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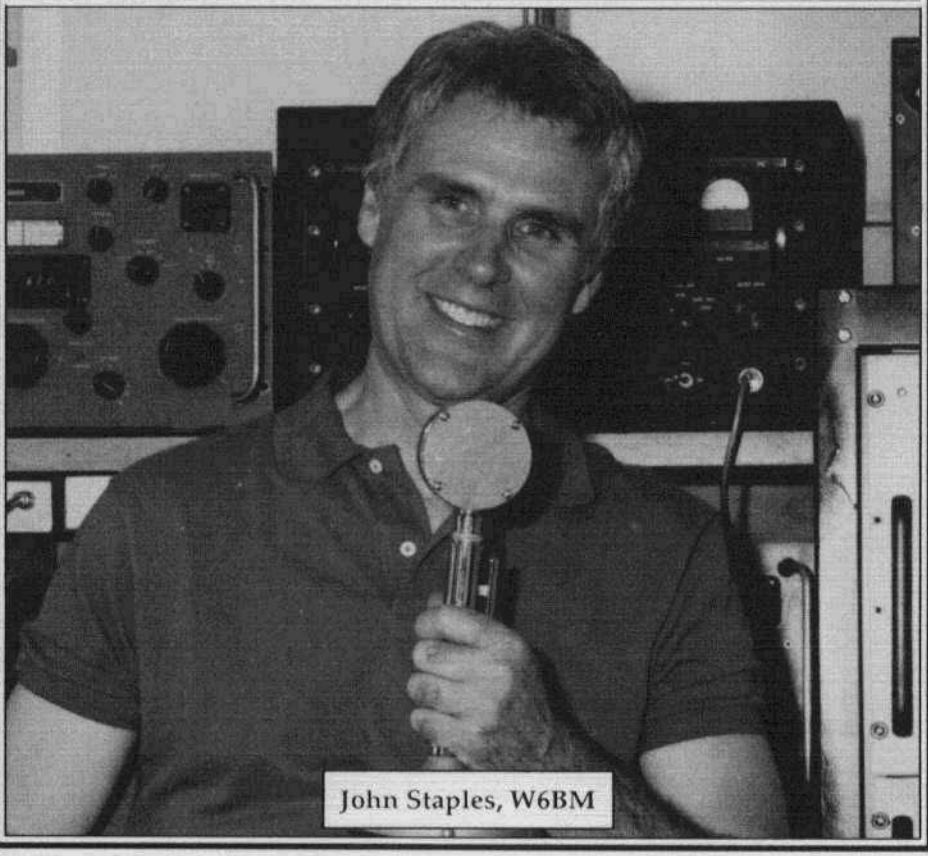
ELECTRIC RADIO

celebrating a bygone era

Number 15 July 1990



John Staples, W6BM

ELECTRIC RADIO

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; John Staples, W6BM; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Jim Musgrove, K5BZH; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Dick Houston, WØPK; Andy Howard, WA4KCY; Skip Green, K7YOO; George Maier, KU1R; Albert Roehm, W2OBJ; Mike O'Brien, NØNLQ, Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS

Barry Wiseman N6CSW/Ø

The first order of business is the AM power issue. As announced by Dale, KW1I, in his AM Power Issue Update on page 2, the FCC has assigned RM numbers to four petitions of great interest to us AM'ers. The first three; one filed by the ARRL, one by Norm, WB6TRQ for SPAM and one by Dale, KW1I all petition for a change in the AM power regulations. The fourth, by W3KO, petitions the FCC to outlaw AM.

We all have to write letters in support of the first three petitions and against the fourth by W3KO. Please read Dale's article and get all the details and his ideas on what's happening. This is the most important issue in the history of amateur radio for those of us who love vintage equipment and AM. Please write the FCC and persuade your friends (SSB operators perhaps) to do the same. The 30 day comment period ends July 27 which will not give you much time after you read this. **PLEASE WRITE YOUR LETTER NOW.**

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Cover: John Staples, W6BM. In his second article for ER (the first was in #11) John describes his homebrew 1 KW transmitter. The story is on page 22.

AM POWER ISSUE UPDATE

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

RM numbers assigned to power petitions

Mail, phone and personal contact with the FCC by AM'ers and friends of AM'ers, including at least one member of Congress, has resulted in RM number assignments for the AM petitions before the FCC. RM numbers are as follows: RM-7401 petition for the elimination of AM, W3KO; RM-7402 petition for permanent AM input power grandfather clause, ARRL; RM-7403, SPAM petition for 1500 watts carrier power, WB6TRQ; RM-7404, petition for 750 watts carrier power, KW1I. Though RM number assignments is a necessary and positive development too much should not be read into this. RM-7401, a three paragraph petition for elimination of AM, should not have been assigned an RM number because it did not raise any new issues over a similar petition denied ten years ago by the FCC. Legal counsel for the ARRL feels that the FCC strategy may be to ultimately deny all of these petitions and call it a draw between the pro-AM and anti-AM constituencies. If this is the FCC's strategy it is based on their continued belief that there are very few AM operators.

THIS IS OUR CHANCE, with RM numbers now assigned, we now have a small window in time to submit a volume of comments to convince the commission that there needs to be a separate consideration in the power regulations for the AM mode. When you receive this copy of Electric Radio you will have less than 2 weeks before the 30 day comment period for these petitions ends on July 27.

The following information will help you prepare comments for these petitions. The FCC's 30 day comment period on the petitions is principally to file statements in favor or against the referenced petitions according to William Cross of the Personal Radio Branch. **Your comments should have the FCC address on the top of the page, followed by RE: Comments on RM- xx xx, and then a heading: To The Commission. Clearly state in the first paragraph whether you are in favor or against the petition. Feel free to make a point why you are for or against.** Some reasons you may want to include in your favorable statements on the AM power petitions:

* Your earned privileges should not be reduced
* Having high power limits will cost you money for transmitter modifications. Be specific.
* You do not have any existing local interference issues that require a reduction of power.
* Amount of AM activity today justifies a separate measurement consideration just like it did in 1983.
* Carrier output power can be measured with existing FCC field equipment without retraining FCC field personnel.
* A cost conscious FCC should not be spending time in regulation activities that penalize one group of amateurs with no offsetting benefits for anyone.
* Canada has a special power measurement category for AM of 750 watts carrier power that preserves their amateurs historic privileges.

Use the RM number of the AM power petition that you feel has the best chance of success or file separate comments for more than one petition agreeing with the points you like in each one. A few statements on a single page is an adequate comment. Please include a separate comment on RM 7401 with as little as one sentence, voicing your opposition to W3KO's petition. **Include the original and 2 copies of each comment in your letter to the following address:**

Federal Communications Commission
FCC Secretary - Donna Searcy
1919 M Street, NW
Washington, DC 20554

In 1980 a petition asking for the elimination of AM received over 80 opposing comments from the AM community to 1 in favor. The petition was denied. We need hundreds of favorable comments this time around to move the FCC towards favorable rulemaking. Write your comment today and get others to write. It would be extremely beneficial if you could also get your Congressman and Senator to write letters as well.

ELECTRIC RADIO IN UNIFORM

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

"The ARR-1 and ARR-2"

Down he goes! Altitude 10,000... throttle to 29" manifold pressure, RPM to 1600... good thing your wingman got that one off your tail... Time to head for home now... just about enough fuel to make it. Let's see... the carrier was there three hours ago; at 30 knots she should now be here. Hope she didn't have a change of plans, 'cause it's a big ocean...

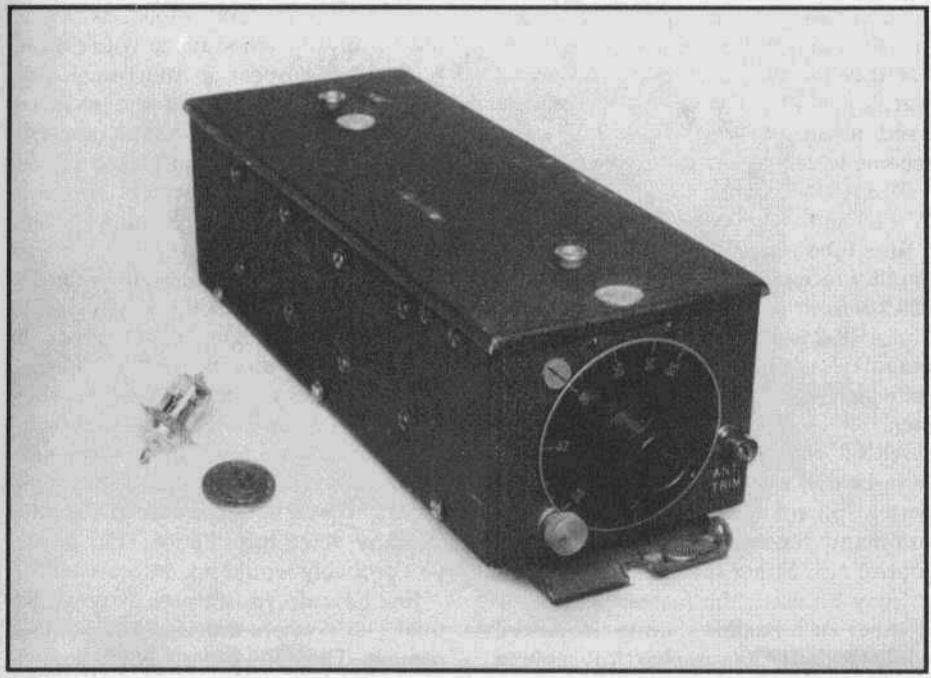
The problem of how returning planes would find an aircraft carrier was recognized in the 1930's as tactics for this new system were developed. Aircraft of the time had only magnetic compasses and airspeed information; winds, compass error, and the confusion of combat or complex search patterns might cause navigation errors of tens of miles or more. Then of course your carrier might not be where you expect, either.

Under our 'no boring radios' rule, In Uniform generally doesn't 'do' navigation sets, but the ARR-1 and ARR-2 are exceptions. The system is unique and despite the sets having appeared on the surplus market in vast numbers and being the topic of many conversion articles, it has (so far as I know) never been correctly described in ham literature. Moreover, this system is an example of a simple technical approach which solved an important problem -- or ... did it?

I have been interested in the ARR-1 and ARR-2 story for some time. This column would not have been possible, however, without information provided by Sam Hevener, W8KBF, William A. Smith, N9TT, and Sheldon Wheaton, KCOCW. Many of the manuals for these radios were classified ('CONFIDENTIAL' -- which during the war meant about what 'SECRET' does today) and for that reason, few have survived. I'm indebted to my fellow collectors for taking time to copy and send the most important parts of them together with some descriptive info on the transmitters with which they were used.

The AN/ARR-1 and ARR-2 are two generations of receivers for an aircraft navigation and communications system. There are also two generations of transmitters, namely the YE and YG -- strange sounding, pre-1943 Navy nomenclature for a navigational transmitter.

The main purpose of the system was to allow aircraft equipped with either the ARR-1 or -2 to find a transmitting station (usually on a ship) having a YE or YG transmitter without direction finding; such a system is called a homing beacon.



The ARR-1 receiver with a 954 'acorn' tube and a quarter for size comparison. The projections on top of the unit are snaps for a canvas cover.

The transmitter operated on a frequency between 234 and 258 Mcs. It transmitted either CW (the usual mode of operation) or voice signals from a highly directive antenna rotating at 2 RPM. The beam thus swept past a receiver once every 30 seconds; because of the narrow beam the signal was audible for perhaps two seconds out of each interval. Because propagation at these frequencies is usually line of sight, the transmitter would rarely be picked up on the surface beyond ten or twenty miles; the range for properly equipped aircraft at an altitude of 10,000 feet or above was 50 to 75 miles.

When transmitting navigational signals, the transmitter was keyed with a different letter of the alphabet for each 30 degree sector. The letters were chosen from the set A, D, F, G, K, L, M, N, R, S, U, and W.

For example, from 000 (North) to 030, the letter 'A' might be sent, then from 030 to 060, 'R', then from 060 to 090, 'N'... and so on through all twelve letters. Each letter was transmitted twice in its sector. Though the set of letters was fixed, the order in which they were used as the antenna turned could be changed. Thus, not only was the directional information coded, but the code could be changed. Pilots were supplied with a 'decode card' showing the pattern currently in use.

In our example, when the returning pilot picked up two 'R's, he knew that the station (probably his aircraft carrier) was within a few degrees of 45+180 = 225 degrees from his location.

Every tenth revolution, the transmitter sent a two letter station identifier in all sectors; neither letter was one of the twelve so no confusion could occur.

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Of course, unfriendly aircraft might also hear and try to use the information. For that reason, the transmitted signal wasn't just VHF CW or AM. Instead, it used a unique double modulation scheme which will be discussed below.

The ARR-1 is about 3" x 4" x 10" (H x W x D) and weighs about 4 pounds. It is a four tube set and must be used with another receiver which covers 540 kcs to 830 kcs from which it also draws power. The ARR-2 is 6" x 5" x 11", and weighs 9 pounds. It is a self-contained eleven tube set which mounts in a command receiver rack.

