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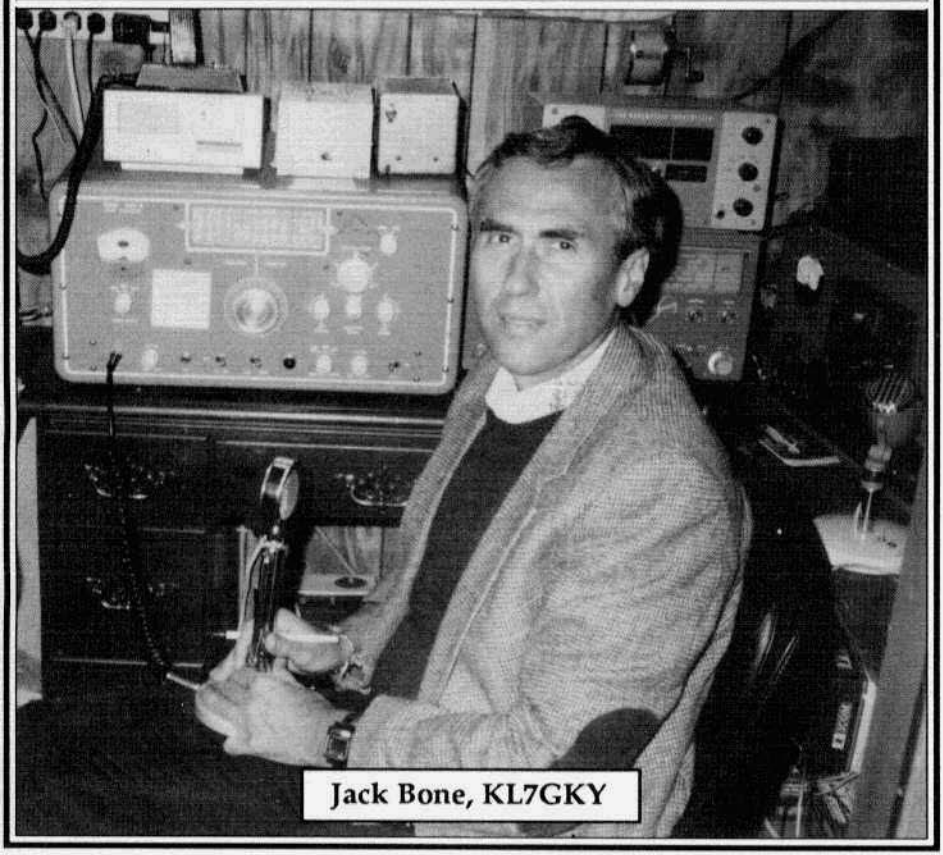
ELECTRIC RADIO

celebrating a bygone era

Number 22 February 1991



Jack Bone, KL7GKY

ELECTRIC RADIO

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The Purpose of Electric Radio

Electric Radio is published for amateur radio operators and others who appreciate vintage radio equipment. It is hoped that the magazine will stimulate the collecting of, and interest in, this type of equipment.The magazine will provide information regarding the modification,repair and building of equipment. We will also work towards a greater understanding of amplitude modulation and the problems this mode faces.

Electric Radio Solicits Material

We are constantly searching for good material for the magazine. We want articles on almost anything that pertains to the older amateur equipment or AM operation. From time to time we will also have articles and stories relevant to the C.W operator and the SWL. Good photos of ham shacks, home-brew equipment and AM operators (preferably in front of their equipment) are always needed. We also welcome suggestions for stories or information on unusual equipment. For additional information please write us or give us a call.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

It won't be long until the AM power issue is behind us... one way or the other. I think that if the Petitions for Reconsideration are denied we can consider the AM Kilowatt a thing of the past. And I find that very sad. It isn't the 3 dB that I will miss - we can make up for that with a better antenna- its the tradition. The AM Kilowatt has been around for a long time and it has always been a design standard for the 'ultimate transmitter'. I think most of us wouldn't feel quite so bad if the reasons for the power reduction were better. Somehow "leveling the playing field" just don't seem like worthy justification. We still have some time left before the FCC makes its final decision. Let's all start writing letters. For more information see Dale's update on page 3.

The next issue of ER will probably be the Collins KW-1 issue. I had thought that I might have it together for this issue but snags developed and it just couldn't happen. I think everyone will get something out of this special issue. Another project we're working on is an index of all back issues. I'm going to find that very useful myself as its getting impossible to remember which articles appeared in which issues. Speaking of back issues; since the beginning we've been pleasantly surprised with the number of these that we've been able to sell. At the moment issue #1 and #2 are being reprinted. They should be available by the time you receive this issue.

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Cover: Jack Bone, KL7GKY, Canyonville, Oregon, is one of the more active AM'ers in the Pacific Northwest. He says his favorite bands are 10 and 160 meters. Jack's former home was Sitka, Alaska.

Reflections Down the Feedline

by Fred Huntley, W6RNC
POB 478
Nevada City, CA 95959

KH6B of Hilo, Hawaii, sent in some good information about underground antennas with a copy of an article from the ARRL Antenna Compendium Volume I. This article by WØYBE of Boulder, Colo. is entitled, "Subsurface Antennas And The Amateur".

Underground antennas have been investigated as far back as 1912. In the 1950's and 1960's interest in these antennas peaked due to their usefulness in civil defense and military applications in connection with protection against nuclear military scenarios.

The article points out that there are two main reasons for underground antennas: 1) concealment and 2) physical protection again nuclear blast. These antennas perform for receiving and transmitting but actual antennas show 16 to 25 dB reduced efficiency as compared to an elevated dipole.

An interesting effect in these antennas is the physical length of resonance. An antenna lying flat on the ground surface is resonant at about 55% of the length of an elevated one. When buried 8 inches deep, the antenna length shortens another 10% with deeper antennas going as low as 25% in length.

The antenna article mostly covers the technical aspects. After wading through 5 pages, in over my head at times, I have come to the conclusion that the 160 meter SSB underground antenna signal claimed by a WA6 station (as related in this column September 1990) was too good to be true. But this incident stimulated a lot of interest and speculation. Amateur radio, these days, could certainly use a few more such ventures or misadventures to stir things up on the HF bands. In thinking about 'the unthinkable', 'the undoable' and 'the impossible', something new might be discovered. In former days, hams did things like running 200 watts into a single 807 and operating a mobile xmtr at 27 KW!

The Wall Street Journal of Monday, January 7, 1991, (page A16) contains an item of possible use by the AM community in our quest for re-establishment of the 1 KW power limit. It seems that the Federal Aviation Administration has proposed rules for FM broadcast antennas in order to limit electromagnetic interference with airport operations. "Chairman Alfred Sikes of the Federal Communications Commission warned the Transportation Secretary, Samuel Skinner, that the proposed air safety rules would be costly to the FCC and the communications industry WITHOUT PROVIDING ANY BENEFIT" (caps added). The National Association of Broadcasters also complains," If broadcasters have to reduce their power or modify their physical plant in other ways, they would probably lose some of their intended service areas, thereby reducing their potential audience."

The above information could be an opportunity for AM'ers to mount a campaign focused on Chairman Sikes, pointing out, using his own words, "Without providing any benefit", that the FCC radio amateur AM power limit regulation is also in this same category. What we should do is get 100 U.S. Congressmen to ask Mr. Sikes, "How about this?"•

AM Power Issue Update

by Dale Gagnon, KW1I
9 Dean Ave.
Bow, NH 03304

February, 1991

One year ago our lobbying with the ARRL Division Directors paid off with the passing of a motion at their board of directors meeting. The League had agreed to petition the FCC to protect our earned AM power privileges. This was a high point of visibility for AM operators. Later in the year we saw another high point when the FCC assigned rulemaking (RM) numbers to the AM petitions. Our highest point of all was reached when AM'ers submitted over 800 comments on these petitions within a 30 day period. Of course the later denial of the power petitions this fall was a discouragement but we should not lose hope. Two petitions for reconsideration are filed and many of you are writing your government officials.

Don Chester, K4KYV, editor of the AM Press Exchange, in the Nov./Dec. 1990 issue urges AM'ers to write the President directly with this problem. One of the most recent amateur FCC actions concerning modification of code test requirements for handicapped individuals is reported to have been expedited because of Presidential attention. Remember if you do write, be brief, give important facts, don't blame any specific personalities and offer to supply backup documents. See Don's sample letter and my last report in December ER for some points to make in your letters.

The war in the gulf has suggested an additional point that government officials may be sensitive to; communication facilities are a potential terrorist target. It would be all to easy to isolate whole population centers by taking out the handful of radio and broadcast stations. The presence of amateur AM kilowatt transmitters across this country actually represents a national asset and reserve of communications equipment that could be pressed into service in a crisis after the loss of local broadcast facilities. Requisitioned amateur gear played an important part in the defense effort early in WW II and it could again.

If your U.S. government representatives are willing to help but you need assistance with planning document preparation and backup information please contact Electric Radio.

The letter that follows was written to FCC Commissioner, Ervin Duggan, by Rick Miczak, K8MLV/Ø. It also contains some good ideas that we might incorporate in our own letters.

Dear Commissioner Duggan:

Since the age of 15, I have been an active licensed radio amateur, devoted primarily to AM operation. On behalf of the entire AM community of the Amateur Radio Service, I extend my heartiest congratulations on your appointment to the Commission.

I also enthusiastically applaud your call for a major reform of the FCC power structure, which prompted me to write this letter.

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ELECTRIC RADIO IN UNIFORM

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

"The Number 19 Mark II Transceiver"

When Americans think about military equipment (radios or anything else), we take it for granted that only the finest quality is acceptable. But what would happen if a military radio were designed to be only 'good enough'? Suppose, for example, that a military transceiver was built with the parts and methods of a medium price ham set of the 1940's?

Such a transceiver is the No. 19 Mk. II, designed in England for use by British Empire forces, but also manufactured in the United States... and by a quirk of fate, dumped (brand new) on our surplus market by the many thousands after the war.

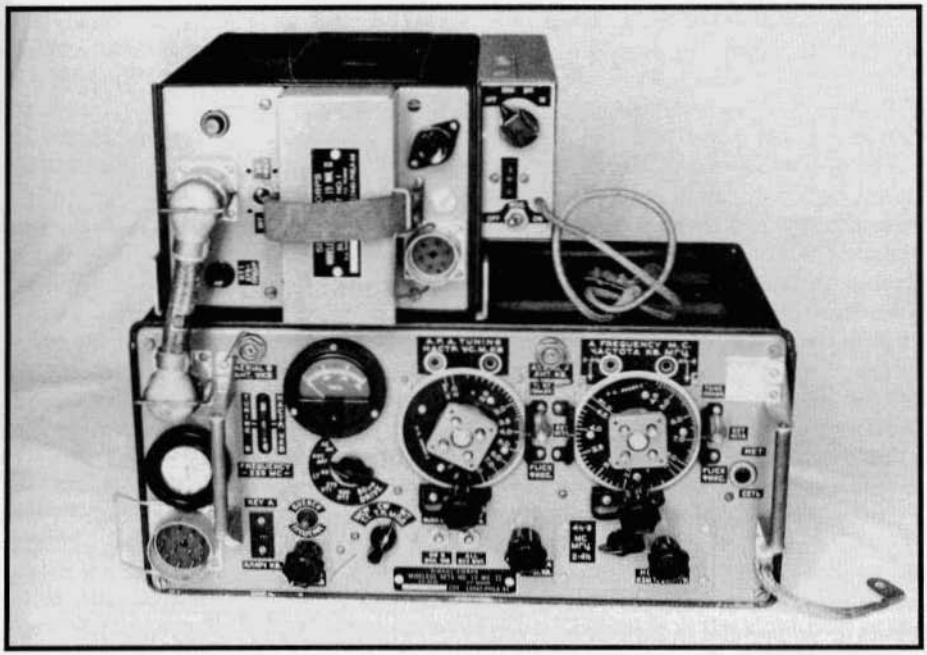
In Uniform doesn't generally 'do' foreign sets but one built in the U.S. and familiar to hams seems entitled to an exception, especially when it has as much to teach us as this one. A few of the questions we will be asking are: Can a cheap military radio be any good? Does 'cheap' mean 'not innovative', 'poorly designed' or 'hard to work on'? And what, for goodness sake, are those strange panel markings?

Overview

The No. 19 is a vehicular radio, used in many types of tanks but also installed in trucks, armored personnel carriers, self-propelled artillery and other types of equipment. Its full name is "Wireless Set Number 19 Mark II" -- British military radio nomenclature which tells you that this is the 19th wireless set (radio) to be produced and the second version of that set. It consists of a HF transceiver covering 2 to 8 Mcs in two bands (the 'A' set), a VHF transceiver covering roughly 230-240 Mcs (the 'B' set) and an intercom. The HF set puts out about 3-4 watts on AM and 10-20 watts CW; the VHF set under 1 watt. The HF set can be used on AM, MCW, or CW; the VHF set is AM only. Both transceivers are directly calibrated in frequency and both have a single knob to set transmitter and receiver frequencies.

