator would be handy for the latter portion of calibrating the "S" meter, but it's not essential.

While circuit tracing during the development of this modification, I discovered significant wiring changes from the schematic included in my manual. The audio phase splitter had been changed from a single 6J5 to half of a 6SN7, but retaining the original circuit values. The other half of the 6SN7 is the "S" meter circuit—the "peg-proof" design seen later in the NC-300/303 (see **Figure 3**). Also, radical redesign of the RF gain/AVC circuitry had been done (see **Figure 4**). You might want to incorporate these upgrades in your receiver. You'll see later that it makes taming the "S" meter very easy.

All the gain-controlled stages, except the first IF, have their cathodes wired directly to chassis ground. Lift all those cathodes (pin 7 of V1, V2, V6, and V7) and insert 180 ohm half-watt resistors, unbypassed. The first IF (V5) cathode may already have a 100-ohm resistor, unbypassed, to ground—close enough. ***Caution:*** The RF amplifier (V1, V2) cathode leads also ground the filament returns and suppressor grids, pins 2 and 3. You'll have to rewire them to the nearest grounding terminal, see **Figures 1 and 2**.

Now, it's time to take advantage of "The Timtron's" genius. In the IF stages, cut all three screen-grid dropping resis-

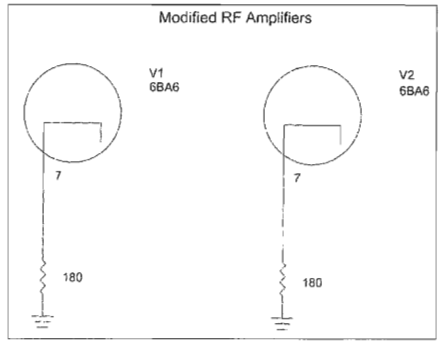


Figure 1: Modified RF amplifiers.

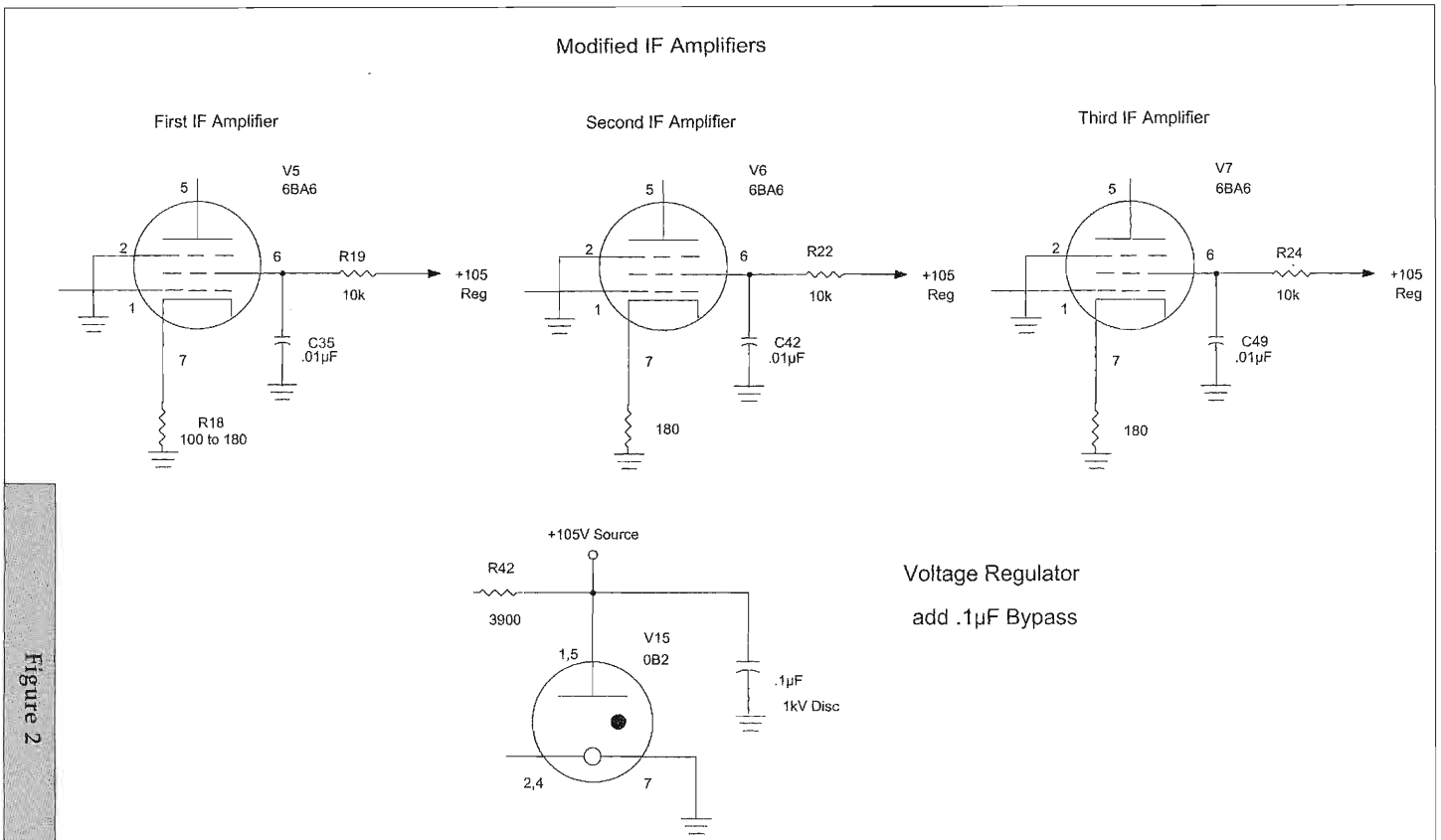

Modified IF Amplifiers
First IF Amplifier
V5
6BA6
5
2
6
1
7
R19
10k
+105
Reg
C35
.01µF
R18
100 to 180
Second IF Amplifier
V6
6BA6
5
2
6
1
7
R22
10k
+105
Reg
C42
.01µF
180
Third IF Amplifier
V7
6BA6
5
2
6
1
7
R24
10k
+105
Reg
C49
.01µF
180
+105V Source
R42
3900
V15
0B2
1,5
2,4
7
.1µF
1kV Disc
Voltage Regulator
add .1µF Bypass

Figure 2

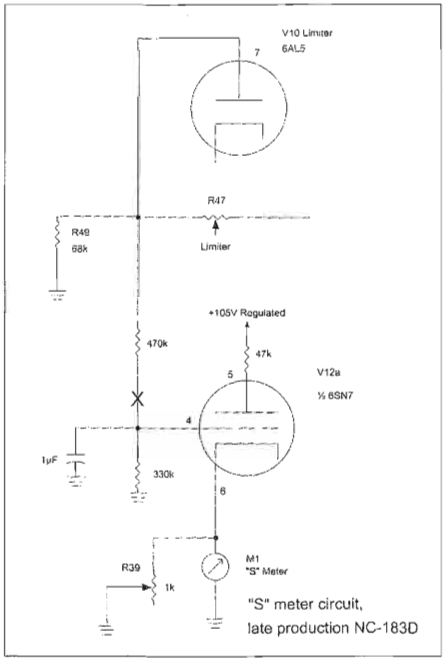
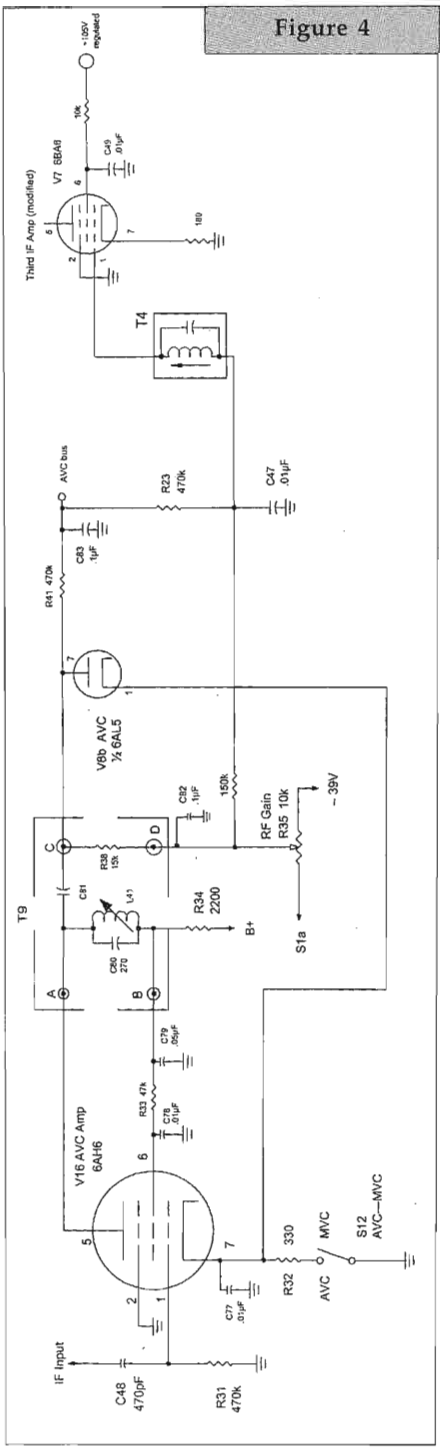


Figure 3: S-meter circuit for late-model NC-183D receivers.

tors, (R19, R22, R24: 47k, ½ watt) loose from B+ and replace them with 10k, ½-watt resistors, nominal. That's the value which worked best for me; your results may vary. Then, extend the wiring from the +105 VDC regulated source (0B2 pins 1 and 5) and connect to the other ends of the new 10k-ohm screen resistors. Add a .1µF 1000-volt disc ceramic capacitor bypass to ground (see **Figure 2**). I simply used a scrap piece of AWG 20 insulated hook-up wire stripping the ends and two short places in the run to attach to the new R22 and R24. When the modification did not work right at first, I replaced the 0B2 with a brand-new one of late manufacture. I also attempted to extend this scheme to the two RF amplifiers, as well, but loaded the 0B2 too much and lost voltage regulation. Thankfully, just the unbypassed cathode resistors of V1 and V2 yields adequate gain reduction. With no signal input it should be possible to start the RF gain pot at maximum anti-clockwise with a healthy glow in the 0B2 then advancing the RF gain pot to maximum clockwise and observe only a slight reduction in gas glow intensity. The object is to keep the total load on the regulator below 40 mA while supplying the BFO, two mixers, three IFs, and the "S" meter cathode follower.

Earlier, I mentioned that in my NC-183DR, wiring changes illustrated in **Figures 3 and 4** led to improved "S" meter circuitry and freed up bandswitch wafer S1-B. Cross checking the "S" meter action versus sensitivity I found the meter to be too optimistic. Band "C" was the worst offender at S9 + 40 dB = 100 µV! So, I cut the wire off of the grid pin (pin 4, 6SN7) and added series resistance until S9 = 100 µV. A one Meg-ohm ½-watt resistor worked there, but not on other bands. I got an idea that I had a job for bandswitch wafer S1B! I ran a pair of light-gauge (AWG 24) twisted-pair about six inches from the opened grid circuit to S1B, routing around the front-end coil shield. Tying one of the wires to the wiper contact and leaving the other "floating" allowed me to switch from band "B" through "E" installing the resistor values which produced S9 = 100 µV at the center of each band. I never use this receiver on six meters, so I omitted band "A." Determine which contact to use on each band with an ohmmeter, and connect the proper resistor between that contact and the "floating" lead from V12A. I used standard value 10% resistors and settled for ± 1 "S" unit (6 dB). Shortwave QSB being what it is, that's an acceptable compromise. After all, this isn't rocket science!

Timmie also favors fattening the values of the audio coupling capacitors. And, I agree with him. Strictly by ear



(and the fact that I had a NOS set of four) I replaced C9B, C91, C96, and C99 with .068-F, 600-volt Orange Drops®. Now that output audio is full and robust, while retaining a wide range of tone control. Audio bypass and inverse feedback values were not changed.

Since the NC-183D is essentially a band-switched HRO, this approach should work on many Nationals and other brands with similar circuitry. My NC-183D now sounds great; how's yours?

[1]"The Real Amateur Radio" program; WBCQ 7415 kc, Saturdays, 7:00PM EST.

[Editor's note: More information on the NC-183D has appeared in Electric Radio as follows:

National Company's NC-183D, ER #40, August, 1992

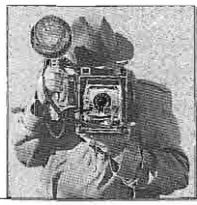
A Product Detector for the NC-183D, ER #44, December, 1992

A Calibrator for the NC-183D, ER #49, May, 1993

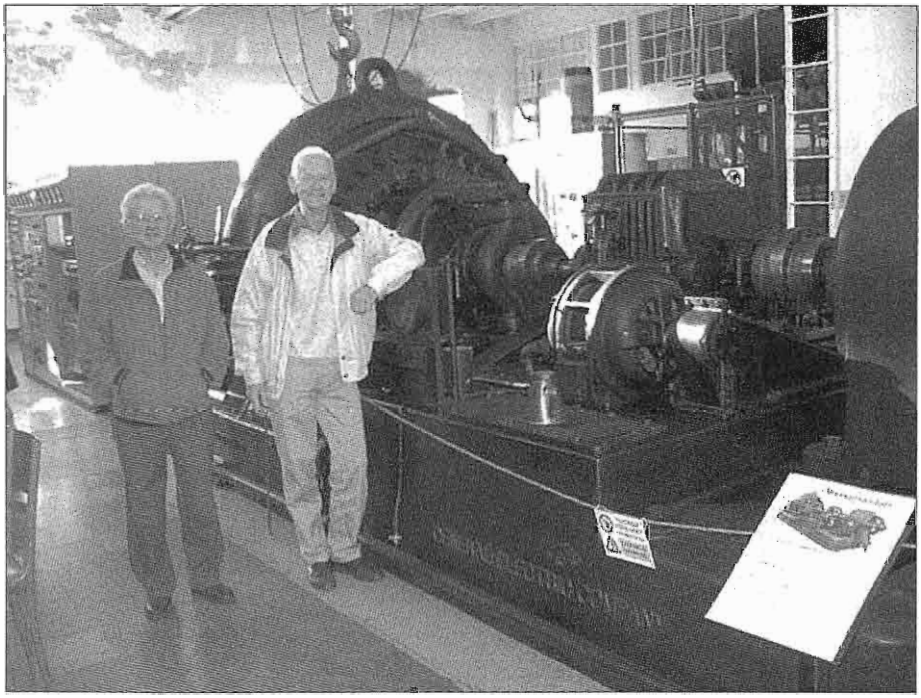
Revival of a National NC-183D (AVC S-Meter) ER #122, June, 1999

More on the Military NC-183D from ER #131, ER #133, May, 2000]

ER



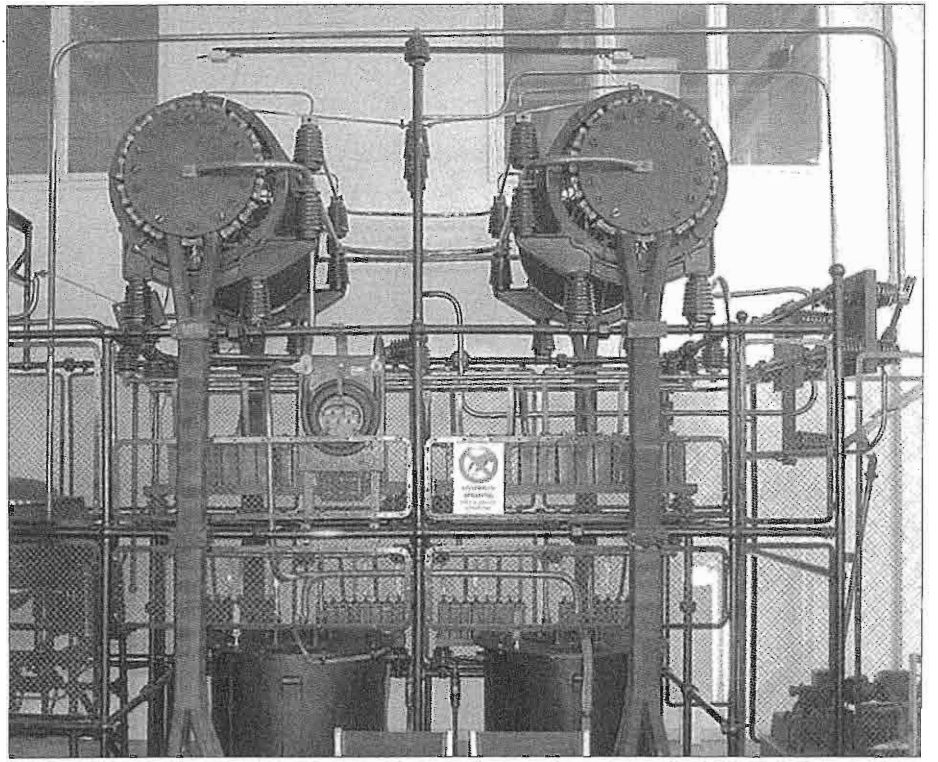
PHOTOS



The last operational Alexanderson alternator transmitter is located at Grimeton, Sweden. Not many transmitters have an oil can within easy reach, as seen in the photo above!