ARR-2 channels (we will define this term below) may be selected at the set with a spline knob like that used on the command receivers or from a remote control box. Either the C-2/ARR-2 or C-15 may be used; the former selects the channel via a flexible shaft to the ARR-2 while the latter has an electrical cable to a motor drive mounted on the front panel of the ARR-2. A third possiblity is the C-38/ARC-5 box, capable of controlling one VHF command receiver, two MF command receivers, and the ARR-2, with channel switching by a flexible shaft. In this configuration, the ARR-2 was usually mounted with the two MF sets in a three receiver rack.

The Double Modulation Scheme

The unique feature of this system is the modulation scheme. First, the signal to be sent (either CW or AM voice) was generated in the usual manner on a frequency between 540 kcs and 830 kcs which we will call the channel frequency. Then this MF signal was used to amplitude modulate a 234 to 258 Mc carrier and this double modulated VHF signal was transmitted.

Assuming the use of a 600 kcs channel frequency and a transmit frequency of 250 Mcs, you would have a carrier at 250 Mcs with two sidebands at 249.4 Mcs and 250.6 Mcs respectively. Search receivers of the time usually had over a 1 Mc bandwidth; the CW sidebands would most likely be demodulated with the carrier and disappear in the (much narrower) audio section of the receiver, making the signal appear as an unmodulated carrier. Even if you picked up just a sideband, your relatively unstable search receiver certainly wouldn't be able to put a BFO on it (a 955 'acorn' triode as a local oscillator was the state of the 250 Mc receiver art in 1939!) so you would only notice the signal if it was strong enough to suppress the receiver noise.

If transmitting voice, each 600 kcs sideband would have a pair of voice sidebands of its own. Since the 600 kcs sideband (taken alone) is an SSB signal, there's no way you'd be able to demodulate any voice information, and in fact you probably would not detect it at all.

Just how do you receive a signal like this? That's where the ARR-1 and ARR-2 come in. The ARR-1 (early Navy nomenclature 'ZB') is a four tube TRF receiver covering 234 to 258 Mcs. (The dial is marked 34 to 58, probably for security reasons.) The incoming signal (all of it, from 249.4 to 250.6 Mcs) is amplified in three stages, and then detected. We now have the original 600 kcs signal, either CW or AM.

Giving us back this signal is the only function of the ARR-1. Its 600 kcs output goes to another receiver of any type which can be tuned to that frequency. The Navy used the RU, ARB, ARA (the ARA is the first Navy command receiver), and probably others; the Army used the BC-229, BC-433, and BC-946. The second receiver processes the 600 kcs signal just as if it had come from an antenna. If the original signal is AM, you will hear the modulation; if CW, you would use the BFO, except on the BC-229 which doesn't have one.

The ARR-2 works the same way, except that no companion receiver is needed because everything is done by the ARR-2.

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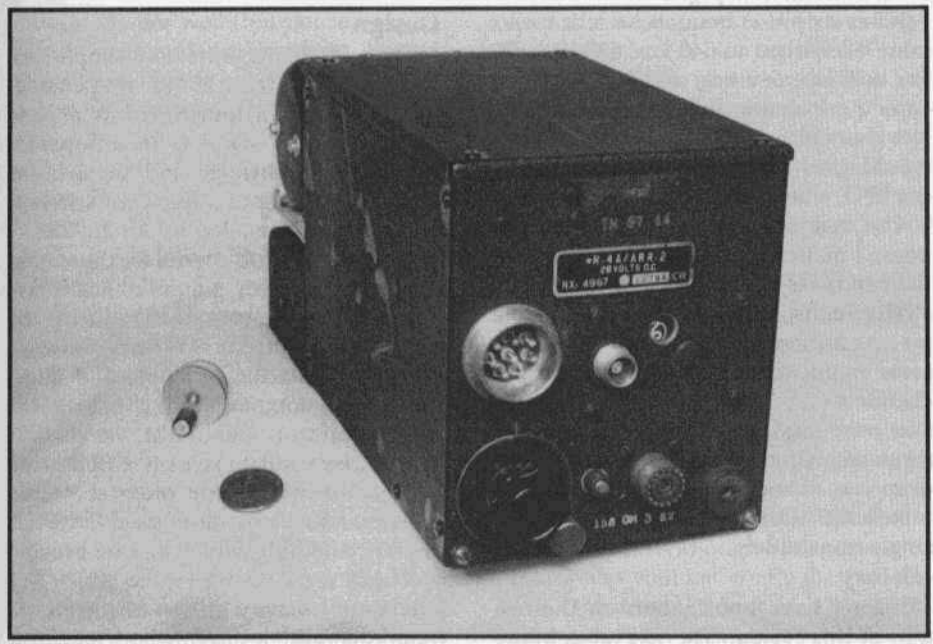
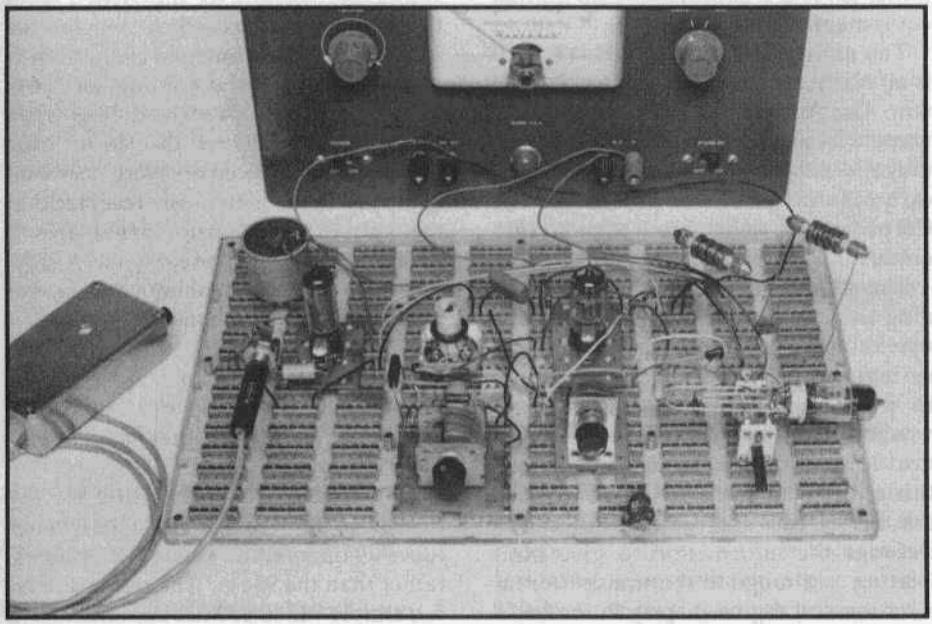


The ARR-2 receiver. The knob can be attached to the threaded bushing near the center of the panel for local channel selection.



The test transmitter. Stages (left to right) are a 6AQ5 voice modulator, a 12AU7 MF oscillator-modulator, and a 12AT7 VHF oscillator. Output (on 250 Mcs) is a few milliwatts, by radiation from the oscillator plate lines.

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It has six preset frequencies (channels); mine was tuned to 540 kcs, 570 kcs, 600 kcs, 630 kcs, 660 kcs, and 720 kcs. To copy our example signal, you would select channel 3 (600 kcs) and the ARR-2 would give you either voice or (using the BFO) a beat note.

The stability of the VHF frequency doesn't matter, as long as it stays within the bandpass of the ARR-1 or the ARR-2 VHF circuits. It would even be possible for several transmitters to operate on the same frequency, provided that different channels (say 540 kcs, 600 kcs, and 720 kcs) were used. Any listener without the right receiving equipment would have even less chance of sorting out such a mixed signal than he would one from a single transmitter.

History

I don't have information on the origins of this system. The 954 tubes in the ARR-1 date it's design to about 1938; some information I have on the YE transmitter gives a 1938 contract date for that equipment.

The early nomenclature (ZB, YE, YC) is all Navy, so it is definitely a USN system. The Army used it but most Army nomenclature is 'new' (post-July 1943) so they did not pick it up until late 1942 or early '43. Army use was probably at Air Corps landing fields, but I have no info on this.

The ARR-2 replaced the ARR-1, beginning about 1944. One of my ARR-2's was overhauled by the Navy in 1954 so the system was probably still deployed then in some active units. By 1957, when I was first aboard ship, the TACAN (TACtical Air Navigation) system was in use; this equipment transmits coded pulses around 900 Mcs and the aircraft receiver decodes the information to give both bearing and range to the transmitter on a mechanical digital display in the cockpit. William Smith believes that the ARR-1 and -2 were used in some National Guard units into the 1970's.

Design

The ARR-1 and -2 are both simple sets. The ARR-1 has three 954 (acorn pentode) RF stages and a fourth 954 as a plate detector. Each stage is in a separate shielded compartment and has a tuned circuit consisting of a two turn self supporting coil paralleled by an air dielectric trimmer. A rod driven by the tuning knob moves silver plated conical brass plungers into the coils, thus reducing the inductance as the knob is turned toward higher frequencies -- simple and effective for this not too critical application.

One point of mechanical weakness is the micalex insulator which supports the coil and trimmer. You often see these broken and for any radio used in carrier aircraft, anything which can be broken, will be! (I recall seeing a radio which had smashed its way down through its mounting rack, destroying both itself and the rack, as the result of a 'hard landing'!)

The MF output of the ARR-1 goes through a relay box which switches the accessory receiver antenna connection to the ARR-1 when the homing set is on, and switches it to its own antenna when the homing set is off. BC-946 or ARA broadcast band receivers were nearly all equipped with a five pin receptacle at the bottom of the front panel; this is where you get power for your ARR-1. The ARB has a permanent connector at the upper left of the panel.

The ARR-1 mounts with two snap slides; both the ARB and RU receivers have matching studs on top. If used with an ARA receiver or another set, a mounting plate could be used.

The front end of the ARR-2 is very similar to the ARR-1 but it has better tubes -- three 6AK5's as RF amplifiers, rather than the 954's. The rest of the set is a simple 540 to 830 kcs superhet using seven 9001's and a 12A6.

Both sets are well (but not too expensively) built and not overcomplicated; access for service is good on both.

The ARR-1 and -2 were probably designed by Western Electric; manufacture was by both Western Electric and Zenith Radio. Production was probably over 100,000 units.

On The Air With The ARR-2

When I finally understood the modulation scheme, I found it a little hard to believe! Was there any choice? I had to build a transmitter, just to see it work. Since this frequency range is allocated to military use and in any case, this type of modulation isn't legal for hams, I used very low power and did not connect the transmitter to an antenna; the greatest range achieved was a few feet.

The 250 Mc transmitter is a 12AT7 in the time-honored TNT (Tuned-not tuned) oscillator circuit. Half of the 12AU7 is an oscillator tunable from 520 kcs to 900 kcs using a coil borrowed from a 'broadcast band' command receiver. It drives the second half of the 12AU7 which modulates the 250 Mcs oscillator via the 'modified Heising' circuit. Because of the high modulation frequency -- 540 kcs to 830 kcs -- 2.5 mh chokes make adequate modulation reactors!

The second half of the 12AU7 is plate modulated by a voice signal from a 6AQ5. This too is a Heising circuit, using a 3 henry choke.

The VHF part of the ARR-2 tunes quite broadly -- the 3 db bandwidth is about three megacycles so if you are even close to the right setting, the radio will work. The MF section (the channel frequency), however, is only about 12 kcs wide. If you are on the wrong channel, you hear nothing but when you switch to the right one, the voice signal jumps out loud and clear.

To learn what the signal would sound like on a normal 250 Mcs receiver, I plugged the phones into a PRM-10 grid dip meter set to 'diode'. With the PRM-10 coil tightly coupled to the 250 Mcs oscillator tank, the meter was pegged and I could hear a slight rush in the phones but the voice modulation was imperceptible. Even when I keyed the 600 kcs channel frequency (simulating CW operation for navigational purposes) I could hear nothing.

Conclusions

It's hard to draw conclusions about a system for which one has such fragmentary knowledge, but a few things seem clear.

The function is an important one and the basic method --transmitting a signal coded for direction, rather than requiring the aircraft to do direction finding -- seems sound. Although radio direction finding was well known by the late 30's, VHF D/F from aircraft is a headache because the aircraft structure distorts the antenna pattern.

The concepts of the system -- VHF, double modulated, coded directional information -- make it reasonably secure, in the sense that with the tools of the WW-II period it would be unlikely to give an enemy useful information.

The ARR-2 is a vast improvement over the ARR-1. One can easily imagine the operational problems of shifting a tunable receiver back and forth between the ARR-1 and its normal function. And a self-contained radio is certainly more reliable.

I can't find any negatives in the design of the ARR-1 and ARR-2 hardware, either. The design of these sets is about as complicated as a command receiver; my ARR-2 worked when I switched it on. The YE and YG transmitters were hardly more complex than the receivers (the YG has only 7 tubes!); despite being VHF sets, they were probably about as reliable as other shipboard low power transmitters -- which is excellent if you don't mount them near your own guns.

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VINTAGE PRODUCT REVIEW

by Bill Kleronomos, KDØHG
POB 1456
Lyons, CO 80540

JohnsonViking Thunderbolt HF Linear Amplifier

Sometimes, a guy can kinda figure out what something does just by the sound of its name.

One would guess that Colt 45 Malt Liquor is probably not sold at the neighborhood Dairy Queen, and a Ford Cobra is probably not a car your mother would buy. I would suspect that a QRP enthusiast would be making a big mistake by buying a radio called a Thunderbolt - and for good reason. The Johnson Thunderbolt is one big 'mutha' of a desktop linear amplifier - and wimp desks shouldn't apply for the job.