In tanks, the VHF set was used to communicate with other tanks of the same platoon (range about 1000 yards) and the HF set was used to reach other platoons and units at higher levels. The intercom was used to allow crew members to talk to each other -- the noise level inside a tank on the move is much too high to allow unassisted talk! A 'transportable' version powered by lead-acid batteries and installed on a wheeled cart called a 'baby carriage' was also used.

The set requires either 12 volt or (with a center tapped supply) 24 volt power. A single dynamotor in a separate power supply delivers high voltage for both transmitter and receiver. Several types of control boxes were used, depending on the vehicle in which the set was installed. The control boxes have mic and headphone connections, switches to select the 'A' or 'B' set or the intercom, call buttons and buzzers for the intercom,



The No. 19 Mk. II transceiver. The two large dials on the right are for the HF set and the VHF set controls are on the left. The dynamotor power supply is the box at the top left; the accessory crystal calibrator mounted on the right side of the power supply. A more common configuration had the power supply and transceiver side-by-side with the supply on the left.

and lamps to show the status of the radio. An external crystal calibrator was supplied as an accessory.

Like other British wartime sets, the No. 19 is used with a dynamic microphone, much superior to the carbon mics used by our forces until the 1960's PRC-25 and VRC-12 equipments.

The set is a compact 8" x 17" x 12" (H x W x D) and weighs 69 pounds with dynamotor but less (heavy) cabling, control boxes, headphones, etc.

History

From the general design it seems that the original No. 19 (Mk. I) was finished in the mid 30's; the tubes used in the Mk. II suggest that it dates from 1938, with minor improvements thereafter. The Mk. II (and the improved Mk. III, introduced about 1943) served wherever British forces fought during WW II. It was also used by Canada and in other parts of the British Empire. Most of those found in the U.S. today are from stocks of sets built by Zenith and RCA in 1943 (to the British designs) which were intended for shipment to Russia as part of the Lend-Lease program; this is the reason the panel markings are in both English and Russian. But problems in the alliance with Russia, the nearly impossible sea route to Russia, and the sudden end of the war, kept most here, to be supplied to other countries and sold as surplus to U.S. hams.

The No. 19 served in the Canadian army until the early 60's.

Design

The design of the No. 19 may shock the sensabilities of those used to our radios. If your children are under 13 and trained on U.S. military sets, you may

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wish to read another article until they are in bed.

The set is built on a flat steel chassis with folded sides and riveted corners. The front panel is steel stamping.

The case is made of spot welded steel stampings with raised sections for increased stiffness. The set is barely splash resistant -- there are clearance holes around the tuning shafts, none of the connectors is sealed, and there's a 1/32" crack between the panel and the case.

Even the two dial drives (HF frequency and HF antenna tuning) are made mostly of stampings. Both dials are plates with painted scales; they connect directly to the capacitor shafts. The knob shafts have a tapered groove which just fits the edge of the dial plate; they are spring-loaded so the shaft drives the plate by friction when the knob is turned. This is the 'pinch drive' popular in simpler ham sets before the war. One revolution of the A FREQUENCY knob covers about 400 kcs on 80 meters so tuning takes a steady hand.

A lever to the right of each dial controls a preset function called 'FLICK' by the British. When the lever is up, FLICK is disengaged and the set is tuned normally. In the 3 o'clock position, coin-slotted screws on the dial hub can be loosened to set one or both of two FLICK frequencies, referred to as RED and BLUE; this positions a notched plate on the capacitor shaft.

With the lever turned to 6 o'clock, the tuning knob is disengaged by lifting the pinch drive from the dial rim; to go to a previously set FLICK frequency you turn the square hub of each dial until a lug drops into the notch on one of the plates. When the lug drops, the dial is locked and a white flag shows behind the window with the corresponding (red or blue) circle.

Panel markings are luminous but not radioactive; they glow only after exposure to light.

The electronic design is equally uncomplicated but it has several features of great interest. The 'A FREQUENCY M.C.' control tunes both transmitter exciter and receiver. This control covers the range in bands of 2-4.5 Mcs and 4.5-8 Mcs.

The 'A P.A. TUNING' control tunes the P.A. tank but the receiver input is also taken from this circuit. This gives added selectivity at the receiver input and allows approximate tune-up of the transmitter without radiating. This control covers the range 2-8 Mcs without bandswitching. Both controls turn clockwise to increase frequency which is good 'human factors'.

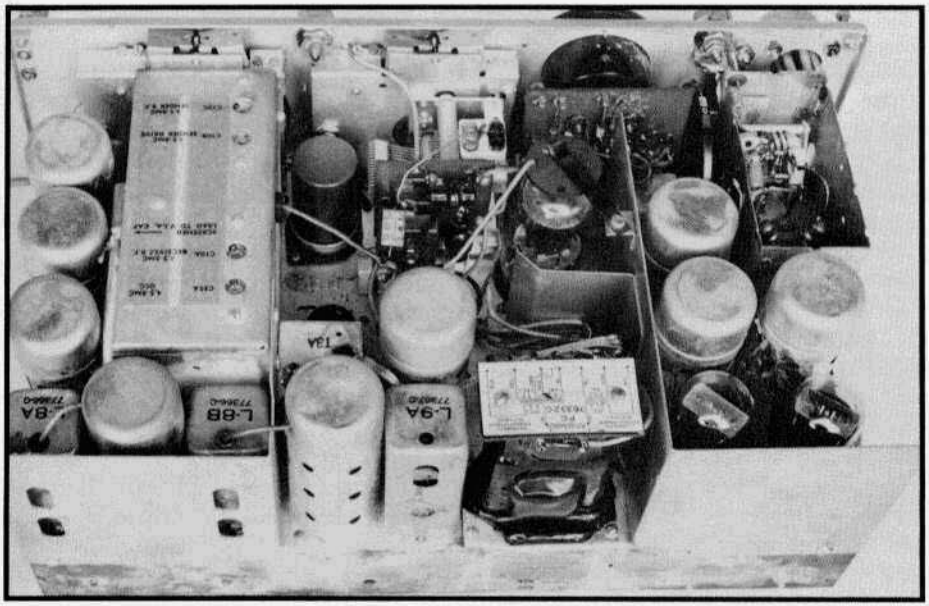
The receiver uses six tubes: 6K7 RF, 6K8 local oscillator/mixer, two 6K7 IF's, a 6B8 detector and audio stage, and a second 6K8 (triode section) BFO.

The receiver IF is 465 kcs. There is a front panel control for the BFO frequency. There's no RF gain control, no way to turn off AVC when receiving CW, no crystal filter, and no noise limiter.

On transmit, the receiver local oscillator feeds the hexode section of the second 6K8. The BFO operates too (with the front panel control disabled); it mixes with the local oscillator signal at the hexode plate and a tuned circuit there selects the channel frequency. This signal is amplified by an EF50 pentode and used to drive the 807 PA. The PA is control grid modulated by the 6B8 receiver audio amplifier which is reconnected by the t/r relay to do this job.

To get 100% modulation, the PA must be biased to 25% of full output when there is no modulation. A 6H6 rectifies part of the 807 grid drive and feeds a negative voltage back to the grid of the EF50 to stabilize the drive and thus the grid leak bias.

HF set output goes by a coaxial cable to a series loading coil made up of two coils mounted so that the inner coil can be rotated to either add or subtract from



Rear view of the No. 19 with case removed. The VHF set is at the right next to the panel; the intercom is behind the VHF set. The HF transmitter final is next to panel at the center; the receiver is at the left. The shield box covers the main tuning condenser.

the field of the outer coil. This 'variometer' allows smooth control of the series inductance used to resonate a whip antenna. Depending on the installation either one or two whips between four and 16 feet were used; eight feet is the recommended limit for vehicles in motion.

There's no way to adjust the coupling to the PA tank so the antenna must have an impedance of around 25 ohms. The manual recommends laying 1/2 wavelength ground radials and attaching a 1/2 wavelength piece of wire to the top of the vehicle antenna when longer range is required from a stationary vehicle. Tests showed that ranges of up to 180 miles could be obtained between No. 19 sets with such antennas.

The VHF set consists of a type E1148 triode operating as a superregenerative detector on receive and a modulated oscillator on transmit. A 6K7 oscillator provides quench voltage for the detector. A 6K7-6V6 audio amplifier serves as a modulator on transmit and an AF amplifier on receive. This is an improved version of the two-tube VHF transceiver familiar to hams from the 30's and discussed when we covered the BC-222 (E. R., November 1990). The VHF set is coupled by coax to its own 1/4 wave whip antenna.

The front panel meter allows checking the supply voltage and both 275 and 500 volt HV lines. In 'DRIVE' position it reads PA grid drive voltage. In 'AVC' position, the meter reads the cathode current of the AVC-controlled first IF stage; a strong signal makes the current decrease giving the effect of a backward-reading S-meter.

The 'AE' meter switch position reads HF antenna (AErial) current. This is not done with a thermocouple as in U.S. sets of the period. Instead, a pair of rectifiers in the variometer sample the current in the antenna lead and feed a DC current back down the coax to the transmitter

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where it is picked off through a choke to operate the meter.

Tune up could hardly be easier. The 'NET' button on the panel turns on the BFO so you can zero beat the other station. You then key the set and adjust the PA TUNING and variometer for the maximum AE reading.

The parts in this set are good quality ham set items -- paper capacitors in lacquer sealed aluminum cans, non-sealed IF cans, and open frame transformers sealed with tar. Most coil forms are varnished paper; most tube sockets are molded bakelite. The HF oscillator coils and the two 6K8 sockets are ceramic. The RF coils in both transmitter and receiver have glued-in ferrite cores, giving Q's of 150-200. Trimmer capacitors are Erie rotary ceramic types having negative temperature coefficients. The tuning capacitors have ceramic insulation.

The multi pin connectors on the No. 19 -- set to power supply, power supply to source, and set to control boxes -- are about the lowest-cost design you can imagine. The pins are stamped and folded, much like a cotter pin with a flattened eye. Insulation is paper-base phenolic sheet (like a wafer type tube socket) or molded bakelite. The connector shells are thin steel stampings held together with clips. Plugs are kept in their sockets by a spring wire bail across the back. The result is a connector which is adequate -- though not as strong or long-lasting -- at perhaps 1/4 the cost of the 'AN' and other types of connectors used in our sets.

Point to point wiring is used and wires which go through the chassis go through smooth-edged holes without gromets. But the larger tubular and mica caps are firmly mounted with clips or screws; if your No. 19 works when you start the engine, my guess is it will still be in one piece after your Crusader tank chews up a couple hundred miles of North African desert.

Access for the most commonly serviced parts is good but a few parts underneath can be reached only by removing several others.

On The Air With The No. 19 Mk. II

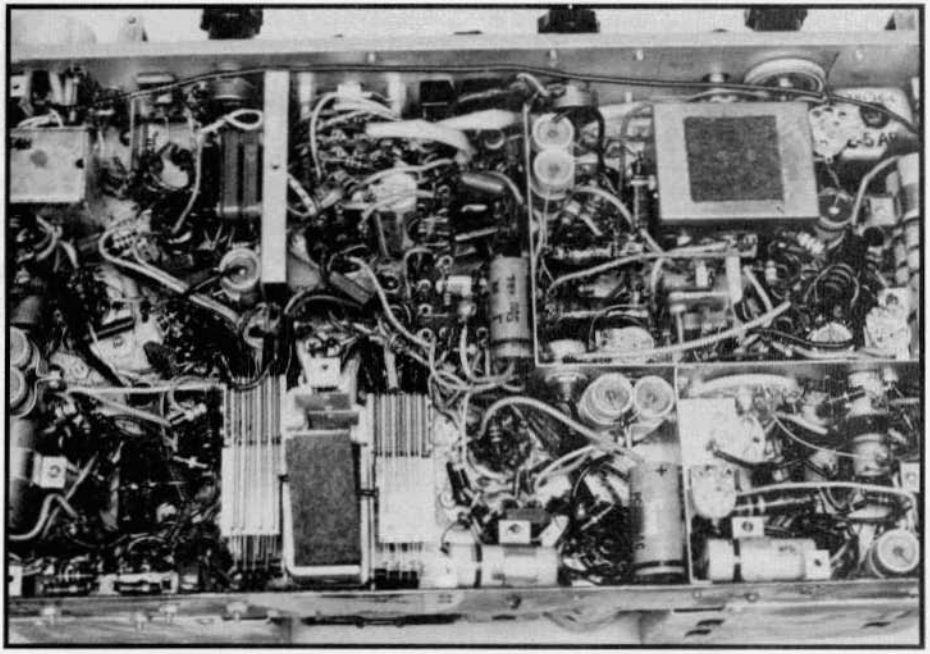
My No. 19 arrived in filthy condition, but under the crud was a near-new radio. One of the electrolytic capacitors in the dynamotor power supply was shorted and the other blew the HV fuse repeatedly, until I re-formed it with a bench supply. The set had a couple of bad paper caps; several tubes were either bad at the start or failed during testing. A leaky mica coupling cap from the plate of the second 6K8 to the EF50 grid caused transmitter output to vary irregularly while declining slowly from 3 watts to 1 watt when the set was keyed.