Erik Kollberg, who is a Professor of EE at Chalmers University, Gothenberg, Sweden took Dave Rutledge (KN6EK) on a tour of the radio station during 2003 at Grimeton, Sweden, which apparently has the only working Alexanderson alternator transmitter. It is still used for communication with Swedish submarines. In the photo above, Erik is on the left. The station manager for many years, Bengt Dagas, is on the right. The output is 200 kW at 17 kHz. The photo on page 27 shows the magnetic amplifier that acts as a modulator by presenting the alternator with the antenna as a load key-down, and an inductive reactance load in key-up. This gave about 20-dB amplitude variation between key-down and key-up

Alexanderson's Alternator is nothing more than an AC generator, with enough



The modulator for the Alexanderson transmitter is a very large magnetic amplifier.

poles and enough RPM to generate higher frequency AC. I don't recall the record frequency, but Alexanderson pushed the limits of mechanical strength to make it in excess of 50 kHz.

Poulsen arc transmitters (the invention of another Scandinavian) were another beast altogether. Here, an arc connected to a tuned circuit was struck in a hydrocarbon-rich atmosphere (like alcohol vapor) and a strong constant magnetic field. The vapor and magnetic field quenched the arc every half cycle, so the excitation of the tuned circuit was essentially uniform current pulses at the operating frequency (albeit rich in harmonics like a Class-C amplifier). This produced a much narrower spectrum than the typical spark transmitter, where the current pulses were many RF cycles long, but decaying exponentially, producing a much wider spectrum. Arc transmitters built by Federal Radio (in what is now "Silicon Valley", California) for the Navy in 1917, produced a half Megawatt of RF by this means, and they were relatively efficient as well. It was only many years later that vacuum tubes could match the power and efficiency of arc transmitters, but of course, vacuum tubes could operate at much higher frequencies than the 20-30 kHz limit of arcs. Incidentally, one of the "surplus" electromagnets from Federal's then-defunct product line was used in the 1930's by E. O. Lawrence at U. C. Berkeley to make one of his bigger cyclotrons.

(Photos and text courtesy of Bill Bridges, W6FA)

By Jeff Covelli, WA8SAJ

The spring, 2004, May 1st gathering of the Lake Erie Boatanchors Group was at Tom O'Conners location (NI8G) in Milan, Ohio between Cleveland and Toledo. There were about 60 folks attending the festivities. Tom hosted the event as in the last few years, and provided the cooking grill which he made from welded pipe. Mike (N8ECR) did the cooking on Tom's grill with all the hot dogs he could muster up.

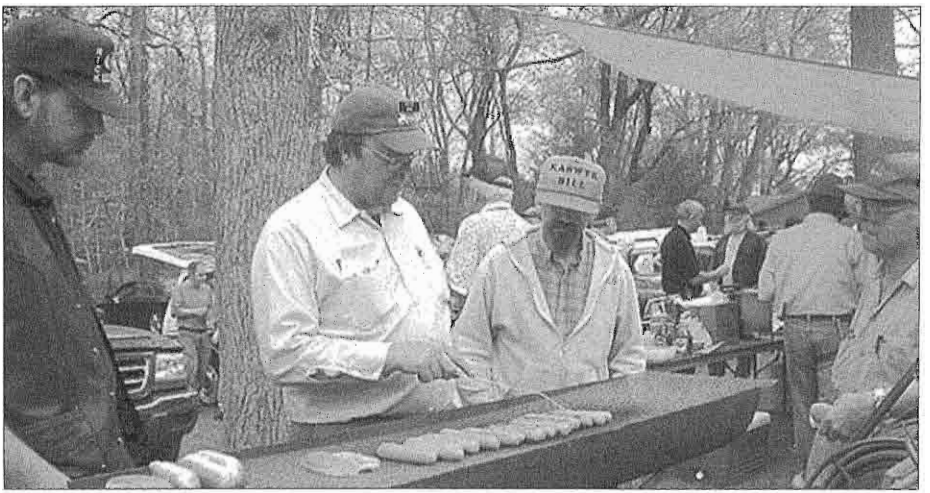
There was plenty of used gear to be had during the event. I found a small Variac I had been looking for. Bernie (KC8BTI) sold his Hammarlund SP-600 as soon as it came out of the truck, and Tom (WA8ICH) found an Autek filter,

The summer September 18th gathering was at the Daniels Park in Willoughby just east of Cleveland. The amount of folks coming to this one was down a bit 35 compared to 55 or so last year. We had a lot of small parts around to dig through, such as new tubes for a dollar each! Mark (WBØIQK) had all the great tubes, along with new capacitors and resistors of all kinds. It was like a surplus house being delivered to the pavilion. Barney (KC8LTD) showed off his new homebrew CW breadboard transmitter. Bob (W8ATH) had a beautiful Hammarlund HQ-180, which found a home. We had Ashtabula Bill (W8VYZ) show up, which was a real treat, since Bill has not been to many of these gatherings, turns out Bill was a B-24 pilot during WWII.

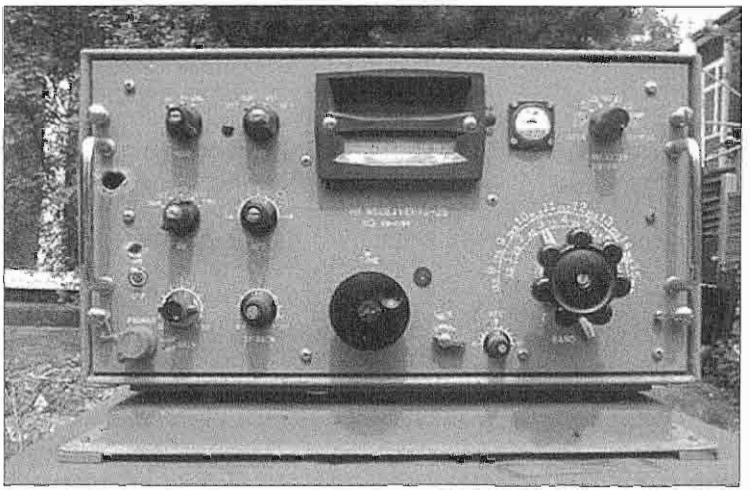
On a sad note, Tom O'Conner (NI8G) passed away just after the spring gathering. I remember Tom as being a very caring person that would do anything to help someone. A few days before he passed on, Bill (K8DBN) was able to visit him. Tom told Bill "I have lived a great life and have no regrets". We sure will miss you Tom!

If anyone would like to attend one of the Lake Erie Boatanchor gatherings, please call or e-mail Jeff (WA8SAJ), Bill (K8DBN) or Ron (W8KYD). The next one will be in February on the West side of Cleveland, Ohio.

(Photos and text courtesy of Jeff Covelli (WA8SAJ) 5368 Melody Lane, Willoughby, Oh 440894 wa8saj@ncweb.com)



Above, Michael Beachy (N8ECR) is working the hot dog line during the spring meeting of the Lake Erie Boatanchors Group.



This is a Chinese military HF receiver, the Type 70-2b, and is rather rare in western countries. It is their answer to the R-390A, and it dates from the late 1970's. The interesting thing is that it has a projection dial scale as featured on the WWII German Telefunken E52 "Koln" or the military SRR-11/13 receivers. I presume it is full of Chinese mechanical filters. I am aware of at least one mechanical filter factory in the former USSR, and it appears the Chinese have done the same thing. My 1990 vintage Russian "Lavina-M" QRP pack-radio's receiver contains a mystery mechanical filter which appears to be about a 2 KHz b/w and which performs very well.

Some interesting features of the 70-2b are the English letters on the panel and the variable IF gain (shades of Heath's Mohawk). This one has bullet holes over on the left side of the panel, so evidently at one time or another someone put a round through it. Hopefully not because of QRM!

(Photo and text courtesy of Geoff Fors, WB6NVH) ER

An Audio Filter Modification for the R-390A: Easy, Reversible, Useful

By John Svoboda, W6MIT
2261 Peaceful Garden Way
Rescue, CA 95672
svoboda@directcon.net

Recently, having overhauled an R-390 (non-A), I had the opportunity to try out the audio filters. I was somewhat surprised to find that that the MED position really did very little to improve received voice quality although it did help with general crud. This was probably the reason that it was dumped when the R-390A was being designed.

When listening to AM, one often hears stations where the audio is weak or flat and uninspiring due to poor EQ or perhaps the operator's voice (or maybe it's just my old ears). In any event, the ability to add a little "Presence" at the received end can make copy decidedly better. I ran some sweeps on my R-390A and found that the audio channel was flat from around 80 Hz to 15 kHz. It appeared to me that a little shaping might be useful.

The schematic shows an "equivalent" component environment to facilitate proving a filter on the bench without risk to your radio **[Figure 1]**. You will note that the filter can be any number of configurations so long as it suits your requirements and the existing circuit. I chose a Pi network as I hoped it would have a relatively broad peak and attenuate many of the highs beyond it. As it turns out, it did just that. Also, I was fortunate enough to find an UTC Y-6683 **[Figure 2]** adjustable choke in my junk box. These chokes are potted, about an inch tall, and have a giant silver screw on top. Other UTC adjustable chokes are the VIC series. These are somewhat larger and are adjusted with an Allen wrench on one side. A VIC-14 or 15 may work. Using an adjustable choke, however, will allow you to easily shift the peak to suit your personal listening. If only a fixed choke is available, try to get one near 3.5 Hy. Substitute caps until the peak is around 2 to 2.5 kHz. (Note: A power filter choke will have a lot more inductance than the label indicates when there is no DC going through it.)

After getting the prototype working on the bench, I installed it in the audio module and was astounded to find the filter had gain! Well, not really, it turns out that the filter selector switch in the WIDE position adds a feedback network (C601 and R601) to compensate for the 5 dB loss of the original sharp filter. Those components can be changed to suit or just removed if desired.

There is plenty of space on the audio module to install the choke in the area where the blank plates are located. With skill and daring in layout, the leads to the existing filter will be long enough to reach the new filter. With a little more effort it may be possible to add a filter selector switch that would be accessible through one of the side vent holes. Someday I'll get around to it. Good listening!

ER

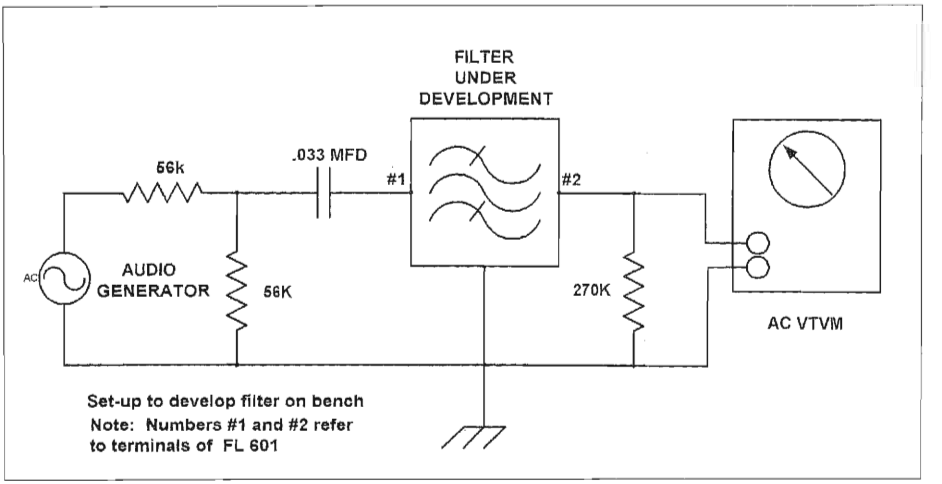


Figure 1: Bench test setup that was used to develop my R-390A audio filter modification.

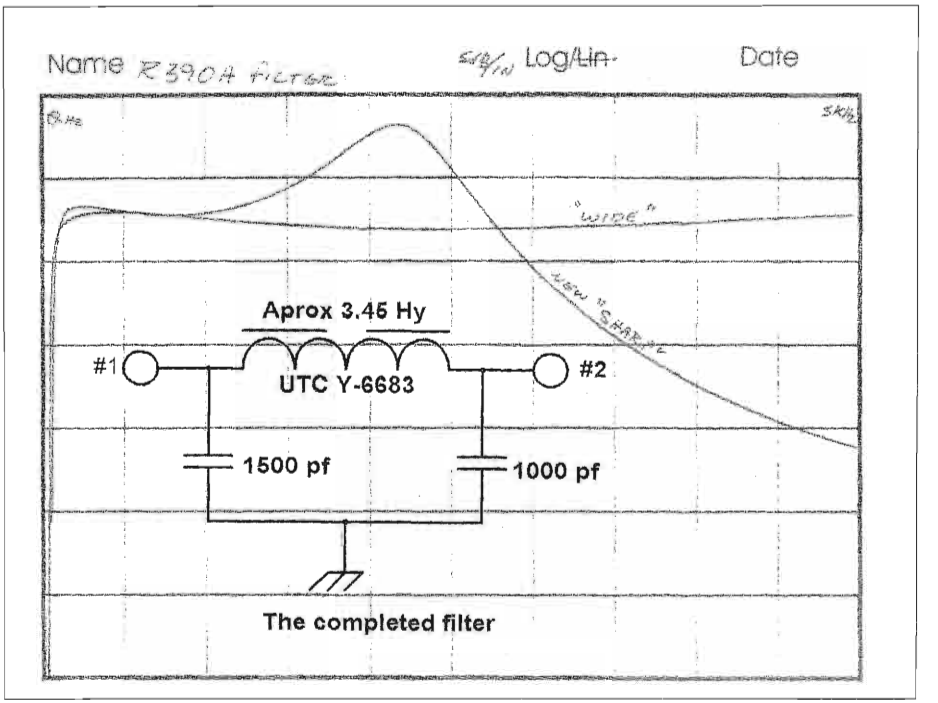


Figure 2: The completed filter and a log sweep of its response curve.