Big (11 1/2" high, 21" wide, 17" deep), heavy (120+ pounds), and powerful looking, the Thunderbolt, for many years in the late 50s and early 60s, was considered the ultimate in amateur amplifiers by many, and while there are more powerful amplifiers on the market today, it can still hold its own in many respects.

Design Overview

The Viking Thunderbolt is a completely self contained HF linear amplifier capable of operation over a continuous frequency range of from 3 to 30 Mhz. Most models use a pair of 4-400A tetrodes in a grid driven, bridge neutralized configuration. Some models were manufactured with a pair of PL-175A pentodes. In either case, a total of 800 watts of plate dissipation is available.

The Thunderbolt employs several unusual features not found in more modern commercial amplifiers. There is no plate bandswitch; the plate tuning control operates both a plate tuning variable capacitor and roller inductor which are geared together. As the tuning is varied, both the inductance and capacitance are continuously and proportionately varied thereby providing an optimum tank circuit Q over the whole HF range. The strange looking slot on the front of the amplifier is actually an illuminated logging/tuning indicator driven off the plate tuning mechanism.

As the Thunderbolt employs a grid driven configuration the driving requirements are exceedingly low. Only about 10 watts are needed to drive this amplifier to full output. Several hundred watts of output are obtainable with only 5 watts of drive. An attenuator is a necessity for use with a transmitter in the 100 watt output class. Another useful feature is the ability to operate class C at the turn of a control. This increases the efficiency of the amplifier while in operation with modes such as CW, NBFM and RTTY. The grid bandswitch has a position labeled "RES", which converts the grid input from a tuned circuit to a 300 ohm resistive load. Providing the RF exciter can load into a 300 ohm load, using this feature converts the grid circuit to a 'no tune' variety.

The power supply uses a pair of 866A or 3B28 rectifiers in conjunction with an extremely husky (40 pounds) power transformer in a full wave circuit. This is not your run of the mill voltage doubler prevalent in many modern amplifiers. The high voltage filter is of the choke input variety and uses either an oil filled or bank of electrolytic filter capacitors, depending on vintage.

Cat. No. 240-353-1 Viking "Thunderbolt" Kit with tubes

Both the grid bias and screen supplies are VR tube regulated.

Cooling is handled by a pair of quiet fans; one pressurizes the grid compartment and forces air through the base seals of the 4-400s, the other forces air around the glass envelopes and plate seals.

On the whole, the Viking Thunderbolt is very well shielded; all power and control connections run through LC filters and the shielding is completed through the use of RF gasketing material and shielded panel meters. The only RF coming out of the unit is going to be via the coax connector!

Operation

As with any other amplifier, the use of 240 volt AC power is preferred, but the Thunderbolt will run off 120 volts. To use the amplifier with a transceiver, a pair of DPDT coax relays with a SPDT auxillary contact is required to route RF, either through (TX) or around (RX) the amplifier. The auxillary contacts are needed to operate the T/R bias switching of the unit. Plate voltage is applied at all times; in standby the tubes are biased off.

Tuning and loading is quick and painless. The grid tuning is very broad and non critical, the plate tuning and loading can be accurately pre-set once the proper settings have been found with only slight tweaking required. The PI network is capable of matching a wide range of loads.

Performance

Ok, you want to know so I'll tell you first. With a good pair of 4-400s the Viking Thunderbolt will put out a maximum of 850 watts CW. Let's continue on this. This amplifier was designed in the good old days of the 1 KW DC input, for starters. Under full load, the plate supply delivers on the order of 2100 volts, and one can load the tubes up to about 700 to 750 milliamperes max for a maximum DC input on the order of 1500 to 1600 watts. This was plenty of soup in the 1 KW days, but not in today's 1500 watt output world.

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RCA AR-88 -- A CLASSIC IN RADIO DESIGN

by Sam Thompson, W6HDU
1031 San Antonio Ave.
Alameda, CA 94501

You won't find this receiver in any of your ARRL Handbooks or radio catalogs from Allied, World Radio Labs, etc.. It was never sold as new equipment in the amateur marketplace.

The December, 1976, issue of RCA's 'Trend' magazine gives this account as written by Ed Braddock, W2BAY/W1BBK, former Manager, Amateur Radio Section, Engineering Products Division, Camden, New Jersey.

" Ed note: Trend readers may be interested in a brief history of an amateur radio receiver that was designed by RCA and is still in use after 35 plus years.

"It is unusual that an electronic equipment design weathers the technological advances over a period of 35 years and is still found suitable for use by an exacting group of radio operators. This situation exists today for the model AR-88 Communications Receiver in the operation of RCA Marine Radio Station WWC on Cape Cod, Mass. Here, these receivers are in daily use for world-wide ship-to-shore message handling. Other RCA shore stations, such as WSC, Tuckerton, New Jersey, also use them.

"The initial concept of the AR-88 design was to provide a deluxe model to be sold by the RCA Amateur Radio Section as a sequel to a prior model (AR-77) in the amateur equipment market of 1939-1940. The AR-88 was designed as a general purpose 6-band communications receiver, cover frequencies of 535 Khz to 32 Mhz. The electrical design of this receiver was done by Lester T. Fowler [still active] and the mechanical design by George Blaker, both of whom are now retired.

However, before the AR-88 reached the production stage, the outbreak of World War II created an export market, particularly to Great Britain, that was going to overshadow the dwindling amateur market. (Amateur operation was not permitted during World War II, curtailing the equipment sources for amateur stations.)

" To meet this changing market demand, organization of the AR-88's production and sale was taken over by Export Sales, under the late Charles W. Roberts, at the Camden offices. Large numbers of the units were produced in the RCA plants in Camden; Bloomington, Indiana; Montreal, Canada and in the Grigsby Grunow plant in Chicago, Illinois. Most of these receivers were procured by Great Britain and used at many places, including the Battle of Britain. Russia also used the receivers.

"During the time when RCA's shortwave shore facilities were being expanded, many AR-88s were installed to meet the increase in message traffic. These receivers have been kept in use up to the present time.

"One of the problems of keeping a receiver in service 24 hours daily for 7 days each week over the years has been the availability of replacement parts. Fortunately, components were found in military supply depots set up during World War II in Tangiers, Africa, and in San Juan, Peurto Rico, preventing many of these venerable AR-88s from being retired from service.

"After World War II, many of these receivers were sold in surplus markets where they were purchased by radio amateurs and are still in use."

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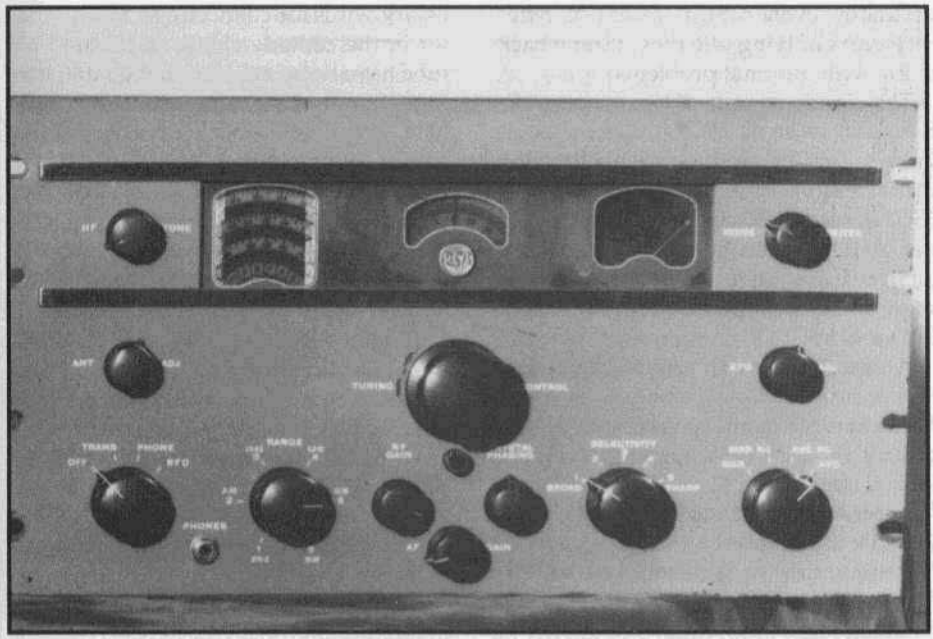
The orignal AR-88. Note the large RF and AF gain control knobs below the tuning knob.



The successor, CR-88, now with added crystal phasing control grouped with smaller RF and AF gain controls, below the tuning knob. The small knob directly below the tuning knob is the tuning lock.

RCA AR-88 from page 12

This article was later reprinted in entirety in the older, small format, QST under the "Strays" column. I do not know the date of the article but it was finding a copy of this article attached to the AR-88 manual, that sparked my interest to procure an AR-88. It's credentials were good - I expected a lot and I was not disappointed.

The AR-88 is a 14 tube superheterodyne heavyweight, weighing 73 pounds without cabinet or 99 pounds in it's especially deep cabinet. Rugged construction includes a heavy 10 1/2" copper plated steel front panel, side brackets and a heavy chassis. Quality parts are used throughout, such as sealed transformers, oil capacitors, laced wiring harness, a precision gear drive tuning mechanism and ceramic insulation on gang condensers, tube sockets and switches. Parts are mounted with screws and nuts for fast and easy servicing. Workmanship is of the best. It has been designed to stand up under severe conditions of use. After fifty years of lying idle they'll come back to life with minimal problems.

The circuit consists of two stages of R-F amplification (2 6SC7s), first detector (6SA7), first heterodyne oscillator (6J5), three stages of I-F amplification (3 6SC7s), second detector (6H6), noise limiter (6H6), second heterodyne oscillator (6J5), A-F amplifier (6SJ7), output power stage (6K6) and power supply system (5Y3 and VR-150).

A description of the receiver includes these features:

* Mechanical band spread with single control for ease of tuning a previously logged station
* Automatic noise limiter with switch and variable tone control
* Continuously variable tone control
* Antenna trimmer
* Tuning lock
* Five position selectivity control which offers two non-crystal selectivity positions: for high fidelity and normally modulated reception; and three crystal positions: for CW or sharp modulated signal reception, for sharper CW and for sharpest CW reception. The CR-91A manual lists the bandwidths at points on the selectivity curve 3 dB (or 2 times) down with respect to response at resonance as: 16 Kc, 9 Kc, 4 Kc, and 500 cycles. This receiver has really superb sounding audio. Crowded ham bands require crystal selectivity. There is no crystal phasing control.
* Temperature compensated oscillator circuits give exceptionally good oscillator stability. This receiver doesn't drift; lock it on frequency and it stays put.
* Four gang condenser gives high image ratio on all bands. No images on 10. 12 tuned I-F circuits give a very high degree of selectivity. The sensitivity equals my HRO-60 on ten meters.
* Wartime production and a scarcity of meters saw many AR-88s produced without meters. The manual states; "The necessary wires for connecting a tuning meter in the cathode circuit of the first I-F tube have been included in the cable wiring. If and when meters become available, it will be a simple operation to install a tuning meter." Original tuning meters are an amber color and are marked, "DB above 1Mv". Post war production of later models show receivers being made with and without meters.

Models and Variations

* AR-88, AR-88D: Black crackle front panel, built between 1941 and 1945, maybe longer but probably not. 6 bands covered 535 Kcs - 32 Mcs,455 Kc I-F.
* AR-88LF: The low frequency version. Tuned 73 Kcs - 550 Kcs in two bands and 1480 Kcs - 30.5 Mcs in 4 bands. 735 Kc I-F.
* DR-89: This was a triple diversity receiver which utilized 3 AR-88s (each with diversity control on the lower right of the front panel), a tone keyer unit (to combine the output of the 3 receivers), a monitoring unit with power supply, and

a loudspeaker assembly, combined to make a 6' tall, 650 pound receiver. For optimum diversity reception a spacing of 1000' between antennas is recommended.

* CRV-46246B (Navy designation for AR-88): had black crackle front panel.

* RDM-1: This was the Navy triple diversity receiver which utilized 3 CRV-46246B (AR-88s) each with diversity control on the lower right of the front panel. Black crackle front panel. Similar to DR-89.

* CR-88: Smooth gray front panel. A manual for this receiver is dated July, 25, 1946. The significant difference is the addition of a crystal phasing control on the front panel. All receivers in this list which follow are made after this 1946 date and all have crystal phasing controls. Now the AF gain, RF gain and crystal phasing controls use smaller knobs and are mounted in a triangle below the large tuning control knob. Some have carrier level meters. Six bands cover 535 kcs - 32 Mcs. They have 455 Kc I-F.

* CR-88A: Smooth gray front panel. Some have tuning meter. Later CR-88 with low production run expected. Bob, W5PYT, reports owning #171.

* CR-91, CR-91 A: Also known as MI-17091A. Smooth gray front panel with crystal phasing control. Same front panel as CR-88. Has low frequency coverage of 73 Kcs - 550 Kcs in two bands and 1480 Kcs - 30.5 Mcs in four bands. 735 Kc IF frequency. Uses 6V6 in audio output - the only one that does. Probably same vintage as CR-88 (about 1946) and believed to follow the AR-88.