Rather than use the bulky 'original' control boxes, headphones, and mic I built up a small adapter which plugs into the control box connector and which takes regular PL-55 and PL-68 phone and mic connectors. I included an RF gain control, wiring it through spare pins on the connector.

With grid modulated sets, antenna loading must be right to get good linearity with full modulation. I built the matching coil shown in E.R. for April, 1990, for this set, including in it the necessary rectifier circuit to operate the panel meter on the 'AE' position.

The oscillator could not be tracked to the dial with the trimmer capacitors and index mark adjustments provided. I put a shorted turn of wire on the end of each coil and used it to adjust the inductance for perfect tracking. The same trick was needed on some of the exciter circuit coils to get enough grid drive across the bands.

Drift of my No. 19 after four minutes warmup totaled -1097 cps at 3885 kcs during 30 minutes of four minutes receive/one minute transmit cycling. During 10 more minutes key down, drift was an additional -165 cps. This is the worst



Underside of the No. 19 Mk II with the bottom plate removed.

warm up stability of any early WW-II transmitter tested so far.

At 3885 kcs, the actual transmit frequency is about 800 cps higher than the zero-beat frequency, most likely because of change in the local oscillator frequency when going to transmit. Detuning the antenna circuit by enough to reduce power output by half changed the frequency by about 25 cps, showing the excellent isolation between the oscillator and P.A.

The receiver 6db bandwidth is about 6 kcs -- narrower than any other early transceiver. Its selectivity and general 'good manners' make the No. 19 an excellent choice for the ham who wants to try a low power military set.

Conclusions

There's a whole lot to like in the No. 19. Single knob tuning for both transmitter and receiver means fewer operator errors, especially when your operator also loads the gun. (The first U.S. HF military set to have single knob tuning was the Collins ARC-2, delivered in 1944.) Building all the communications equipment for a vehicle into one package makes for a very simple installation.

The easy tune-up is commendable; so is the fact that enough voltages and currents are metered to allow troubleshooting any problem the operator might be able to fix.

The No. 19's panel markings are clear and they are large enough to read under less-than-perfect conditions; few of our radios were or are today -- so clearly marked. The preset (FLICK) arrangements are not perfect -- you must take care to stop on the right (red or blue) frequency and to set the bandswitch and readjust the variometer -- but they work well enough to be helpful.

There are a bare minimum of expensive 'just for this radio' parts and no 'tricky' parts or assemblies. This set could be built without retooling by any company making ham gear or receivers for the consumer market; this is handy if

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your country finds itself unexpectedly at war and needing replacement gear.

Warm-up drift is somewhat high but in this application the set would be on continuously and an operator would be there to retune if necessary.

The one real mistake is the poor sealing. Even if you decide your vehicular radio does not have to operate while submerged, it will be exposed to dripping water (rain through hatches, wet clothing) and dust. (They say that in the Saudi desert the dust will blow into a concrete block building through the pores in the blocks!) Really tight sealing would have been expensive but it could have been improved a lot at little cost.

Except for the sealing, the No. 19 is superior to any of our wartime small ground HF radios -- the designers really understood what the radio was for and how it would be used. It gets an A+ grade for cost-conscious design. The manual is outstanding -- far ahead of any of our manuals of that period.

The No. 19 represents both an old approach (single channel HF) to vehicular communications and cost-conscious design. U.S. tanks and other combat vehicles (on the other hand) got ten-channel crystal controlled FM radios (5CR-508 series) by 1943. Though more costly, this new approach paid off -- the superior coordination it made possible probably contributed as much to ending the war in Europe quickly as our use of radar.

As a new approach matures, costs should tumble but until recently that rarely happened with our small military sets. For example the SCR-300, PRC-8/9/10, and PRC-25/77 (E.R., September 1990) manpack FM sets are three generations of the same basic idea yet only the SCR-300 is as cost-conscious as the No. 19.

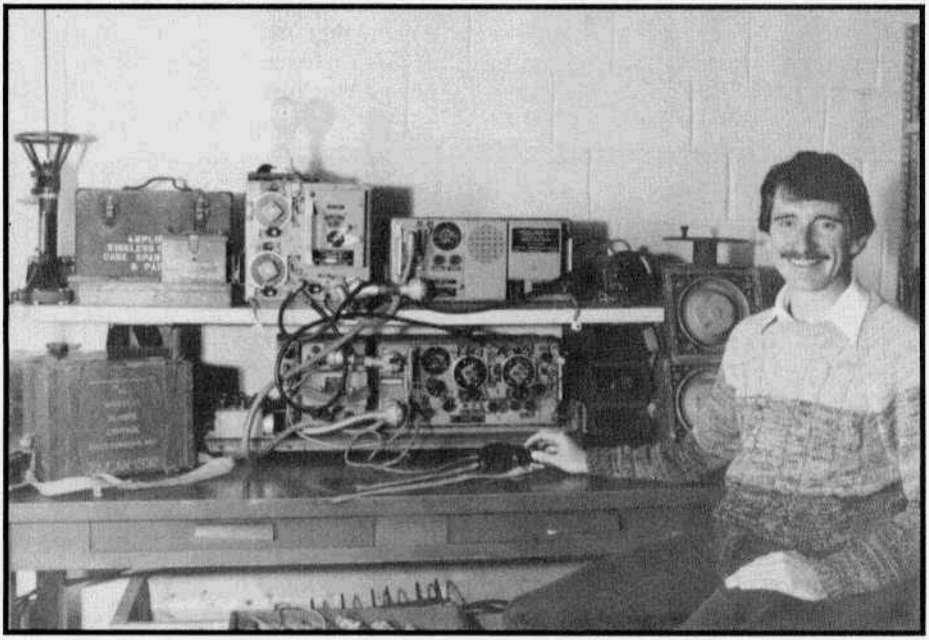
The debate between old and new methods and its parallel 'low cost' versus `only the finest' is as old as war itself. When the time comes to replace equipment lost in Operation Desert Storm we'll be visiting it again. The good news is our next generation of small radios is supposed to be cost controlled. The PRC-119 frequency hopping manpack set which will replace the PRC-77 was expected (in 1980) to cost $1400 -- less than the PRC-77 at that time. The bad news is the latest generation of planes and some other items is so much more expensive than the earlier ones that unless losses are very small we won't be able to afford 100% modern replacements even if our armed forces are downsized as planned.

A Military Radio Round Table

It's happening! Each Saturday at 0500 EST on or near 3885 kcs a group of us gets together to talk about and use classic military sets. On December 28th, we had ten check-ins: Chris, AJ1G, running both his TCS and No. 19 Mk. II setups (he runs them through an SB-200 to get 170 watts output); Warren, NY2H, with an R-392; Steve, KJ8L, (whose four-watt GRC-9 was booming in from Marietta, OH, with help from a full wave horizontal loop); Pete, WB2JWU, with a restored SCR-274N setup (BC-454 receiver, BC-696 transmitter,accessories);Andy, WA4KCY, on an ART-I 3, (looking for a BC-348 to complete a bomber 'liaison' installation); Steve, WA2O, on a TS-430 (but he has a TCS setup and plans to have it on the air soon); Mike, N4FS, with another No. 19 Mk.II ('barefoot' but loud here from 50 miles away!); Jody, WD0AJP,on a T-368/R-390A (= GRC-26); and Pete, W1VZR, with a non-military set. I was running the ARC-38 (E.R., October 1990).

That must surely be a world's record for the number of different military sets in one QSO and at least a tie for the amount of fun in one hour! •

No. 19 accessories. Clockwise from lower right: microphone; key; spare parts box containing fuses, dynamotor brushes, lamps, and space for the key; spare tubes box; headphones. A typical control box is at the center.



Chris Bisallion, VE3CBK, with his Wireless Set No. 19 Mark II, complete with the linear amplifier and many accessories

Collins 75A-4 Survey .... coming up

The Collins 75A-4 receiver was the last of a series that began with the 75A designed by Roy Olson just after WW II. It's probably the most popular receiver in use today by vintage enthusiasts and there were a bunch of them manufactured - 5 to 6 thousand I'm told. Throughout the production years there were modifications made to the circuitry and some subtle cosmetic changes.

There seems to be a great deal of interest amongst owners and others (I fall into the 'others' category) regarding the statistics of these modifications and changes. Basically when (at what serial number and date) did the changes occur and if they did not continue to the end of the production run when did they stop; that sort of thing. And how many were actually manufactured? I wonder if a survey of owners would give us any of this information?

The photo below was sent to me by Skip McElfresh, VE6WHM, of Calgary, Alberta, Canada. In the photo, note the grey hammertone 75A-4. Skip says it was manufactured by Collins of Canada. I wonder how many of those are around? I'm told that all 75A-4s after serial number 5000 were manufactured in Canada. Is that true?

I'm going to need help with this survey because I'm really not very knowledgeable about this receiver. If you have a question that you think should be on the survey please let me know. Next month we'll print the survey and the following month or the month after that we'll print the results. Depending on the response to this survey, we may make this sort of thing a regular feature of ER. I think it has the potential to be very interesting. Thanks to Bill Smitherman, KD4AF, who 'infected' me with his curiosity regarding the 75A-4.

By the way; I would like to hear from anyone that owns a 75A receiver - NOT A 75A-1. We have all seen the ads (and I have a brochure) but was the 75A actually produced? **N6CSW/Ø**

Dear ER

I have been a ham for 2 years now and I'm one of the younger folks (27, married in June and still apartment bound) whose main interest is operating AM. My VFO sits on 7295 or 3885 most of the time.

The Valiant and HQ-160 as well as some of the microphones are from my grandfather's old station - Henry Heidtmann Sr., he was W2DZO, now N2ECQ. I am very proud that I have been able to bring his equipment back to the airwaves. If you can fit my picture into one of your future magazines, you can help me say,"Thanks Grandpa".
73 Henry Heidtmann III, N4VHK

P.S. The DX-100 was the one mentioned in a previous issue of ER. I bought it at Shelby, NC, and the writer of the article mentioned that. I was the one who bought it for $75 - and it's a great rig. Also notice in the picture that antique mic stand that Grandpa used - it's solid brass!

Update That Super-Pro

Part Three

by Bill Kleronomos, KDØHG
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Lyons, CO 80540

Allow me to quote some comments about receiver sensitivity found in several texts: "Experience has shown that about an 8 dB noise figure is adequate under most circumstances below 30 Mhz"(Editor's and Engineer's Radio Handbook, 20th edition). "Noise figures of 2 to 4 dB are of little or no use below 30 Mhz" (ARRL Handbook, 53rd edition). "Atmospheric noise is the principal limitation of radio service below 30 Mhz" (Reference Data for Radio Engineers, 4th edition).

I realize that I'm sticking my neck out on this, but I don't agree with these conclusions. Yes, of course, on 75 and 160 meters during the summer, the noise can be so outrageous that one can hardly hear any signals but extremely strong ones, but what about the same bands in the dead of winter on 20, 15 and 10?

I've discussed this topic with several other hams and here's the gist of our mutual conclusions:

1.The internal noise of your receiver adds to what comes in from the antenna; it is not necessarily masked by atmospheric noise. Assume a receiver with a 10 dB noise figure receiving another 15 dB of atmospheric noise; that totals 25 dB. Assume a second receiver with a 1 dB noise figure with the same antenna. Would not the total noise be 16 and not 25 dB as in the first case? If you have any comments on this send them to ER.

2. Receiver noise tends to sound like a white noise "hiss", blanking everything. Atmospheric noise sounds like an intermittent pulse; lightning crashes, crackles, pops etc. One can use the excellent natural filters and error correction in our brains and ears to copy signals through atmospheric noise - we do it all the time. What good does it do, therefore, to say it's ok to add the masking effect of white noise from a poor noise figure to the effects of atmospheric noise and say it's of no importance?

3. Our HF bands can be extremely quiet at certain times of the year. At those times almost any receiver noise at all will degrade your ability to pull the weak ones out of the mud, say, on the low end of 20 meters.

4. A low noise figure is invaluable on any band when receiving on antennas that are naturally quiet, such as a beverage or a loop.

The point I'm trying to make is that working to achieve a good noise figure is worthwhile and not a waste of time as implied in the communications literature. Let's talk about doing this with the SP-600 and other receivers.

The subject of receiver noise is covered rather thoroughly in a number of amateur and other technical publications, and I won't get into great detail on the theoretical aspects of the subject here. I do want to offer a hands-on approach to the reduction of noise instead.