Finding the Outside Foil Terminal on Modern Capacitors

By Clark Hatch, WØBT
3310 NE Crocco Rd.
Topeka, KS 66617

Most modern tubular foil capacitors do not seem to have the outside foil terminal marked on them, as was common practice in years past. I believe it is important to know which lead is connected to the outside foil because that is the low-impedance side of the capacitor. The low-impedance side of the capacitor should always be connected to the low-impedance point in a circuit to provide increased shielding from noise pickup.

In the case of a tube-type amplifier, the plate impedance is usually lower than the grid impedance. The outside foil of a plate-to-grid coupling capacitor should be connected to the plate. In the case of an audio amplifier, if the outside foil were to be connected "backwards" to the high-impedance grid, you will have some metal—the foil inside the capacitor—"floating" out in the open in the circuitry. The foil will act as a resistance across which noise voltage may drop, and could possibly induce noise currents into your equipment. The noise voltage could possibly be picked up from hum or stray signals anywhere in the wiring or from any nearby electromagnetic field.

Even though a cathode circuit is low-impedance, by making sure the outside foil of a bypass capacitor is connected to the chassis ground, you will provide some additional shielding. This is important in low-signal level circuits.

The same idea applies to the screen bypass capacitor. The bypass capacitors should all have the outside foil connected directly to chassis ground with short leads. In the case of an amplifier that has the screen bypass connected to the cathode, the outside foil should connect to the cathode pin.

Larry Rosine (WØOG) suggested a method of finding the outside foil to members of the MOKAMT net on 3885 kc recently. His method is given in this article, and is an easy way to find the outside foil on a capacitor that does not have the terminals marked.

You have to make a simple test jig out of shim brass and scrap pieces of circuit board material, and I have shown this method in **Figure 1**. Using a jig such as this one makes rapid testing of many capacitors easy.

A schematic drawing of the test jig is in **Figure 2**.

A low-frequency signal generator and an oscilloscope are used to find which capacitor terminal is connected to the low-impedance outside foil.

The pickup is made of .005" brass shim stock, ½ inch wide, and is mounted on four 47k, ¼-Watt resistors. The resistors serve as a mount for the pickup. Thin brass shim stock can usually be found in any hardware store.

Clip the scope test probe to the pickup. Adjust the signal generator output and frequency, and the scope sensitivity as necessary to get a full scale reading on the CRT. Any frequency between 1 kc and 300 kc is OK. The idea is to search for the frequency that gives the greatest difference between the inside and outside foil connections. The best frequency to use will vary with the value of capacitance.

Reverse the capacitor leads in the test jig and the reading should either increase or decrease. If it decreases, then the outside foil terminal is now connected to the ground side. If it increases, adjust the output to full scale, reverse the capacitor. The reading should decrease, indicating the outside foil terminal is now connected to ground.

If you have some older capacitors in stock that have the outside foil marked on them, it is easy to test a few and become familiar with the differences in amplitude on the scope when the capacitor is changed from the high-impedance to the low-impedance side of the test circuit.

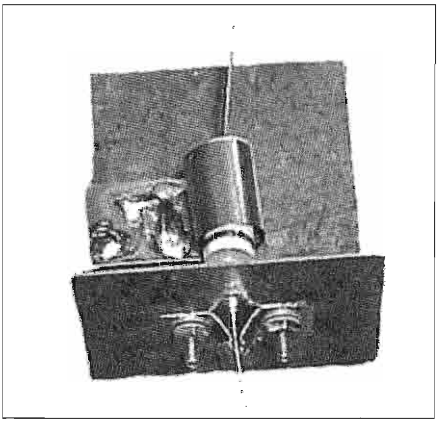


Figure 1: A simple test jig is made from scrap pieces of brass or circuit board.

ER

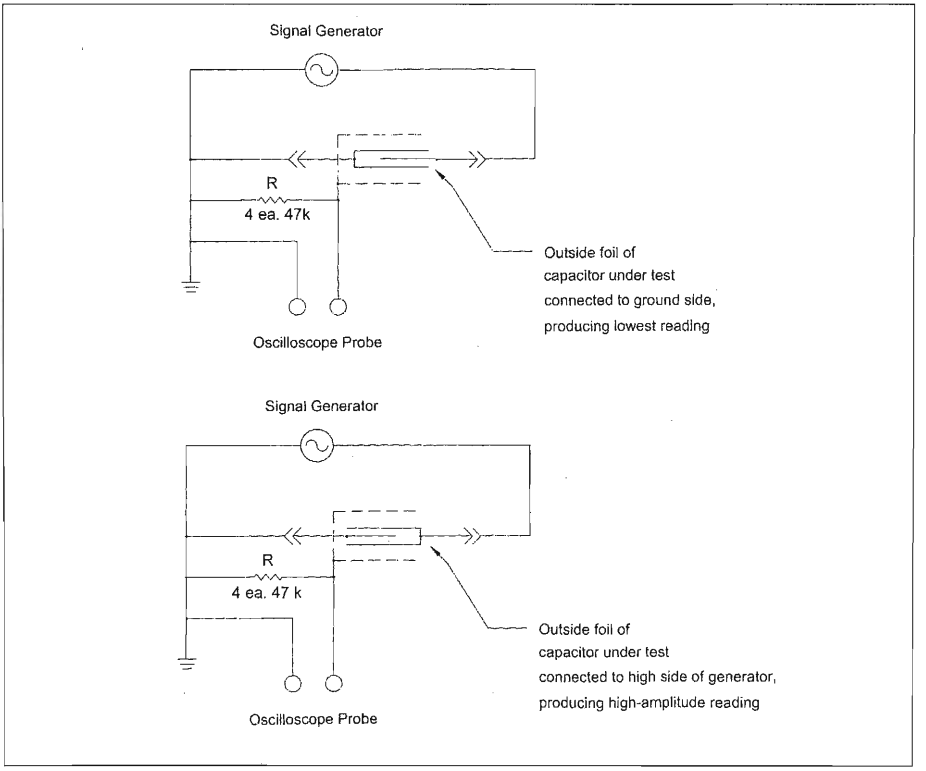
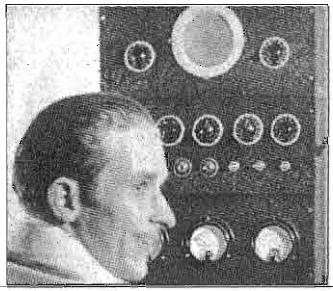


Figure 2: Schematic diagram of the test jig for finding the outside foil. The connections labeled "oscilloscope probe" are shown in Figure 1 at the front of the test jig as screws extending out the front of the jig. See text for the signal generator frequency to use.

The Restoration Corner



The Restoration Corner can run only if your restoration topics are sent in to Electric Radio!

By Eric A. Jones, N4TGC
6537 County Road 61
Florence, AL 35634

In refurbishing tube-type equipment, never assume the tubes are the right ones, nor are in the right place! Though experience will give you some idea of the placement, I've found there's no real substitute for a manual. Especially if the rig was offered as a kit, and before powering it up, get the construction manual and go over the circuit carefully to be sure nothing is miswired or just plain missing. I have a Heath VF-1 VFO in which the oscillator cathode choke was gone, and the VR tube was miswired. The unit could never have worked! But it does now!

Quirky Fault Department

In refurbishing an EICO 315 sig-genny, the Eico worked just fine, except that when the dial was run down to the bottom quarter of its range, the oscillator would suddenly quit on all bands. This told me it had to be the tuning capacitor, but close inspection with a lighted magnifier didn't reveal any warped plates or trash shorting them. I bent around on it awhile (don't do this at home—ha!), and finally tried resetting the rotor tension screw. And that was it: there was just enough twist to all the rotor plates that when nearly meshed, some touched. A 1/8th turn loosening of the tension screw fixed it. I suspect this was a factory defect —I pity the original owner!

By Dennis Olmstead, WB9EMD
1124 South 11th
Montrose, CO 81401

R3 Cook-off in the Viking Ranger

Although this VFO restoration story is about the Viking Ranger, the same or very similar VFO exists in the Viking Pacemaker, Valiant, and the Viking 500.

The girlfriend says something is burning in the radio room.

Sooner or later Resistor R3, the 18k resistor in the Viking Ranger will change value and require replacement.

My Ranger has a couple of muffin fans, in series, on top of the unit. This moves the air around but is of no value inside of the VFO box. A month ago the hot plastic smell indicated a need to look inside.

There are two ways to get at the VFO box. One is to carefully take the left side (viewed from the front) off of the VFO without taking the front panel off. This is a slow process that involves taking two nuts off lug bolts on the bottom and

working the cover screws off the VFO box. You can see R3 under the tubes. It will probably look quite brown. I replaced mine with a 20k, 10-watt resistor. The simple fix is to clip the leads and put the new resistor as a patch. It's hard to get at the tube socket.

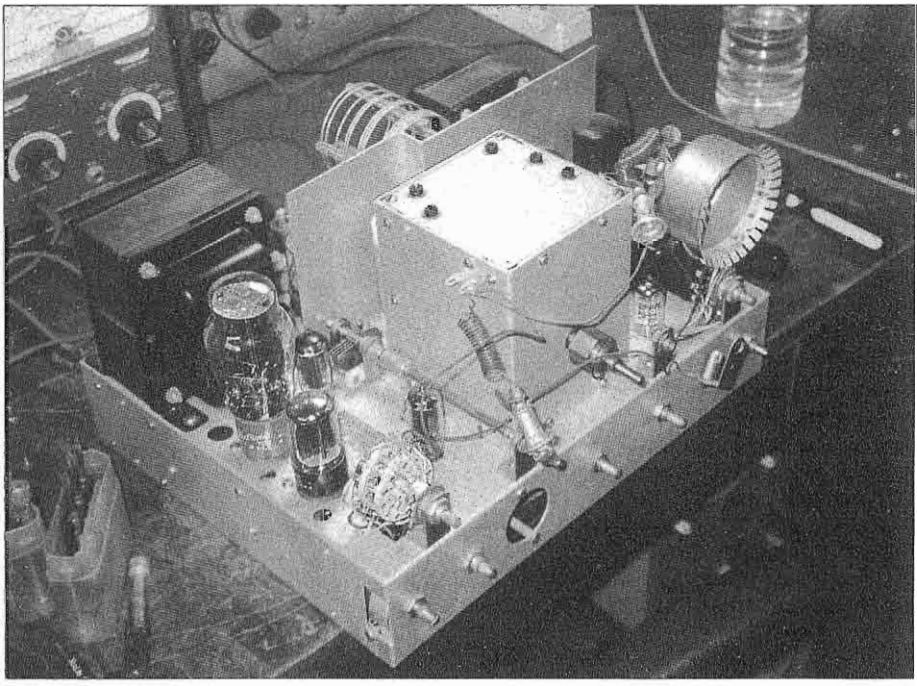
Some people have placed this resistor under the chassis. I left it in the VFO, as I believe the resistor heat in the VFO box tends to make it more stable frequency wise.

A second, and I believe easier method, is to remove the front panel. The VFO is easier to work on with the front panel off of the transmitter. Make certain to take notes as you go along. These notes are knob settings, with capacitor open or shut, and where the sheet metal screws go. This is also a good time to clean the switch contacts and lubricate the switch click points on the front part of the switch.

Also, clean the chassis with a medium brush. Wash dirt off of and test all the tubes. When I put my Ranger back on the air, the meter did not work. So, before placing everything back in the case, power it up and test its operation. Check to see if the VFO needs realignment.

My unit is about 40 years old; will it last another 40?

ER



Above: The author's Ranger on the bench with the front panel removed.

Making the Collins R-392/URR Into An Excellent Communications Receiver

By Hugh L. Moore Sr., W6DUZ
453 11th St.
Santa Monica, CA 90402

The Collins R-392/URR is a wonderful receiver and is shown in **Figure 1**. It is one of the last tube receivers designed by Collins and covers a range of frequencies from .5 Mc to 32 Mc. It was designed with a variable IF bandwidth of 2 kc, 4 kc or 8 kc. The bandwidth in the 2 kc position at 3 dB is 2.0 kc. At 6 dB down it is 2.5 kc or less. It was intended to be used with either FSK or AM modulation. The receiver has a IF frequency (455 kc) output on the front panel at 50 ohms. This output can be used to drive experimental SSB, regenerative, or FM detectors, or demodulators such as I-Q, digital or RTTY. The CW sensitivity at 2.0-32.0 Mc is 2μV or less. It also comes with a 100 kc calibrator that is used to check the dial accuracy throughout the range of the receiver. Other features of the R-392 are the amplified AGC, squelch, a break-in relay.

An open receiving antenna cable can pickup RF from the transmitter and temporarily overload the receiver. This is prevented by an input relay that connects the receiver antenna post to ground while transmitting. There is also a neon tube connected between the antenna terminal and ground to prevent lightening from destroying the input circuit.

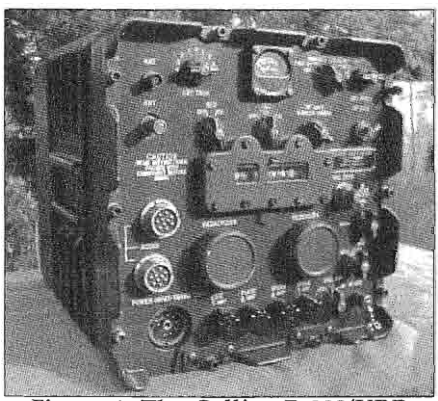
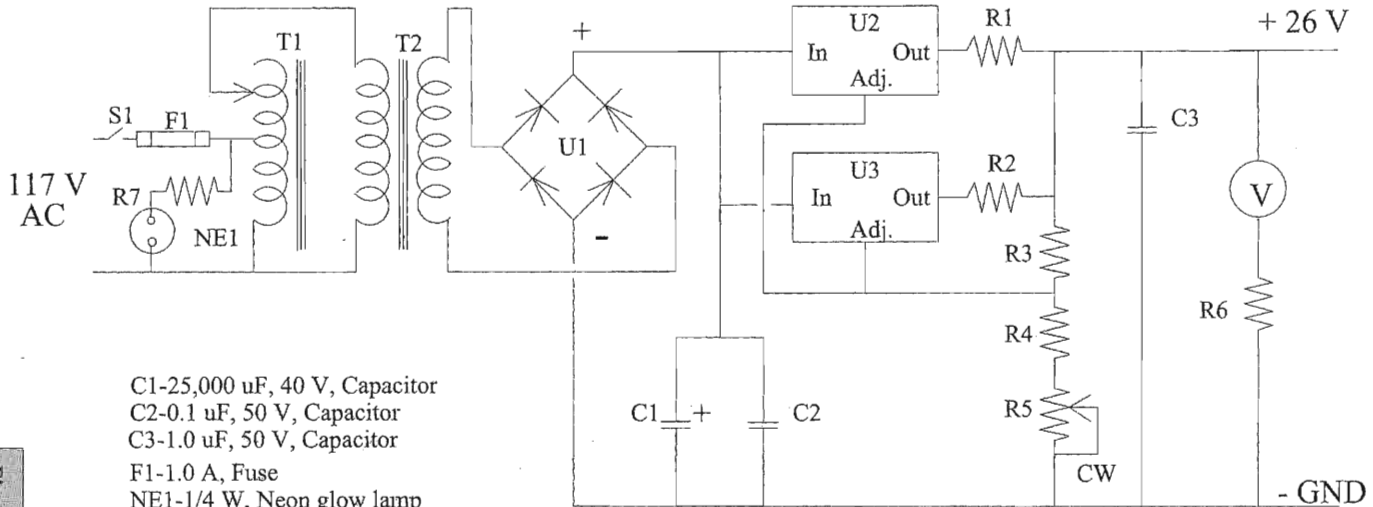


Figure 1: The Collins R-392/URR general coverage reciever.