* SC-88: Black crackle front panel. Crystal phasing control. Main difference is single band in use shown in main tuning dial. Some with diversity control. Some with meter.

* R-320/FRC: Signal Corps designation for SC-88. Black crackle front panel.

* OA-58A/FRC: The complete diversity receiver which used 3 R-320/FRCs (SC-88) receivers etc. as other diversity setups. 535 Kcs - 32 Mcs. A manual is dated October 1949, perhaps close to the introductory date of the SC-88.

* CR-88B: Probably the latest derivation of this receiver with many changes. A manual shows these differences: single band-in-use shown in main tuning dial; provision for crystal control; 500 Kc crystal calibrator; three position selectivity control: broad for Hi-Fi, medium with crystal for CW and sharp phone, sharp with crystal for Sharp CW reception; push pull 6K6 audio, a 6SL7 for AF amplifier and inverter, a 6J5 for crystal calibrator, a heavier rectifier, 5U4; two position tone control; power transformer moved forward toward front panel; one choke in power supply instead of two; large multi-section oil capacitor replaced with plug-in electrolytics; carrier level meter; shorter, bright metal horizontal trim stripes, the bottom one is now of 2 pieces and has a center gap between them; 15 tubes; light color front panel than cabinet with large letters, CR-88B, above top bright metal trim bar. The instruction manual was printed, "RCA Radiomarine Corp. of America , a service of RCA". It was probably introduced between 1951 - 1954 and is a scarce receiver.

Owner/operator reports are enthusiastic. Zeke, W5LUT, commented that it didn't overload when a ham club across the street goes on the air. "They were all over the band on my Kenwood 440", he said. He also mentioned that his HRO doesn't overload and his 75A-4 was ok. During part of the war he was stationed at an Air Force base in the Azores, which had about 50 shiny black lacquer panelled AR-88s, mostly for RTTY. He recalls another time onboard ship when the Captain had the best receiver in his cabin, an AR-88. The radio room had HROs he said.

Zeke says there was an agreement not to return these receivers to this country.

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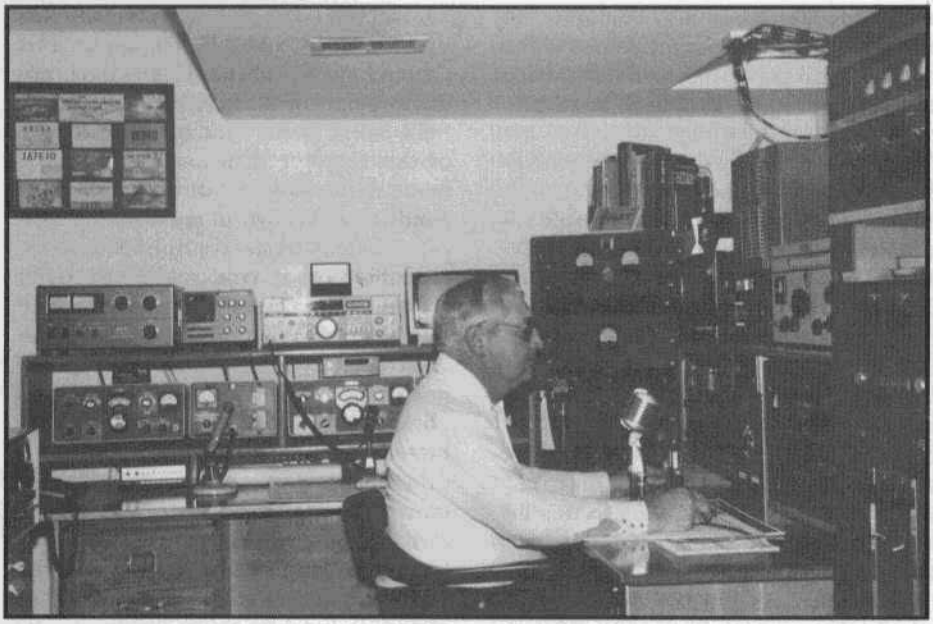
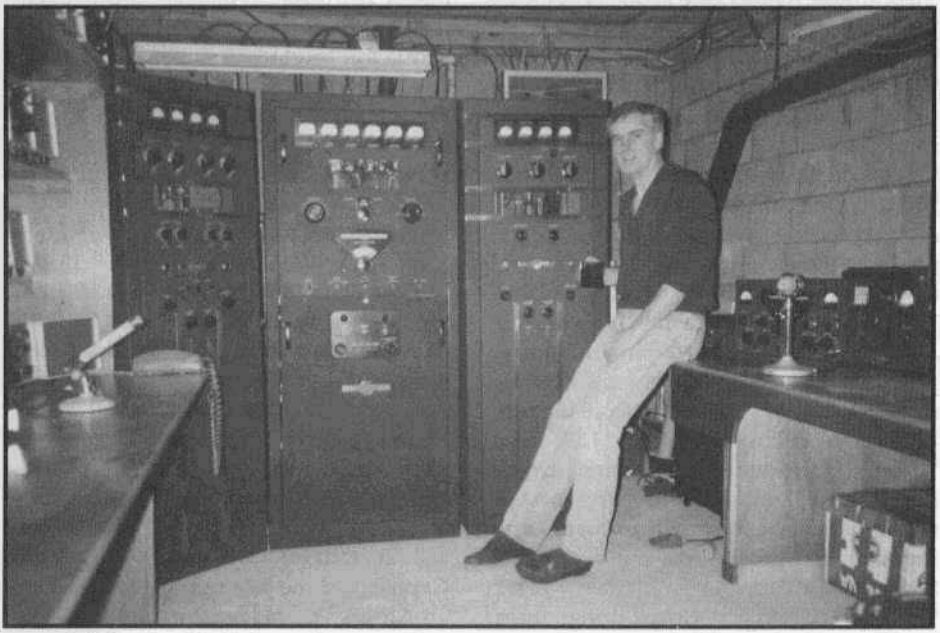
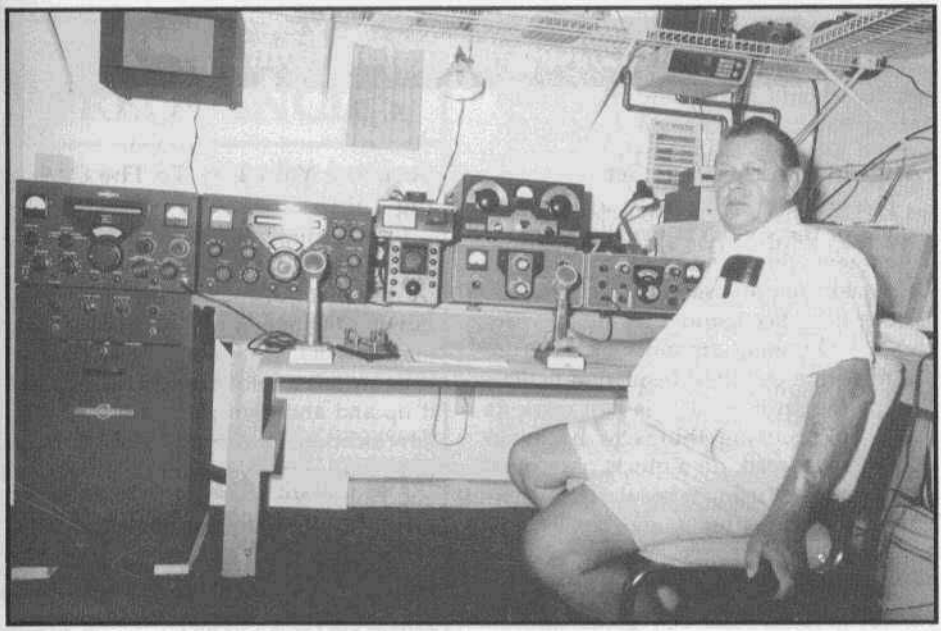


Dick Callahan, W8GNV



Mike Drake, N2DXO



Del Schisler, K9FCM

Bill Thissell (Phoenix Bill), K7VZP, with friend overhauling 2 meter amp.

Collecting/Repair/Restoration...TIPS

Aligning The Vintage Set

The last step in restoring a classic receiver or transmitter is usually a careful alignment. But don't work too hard at this task before using the set. Radios which have been stored for many years often have small amounts of moisture deep within coils and insulation materials; as the set is used, this will work its way out, causing things to be again detuned. Instead, do a quick 'once over' and then start using it regularly. A careful alignment after a few weeks will probably last for years.

Repairing Transmitter Tube Plate Cap Connectors

I discovered the following "fix" to be very effective and permanent. First, apply heat from a soldering iron to the cap in order that it might be safely removed without damage to the envelope and lead. Shake the solder off the cap, once removed, in order that the hold for the plate lead might be clear of any obstruction.

Next, stir up a small batch of two-part slow-cure epoxy cement, and glue the cap back atop of the tube, with the plate lead clearing the soldering hole. Allow this to dry for at least 24 hours, and then re-solder the lead to the cap. Use a generous amount of solder to "fill" the top of the connector. Your tube is as good as new again, and ready for action.

I have found epoxy cement to be excellent for re-securing loose bakelite tube bases as well; a thin bead bridging both components does the job.

Eddy Swynar, VE3CUI

Securing Your Key To The Operating Table

I put a couple of pieces of coax watertight tape - which is like putty in a strip - on the feet of the key and then press down. This makes the key secure to the table and it'll will take a lot of hard fist. If you want to move it you can just pick it up and and then press it down in the new location. I have been using the same coax putty for 7 years and it still does a good job.

Edward White, WA3BZT

Replacing The Return Spring In Hand Keys

If you've ever lost the original spring from a hand key, a reasonable substitute is the spring from a click-type ball-point pen. This new spring can be trimmed to the correct length with a pair of cutters.

Eddy Swynar, VE3CUI

Removing Old Masking Tape

The curse of the flea market buyer is that masking tape price tag. The same problem shows up on government surplus gear , which seems often to be given it's 'discharge papers' with masking tape several years before it reaches your local hamfest. A solution - - which does not seem to damage most paints - is automotive 'waterless' hand cleaner. This is the jelly type which says it will remove the toughest grime. Spread it on over the tape you want to remove and cover it with aluminum foil to keep the solvent from evaporating.

Check after 24 hours, then every two or three days, adding more cleaner as it is absorbed. In a week or so, you'll be able to peel away the tape. Remove any traces of the adhesive with more cleaner and a coarse terrycloth towel.

AM FREQUENCIES

2 Meters - - - 144.4 - calling frequency Activity in most cities.
6 Meters - - -50.4 - calling frequency
10 Meters - - - 29.0 - 29.2 operating window. Most activity occurs here, although there is some activity around 28.325
12 Meters - - - 24. 985 - calling frequency
15 Meters - - - 21. 385 calling frequency
17 Meters - - - 18.150 calling frequency
20 Meters - - - 14.286 nightly SPAM net starts around 5:00 PM CA time.
40 Meters - - - 7160, 7195, 7290 - main operating frequencies. Westcoast SPAM every Sunday afternoon on 7160. Starts at 4:00 PM CA time.
80 Meters - - - 3825 - 3850, 3870 - 3890 main areas of operation. Westcoast SPAM net , Wednesday evenings, starting at 9:00 PM CA time. The frequency is 3870. The Northeast SPAM group meets Thursday evenings , starting at 7:30 EST. The frequency is 3885.

Parts Unit Directory...

Here's how it's going to work. If you have a parts unit - some kind of vintage rig (or rigs) that is only good for parts - you could drop me a card and tell me what it is. I'll put the rig, with your name and address, into the computer. **This information will be available to any subscriber who also has a rig on the list.** For $1 and a LSASE I will send a print out. If the list gets real long the price may go up. Remember in order to get a print out of the list, you must have a rig on the list. Those of you who would like to be able to get copies of the list to acquire parts for your restoration projects but do not at present have a parts unit, I suggest you rescue one at the next hamfest. It doesn't matter what it is as long as it's vintage.

But before you start sending for the list let's see how many rigs we get on it by next month. It seems to me like a good idea but let's see how many people want to get involved. Editor

Twenty Meter All-Nighter Results

And the winners are.....Bill, WA8LXJ, John, WA6ZJC, and Les, K6HQI; first,second and third respectively.

The logs worked out this way: Bill worked 38 U.S. stations for 38 points plus 7 DX stations for 70 points plus 50 points for working the entire contest for a grand total of 158 points. John worked 32 U.S. stations, 3 DX stations plus the entire contest for a total of 112 points. Les worked 38 U.S. stations, 2 DX stations plus the entire contest for a total of 108 points.

So, certificates and my congratulations will be on the way shortly to Bill, John and Les.

This first contest was something like a 'shakedown cruise' but I think everyone had a good time and it could be deemed a success. Next issue I'll announce the details of the next contest. Editor

LETTERS

Dear ER

I was licensed in 1957 and at that time all the goodies Hams were using were U.S. Signal Corp. surplus. I was just a teen-ager so most of the equipment was impossible for me to acquire. Then for more than ten years I was QRT for study and work. I got my first BC-348 from a friend in 1978.

From 1983 to 1988 my family and I lived in Westchester County,NY where I took the U.S. license and became KD2HB. During that period I acquired a good deal of surplus gear.

When we had to come back to JA, I of course brought back many boxes (about 30 boxes) and have them in my shack now in working condition.