The key element in improving the noise figure of any receiver is the first RF amplifier. If it has enough gain to override the noise of the succeeding RF amplifier or mixer, then it alone will determine the noise figure of the receiver. It is possible to calculate how noisy a tube will be as a mixer or amplifier if one knows the transconductance and the

various DC currents drawn by the tube. This information is easily obtainable from tube manuals. When these values are put into a formula, a number referred to as 'equivalent noise resistance' is derived. This number is the value of an imaginary resistor placed in the grid circuit of a perfectly noiseless tube that will degrade the performance of the tube with it's thermal agitation noise. The key thing to remember is that the lower the equivalent noise resistance the better.

As a rule of thumb when looking at the tube data sheets, you want high transconductance, low input capacitance, low screen current and high plate resistance. Note that low plate resistance will load the tube's tuned circuits, and unfortunately, the higher the transconductance the lower the plate resistance generally gets. Triodes, in particular, can have atrociously low plate resistance. Another factor is that the plate voltage affects plate resistance. All these factors go into play when selecting an RF amplifier tube, so one that has great specs on paper might perform poorly in a given receiver due to the plate voltage or LC ratio of the tuned circuits. It also helps if the pin out is correct to mate the tube socket wiring!

Ray Osterwald, NØDMS, has written a computer program that greatly facilitates characterizing triodes and pentodes for noise figure. All one needs do is enter the information from a tube's data sheet, specifiy mixer or amplifier and the equivalent noise resistance is quickly displayed. Table 1 lists the calculated noise resistances for a number of tubes.[1]

As suspected, the noise performance of the 6BA6 as a front end amplifier is rather poor compared to a number of other tubes, being over 3.5 K. By comparison, the 6DC6 has about half the equivalent noise. It is no surprise that the 6DC6 is used as the first RF amplifier in the Collins S-Line, R-390 and other receivers with very good performance. Even better looking on paper are the 6DK6, 6GM6, 6JK6 and at the top (or bottom) of the heap is the 6GU5 with about 1/20th the value of the stock 6BA6. All of these tubes were designed in the late 50's and 60's as RF and IF amplifiers in television receivers. The 6GU5, developed in the 60's, probably represents the highest level in mass produced RF pentode designs, as it was well into the era of the Nuvistor and FET by the time it was developed. It was considered obsolete almost as soon as it was designed!

It turns out that the stock plate, screen and AGC voltages in the SP-600, as well as the socket wiring are compatible with all these tube types, so I tried a number of them and did a minor realignment of the front end as required. Using an IFR-1200-S signal generator, Kay step attenuator and looking at the demodulated output of the receiver, I made the measurements in Table 2.

Clearly, a number of tubes provide significantly better performance in the SP-600 than the stock 6BA6. The methods I used for the above tests, by the way, are the same as those used in the ARRL lab for their product reviews.

To put things into perspective, a noise floor at 14 MHz of -141 is astoundingly good. The December 1990 QST reviews the Icom IC-765, a $3500 transceiver. The ARRL lab measured a noise floor of -142 dBm and a SSB/CW sensitivity of -125.5 dBm at 14 MHz. The noise floor of other receivers, for comparison, is as follows: TS-930S, -133 dBm; TS-940S, -135 dBm; KWM-380, -126 dBm; Drake TR-7, -135 dBm.[3] One big help in the favor of this big old Hammarlund is the lack of a synthesizer with it's noise that degrades receiver performance.

What about dynamic range and overload point? For this test I used a nearby 50 KW AM broadcast station on 1510 Khz that puts a 100,000 uV signal into the receiver and the Kay attenuator. I tuned in a weak station on 1530 Khz which was being completely blocked and cross-

continued next page

Update That Super-Pro from previous page
modulated by the station on 1510. I then switched in attenuation until the cross-modulation and any blocking disappeared and called it the point of maximum signal handling capability of the receiver, or overload point (blocking). The difference between this point and the noise floor was 105 dB, therefore, one could call this the dynamic range under the conditions of the test. This is also not a bad figure.

One the air tests were done last. On a quiet evening I listened to the bottom end of the 20 meter CW band. Time and time again I'd hear a weak station in a 'good' DX country calling CQ DX, over and over, with no response. Eventually, one guy would answer and work him, then all hell would break loose with bigtime pile-ups. Had I wanted to work the DX station, I could have done so first with no competition. I truly believe that the 10 dB improvement in the noise floor of the modified SP-600 over the majority of modern synthesized receivers allowed me to clearly hear signals that few others could. Over the past month of DXing, I feel that having a virtually noiseless HF receiver gives one a clear advantage for DXing and pulling those weak ones out of the mud, even on AM and SSB.

Before you run out and buy a bunch of tubes, a few more points. Arm yourself with an old RCA or GE tube manual, and look at all the parameters of a given tube - as with all things in life, there are tradeoffs. First, most of the ultra-low-noise tubes I've mentioned are sharp-cutoff pentodes. Sharp cutoff pentodes can be somewhat worse with respect to cross-modulation and overload when used in an AGC controlled stage than a remote-cutoff or semi-remote cutoff type. Make sure that you haven't degraded your receiver's strong signal handling performance by a tube swap. Another complication - a certain type of tube made by one manufacturer may check out to be a sharp cutoff type, but one made by someone else may act more like a semi-remote-cutoff type! I found, for example, that 6DC6s made by Westinghouse have a less sharp cutoff characteristic than those made by RCA. The 6GU5, listed as a sharp cutoff type in the manuals, looks more like a semi-remote cutoff type when it's curve is plotted.

Also note that such factors such as bias, screen and plate voltage affect whether a particular tube will provide an improvement in a given receiver. It was difficult, for example, to find ANY tube, regardless of expected low noise, that would improve the performance of the S-Line receiver, which uses a low plate voltage. On the other hand, any one of a number of tube types could produce a 3 dB or better S/N improvement in the Super-Pro, equivalent to having the guy at the other end double his power. It may even be necessary to alter the value of an AGC or grid bias resistor to make a tube work well in a particular receiver. But hey, isn't that what ham radio ought to be all about? As Art Collins said," A ham shack ought to be a place of discovery and experimentation".

So, go ahead and experiment. I am tremendously pleased with the performance of my "new-improved" 1990 model SP-600JX. Perhaps in another 20 years they'll be selling solid state receivers with equivalent performance....°

HEY, WHAT A COINCIDENCE - - - THAT'S WHAT I COLLECT, TOO!

1. Ray Osterwald,NØDMS, can provide a diskette containing this software at no charge if you send a formatted disc and return postage to him c/o 969 Broadway, Denver, CO 80203.
2. Interestingly, no tubes I tried worked any better in the S-Line. I think that the stock 6DC6 is about the best choice at the low plate voltage Collins elected to use. It's tough to re-engineer Collins equipment for better performance!
3. These receiver specs are from "Low Band DXing", published by ARRL. An absolutely excellent book and well worth having in your library.

TABLE 1 EQUIVALENT NOISE RESISTANCE OF SELECTED TUBES USED AS AMPLIFIERS

OCTAL	Equivalent Noise Resistance	Transconductance
6AC7	716 ohms	9000
6SK7	11,000 ohms	2000
6SG7	3,100 ohms	4700
MINIATURE TUBES		
6BA6	3551 ohms	4400
6AG5	1650 ohms	5000
6DC6	1828 "	5500
6DE6	1278 "	8000
6DK6	794 "	9800
6GM6	478 "	13,000
6GU5	173 "	15,500
6JK6	280 "	18,000

TABLE 2

TUBE TYPE	SIGNAL NEEDED FOR 10 dB S/N - CW/SSB	NOISE FLOOR
6BA6	-115 dBm (.4 uV)	N/A
6DC6	-118 dBm (.26 uV)	N/A
6GM6	-120 dBm (.2 uV)	N/A
6GU5	-124 dBm (.15 uV)	-141 dBm

Collecting/Repair/Restoration...Tips

Using R-390A filters in the 75A-4

Having just read the latest issue and noting lots of people looking for a 6 khz filter for the Collins 75A-4, I decided to share my experiences with a "poor man's filter" for this receiver. I've only been into boat anchors for a few months and this was my first 'modification'. An old-timer told me I could get a 4 khz filter for the R-390A from Fair Radio for $35 and it would work just fine. Sure enough, it did.

The Collins R-390A mechanical filter doesn't plug in as those for the 75A-4 do, and I couldn't find a 9 pin plug. Therefore, I soldered some brads of the right size to the filter leads and plugged it in that way. It isn't pretty, but who knows with the lid closed? The 4 khz filter is a nice improvement for AM over the standard 3.1 khz filter. There is also an 8 khz R-390A filter available but I haven't tried it.

Steve Harris, KF8KS

Editor's Note: The 8 khz filter works just fine from reports I've received.

Source of lacing thread

Those liking to do wiring jobs may like to know that a good source of lacing thread can be found in the dental care section of your drugstore. It is called dental tape, used as floss, comes waxed or unwaxed and is just about the same width as the material used for lacing in vintage gear.

Collins S-Line cables

Collins S-Line owners can find cables equiped with RCA plugs in the audio section of any Radio Shack. They come in various lengths, with different plug combinations and the color matches the Collins grey.

U.J. Orgnero

Paint for Collins gear

Caution: These formulas are for a Pittsburgh Paint store only; interior enamel, wall and trim, low lustre oil. I like to shoot it with naptha because it dries quickly. I've been using these formulas for about 2 years with great success. If you have any trouble or questions please feel free to call me in the evenings (417) 532-7710 or catch me on the Collins Users Net, Sundays, at 2:00 p.m. CST on 14.263

For the S-Line and KWM2

Shade #126 (trim ring) 20-110 B10 C12
white and pastel mixing base #20-110
Shade #180 (cabinets) 20-150 B34 C12
Midtone mixing base #20-160

For the KW-1, KWS-1, 75A1-75A4, 32V1-32V3

Shade #270 (St. James Gray) B2Y+20 C14 W18 A12
neutral mixing base #20-554

Bill Wheeler, KØDEW
272 Donna Lee St.
Lebanon, MO 05536

4H4C current regulator info

I would like to inform readers who own equipment using the 4H4C current regulator that the National Radio Company issued a customer service bulletin FSN-41, dated November 23, 1956, stating that the 4H4C tube is replaceable with a 6V6GT. They claim that the additional drift caused by this substitution will not exceed 300 cycles at 29 MHz.

Gene Santilli, W3ETP

Editor's note: If you have a tip that you would like to share with the rest of us, please send it in.

AM FREQUENCIES

2 Meters - 144.4, calling freq., activity in most cities; **6 meters** - 50.4 calling freq. **10 meters** - 29.0-29.2 operating window; **12 meters** - 24.985 calling freq.; **15 meters** - 21.385 calling freq.; **17 meters** - 18.150 calling freq.; **20 meters** - 14.286 for the nightly SPAM net starting at 5:00 CA time; **40 meters** - 7160, 7195, 7290 are the main freqs. Westcoast SPAM net every Sunday afternoon ,4:00 PM on 7160; **80 meters** - 3870, 3880 and 3885 are the main freqs. Westcoast SPAM net Wednesdays nights, 9:00 PM on 3870. Northeast SPAM net Thursday nights, 7:30 PM on 3885; **160 meters** - sporadic summer-time activity but during the winter signals can be heard anywhere on this band.

AM, Latin Style

A rather interesting DX'ers program was broadcast on Radio Havana on the evening of January 27, in which the host, Arnie Coro, explained some of the new amateur licensing structure in Cuba. According to Mr. Coro, Cuba has just begun issuing a new entry level amateur license with a 5 wpm CW requirement. These new "novice" licensees are limited to operation with a power limit of 50 watts using CW or AM emission only in the 1900 to 2000 khz band. These new amateurs will have a distinctive "CL" prefix in their calls.

Mr. Coro brought out several other interesting points I'll pass along. As the government there wishes to have this entry level license be an educational stepping stone to further study in electronics, (what ??? -that's an outrage! No appliance operators?) most of the newcomers are constructing simple solid state or hybrid transmitters with standardized designs using components produced by Cuban electronics firms. Several hundred individuals have reportedly passed their exams recently and are waiting for their call signs (as of early January) and a number of AM nets are planned by individuals in eastern Cuba, Mr. Coro reported.

Having seen film on Havana and noticed that they are still driving American cars manufactured previous to the 50's revolution, I wonder how many old Elmacs, Rangers and 32V's there might be down there getting refurbished by enthusiastic newcomers. Let's listen for these AM newcomers on 160 and give them a hearty welcome with our heavy iron. KDØHG

New North Texas Spam Net

Marty Drift, WB2FOU/5 has asked me to announce that he has started what he calls the North Texas Spam Net. The net will start at 8:00 p.m. CST on 3880, Thursday evenings. There will be a check-in period, technical discussions and a swap session. N6CSW/Ø

160 Meter Contest Results

As I mentioned here, last month, the 160 meter AM contest that ER sponsored over the weekend of Dec. 28 and 29th was really a 'big hit'. Despite the awful conditions (more on that later) the level of participation was a real surprise. It seemed everyone was out for the contest or 'jamboree' as some preferred to call it.