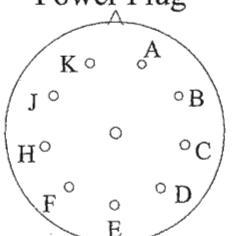
A 24-volt, 3-amp power supply is required to operate the tubes in this receiver. It is rather simple to build a power supply by attaching a bridge rectifier to a 28 or 35-volt transformer. The IC audio amplifier included in this article will reduce the current requirement of this receiver by .6 amps, or more. The power supply uses a single filter capacitor and a voltage regulator to finishing the filtering process. See **Figure 2** for a schematic of the power supply. To make the power supply more deluxe a variable voltage autotransformer and DC voltmeter were added. This will allow the operator to bring up the heater voltage gradually and increase tube life. This receiver will operate very well without the voltmeter or the variable voltage transformer. If the 26A7 is retained in the receiver the power transformer will need a 3-amp current rating. It was suggested that the cathode heaters could operate on 24-volts AC. It was found that AC on the heater caused a hum in the audio output. So, the tube heaters need DC to operate properly.

The variable voltage autotransformer determines the amount of voltage that is presented to the regulators. The voltage regulators determines the output voltage of the power supply. The potentiometer



C1-25,000 uF, 40 V, Capacitor
C2-0.1 uF, 50 V, Capacitor
C3-1.0 uF, 50 V, Capacitor
F1-1.0 A, Fuse
NE1-1/4 W, Neon glow lamp
R1,R2-0.22 ohms, 1/2 W, 5%, Resistor
R3-240 ohms, 1/4 W, 5%, Resistor
R4-3.9 k ohms, 1/4 W, 10%, Resistor
R5-2.0 k ohms, Potentiometer
R6-See text
R7-47.0 k ohms, 1/4 W, 20%, Resistor
S1-SPST, toggle, Switch, (RS 276-651)
T1-0-145 V 1A, 60 cy, Autotransformer
T2-117 V AC pri, 30 V AC 3 A sec, Transformer
U1-3 A, 150 PIV, Bridge rectifier, (RS 276-1184)
U2,U3-LM317T, Voltage regulator, (RS276-1778)
V-Meter, See text

Power Plug



A = +28 volt plate supply
B = Break-in relay
C = Jumper wire
D = +28 volt heater supply
E = Ground
F = Jumper wire
H = Audio output, 600 ohms
J = Jumper wire
K = Carrier relay control

Figure 2. Power supply schematic.

(R5) sets the output voltage of the regulators. For the regulators to work, the autotransformer-transformer combination must present a slightly greater voltage (1.25 volts) than the power supply output voltage. The receiver is turned on with the autotransformer near zero. The autotransformer voltage is increased to a point where the DC output voltage no longer increases. By adjusting the potentiometer (R5) either up or down, the output voltage can be set. The autotransformer should be set slightly higher than the stabilized output setting to allow for any drop in the line voltage.

The output audio originally was a push-pull beam pentode (26A7). By converting this to a IC amplifier the heater supply can be reduced by .6 amps. The heat generated inside the receiver by the 26A7 is like a small 15-watt soldering iron.

Figure 3 is a schematic diagram of the IC audio unit. Since the LM386 has sufficient gain at its lowest setting, this makes it an ideal replacement for the 26A7 tube. The LM386 operates on 12 volts or less. This would require that the 24-volt supply be reduced to about 10 volts. Since the output of this IC is class B and the current for this stage jumps around considerably, this eliminates the possibility of using a voltage dropping resistor. The most efficient way to reduce the voltage to the IC is to use some kind of a voltage stabilizer. Most 12-volt regulators can not be used because of the noise generated by their internal Zener diode. A third LM317T was used to lower the voltage to the IC. The mathematics of selecting the resistor for an LM317T Positive Voltage Regulator used in audio amplifier is:

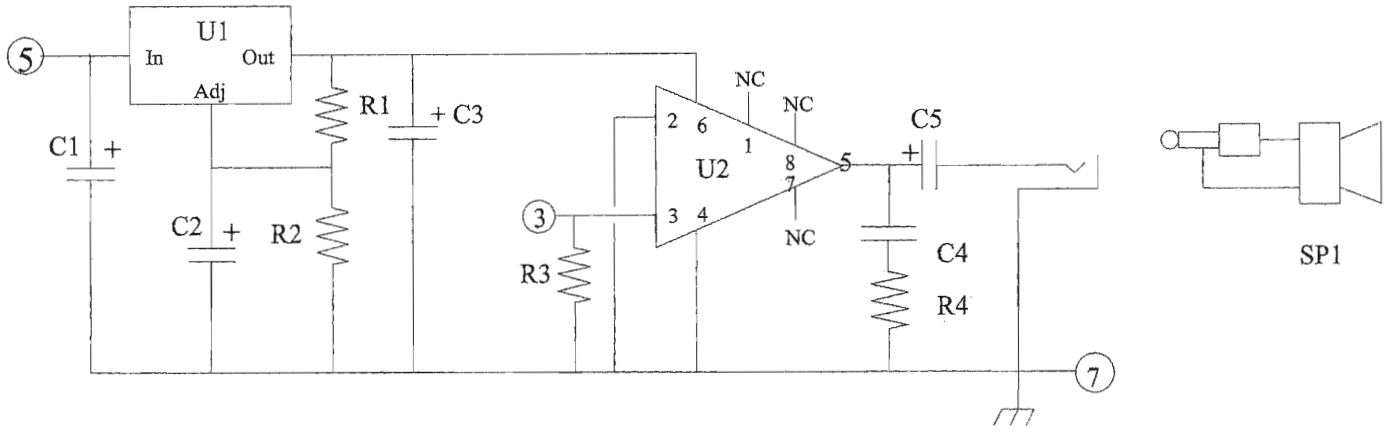
Vin = 26 volts
RI = 240 ohms
R2 = 1800 ohms
Vout = 1.25 1 + R2/R1
Vout = 10.625 volts

If the 26A7 is preferred over the IC amplifier, then a 70-volt line transformer can be obtained trom Radio Shack (RS 32-1031B). This transformer has many taps on both the primary and secondary and should match the 600-ohm line to any speaker. Simply try various taps and adjust for the maximum volume and minimum distortion. The best combination found was the 5-watt tap on the primary and 8 ohms on the secondary. This same transformer can be used to step up the impedance of the IC output to accommodate high impedance earphones. Just connect the 8-ohm secondary to the output of the IC and the high impedance phones to the primary tap that works best.

Figure 4 is the chassis and parts layout of the IC audio amplifier. Because this amplifier has to fit in a very restricted space, the layout and measurements are provided in **Figure 4**. The IC and other components are mounted in a 3-sided, cornered aluminum chassis. Right angled soft aluminum sheet metal is used to make this chasis. The right angle metal is split down the corner, and the two sides are folded over to make a double bottom, see **Figure 5**. This makes a very rigid three-sided chassis. See **Figure 4** for mechanical layout of audio chassis. All the small parts are mounted on Vector board and are wired point to point.

An octal tube base is mounted to the double bottom of this corner chassis and provides connections to the audio circuit in the receiver. Note the position of the keyway in relation to the sides of the chassis. There is also a countersunk hole needed on the bottom side to accommodate a large head screw near the audio amplifier. This countersunk hole is made with a ½" drill going part way through both layers of the aluminum. Holes must also be drilled in the double bottom to accommodate the wires from pins 3, 5, and 7. A single hole is drilled in the double bottom to attach the octal tube base.

Figure 5 is a photo of the audio amplifier module. It is presented in a 3D form so that the reader can have a clear mental picture of how this strange chassis looks when completed. The folded over double



C1-2,200 uF, 30 V, Capactor
C2, C3-470 uF, 15V, Capactor
C4-.047 uF, 10 V, Capactor
C5-250 uF, 10 V, Capactor
R1-240 ohms, 1/4 W, 5%, Resistor
R2-1,800 ohms, 1/4 W, 10%, Resistor
R3-10 k ohms, 1/4 W, 20%, Resistor
R4-10 ohms, 1/4 W, 20 %
SP1-8 ohms, Speaker

U1-317T, Regulator, RS 276-1778
U2-386, Op. Amp., RS 276-1731

26A7 Socket
③Signal
⑤+ 28 Volts
⑦Ground

Figure 3: Audio amplifier module

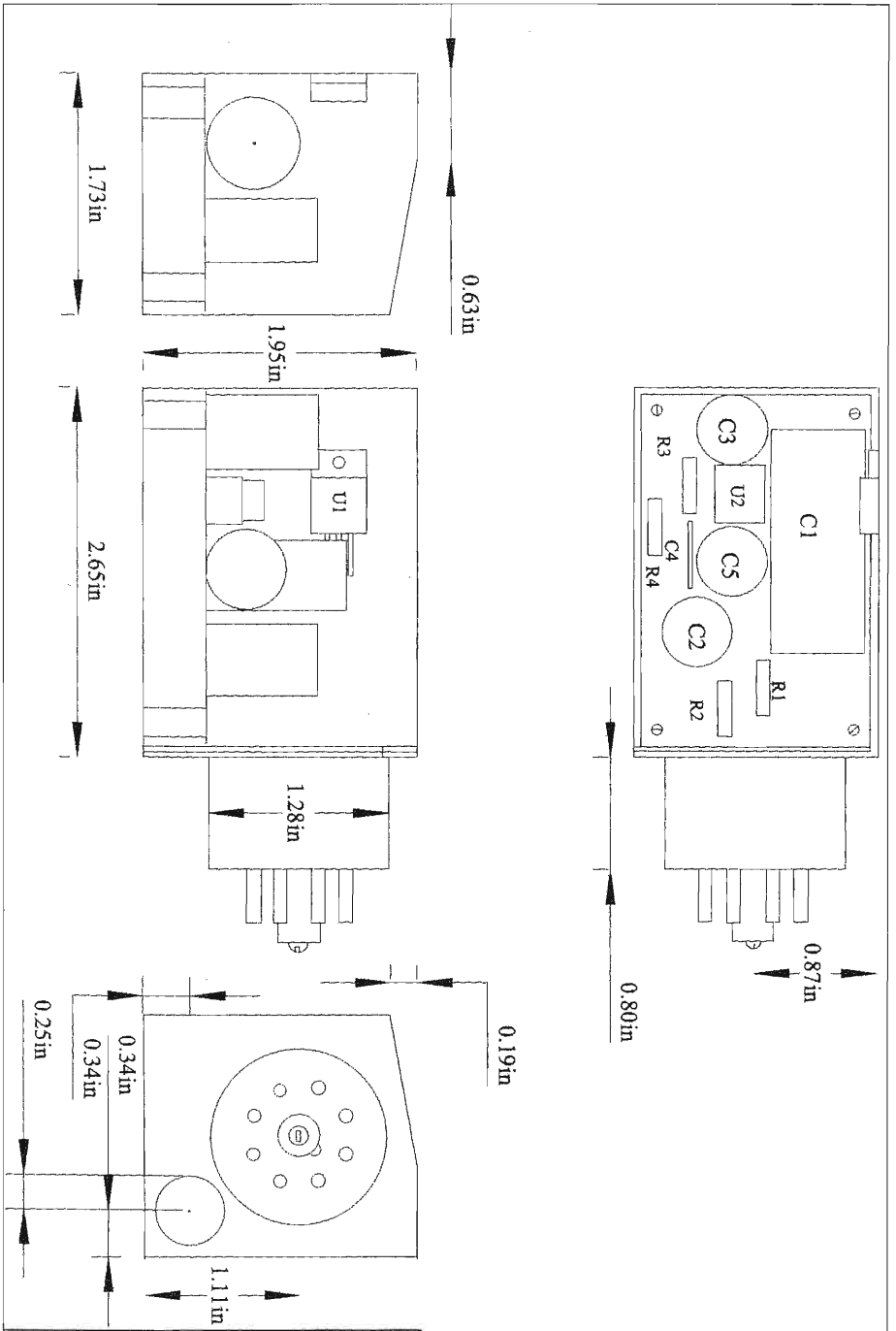


Figure 4: Audio amplifier chassis.

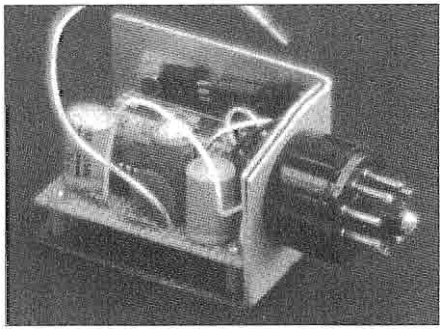


Figure 5: Audio amplifier module.

bottom is clearly shown at the right side of this photo.

This receiver uses a 455 kc IF only after great consideration is given to preventing image interference. An image, at this IF frequency, is only 910 kc above the received signal. At the higher RF frequencies this is too close for easy rejection. This receiver was designed to prevent any image frequency from being detected. There are 2 RF stages ahead of the 3 mixer stages. The 1st and 2nd mixers convert the RF to the 2 and 9 Mc range. The 3rd mixer then converts the output to the 455 kc IF frequency. The engineers that designed this receiver wanted to be sure that the local oscillator did not radiate, and that images did not appear on any band.

The receiver has a mechanical digital dial and band switching that allows the operator to switch bands at every one megacycle frequency change, (31 bands at 1 Mc each). The mechanics of the digital dial and the multiple mixers are a marvel in mechanical engineering. The geared digital dial means that there are no dial cords to slip, stretch, or wear out.

The secondary of the first IF transformer is not tuned in order to prevent conversion of non-audible static into audible noise. The low-noise first IF makes it an ideal receiver. The 6 IF stages will produce steep skirts of the bandpass.

CW Crystal Filter

Unfortunately there is no filter for CW. Most 455-kc filter units can be quite expensive. The circuit in **Figure 6** uses five crystals, all at the same frequency of 455 kc. This eliminates the process of mix and match. Three of the crystals are capacity coupled to give the maximum sharpness. The other two crystals are direct coupled to give moderate selectivity.

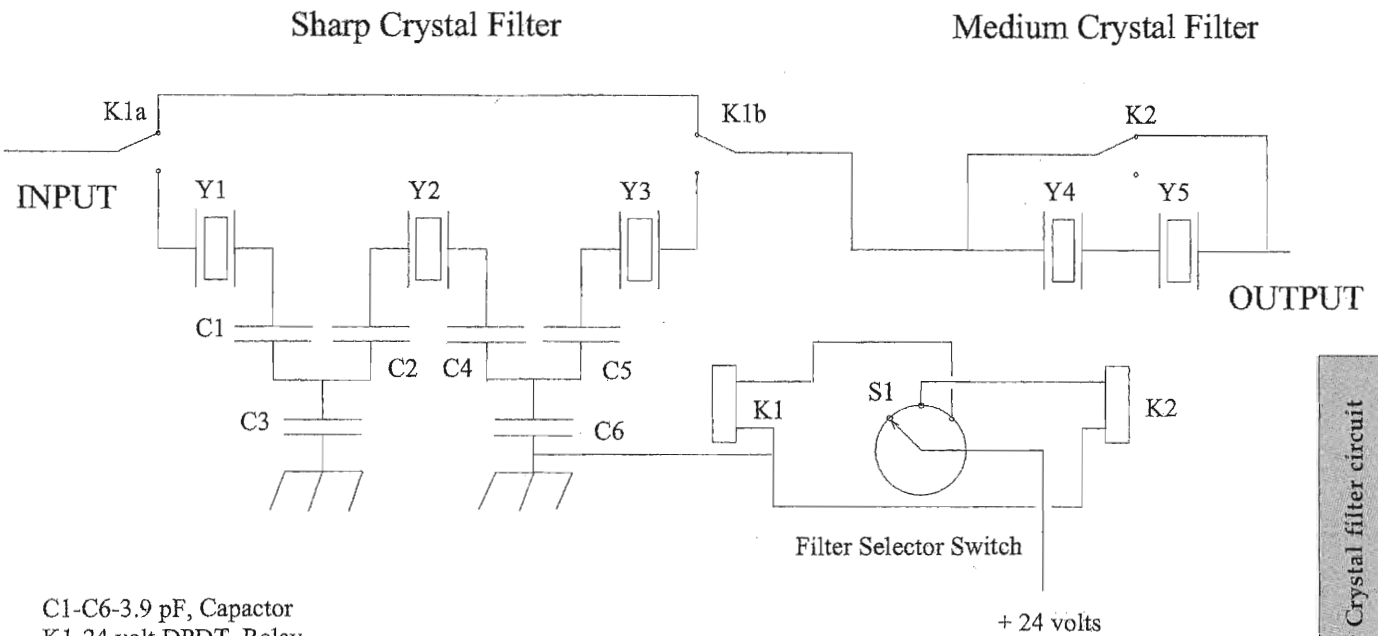
The crystals are mounted in a small fabricated aluminum box, see sheet metal layout **Figures 7a & 7b.** [Editor's note: Please send a large #10 SASE to Electric Radio for figures 7a and 7b, the sheet metal layout drawings.]