Here is some information about surplus/vintage gear in Japan:

There are a few shops in Japan which specialize in surplus gear but mainly from the Korean era.

Prices are astronomical. E.G. R 392....U.S. $600, R388....U.S. $800. Wanna bring your 'boatanchors' to Japan? Well the quality must be excellent.

There is no publication like ER in JA. (No AWA, Yellow Pages etc.)

There are many people who are interested in vintage/military gear here in JA but there are no AM nets yet.

In JA there are no flea markets. The only place we swap gear is via ads in CQ Ham Radio magazine (very thick, but no real contents) or via people.

I would like to take this opportunity to thank you for the most enjoyable magazine and to extend my regards to all whom I have become acquainted with in the U.S.

God Bless America.

Stan Tajima, JA1DNQ/KD2HB

Dear ER

This is in response to your consideration of organized AM activity during Field Day. I believe this would be an ideal opportunity to showcase the warm and inviting nature of the AM mode.

Some sort of motivation would have to come along with any effort to orchestrate AM contacts during Field Day. Operations in the middle of the night, for example, take advantage of the tougher "hunt" during this part of the contest for non-duplicating QSOs, encouraging outsiders to tune in.

It's also possible to ride on the coattails of this ARRL-sponsored contest with a sub-contest for AM operators. Most hams can appreciate a plea to help someone with a special contact during a competition. A call of "Field Day - AM!" with a request that those answering use that mode, could be combined with a gentle but encouraging hook of some kind to get folks outside the AM community to take part.

For regular AM-ers, the "prize" is the rich reward of hearing appreciative remarks from those tuning and using the mode, possibly for the first time. For those who press the AM button on the contest transceiver, they hear the wonderful sound of someone's personality.

Electric Radio may have some ideas of other "bonus" incentives (free subscriptions or extensions, advertiser co-op prizes, etc.) for the AM community to help encourage turnout.

From my perspective, the goal is to create an atmosphere of acceptance for AM, and foster attitudes that hold the mode in high regard as the "classic radio" of the Amateur service. With that in mind, some attention needs to be paid to how AM activities during Field Day should come across.

Younger hams outside the AM community are likely to respond well if the contact is creatively presented as a specialized programming "format", in much the same way commercial broadcasters promote themselves to selected audiences. The high-fidelity AM stations here could appeal with the happy sort of "radio station" mentality found in personality-oriented shows on the broadcast bands.

Longtime hams, some of whom are reluctant to embrace AM as they recall the struggle sideband had in gaining acceptance years ago, need special courting to make a contest exchange a positive one. One angle might be to put across our enthusiasm for the mode as a small but dedicated way to preserve the appeal of old-time radio broadcasts, when the family would gather around the console to listen for exotic stations.

Off-peak QSOs involving AM are likely to have the luxury of higher quality dialogue with the other station. The time could be spent complimenting those contestors who's AM sounds "good", which in effect brings a realization by the newcomer that yes, indeed, this mode DOES, sound better! That's the idea, and they then will have "discovered" it all on their own (wink, wink!).

Paul Courson, WA3VJB

A Modern One Kilowatt AM Transmitter

by John Staples, W6BM
732 Craigmont
Berkeley, CA 94708

Introduction

This article describes a modern 1 KW AM transmitter that I recently designed and built. I wanted a compact, inexpensive and good looking bandswitching transmitter that was safe, easy to service and TVI suppressed. I will describe some of my design choices and experience in putting it on the air.

The rig consists of a 1 KW amplifier, modulator, control and power supply that uses 813's modulated by triode-connected 813's. This tube is cheap, readily available and matches the drive available from small rigs such as my Viking Ranger. The circuit is standard: the same electrical layout that has proven itself over many years. Enhancements include a fully shielded bandswitched final amplifier which uses a pi-L output circuit to attenuate harmonics. The rectifiers are all solid state, an oscilloscope modulation monitor is included and a compact, lightweight mechanical design is adopted. The rig has performed well, has good audio and negligible TVI.

Mechanical Design

I've found commercially built chassis expensive and flimsy. Since I had a metal shear and break available, I did my own chassis work and tailored the construction to my exact needs.

The 42 inch high rig is built in four rack-mounted units: the final, modulator, control/rectifier and power transformer modules, all in a modern 19" enclosed cabinet with the power transformer sitting on the bottom. The top three units are closed boxes with removable tops (and bottom for the final) with parts mounted on the sides and bottoms. This results in a compact arrangement that is easy to build and service.

Each module had to be light enough to be handled easily. Lightness and strength are achieved by making each box of 16 gauge aluminum which needs no additional support bracing. Sixteen gauge is easier to work with than aluminum as it resists denting and is easier to saw. Handles on the front of each unit allow easy installation. The warm exhaust air comes out the sides and through louvers in the rack cabinet.

TVI suppression is helped by screening all holes and filtering all power leads to the final amplifier. All low voltage supplies (filament, bias, screen and oscilloscope) are included in the final amplifier enclosure to minimize the number of circuit leads entering the module. The leads are bypassed with commercial line filters supplemented by additional VHF chokes and capacitors at the rear connector. Each enclosed box is forced-air cooled by a muffin fan which is turned off during receive, except in the final, where it runs at reduced speed.

The cables use octal type (8,9, and 11 pin) connectors instead of barrier strips, allowing quick removal of each unit. The cables are long enough to permit any section to be operated outside of the rack cabinet. There are no exposed terminals so interlocks are unnecessary.

As you can see in photo 1, the final amplifier has three meters, an observation window and an oscilloscope modulation monitor. The knobs control the final tune and load, the bandswitch and the grid tuning. There are several other less used controls in the rear of the unit to adjust the oscilloscope, and the screen and bias voltages.

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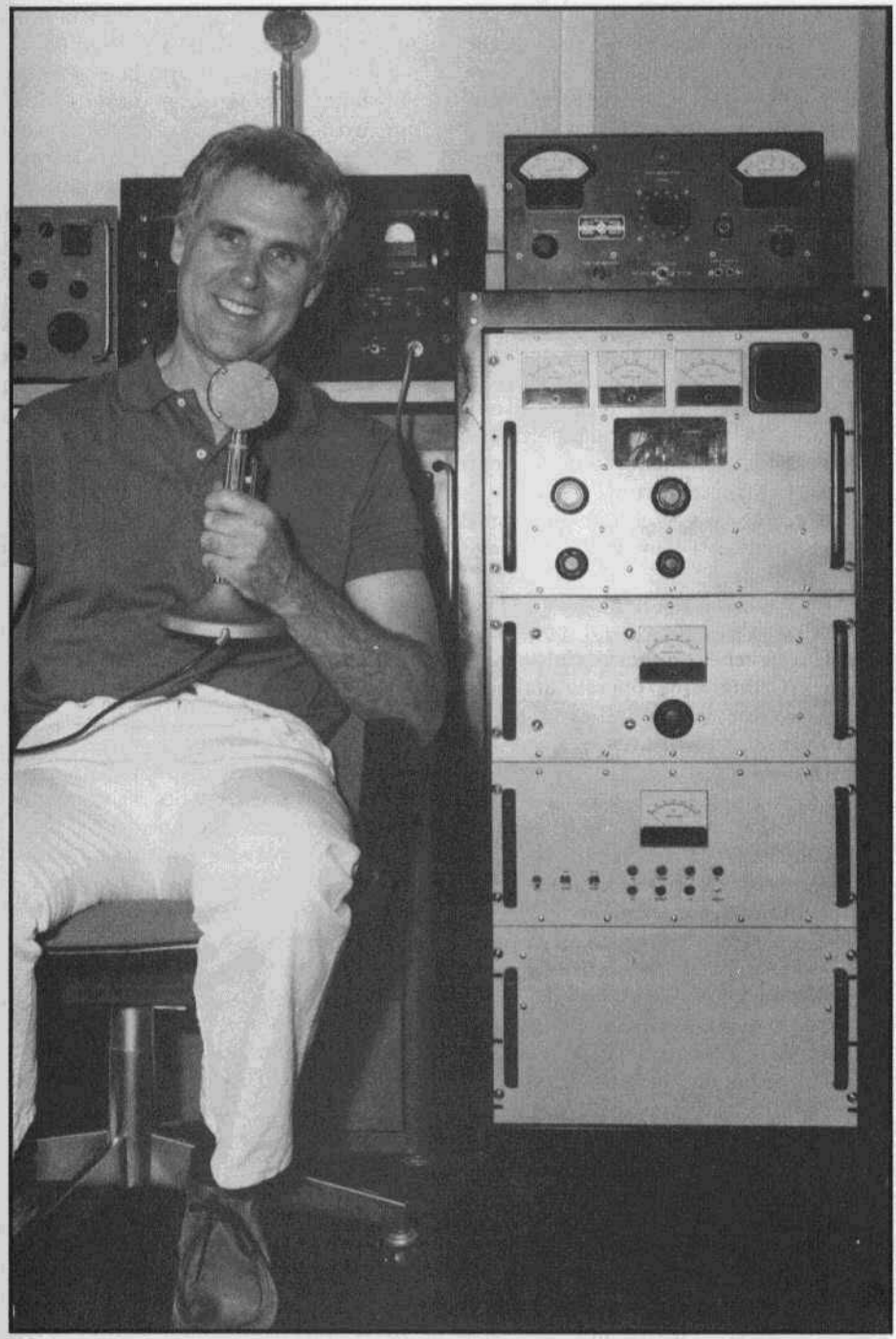

Photo #1 of John's 813 transmitter. Sitting on top is a General Radio modulation monitor.

Photo 2 shows the inside of the amplifier compartment with the plate circuit in the foreground, the power transformers along the right under the scope shield and the blower in the rear near the tubes. The plate choke,variac, grid potentiometer and scope controls are mounted on the rear panel, the T/R relay on the left. The plate bandswitch is coupled to the grid bandswitch below the chassis by a non-conducting toothed belt arrangement, shown in Photo 3. The grid bandswitch is mounted on slotted supports so it can be slid to tension the belt. The belt is twisted in a figure 8 pattern so it penetrates the chassis through a grommet-lined slot, minimizing coupling from the plate to the grid circuit.

A large rotary switch (an old bandswitch) handles the modulation transformer switching from AM to CW with a second contact providing a control signal that activates relays in other modules. The switches on the control chassis handle AC line, tune/operate and test mode selection. Seven indicator lights show the transmitter status.

Electrical Design

The final amplifier electrical design is fairly standard using parallel 813's with 2500 volts on the plates and a separate 400 volt screen supply is located in the final amplifier compartment. A variac controls the screen voltage to allow optimization of the amplifier efficiency and screen current for various input power levels. The measured plate circuit efficiency is 76 to 78% over the range of 500 to 1000 dc input on 75 meters.

As the 813 has a high output capacitance, the lowest operating band is 20 meters. A three-section bandswitch switches the pi and L coils, with the third section switching in extra fixed capacitance across the loading capacitor in the 75 and 80 meter positions. The pi-L output network provides considerably more harmonic rejection than a simple pi network, both in the HF bands and over the television frequencies. The screen voltage is turned off during receive with a relay contact, but the grid bias is left on to facilitate tuning of the driver and input circuit to get the proper 813 grid current. A 2.5 mH RF choke across the amplifier output acts as a static drain and prevents audio from riding through to the antenna and monitor scope.

A modulation monitor scope is included in the final amplifier (see my article in ER #11). A three inch tube is operated at 2 kV for good brightness. During AM operation, a portion of the modulated high voltage from a ten stage frequency compensated voltage divider is applied to the horizontal plates. For CW operation, a relay switches the horizontal plates to a 60 cycle sweep supply. An RF sample is applied to the vertical plates through a small variable capacitor.

The modulator uses triode connected 813's which reduces needed tube inventory, needs no screen supply and matches the audio power available from the Viking Ranger. With all three grids tied together, the 813's operate with just a few volts of bias and easily put out 500 watts of audio with 2500 volts on the plates. The Ranger ouput transformer has a center tapped secondary with connects to the grids of the 813's directly with 1.6 K swamping resistors each side of the center tap. The nearly zero bias configuration puts a steady load on the audio driver for low distortion. The 813's run nearly class B and the low plate resistance due to the triode configuration protects the modulation transformer from high voltage spikes during downward overmodulation peaks.

A General Radio 1931B high fidelity broadcast modulation monitor is used to measure modulation percentage, carrier shift, and to drive headphones for aural monitoring. The carrier shift is undetectable and the headphone output has proven very useful in selecting microphones and shaping the audio response curve.