I received 18 logs and the winners are: Bill, WA8LXJ, (70 points), first place; Gary, W7FG, (69 points) second place; and Bill (Ashtabula Bill), W8VYZ, (60 points) third place. Congratulations to Bill, Gary and Bill. Certificates will follow in the near future.

Dale, KW1I, is deserving of some mention for his 'special effort'. He used a 40" helium balloon to hoist 140 feet of

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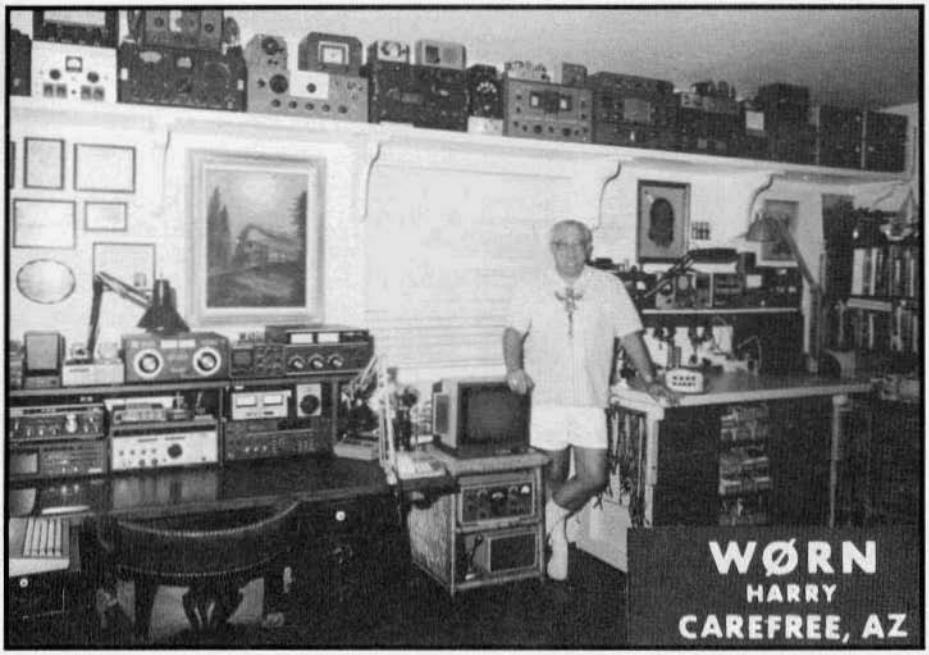
Some of the Milwaukee group that gathered at the home of N9IPQ for a Christmas party December 15. Standing - N9IYC; kneeling left to right - N9ISH, N9IPQ, N9IRD and N9INW; sitting, left to right - N9IQM and N9JBF.



Harry Snyder, WØRN. I don't think we could describe this as a 'shack'. This is a radio room/museum/workshop/library and all very nicely organized. Congratulations Harry.

John Lippincott, N7BEG, in his vintage station. John says that he has collected this gear over the last 22 years.

Update On The Amateur Display At Western Heritage Museum

You will recall the story we did on the new amateur radio exhibit at the Western Heritage Museum in Omaha, and Leo Meyerson's involvement with it, in the November issue. Recently I got an update from Leo.

" Since I talked with you last I have acquired about 40 additional pieces for the museum. I visualize several hundred receivers and transmitters and other pieces of gear. I know that the 15,000 square feet allotted to the exhibit at this point will not be enough.

"Last October I had the executive director of Western Heritage accompany me to the National Board meeting of QCWA in Kansas City. When the directors viewed the slides of the museum and learned what it had to offer - security, maximum display area, 12 employees, the beautiful building - they opted to take their national collection to Omaha. I am really pleased and excited about this development.

"Western Heritage plans to spend several hundred thousand dollars on improvements to make the surroundings and environment even better for the display of equipment like ours. This money comes from corporate giants including Union Pacific.

" I think we hams have a wonderful opportunity to place our collections on exhibit for thousands to see and to preserve the history of amateur radio."

If anyone has any gear that they would like to either donate, loan or sell for this display they can contact Leo Meyerson at either of the two phone numbers that follow: until April - (619) 321-1138,April thru Nov. - (402) 392-1708

N6CSW/Ø

A display of Leo's early WRL equipment

Another display area. Is that a Globe King to the far right of the picture?

Another display of WRL gear. Most everyone will recognize the distinctive WRL reference map. Leo advertised that for many years in all the ham publications.

Simple Heater-Voltage Regulation-Revisited

and other tricks long proven on an old HRO

by Jim Hanlon, W8KGI/5
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Sandia Park, NM 87047

One of the improvements that Bill Kleronomos made in his Super Pro[1] was to regulate the filament on his first local oscillator. Bill used a rectifier, filter and current regulator; certainly a satisfactory and up-to-date solution. But there is another, somewhat older technique that I've had running in my HRO50 since 1968 when Bill Scherer wrote it up in CQ[2]. I regulated the local oscillator, mixer and bfo filaments, and like Bill Kleronomos obtained relief from drift due to line voltage changes when my transmitter was on the air.

The idea is shown in Figure 1. Bill Scherer gave a thorough description of how it works in his article. Basically what happens is that the capacitor decreases the net reactance of the primary circuit so that enough current flows to drive the transformer core into saturation. The capacitor then limits current flow so that the transformer does not overheat. With the core in saturation, the secondary voltage becomes more nearly a square wave whose peak amplitude is independent of changes in primary voltage. The secondary voltage also increases well beyond its normal value so that a dropping resistor is required in series with the filaments to be regulated.

A little cut-and-try is required to put the idea to work. The transformer can be rated at the same nominal voltage as the tube filaments or somewhat less. In my case I used a retired 5 volt rectifier transformer to power my 6.3 volt tubes. The capacitor is chosen big enough so that good regulation is obtained over the desired voltage range, but not so big that the transformer gets too hot. If you use a Variac to increase the primary voltage from a low starting value and put a voltmeter on the transformer secondary, you will see the voltage "snap" into its regulated value when you hit the saturation point. Bill Scherer suggested starting with a 1 mfd capacitor. I wound up using 1.75 mfd and obtaining saturated regulation down to about 95 volts input.

To determine how much series resistance you will need for the filament circuit, just apply ohms law. While the secondary voltage will not be a sine wave, most good old VOMs with a Darsonval meter movement will read the rms value of the secondary voltage. The resistor can then be calculated as:

$$R = (V_{secondary} - V_{tube}) / I_{tube}$$

Actually this resistance includes the transformer winding resistance, but that is usually negligible.

In my case, I am powering a 6C4 local oscillator, a 6BE6 mixer and a 6J7 bfo through a 0.9 ohm series resistor.

I've made lots more changes in this old HRO through the years. It was my original receiver back in 1950, and for quite a while I added and modified to keep it "up-to-date". Other modifications include a calibrator with selectable markers at 100, 50, 25 and 10 khz points; a replacement for the crystal filter incorporating SSB and CW bandwidth mechanical filters and the notch circuit used in the 75A-4; an SSB/CW product detector mounted in the NBFM detector socket and a modification to the AVC and noise

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Johnson Viking I and II Modifications

by Dave Mills, AJ7O
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Stabilizing the grid drive on the Viking I and II

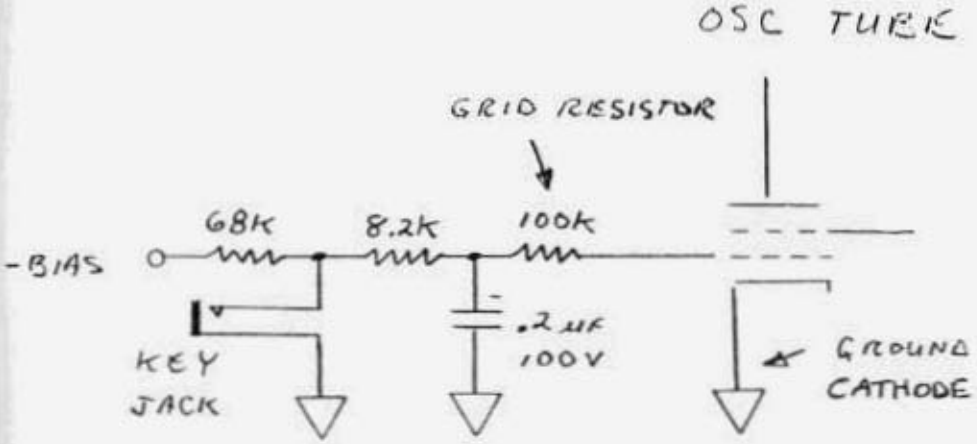
Many of the Vikings have a problem with unstable grid drive, especially on 10 meters. The problem was traced by Bill, K6EOB, to the coupling capacitor between the buffer and the grid of the final amplifier. This capacitor is easily identified because its made up of two mica types parallel connected from the buffer variable capacitor to the grid pins of the final amplifier. The replacement with a single 51 pfd 1000 volt dipped mica capacitor has the solved the problem for both Bill and me.

Grid block keying circuit for the Viking II

The Viking II CW keying is often not so clean. A very simple block keying circuit has solved this problem for me. When I mention it on the air to other Viking owners I am asked to send them a diagram because there are a great many CW operators out there with Vikings!

The original circuit used cathode keying. First, remove the wire that is connected to the oscillator tube cathode from the key jack and ground it. Disconnect the end of the 100 K ohm grid resistor that is grounded to the chassis ground. The blocking bias will be connected to it. Make up the simple circuit on a small terminal strip and mount it near the key jack and oscillator tube.

The bias voltage is available on the lug closest to the front panel on the terminal strip located between the final amplifier tube sockets and the clamp tube chassis.



Grid Block Keying Circuit

Amateur Radio In Bulgaria

by Bill Neeley, K7INK/6
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Denair, CA 95316

During last April and May, I was invited to participate in an international conference in Sofia, Bulgaria. While there I briefly visited an amateur radio club and interviewed a prominent Bulgarian ham, Rumen Gechev, LZ1MS.

Rumen was a Fulbright Scholar at the University of Illinois during 1987-88 and holds the American call NW9Y. He also represented Bulgaria at the International Friendship Games in Seattle last July. This description of Bulgarian amateur radio was largely formed by information which LZ1MS supplied.

First of all, and most disappointing, there appears to be no AM activity in Bulgaria and perhaps not in eastern Europe. Apparently, the mode is legal but equipment for its use is not available. SSB and CW are the dominant modes, with high speed CW particularly popular. There is some RTTY activity, a little SSTV, VHF FM is popular although there are no repeaters yet in Bulgaria, and no packet radio yet. There is great interest in contests, with most contesting taking place in clubs.

There are 300 club licensees in Bulgaria with about 1200 individual licensees. There are three classes of license: Class A which give full privileges and the use of 1 KW, Class B which allows full privileges at 250 watts and Class C which allows operations on 160, 80 and 40 meters with 50 watts input. To receive an individual license one must be at least 18 years of age and pass a code test of code groups at 12, 16 and 20 wpm for the Class C, B and A respectively. While individuals may and do have home stations, much amateur activity centers around the clubs. In fact, all licensed amateurs must belong to a club.

I visited one of the Sofia clubs, LZ1KDP, which is housed in a Technical College on the 6th floor. I was quite impressed with their antenna farm, particularly the six element, 75 meter log periodic fed wire beam strung between the building and another, identical building. The radio club had a TS830S and a homebrew linear. The linear used a Soviet tube, the GU43 (?) which is capable of 1500 watts PEP with five watts drive. Without prior application, I was allowed to operate using the call LZ1KDP/K7INK which I'm quite sure is the longest call (especially when expressed phonetically) that I shall ever use. In quick order, Italy, Ireland, Germany, the Soviet Union, Spain and the U.K. were worked. No U.S. contacts were made; propagation just wasn't right.

I was informed that commercial gear is scarce and expensive so ninety percent of hams build their own. Many use a design which is almost like a kit, the UW3DI transceiver. This transceiver can be built in three versions: tube, hybrid or solid state.

Generally, the level of technical competence among the Bulgarian hams seemed quite high. They, and the Bulgarians generally, were friendly, helpful and charming people. Although Bulgaria is going through tough times economically, current events are exciting and momentous. The opportunity to be among these wonderful eastern European friends is one I will remember always. •

Elmac AF-67 Audio Mod

by Willis Seaman, W9FGJ/7
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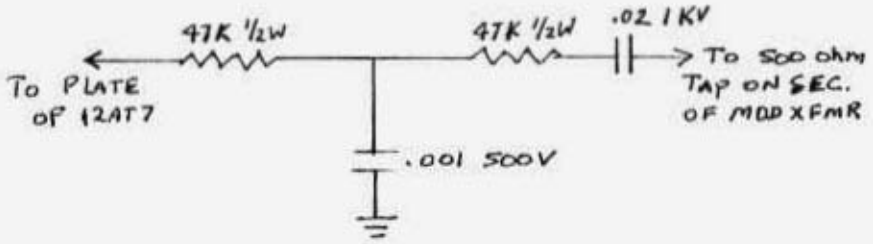
Lake Havasu City, AZ 86403

1. Change coupling caps C61 and C65 to .02 mfd
2. add 330 ohm 1/2 watt resistor from driver cathode to ground
3. Change 12AU7 to 12AT7
4. Clip negative end of C71 and add the following:

5. Add this feedback network. If you should get regeneration reverse the grid leads of the 5881 modulators.



6. Add a 47 pfd cap from pin 1 to ground on the 6AU6
7. If the grid of the driver has a capacitor to ground, change it to 67 pfd. Some AF-67s have a cap here but some do not.