The box fits the bottom of the receiver, see **Figure 8**. Space for mounting this filter box is very limited. It is attached to the receiver by two holes in the flap that are placed over studs on top of the IF can. This box contains the crystals, one 24-volt DPDT relay, and one SPST relay that are used to change the receiver from crystal filter to no crystal filter.

By removing the dial lamp control switch on the front panel, a hole will be left that can be used to mount a switch to operate these relays. The original dial lamp switch was wrapped in heavy plastic with the wires still connected to it, and it can be tucked into a vacant space to be ready for reinstallation if needed. The receiver can be returned to its original condition by removing the crystal filter box and replacing the dial lamp switch.

Wires are run from the added switch to the filter-box relay coil. A third wire is run from 24 volts of the fuse holder to the rotating contact of the added 3-position switch.

The Collins Company may have been thinking of helping in the conversion of this receiver by providing a coax cable running from the mixer output transformer to the input of the 1st IF with a BNC connector. A BNC socket is mounted on the filter box to bring in the signal from the mixer. This coax connector will now plug into the filter box to provide input to the filter. A short piece of high-impedance coax, with a BNC connector, is connected between the filter box and



C1-C6-3.9 pF, Capactor
K1-24 volt DPDT, Relay
K2-24 volt SPST, Relay
S1-manual SPTT, Switch
Y1-Y5 - 455 kc, Crystals

Figure 6: Crystal filter circuit

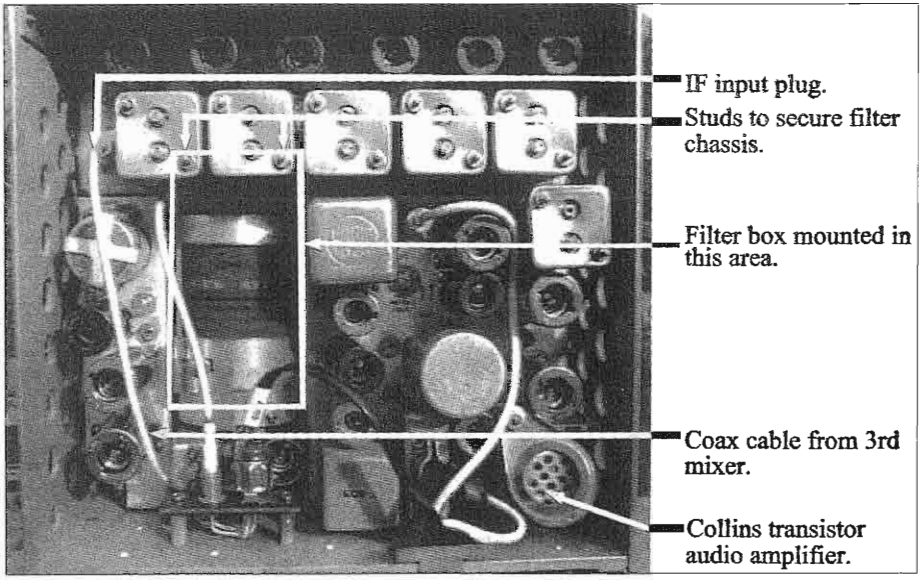


Figure 8: Bottom view of the R-392.

the first IF. The other end of this coax enters the filter box and connects to the relay. If a rotary switch is used to turn on various filters, it should be wired so that in the counter-clockwise position, neither relay coil is activated (bandpass of 2 kc). The center position should allow the signal to travel through the two series crystals. In the clockwise position the signal should travel through the three coupled crystals. Now the receiver has 5 different bandwidths; 8 kc, 4 kc, 2 kc, broad 110 cycles and narrow 110 cycles. In this receiver, the crystal filters are usually used with the 2-kc bandwidth.

The 2-crystal filter was suggested by Richard R. Simpson (W6SRL). It consists of two crystals in series with no coupling capacitors. The bandpass of this filter is also 110 cycles, but the slope on its bandpass is much broader. The signal level is not diminished as much. The noise level is down quite a bit from the 2 kc bandpass. This makes a good intermediate level between the other two choices. When the dial is tuned, using this filter, you can hear the signal as the dial approaches the station.

With this filter in operation the bandwidth of the receiver was measured at the output of the IF amplifier that is available on the front panel. A high frequency oscilloscope was used to measure this output voltage. An oscilloscope was used to insure that the IF signal had no unexpected oscillations in the output. At the minus 6 dB point (minus 50% peak-to-peak voltage) the bandwidth is 110 cycles. This is quite an improvement over the 2 kc pass-band of the original circuitry.

One of the real advantages of this crystal filter conversion is the reduction of QRN. The amount of noise that is wiped out by switching from a 2-kc bandwidth to a 110 cycle bandwidth is remarkable. Even if tighter bandwidth isn't needed to reduce QRM, the reduction in noise is very worth while.

After the crystal filter has been installed be sure to check the IF alignment. The 2-kc bandpass should peak at the crystal frequency. This will allow you maximum output at the crystal frequency.

Try tuning the receiver now that the filter is installed and running. Turn on the BFO and turn off the AGC. The BFO knob needs to be set close to BFO zero.

In the 3-crystal filter position, the bandpass is now quite small and needs a steady hand to tune the Kilocycles dial. An easy way to tune this receiver is to cut the filter out and use the 2-kc bandpass to find the station. In the 2-kc position there will be more noise. This is because the wider the bandpass becomes, the higher the noise level becomes. Now, tune the receiver to a CW station that is beating with the BFO at some where between 500 and 1000 cycles. Turn the filter on. The station that was tuned in should be very close to this dial setting. A steady hand in moving the dial should bring in that station. When the BFO and the dial are set right, there should be very little difference between the volume of the station when the 2-kc bandpass is used or when the filter is used. The filtered signal should have a noise level near zero. If a second station should appear in the pass-band, the audio frequency of the two stations can be moved by changing the BFO frequency. On one side of the zero setting on the BFO frequency knob, the undesired signal has a higher audio frequency than the desired signal. On the other side of zero the undesired station is lower. Now the operator can move the undesired signal off the edge of the bandpass or move the undesired signal into zero beat. By tuning the BFO frequency control to the other side of zero, the interfering station can be placed on the outer edge and the QRM can be eliminated or greatly reduced. Knowing how the controls affect the received signals is an important part of operating a shortwave CW station.

Now, don't forget the 455-kc output on the front panel. This can be the door to experimenting with a SSB demodulator or a digital mode. The addition of one of these receivers to a Ham shack could be the greatest thing since the crystal receiver.

Judging by the quality of the construction of this receiver the government must have paid a big price. The original high price of this receiver and the go-anywhere construction makes this receiver the Humvee® of all receivers. By the way, for those of you that own a Humvee®, the Humvee® has a 24-volt battery so it becomes a "plug and play" installation. The mechanical digital dial, the crystal calibrator and variable bandwidth IF make this a receiver a real collector's item.

The weatherproof case assures that the receiver can stand up under the most adverse weather conditions. There are not many receivers on the market that can be left out in the rain for hours and be expected to work when they are powered up. This receiver can take all kinds of weather and still function. Another situation that is worth considering is operating a receiver in a salt air environment. Salt air can be murder to any electronic equipment. This receiver, being contained in an airtight container, makes it the preferred choice for boats or ocean beach areas. This airtight construction assures that any surplus receiver is internally in good shape.

Notes
The photographs of the R-392/URR were provided by:
Mr. Ben Azari
Army Radio Sales Co.
109 Booth Road,
Colindale
London NW9 5JU England
www.armyradio.com

R-392 Maintenance Manual CD can be obtained from:
Jeffery L. Adams
210 Kent Ave.
Frederickburg, VA 20405 USA
For more information contact Jeff at eengineer@erols.com Price $10.00

ER

AMI Update November 2004

By Dale Gagnon, KW1I
AMI President

AMI Discovery Weekend (September 24-26) – So far, award certificates have been mailed to Tim Long, N5DWV, Don Grantham, W6BCN and Bill Riches, WA2DVU. Bill reported he is just starting to work more AM, "it brings back my childhood in the 50's when I started with an ARC-5 and S-38."

Thanksgiving AM Jamboree

Thanksgiving AM Jamboree is scheduled for November 26–28, 2004. This year's operating event rules are the same as last year. The event begins Friday evening and ends late Sunday evening. Participating stations should leisurely exchange Thanksgiving greetings, signal reports, transmitter in use and AMI certificate numbers (if they have one). AM contacts on any amateur band count. You can work the same station on more than one band, but not more than once on the same band. Each contact is one point. Multiply your total contacts by the number of bands used for AM contacts. Multiply again by the number of different AM transmitters worked. Major transmitter variants count, e.g. Ranger I and Ranger II, but not both T368 and T368A. Record the final and modulator tube types for homebrew transmitters. If you work more than one homebrew transmitter with the same RF/Mod tube configuration, only count it as one transmitter multiplier. Certificates will be awarded to any station submitting a 1000 point log, e.g. 4 bands, 25 contacts, 10 transmitter types. Take the "Thousand Point Challenge" and have some fun this holiday weekend. Please calculate your point total at the end of your log for faster processing at AMI Headquarters. Send logs to AMI, Box 1500, Merrimack, NH 03054. Send requests for lost AMI numbers to aminternational@earthlink.net.

ER

AM Calling Frequencies

160 meter band: 1885, 1945 kc. In the Midwest, listen on 1980 and 1985 kc.
80 meter band: 3870, 3880, 3885 kc. In the Midwest also try 3891.
40 meter band: 7200, 7290 kc national calling frequencies. Also 7295 in the Midwest.
20 meter band: 14.286 Mc
15 meter band: 21.400 to 21.450 Mc
10 meter band: 29.0 to 29.1 Mc
6 meter band: 50.4 Mc
2 meter band: 144.450 Mc

Vintage CW Calling Frequencies

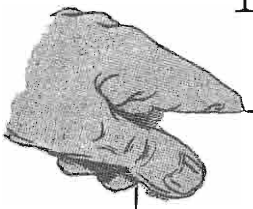
80 meter band: 3546 kc
40 meter band: 7050 (+/- "Fists" club)
30 meter band: 10120 kc
20 meter band: 14050 kc

[Editor's note: Additions have been coming in, and that's great. I'd like to keep the frequency list as accurate as possible because many newer AM'ers are not familiar with the traditional gathering spots.]

To Join AM International, send $2.00 to AM International, PO Box 1500, Merrimack, NH 03054. AMI is our AM organization and it deserves your support!

An on-line, searchable index to the entire 15-year history of Electric Radio Magazine may be found under the "links" tab at www.ermag.com or at Don Buska's web site: www.qsl.net/n9oo/ersearch.html

Mailbag



To:
Electric Radio
PO Box 242
Bailey, CO
80421

Dear ER,

"...This letter is going out to members of my family and several of the far distant, but good friends that I have had the opportunity to meet over the years. And, while the following story and attached description for our local news service did not make the national news networks, the events from the evening of October 9 have deeply and sadly affected both of us and many of our close friends and associates here in Michigan.

As you mayor may not know, Clare and I are members of the Yankee Air Museum and Yankee Air Force located at the East end of Willow Run Airport in Belleville, Michigan. We have enjoyed several programs at the museum over the past ten years that have included the annual Thunder Over Michigan events, movie nights in the hanger, and numerous dinners where the YAM/AF has hosted several key-note speakers that have include such notables as; Frank Tibbets, Chuck Yeager, Bud Anderson, Gnter Rall, Gabby Gebreski (now deceased), 'Tex' Hill, Donald Lopez and Walter J. Boyne. We have also honored and celebrated members from such original groups as; The Flying Tigers, The Black Sheep Squadron, and the pilots who participated in the Jimmy Doolittle raid, where, in 1942, seventeen B-25's were flown off the deck of the aircraft carrier, Hornet, to carry off a first-strike bombing raid against Japan. Their particular story has been retold in the film, '30 Seconds over Tokyo'. Our Thunder Over Michigan summer programs have included featured events for bombers, fighters, and aircraft of the Pacific theater of operations. Fifi, the CAF's B-29, has graced our pad along with a MATS Constellation, PBY's, Wildcats, Hellcats, Corsairs, Avengers, B-17s, B-24's, B-25's, B-26's, P-38's, P-4Ts, P-51 's, AT-6's, a MIG-17, and let's not forget the gaggle of WWI aircraft that showed up during our Fighters program: a Sopwith Camel, a Newport, two SPAD XIII's, and the dreaded DR-I Tri-plane, painted a bright red in the best tradition of the famous, Baron Manfred Von Richtofen.

It was during our dinner programs or on numerous visits to the museum where we observed or mentioned that the aged main hanger was sadly in need of repair, or at best, could be labeled as a fire-trap since there is no fire suppression system, such as sprinklers, installed in the facility. The three storied, 63 year old wooden structure housed our main storage hanger for our larger aircraft, several aircraft undergoing restoration, all of our memorabilia displays, and also included our gift shop and numerous rooms used by the museum staff and visitors. We have

planned a major upgrade project to replace the hanger, but remain short of funds to actually start the project. I have often mused that if I was somehow amazingly fortunate enough to win the Multi-State lottery, that I would take care of my family firt, my church second, and thirdly, I would visit the museum, open up my checkbook, and ask the board members, "OK, how much did you say you needed for that new hanger?" So, while I consider myself most fortunate, the fortunes have not smiled in that direction. So, I routinely put a small check in the donation box located outside of the gift shop. As they say, every little bit helps. Our museum includes roughly 65 aircraft, and while a few have been restored to airworthy condition, most aircraft are on permanent 'static' display. Our most noteworthy restorations include our B-17, the Yankee Lady; a B-25, the Yankee Warrior; and a C-47 military transport. You can get the full 'scoop' on our facility and our programs by visiting the following web site: www.yankeeairmuseum.org

On October 9, the B-17 was just returning from one of our Fall Color Tours, where flights are run to the Upper Peninsula of Michigan so that members of the general public can view the brilliant fall colors that are plentiful during this time of year. The B-25 and C-47 were in the hanger undergoing routine maintenance and the main hanger doors were open as it was a lovely fall day. It was near closing time for the museum when someone from the aircraft maintenance staff smelled something burning and noticed smoke coming from the rafters above the gift shop area. The general fire alarm was pulled to alert the local fire and rescue units, and the facility and grounds were soon evacuated. But, the remaining aircraft maintenance workers, most being near or at retirement age, looked in shock and fear at the planes still in the hanger. Somehow, they were able to push the B-25 and C-47 out on the ramp to safety before the blaze entered the main hanger. I can only imagine what they must have felt as they looked on in horror as many aircraft were consumed by the flames. Thankfully, the B-17 was still in the main aircraft parking area and was also spared. It has been noted in various aviation journals that the 'Lady' is the most historically correct restoration of a B-17. Every spring we host a 'Polishing Party' to keep her aluminum in shiny, as-new condition.