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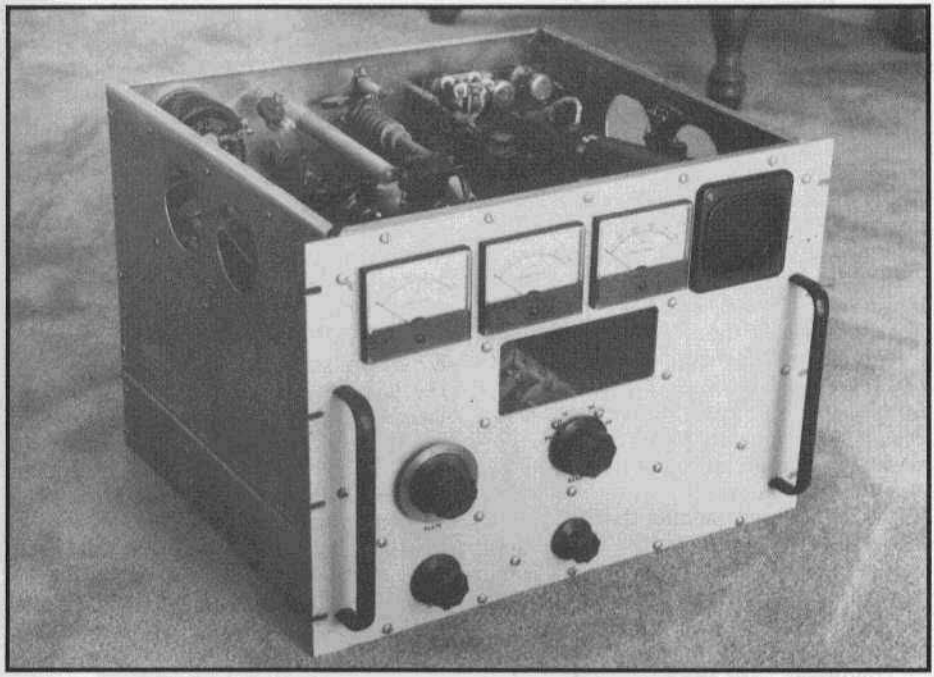

Photo #2 This view shows the front and top of the RF unit

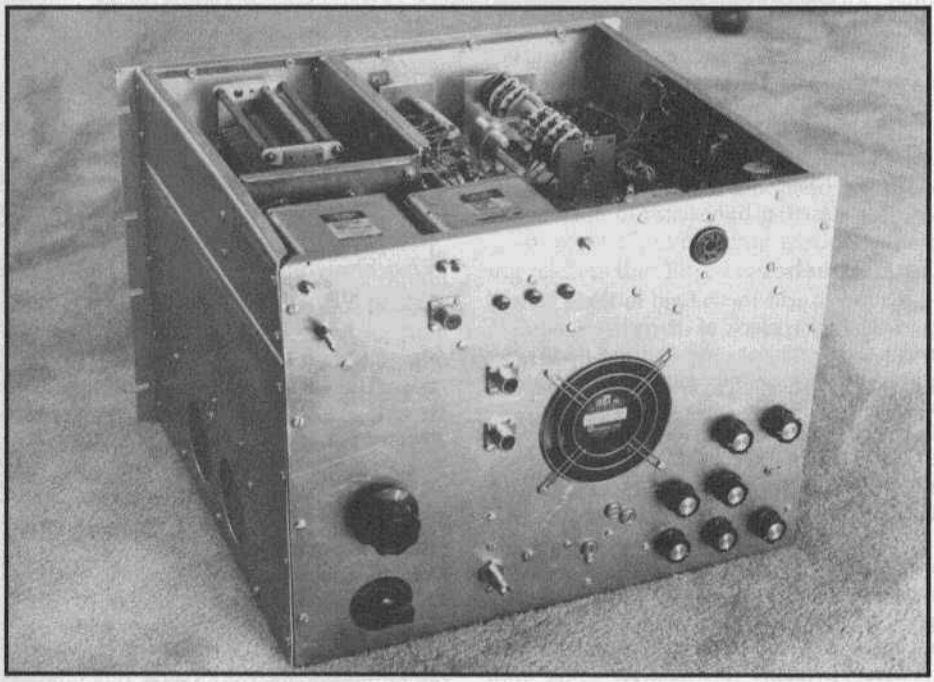

Photo #3 The rear and bottom of RF unit.

A Modern AM Transmitter from page 24

All power supplies use solid state rectifier stacks made of 1 kV PIV, 1 amp diodes shunted by equalizing resistors and capacitors. The 3100 volt plate power transformer provides 2500 volts dc full load through a full-wave bridge and choke input filter with the choke in the ground lead. The power supply bleeder uses two 150 watt resistors in parallel for safety if one burns out. With a swinging choke input and 250 watt bleeder dissipation, the no load to full load regulation is about 8%, or 200 volts. Surge protectors across the power transformer primary suppress switching spikes. A step start circuit with a relay in the transformer primary reduces inrush current to a safe level. Without mercury vapor rectifiers, the transmitter can be put on the air seconds after it is turned on.

Five panel meters monitor the final plate, screen and grid currents, the modulator plate current and the high voltage. The meters are in the low voltage side for safety. It is useful to monitor the screen current as it is very dependent on the power and loading conditions. Test jacks on the back allow grid and screen voltages to be measured. An overcurrent relay is provided in the final amplifier cathode circuit.

The control system is very simple: switching in each unit is handled with 120 volt relays. This minimizes the number of lines entering the final that must be filtered for TVI. The control deck contains provisions for operating at half plate voltage, and for allowing the exciter to operate by itself.

Final Touches

It's fun to add those final touches which personalize a piece of homebrew equipment. The monitor scope in the final amplifier is an excellent modulation indicator. With an audio phase inverting switch in the modulator grid circuit, the scope can be used to determine the proper phase so the higher asymmetric voice peaks modulate upward.

The antenna relay is built in, and several undedicated relay contacts are provided for receiver switching. I bought several inexpensive high quality meters and made new scales with a computer graphics program and laser printer.

The appearance of the transmitter is enhanced by painting all the panels a light beige color, using art store rub-ons for lettering, and then spraying the panels with clear Krylon. A window on the front of the final amplifier backed by a copper screen and clear Lucite allows the 813's to be checked.

Operating Experience

With breadboarding, careful checking and testing each section as it was wired, the rig worked the very first time and reliability has been excellent. The audio quality is very good, with inverse feedback in the Ranger audio system providing low impedance drive to the 813 modulator.

The transmitter produces negligible TVI on 75 and 40 meters (20 has not been tried yet) on a TV set in the shack. Adding a low pass filter made no difference. Telephones, however, are another story, but cleaned up completely with 2.5 mH RF chokes in series with each side of the line.

Parts Collecting and Homebrewing

You can't run down to Radio Shack and get parts of a AM KW. I have been collecting items for a kilowatt rig for some time without having a particular design in mind. When enough parts were collected, the rig was designed and built in six weeks with about a $250 investment. I found it useful to breadboard the major sections before actual construction. This helped, for example, to determine the power supply configuration for proper voltage and regulation, and to determine the characteristics of triode-connected 813's for the modulator.

Good sources of parts are ham radio flea markets, some surplus parts dealers, and other hams interested in vintage equipment. The best way to make contact is to get on AM yourself (even with a small AM transmitter, which may eventually be the driver for a high power rig), and get to know the AM'ers who can help out. Many parts for this rig came from fellow AM'ers.

Finally, you will have the satisfaction of going on the air with a rig of your own design. That, I suppose, is the ultimate satisfaction, and is our legacy from the homebrewers of the past.

Edgar Johnson swamped with hundreds of letters

Reprinted from the Waseca Sun-Review
story by Tom West

Edgar Johnson has been receiving quite a bit of mail lately. A lot of mail.

How much mail? Well over 600 cards and letters from around the world have been flooding Edgar and his wife Ethel's mail box in the last few weeks.

"It's so big that I haven't even attempted to go through it," said Edgar.

The cards are the result of two gestures. DEI, the parent company of E.F. Johnson Co., sent a note to its customers that Edgar had undergone surgery recently. That prompted a large number of get well cards.

Meanwhile, Bill Knish [WBØKEK] of Waseca, currently Edgar's barber and formerly an employee, visited him in the hospital and wanted to do something for him.

He talked to John Foster [WØYDX], a retired Johnson engineer, and then sent notices to Electric Radio in Durango, Colo., and QST in Newington, Conn., telling readers that Edgar had recently celebrated his 91st birthday.

"I wanted to do it a year ago for his 90th birthday," Knish said, "but I started too late and the magazines did not have enough lead time."

Those magazines may not be household names to the general public, but to ham radio operators they are as important-as Edgar Johnson, who is one of the pioneers of the industry.

Why so many letters for Waseca's Edgar Johnson? As Foster said, "Edgar sold thousands upon thousands of amateur radio transmitters over the years, and a ton of parts after that."

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ER in Uniform from page 9

One question is -- what (if anything) was the voice capability used for? It would have been of little use with a rotating directional antenna but the documentation doesn't mention anything else.

But there is a much larger question.

Tens of thousands of ARR-1 and ARR-2 sets were built, 'used' units were common in surplus after the war, and one tabulation lists the ARR-2 as part of the equipment of Navy fighters and torpedo bombers in 1945. The 1945 edition of the pilot's handbook for the F4F Wildcat (early WW-II Navy carrier-based fighter) shows two configurations installed in that plane, one a ZB (ARR-1) and RU setup which would have been the 'early' wartime arrangement and the other an ARR-2, installed in later aircraft and probably retrofitted to earlier ones in front-line units. With so many receivers installed, the aircraft carriers surely had transmitters.

But -- did our WW-II carrier task force commanders ever use this system? Fear of an enemy submarine picking up our radio signals was ever present during the war, but shipboard search radars --far easier to detect than a YE -- played an important role in several battles.

There was one battle in which the YE system might have played a part. In the final U.S. air strike of the Battle of the Philippine Sea, (afternoon/evening, June 20, 1944), 216 fighters, dive bombers, and torpedo planes pursued the retiring Japanese fleet, catching them just at dusk, sinking one and seriously damaging another carrier. The strike was launched at maximum range and because of the time, the return flight and recovery of aircraft took place at night. The air navigation problem was relatively simple because the enemy's position was known and our carriers were able to steam toward the returning planes. Even so, Admiral Mitscher's decision to "Turn on the lights" -- pointing searchlights at the clouds, firing star shell, and lighting flight decks as for peacetime night flight ops -- saved many planes and lives. The use of searchlights and star shell suggests that many fliers were expected to miss the group by ten miles or more, which would hardly have been the case if a homing beacon system was in use.

The usual history books don't give an answer. Is there a reader out there -- perhaps one who was there -- who can enlighten us on this?

More About The BC-375

When I wrote about the BC-375 (May, 1990) I mentioned that I had no source for the history of this interesting transmitter. I am grateful to Mr. Alan Douglas of Pocasset, MA, for fixing this by sending me a copy of an I.R.E. (Institute of Radio Engineers, the forerunner of the IEEE) paper which appeared in the August 1932 Proceedings, Volume 20, Number 8.

The paper is titled "Modern Radio Equipment for Air Mail and Transport Use". It describes the General Electric RT-76-A commercial aircraft radio transmitter. While a few details differ, it is apparent from the photos and schematic diagram that this radio was the prototype for the BC-AA-191 which was the first BC-191 -- the 12 volt version of the BC-375. I was surprised to learn that these military sets were adaptations of commercial equipment.

The paper describes the set in detail and gives the reasons for the main design choices. For example, MO (rather than crystal control) operation was chosen because a crystal oscillator would have had to work at a lower power level, necessitating an intermediate amplifier, and would have needed a doubler stage to reach the higher frequencies. No antenna tuner was included in this set because it was felt that it would be easier to find space in smaller aircraft for a transmitter and tuner mounted separately. The design is splashproof to allow use in open cockpit aircraft!

ER in Uniform from previous page

Some of the differences between the RT-76-A and the later military versions are interesting. The tuning controls on RT-76 tuning units are bar knobs, rather than the vernier dial and National Velvet Vernier mechanism of the military sets. The military sets have meters for the filament voltage and total plate current; the RT-76 has jacks for metering of these and the PA grid current.

The paper is twelve pages long, so I can't do it justice here. Any university engineering library should have the Proceedings in which it appeared.

How to Ship Radio Gear

The good news is that U.S. Postal Service 'parcel post' goes everywhere. The bad news is -- packages are handled roughly and must be extremely well packed to avoid damage. An alternative is the parcel mailing service now offered by many local businesses (such as hardware stores); these firms ship your item via UPS and some will also pack it for you. Ask to see a sample before using the packing service as some don't do a good job.

In most areas UPS will also pick up packages from your home or business. You can call a local number and give the dimensions, weight and address for each item; the operator will give you the charges. There's a charge for each package plus a flat fee (now $4.50) for the pickup; you can pay the driver or leave a check with the packages on your porch. Damage to these items shipped UPS is very rare if they are reasonably well packed.

The costs to send a 70 pound (maximum weight) package from Virginia to San Francisco are: Parcel Post - $25.46; UPMS (a local parcel mailing service) - $30.78; UPS (including $4.50 pickup fee) - $25.23.

Parcel Post is cheapest and thus best for mailing a single small item which can't be damaged -- say a hammer or small rock. In almost all other cases, UPS pickup is the best method; it is also cheapest if you are sending more than one item. Parcel mailing services make sense only if you need packing service or can't arrange a UPS pickup.

Editor's Comments from page 1

These days most of my ham activity is confined to the 20 meter SPAM net. I get on almost every night and it's always an enjoyable experience. The net starts at 5:00 PM CA time on 14.286 and usually carries on till about 8. The regulars besides myself are: Les, K6HQI, who has acted as net control for the last 20 or so years; Doug, VE4BX, Mark, WA4IRE, Sam, W6HDU, Ozzie, WB6ICM, Fred, WB8KMJ, Dave, W6PSS, Andy, N5JBT & Mike, WA4AQL. Less regular check-ins are: Andrew, WA4KCY; Dale, KW1I; Skip, K7YOO; Bill, W8VYZ; Bob, W5PYT; Ron, AA8AD; Chad, W5DBA;Tim, WA1HLR; Bill, WA8LXJ and a host of others. Last week, for the first time, Bill, VE3AUI, joined us. You will remember that Bill wrote the article,"The Romance of AM Phone", for QST, Canada, that I reprinted last issue. Needless to say everyone was delighted to meet Bill and gave him a hearty welcome to our group. He was running a homebrew 813 rig driven by a Ranger. He had a FB signal with excellent audio.