This modification works good with a Hi-Z dynamic microphone. If you were to use a crystal mike I would suggest changing R62 to 5 megs.

Editor's Note:
I first heard this rig during the 160 meter contest. Willis was using it with a NCL-2000 amplifier. I thought it sounded great and I have heard many others making the same comment.

Let's Stop TVI Before It Starts

by Bill Kleronomos, KDØHG
POB 1456
Lyons, CO 80540

Several months ago I spent some time at a neighborhood friend's home for the purpose of installing a low pass filter on his VCR. You see, I had been coming through his 'quality' video equipment with audio almost as melodious as MTV when I operated on 75 meters. While not an electronics wizard, Rich was curious about just exactly why I had been trashing his reception. I explained to him how the problem was one that could have been easily prevented if the manufacturer had bothered to include a half dollar's worth of high pass filtering in the front end of the equipment. Rich's next two questions were real 'bellringers'and they really got me to thinking; "How come Ron's TV next door doesn't pick you up?" and "When I go to buy a new VCR or TV someday, how can I know which one is designed so as to best reject interference from hams and other RF sources?"

I explained that his neighbor's TV was probably immune to my RF due to better or different front end design or shielding, but I was stumped by the second question. I instantly visualized a part time teen-age salesman at a Denver consumer electronics store trying to answer that one! Even the manufacturers probably don't know how well their equipment might reject an out-of-band signal.

Later on in the evening I realized that there was indeed a way that he might find an answer to question number 2. Many of us, hams or not, subscribe to or read Consumer's Report magazine when trying to make an intelligent decision on the best product to buy. It would be great if Consumer's Union would perform some basic tests on electromagnetic compatibility on the consumer electronics equipment they test and review! Nothing fancy, mind you, perhaps nothing more than looking to see if a light dimmer might wipe out every AM radio for a hundred yards around, or checking to see if a VCR, stereo, answering machine or telephone will adversely respond to RF input at about a level commonly encountered from a ham in the neighborhood. That way, if a consumer was aware of a nearby ham, or had had past problems, he could select a product that might have better RFI protection than another. I would also suspect that those products better at rejecting or generating interference are probably designed better overall - an added bonus! Lastly, since this is a throwaway world, most consumer electronic equipment is probably replaced every few years so it wouldn't take long for a dramatic improvement in our problem of electromagnetic compatibility to occur.

Now, I'm not saying that this is the best idea in the world, but it did appear to have some merit to my friend and me. Shortly thereafter, we sent letters to Consumer's Union, the publisher of Consumers Reports, to ask that they consider this sort of testing. Unfortunately, neither of us ever got a response. Consumer's Union is apparently not interested, it seems, in providing this public service to its members. So, at a later date, I sent a letter to ARRL headquarters outlining this story and asking that the League contact Consumer's Union by letter and explain the desirability of including the results of such tests as a benefit to both the general public and members of CU. The League, to this date, has never acknowledged or responded to these comments.

There is probably no other group of amateurs that would benefit from an improvement in the RF susceptibility of consumer electronic equipment than those of us who use vintage "heavy iron".

Anyone who has ever been tormented by a cheap light dimmer while trying to operate on 160 would praise such a move by our leading consumer protection service. I'd like to suggest to those of you who had problems with RFI contact both your League Director and Consumer's Union and explain the benefits to everyone that basic RFI testing of consumer electronic equipment would have. Perhaps a few dozen letters from those of us tired of dealing with this sort of problem, year after year, could convince CU and the League that there is indeed a need for this service.

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160 meter contest results from page 19

surplus phosphor bronze wire. He said the antenna worked well but not well enough to overcome the terrible band conditions.

Skip, K7YOO, reports that Ron, WBØLXV, had one of the 'classier' set-ups with a complete BC-375/BC-348Q station that was stock right down to the dynamotors!

Two Canadian stations sent in logs. Bill, VE3AUI, said,"propagation back here in the east was not too hot". He also added,"I heard no aggression or nastiness, even though there was QRM; a good example to the Amateur Service and to the FCC of how the AM fraternity operates." Eddy, VE3CUI, said," I thoroughly enjoyed myself, Barry, as I always do in such events.. however, as an enticement to those who seem to (literally) wince at the very name "contest" may I suggest that in future you call these gatherings "jamborees" instead?"

Bill, KDØHG, sent along a news item from the Denver Post and a comment. First, Bill's comment:"Just how bad were conditions? Just to make it tougher, next year ER should hold its 160 meter AM contest during the month of July!" The news item gives solar flare data that was collected from a NASA balloon that was aloft above Antarctica from Dec. 20 to Dec. 30. The balloon recorded 16 major flares and the activity was summarized as " some of the strongest on record".

A couple of people commented that I might give more advance notice for future contests. I think that's a good suggestion and we'll try to do that. So far, we've sponsored contests on 10,15,20 and 160 meters. All those contests will be an annual event on or about the same dates that they were first held.

The next contest will be on 15 meters after 10 meters 'poops out' this spring. We'll announce the exact date next issue.

N6CSW/Ø

Editor's Comments from page 1

Spring is just around the corner and that means that 10 meters will be fading out for the summer. I think we should make an attempt to get some AM activity on 15 meters. One idea that has been suggested is that we might try working above 21.400. If anyone has any comments I'd be very interested.

Speaking of spring, it's going to very welcome this year. I've found this winter in southwest Colorado to be exceptionally cold, windy and just plain miserable. On to #23.....

YOU MUST HAVE HAD THAT UP ALL NIGHT-- THE LITTLE GREEN EYE IS BLOODSHOT!

AM Update from page 3

I realize that amateur radio is but a small portion of the FCC agenda, especially, since I am employed in the broadcasting industry. However, amateur radio, particularly AM amateur operation, is very dear to my heart.

The amateur regulations were a stable institution before about 1970. Amateurs did not have to worry about constant rule changes and repeatedly having to defend their positions. However, since the early 1970s there has been an endless parade of far reaching changes in the basic structure of amateur radio in the form of FCC dockets; a concerted, continuing effort to chip away our hard-earned privileges.

These include the restructuring docket (20282), containing the original proposal to limit the maximum legal power of the AM mode. Soon, the infamous 20777 appeared, which seemingly proposed deregulation on modes of emission, but in reality would have eliminated the AM mode below 28 MHz!! The "plain language" rewrite (docket 80-729), disguised as a rewrite of the amateur rules and regulations, but sneaking in a P.E.P. (peak envelope power) measurement standard which would severely hurt the AM mode, was a tremendous waste of taxpayers' money. There were many other "restructuring" dockets which posed a danger to the AM mode of operation. The so-called Novice enhancement docket (86-161) gave the Novice class licensee more privileges, which did not accomplish the desired intent of substantially increasing the number of new persons entering amateur radio, as the many previous FCC actions giving Novices more privileges also did not. Docket 86-161 also went two steps further than its predecessors by giving the Novice class licensee the CHOICE part of the ten meter band (contrary to FCC's position of "incentive licensing") AND forbidding Novice AM operation on this new subband, further denigrating the AM mode! This certainly was in direct opposition to the purpose of the Novice license class; allowing them to operate the MORE COMPLEX mode of single sideband, while forbidding them operation of the LESS COMPLEX mode of AM, whereby they could LEARN BASIC RADIO!!

After attempts to sneak the P.E.P. output measurement standard unsuccessfully into previous dockets, the FCC railroaded this through in 82-624. Nowhere in 82-624 was any SOUND TECHNICAL, PRACTICAL, OR WARRANTED JUSTIFICATION given for this latest radical change, that was OVERWELMINGLY REJECTED by the amateur radio community, at least twice before!! By changing the METHOD of power measurement, the REAL maximum AM power limit has been cut in half, due to a fluke in the characteristics of this mode, while some other modes have enjoyed a substantial increase in REAL power. FCC has, therefore, finally singled out the AM mode for an unjust power reduction, after two decades of attempts!!

The above examples certainly do not include all of the dockets that have cost AM enthusiasts much valuable time, having to interrupt their experimentation and operation for the constant defense of their position. In some cases, ample time was not given for a response from the amateur community before yet another docket was released!

In the Report and Order of docket 82-624 the FCC limited the grandfather clause on the AM power limit to June 1, 1990, and stated, "If it appears there is any justification to do so, we will reconsider the matter at that time." Finally, only after much prodding, many letters, phone calls, and RM (rulemaking) proposals, the FCC had assigned RM numbers to this proceeding, while not even giving the common courtesy of extending the grandfather clause, while this proceeding was underway!! This has created a continuing hardship for many who

have fine, classic radio transmitters, now rendered obsolete and illegal to use, by the expiration of this grandfather clause and the subsequent denial of all these proposals (RM 7401, 2, 3, and 4), thus arbitrarily annihilating a historic power limit for the AM mode that had endured for over sixty years!! However, Mr. Dale Gagnon has filed a Petition for Reconsideration of RM 7404.

The government should serve, not punish, law abiding taxpayers! Therefore, on behalf of the AM community, I am asking for your help in restoring our AM power privileges, by your support of this Petition for Reconsideration. A permanent grandfathering of the historic AM power limit will not endanger, or incur any equipment or training costs for FCC personel, hinder FCC purposes, or in any way adversely impact operating conditions or interference problems.

The AM mode is used extensively throughout the world, and is the basis of the broadcasting industry.Amateur use of this mode should not have to suffer this acrimoniously unjust fate. In fact, Canada has preserved their amateurs' historic privileges with a special power measurement category for AM of 750 watts carrier output power. This is all that we, the U.S. amateur radio AM community, are asking.

For a more in-depth view, I have enclosed copies of some of my formal filings in the above cited docket proceedings for your perusal. Thank you.

Very respectfully yours,

Richard J. Miczak

Heater Regulation from page 24

limiter circuits ala the NC-303 so that they work with appropriate time constants on AM, SSB or CW. I'd be glad to share these with anyone who is interested.

One more tip might be of interest to owners of HROs. Those of us who love the breed know that to the very end National had problems with thermal drift in the HRO's. They are fine once they warm up, but it can take quite a while for that massive plug-in coil drawer to come to thermal equilibrium with the rest of the receiver. And if you change bands, the problem starts all over again.

I cured thermal drift in my HRO by installing a muffin exhaust fan on the rear of the cabinet behind the rectifier tube and by covering up all of the normal ventilation louvers on the rear of the receiver with aluminum duct tape. The fan now pulls in cool air from all the other open nooks in the receiver, mostly around the coil drawer. The result is that the coil drawer now runs at much more nearly room temperature and warm-up drift is essentially eliminated.

References

1. Bill Kleronomos, KDØHG, "Update That Super-Pro", ER, December, 1990
2. Wilfred M. Scherer, W2AEF, "Simple Heater-Voltage Regulation", CQ, November, 1968

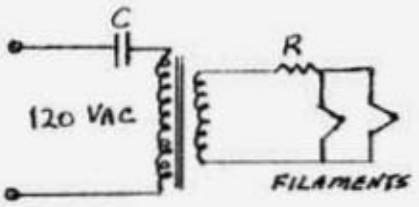

FIGURE 1

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DEADLINE FOR THE MARCH ISSUE: MARCH 3

WANTED: Collins R389 and Hammarlund SP-600 VLF receivers. Tom Smith, 13034 Elmington Dr., Cypress TX 77429.

FOR SALE: Do you need tubes, parts, schematics? Send SASE. Nick Marshal, 2207 Peachland Ave., Sebastopol, CA 95472.

FOR SALE or TRADE: Hallicrafters SX-122 w/manual, mint. **WANTED:** Plate amp meter for Henry 2K or 2K3 amplifier; RME -45. Gary Elliott, K7OX, 6229 Joan De Arc, Scottsdale, AZ 85254. (602) 948-4772

FOR SALE: URM-124 module tester for TRC-75 or ARC-58 equipment, includes cabeling, 60/400Hz power supplies. David Ross, 2502 Amethyst Dr., Santa Clara, CA 95010-1139. (408) 984-1929

FOR SALE: New catalog of old books on wireless/radio is now available. Send $.50 (stamps) to: Rainy Day Books, POB 775, Fitzwilliam, NH 03447.