The fire crews arrived surprisingly fast and were barely able to contain the blaze to prevent the fire from spreading to other aircraft or buildings. In the end, the hanger, gift shop, and surrounding area was a total loss. And, as of this writing, the officials are still looking for a cause. The list of aircraft destroyed in the blaze include: a fully restored and flyable OV-IOA Bronco that was a high performance aircraft used in during the Vietnam War as a Forward Air Control aircraft and light, but highly effective ground attack platform, and a Waco Glider that was once used to ferry troops into the fields of France while the water born assault was attacking the beaches of Normandy during D-day. We also lost an F-105 Thunderchief that was being restored. Other small aircraft consumed in the fire include a handful of biplanes and some actual Piper Cubs. All of our museum displays including engines, uniforms, medals, cockpits, numerous spare parts, and our workshop were also lost.

I'm not asking for a donation. I simply wanted to share this story and ask for your prayers, hopes, and concerns for a better future. Please visit our web site and see what we're all about. If you do care to make a donation, information is available at the web site. The museum did have insurance. Needless to say, our efforts towards building a new hanger have been greatly accelerated.

Peace and renewed happiness to all.
Glenn R. Bowman [KC8WUL]
16 October 2004

ER

VINTAGE NETS

Arizona AM Nets: Sat & Sun: 160M 1885 kc @ sunrise. 75M 3855 kc @ 6 AM MST. 40M 7293 kc 10 AM MST. 6M 50.4 mc Sat 8PM MST. Tuesday: 2M 144.45 7:30 PM MST.

Boatanchors CW Group: QNI "CQ BA or CQ GB" 3546.5, 7050, 7147, 10120, 14050 kc. Check 80M winter nights, 40 summer nights, 20 and 30 meters day. Informal nightly net about 0200-0400Z.

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

California Vintage SSB Net: Sunday mornings @ 8AM PST on 3860 +/-

Colorado Morning Net: An informal group of AM'ers get together on 3875 kc Monday, Wednesday, Friday, Saturday, and Sunday @ 7 AM MT.

Canadian Boatanchor Net: Meets daily on 3725 kc (+/-) @ 8:00 PM ET. Hosts are AL (VE3AJM) and Ken (VE3MAW)

Collins Collectors Association Nets: Technical/swap sessions meet every Sunday on 14.263 Mc @ 2000Z. Informal ragchew nets meet Tuesday evening on 3805 kc @ 2100 Eastern time, and Thursday on 3875 kc. West Coast 75M net is on 3895 kc 2000 Pacific time. **10M AM net starts 1800Z on 29.05 Mc Sundays, QSX 1700Z.**

Collins Collector Association Monthly AM Night: Meets the first Wednesday of each month on 3880 kc starting @ 2000 CST, or 0200 UTC. All AM stations are welcome.

Collins Radio Association nets: Mon. & Wed. 0100Z on 3805 kc., also Sat 1700Z on 14.250 Mc.

Drake Technical Net: Meets Sundays on 7238 kc, 2000Z. Hosted by John (KB9AT), Jeff (WA8SAJ), and Mark (WBØIQK).

Drake Users Net: This group gets together on 3865 kc, Tuesday nights @ 8 PM Eastern Time. Net controls are Gary (KG4D), Don (W8NS), and Dan (WA4SDE)

DX-60 Net: This net meets on 3880 Kc @ 0800 AM, Eastern Time on Sundays. Net control is Mike (N8ECR), with alternates. The net is all about classic entry-level AM rigs like the Heath DX-60.

Eastern AM Swap Net: Thursday evenings on 3885 kc @ 7:30 PM Eastern Time. Net is for exchange of AM related equipment only.

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

Fort Wayne Area 6-Meter AM net: Meets nightly @ 7 PM Eastern Time on 50.58 Mc. This is another long-time net, meeting since the late '50s. Most members use vintage or homebrew gear.

Gulf Coast Mullet Society: Thursday @ 6PM CT, control is Charles (K4QZO) in Pensacola.

Gray Hair Net: The oldest (or @ least one of the oldest @ 44+ years) 160 meter AM nets. Net time is Tuesday evening on 1945 kc @ 8:00 PM EST and 8:30 EDT. Also check www.hamelectronics.com/ghn

Hallicrafters Collectors Association Net: *Sunday*, 14.293 Mc, 1:15 PM EST/EDT. *Saturday*, 7280 kc, 1:00 PM EST/EDT. *Wednesday*, 14.315 Mc, 6-8:00PM EST/EDT. Control op W8DBF.

Heathkit Net: Sunday on 14.293 Mc 2030Z right after the Vintage SSB net. Listen for W6LRG, Don.

K1JCL 6-meter AM repeater: Operates 50.4 Mc in, 50.4 Mc out. Repeater QTH is Connecticut.

K6HQI Memorial Twenty Meter Net: This flagship 20 meter net on 14.286 Mc has been in continuous operation for @ least 20 years. It starts @ 5:00 PM Pacific Time and goes for about 2 hours.

Midwest Classic Radio Net: Meeting Saturday morning on 3885 kc @ 7:30 AM, Central Time. Only AM checkins are allowed. Swap and sale, hamfest info, and technical help are frequent topics. Control op is Rob (WA9ZTY).

MOKAM AM'ers: 1500Z Mon. thru Fri. on 3885 kc. A ragchew net open to all interested in old equipment.

Northwest AM Net: AM activity is daily on 3870 kc 3PM to 5PM winter, 5-7 PM summer, local time. The same group meets on 6 meters @ 50.4 Mc. Times are Sundays and Wednesdays @ 8:00 PM. 2 Meters Tues. and Thurs. @ 8:00 PM on 144.4 Mc.

Nostalgia/Hi-Fi Net: Started in 1978, this net meets Friday @ 7 PM Pacific Time on 1930 kc.

Old Buzzards Net: Daily @ 10 AM local time on 3945 kc in the New England area. Listen for net hosts George (W1GAC) and Paul (W1ECO).

Southeast AM Radio Club: Tuesday evening swap net, 3885 @ 7:30 ET/6:30 CT. Net controls are Andy (WA4KCY), Sam (KF4TXQ), and Wayne (WB4WB). SAMRC also meets for Sunday Morning Coffee Club Net, 3885 @ 7:30 ET, 6:30 CT.

Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM on 50.4 Mc. Net control op is Will (AA6DD).

Swan Nets: User's Group meets Sunday @ 4 PM Central Time on 14.250 Mc. Net control op is usually Dean (WA9AZK). Technical Net is Sat, 7235 kc, 1900Z. Net control is Stu (K4BOV)

Vintage SSB Net: Sunday 1900Z-2000Z 14.293 & 0300Z Wednesday. Net control Lynn (K5LYN) and Andy (WBØSNF)

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Brian (NI6Q), Skip (K6LGL), Don (W6BCN), Bill (N6PY) & Vic (KF6RIP)

Westcoast Military Radio Collectors Net: Meets Saturday @ 2130 Pacific Time on 3980 kc +/- QRM. Net control op is Dennis (W7QHO).

Wireless Set No. 19 Net: Meets the second Sunday of every month on 7270 kc (+/- 25 Kc) @ 1800Z. Alternate frequency is 3760 kc, +/- 25 kc. Net control op is Dave (VA3ORP).

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free 20-word ad per month. **Extra words are 20 cents.** Here is how to count the words in your ad: "For Sale" or "Wanted" and your contact information counts as 7 words. Hyphenated words count as 2 words. **Please count the words in your ad as described above, and if you are over 20 words, send payment for the extra words at .20 each.** Note: Not all readers use email, so it is a good idea to include phone numbers. Non-subscribers: $3.00 minimum for each ad up to 20 words. Each additional word is 25 cents. Email ads are fine.

Please call or write for display rates.

VINTAGE EQUIPMENT ONLY!

ER
PO Box 242
Bailey, Colorado 80421-0242

Telephone: 720-924-0171
FAX (call first): 303-838-3665
NEW email: 1editor2@indra.com

Deadline for the December, 2004 issue: Monday, Nov. 29

SERVICE FOR SALE: Repair and restoration on all vintage equipment; 45 years experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. 303-770-5314

MANUALS FOR SALE: Military Radio manuals, orig. & reprints. List for address label & $1. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, wa5cab@cs.com

FREE: BC-496 control box, MC-385 adapter, DV-11 dynaverter, Type P-12 power unit, 25V vibrators, + FT-224 mount. Must take all. Mike Forgensi, 916-630-0932 10AM-2PM Pacific time.

FOR SALE: Regency MR-10 Monitoradio $30.00, Hallicrafters S-53A $65.00. Mark Castonia 920-494-0787, markcastonia@itol.com

FOR SALE: National SW-3 with coil set #65.No shaft cover or PS. $280. Mike Grimes, K5MLG, 5306 Creekside Ct.; Parker, Texas, 75094, 972-384-1133. grimesm@flash.net

FOR SALE: Simpson 379 Battery Tester, manual copy, $75.00. B&K 520B Transistor Tester, manual copy, $75.00. Hickok 820 Tube Tester, manual copy, $45.00. Ross Wollrab, 229 N. Oakcrest Avenue, Decatur, IL 62522-1810. 217-428-7385. rewollrab@aol.com

FOR SALE: NOS power micro-switch for the R-390A / R-390. $11 each postpaid. Dave, WØNBZ, 13020 Lakeview, Burnsville, MN 55337. w0nbz@juno.com

FOR SALE: Hallicrafters HT-37 repair/ parts $100. Drake SW-4A shortwave receiver $150. Icom ICR10 Rcvr $150. Al Jenkins, WA1RWB, 508-325-7122

FOR SALE: Globe King 500A AM transmitter with WRL remote VFO, working, lots of new parts. Pick up only in S. California. $900. Larry, K6LXT, 562-860-3131, LTinkler@msn.com

FOR SALE: Zenith tombstone 4B231. Two panadapters. BC348L. Japanese navy microphone elements, RF Ammeter, interstage transformers. Bill Coolahan, 1450 Miami Dr NE, Cedar Rapids, IA 52402-2933, 1-319-393-8075

FOR SALE: McElroy S-600 chrome, teardrop-shaped bug, $600. Bunnell telegraph set (late 1800s), $150. Richard Prester, 131 Ridge Road, West Mllford, NJ 07480. 973-728-2454. rprester@warwick.net

FOR SALE: Millen 90711 VFO $395. Millen 90700 Variarm ECO $195. Two Millen 90800 xmitters, $75 ea. Don Galarneau, W7KCK, 503-289-2326 dgkck@qwest.net

FOR SALE: Drake SSR1 - $275, HT-32B $300. All plus ship. Edward Sauer, 787 N. Peterman Rd. Greenwood, IN 46142 317-881-1483

FOR SALE: Hallicrafters HT-32A $300.00. Drake TR-4W/ power supply $200.00.

The Collins Radio Association

Supporting the restoration and preservation of Collins Radio, now the world's largest Collins organization. Join today and receive the *Collins Journal*, bimonthly for only $20.00, now in its 11th year of publication. Help Support the CRA.

The No. 1 Collins website is still at www.collinsra.com

both units in very good condition. Bob, W1RMB 508-222-5553.

FOR SALE: SB-100 with HP-23 supply in a SB-600 speaker cabinet $300. SB-300/ SB-400 combo $350 HW-101/HP-23 incl-CW filter $200 All plus shipping.K8TFD Ken Sands 734-453-7658 ken.sands@juno.com

FOR SALE: Working 1940 Model 15 Teletype, complete, with Flescher demodulator. $150, PICK UP ONLY. Brian Roberts, K9VKY, 130 Tara Drive, Fombell, PA 16123 724-758-2688 k9vky@arrl.net

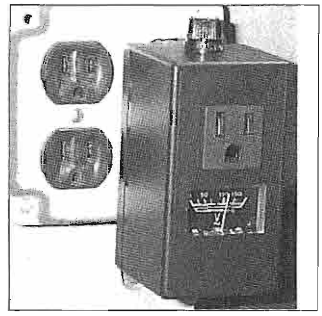
FOR SALE: Heathkit HW100, works, manual, $115. BC639A Receiver RA42B $175. Radio Shack DX302 $395. Pro 2006 $395. Ron, 517-374-1107

FOR SALE: BC-611, $300. BC-191F w/ TU-6, TU-10, no tubes, $450. BC-625 mine detector set, no tubes, $75. SCR-543 = BC-669 w/wood chest, $750. BC-312, $125. BC-652 rcvr, $75. 2 mF 4kV = 1000 S36 WWII modified $25. I-177 tube tester, $140. Hickok 532, $140 + ship. Steve Bartkowski, 4923 W. 28 St, Cicero, IL 60804 1-708-863-3090

FOR SALE: Old books: Electronics and other subjects. Send SASE for list. John Martin, POB 14, Paloma, IL 62359 217-455-3003.

FOR SALE: TMC SBE-2 manual for exciter and power supply with factory addendum. Original, very good condition, $22.50 shipped. 864-855-9570 or k4deejim@aol.com

Inrush Current Limiters are now available from the Electric Radio store! These inrush limiters were reviewed in the September, 2004 issue of Electric Radio and are available in two versions:



ModelAB-1M (With Voltmeter) $34.95
Model AB-1 (With Pilot Light) $29.95
Priority Shipping $4.95

The Inrush Limiter provides a gentle, slow startup for your vintage equipment in the 150 watt range, and also reduce the line voltage to original design values. They come with a full money-back guarantee.

FOR SALE: Hallicrafters SX-28 receiver, good electronics and cosmetics. $225 plus shipping. John, W2PRR, 585-671-4228, ,jandjm130@juno.com

FOR SALE: National coil boxes; 3-hole, exact mechanical and dimensional reproductions; 1-coat water-based paint; very limited quantity. $55 ea plus $5 shipping. Kelley, W8GFG, 9010 Marquette St., St. John IN, 46373, 219-365-4730

FOR SALE: QRP transmitter kits. Step-by-step instructions. Wood model, up to 5 watts 40/80M $15. "Tunatin" one watt 40M $10. You furnish crystal and power. Robert Larson, 1325 Ridgeway, Medford, OR 97504 W7LNG@arrl.net

FOR SALE: R-390A's, R1051's, Harris RF-550's, URM-25D signal generators, military 28VDC gas generators, AS-2851 antenna kits. Call, Lots more stuff! S. Daniels, 636-343-5263

FOR SALE: 3-year old colonial home on 2 acres of land, 3,500 sq. ft. zoned for tower, finished basement with station and shop area, both wired for 120/240 volts. Near IBM in Poughkeepsie, NY. Asking price 495,000. Call Charlie, WB2ZKS, for additional details, or to arrange a visit. 845-223-8392.

FOR SALE: HP200AR audio oscillator, rack mount, nice $75. Fred Clinger, 417 Beechwood Dr., Galion, OH 44833 419-468-6117 after 6 PM.