Some AM'ers find the 20 meter net somewhat discouraging. At times the group gets quite large and it isn't often that we can hear everyone that's on. But the net is, at the present, the only action on 20 and I would encourage everyone to at least 'check-in' from time to time. There's no requirement that you stay on for the entire session and those that just 'check-in' and 'check-out'will be most welcome. For those of you who have never checked in to the 20 meter net I invite you to do so on behalf of Les and the whole group. You'll find everyone friendly, the conversation interesting and be quite impressed with the orderly fashion that Les, K6HQI, conducts the net.

I also want to comment on the KW-1 special edition that I promised many months back. It's still in the works and will be forthcoming. I've had some difficulty getting it organized between regular issues but it should appear before fall; bear with me. So till next month....

Dallas Ham-Com

by Mike Palmer, K5FZ
16707 Creeksouth,
Houston, TX 77068

The Dallas Ham-Com, held in the Arlington Convention Center in early June, was a great hamfest for those who like crowds (about 8500 attended) and those who like to see the latest equipment. There was plenty of older test equipment, parts and not-so-old SSB gear. But as I observed last year, it was sad to see so few pieces of old gear for sale. There was a 75A-3/32V-2 combo for $400, a few Hammarlunds and a few low tier Hallicrafters. The good stuff is finding a home faster than we realize and is becoming scarce.

My spirits were lifted by the SPAM forum conducted by Marty, WB2FOU/5. Seeing the old equipment restored and in use in the many slides provided to Marty were the most exciting two hours of the hamfest. One picture being worth a thousand words conveyed much about the hams who find great pleasure in restoring and using the old equipment. The slides were shown twice at the request of the small crowd (50 - 60) who attended.

With eleven months to plan next years program, Marty and I have planned a "show off" of receivers and transmitters of the 30s, 40s and 50's for the flea market area.

None of this equipment would be for sale but this would create a big interest to attend the two hour SPAM meeting in the afternoon.

Stand-by for next years report.

Vintage Product Review from page 11

The manual claims the amplifier is capable of "2000 watts PEP input on SSB", but I think that that's fluff from the Johnson marketing department. If someone could explain to me how 1 KW DC input automatically becomes 2000 watts peak, I'd sure like to know!

In any event, the Viking Thunderbolt and its tube compliment are just loafing at 1600 watts input. While key down in linear mode, the finals barely glow orange at full input. In class C I can see no plate color at all. This amplifier is the original 'put the brick on the key and leave town a few weeks' amplifier. You can be assured that your precious 4-400s are going to last a long, long time.

I did hang a Bird 43 peak reading wattmeter on the output to check the SSB performance. The maximum reading was 950 watts peak output on 80 through 20; slightly less on 10.

Conclusion

The Viking Thunderbolt is well worthwhile as an extremely rugged HF linear amplifier. You get output with a db or two of the maximum legal limit with full WARC band coverage in a unit using tubes that are reasonably easy to obtain via the surplus route. Consider the price - most Thunderbolts I've seen sell in the range of from $350 to $500. Comparable new generation amplifiers go for $900 (for a single 3-500) on up. Consider the price of replacement tubes - the 8874 used in the ETO/Alphas goes for close to $400 each! One mistake could cost you close to a thousand dollars to re-tube some of the amplifiers on the market today. I highly recommend the Viking Thunderbolt as a versatile, cost effective means of getting your signal to the level it deserves.

Edgar Johnson from page 27

A Waseca native, Edgar has been interested in radio electronics all his life. While still in high school, he and a friend, Carl Erickson, strung a telegraph line between their homes. The homes were five or six blocks apart, and the manager of the telephone company allowed them to use telephone poles to string the wire.

After high school, Edgar attended the University of Minnesota, studying electrical engineering.

Upon graduation, Edgar had a job offer of his own, but he decided to come back to Waseca to set up his own business. "I've never been sorry that I started it right here," he said.

The business started on Oct. 10, 1923 with just Ethel and him. In 1936, he built the first plant. Expansions came in a hurry, with additions being added in 1940, 1941, 1942 and 1944.

There were tough times during the early years, he said. "The Depression days, the 1930s, were hard on us too. The maximum wage was 30 cents an hour, and people were glad to have it."

The secrets to the company's success, said Edgar, are "An awful lot of hard work, and an awful lot of fine people."

The E.F. Johnson Co. was about the second company in the state, Edgar said, to establish a profit-sharing program for its employees. "It's been a wonderful thing for many, many people," he said, noting that one of the letters he had received was from a couple, both of whom had been 25-year employees, who had used their profit sharing to buy their own business. "That meant a lot to those people," he said.

It could be said that the feeling is mutual. Edgar Johnson has meant a lot to Waseca, to amateur radio operators and to the radio industry. Just ask his mail carrier.

RCA AR-88 from page 15

RCA was "real cranky" he says. Those that came back were smuggled back in a duffle bag or whatever. Others were probably waiting in a warehouse to be shipped out and weren't and others came back as surplus. Many are overseas in Britain and Russia. If you worked DX into those areas and your contact reported using a 14 tube receiver, it was probably an AR-88.

Often the RCA medallion is missing from these receivers, perhaps a requirement in the disposal of the receiver.

Bob, W5PYT, recently acquired two AR-88s in original packing crates and a CR-88A. He has some of the best ham receivers built but his favorite is the RCA. If you talk W5PYT, 'Mr. Ozona, Texas', you'll hear about the AR-88.

Mac, W6SDM, wrote Bob, W5PYT, a lengthy letter in 1986, about his last 8 years of testing and evaluating the AR-88. "So far, the only thing that does as well on weak CW signals is my old BC-348, acquired from a surplus outfit, which let me pick it out of the airplane, out in the Island in 1947. I used to use the '348 rather than a National receiver to work Europeans from KH land, since it did better on weak signals with echo on them. Anyhow, the operation of the AR-88 astonished me. I have a Kenwood R-1000 which does a good job, but the AR-88 will hear things that are drowned in the QRM on the R-1000, because of all the tuned circuits, and selectivity thus generated in the AR-88. It was the first 'store-bought' receiver I ever saw that did not need some hopping up on 10 meters. The stability and freedom from drift using a self excited oscillator, with mud based tubes like the 6J5, astonished me, too. Have not had any other receiver using tunable HF oscillator that would do as well." Mac's letter goes on to mention that "he got into radio operating in the Navy, and landed up also being in receiver maintenance there, and from that got a ham ticket in '39 which stationed in NPM (1939-1941), and spent more time in building and fixing receivers than even trying to keep old cars going !!!"

My original, February QST want ad, has brought responses from enthusiastic owners including ZL4TCC in Napier, New Zealand. He reports having a fine AR-88D, (the D means it came with a cabinet) which he uses daily for BC or VOA listening. He was interested to learn of the receivers history. He said they were very popular in New Zealand.

I have acquired several of these receivers with owner added product detectors. They are detrimental to AM operation and in all instances receiver gain was raised greatly with their removal. Normal AF gain setting is 8:30 to 9:00 o'clock; they have a lot of gain reserve.

These receivers can still be found with a little digging but they are heavier than the 70 pound UPS limit for transporting. Cabinets are scarce and many will be found without the original amber color meter or a meter will have been added. The matching original 8" speaker strongly resembles the 10" round-sided Hammarlund speaker. The original RCA speaker is black crackle and had a metal protective grill with a horizontal slotted pattern. They are scarce. The receiver is 17 1/2" deep (behind the front panel) so it won't fit a standard Bud type cabinet.

Many questions still remain unanswered about these receivers. No advertising has been found. No prices are known. The meaning of AR, CR, and SC prefixes are not known with certainty and exact introductory dates are still elusive. Any contributions of this information and information on model variations would be appreciated and anecdotes welcomed, for a possible follow-up article. In the mean-time, if you did one up, as one report stated, "Two people are recommended for porterage".

Thanks to Mac, W6SDM, Pat, K7YIR, Forest, W6LWD, Bob, W2PUA, Zeke, W5LUT, Shally, K6VHP, Bob, W5PYT, and Hugh VE7ETU; for their input which made this article possible.

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Advertising Information

Subscribers receive 1 free - 30 word- ad per month. **Extra words are .10.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word.** Your name, call, address and telephone number count as **6 words.** Hyphenated words count as **2 words.** **Please count the words in your ad and if you're over 30 words send payment for the extra words.**

Non-subscribers: $3 minimium for each ad (up to 30 words). Each additional word is .20. **Please call or write for display rates.**

VINTAGE EQUIPMENT ONLY

E.R.
Box 139
Durango, CO. 81302 303-247-4935

DEADLINE FOR THE AUGUST ISSUE: AUGUST 7

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

FOR SALE: Babcock mobile "DX-MITTER", 80 - 40 meters, 40 watt, plate modulated, 1953 vintage, clean - $45. **WANTED:** manual or copy for WRL Globe Scout 65B xmtr; matching speaker for HQ-145. Bernie Doermann, WA6HDY, 452 Oxford Dr., Arcadia, CA 91007. (818) 445-2891

WANTED: National receivers NC-45, NC-80, NC-81, TV7. Also National brochures, advertising items, displays, knobs, speakers etc. Anything National. Steve Sauer, WA9ASZ, 1274 Londonerry Lane, Greenwood, IN 46142. (317) 882-4598 eves. after 7:00 EST

WANTED: Collins W/E 32S-3, with or without cabinet. Bill, KØDEW, (417) 532-7710

FOR SALE: Sears 23 channel AM/SSB, base/mobile CB with mount, manual, hardware, never used - $50 or trade for Harvey Wells or ? Chuck Graham, K6KDZ, 20335 Casa Loma Rd., Grass Valley, CA 95945. (916) 273-6847

WANTED: Johnson Viking 500; National NC-400; speakers; R42 (Hallicrafters), NTS-2 (NC-303). Bill, K1KV, (617) 272-3522

FOR SALE: National rcvr HRO-50T, S/N 2800473, with crystal cal., NBFM, 10" speaker, manual, coil sets, mint cond. - $275; Collins 75A2, SN 674, clean, needs work, $120. Bill, K6DUY, (415) 820-6966

WANTED: Someone equipped to repair Collins 51J4 Navy desk model, electrically and mechanically. If you are qualified or know someone please let me know. Larry D. Cohen, AJ5N, 1011 Hummingbird, Waco, TX 76712. (817) 776-7357

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WANTED: U.S. Army tech. manuals; TM-11-809-20 Organizational Maintenance Manual and TM-809-35 Depot Maintenance Manual for radio transmitter T-368. Bill Mills, KC5PF, 1740 Tonys Court, Amissville, VA 22002. Office: (703) 818-3955, Home: (703) 937-4090

FOR SALE: As new monaural tape recorder, Rheem model 70, solid state, reel to reel, manual and microphone - $50; Patridge Joymatch Low-Z, 500 watt antenna tuner, w/manual - $32.50. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

WANTED: Radio Control Box BC-AR-232; Antenna Switching Relay BC-AR-193; HS-22 Headset for SCR-194; CD-125 Power Cord (4-pin) for SCR-131; TM-11-237. William L. Howard, 219 Harborview Lane, Largo, FL 34640.

FOR SALE: Jackson RF signal generator, model 106 - $30; Superior tube tester, model TD-55 - $15; Pincor dynamotor, model VS-25, 6 or 12 volt input, 500 volt at .16 A. output - make offer; T.R. McElroy Hand Stream-Key and Western Union Polechanger-key, model 1-B - make offer. All good condition. Plus shipping. John Chenoweth, W8CAE, 9130 Yankee St., Miamisburg, OH 45342. (513) 885-2566

WANTED: Information on Air Associates Inc., Aircraft Radio System type BR3T; clean unmodified NC-240D w/ spkr. Vance Guildersleeve, K5CF, 206 Michelle Dr., Poteau, OK 74953. (918) 647-9044

WANTED: Matching pwr sply for the Harvey Wells TBS-50D in working condition. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (404) 748-5968

WANTED: Johnson Viking Navigator; Speed-X bug; Hammarlund Four Twenty transmitter; expertise in trouble shooting a Viking Ranger; pre-war ham or maritime apparatus. Brian Roberts, 3068 Evergreen, Pittsburgh, PA 15237.

FOR SALE: WW-I airplane antenna reel, dated 1918 - $115 postpaid; BC-645 - $75; Hallicrafters SB-40B, works - $45; Lafayette shortwave receivers, models KT-200 and HA-700, working - $45 each; Zenith Universal portable, works - $45; Standard signal generator, model 80 - $65; Ryder Radios #10 and up - $18 each; Ryder TV - $8 each; headphones - $10 each; Windsor transistor radio, NIB - $18; Auto 8 track N.O.S. - $8; tubes, all tested: 45 - $12, 27 - $4; RCA Redbook Vol. II - $40; Radio Amateurs Handbooks: '45, '46, '47, '48 - $10 each; RCA tubemanuals - 1968 and '70 - $10 each; Hallicrafter SX-99, almost mint, works - $95. All plus UPS. Peter Dieguez, 36-48 34th St., L.I.C., NY 11106. (516) 625-0429

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.