FOR SALE: NIB 4-1000A - $275 plus UPS. Bill Kleronomos, KDØHG, POB 1456, Lyons, CO 80540. (303) 823-6438

FOR SALE: Viking Desk KW , minor scratches, excel. cond. - $1600. Bill Barry, K1KV, 5 Oak Knoll Road, Burlington, MA 01803. (617) 272-3522

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

FOR SALE: Tubes, new in box. Please send $1 for list of 300+ tubes. Refundable. Wilson Hauck. BTB. Inc. E.R., 6820 Stout Rd., Memphis, TN 38119

WANTED: ARC-5 xmtr variable capacitors with worm gear drive; Johnson and Millen neutralizing capacitors; B&W turns counters; 10V CT 10 amp filament transformers. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

FOR SALE: Bigelow Electronics has been in the electronic mail order business since 1954. Vintage parts and equipment available. Request free "Vintage Flyer". Bigelow Electronics, Box 125, Bluffton, OH 45817.

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FOR SALE: Navy AN WRR2;RU17-GF12; WW II German Blaupundt rcvr. Trade for W.E. tubes. Vogt, 330 S.W. 43rd St., #247, Renton, WA 98055. (206) 251-5420 ex. 247

FOR SALE or TRADE: R-1000, good-excellent, for general coverage rcvr or $315. PPD. Levy, 8 Waterloo Dr., Morris Plains, NJ 07950. (201) 285-0233

WANTED: Complete AN/GRR-5 or components as R-174 rcvr, PP-308 ps, CY-615 case and tech manual. Homer Henrioud, 2772 Plantation Dr., East Point, GA 30344. (404) 767-0404

WANTED: ARC-65 and ARN-7 equipment, accessories, etc. Mark Meltzer, 335 Prentiss St., San Francisco, CA 94110-6140. (415) 826-3889 home or (415) 826-8994 ext. 3019 work

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FOR SALE: Radio, test, electronic equipment, mil surplus, avionics, parts, accessories, books, magazines, manuals, long list - $.50 (coins). J. Orgnero,Box 32, Site 7 SS 1, Calgary AB T2M 4N3, Canada.

FOR SALE: Two National receivers, models NC-173 and NC-125, both working - $75 each. Rhyme Killian, 129 Mill Rd., Chelmsford, MA 01824. (508) 256-0853

FOR SALE: Used technical books: radio, electronics, math, military, magazines, etc. $1 for large list. Stamps OK. Softwave Communications, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462.

FOR SALE: Miscellaneous odds and ends, antique radios and parts. LSASE for list. Hidyne Research, POB 3342, Williamsport, PA 17701. (717) 326-2148

WANTED: Sideband switch (lower-upper-both) for Hammarlund HQ-180. Robert L. Green, WA6ICL, 14463 Astoria St., Sylmar, CA 91342. (818) 362-7404

WANTED: Stock knobs for Viking VFO. Dick Geordan, W6SCJ, 1347 Albertson, Covina, CA 91722. (818) 339-9852

WANTED: Machine shop work. Knobs shafts, bushings, etc. made to your sample or drawing. Reasonable. Jim Dill, Box 5044, Greeley, CO 80631. (303) 353-8561 evenings.

WANTED: SCR-399A;HO-17 shelter;BC-610E; BC-312; BC-939; BC-614; JB-70A;tuning units; coils; chests; reels; whips; cables etc. BillHarris, W7KXB, 852 W. Jerome Cir., Mesa, AZ, 85210. (602) 838-0215

WANTED: WW-II military radio sets, operating spares and mounting racks. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244

WANTED: Any model of Brown Brothers Machine Company key, paddles or bugs. Jim Zimmerman, KG6VI, 2316 W. Dallin St., Lancaster, CA 93536-5702. (805) 945-6539

FOR SALE: Transmitting/Receiving tubes, new and used. LSASE for list. I also collect old and unique tubes of any type. Maybe you have something to trade? **WANTED:** Large tubes and sockets from the old Eimac line; 750T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

HAMFEST NOTICE: Sterling, Rock Falls, Illinois, Hamfest Sunday, March 17, 1991 at Sterling High School Field House. Advance tickets - $3, at door - $4, tables - $5. Info call Sue Peters, 511 Eighth Ave., Sterling, IL 61081. (815) 625-9262

WANTED: WW-II military radio sets, manuals, accessories, mounting racks, etc. Must be in military condition. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: Hammarlund HQ-180A w/ manual - $225; 4D32, boxed - $35; HO-10 monitor scope - $60. **TRADE:** Collins F 455 J60 filter for complete NC-303 rcvr or Valiant II. **WANTED:** GPR-92 rcvr. Steve, KE4MN, (904) 327-4179

CLASSIFIEDS

WANTED: McElroy and Telegraph Apparatus Company keys; McElroy Chart of Codes. Please send description (photo if possible), condition and price. Tom French, POB 26082, Tempe, AZ 85285.

FOR SALE: T-213/GRC-26 (last BC-610 model), gov't reconditioned with one set of tubes - $650 FOB Dallas or Houston; some TU's, coils and parts; connectors for most military radios before 1955; TM's and TM repros. **WANTED:** BC-344/BC-314; SCR-506 parts; MP-37, MP-47, MP-48 and MP-50 antenna mounts; Dynamotors DM-41, DM-43, DY-31/ARC-2, DY-96/VRC; cables ; chests, and other parts for SCR-499 (BC-610E, etc). Robert Downs, WA5CAB, 2027 Mapleton, Houston, TX 77043. (713) 467-5614

FOR SALE: Sonar model CFC vfo/xmtr with built-in FM modulator, vg condition, w/manual - $50 plus UPS. John Werner, WB8IPG, (313) 757-3943

WANTED: Vacuum switch replacement for ART-13 antenna relay, new preferred - used if I must. Ted Althof, KA3TVH, 504 E. 9th Ave., Tarentum, PA 15084. (412) 224-0905

FOR SALE: Moving, must sell excess collection of vintage radios. Send SASE for list or call with your needs. G. Hawrystko, K2AWA, POB 568, Boro Hall, Jamaica, NY 11424. (718) 224-2448

FOR SALE: Speedex buzzer, NIB, E.F. Johnson - $10 ppd; antique Cardwell tuning condensor, 10"L x8"W x7"H, patent #1626391, type "S" - $50 ppd; Motorola T12071, includes telephone handset, remote transmitter control and intercom - $50 +$10 shpg; summer 1967 Radio Amateur Callbook - $5 ppd. **WANTED:** Copy of users manual for the KnightKit R-100A radio receiver. James Fred, R1, Cutler, IN 46920.

WANTED: FM signal generator/sweep generator and marker, manuals, plus all test leads included. Steve Kalista, HC-1, Box 137, Jim Thorpe, PA 18229.

FOR SALE: RBB-1 w/ps - $100; RBC-2 w/ps - $100; SX-28 - $65; R-390, excellent - $225; Magnum Six for Collins - $50; Swan 406B VFO, no case -$20; Central Electronics Multiphase RF Analyzer MM-2 - $40; LM-18 Freqmeter - $18; BC-221AH Freqmeter - $40; HP-608D - $35; Ballantine 310A VTVM - $15; HP-410BR VTVM - $20; Eico 232 VTVM w/probe - $15; Viking Valiant VFO subassembly - $15; LP-5 Siggen, 9.5kcs to 50 Mcs - $35; 1948/1949 callbook - $8; Tek 53/54 and "D" plugins - $20 each; RCA M-158 scope - $15; Sylvania 104 electronic switch - $10; Sencore CG-185 color generator - $10; Magnavox 302 , 12" speakers, pair - $20; list of over 2400 tubes - $1 plus LSASE. Shipping charges extra. George Babbits, WA7HDL, Rt 1, box 178-A6, Salmon, ID 83467. (208) 756-4147

WANTED: 6 kc filter for 75A-4 and 75A-3; 75A-4 rcvr; 32V xmtr and manual for 51J3. Bob, KK4GO, (404) 945-8642

FOR SALE: NC-57B - $20; Collins 75A-1 - $275; Collins 75A-2 - $250; Precision signal generator, E200C - $50; Heath HA-10 linear (4-811s) - $300; BC-368 (4-400s mod. by 4-125s) AM rig, heavy - offers; Johnson Ranger - $125; many others, send SASE. Parker, W1YG, 87 Cove Rd., Lyme, CT 06371. (203) 434-7783

FOR SALE: Machine shop service. Knobs, shafts, bushings, etc made to sample or drawing. Reasonable. Jim Dill, Box 5044, Greeley, CO 80631. (303) 353-8561

FOR SALE: 100+ item list of vintage ham gear and antique radios. Send SASE. Jim Weil, KE8AP, 15915 Armada Ctr. Rd., Romeo, IL 48065. (313) 784-9860

FOR TRADE: RF Communications receiver model RF 102, rack mounted, six crystal controlled (in ovens) channels between 2 and 16 Mhz, AM and SSB, Collins mech. filter. Would like HRO-60 or Johnson Ranger. Herb Spivey, POB 27, Baldwyn, MS 38824. (601) 365-5594

CLASSIFIEDS

WANTED: Kilowatt transmitting twin lead, 100' to 500'. George, W2WLR, 1-800 724-7460, 8:00 a.m. to 11:00 p.m.

FOR SALE: Hallicrafters S-20R w/manual copy - $55; PM-23 speaker - $35; T-54 7" TV - $65. All plus UPS. **WANTED:** Hammarlund PRO-310. Dan Mason, 1325 N. Lima St., Burbank, CA 91505. (818) 848-9474

WANTED: Still badly need the manual and/or schematic diagrams for Collins 30K. Fenton Wood, 109 Shoreline Dr., S.H., Malakoff, TX 75148. (903) 489-0204

FOR SALE: Triplett 850 VTVM - $42; Hickock (Stark) 1604M VOM to 700 Mhz - $89; Hickock MX-331 D.V.M., new$179 - $79; Heathkit AG9 audio generator and AV3 A.C.V.M. - $38 for both; HP 214 200 W pulse generator - $89; Hammarlund HQ-129X - $75; GE tube manual, 1973 - $10. Ed Richardson, W15D, 1040 Cleveland, Stephenville, TX 76401. (817) 968-3365 evenings.

WANTED: For adoption, Collins KW-1 for my collection and good home. Joe Rose, WA2PJP, 60 Sunset Ave., Selden, L.I., NY 11784.

FOR SALE: Please send SASE for 5 page list of vintage gear for sale; xerox's available for over 200 vintage manuals - 10 cents per page. Mike Horvat, 112 E. Burnett, Stayton, OR 97383.

WANTED: National HRO-60T accessories: HRO-60TS speaker; SOJ-3 Select-O-Ject; Coils: AB & AC. Collins 75A-4 accessories: 270G-3 speaker, mechanical filters: 455 J-08 & 455 J-60. I will pay top $ for any or all of the above. Frank DeCoito, WB6YSP, Star Rt. #2, Box 242, La Honda, CA 94020. (415) 948-2045

FOR SALE: 1940 Collins TCH Naval transmitter which includes 18M-5 transmitter, receiver and AC power supply. Roy Delk, WB7NXX, 5055 NE Elliott Cir., Corvallis, OR 97330. (503) 758-7192

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"REAL RADIOS GLOW IN THE DARK"®

Bumper sticker - $1 each with a #10 SASE. We service American made amateur radio products circa 1940's, 50's and 60's. Manuals and/or schematics available for most rigs and radio sets back to mid 1920's. Call or write for a quote on your service or tech data requirements. **Classic Radio,** PO Box 3486 Eureka, CA 95502. 24 hour phone (707) 444-3911. K6VHP

FOR SALE: Repair/replacement of meters before 1930 - trades for repairs okay. **WANTED:** Old meters/galvo's, scientific instruments, open frame motors, working or not, before 1920. Leonard W. Cartwright, 113 Sea Terrace Way, Aptos, CA 95003. (408) 662-2977

FOR SALE: Hallicrafters SX-115 and HT-32B - $550 plus shipping. Both in good condition. Craig Larson, KØNR, 3823 Wellington Court, Owensboro, KY 42303. (502) 683-6972

WANTED: Manual for Heath SB-102, photo copy ok; also looking for two SB-640 remote LMO's. Will pay for copying, shipping, etc. Marty Drift, WB2FOU/5, 108 Hickory Ln., Hickory Creek, TX 76205. (817) 497-6023

FOR SALE: Drake R-4C, T4XC, MS-4, AC-4, excellent cond. - $425; Drake 1500 Hz filter for R-4C - $35; Collins 200 Hz filter for 75S3, p/n 293 084300 - $125. Duane Vasold, 5768 N. River, Freeland, MI 48623. (517) 695-5140

WANTED: Complete National SW3, FB-7/X; Pilot Wasp; Collins 51J4; Ranger meter; WRL vfo; HRO-5 parts source. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

FOR SALE: We have a large selection of HV capacitors, 400V to 6KV. New, long lead, many types and styles. Priced right. Vintage, surplus, N.O.S., new parts, crystal calibrator kit, more. Call or write for our FREE catalog. Steve, NW2F, Two Fox Electrix Co., POB 721, Pawling, NY 12564. (914) 855-1829 12 noon to 8:30 p.m EST

WANTED: KW-1, 32V-1,-2,-3. **FOR SALE or TRADE:** KWS-1; 600-L; 312B-4; Drake 2-B; HRO coils; 312E-1; BC-453; BC-221; Bencher paddle. Joel Thurtell, 382 N. Harvey, Plymouth, MI 48170. (313) 453-8303

FOR SALE: Hallicrafters speakers: R-48, R-50, R-51; matching speakers for receivers S-9, S-16, S-25 and S-42 - make offer. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

WANTED: National NC101X with "S" meter in excellent operating condition, cash or trade; transmitting condensers, plug-in type; tubes sockets for 813 and 4-65A tubes. Roland Matson, K1OKO, RFD #1, Box 2943 Kennebunk, ME 04043.