FOR SALE: Tube tester, Accurate M-257 w/ cords & manual, works, handle missing, @ 9 $30. Superior genometer, M-TV-50A w/ test cord. no damage, clean @ 9 $30. Realistic DX160, N/D (no damage) A/O (all original) clean, plays $85. Link (unit) 5 3/4—3 1/4 by 2 1/2 H 2 toggle switches, top, pwr, bottom ch 1, L ch 2, —lights top, xmitt, rcv, bottom, left,squelch, right , vol. no fuse cap. $30. Bernie Samek, 113 Old Palmer Rd., Brimfield MA, 01010, 413-245-7174, FAX 0441. Bernie@samnet.net

SERVICE FOR SALE: Repair, upgrade, performance modification of tube comm. & test equip. Accepting most military, all Collins & Drake, & 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

WANTED:

McMurdo Silver 14-15
Sargent 21-AA
Sargent 21-MA
Sargent WAC-44
Sargent 51-AK

Please contact:
Hardy Trollander
3 Aspen Court
Yellow Springs, OH 45387
937-767-4551

FOR SALE: General Radio lab equipment, over 250 pieces, manuals, write wants, SASE. Stuart T. Carter II, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904, 321-727-3015

FOR SALE: FT243 Crystals: 1815, 1822, 1885, 1945, 1985, 3535, 3560, 3579, 3875, 3880, 3885, 3890, 7035, 7045, 7050, 7143, 7280, 7285, 7290, 7293, 7295, 8400, 10106, 14286 kHz. Many others available. See list at: http://www.af4k.com/crystals.htm or call Brian, AF4K on 407-323-4178

REPAIR!: Radio repair reasonable charges. Manuals for sale. I buy Radios. J. Dan Rupe 998 Whipple Ave, Grayland, WA 98547 360-267-4011 W7ddf@yahoo.com

PARTS FOR SALE: Request free vintage flyer. USA only. 50 years of mail order electronics. Bigelow Electronics, POB 125, Bluffton, OH 45817-0125

FOR SALE: Countermeasures receiving set AN/WLR-1D, 50-10750 MHz, 9 bands, simultaneous display of frequency, spectrum, and modulation info on dual displays, manual, 1200 lbs., $4,500. Carl Bloom, 714-639-1679, carl.bloom@prodigy.net

QSL'S FOR SALE: Your old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, NZ5M@arrl.net

Mil-Spec Communications
R-390, R-390A, R-388 & Other Military Receivers
Sales - Service -Manuals - Parts
Box 633, Englewood, FL 34295-0633
Please call us at: 941-474-6818
FAX: 941-474-7874
milspec39Ø@aol.com
"Since 1985"

FOR SALE: 100+ NPN transistors $15 postpaid. Len Gardner, 458 Two Mile Creek Rd., Tonawanda, NY, 14150. email: radiolen@att.net

FOR SALE: Naval Receivers RAK, RAL, RAO, RBA, RBB, RBC, RBL, RBM. Some checked, pwr splys available. $75-$450 depending on condx. Many other types. Carl Bloom, 714-639-1679. carl.bloom@prodigy.net

TUBES FOR SALE: Tested good globe 201A $14, 226 $15, 227 $10 and others. Slightly weak tubes guaranteed to work in early radios ½ price shown. Write or e-mail: tubes@qwest.net for a new price list or see www.fathauer.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281, 480-968-7686. Toll Free 877-307-1414

SERVICE FOR SALE: Authorized repairs and sales of all types of amateur radio, communications, and test equipment. Please call LAND AIR COMMUNICATIONS, 718-847-3090, visit our web site: www.landaircom.com. We have over 3,000 items in inventory and carry all types of communications parts.

SERVICE FOR SALE: Repair, Restore, Sales of antique, vintage tube radios. John Hartman, NM1H, www.radioattic.com/nm1h

SERVICE FOR SALE: Vintage Radio Service. We repair radios, record changers, radios home, auto, tube & transistors. 1930-1980. Ken Hubbard, KA9WRN, POB 792, Beloit, WI 53512. 608-362-1896

BOOKS FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hi-fi, parts. Send 2 stamp, LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857. ka1edp@juno.com

JOHNSON PARTS FOR SALE: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig. - $17.50 ppd. Bruce Kryder, W4LWW, 277 Mallory Station Dr., Ste. 109, Franklin, TN 37067. bak@provisiontools.com

ACCESSORIES FOR SALE: KWM2/S-line metal logo pins. Meatball or winged. Excellent replica of the original. Put one on your hat, badge, or replace a missing logo on your panel. $6.25 shipped. W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029. 760-747-8710, w6zz@cox.net

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

DRAKE SERVICE FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covelli, WA8SAJ, 440-951-6406 **AFTER 4 PM**, wa8saj@ncweb.com

NOTICE: Visit Radioing.com, dedicated to traditional ham radio & vintage radio resources. Let's Radio! Charlie, W5AM. http: / /www.radioing.com.

BOOK FOR SALE: Heath Nostalgia, 124 PG book contains history, pictures, many stories by longtime Heath employees. (See ER Bookstore.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028

WANTED: Pwr supply for Swan 350. Broadcast Mikes. K. Poling, N8EIJ, POB 142, N. Olmsted, OH 44070 440-777-8785

TUBES FOR SALE/TRADE: Transmitting/Receiving tubes, new & used. $0.55 & LSASE for list. I collect old & unique tubes of any type. **TUBES WANTED:** Taylor and Heintz-Kaufman types and large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 13406 W. 128th Terr. Overland Park, KS 66213. PH: 913-782-6455, Email: jhwalker@prodigy.net

TREASURES FROM THE CLOSET! Go to www.cjpworld.com/micromart to find some unique items many hams would lust for! Gus, WA, 360-699-0038 gus@wa-net.com

MISC FOR SALE: Vintage equipment at the K8CX Ham Gallery Classified Ads section. Visit the largest Antique QSL Card Gallery http:/ /hamgallery.com

BOOKS FOR SALE: Lots of old radio & related books. Eugene Rippen, WB6SZS, www.muchstuff.com

PARTS 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. 631-653-5350

PLEASE VISIT: RadioWorld-Online. Come to see our ham gear, parts, and more. Carl Blomstran PO Box 890473 Houston Tx. 281-660-4571.

ACCESSORIES FOR SALE: Spun Aluminum Knob Inlays for most Boatanchors. Collins Dial Drum Overlays. Dakaware Knobs. Charlie Talbott, 13192 Pinnacle Lane, Leesburg VA 20176-6146. 540-822-5643, k3ich@arrl.net

PLANS FOR SALE: Build your own "Midget" bug replication by KØYQX, ca 1918, featured by K4TWJ in CQ Magazine, May '98. 10 detailed blueprints. FAX: 507-345-8626 or e-mail bugs@mnic.net

PARTS FOR SALE: Parts, tubes, books, ECT. Send two stamp SASE or email for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761 letourneau@wiktel.com

SERVICE FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W9OJI / N4FZ, IL, 815-734-4255 or N4PZ@aol.com

PARTS FOR SALE: Complete hardware set to connect Collins PM2 to KWM2 - $19.95 ppd. Warren Hall, KØZQD, POB 282, Ash Grove, MO 65604-0282.

PARTS FOR SALE: New Release. For details send 2-stamp LSASE to: Olde Tyme Radio Co, 2445 Lyttonsville Rd. Ste 317, Silver Spring, MD 20910

EQUIPMENT FOR SALE: Military and commercial communications items. Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. 619-444-7717 www.Murphyjunk.com

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

ACCESSORY FOR SALE: RIT for Collins KWM-2/2A; No modifications needed. $79.95 SASE for details. John Webb, W1ETC, Box 747, Amherst NH 03031 bigspndr@bit-net.com

PARTS FOR SALE: Aluminum heat dissipating plate and grid connectors for all 3, 4 and T series Eimac tubes including 3-500Z, 4-1000, 304T's and others. Alan Price, fixer7526@wmconnect.com

PARTS FOR SALE: Ships radio room clock repros, boatanchor mugs and t-shirts, more. http://www.cafeshops.com/amradio.amradio2 1-877-809-1659

SERVICE FOR SALE: I built hot-rod receivers; R390A, SP-600, R-388/51J. NC-183D...and transmitters: Valiant, DX-100, T-4X-A-B, HT-32. 51J-4 filter replacements, R390A Hi-fi AM $245.00 ea. Chuck Felton, KDØZS, Wyoming, 307-322-5858, feltondesign@yahoo.com

COLLINS PARTS FOR SALE: Collins reproduction items available through the CRA on www.collinsra.com. Join the CRA and subscribe to the Collins Journal. Dave, W3ST

SERVICE FOR SALE: PANEL AND CABINET REFINISHING; Johnson, Hammarlund 180(a), R390(A), & others total restoration & sales; My updated web site: http://w4pnt.8k.com Patty & Dee's Marina; Dee Almquist, 534W. Main St., Waynesboro, VA 22980. 540-249-3161 Cell: 540-480-7179, FAX 540-249-5064, w4pnt@highspeedlink.net

FOR TRADE: Two good RCA 833A's for one Taylor 833A. Also looking for Taylor 204A, 813, TR40M. John H. Walker Jr., 13406W. 128th Terr., Overland Park, KS 66213. PH: 913-782-6455, Email: jhwalker@prodigy.net

WANTED: Information and references on use of the metal alloy "Invar" in variable capacitors. Louis L. D'Antuono, 8802-Ridge Blvd., Bklyn, NY 11209. 718-748-9612 AFTER 6 PM Eastern Time.

WANTED: Top dollar paid for WWII radios, PRC-1, PRC-5, AR-11, SSTR-1, SSTR-5, British B2, need pts for PRS-1 mine detector. Steve Bartkowski, 708-863-3090

WANTED: Low frequency coils for Millen Grip Dip meter, 51J4, and T368. Ward Rehkopf, K8FD, 16173 Indian Valley Road, Schoolcraft, Mi 49087. 269-679-3435 or radiohound2@yahoo.com.

WANTED: Central Electronics 10A/B. Any condition with or without tubes or coils. Ted Bracco, WØNZW, 203 E. Main St., Teutopolis, IL 62467, 267-857-6404, braccot@hotmail.com

WANTED: Will buy SP-600 and some other Hammarlund equipment, working, not, or incomplete. Al, W8UT, anchor@ec.rr.com, 252- 636-0837

WANTED: General Radio Type 1493 precision decade transformer in good functional condition. Ross Wollrab, 229 N. Oakcrest Avenue, Decatur, IL 62522-1810. 217-428-7385. rewollrab@aol.com

WANTED: Solid State product detector for my R-388 as advertised in ER several years ago. Phil LaMarche, W9DVM, 4227 Lake Ave, Palm Harbor, FL, 727-944-3226

WANTED: Test leads for Simpson 355 Midgetester. Joe, K2MZE, 603-652-4873 or joek2mze@aol.com

WANTED: Looking for different types of receivers and related books. Send list. K. York, 5218 Hunter Ave. Cincinnati, OH 45212.

WANTED: HP4815/4193A probe. Says "Caution 50 VDC Max" on probe body. Mike Zuccaro, 858-271-8294, mjzuccaro@aol.com

WANTED: Meters for following tube testers: Western Electric KS-15750, Weston 774-5 Analyzer. Walter L. Hughes, WB4FPD, 6 Academy Ct., Berryville, VA 22611 540-955-2635

WANTED: Vols. 1 & 2 of ARRL's "Hints & Kinks (both pre-WW2.) Chuck Brumley, KB2E, 72 Glenwood Dr., Saranac Lake, NY 12983. 518-891-5704. Brumloff@adelphia.net

WANTED: Heathkit GR-81 regenerative receiver. Working or repairable. Doug Beard, KFØVF, 604 7th St, Springville, IA 52336 336-854-6312

WANTED: Coil set for Heath Grid Dip Meter, model GD-1B. Bob, WBØDMC, 507-331-5103.

WANTED: WW1 and early 20's hi-end sets and lit for same: IP 500/143; SE 1420/501; 950, 1950; National 239; Marconi 106; Kennedy 110, 220; Grebe CR 18. Also amps: SE 1000; Kennedy 525; similar. Want to buy: Grid dip meter to read low frequencies; knobs: Westinghouse RA/DA type, 1", also 1 & 3/8". Have Federal RFT's and AFT's for type 61 for trade. Also, trade radios, what-have-you or cash. Always looking for vintage broadcast mics and tube compressors, pre-amps, by RCA, Sony, Western Electric, etc...WW II era spy radios and related stuff. E-mail best way to contact, but if you use telephone, don't be bashful, leave a message! Ward Kremer, 1179 Petunia Rd., Newport, TN 37821; Ph/Fax: 423-625-1994, email: witzend99@earthlink.net

WANTED: 23-channel, tube-type CB radios, also 23-channel mobile sets. Ed, WA7DAX, 1649 E. Stratford Ave., Salt Lake City, UT 84106. 801-484-5853

WANTED: Information and plug-in coil units for CU-52?URR receiver multi coupler. Also want SP-600 or 51J-4. Ward Rehkopf, 16173 Indian Valley, Schoolcraft, MI 49087. 269-679-3435 or radiohound2@yahoo.com.

WANTED: National NTE CW xmtr in working Condx. I love National. Sylvia Thompson, 33 Lawton Foster Rd., Hopkinton, RI 02833. 401-377-4912. n1vj@arrl.net

WANTED: TCS & TBY Navy radios. Ken Kolthoff, K8AXH, PO Box 215, Craig, MO 64437. Work #913-577-8422.

WANTED: Teletype Model 28 Compact, UCG-20 or 25. CQ Anthology 1, CQ Anthology 2, AWA Review 1, 3, 4, 9, 12. George Rancort, K1ANX, 82 White Loaf Rd, Southampton, MA, 01073. 413-527-4304

WANTED: PYE, Fairchild, Syncron, Langevin. Richard P. Robinson, PO Box 291666, LA CA 90029 323-839-7293 richmix@erols.com

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 900 N. San Marcos Dr. Lot 15, Apache Junction, AZ 85220

WANTED: For SCR-178 Generator GN-37, Insulator IN-85, Lamp LM-18, Insulator mounts, leg supports, other parts. Robert Forte, 518-696-2400 rvforte@frontiernet.net

WANTED: Still need audio amps w/ 6V6, 6K6 or similar. Condx not critical, I can repair. DB-110 owner, need your phone, address. Charles Graham, 914-666-4523. 4 Fieldwood Dr., Bedford Hills, NY 10507

WANTED: RCA communications receivers, ACR-175, ACR-111, CR-88, AR-8516, CRM-R6A, SRR-13. Dan Gutowski, 9753 Easton Rd, Dexter MI, 48130. 734-718-7450, dg16ms26@msn.com

WANTED: A Collins R-389 LF rcvr to complete my SWL shack. Have quality trades/pay cash. Dan Gutowski, 9753 Easton Rd, Dexter MI, 48130. 734-718-7450, dg16ms26@msn.com

WANTED: Scott Special Communications rcvr. EA4JL, please call Kurt Keller, CT, 203-431-9740, k2112@earthlink.net

WANTED: Technical Materials Corp. model DCU combiner, DVM monitor, LPP patch panel, LSP speaker, DCP power panel VOX V.F.O., CFA converter, and PSP-1 power sply. K8CCV, Box 210, Leetonia, OH 44431-0231, 330-427-2303.

WANTED: *ANY* Harvey-Wells speaker, aircraft unit, or military surplus component. Will answer all. Kelley, W8GFG, 9010 Marquette St., St. John IN, 46373, 219-365-4730

WANTED: SCR-602 components, BC-1083, BC-1084 displays, and APS-4 components. Carl Bloom, 714-639-1679

WANTED: Collins 310B-3, basket case OK, 70E-8A PTO per 1948. Chicago CMS-2, pair of Taylor T-21. Jerry, W8GED, CO, 303-979-2323.