WANTED: RU receiver, coils and control box; RAX receiver (prefer 7-27 Mhz version); BC-342; BC-348. Marv, KH6MM, POB 392, Wailuku, HI 96793.

FOR SALE: Radio, test and electronic equipment, parts and components. Long list - $.50. J. Orgnero, Box 32, Site 7 SS 1, Calgary, AB T2M 4N3 Canada.

FOR SALE: NC-300 - $100; NC-303 - $250; SX-28A - $125. SASE for list of many others. Parker, W1YG, 87 Cove Rd., Lyme, CT 06371.

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FOR SALE: Hammarlund HQ-120X, mint - $250; Hammarlund SP-400 - $200; Hallicrafter HT-32 and companion, matching SX-101A, both mint - $500 for pair; Johson Invader, mint and working - $250. No speakers but manuals for all. Art Robertson, WØIWV, 12110 W. Rice Pl., Morrison, CO 80465. (303) 979-3225

WANTED: Espionage equipment. Historian purchases spy radios, code and cipher machines and any equipment, devises or manuals pertaining to the world's intelligence organizations. Keith Melton, Box 5755, Bossier City, LA 71171. (318) 747-9616

WANTED: 32V-3 owners, does your rig generate TVI? How have you cured it? Please write or call. I also need a S38D in decent condition. Jim Hanlon, W8KGI, Box 581, Sandia Park, NM 87047. (505) 281-0814

FOR SALE: HQ-129X - $65; Viking Challenger - $35; NC-173 - $65; NC-200 - $75; S38B - $15; Geloso G209 - $60; Super Skyrider - $45; Mosley CM-1 w/speaker - $85. Don, KV7S, (602) 795-6228

FOR SALE: Clegg Interceptor and Zeuss with P/S; Belden 8238 (RG-11), 75 ohm - $.25 per foot; Yeasea earphones, 8 ohm - $25; Telex earphones, 8 ohm - $10; Lambda power supply, 13.8 volt at 30 amps - $65 with manual. Art Reiss, 169 North Delaware Ave., Lindenhurst, L.I., NY 11757. (516) 884-8527

FOR SALE: Collect keys? You'll enjoy W1IMQ's illustrated references. "Introduction to key collecting", 64 pages - $9.95, "Vibroplex Collectors Guide", 87 pages - $14.95. Add $2 s/h to total. See your dealer or order direct from: Artifax Books, Box 88-E, Maynard, MA 01754.

FOR SALE: Newly published instruction books, authorized by Rockwell International, are now available for the Rockwell/Collins S-Line. These instruction books are brand new and have been printed from the latest editions - complete in every detail, including the front and rear color covers. 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: Old National sets: esp. SW-4 and NHV for cash or nice trades. Also need a SP-400. Robert B. Enemark, W1EC, Box 1607, Duxbury, MA 02331. (617) 934-5043

FOR SALE: Hammarlund HQ-140X rcvr - $125 includes shipping. Jerry Boles, N5KYE, 14857 Redbud Lane, Piedmont, OK 73078. (405) 373-2228

WANTED: Socket for 304-TH/TL; 6 to 10 amp RF ammeter. Bill Kleronomos, KDØHG, Box 1456, Lyons, CO 80540. (303) 823-6438

FOR SALE: Universal double button carbon microphone, circa 1930 (?), good display condition, marked as LL455X - asking $15 plus shipping or will trade for other vintage conponents. Wes Chatellier, W5DPM, 1950 Chevelle Dr., Baton Rouge, LA 70806. (504) 927-2199

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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: Hammarlund HQ-215 with two filters, excellent condition, manual - $250. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

WANTED: Glow in the dark audio gear and old speakers. Especially love Western Electric, Fairchild, Regency and old theatre gear. Have mint SX-115, Thunderbolt, 310B, misc other radios to trade or pay cash. Joe, N4WQC, Box 19302, Alexandria, VA 22320. (703) 683-2955

FOR SALE: Large quantities of R390A modules and other parts unused. Dennis Kimble, 3171 Ramesses Ct., Herndon, VA 22071. (703) 435-3060

WANTED: General Radio Company instruments in wooden cases. Especially want laboratory type equipment. Also need GR experimenter magazines, manuals and catalogs. Frank R. White, KBØTC, POB 2012, Olathe, KS 66061.

WANTED: Military radios - any vintage - any country - any related items. Will trade. Also need 801 and 843 tubes. Charles DiCecca, 501 Mystic Valley Pkwy, Medford, MA 02155. (617) 396-9354

FOR SALE: VRC-34 Radio Set includes, RT-77/GRC-9, DY-105 (24V), ME-61 meter, LS-203 speaker, cables, mounts, bag, and antenna, 140 lbs, used - $210; RT-77, 40 lbs, used - $75; DY-105, 40 lbs, used - $45. Add for shipping. Send for list. Tartan Electronics, Inc., Box 36841, Tucson, AZ 85740. (602) 577-1022

CLASSIFIEDS

"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

WANTED: Amateur band spread coils for AC model National SW-3. Leland Smith, W5KL, HCR-31, Box 147, Jasper, AR 72641.

FOR SALE: Very old RCA output indicator, TMV-121-A, serial #1209 - $16 ppd; antenna relay unit BC-442-A, Colonial Radio Corp. - $15 ppd; Dynoptium tube tester, model 322, Radio City Prod. Co. - $30 ppd; Instruction and Service Information, Issue 1 for the Hammarlund HX-50 transmitter/exciter, over 50 pages, original, not a copy - $15 ppd. James Fred, R1, Box 41, Cutler, IN 46920.

WANTED: Geloso receiver, model G-250. D.H. Moore, POB 521, Palo Alto, CA 94302. (415) 322-2728

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: Information/memorabilia to help create circa 1947 station for my 75A-1/32V-1. Photographs, magazines, period accessories wanted. Also want National Thrill Box SW-4. Carty Ellis, KA2Y, 32 Upland Dr., Rochester, NY 14617. (716) 544-3249

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

FOR SALE: Heath Apache, excellent, new tubes - $125; Hammarlund HQ-170A, very good - $200. Carty Ellis, KA2Y, 32 Upland Dr., Rochester, NY 14617. (716) 544-3249

WANTED: Globe equipment: 500 B or C, Globetrotter, Globe Scout 40, 40A, 65A, 65B, Globe Champion 300A, Champ 300 etc. Steve Abbott, WBØHUR, R-1, Box 140, W. Branch, IA 52358. (319) 643-2617

FOR SALE: Johnson 275 watt matchbox with built in SWR bridge - $110; NC-300 - $125; bread slicer (new in box) Cardwell XE-240D - $25; dual section 350 - 1/8" spacing - $25. I will ship. Herman Gibbs, KD8PD, The College of Wooster, Box C-3177, Wooster, OH 44691. (216) 264-3060, 6 to 9 PM only

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WANTED: Johnson 122 vfo and copy of Viking II manual. **FOR SALE/TRADE:** Collins SM-3 microphone - best offer. Paul Bauer, N3DAN, 11708 Bacon Race Rd., Woodbridge, VA 22192. (703) 590-0843

WANTED: 'Cal-O-Matic' two speed tuning shaft for RME-45 or will purchase junker set provided this part works. Gus Stellwag, 117 Edgewood Drive, Orangeburg, NY 10962. (914) 359-0769

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

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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

FOR SALE: Connectors for ART-13, ATD, TA-12, ARB, TCS, GP-7, SCR-543, others using K, MS, large banana type; M-38/A1 radio power connector. Robert Downs, WA5CAB, 2027 Mapleton,Houston, TX 77043. (713) 467-5614

FOR SALE: Transmitting/receiving tubes, new and used. Exa: OC3, 2E26, 3B28, 4X150, 4-65A, 4-125A, 6L6, 12A6, 45, 807, 809, 810, 811A, 815, 829, 832, 836, 872, 1619, 1625, 5894, 6130, 6146, 9003 plus others. LSASE for list. I also collect old and unique tubes of any type. Maybe you have something to trade? John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE: National NC-125 and matching speaker - $75. WANTED: National AGS or AGS-X. Henry Rogers, POB 501, Minden, NV 89423. (702) 267-2725

WANTED: Several aluminum chassis 5"x7"x2", 5"x7"x3", 6'x8'x2' etc; copy of manual for Hallicrafters S-120. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Brown case "Oceanic" type radios. Also want SR-500 and Electro-Voice 419 mike stand, mike or both. Edward Deptula, KA3OTT, POB 751, Havertown, PA 19083.

FOR SALE: Military, Ham, test equipment, books, tubes, etc. Send LSASE for list. Gary Cain, 1775 Grand, #302, St. Paul, MN 55105.

FOR SALE: NC-183 - $100; NC-125 - $50; Eico 950B cap. checker - $20. All with manuals. Plus UPS. Dan Mason, 1325 N. Lima St., Burbank, CA 91505. (818) 848-9474

WANTED: (2) V-70-D tubes. Mike Nichols, KE9FK, 105 N. 4th St., Fort Atkinson, WI 53538. (414) 563-2825

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.

FOR SALE: 1920's radios, tube testers, wave meters, transmitter/receiver parts, catalogs, flyers, books, TV's, tubes, testing equipment. 48 page list - $1. Covers 1920 to 1970. Francis Yonker, 7 Old Farms Road, Saddle River, NJ 07458. (201) 825-1895

WANTED: (2) sockets for 805; (1) socket for 810; (1) modulation xfmr, 30 watts, UTC S-19 or equiv. Ed Barbacow, K3ZCY, 330 Ceylon Rd., Carmichaels, PA 15320. (412) 966-7934

WANTED: Eldico xmtr TR-75V in good working condition for my use; books: VLF Radio Engineering by A.D. Watt, 1965; Radio Receiver Design by K. Sturley, 3rd edition, 1965 or later. Leonard Herring, WB4ARK, 1310 Andover Rd., Charlotte, NC 28211. (704) 366-6600

WANTED: Colored plastic radios from the 30's and 40's. I have a nice Hallicrafters SX-62A to trade or will pay cash. Kevin Eftink, 16 Edgewood Dr., Quincy, IL 62301. (217) 228-2221

FOR SALE: HRO-60R with A-B-C-D, very nice condition - $350; must dispose of most of my radios, tubes, parts. Will send list for long SASE. K4UJZ, 608 W. Thompson Lane, Murfreesboro, TN 37129. (615) 893-5344

WANTED: Pre 1950 ARRL handbooks. WA7NNH, 1024 Main St., Boise, ID 83702.

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WANTED: R-46A speaker and a National 183D speaker. Andy Howard, WA4KCY, 105 Sweet Bay Lane, Carrollton, GA 30117. (404) 832-0202

FOR SALE: Hammarlund HQ-160 and HQ-110 receivers, w/manuals, good cond. - best offer. WANTED: RK 4D32 PA tubes. Burt Ostby, KB8DL, 2424, F-30, Mikado, MI 48745. (517) 736-8020

FOR SALE: PU only. TCK-4 xmtr w/ manual - $300; RAO-7 rcvr - $150; RBA-2 rcvr w/manual - $100; BC-348K rcvr w/ac ps, will ship - $75. WANTED: RAX LF rcvr. Steve Davis, KD2NX, 2372 84th St., Brooklyn, NY 11214. (718) 265-2390

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FOR SALE: Radio Broadcast Books catalog and Antenna/Radio Propogation Books list now available. Send .25 stamp for each one wanted. Rainy Day Books, POB 775, Fitzwilliam, NH 03447.

FOR SALE: UTC transformers, brand new in factory cartons, 100 different types: transmitting, filament, chokes and modulation transformers. Also audio, interstage and outputs etc. Commercial, military and amateur grades. Send #10 SASE for catalog and inventory to: Len Crispino, POB 702, Hudson Falls, NY 12839. (518) 638-8199

FOR SALE: Antique radios, parts, tubes, books, vibrators, knobs, amateur items, test equipment, (5) scopes, transmitter crystals etc. Twelve lists. LSASE + $2 cash (no checks). Richard and Rose's Radio Mart, POB 691443, Tulsa, OK 74169.

FOR SALE: National HRO 60 with all coils - $100 plus shipping; Heathkit Apache, mint, w/SSB adapter - $150; near new 4-1000A Eimacs - $75 each; International Frequency meter, model C-12B - $65; Panadaptor Panoramic receiver, complete- $45; type 813 tubes with sockets and plate caps - $20. **WANTED:** 600 ohm headphones for my ARC-5 receiver. Levy, 7600 Blanco Rd., Apt. #608, San Antonio, TX 78216. (512) 341-9549

WANTED: QST'S --Dec. 1915, 1916 -- Mar - May- June-July-Aug-Sept-Dec.; U.S. Amateur Callbooks -- all 1920 -- 1930 and 1941 --42 --45 and 55. **FOR SALE or TRADE:** Some QST's from 17 and 19. Bob, W4JNN, POB 166, Annandale, VA 22003. (703) 560-7161

WANTED: Brown Brothers keyer paddle, crystal set parts. John Strang, K9HBM, (714) 454-2701

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