WANTED: Tubes - V-70-D, 5514 and 806; manual for HQ-150; TU-61 tuning unit and coils for BC-610; repairable BC-610 also wanted; coils for Globe King. Michael Nichols, KE9FK, 105 N. 4th St., Fort Atkinson, WI 53538.

WANTED: Clean and reliable 516F-2 supply, cabinet not necessary. Please describe condition and state price. R.W. Parker, KB2DMD, 21 Blue Grass Drive, Trenton, NJ 08638.

WANTED: Harvey Radio Labs FT-30 xmtr (FOS p. 257) National SW-4, SW-45, NHU;also RME-9. Best deals or cash /reward. Robert Enemark, W1EC, Box 1607, Duxbury, MA 02331. (617) 934-5043

FREE: Heath QF1, Transcon 10, Millen preamp #92101. Need cabinet for Ranger, ceramic rod for mini quad. Mike, KE9FK, 105 N. 4th St. Fort Atkinson, WI 53538

CLASSIFIEDS

WANTED: Permeability tuned oscillator for the Collins KWS-1, also copies of engineering change bulletins for the KWS-1. Bob, K7NWB, 708 North Chestnut Circle, Mesa, AZ 85213. (602) 833-7786

WANTED: Type 6000 electron tube for T-368 transmitter and "Radio Antenna Engineering" by Edmund A. Laport, McGraw-Hill, 1952. Bill Mills, KC5PF, 1740 Tonys Court, Amissville, VA 22002. Office: (703) 818-3955, Home: (703) 937-4090

WANTED: Gross Radio CB 55 amateur transmitter schematic/manual . Please, need data for restoration. Will pay any replication costs. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528. (914) 691-6247

WANTED: Electronics Illustrated magazines - June 1961 and Nov. 1972; Heath HBR-5 aircraft rcvr, 190 kcs to 420 kcs; Radio News - Aug. 1958 and Jan. 1948. Al Bernard, NI4Q, POB 690098, Orlando, FL 32819. (407) 351-5536

ORLANDO HAMCATION: March 15, 16, and 17th at the Orange County Fairgrounds in Orlando Florida. Tailgating and swap tables available. An AM/vintage equipment forum will take place. Call (407) 657-9052 for further information.

FOR SALE: Collins KWM-2 w/515F2 W/E - $450; Johnson Ranger (needs works) - $50; CV-591A/URR SSB converter - $30; Beckman 905 WWV receiver - $40. Shipping extra. Jack, WA2HWJ/7, (206) 487-2111.

FOR SALE: Gonset G-76 w/mobile supply and manual - $100. **WANTED:** Elmac AF-67 and Johnson speech amp. Skip Green, K7YOO, POB 595, Winona, MN 55987. (507) 452-4989

FOR SALE: Collins TDO transmitter - 400 watt CW, 250 watt AM phone. Pick up only. **WANTED:** GO-9 transmitter. Ted Bracco, Quincy College, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

CLASSIFIEDS

WANTED: National receivers NC45, NC80, NC81, NHU;National TV sets esp. TV7; HRO-5TA-1 coils E, F; HRO-7 coils E, F; HRO-50 coils G, H, J, AA, AB; HRO-50 FM adapter, NFM-50; HRO-7 RACK main tuning knob (black PW dial with mirror inlay); feet for the NC-2-40D and it's speaker; National black crackle speakers; SX-62A main tuning knob(s) and silver escutcheon;Millen 90932 modulation monitor; any tube kits complete but unbuilt - receivers, transmitters, audio equipment. Steve Sauer, WA9ASZ, 1274 Londonerry Ln., Greenwood, IN 46142. (317) 882-4598 eves. after 7:30 EST

WANTED: US military keys, including all Signal Corps J-series and Navy CXX26000 series. Tom French, 120 Great Road, Maynard, MA 01754.

FOR SALE: Hallicrafters S38E - $45; WRL 10M 100 W mobile amp - $40; Heathkit IG18 audio gen. - $35. Plus shipping. Bill Kipping, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

Electric Radio - the first year - all twelve issues delivered First Class in a padded envelope - $25. Individual copies $2.50 delivered. #5, 11 and #12 are reproductions.

WANTED: Collins R389 and Hammarlund SP600 VLF receivers; manual for 51J-4 rcvr, prefer original; ER #1,2,5 and 11 originals. Tom Smith, 13034 Elmington Dr., Cypress, TX 77429.

WANTED: Collins 51S1, 62S1, 51J4, KWM-1, KWM-2A, S-Line, 312B3, 312B4, 312B5, 75A-1, 75A-4 with filters, 270-G speaker, 30L-1, 30S-1 round only. Larry, NE8V, 9307 Worley Mill, Hillsboro, OH 45133. (513) 981-2462

FOR SALE: Heath GR-91 - $25; V-5 VTVM - $10; S-40A w/Drake QX'r - $40; S-120 - $35; S-72R - $40; Knight Span-Master - $10; Elmac A-54 - $35; ARC-5s: T-22 - $35; T-19 - $45; CQ Command Set book - $15. All Postpaid. N4TGC, Rt 11, Box 492J, Florence, AL 35630 (205) 764-0675

ER Parts Unit Directory

At this point the directory has 135 units in it and it's growing daily. If you need a part for a vintage restoration send $1 and an SASE for the list. If you have a parts unit consider putting it on the list. Your dead unit can help bring others to life.

CLASSIFIEDS

WANTED: Radar equipment, units or whole systems. Early TV cameras also sought. Allan. H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

FOR SALE: Transformers: Thordarson T19M16 Modulation; T64F14, 10 V, 8 A, CT; R195 Hi/Lo power CT; Filament, 1.5, 2.5, 5V CT; WE D163065 Hi V CT - all for $25 plus 35 lbs UPS; post-war model 900 "Vomax" by McMurdo Silver - $50 OBO. Dick Martin, KC5KW, 4631 Hannett Ave., NE Albuquerque, NM 87110. (505) 265-2721

FOR SALE: New KWICK -patch, KWP-4 - $30; Kellogg headset, 82A - $25; T17-F microphone, new - $25; flex shaft 17"x1/4" - $7. Jos. Battyany, W6CAS, 1501 Sherwood Ave., Sacramento, CA 95822. (916) 731-8261

WANTED: AIS 90 power supply for Harvey-Wells T-90 transmitter. Preferably in good condition. B.G. Martin, N4YYP, 127 South Oliver St., Elberton, GA 30635.

FOR SALE: (2) AT-1 xmtrs with VF-1 - $125; Johnson Adventurer - $60; 6550 tube (100V) - $10. Clem Duval, W8VO, 33727 Brownlea, Sterling Heights, MI 48312. (313) 268-2467

WANTED: Wireless set No. 19 equipment circa WW II. Also looking for anecdotes, operators pocketwatch and manuals. Chris Bisaillion, VE3CBK, Whiskeytown Wireless Collection, 1324 Old Carp Rd., RR#1, Kanata, Ont., K2K 1X7, Canada.

WANTED: Collins S-Line, 75S3C + 32S3A. Clean and complete. Lloyd, AA6T, (408) 722-4349

FREE: 1991 Catalog Available. Dealers in surplus electron tubes. Electron Tube Enterprises, Box 311, Exxex VT 05451. (802) 879-0611. FAX (802) 879-7764

WANTED: Turret Assembley of rcvr 6010 by Radcom/Westrex. Edward J. White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121. (302) 322-1313

FOR SALE: Drake 2B rcvr, mint condition, original owner, recent alignment, with original manual - $100 or offer; Hallicrafters SR-46A six meter AM transceiver w/ original manual - $40; Navy WW II rcvr, model RBS, very nice, works great, w/original manual - best offer; TCS rcvr, very clean, w/ps, works great - $40; Multiphase exciter, model 20A - $50. Ed, WA7DAX, 3509 Muriel Way, Salt Lake City, UT 84119. (801) 966-2037

FOR SALE: Rare 1935 Tobe ham band receiver - $100; (2) HW-101s - $100 each; (2) 304TLs w/sockets and plate cond. - $50; Raytheon 4D32 (new) - $30; 50 assorted ceramic sockets 813, 805, 4-400, 810, etc - $5 each; various high power components caps, inductors etc - adivise needs; WW II equip. - BC 442 ant. box - $10; APN1 - $20; (new) ABA I IFF/TX-RX w/plugs and inst. - $40; BC-639 VHF RX (see Jan. ER, p 21) - $40. Roger Faulstick, 210 Mariah Ct., Merritt Is., FL 32953. (407) 453-3312

FOR SALE: Hallicrafters S20R w/manual; Lafayette HE-98, 30-50 MHz rcvr; National NTS-1 speaker for NC-188. **WANTED:** Downkey coaxial antenna relay. Al Coil, KO9S, 607 Countryside Lane, Hudson, WI 54016. (715) 386-5284

WANTED: 6 Kc and 800 cycle filters for Collins 75A-4 rcvr; 75A-4 rcvr and 32V-3 xmtr. Dennis Cody/Marla Banuelos, 1386 St. Louis Ave., Apt. #C, Long Beach, CA 90804. (213) 438-2817

WANTED: WW II equipment. BC-966/SCR-695, Navy ABK IFF, RT-53/TRC-7, ID-59/APA-11, AN/APN-2. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707. (714) 540-8123

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

CLASSIFIEDS

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

FOR SALE: Newly published instruction books, authorized by Rockwell International, are now available for the Rockwell/Collins S-Line. These instruction books have been printed from the latest editions - complete in every detail. A money-back guarantee of the purchase price ensures your complete satisfaction. Instruction books for the following models are currently available. KWM-2/2A ($35); 75S-3B/C ($30); 32S-3A ($30); 75S-3/3A ($25); 32S-3 ($25); 312B-4/5 ($20); 516F-2 ($15). For U.S. orders, include 7% of the purchase price for shipping and handling. (Canada and Mexico add 12%; all other international countries add 25%) Ohio residents add 6% sales tax. VISTA Technology Incorporated, 3041 Rising Springs, Bellbrook, OH 45305. (513) 426-6700

WANTED: Very old or unusual Hallicrafters equipment, entire 1934 "H" and "Z" line of Silver Marshal, parts, memorabilia and manuals. Chuck Dachis, "The Hallicrafter Collector", WD5EOG, 4500 Russell Drive, Austin, TX 78745.

WANTED: Coils, power supplies, speakers, manuals and accessories for National HROs (early black wrinkle models). Also, want early HRO receivers. Absolutely top dollar paid. Jim Allen, 1653 Newcastle Drive, Los Altos, CA 94024. (415) 968-0640

WANTED: RCA AVT-15 transmitter; AVA-120 trailing wire antenna reel and related hardware; SCR-319 items. Ken Gillis, 27217 Garden Way, Franklin, MI 48025. (313) 390-6873 days.

BOOKS, MAGAZINES WANTED: Modern Electrics, Experimenter, Science Invention, Radio News, Radio Retailing, Radiocraft, M.I.T. Radiation Laboratory Books, OTHER TECHNICAL BOOKS, MAGAZINES, also CRYSTAL SETS, MICROPHONES. State lot price for resale. Delton Lee Johnson, WB6MNY, 14 McKevett Heights, Santa Paula, CA 93060. (805) 525-8955, evenings

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FOR SALE: Antique radios, parts, tubes, books, 150 panel meters, knobs, amateur, test equipment, transmitter crystals, etc. 13 lists. SASE + $2 cash (no checks). Richard & Rose's Radio Mart, POB 691443, Tulsa, OK 74169.

WANTED: WW-II military electronics; test equipment, radios, radar, odd-ball items, counter measures, APS-13; also manuals, books, articles pertaining to same. William Van Lennop, POB 211, Pepperill, MA 01463. (508) 433-6031

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

ELECTRON TUBES: All types - microwave, transmitting, receiving, obsolete, military--Large inventory. **Daily Electronics Corp.**, POB 5029, Compton, CA 90224. (213) 774-1255; (800) 346-6667

A directory of vintage parts unit rigs available to subscribers for $1 and a LSASE. Presently there are 150 units in the directory and it's growing daily. The list of units is by manufacturer in alphabetical order followed by the owners address and telephone number. If you have a parts unit please let us put it on the list.

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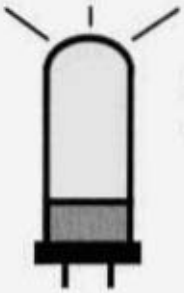

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