WANTED: James Millen coils 42080, 42040, 42015, 43015. Navy SE2511/SE2512 rcvr, SE2513 coil set. Gary Carter, WA4IAM, 1405 Sherwood Drive, Reidsville, NC 27320. Phone: 336-349-1991. Email: gcarter01@triad.rr.com.

WANTED: Collins R-389 LF receivers, parts, documentation, anecdotes, antidotes. W5OR Don Reaves, PO Box 241455, Little Rock AR, 72223 501-868-1287, w5or@militaryradio.com, www.r-389.com

WANTED: Any TMC Equipment or Manuals, what have you? Will buy or trade. Brent Bailey, 109 Belcourt Dr.,Greenwood, S.C. 29649 864-227-6292 brentw@emeraldis.com

WANTED: QSL card from my Grandfather, W9QLY, from before 1957. Also seeking original National Company logos from Ham or military equipment. Don Barsema, KC8WBN, 1458 Byron SE, Grand Rapids, MI 46606. 616-451-9874. dbarsema@prodigy.net

WANTED: Top prices paid for globe shape radio tubes, new or used. Send for buy list or send your list for offers. Write or email: tubes@qwest.net See www.fathauer.com or send for catalog of tubes for sale. George H. Fathauer & Assoc., 688 West. First St., Ste 4, Tempe, AZ 85281. 480-968-7686, Call toll free 877-307-1414

WANTED: Old military radar displays, scopes, antennae, receivers, manuals, etc. Even half ton items! William Donzelli, 15 MacArthur Dr., Carmel, NY 10512. 847-225-2547, aw288@osfn.org

The Collins Video Library

The Collins KWM-2 Video (4 hours, $89.95) Highly detailed video on operation, rebuilding, alignment, troubleshooting, and neutralization of this classic! A must for anyone who owns and operates a KWM-2 or 2A. Printed documentation included.

The Collins 75S-3 and 32S-3 Video (3.5 hours, $74.95) An excellent in-depth examination of the most popular version of the S-Line equipment. Operation, modification, alignment, neutralization are covered and more! Much of this information applies to all versions of the S-Line!

The Collins 30L-1 video (1 hour, $39.95) This is a complete guide to the 30L-1 amplifier. Topics covered are operation and safety, updates, and a discussion of the classic 811A triode. Learn the secrets to greater performance.

The Collins 30S-1 video (1 hour, $39.95) Finally, here is the one everybody has wanted! This extraordinary video describes operation and user safety, maintenance and modifications of this classic Collins powerhouse amplifier. Very informative--truly a must for all 30S-1 owners. Complete with printed documentation.

The Collins KWS-1 Video (2 hours, $39.95) This video is the perfect companion to the 75A-4 video for owners of the "Gold Dust Twins"! Butch Schartau (K0BS) shows you how to operate, maintain and repair your KWS-1. Watch as Butch goes theough the entire alignment and neutralization process, as well as showing you how to properly operate this famous transmitter.

The Collins 75A-4 Video (4 hours, $89.95) This video is four hours of great information on how to repair, maintain and restore this classic receiver. Butch Schartau (K0BS) guides you through all aspects of keeping your 75A-4 running like a top.

R-390A Video (7 hours, $109.95) At last it's available! Long awaited by serious "boatanchor" enthusiasts this is a great video all about the ultimate receiver. Now you will have the ultimate video to go along with it. R-390A expert Chuck Rippel (WA4HHG) covers an absolutely incredible array of information in this "heavy duty" video. This video looks at operation, the receiver modules, complete circuit description, front and rear panel details, complete mechanical and electrical alignment, PTO details, and performance evaluation, modifications, troubleshooting, and restoration. There is nothing like this video available today, at any price!

R390A Addendum Video ($49.95) Another 3 hours and 40 miutes of R-390A information from Chuck Rippel (WA4HHG).

SP-600JX Video (4 hours, $89.95) In this video, Chuck Rippel takes us through all aspects of SP-600-JX servicing including repairs, restoration and modifications. This video is a must for any new owner needing to work on the SP-600.

Purchase three or more videos and get 10% off of the retail price!
Add $5.95 each for the first two videos for shipping and handling in the USA, additional videos are shipped free.

Produced by Floyd Soo, W8RO (ex-KF8AT)

ER BOOKSTORE, PO BOX 242, BAILEY COLORADO, 80421-0242

Now Available on-line at WWW.ERMAG.COM

WANTED: Seeking unbuilt Heathkits, Knight kits. Gene Peroni, POB 7164, St. Davids, PA 19087. 610-293-2421

WANTED: Western Electric horns, speakers, amps, and mics. Barry Nadel, POB 29303, San Francisco, CA 94129. museumofsound@earthlink.net

WANTED: Manuals, manuals, and manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. 732-238-8964

WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, 631-360-9011, w2krm@optonline.net

WANTED: Info on xmtrs made by Clough-Brengle Co. Used by the CCC, in the mid to late 30's. Any help would be greatly appreciated. Ron Lawrence, KC4YOY, POB 3015, Matthews, NC 28106. 704-289-1166 hm, kc4yoy@trellis.net

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug-in coils) for restoration & ER articles. Ken Lakin, KD6B, 63140 Britta St., Ste. C106, Bend, OR 97701. 541-923-1013. klakin@aol.com

WANTED: Searching for RME CT-100 or 3R9 xmtrs and info about them. David Edsall, W1TDD, 156 Sunset Ave., Amherst, MA 01002. 413-549-0349, dedsall@crocker.com

WANTED:.Looking for information on radio and radar equipment aboard the Navy PB4Y-1. Warren, K1BOX, NC, 828-688-1922, k1box@arrl.net

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW3Oth, Oklahoma City, OK 73112. 405-525-3376, bglcc@aol.com

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

WANTED: Incarcerated ham seeks correspondence. w/others on mil (R-390's &backpacks) & tube radios. Also copies of postwar-90's surplus catalogs, backpack specs & photos. W.K. Smith, 44684-083, FCI Cumberland Unit A-1, POB 1000, Cumberland, MD 21501.

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: Books about flight simulators, aircraft instruments, panel meters, or tube computers. Chris Cross, POB 94, McConnell, IL 61050.

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. 501-318-1844, Fax 623-8783, www.boatanchor.com

WANTED: Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. 661-259-2011. FAX: 661-259-3830

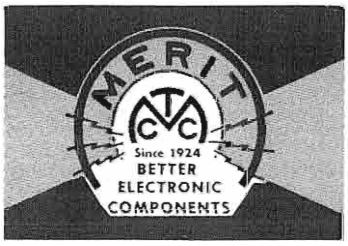
WANTED: JOHNSON RANGER CABS & or BEZELS. Or the whole cab set. Dee Almquist,W4PNT, 540-249-3161 (msg). Cell: 540-480-7179 Virginia. Willing to trade. w4pnt@highspeedlink.net

WANTED: Westinghouse MW-2 Transmitter (RF Unit, Modulator, Power Supply, Coils, Transformers, Parts). Will pickup anywhere. Gary, WA4ODY, Seabrook, TX. 281-291-7701, myctpab@earthlink.net

WANTED: Coils Forms for National FB-7 and preselector. Mike Sanders, 18169 Hwy 174, MT Vernon, MO 65712-9171 k0az@arrl.net

INFO WANTED: RCA/Radiomarine T-408/URT-12/USCG. Sam KF4TXQ PO Box 161 Dadeville, AL 36853-0161 stimber@lakemartin.net 256-825-7305

NOTICE: Expert HRO-500 alignment done with modern test equipment (HP, TEK, etc.) www.nortrex.net or nortrex@bigplanet.com. Ph. 650-529-9180



BACK ISSUES

All Electric Radio back issues are available at **$38.00 per year** (or any 12 issues), or **$3.75 for single** copies. Buy the entire run of Electric Radio from #1 for **$375,** a 55% discount over single issues. **Special deal on any four years (or any 48 issues): $100.00.** These prices *include* delivery by media mail in the USA. Foreign orders please inquire for shipping rates.

COMPENDIUMS

Collins 75A-4 Modification Compendium: All the factory modification bulletins from Collins Radio Co., and all the articles printed in CQ, Ham Radio, QST and ER over the last 45 years, 85 pages, **$20.00 plus $4.00 S&H.**

Collins S-Line, KWM-1, KWM-2, KWM-2A Service Modification Compendium: 260 pages, **$45.00 plus $5.00 S&H.**

Collins KWS-1, 32V series, and 75A series (A1 thru A-3): 42 pages, $15.00 plus **$4.00 S&H**

BOOKS

A. Atwater Kent, The Man, the Manufacturer and His Radios: This 108 page paperbound book describes Atwater Kent's biography, and his rise from a saleman and inventor of electrical equipment to become one of America's foremost radio manufacturers and a household name. There are historic photographs and diagrams on nearly every page, and color plates with vintage AK advertising, by Ralph Williams and John P. Wolkonowic. **-- $25.95 - 10% = $23.35**

A Pictorial History of Collins Amateur Radio Products: Jay Miller's (KK5IM) classic volume describes the amateur radio products produced by the Collins Radio Company. It has high-quality historic photographs on nearly every page, and the text is backed up by Miller's personal research. ---------- **$39.95 - 10% = $35.95**

A Family Affair, The R.L. Drake Story: The complete story of the R.L. Drake story, as told by John Loughmiller, KB9AT. 273 pages all about the history of the company, product descriptions, technical repair tips, and great shack photos make a must-have volume for Drake users and collectors. ---------- **29.95-10% = $26.95**

Arthur Collins, Radio Wizard: 394 pages by Ben Stearns tell Arthur Collins biography from his early years until retirement. Stearns is a professional journalist and was employed by Collins from 1962 to 1977. Many historic photographs and stories from former employees.
---------- **$18.95-10% = $17.05**

Miller's Collecting Science and Technology: 160 pages of high-quality color photographs from museum collections make this hardback volume an excellent introduction to this new collecting field. Written by Lindsay Sterling ---------- **$29.95-10% = $26.95**

Communications Receivers, The Vacuum Tube Era: 1932-1981: This is the classic136 page volume that has much invaluable information about vintage receivers in one handy volume. By Raymond S. Moore, 4th edition ---------- **$19.95-10% = $17.95**

NEW! **Crystal Clear: Crystal Sets, Crystal Detectors and Crystals:** A 282 page guide to crystal sets and related equipment made in the US from 1920 to 1955, by Maurice Sievers ---------- **$29.95 - 10% = $26.95**

Heathkit, A Guide to Amateur Radio Products: This is the new revised second edition including some 30 additional products, a tube chart, sales data, a separate ER article index, a completely new introduction, and a new section devoted to Heath's CB equipment. The book is 75 pages larger than the original. By Chuck Penson, WA7ZZW----------**$29.95-10% = $26.95**

Heath Nostalgia: Written by Terry Perdue, K8TP, an ex-Heath employee, this 124-page book is a great history of Heath and the Heathkits that we all remember. ------ **$14.95-10% = $13.45**
SPECIAL DEAL! Heath Nostalgia *and* Heathkit, The Early Years CD both by Terry Perdue
---------- **$27.00**
Heathkit, The Early Years CD: By Terry Perdue, high quality scans of documentation from Heath publications, plus a voice recording of Gene Fiebich. ----------**$18.95 - 10% = $17.05**
Hiram Percy Maxim: Published by Electric Radio, this is the complete biography of HPM, the famous founder of ARRL, by Alice Clink Schumacher, 216 pages. ----- **$19.95-10% = $17.95**
The Collector's Vacuum Tube Handbook: This is a 205 page book that is full of unique, hard-to-find information on tube types that were released before 1934. Includes company histories and good photos. ---------- **$25.95-10% = $23.35**
Radio-Craft: 50 Years of Radio by Gernsback: This is a high-quality reprint of the March 1938 edition of Radio-Craft magazine and is about the first 50 years of radio, and contains hundreds of vintage advertisements. ---------- **$15.95-10% = $14.35**
Radios by Hallicrafters : High-Quality photos, descriptions, approximate values, and short histories of nearly everything made by Hallicrafters. By Chuck Dachis -- **$29.95-10% = $26.95**
Radio Tubes and Boxes of the 1920s by Fathauer: If you appreciate the rare and colorful vacuum tubes and advertising art from the early days of radio then this great 104-page book is for you!
---------- **$26.95-10% = $24.95**
Shortwave Receivers Past and Present, Communications Receivers 1942-1997, 3rd edition:
NOTE: This volume is out of stock and out of print until 2005. Fred Osterman is working on the 4th edition. The ER bookstore will carry it when it becomes available.
The All-American Five Radio: Although this book is about classic American 5-tube broadcast receivers, it also contains a wealth of accurate information on vacuum tube receivers, proper troubleshooting, and alignment and is recommended for experienced repairmen and novices alike. 92 pages by Richard McWhorter ---------- **$21.95 - 10% = $19.75**
Transmitters, Exciters & Power Amplifiers : This is the companion volume to Moore's communication receiver book, by Raymond S. Moore, 144 pages. ---------- **$21.95-10% = $19.75**
Tube Lore : This is one of the best vacuum tube reference books ever published. All types of information is included, such as tube date code information and production history. 173 pages by Ludwell Sibley ---------- **$16.95-10% = $15.25**
Tube Testers and Classic Electronic Test Gear:Written by Alan Douglas, a retired engineer, the bookis packed full of valuable information about test equipment, including hard to find calibration data. 166 pages. ---------- **$29.95-10% = $23.35**
Vintage Anthology, Revised Edition: by Dave Ishmael, WA6VVL, is a revised and updated version of Dave's popular book. 209 pages of great information especially valuable to radio builders. **$21.95 - 10% = $19.75**
Zenith, The Glory Years, 1936 to 1945: 244 high-quality pages all about classic Zenith radios. Hundreds of high-quality color photos, and history from the Zenith company archives, never before available. If you like beautiful Zenith consoles, you will like this book! by Cones, Bryant, and Blakenship ---------- **$34.95 - 10% = $31.45**
Zenith, The Glory Years, 1936 to 1945, Illustrated Catalog and Database: A companion volume to "The Glory Years," this one has 151 pages of reproduced Zenith advertising and full serial number, chassis number, and production data that has never before been available in one reference manual, or to the public. 151 pages by Cones, Bryant, and Blankenship.
---------- **$29.95 - 10% = $26.95**

Four or more books are *shipped free* for US or Canadian orders!

Please add $4.00 shipping and handling for one book and $1.00 for each additional book

T-Shirts

The front displays the logo from the cover of ER (the tube logo, Electric Radio, and "celebrating a bygone era"). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio). The T-shirts are 100% cotton and come in Small, Large, X-Large, XX-Large. The color is slightly lighter than the cover of ER. $15.00 delivered, $16.00 for XXL.

Electric Radio, PO Box 242, Bailey, CO. 80421 720-924-0171 or now on-line at:
WWW.ERMAG.COM

Subscription Information

Published Monthly

Rates within the US:

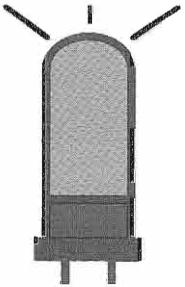
1st Class: $42 (mailed in envelope)
2nd Class: $32

Rates outside the US, by airmail only:

Canada : US $48
All other countries: US $60

The Electric Radio mailing date is posted monthly at www.ermag.com

Electric Radio
PO Box 242
Bailey, Colorado 80421-0242
Office Hours: 9:00 AM to 5:00 PM MT, Monday to Saturday
Subscriptions and renewals may now be purchased on-line at WWW.ERMAG.COM
Visa, Mastercard and American Express
Telephone: 720-924-0171
FAX Line: 303-838-3665
email: 1editor2@indra.com



Electric Radio
PO Box 242
Bailey CO
80421-0242

PERIODICAL

TO: