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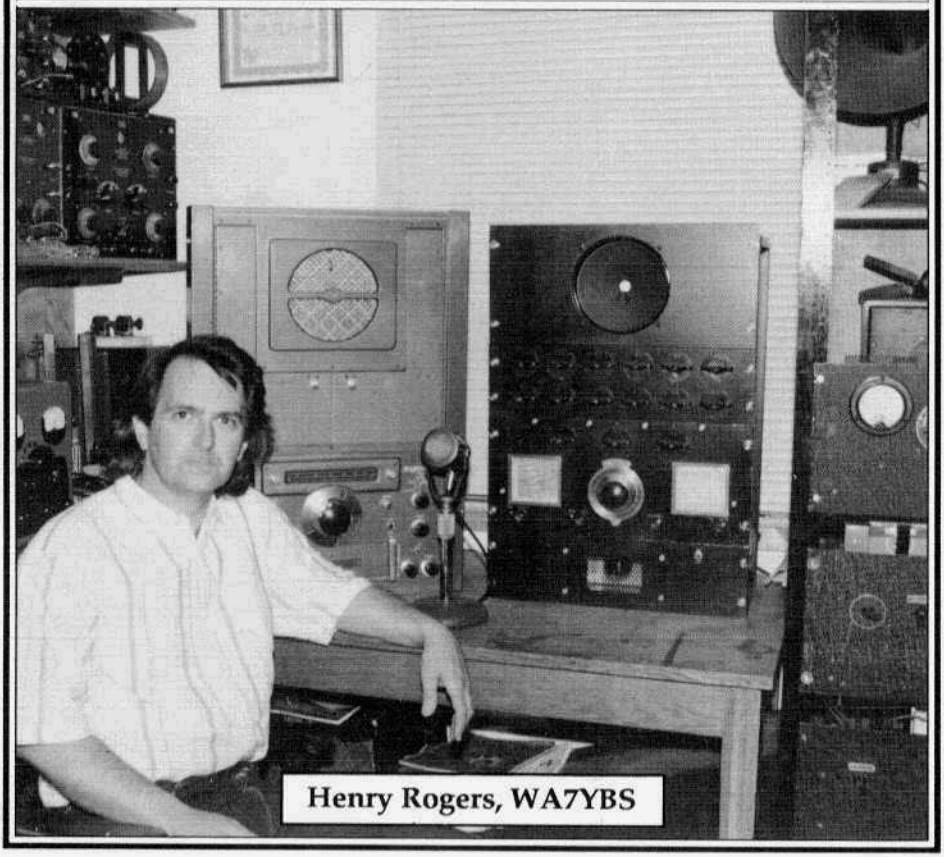
ELECTRIC RADIO

celebrating a bygone era

Number 27 July 1991



Henry Rogers, WA7YBS

ELECTRIC RADIO

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The Purpose of Electric Radio

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

Electric Radio Solicits Material

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

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

Just recently, I received permission from General Electric to reprint from their old bi-monthly publication "Ham News". Needless to say, I'm delighted. I think the information contained in these publications is absolutely first class. For those of you not familiar with "Ham News" here's a brief run-down:

Volume 1, Number 1, of "Ham News" appeared for the months of May and June of 1946. I believe that the last one was Volume 15, Number 6, November-December, 1960. These publications (pamplets) were produced by the Tube Division of General Electric at Schenectady, New York, in the beginning, and later at Owensboro, Kentucky. In Canada they were published by GE in Toronto, Ontario. They were made available to hams and others free at GE tube dealers as a promotion. They also collected all the issues in three hardbound volumes. I feel very fortunate in having all of these.

The contents were developed by the engineering department at GE and from input from hams. They consisted of construction projects, a question and answer section and another section they called "Tricks and Topics". "Ham News" was a first class publication - great photos and schematics and very well written. They started out with 4 pages and towards the end were up to 12 pages, occasionally. I imagine that by 1960 interest in "Ham News" was beginning to wane parallel with the interest in tube type gear. Too bad.

One constant throughout the 15 years of "Ham News" publications is "Lighthouse Larry". This 'cartoon character' in the form of the G-E lighthouse tube seemed to be the "editor" of the publications. I'm thinking that for the first few years there was no 'real editor'.

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Cover: Henry Rogers, WA7YBS, author of the article on the National AGS receiver is this issue. He is presently working on another article, this one dealing with the designer of the AGS, James Millen.

Reflections Down the Feedline

by Fred Huntley, W6RNC
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Continuing the saga of Technical Materiel Corp. from May, 1991, ER: A live sighting of a GPR-92 receiver has been made down Texas way. According to the landline report from the owner, he also has the tech manual and factory calibration checkout sheet for the receiver.

From W1YG comes more information, as well as donation of a preliminary edition of the GPR-92 tech manual. About 2 years ago, W1YG purchased the radio portion of the estate of William Deans, W2AEA, who was sales manager for TMC during its most productive years. Along with several pieces of TMC radio equipment, W1YG acquired an extensive amount of company product catalogs, sales and facilities information and the personal records of sales manager W2AEA. Also acquired were tech manuals on 24 individual equipments. W1YG, who is an avid collector of pre-1947 Collins transmitters, has a deal pending to offer his TMC literature as a finders fee for said Collins gear. He advises that in case this deal falls through he will make this same offer to anyone else.

Now comes some real history on TMC from Donald J. Toman, K2KQ/W2UFT: "My father, Joe Toman, W2ANX, (who's 81 and still active on 75, but SSB) was the guy who set up and operated TMC's manufacturing operations from scratch, starting in 1950 in the old police garage on Spencer Place in Mamaroneck. The founder of TMC was Ray H. DePasquale (also a ham, but I forget his call.... still alive).

"Ray was the director of manufacturing for Press Wireless during the waning days of WW II. PREWI was a company set up by the press and wire services to establish a worldwide radio net. It was founded in the '20's. It worked a lot like ARINC does for the airlines...The manufacturing operation, which designed and made all their transmitter equipment (CW, RTTY and radiophoto/FAX) was here in the New York area.....Ray recruited a number of people from PREWI, particularly some of the talented R&D personnel (some of whom were from Hammarlund, makers of the old Super Pro) and my father, to set up TMC in 1950.

"I worked for TMC during a couple of summers and, since I was an experienced ham and a hotshot operator as well as an EE student at Cooper Union, they let me work as an engineer on some of the gear. One of the pieces I helped design was the GPT-750, particularly the RF deck. I also was involved with part of the exciter (an oven-stabilized VFO called the PMO, or "portable master oscillator". TMC's primary customer was the intelligence community, which became energized during the early '50's.

"Some of the key people at TMC were Leslie Norde, a Cooper Union graduate who eventually became director of research at Motorola, Phoenix; Tony Bernardi (who was chief engineer for a time), Bill Gallione (VP, marketing), Tom Orefice (who really did the GPT-750) and Al Jurafsky (who designed a variety of RTTY regenerators). A fellow named Conrad Gebhardt was responsible for the artistic design of the equipment.

"One of Les Norde's great accomplishments was developing linear tuning and stable VFO's that cover an octave of frequency. He used a very fine linear capacitor (I believe Cardwell) using worm drives, anti-backlash gearing, heavy cast end plates, silver plating and had the whole oscillator frequency-determining elements

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Editor's Comments from page 1

The first time an editor was acknowledged is in the Jan. - Feb. 1950 issue, and that was George H. Floyd, W2RYT. He was listed as editor until the July-August 1952 issue, when R.L. Voeller, W2WPV, took over. Voeller was editor up to the Jan.-Feb. 1953 issue, and then came S.E. McCallum, W2ZBY. He was editor until the March-April 1955 issue, when E.A. Neal, W2JZK, became editor and remained as such until the last issue in 1960. He's listed with a new call-W4ITC - in the July-August 1959, issue.

I learned recently that Mr. Neal was living in Phoenix and that his call was W7ARF. I looked the call up in the Callbook and called information in Phoenix. When I called the number they gave me, I got a recording telling me that this number had been disconnected. I called the telephone repair department there and they told me that the number had been disconnected just the day before. They had no further information. I then sent a letter to his address and a few days later it came back with a stamp saying that he was no longer at that address and the "forwarding order had expired". I then made some enquiries of hams I know in Arizona and came up blank. Meanwhile a friend who was also doing some sleuthing found one ham (I think he is an ex-GE employee) who said that Mr. Neal had passed away about a year ago. Can anyone provide additional info here?

The people that I've talked to at GE have only vague recollections of the Ham News publications. However, the company does have a museum at Schenectady, New York, where there may be some archival material. I'm sure more information will be forthcoming. And if any of my ER readers have any info I'd appreciate your sending it in.

The "Ham News" publications contain enough good information to be a part of ER for many years to come. Of particular interest are some early AM and SSB transmitter construction projects. There were also articles on receivers, amplifiers, modulators, speech amps. and so on. And I shouldn't forget to mention the stress they put on tubes ; "Ham News" may be one of the best sources for information on tubes. I'm using information from "Ham News" in this issue, in our regular "Tips" column on page 18.

I'm looking forward to hearing from anyone with additional information on any aspect of "Ham News". As you can probably tell I'm pretty excited about this publication and how it's going to enhance ER.

Moving on to other subjects:

Last week I learned of the recent passing of Karl E. Pierson, W6BGH, at the age of 83. He was the man behind the Patterson receivers like the PR-15 (maybe the PR-10) and the Pierson KE-93. He also was the last person to have talked with Amelia Earhart. He claimed in a "Los Angeles Times" story that he "definitely did pick up signals from the Earhart plane after it was down." I've had telephone conversations and correspondence with his son Richard and next issue we'll have a detailed report with some photographs.

Chuck Dachis, WD5EOG, sent this in recently, "There is a serious error in the historical overview I wrote for Electric Radio last year. [Hallicrafters: The Man and The Company, ER #9, January, 1990] I have had recent communication with Bill Halligan, Jr., [son of the founder of the Hallicrafter Company, William J. Halligan] and he is very much alive.! I don't know how the rumor of his death got started. I thought my sources were reliable."

This will be the last issue of ER put together here on the farm. As soon as this issue gets in the mail we'll start our move to Durango. We've rented a very large house there that will very easily accomodate my office requirements. Because of the close proximity of neighbors (many) I'll be setting up my ham station on a friend's farm just outside of Durango.

After careful consideration I've decided to keep my all my post-office business here in Hesperus. It means a 30 mile drive daily to deliver and pick up mail but it's probably less time-consuming and stress-

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ELECTRIC RADIO IN UNIFORM

by Walt Hutchens, KJ4KV
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"The AN/SRR-13 Receiver"

In the early 60's, I was a young Ensign (younger than most, as I recall) on a Navy destroyer in the Pacific. We had three types of communications receivers: an R-390, a large but very stable WRR-2, and several SRR-13's and its SRR-11 and -12 relatives. The R-390 we used mostly for copying unclassified teletype; the WRR-2 was used for the more demanding classified fleet broadcast over which we got most message traffic.

The SRR sets did everything else. They were the receivers mounted at our radio operator positions, both in Radio Central and in two emergency radio rooms in other parts of the ship. We used them to guard two or three HF frequencies and when we operated on CW nets. And it was probably an SRR-13 patched to the general announcing system on which we listened in sober silence to news reports of the assassination of President Kennedy, one sunny afternoon a few hundred miles south of Japan.

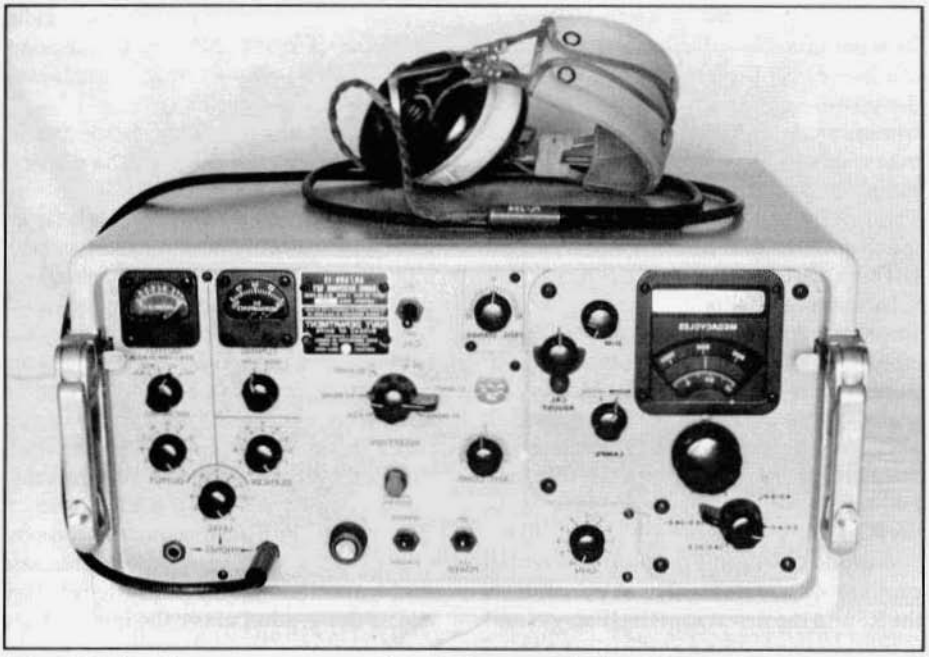
As a ham, I paid more attention to our radio gear than my duties required and I remember being impressed by the SRR sets' beautiful construction. I also remember that the dial calibration didn't seem quite right and that when I tuned in 75 meter signals, they were hard to understand -- but radios were not my job at the time, and I thought no more of it...

Overview

The R-441/SRR-13 is the HF member of a family of three communications receivers built for U.S. Navy ships in the early 1950's. The R-441 covers 2-32 Mcs, the R-440/SRR-12 covers 0.25-8 Mcs, and the R-439/SRR-11, 15-600 kcs. There's also an SRR-13A (a -13 with solid state diodes, an AGC ON/OFF switch and other small improvements); and R-501/FRR-21, R-502/FRR-22, and R-503/FRR-23, shore versions of the R-439, 440 and 441 respectively, which have an overlapping set of improvements plus features to adapt them to shore station use. All of these sets are similar; though we will talk specifically of the SRR-13, most of the discussion applies to the others as well.

The SRR-13 is a 27-tube superheterodyne covering its frequency range in bands of 2-4, 4-8, 8-16, 16-24, and 24-32 Mcs. A mode switch allows selecting A1 (CW) Broad or Narrow, A2 (MCW), A3 (AM voice) Broad or Narrow, or FSK. The effective bandwidths are 8 kcs, 3 kcs, or (with an audio filter inserted for A1 Narrow) about 350 cps. The receiver measures 8-1/2" x 18-1/2" x 17" (H x W x D) and weighs 65 pounds. It is directly calibrated in frequency using a projection-type dial which gives a scale about 4-1/2 feet long on each band.

The SRR sets can furnish audio to a remote control box; muting on transmit must be provided externally. By changing links in the power supply they can operate on 105 to 125 VAC, 50-60 or 400 cps.



The SRR-13. The meters at upper right indicate carrier level for tuning purposes and audio output to allow setting a standard level for remote speakers. The tuning has an excellent 'feel', but a crank or spinner knob would have been helpful.

History

The U.S. Navy entered WW-II with the RBA, RBB, and RBC (we' Il call these the `RBx series') as its standard communications receivers – huge but successful 1930's sets built by Federal Telephone, RCA and others. With the many urgent demands of the war, design of a new receiver was not top priority so the RBx units and drafted civilian sets like the National HRO (USN RAS, RBJ, RCE and RCS) and RCA AR-88 (USN RDQ) had to carry the load.

After the war, the Navy worked with RCA at Camden, New Jersey, to develop a replacement for the RBx family. The result was the SRR-11, 12, and 13 built on two August 1950 contracts. The shore station ('FRR' for 'fixed') version was built on 1951 contracts; I don't know of any later procurement of either set. The final contract for RBC's was dated September 1950!

These radios served on everything larger than a tugboat as well as at shore stations, but I don't know how many ships actually got them. If they substantially replaced the RBx sets, the total procurement might have been a few thousand but the highest serial number on the three SRR units I have is 989.

These sets can copy SSB but they're really not stable enough for military use in that mode, so as the services converted from AM to SSB for voice (1970's) better receivers would have been needed. And, as we will see, it is likely that they were serving primarily in 'standby' status long before then.

Design

The SRR-13, built just before crystal stabilized oscillators became the standard, is surely near the high point of the development of the tunable oscillator bandswitching superhetrodyne. While the circuitry is conventional, the set's mechanical design and mechanical and electrical construction is the most refined I have ever seen.

Considering the circuitry first, the SRR-

continued next page

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13 is a double-conversion superhet using 25 subminiature tubes plus a couple of miniature rectifiers and a ballast tube in the power supply. This is one of the first communications sets to use subminiature tubes; advantages include about a 50% reduction in power consumption (for example, 6.3 volt 0.15 amp heaters) as well as much smaller size.

There are two RF stages, a mixer with a separate local oscillator, a 1600 kcs first IF converter, and three IF stages operating at 200 kcs. The IF stages are quite broad; selectivity is determined by which of two sealed filters (3 kc or 8 kc) is switched in ahead of the 200 kcs IF. These are not mechanical or crystal filters but common L-C units; there are ten tuned circuits in the 8 kc unit and eight in the 3 kcs filter.

A diode detector is used for AM and to provide AVC voltage. The AVC controls the RF and the first two of the IF stages and is specified as holding audio output to a 6 db increase as the input signal goes from 10 microvolts to 10,000 microvolts – not a very impressive performance.

A product detector (called a 'BFO mixer' in the manual) is used on CW and FSK. A separate tuned circuit feeds a diode rectifier to drive the tuning meter on the front panel.

There's a self adjusting (from the carrier level) series diode noise limiter which is in the circuit at all times. A separate double diode audio limiter is switched in on CW. The clipping threshold for this limiter is adjusted manually by the 'OUTPUT' control on the panel.

On AM, a carrier rectifier drives a DC amp controlling a squelch ('SILENCER') diode. This lets you set the receiver up so it will be quiet until someone transmits – important when you have several receivers guarding different channels as in CIC (the Combat Information Center) or on the bridge.

To overcome losses in the clippers and silencer, four stages of audio are used. The output stage is a single 5902 beam pentode capable of perhaps 1/2 watt output. A crystal controlled multivibrator provides checkpoints every 200 kcs; unlike some calibrators it gives adequate signals over the entire tuning range.

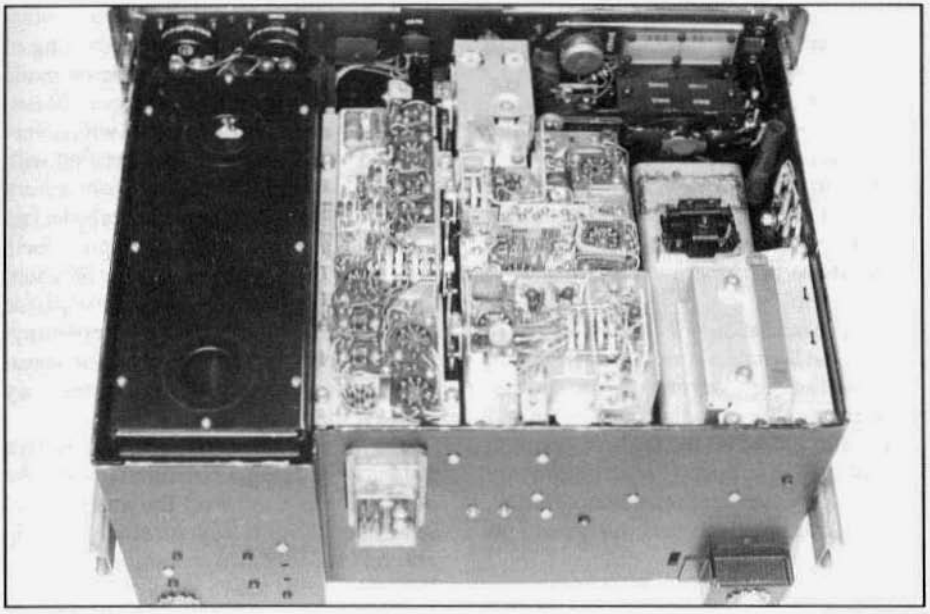
Except for the product detector, the circuitry is from the 1930's. But the physical design is another story.

Starting at the front panel, this is (as far as I know) the only military receiver with a projection dial. A lamp just behind the panel lights the front of a glass disk mounted on the shaft which drives the tuning capacitor. The dial scales are etched on this disk; located behind it is a lens which picks up the light passing through the scale to form a rearward-directed beam. A mirror reflects the beam back toward the front of the set where it falls on a ground glass screen forming the 'dial' you see from the front. As the glass dial (capacitor) turns, the scale marches across the ground glass; the numbers are large and easy to read, even in a well lit room. Turning the 'CAL ADJUST' knob moves the focusing lens left and right so the scale moves relative to the index on the ground glass.

The tuning rate is about 60 kcs per knob revolution on the 2 to 4 Mcs band and proportionately higher on the higher bands.

This radio is – by design – easier to service than any other I can think of. To begin with, your SRR-13 is mounted in its cabinet on slides; when you pull it out you can release latches on the panel and rotate the set in steps up to about 120 degrees either toward or away from you to allow access to either the top or bottom. A jumper can be connected from the rear of the set to the cabinet receptacle to allow powering up in this configuration. When you consider the problems of pulling out and carrying to the shop (perhaps down a ladder from Radio Central) a delicate but heavy radio aboard a rolling ship, the advantage of being able to perform most service with it firmly mounted becomes even clearer.

(In really heavy weather, service is still



SRR-13 top rear view. The box at left is the power supply. The covers have been removed from the audio assembly (above rear connector) and IF assembly. The function switch rail is visible in the space between IF and audio assemblies. Inside of set is painted flat black to minimize reflected light which would reduce dial contrast.

risky because of the danger of falling or putting a hand in the high voltage. Such conditions rarely last more than a few days and there is usually enough extra equipment to put off repairs for that long.)

The receiver frame holds ten main assemblies: first and second RF, local oscillator, mixer, 1600 kc converter, 200 kc IF, audio, power supply, calibrator, and BFO. Each of these can be replaced as a unit by loosening a few captive screws and unpluging. The dial mechanism and tuning capacitor are also easily replaced.

Within the main assemblies there are from one to nine smaller plug-in units containing one or two tubes and the associated small parts. They slide into individual cells in the main assemblies (mating there with a special socket) and are held in place by turning a bar which locks into slots in the sides of the cell. Each stage unit is completely shielded, and protected against damage -- yet it can be replaced in a moment.

Most problems can be corrected by replacing either a major assembly (which could in many cases be identified from the symptoms) or the faulty stage. The bottoms of the major assemblies face up on the top of the set and down on the bottom; by taking off a cover you can reach the connections to the stage units and the tubes themselves for signal tracing or other troubleshooting. This is even more important than it seems: since the tubes are soldered in to the stage units, they can't be tested in a tube tester. On the SRR-13, checking stage gains is one of the first (rather than the last) things you do.

The stage units are easy to repair; if the problem is a burned out tube or resistor, you can change it in a couple of minutes. As I recall, our ship had both replacement stage units and the tubes and small parts to repair them.

The attention to maintainability goes beyond physical design. With a projection-type dial, you can't read the frequency

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if the dial light goes out. A knob on the panel slides a spare bulb into position in the optical system and turns it on.

The pilot light is a neon bulb supplied from the set's high voltage. If the pilot light goes out but the dial light is on, a power supply failure is indicated. The tuning meter is driven by rectified carrier voltage; if it shows signals but there's no audio, there is probably a failure in the audio assembly.

The overall layout of the SRR-13 is so logical that it makes receiver design look easy. Left to right across the top are the tuning cap, calibrator, dial mechanism and optics; the 200 kc IF; the audio assembly; and the power supply. On the bottom are the 1600 kc converter, the oscillator, mixer, RF, and antenna units and the lower end of the power supply.

This arrangement puts most of the heat generation (power supply and audio assemblies) at the far right and the most heat-sensitive areas (tuning cap and oscillator assembly) at the far left. The tuning cap and front end coils are further isolated by being in shielded assemblies. The ideal is to put all frequency determining parts in one closed assembly so they warm up together but separate shields which are close together is almost as good.

The receiver case is unventilated but with only 90 watts of heat dissipation, it doesn't get too warm.

One of the toughest design problems in complex radios occurs when many circuits must be switched from one knob. In the traditional communications receiver, for example, the bandswitch and front end coils often form a three dimensional spider web in which even changing a resistor is a nightmare. The RCA solution in the SRR-13 is another 'makes it look easy': rotary switches are mounted with the shafts going left or right. Each switch has a crank arm which drops into a slot in a front to rear rail; turning the knob slides the rail which turns all the cranks. When you take out a bandswitched assembly, its crank arms just lift out, you don't have to unhook anything.

During WW-II, assorted radars (often ten or more) and transmitters covering an ever-wider range of frequencies made ships into 'dirty' RF environments. Masts, superstructures and yardarms which were fairly 'clean' before the war, bristled with antennas, often looking down each other's throats. Prewar receivers generally lacked adequate filtering and 'jamming yourself' was a common problem. On the SRR sets, every line in and out (even the panel phone jacks) goes through a filter to remove anything which shouldn't be there. Such measures didn't solve the problem, but they made it much better.

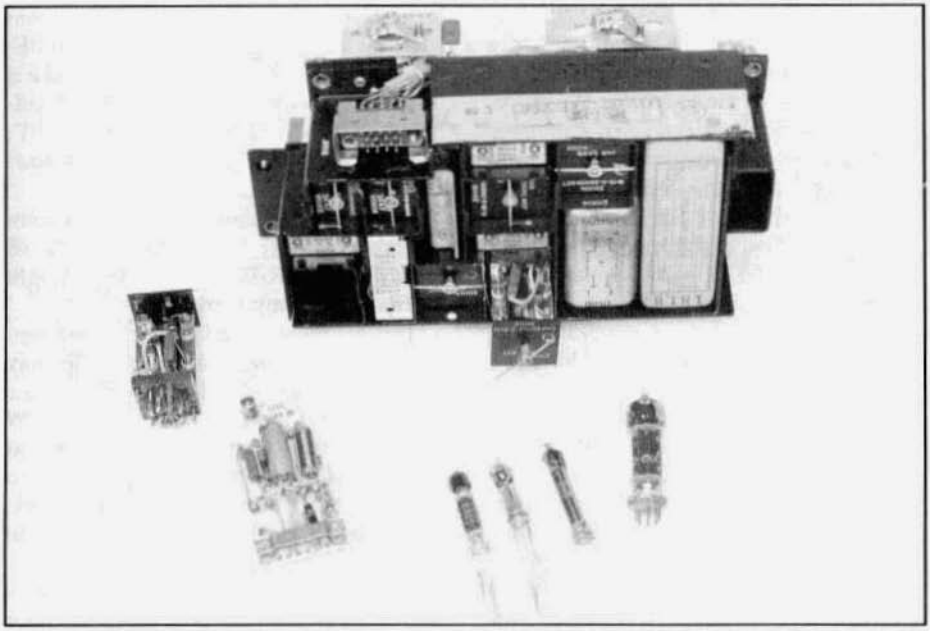
The attention to detail in this set is hard to believe. There's a circuit breaker in the antenna lead to protect the antenna coil against burnout if (say) an adjacent whip antenna is connected to a transmitter. All RF and IF coils are in epoxy sealed cans; the low frequency RF coils have a screw cap over the tuning slug adjustment. The oscillator tuned circuits are temperature compensated by both negative coefficient capacitors and adjustable plastic bushings which move the slugs in the coils. The tuning capacitor is sealed (soldered) in a shield can. The RF grounds for the front end coils don't go to the chassis; instead they pass through ceramic insulators to the inside of the capacitor can where they connect to the respective wiper springs.

On The Air With The SRR-13

My set had only a few failures. The 1HT4 ballast tube in series with the local oscillator filament was dead; a 'parts' set provided a replacement. The calibrator signal was intermittent due to a weak crystal. The 5902 output tube was very weak causing low and distorted audio. There were the usual number of minor mechanical problems to be fixed and the case and panel edge required paint.

Despite 'only a few' failures, my R-441 took more time than most projects because of serious design problems.

The first was severe audio distortion when copying AM. Most of this was caused by the series noise limiter which is de-



Rear — IF assembly with one stage unit pulled partly out. Front — (left to right) The product detector stage unit, local oscillator stage unit, representative subminiature tubes, and 6X4 rectifier.

signed to start clipping at 40% modulation. Because vacuum diodes require a considerable voltage change to go from conducting to non-conducting, a limiter which runs directly from the detector output must start to clip well below the point at which noise pulses are to be cut off. I replaced the vacuum tube with a 1N914 and changed the bias to start clipping at 100%. Later I discovered that the Navy also replaced the tube with a solid state diode – but since they didn't change the bias value, the distortion was improved only slightly.

As with other high gain receivers having marginal AVC action, a good ham antenna gives enough input voltage to cause the SRR-13 to overload; this is made worse by the fact that the RF/IF gain control is disabled on the A3 modes. Using an attenuator at the antenna terminals improved the audio but the right answer would be better AVC and a gain control which operates in all modes.

The most time consuming problem was dial calibration. Even when the set is properly aligned, dial errors of 30 kcs or more are typical on the 2-4 Mcs band, and on the 24-32 Mcs band there are errors of over 100 kcs – about an inch on the dial scale! You can correct the calibration at the 200 kcs check points but near the ends of each band the error changes so fast that there are large errors between points; for example if you calibrate at 3800 kcs, you will be off by 10 to 15 kcs at 3885!

After about 30 hours of changing the values of fixed capacitors in the oscillator tuned circuits, I was able to reduce the errors by 80 to 90%. I then sawed open the tuning capacitor can and bent the oscillator section plates; this reduced the errors to acceptable values with the 'CAL ADJUST' control centered and to essentially zero with recalibration at the nearest checkpoint.

I could not at first believe the problem was designed in. Then I discovered that

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my R-502/FRR-22 (250 kcs to 8 Mcs) has almost zero error on its 2-4 and 4-8 Mcs bands. The tuning cap and coils are the same as those in the R-441 for the corresponding bands but the fixed capacitor values are close to those it took me so long to discover! And the R-502 dial scales differ from those of the R-441 by just enough to get rid of the rest of the error.

I have an SRR-13A parts set; its calibration is no better than the SRR-13's. Does the FRR-23 (SRR-13 shore equivalent) or the 250 kcs to 8 Mcs SRR-12 also have the problem? Perhaps some reader can help. If you have either of these sets and they work well enough to light up the dial would you give me a call or send a note?

With a few changes, the SRR-13 seems likely to become a KJ4KV favorite. A product detector really is better for SSB and while the SRR-13 probably isn't as stable as one of the R-390 family, it is fine for ham use. The modular design makes it an ideal 'test bed' for receiver experiments.

(At 10 Mcs my set drifts about 900 cps during 30 minutes following a five minute warm up. Because I changed parts in the oscillator circuit and did not readjust the temperature compensation, a set in original condition probably would do better.)

I made several pages of notes while working on my R-441; send a business size SASE for a copy.

Conclusions

This is a hard radio to draw conclusions about, for although there's a lot to like, it probably should not have been built. Let's start with the technical part of the picture.

Perhaps most noteworthy is the ease of service. RCA deserves special credit for the many innovations in this area. The general simplicity and ruggedness likewise rate an A+ grade. The two-level modular design is unique, so far as I know.

The projection dial is the clearest frequency read-out I have seen -- easier to read than even the mechanical digital dials of the R-390 and its relatives. The knobs all turn clockwise to increase frequency, band, volume, etc. The only human factors mistake is the labeling of some controls. The BFO knob is marked 'FREQUENCY VERNIER' with no hint that it is for the BFO. Three knobs control the 'loudness': 'GAIN', 'LEVEL', and 'OUTPUT'; can you tell from the labels what they do? Yup, me neither.

The design of these sets shows a commendable effort to control cost. At 65 pounds the SRR-13 is only 2/3 the weight of many contemporaries.

But we have already noted some serious problems. The poor audio quality may have been tolerated because these sets were viewed (and tested) mainly as CW and FSK teletype receivers; certainly that is how I saw them used. However, if a radio has voice capability, it ought to work; The SRR-13 is almost unusable in that mode.

The schematics in the manual are outstandingly readable. Otherwise, it is a poor job. Though the basic information is there, it is so badly organized that several times when I went looking for something, I eventually gave up, unable either to find it or decided it was not there. Remove/replace instructions are fragmentary and there are many errors. The theory sections are too short. In a set with such complex switching you need simplified circuit diagrams; there are far too few of them here.

Now we come to the dial calibration. A communications receiver in this price range (you could have bought a 1950 Cadillac for less) should be able to be set to a frequency with enough accuracy that when a station comes up on the channel, you will hear it. Because of the size and rate of change of the calibration errors near the dial ends, you can't do that with the SRR-13.

A mistake in the 'Table of Replaceable Parts' in the manual may point to how the calibration problem happened. The oscillator coils for the SRR-13 are listed as being for bands of 1.5-3, 3-6, 6-12, 12-20 and 20-28 Mcs rather than the bands on which the receiver actually works. If a change from 1.5-28 Mcs to 2-32 Mcs cover

continued on page 30

Model	Unti	Unti	Unti	Unti	Unti	Unti	Unt	Unti	Unt	Unt	Unt	Unt	Unt	Unt	Unt	Unt	Unt	Unt	Untitle
Model	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Totals
Viking I	156	547	1436	1244															3,383
Viking II				1900	4156	2100	997	500	218	72	71	56	48						10,118
Mobile					817	228	250	192	127	78	52	73	20						1,837
Ranger						2800	2301	1070	1035	876	671	552	748	750	372	156	98	52	11,481
Adventurer						935	1969	1042	647	550	281	278	212	164	51	13			6,142
Desk Kilowatt							258	92	52										402
Pacemaker								501	404	217	114								1,236
Valiant								1175	1518	206	1259	1003	816	634	292	165	75	35	7,178
6N2									587	285	189	241	262	305	154	82	37	18	2,160
Five Hundred									452	134	126	78	43	24	5	3			865
Navigator									356	214	130	67	73						840
Courier									39	185	108	94	39						465
Challenger										653	1085	554	437	458	355	154	86	54	3,836
Thunderbolt										346	237	103	90	48	60	13			897
6N2 Thunderbolt											64	45	51	44	52	29			285
10 M Messenger												166	123	119	85	44	32	16	585
Invader												215	363	221	88	36			923
Invader 2000												79	175	78	34	20			386
Totals	156	547	1436	3144	4973	6063	5775	4572	5435	3816	4387	3604	3500	2845	1548	715	328	175	53,019

E.F. JohnsonTransmitter Sales Figures

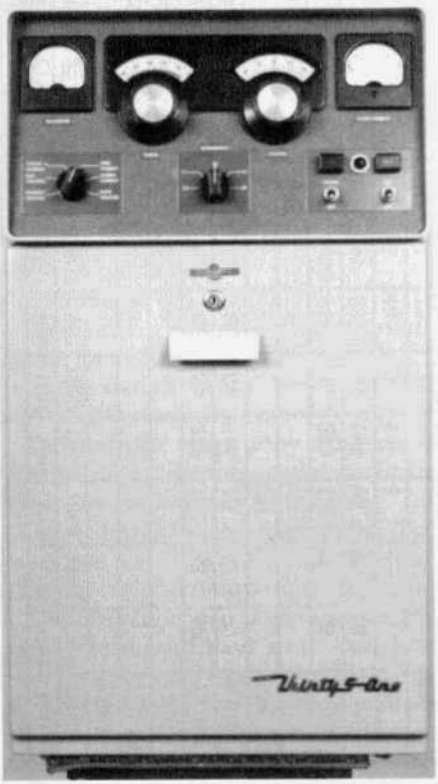
This chart was sent to ER by Butch Schartau, KØBS. It was provided to Butch by Bill Marvin, KB9IV, who works at E.F. Johnson. I think it's very interesting to study the rise and then the fall in production. I would think that sales figures for other amateur radio companies would show a very similar rise and fall.

The Collins 30S-1

Restoration and History

by Harry Snyder, WØRN
P.O. Box 6107
Carefree, AZ 85377

Just one item was needed to complete my 'gray box' collection and that was the 30S-1 amplifier. Good fortune smiled my way when Jim Koshmider, NW7Q, in Tucson offered one for sale. When I went to look at it, it turned out to be a nice, unmodified, no dents, restorers dream. Vintage 1964, it just showed the hours and years of use. It was promptly loaded in the Continental's back seat and hauled back to Carefree.

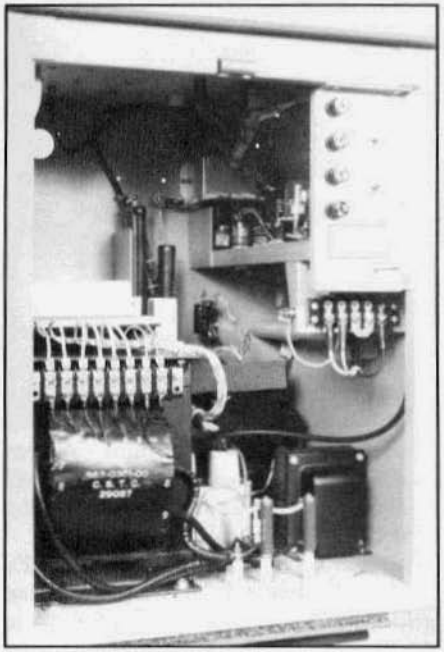


Restoration began with a complete tear-down - Collins construction practice makes this a snap - disconnect everything, unbolt the parts and lift everything out. All hardware, logos, handles, etc. were also removed at this time. The RF deck was stripped of panel, knobs, fan, coil and bandswitch.

Everything was liberally soaked down with Murphy's Oil Soap and washed off - this stuff cuts all the dirt with no harm to parts and paint. As the panel was somewhat scuffed, a new one was obtained from my old buddy Bob Grinnell in Omaha. The entire cabinet, including the masked RF deck, was sent out to Vern Nolte, a professional painter, who used an industrial enamel. He matched the original color perfectly. I think that in the restoration process, painting is best left to professionals unless we are very, very experienced.

The re-assembly began with the installation of a set of wheels to eliminate hernias when I have to move the thing. I installed new bleeder resistors of higher value than the originals to eliminate excessive heat. I also installed K2AW - 14KV 1 amp diodes, replacing the 866's. These were mounted with heat-sink compound to the cabinet bottom. The 866 socket wiring and filament transformer were deleted. The high-voltage choke was mounted on 1" ceramic insulators as I understand there have been some problems with the windings going to earth. All the electrolytics were changed out. I used a 12AL5 for the ALC rectifier - per Dennis Brothers, WAØCBK - making for a smoother ALC. I also left out the thermo switch over the tube along with T103 and R16 in view of the fact that this switch was NG and that replacements are virtually unavailable. It takes at least 1 KW of dissipation to trip this so I felt I was safe without it; Dennis agreed. I may, however, put in an air fin switch to catch blower failure.

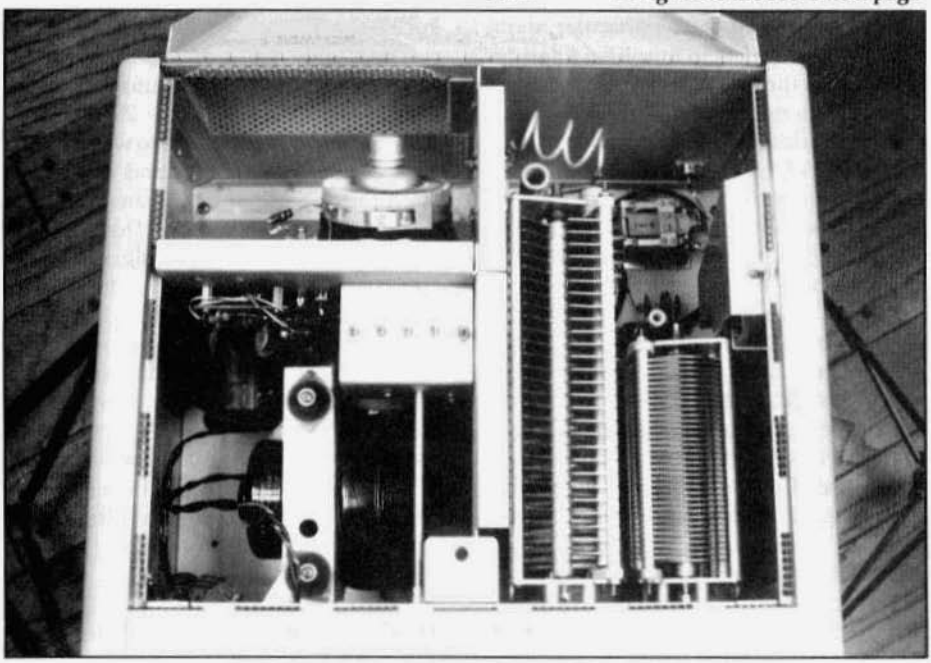
A new RF coupling condenser from the plate to the pi-net was installed. I also



Rear view of ps compartment

replaced the 15-meter switch tap as this one had run hot at one time. The fan was re-installed to the front terminal board with connectors so that it can be removed without having to unsolder the leads. 22 ohm resistors were put in series with the pilot lamps - plenty of light and much longer bulb life. I installed an SO-239 connector at the output - eliminating the need for a Type N adaptor.

All relay contacts were burnished and each was checked with a low-range ohm meter along with all relay coils, choke and transformer windings, both for resistance and to earth. Filter condensers as well as the choke tuning condensers were similarly checked. The three-minute delay relay was bench-checked for both continuity and delay. Both meters were disassembled to allow cleaning of their faces and the inside glass. They were checked for accuracy at several spots on the scale. Finally, all voltages, idle I and ALC settings were checked and/or adjusted. This 30S1 now looks and works just like a new one. **Designer of the 30S-1 next page**



Top view of RF compartment

Warren Bruene, W5OLY, The Designer of the 30S-1

In the beginning, there was Warren Bruene, (now W5OLY) with a somewhat revolutionary idea for a low-distortion, low-drive, HF amplifier designed around the (then new) 4-CX1000A tube developed by Eimac.

Warren - holder of 22 patents and a life fellow of the IEEE - started his engineering career with Art Collins November 6, 1939. The salary was fifty cents an hour! Actually he didn't start as an engineer - there were no positions open at the time - but on the production line. But with the War already raging in Europe, it wasn't long until he was involved in designed gear for the military.

Warren became involved with the early SSB work after having 'sorted out' the output network in the 32V series of AM transmitters and developing the pi/L matching circuit. His basic amplifier circuit - cathode driven, grounded screen, feedback to the grid - is shown in his patent drawing dated July 7, 1958.

Art Collins was very particular about distortion products in amplifiers and required that they be at least 35 dB down - some of the new measurement methods currently in use would equate this to a -41 dB figure. Warren's new amplifier easily met these requirements. Art also insisted on "legal power" - plate I x E = 1 KW. The 30S-1 uses a meter with 'custom' damping to hold down the peaks a little and thus stay legal. Warren feels a few manufacturers did just the opposite - less damping to get higher peaks! The mechanical engineering work on the 30S1 - as well as the other S-series radios - was done by Fred Johnson. His designs are of the usual top quality that Collins is known for and this, of course, made the disassembly and subsequent restoration of my 30S-1 a real pleasure - things all fit right!

The screen grid E is low because the RF drive E is additive - resulting in the screen E that Eimac specifies. I know some of us have raised our screen E's - with a resulting deteriorated distortion figure. Warren said that as designed this amplifier will deliver 1300 watts with low distortion figures.

I understand that in 1962, two '30S-2's' were built. These made use of a grounded grid triode circuit using a tube similar to the 8877. These amplifiers featured automatic tuning of all circuits - some more of Warren's design work. The story is that both are still running nicely - a couple of lucky hams!

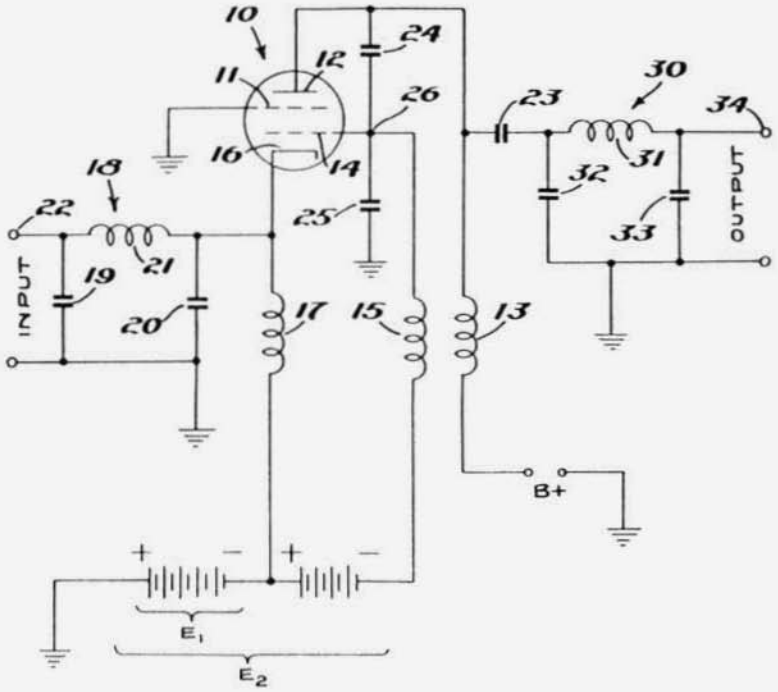
The design work on the Strategic Air Command 205J-1, 45 KW, automatic tuned amplifiers, along with the 204C-1, a 10 KW manually tuned job, also was handled by Warren. I had first hand experience with the 45's at the SAC transmitter site back at Scribner, Nebraska. During a visit that some of us were making, one of the SAC people came up on 20 meters with a 1 KW exciter and a log-periodic antenna to answer a VK. The VK mentioned some QRM. A little button pushing and 'Voila' the SAC station was +60 over 9 down under to finish the QSO! We soon found that he was using one of the 45's with 300 KW ERP aimed at the VK! I am sure that the Statute of Limitations has run out by now. HI! The tubes in both the 205J and 204C were 4CX5000's.

Warren retired from Rockwell/Collins in the spring of 1984. He joined Electrosystems in Dallas where he worked for the following six years.•

April 18, 1961 W. B. BRUENE 2,980,862

LINEAR LOW-INPUT R.F. IMPEDANCE AMPLIFIER

Filed July 7, 1958

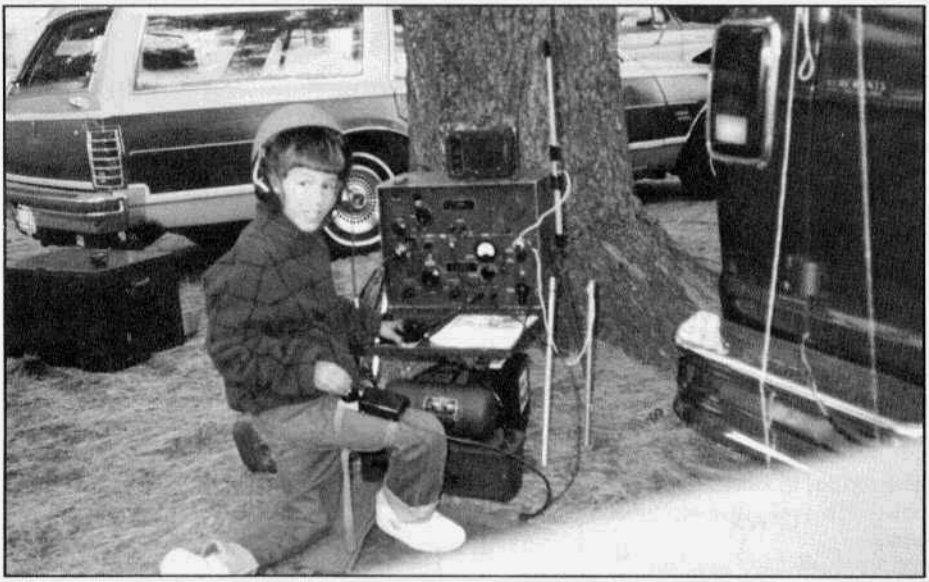


INVENTOR.

WARREN B. BRUENE

BY Marvin Moody

ATTORNEY



Benjamin Bowne, KA1YKG, son of Chris, AJ1G, operating a BC-654 at the October, 1990, Deerfield, hamfest. Ben is a newly licensed novice.

Clyde Sakir, N7IOK, in his AM station that consists of a B&W 5100B transmitter and a National NC-173 receiver. Clyde says that it was Bill, WC7O, and Bill (Tucson Bill), K7CMS, that got him involved in vintage/AM operation. He says they have a nightly 2 meter AM net in Tucson and that these are "enjoyable sessions".

Ed Crosby, K1GWT, in his shack with some of his vintage and homebrew gear. His next project is a late '30's ham station. His transmitter will be a 35T modulated with Taylor T-20's.

This is one of the last photos of Otis Nonken's (K5SWK) daughter, Laurie, prior to her death in an auto accident, July 1,1990. Otis and Laurie had a close relationship and spent many happy hours in the hamshack where Laurie enjoyed talking to the AM gang on 3885.

Collecting/Repair/Restoration...Tips

The material on this page has been reprinted from G-E Ham News Publications with permission from the General Electric Company.

Question: Is it true that reducing the filament voltage of a transmitting tube five per cent will increase the life of the tube? **J.O. Pilant**

Answer: Transmitting tubes usually employ one of three types of filaments - tungsten, thoriated tungsten, or oxide coated. Very few tungsten filament tubes are found in ham shacks, as this type of filament is usually found only in very large tubes. However, the pure tungsten filament tube will have its life almost doubled if the filament voltage is reduced five per cent. In this case, approximately 67 per cent of normal emission is available, which means the tube cannot be run at full rating. However, if the full emission is not required, advantage can be taken of this filament voltage reduction. If the emission is reduced, by this method, too close to the actual requirements, distortion may be increased.

On the other hand, thoriated-tungsten and oxide-coated filament tubes must be run at approximate rated filament voltage, or the emission may gradually decrease until too little is available. Many factors enter into this statement, but it is recommended that the filament voltage be held as nearly as possible to rating. **Lighthouse Larry** G-E Ham News , July-August, 1947

Pilot Bulb Removal

It is often a very difficult job to remove pilot lamp bulbs from the front of the panel, as the fingers tend to slip on the glass, and in addition, the space available is very small. To do the job easily, place a piece of friction tape completely around the bulb. The tape should extend out past the end of the bulb. With the friction tape in place, it is a simple matter to unscrew the bulb with the fingers, or, if there is not room for the fingers, a pair of long-nosed pliers will do the job. – **W4LRE** G-E Ham News, July-August, 1947

Soldering Trick

Here is a stunt which will save many hours of grief when working on polystyrene coil forms and sockets, small crystal rectifiers – in fact, any object which may be damaged by prolonged heating from a soldering iron. Use an ordinary pipe cleaner which has been thoroughly soaked in water. Wrap this around the object being soldered to, and it will prevent the heat from reaching the main part of the object. For example, when soldering to polystyrene coil form pins, the pipe cleaner, wrapped around a pin, prevents the pin from becoming loose in the coil form. – **VE3AOZ G-E Ham News, July-August, 1947**

Question: Is it possible to run higher plate voltage on a tube when it is used as a Class B audio amplifier than when it is used as a Class C radio-frequency amplifier? **W3IJE**

Answer: It is not possible to make a blanket answer to cover all tube types, but in general, the same voltage rating applies to Class B audio as to Class C r-f use. While the tube does not have radio frequency losses when operated as an audio amplifier, increased ion bombardment of the filament occurs due to the plate voltage being applied over a longer period of time per cycle. This and other factors cause the voltage rating to be the same for these two types of service on most tube types (GL-809, 810, 811, 812, etc.)

Conversely, the plate-voltage ratings for Class C radio-frequency plate-modulated conditions are always less than for Class C radio-frequency power amplifier conditions, due to the increase of voltage which occurs with modulation. In other words, more voltage can be put on tubes in Class B audio use than on tubes used as Class C r-f plate-modulated amplifiers. **Lighthouse Larry.** G-E Ham News, May-June, 1946

AM FREQUENCIES

2 Meters - 144.4, calling freq., activity in most cities; **6 meters** - 50.4 calling freq. **10 meters** - 29.0-29.2 operating window; **12 meters** - 24.985 calling freq.; **15 meters** - 21.400 - 21.450; **17 meters** - 18.150 calling freq.; **20 meters** - 14.286 for the nightly SPAM net starting at 5:00 CA time; **40 meters** - 7160, 7195, 7290 are the main freqs. Westcoast SPAM net every Sunday afternoon ,4:00 PM on 7160; **80 meters** - 3870, 3880 and 3885 are the main freqs. Westcoast SPAM net Wednesdays nights, 9:00 PM on 3870. Northeast SPAM net Thursday nights, 7:30 PM on 3885; **160 meters** - sporadic summer-time activity but during the winter signals can be heard anywhere on this band.

15 Meter Contest Results

The ER 15 meter contest held over the week-end of June 15 and 16 was severely affected by the abnormal sun-spot activity that was taking place. I think a lot of AM'ers - myself included - shut down after a couple of hours of frustration. But some folks did enjoy themselves despite the awful conditions.

From John Brewer, WB5OAU, in Albuquerque: "Although I only worked six stations over a 4 hour period, the ragchew sessions were fun. A long QSO with Howie, W2NRM, had me agreeing with his suggestion for a weekly round-up on Saturday or Sunday on the high end of 15. This sounds like a great idea for the summer months."

I agree with John and Howie. It would be a good idea to make it a point to get on 15 on the weekends, particularly in the summer. I've mentioned this before, but I'll mention it again, I think we should have more AM activity on 15. I really can't understand why there is not more activity on this band.

The winners of the contest are: John Barcroft, WA6ZJC, 56 points for First Place; David (Andy) Anderson, N5JBT, 42 points for Second Place and John Brewer WB5OAU, 6 points, for Third Place.

Next month I'll announce the next contest and perhaps a list of all the contests for the next six months or so. That way everyone can mark them on their calendar and make advance plans to participate.• **N6CSW/Ø**

Vintage CW Net Up-date

Tracy Reese, WB6TMY, who last month proposed a Vintage CW net and asked for input from others who might be interested, reports that the response has been quite good. To date he has received about a dozen letters with suggestions and comments. He says the net will definitely become a reality but he would like to receive more input before he decides on the frequencies and times etc.

Personally I think it's a great idea and it's something that is long overdue. In fact, in anticipation of the net I've recently been back on CW after a long absence. I've really enjoyed the experience. As Tracy says, "all the vintage gear has CW capability, why don't we use it"?

In the future, ER will be having more articles for the CW operators. I think we've been remise in this department. The first article along these lines - by Bill Kleronomos, KDØHC, - will deal with improving the CW capabilities of the ART-13.

So, if a Vintage CW net sounds interesting, contact Tracy and give him your ideas on it. Next month we'll announce the frequencies and times of the first net. • **N6CSW/Ø**

Tracy's address is Box 4694, Santa Rosa, CA 95402-4694

The National AGS Receiver

by Henry Rogers, WA7YBS
P.O. Box 501
Minden, NV 89423

National Co. receivers have always been a favorite of the ham community with designs usually coupling great performance and superb mechanical operation. This reputation was developed in the early thirties with famous receivers such as the AGS, FB-7 and the HRO, all products of James Millen's phenomenal influence on National's mechanical engineering.

Millen was a young engineer and author of several radio related articles when he became involved with the National Co. in the midtwenties. He brought with him his interest in ham radio and shortwave receivers, although one of his first projects was a scanning disk television system. Later, turning his attention to the growing public interest in the new shortwave broadcasting, he designed the SW-4"Thrill Box", a four tube, TRF shortwave receiver, using plug in coils. As the SW series evolved, National's reputation along with James Millen's engineering abilities became unrivaled for communication receivers.

By the early thirties, the Department of Commerce, Aeronautical Branch, had decided to replace the antiquated communication equipment then installed at the larger airports around the country. The new radio equipment would be built to rigid specifications of high reliability and performance. The design would be a collaboration of Government engineers and the contracted company engineers. General Electric was selected to build the ground transmitters while Aircraft Radio Corp. was given the contract for the airborne equipment. The ground receivers were to be built by National.

The prototype receiver was tested in Washington D.C. sometime in early 1932 and soon approval was given to build the initial contract quantity. By October, 1932, well over one hundred receivers were in use at their intended airports. Dubbed the "AGS", perhaps for Air-Ground-Service, the receiver was an instrument in which, as National put it, "...consideration of price are entirely subordinate to those of performance and reliability." Only the finest material and components were utilized in assembly while testing and the complicated alignment was accomplished by engineers. The result was a receiver with performance that was unparalleled in it's day.

Design And Construction

Mechanically, the AGS is built for a long life of rugged service, while keeping it a physically manageable receiver. Heavy aluminum plate is used throughout resulting in a strong but light weight chassis and front panel assembly. Each AGS included an aluminum dust cover and bottom plate for added strength and protection.

Evidence of the top quality components can be seen in the oilfilled by-pass condensers imported from Germany and the precision, hand-labeled ceramic-coated resistors used throughout the circuit.

The tuning condensers, which are three separate units ganged together with a spring-loaded rack and pinion drive, were hand selected for specific tolerances prior to assembly.

The accurate tracking of the AGS front end was achieved by a tedious alignment procedure performed by National's engineers. For example, the circuit's residual capacitance was compensated for by varying the position of a sliding joint in the condenser box. Standard reference coils were used to determine the position of the joint which was then soldered in place.

continued on page 22

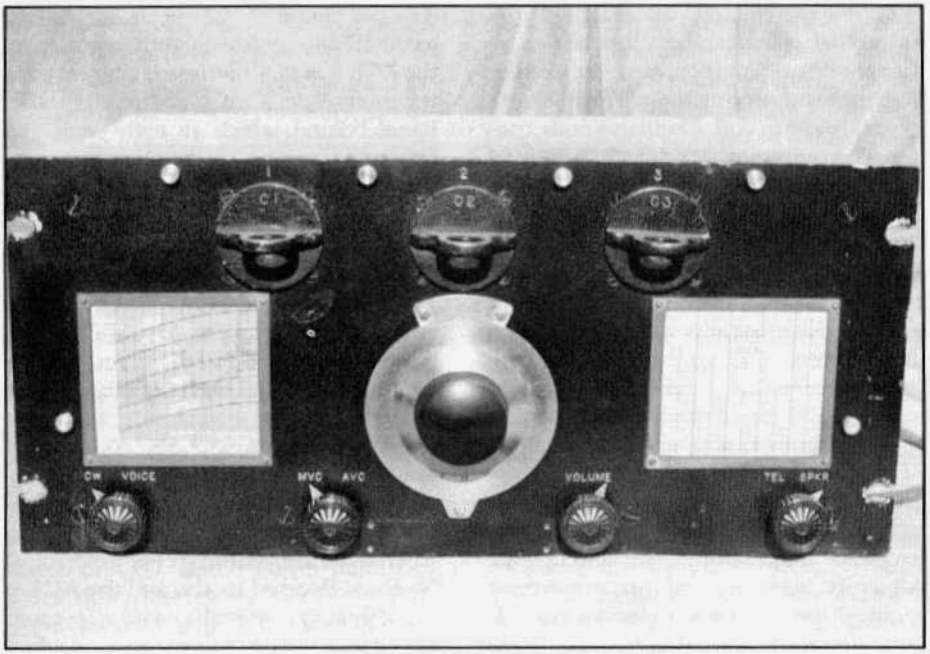


Figure 1. The initial contract AGS. These receivers were originally designated as RHM models.

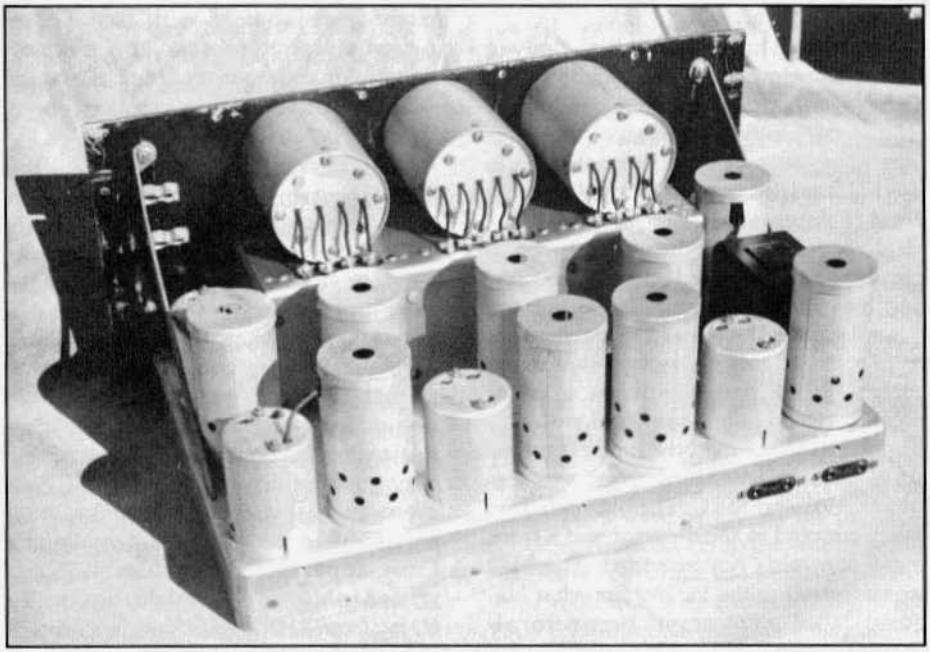


Figure 2. The chassis with the dust cover removed showing the extensive use of shielding .

The National AGS Rcvr from page 20

The plug-in coil sets were matched to an individual receiver and all residual inductance was compensated for during alignment by varying the grid lead length in each plug-in coil. Oscillator coils contained a trimmer condenser mounted within, adjustable through a small hole below the coil handle. The RF and 1st Detector coils, however, were not adjustable at the coil; rather, a pair of trimmer condensers, mounted on the condenser box inside the receiver, were used to align these circuits. Due to the precision construction of the coils and the prior matching by the aligning engineer, one setting of these trimmers was accurate for all the RF and 1st Detector coils in the entire set. The AGS was normally supplied with fifteen plug-in coils which comprised five frequency ranges from 2.4mHz to 15mHz. All coils were wound on a machine grooved form of R-39 material. Incidentally, initial contract AGS receivers were designated as RHM models and all the coils for these sets contain their own trimmers and no adjustment condensers are located in the receiver.

The original nine tube superheterodyne circuit utilized type 36, 37 and 38 tubes. These were a new, rugged design, intended mainly for use in automobile radios. One stage of tuned preselection is used along with two, 500kHz IF amplifiers. A separate tube is used for AVC. MVC also works though the AVC tube by grounding the grid and varying the cathode bias, thereby manually setting the overall gain in the RF and IF stages. This results in an entirely noiseless volume control,(RF/IF gain), with just a slight delay between adjustment and result. A trimmer condenser located under the chassis is used to balance the response between AVC and MVC. The BFO is inductively coupled to the detector and a front panel control is not provided. The BFO was adjusted at the factory for what National called a "pleasant" beat note, although for better CW selectivity this frequency could be readjusted at the BFO transformer.

When supplied to airports, or perhaps as the ID tag suggests, lighthouse service, the AGS was rack mounted. The complete equipment package included a speaker panel behind which an eight inch, PM speaker was mounted. A coil storage panel which consisted of a felt-lined, wooden support form bolted to an aluminum panel. These held the twelve idle coils in a convenient location. The AGS receiver was normally located under the coil storage rack and below it was the Model 58C TRF monitor receiver. The 58C was basically a rack mount SW-58 with the plug-in coils on the front panel. Apparently, no storage was provided for extra 58C coils, which implies that one set was all that was required. A dual power supply completed the rack equipment.

After the initial contract had been filled, National decided to also sell the AGS to the affluent radio enthusiasts who could afford its hefty price tag of over two hundred dollars. National considered it good advertising and it worked! Contemporary QST magazines would sometimes picture ham stations with the AGS receiver quite prominent and, although most depression era hams couldn't afford the AGS, the advertising succeeded in furthering National's quality image.

Production History

The Department of Commerce contract for a high reliability, high performance ground receiver for airport service probably dates from early 1932. At this time the prototype was being tested in Washington D.C. and when final approval was given, it can be assumed production started. The original contract receiver was designated the RHM. It is externally identical to the subsequent AGS, however, the circuit is significantly different. All coils are individually adjustable and the lack of the residual capacitance compensation are most apparent. Production probably started in May of 1932 as evidenced by the ID tag from RHM Serial Number 0 shown in Fig. 6. Contract production lasted only a few months as by October 1932 the AGS had replaced the RHM.

With the introduction of the AGS, additional coils to extend the tuning range to 20mHz were offered. In fact, Leeds, a radio parts house in New York City, advertised AGS amateur bandspread coils at this early date. These advertisements imply by the tube line-up that the circuit is still RHM, however, by January 1933, an article in Radio News published a new schematic for the AGS with an electron coupled local oscillator using a type 36 tetrode. Additionally, the first detector and AVC tubes were also changed to type 36 tetrodes,(the RHM had used type 37 triodes in these locations). The Radio News article also mentions the amateur bandspread coils, a frequency coverage of 1.5mHz to 20mHz and the photographs of the AGS show the new, small ID tag. In March of 1933, Radio News published James Millen's article on the AGS production methods and its calibration. He included a new schematic for the AGS which changed the AF output tube from a 38 to an 89 and relocated the phone output from the AF stage to the detector. Millen details all the production tests and alignment of the AGS. By comparison to the RHM, it is apparent that by this time the AGS had trimmers located on the condenser box and the capacitance compensation adjustment was being used.

By March 1933, the Single Signal AGS had been developed utilizing the Lamb crystal filter. At this time only the Single Signal AGS used air-tuned IF transformers which are identified by the taller than normal cans. The following month QST ran an article by James Lamb about crystal filters and their installation into different receivers. The article pictures the Single Signal AGS, showing some of the controls relocated for this model, e.g., the BFO is adjustable from the front panel and the crystal filter controls are also panel mounted.

In July of 1933, National introduced two new models which were developed from the AGS. The AGU was a high frequency receiver covering 2.5mHz to 6.5mHz utilizing unit plug-in coil sets. The AGL was a long wave receiver which used a frequency selector switch. Also, at this time, the designation of the Single Signal AGS was changed to the AGS-X.

By October of 1933, the BFO tube was changed to a type 36 tetrode. This tube line up of 7-36,1-37 and 1-89 may not have applied to the AGU or the AGL. As these receivers were only advertised once, there is a lack of information on them. Also by this time, all AGS models were using air tuned IF transformers.

National's advertisement in QST for January 1934 is probably the most informative, historically, on the AGS. The ad indirectly tells about the RHM by stating, "hundreds were in use before the first AGS was sold over the counter....." The collaboration of engineers from National and the Government is mentioned as is the Washington D.C. prototype testing. National even relates that the receiver now being sold was the "polished product of National and Government Engineers".

In June 1934, a shielded, walnut veneered cabinet was offered for the AGS-X table model. This is the first time that an AGS is actually pictured. All prior ads show an RHM receiver, identified by the long ID tag. Probably at this time the tube line- up was changed to type 78 and type 77 in the receiver front end, however ,this was not published until October 1934.

By October 1934, National was already promoting their new model, the famous HRO, and their production was certainly concentrating on the problems of introducing a new and very different receiver. The building of AGS models was more than likely reduced, if not entirely stopped. However, in National's 1934-35 catalog, the AGS is still listed and in early 1935, ten meter coils were produced for the AGS models. When ordering these coils it was necessary to include the serial number of your AGS to assure compatibility of the coils with the many circuit changes that had occurred over the production run.

continued on page 25

Figure 3. The AGU receiver showing its unit plug-in coil installed. The AGU was also known as the RHQ in commercial applications.

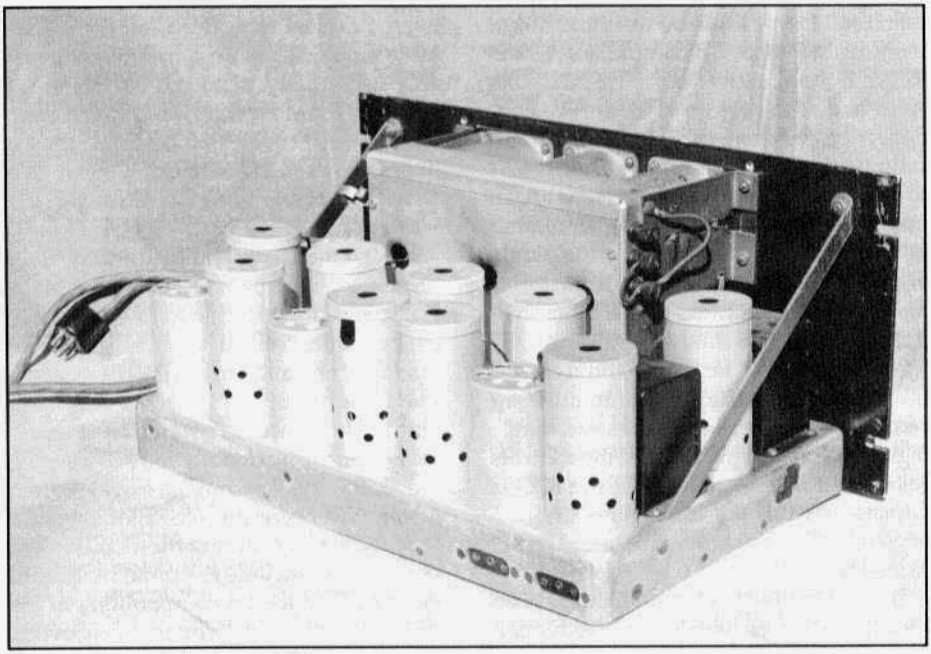


Figure 4. Inside the AGU

The National AGS Rcvr from page 23

Even after production had stopped, the impact of the AGS was shown in the advertising of competitor's models. In March 1935, RCA ran an ad for their new ACR-136 which pictured a rack mount AGS in the background.

The AGU

The AGU was developed to solve the major criticism of the AGS receiver, namely that of handling three separate coils while changing bands. The solution involved mounting all three coils on a common carrier panel and then installing the necessary shielding to protect the coils. A guiding system was engineered to assure mechanical alignment of the three coils when inserting the unit into the receiver. Two handles were mounted on the coil panel for easy removal.

The construction of the AGU is of the same heavy aluminum plate as the AGS. It is slightly smaller in size and considerably limited in frequency coverage. Apparently by mid-1933 airports were standardiz ing their frequency requirements and the AGU reflects this as only two unit coils were supplied with each receiver. The total coverage between the two coils is 2.5mHz to 6.5mHz. An illuminated Type-B, (Type-C), dial was utilized to drive the tuning condenser rack and pinion mechanism, which had remained identical to the AGS.

The circuit is very similar to the AGS except the trimmer capacitors for the RF and First Detector were removed from the receiver and installed into the unit coil assembly along with the local oscillator plate load resistor and coupling capacitor. Provision was made for a balanced antenna input while the AGS retained its single antenna input. Additionally, the plate choke - capacitor coupled speaker output used in the AGS was replaced with a high impedance output transformer. The AGU shown in Fig. 3 & 4 utilizes type 78,77,36,37 and 89 tubes, however it cannot be verified that this applies to all AGU receivers.

The AGU may have also been designated as the RHQ when used in the commercial application just as the AGS was also known as the RHM in similar circumstances. Production started in July of 1933 and it is uncertain when it stopped. What is certain is very few AGO receivers were built and the set was advertised only one time.

The AGU never acquired the fame of its older ancestor, the AGS. Several reasons can be given for the apparent failure. First, of course, would be the limited number built. It just wasn't seen that often. Next was the Type-B dial, while it was fine on the SW-3, it couldn't handle the increased drag of the condenser rack and pinion drive mechanism,especially after the lubrication began to dry up. After a short while, the dial would begin to slip, first showing up as backlash and later as a considerable calibration problem. Limited frequency coverage was also responsible for the lack of interest in the AGO by the HAM community. Who would be interested in a receiver that only covered 80 meters? Last would be timing. During the AGO production, National was gearing up for their new block-buster. Designated the HRO, it utilized the unit plug-in coil idea much more successfully and became more popular than any member of the AGS family.

The AGS Performance

The receiver shown in Fig. 1 is an example of the initial contract AGS, properly known as the RHM. It is a totally original example, complete with its original set of coils. The RHM is normally mounted, along with its speaker coil rack and power supply, in a 28", open table rack similar to many that were available in the thirties. This receiver had several weak tubes, an open detector choke and the 500kHz IF was completely out of alignment, but when these minor problems were corrected the set functioned quite well.

The most impressive feature of the RHM's performance is its incredible dial accuracy. Using coil set "C", WWV at 5mHz should tune in at 19 on the dial. It tunes in at 18 - one division error out of 150 is a .6%

continued on page 27

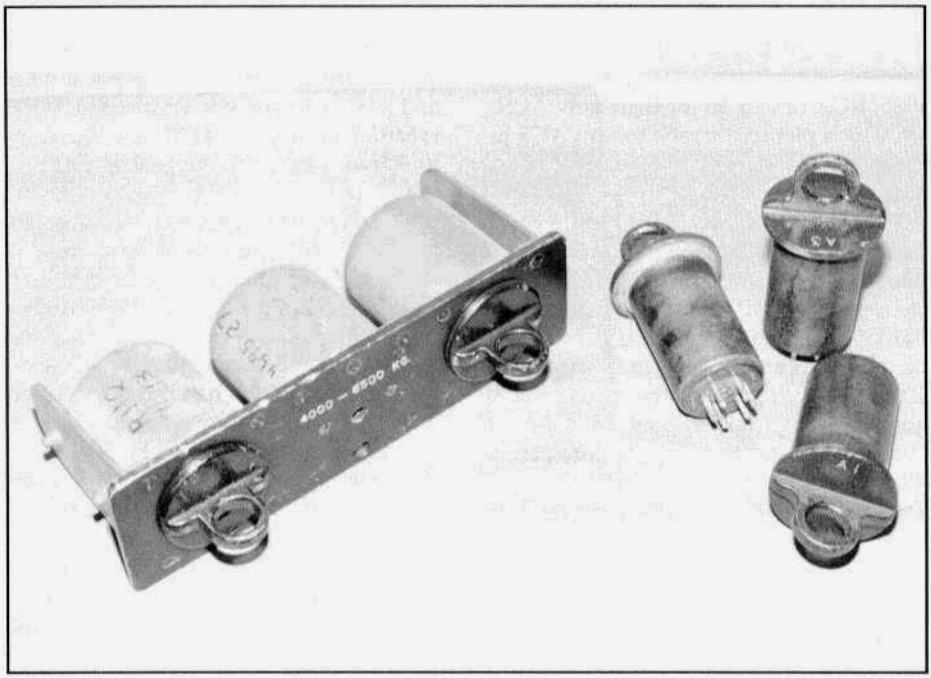


Figure 5. Comparison of the plug-in coils. The AGU unit coil and a set of AGS coils.

Figure 6. Close-up of RHM serial no. 8 ID tag showing contract date of 5-12-32. Photo by Jim Allen.

The National AGS Rcvr from page 25
error! But with coil set "B", at 10mHz should tune at 88 - it tunes at 88! No error! Of course, it takes a little time getting accustomed to reading the charts vs. the dial, but the accuracy still leaves one in awe.

The inductively coupled BFO displays its advantage with the very strong injection into the detector. This, along with the fact that the VOLUME control actually is an RF/IF gain control, allows SSB and CW to be copied with ease. MVC action is somewhat disconcerting as there is a noticeable delay between adjustment and the resulting change in volume.

Bandwidth seems fairly wide when AVC is used, however, the receiver is much more selective in MVC. Additionally, by tuning the BFO slightly off the IF frequency, more selectivity is available by asymmetrical action. This is helpful on CW but AM is at the mercy of QRM.

The RHM's simple detector-amplifier is easily overloaded resulting in severe distortion. This will occur if the volume is advanced too far in MVC or in AVC if the fading is happening faster than the AVC action.

Frequency drift is quite noticeable and a CW or SSB signal must be retuned every few minutes. Drift due to variations in the AC line voltage is also apparent.

By far the greatest disadvantage concerns the lack of a standby switch. Apparently when changing coils, either the power should be shut down or National expected one to change the coils with the B+ on the circuit.

Compared to its contemporaries, the AGS/RHM must have been a phenomenal receiver. Its accuracy, sensitivity and selectivity was far and above anything available in 1932. By today's standards though, the AGS seems crude, its circuitry hardly adequate to deal with QRM. In fact, within just a few years it was surpassed by National's new receiver, the HRO. The HRO was a huge success and an incomparable performer. It remained in production longer than any other receiver, albeit increasingly modernized in form. From the original HRO in 1934, to the HRO-60 of 1964, production lasted 30 years. In the HRO's ancestor's, the RHM, AGS and AGO one can see the mechanical excellence and the uncompromising commitment to manufacturing quality that would establish National Co. as a leader in the communications receiver field. •

References

Radio News - Jan., 1933 - New Shortwave Design by S. Gordon Taylor & Wm. C. Dorf. This article contains a review of the AGS including opinions on its performance.

Radio News - March, 1933 - Testing a Modern Superhet by James Millen. Millen describes the production testing and alignment of the AGS.

QST - Oct., 1932, Jan., Feb., March, May, June, July, Oct. and Nov., 1933; Jan., June and Oct., 1934; Feb., March, and June, 1935 contain National AGS ads. Oct., 1933 and Oct., 1934 issues contain National's catalog of parts and equipment.

CQ - Nov., 1975 - National AGS Receiver, The Golden Age of Radio Series by William Orr. Orr describes the AGS-X in detail with a performance critique.

Editor's Note: Henry Rogers is presently working on an article on James Millen and would appreciate hearing from anyone that has informatation regarding the life and work of this man; i.e. photo's, newspaper stories, letters etc.

LETTERS

A letter to Ray Osterwald, NØDMS, author of the series "The R390a Receiver: A Milestone in HF Communications", ER #24,#25 and #26:

Dear OM:

I have enjoyed your articles in ER very much. I have had about 120 R390a's pass through my hands in the last 20 years and I began to make notes on the name plate data after I noticed so many different manufacturers. Maybe I can help to clear up the order number confusion.

Here is what I know; the name plates almost always listed the "order number". The original numbers went like this:

1950	Collins	21852-PH-50-93	R391 serial 107
1951	Collins	3075-PH-51	R392
1951	Collins	14214-PH-51	R389, R390, R391
1951	Collins	11424-PH-51	R391
1952	Collins	11653-PH-52	R392
1952	Motorola	26579-PH-52	R390

14214-PH-51 is the important order number. I have in my possession R389 serial number 658 built on this order number. I also have R390a serial number 105 built on this order number and the internal parts are code dated Nov. 1955.

According to Collins reports they delivered prototypes of R390a to the Signal Corps in Feb. and March of 1955. Production of the R390a started in 1955, but they made the first R390a on order number 14214-PH-51.

So a correct list of R390a order numbers would look like the following:

1955	Collins	14214-PH-51
1955	Motorola	63-PH-54
1955	Collins	375-PH-54
1956	Collins	08719-PH-55
1956	Motorola	14-PH-56
1958	Motorola	14385-PH-58
1959	Stewart-Warner	42428-PC-59
1960	Stewart-Warner	20139-PC-60-A1-51
1960	Electronics Asst. Corp.	23137-PC-60
1961	Capehart Corp.	21582-PC-61
1962	Amelco	35064-PC-62
1963	Teledyne/Imperial	37856-PC-63
1963	Stewart-Warner	DA-36-039-SC-81547
1966	Comm. Systems	FR-11-022-C-4-26418 (E)
1967	Electronic Asst. Corp.	FR-36-039-N-6-00189 (E)

I also have another number for Stewart-Warner that I can not verify. It is DA-36-039-SC-2-48984.

I did not list Claviex DAAG 05-67-C-0016 because all I have is a brand new xtal deck. This may have been a spare parts contract like order number DAAB-07-77-C-0116 for BFO's and PTO's etc.

I am not absolutely sure about Communications Systems FR-11-022-C-4-26418 (E) because all I have of this set are two I.F. decks, two xtal osc. decks and a Veeder Root counter manufactured for Communications systems.

It was Signal Corps policy to order 10,000 each on the receiver contracts at that time. Incidentally, some joker in the Signal Corps ordered 10,000 SP-600s before the R-390 came out. They had to junk them and rush Collins on the R390, R391, R389, R392 contracts. They even brought in Motorola.

So far as I know, all of the contracts that I have listed were for 10,000 R390a's except for the first order (14214-PH-51) which produced probably only 3 or 4 hundred. In other words there were about 140,000 R390a's made. A lot of them were left in Viet Nam, a lot were sold in Japan and Germany; maybe half of the total production.

73,
Wally K5OP

Dear ER:

Can you stand one more comment about Valiant Audio?

I have a Valiant II, with minor audio modifications - mainly broadened audio response mods, but with the original clipper intact and stock. It can be put in the circuit or taken out.

With the bands the way they have been these past few weeks, there have been many days on 40 meters and some night time operation also, where the carrier levels have not been too much above the noise. There have been some days when conditions are quite marginal.

I have been doing a little experimenting in such conditions by introducing 4 or 5 dB of clipping. This is just the procedure AM operators of fourty years ago would have used. The designers of the equipment expected hams to want audio readability in all conditions and that is why clipping was so popular.

Without describing what I am up to, I ask a station who is not hearing me too well to listen for a change after I make an adjustment, then I put in the clipping. Invariably, the response is that I am more readable, sometimes dramatically so.

In our haste to achieve hi-fi sounding hams stations, I think we sometimes have gone too far toward broadness and bassiness in audio. There are stations I have a hard time reading unless their carriers are well over S-9 because the audio characteristics are so hi-fi that they cut through very little.

Now, I love the sound of a fine AM transmitter as much as anybody, but I just want to suggest that all those guys who have gutted the clipping from their Valiants might have done themselves a disservice. Used sparingly, with the correct amount of compensating audio and when propogation conditions make readability marginal, clipping is a great help. I'm glad I didn't tear the clipper out of my Valiant II.

73,
Bill Skidmore, VE3AUI

Dear ER

In his excellent article (part 1) on the R-390A, Ray Osterwald, said that poor results will occur when using the unbalanced R-390A antenna input with much of anything but an 8 foot whip. This does not agree with my experiences. An 80 foot inverted L antenna (65 feet horizontal, 15 feet down lead, with no coax lead in, just bare wire) is excellent for 0.5 to 32 Mhz. I use a C to BNC adapter and a BNC to binding post adapter and connect the bare end of the inverted L to the binding post. The R-390a unbalanced antenna input does not work well with typical coax fed ham antennas.

Very Sincerely,
Dallas Lankford [Dallas is editor of "The Hollow State Newsletter"]

Ray's response:

Dallas is right, of course. I use similar wires attached to the unbalanced input myself. When I wrote that part, due to space limitations, I stopped short of saying that the unbalanced input likes to 'see' an antenna which electrically is composed of mostly capacitive reactance, such as an 8 foot mobile whip would have. Our typical antennas with fairly long runs of coax (and a complex impedance) don't work too well at this input terminal.•

Reflections from page 2

in concentric ovens, maintaining the internal oven at about plus/minus .001 degrees F. tolerance. The main capacitor was corrected with a special external capacitor which was driven by an adjustable cam and follower. The PMO, based on that design, could easily be set to less than 1 khz accuracy linearly from 2 to 4 Mhz. Les was also one of the key designers of the GPR-90.

"TMC flew high until the mid sixties, when a shift in the market forced obsolescence in their gear. I lost track of what happened to them at that time. My Dad left them around 1964, about the time they developed the GPR-92."

No doubt there's more to come on TMC....stay tuned.•

ER in Uniform from page 10

age was made at the last moment, the fixed capacitors were not changed, and a 2-32 Mcs dial was created by 'translating' the 1.5-28 Mcs one (rather than from a new prototype), you'd get just this type of error. The problem must have been noticed but for reasons of cost or schedule, nothing was done.

Regardless of the reason, an In Uniform 'Turkey With Trimmings' award goes to the calibration errors in this set. And an 'Extra Helping Cluster' – our first such award – for the lousy audio quality.

How could the Navy buy a 1950 receiver based on 1930's circuits and with so many signs of a rush job?

It is possible that it was a rush job. The Korean War started June 25, 1950, and the first SRR-series contract was signed August 11. Faced with the need to reactivate and re-equip many ships, the Navy may have turned a long term receiver project into, "What can you give us right away?" By the time the crisis eased, it may have been clear that not only did the set have some serious (though fixable) problems but also that it was obsolete – and so, not worth fixing.

The Navy went on to buy Collins and National sets for the critical jobs and then (about 1965?) the RI 051 synthesized receiver. It's a bizarre twist, but perhaps taxpayers were spared the cost of thousands of "good obsolete" SRR-series radios by the fact that the Navy needed the first batch in a heckofa hurry.•

Editor's Comments from page 3

ful than standing in line at the 'big city' post-office in Durango. And I've been very satisfied with the service I've received here. Sometimes 'bigger' is not 'better'. Out here in Hesperus, there is never a line-up; in fact I'm usually the only customer in the place.

In response to last month's comments regarding the mailing of ER and some of the problems we face, Bob Beasley, K6BJH, sent in the cartoon below. I hope that if any post-office people see it that they won't be upset. On to #28...

IF YOU'RE HAVING TROUBLE WITH THE MAIL, SPEAK TO MR. VERTIGO. HERE--- HE'S IN CHARGE OF ROUTING AND EXPEDITING"

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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

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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: HQ-110 - $75 plus shipping. **WANTED:** Johnson Ranger II xmtr. Trade? Bill Graham, N5LMX, Box 33083, Fort Lewis, WA 98433.

FOR SALE: APR-4Y receiver with CV-253 tuner - $125; Eddystone 770R receiver - $40; BC-1031 panadaptor - $50; parts, manuals, books, list - $.50. J. Orgnero, Box 32 Site 7 SS 1, Calgary, AB, T2M 4N3 Canada

FOR SALE: Drake 2B w/2BQ - $125; Viking Ranger I, needs work - $75; Viking Pacemaker - $160; Eico 720 w/722 vfo - $90. U pay shipping. Gary, NO5H, POB 295, Epps, LA 71237. (318) 926-3343

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

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

WANTED: Collins 75A4, serial number above 5500 please. Also Collins 30J and 32G transmitters. Bill Smitherman, KD4AF, Rt. 4, Box 79, East Bend, NC 27018.

FOR SALE: Hallicrafters SX-111 rcvr. Art Reiss, WA2YBC, 169 N. Delaware Ave., Lindenhurst, L.I., NY 11757. (516) 884-8527

FOR SALE: National NC-300 rcvr - $100. Jerry Boles, N5KYE, 14857 Redbud Ln., Piedmont, OK 73078. (405) 373-2228

CLASSIFIEDS

FOR SALE: Ranger I , good cond. - $125 shipped; Drake 2A rcvr, works, needs realignment, w/2AQ Q-multiplier and spkr - $75, I ship. Cliff, W3LVC, (301) 796-1070

WANTED: Dial scale for HRO-50T; A, B, D, AA. Marty Drift, WB2FOU/5, 108 Hickory Lane, Hickory Creek, TX 76205. (817) 497-6023

FOR SALE: Clegg 22 AM, good cond. - $60; Johnson Valiant, good cond. - $200; DX-100, good cond. - $150. Cliff Fleury, AI7Y, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

WANTED: Collins KWM2A, KWM1, 75S3C, 51J4, 51S1"round emblem". Excellent or mint condition. Wm. Cabeen, KM6P, 2001 Santa Monica Blvd., #208W, Santa Monica, CA 90404. (213) 829-7678

WANTED: ART-13, BC-610 or T-195. R.F. (Bob) Bricker, K4CSV, 1317 Hickory Terrace, Fernandina Beach, FL 32034. (904) 277-8423

WANTED: Drake R4-C rcvr; MS-4 spkr; CW/AM filters; noise blanker. Good to mint cond. only. Dale Welch, N6DW, 2955 Euclid Ave., Concord, CA 94519. (415) 685-7364

FOR SALE: Hallicrafters: HA-6 six meter transverter w/P-26 ps - $75; HT-30 xmtr - $90. With manuals. New original manuals : HT-9, RAS-5, SX-28A, SR-500, SR-160, SX-62B, S-37, S-40B, S-27, HT-40, SR-75 - $10 each. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

FOR SALE: Motorola FMTRU-5V mobile rig (FM) with mike and control box, instruction books - $30. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405. (503) 345-2169

WANTED: Any model, in any condition, even less coils, of the National SW-3. Should be inexpensive. James Fred, R 1, Box 41, Cutler, IN 46920.

WANTED: Old receivers, SX-73, SP600JX, AR-88, BC-342, BC-348, ST Tube Type HRO and etc. Masahiro Nada 6-9-3 Fujiwaradai-Kitamachi Kita Kobe 651-13 Japan. FAX 011-81-78-981-3261

WANTED: HRO-60 coils, accessories, speakers, manual etc. Have cash/trade for "E" coil. Barry Nidel, Box 29303, San Francisco, CA 94129. (415) 346-3825

FOR SALE: Buy and sell correctly. Used equipment price, buying and selling guide being published early fall. Orders received before 9-1-91 $9.95, after $12.95 + $2.50 shipping. "Gayle Publishing" POB 96, Uniontown, PA 15401.

FOR SALE or TRADE: For W.E. tubes, Hi-Fi tube amps: military radios - ASB-7B, TBX-2, TBY-4, National AN-WRR2; optical - K-24 aircraft cameras, lens cone for K-22 camera, misc periscopes, AN-5851 sextant, MK IV octant, A-1 astrogrph; tubes - 4D23, 100T, 304TL, 15E, 7236, 6336, 304TH, 450TH, 810, 869B, 250TL, 2E22, 1B24, 211; X-ray crystals; old radios - Scott World's Record, Metrodyne, Pierce-Airo; W.E. semiconductors; 12 pf 20 kv vac. caps; RCA ribbon mikes; projection lamps - DTS, EHA, BVE, DMK, CYS. V. Vogt, 330 S.W. 43rd St., #247, Renton, WA 98055. (206) 251-5420 ext. 247

FOR SALE: ARRL Handbook, 1930, excellent condition - $45; DM-28 dynamotor for BC-348, complete w/base and filters etc., excellent condition - $60. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

WANTED: Top dollar paid for manual or useable copy for Singer/Gertsch SSG1 signal generator. Bill, W4CG, 149 Elizabeth St., Eufaula, AL 36027. (205) 687-8966

WANTED: Cash and good home for the following radios: NC400, NC303, HRO50, late 75A4, 51J4, AR88 or CR88. If you have too many, or have a deserving radio that's not being used enough, I can help! TLC, lavish attention and much bragging promised to every radio that resides here. Bruno Bitin, 3311 Calle La Veta, San Clemente, CA 92672. (714) 661-7893

Hamfest Notice: On Sept. 14th, the 3rd annual Dalton, Georgia, Ham-Swap-Fest will be held at Praters Mill, just north of town. Last year 20 or so AM'ers attended and had a ball.

CLASSIFIEDS

WANTED: Wireless Set No. 19 equipment circa WW II. Also looking for information and anecdotes. Chris Basaillion, VE3CBK, 1324 Old Carp Rd., RR #1, Kanata, Ontario, Canada, K2K 1X7

WANTED: Tektronix 3L10 and 3L20 spectrum analyzer modules for 560 series mainframes. Price and condition to Bob Booker, KØNT, 2120 S. Brownell, Joplin, MO 64804.

WANTED: Junk Vibroplex bugs needed for parts. Will pay shipping plus nominal amount. Thanks for your help. Tom French, W1IMQ, 120 Great Rd., Maynard, MA 01754. (508) 897-2226

FOR SALE: Hallicrafters SX-122, good mech. condition, w/calibrator and orig. manual - $100; Hallicrafters HT-18 vfo, excell. condition - $100. **WANTED:** Power supply/speaker/S-meter for Pierson KE-93 receiver or unusual 6-pin power connectors for same. Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (708) 852-4704

FOR SALE: Bound copies of manuals for 51S1, 51J4, 75S3-C, R4C, SPR-4, R-7A - $15 ppd. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

FOR SALE: RME 50, collector quality - $100. B.E. Harris, W7IYC, (208) 466-2803 after 8 p.m. MDT

WANTED: Manual for Western Electric/Hickok tube tester Model #KS-15560-L2. Mike Coulter, W3QK, 45 Cartwright Rd., Wellesley, MA 02181.

FOR SALE: Pick up only! No. 19 set, Mark II, most accessories - $30; BC-669C, looks good, needs work - $25. Won't ship! Rick Ferranti, WA6NCX, 254 Florence Ave., Arlington, MA 02174. (617) 646-6343

FOR SALE: Signal Generators: Knight - $10; Eico 315 - $20. Plus UPS. Fred Huntley, W6RNC, POB 478, Nevada City, CA 95959.

WANTED: 75A-4/KWS-1 and KW-1 within reasonable pick-up distance. Butch, KØBS, (507) 288-0044

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WANTED: Radar equipment, need parts for SCR-584, units or complete systems. Allan Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

FOR SALE: Apache TX-1, SB-10 and 2 mics - $150; Mohawk RX-1 and spkr - $100. Spotless rigs. I will ship them but I would appreciate help with the Apache. Thanks. All cables and manuals. Phil, WA3MNS, 201 Red Oak Ln., Waldorf, MD 20601. (301) 843-1226

WANTED: Hallicrafters HT-1 or HT-4; NB-7 for Drake TR-7. Rich Oliver, KC9GQ, Box 1872, Flagstaff, AZ 86002. (602) 774-7527

WANTED: Top and rear cabinet section for Hallicrafters S-20 or S-20R. Also old National speakers and power supplies. Robert Enemark, W1EC, Box 1607, Duxbury, MA 02331

FOR SALE: Large, high quality, HB, 1 KW, AM xmtr - $400; (2) power xfmrs for 2 KV, .5 amp DC power supplies - $75 each; (1) 7 KV CT , 1 amp xfmr - $100; also many other chokes and large mod. xfmrs. All items pick up only, as they are too heavy to ship. Cash only. Ronald Reu, WBØLXV, Rt 1, Box 334, Winfield, MO 63389. (314) 668-6518

WANTED: Johnson gear: 10 watt audio amplifier; power divider; attenuator; power reducer; small and large Matchboxes. Also Feb. , 1984, 73 mag and Feb. 1985, 73 mag. Mack Fairley, AB4ZF, 506 Tallyrand Ave., Monroe, NC 28112. (704) 283-5146

WANTED: The desk part of the Johnson Desk Kilowatt, will pay any reasonable price; any information on the Wilcox T-158D xmtr. I just acquired one and am interested to see what others have done with it. Howard Mills, W3HM, Rt 3, Box 712, Harpers Ferry, WV 25425. (304) 876-6483

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FOR SALE: Antique radios, parts, tubes, books, 150 panel meters, knobs, amateur, test equipment, transmitter crystals, etc. 13 lists. SASE + 52 cash (no checks). Richard & Rose's Radio Mart, POB 691443, Tulsa, OK 74169.

WANTED: Any radios used by OSS. Examples are SSR-5, SST-1 or other sets with "SS" designations. Gary Cain, 1775 Grand, #302, St. Paul, MN 55105.

WANTED: RCA model ACR-111. Chuck Dachis, "The Hallicrafter Collector", WD5EOG, 4500 Russell Drive, Austin, TX 78745.

Electric Radio Back Issues "The First Year" (#1-#12) - $30, "The Second Year" (#13 - #24) - $30. Individual copies - $3. All prices include First Class delivery in the U.S. and Canada. Foreign orders please enquire.

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, FAX 612-429-0292

WANTED: Leeds and Northrup instruments: NBS type 4015 series resistors; Reich Sanstalt 4221B, 4222B and Thomas 4210; Wheatstone bridge 4232B Voltboxes; mercury stands 4001 etc. Buddy, 1310 Andover Rd., Charlotte, NC 28211. (704) 366-6600

WANTED: Collins 30K; KW-1; VU meter for R390A; tubes - 1614, 5AR4, 26Z5, 6000 and 6082. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429.

WANTED: Pre 1940 ARRL Handbooks; vfo for Harvey Wells TBS 50. Bob Schafer, WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149

WANTED: McIntosh and Electro-Voice amplifiers and accessories for my collection! Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53220-0803. (414) 545-5237

CLASSIFIEDS

FOR SALE: Check your receiver dial with the Tri-Mark Crystal Calibrator. Three WWV referenced outputs provide marker signals from broadcast to UHF. Complete kit, only $19.25. Assembled $26.25. Add $2.75 S&H. NY add sales tax. FREE catalog. Two Fox Electrix Co., POB 721, Pawling, NY 12564. (914) 855-1829 12 noon to 8:30 p.m EST

FOR SALE: Over 150 military manuals of the 1940's and early 1950's. Large SASE w/$.52 postage for list. August J. Link, 2215 Faraday Ave., Suite A, Carlsbad, CA 92008. (619) 438-4420 days.

FOR SALE: Soon available. List of radio, electric magazines. Many Shortwave Craft, Radio Craft from 1930's. Send $.29 stamp. Rainy Day Books, POB 775, Fitzwilliam, NH 03447. (603) 585-3448

WANTED: For a blind amateur, WA3EUL. A Johnson Ranger or Viking series transmitter. Contact Art Rideout, WA6IPD, 2235 Gum Tree Lane, Fallbrook, CA 92028. (619) 728-6834

WANTED: Collins KW-1, KWS-1, KWM-1, R389, R390a, 75A-4 with 3 filters; Hallicrafters SX-115. F.H. Werry, DJ3OE, Saturnweg 18, D-4056 Schwalmtal, Germany. phone: 01149-2163-20528, FAX: 20552. 24 hrs., will call back.

FOR SALE: 3 1/2" dia, 0 - 200 ma meter, has WRL on meter face - $15 ppd; Ballantine model 3000 AC voltmeter - $25 plus shpg; Clough-Brengle, mod. UDA, power level meter, -15 dB to +40 dB - $25 ppd; Seco Electronics Corp. transmitter tester, model 510B, looks mint, w/cables, no manual - $35 ppd; Jewell Acremeter, radio frequency galvanometer, 7 1/2" meter, very old - $50 plus $5 shpg; Heathkit Condenser Checker, as is - $20 ppd; Mercury mod. 501 Component Sub. Tester, carbon, wirewound, ceramic caps and electrolytics - $25 + shpg; Solar Exam-eter - $35 plus shpg. James Fred, R1, Cutler, IN 46920. (317) 268-2214

WANTED: Meter assembly or source of one for Henry 2000/Johnson Thunderbolt II linear amplifier. Gary Harmon, K5JWK, 6302 Robin Forest, San Antonio, TX 78239. (512) 657-1549

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", WD5EOC, 4500 Russell Drive, Austin, TX 78745.

WANTED: Speaker/control unit for WW II TCS equipment. Was built by Collins and others. Bill Thomas, W4CG, 149 Elizabeth St., Eufaula, AL 36027. (205) 687-8966

FOR SALE: 75A-1 - $165; 32V-1 - $145; GPR-90RX w/SSB adapter - BO; Ranger - $115; Viking Mobile vfo - $22; Invader 2000, mint, orig. boxes - $335. Joe Sloss, K7MKS, 4732 119th Ave., SE, Bellevue, WA 98006. (206) 747-5349

FOR SALE: 9 pieces of test equipment from 50's and 60's; also some small filament xfmers and gear. Please send SASE for list. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, L.I., NY 11758.

FOR SALE: Don C. Wallace, W6AM, Amateur Radio's Pioneer. By Jan D. Perkins, N6AW. This book describes the history of amateur radio, as experienced by Don. Hardbound, 320 pages and 200 photographs, 24 in color. $29.95 + S&H ($3 US, $5 overseas). CA residents add 7%. Wallace & Wallace, 11823 E. Slauson Ave., Suite 38, Santa Fe Springs, CA 90670.

WANTED: Hammarlund HC-10 SSB converter in good condition. Jim Wilson, 35 Belgard St., Rochester, NY 14609-7213. (716) 726-0952 days, (716) 288-0427 eves.

FOR SALE: Collins 75A-2, recently aligned - $150. Chuck Graves, KØRFQ, 1932 E. Wayland, Springfield, MO 65804. (417) 882-8041

FOR SALE: For a list of classic radio items and test gear for sale or trade please contact Clyde Sakir, N7IOK, 4243 E. First St., Tucson, AZ 85711. (602) 323-1120

FOR SALE: National HRO-5TA-1, mint, w/6 coils, speaker and orig. ps - BO over $100. Steve Miller, WA3JJT, 909 Walnut St., Erie, PA 16502. (814) 454-8990

CLASSIFIEDS

FOR SALE: Our second Summer Parts Flyer is now available. We have more of the capacitors and parts you've been asking for. Example; 20 kv 500 pf doorknob cap - $6; 10 kv 2000 pf ceramic discs - $.79; 1500 pf 5 kv tubular film - $.45; .01 mf 1200v orange drops - $.45; .02 mf 1600v discs - 4/$1. Much more. Tri-Mark Calibrator, sale price - $17.95 kit, $24.95 built. All orders $2.75 S&H. NY add tax. Free Info: If you have our kit flyer, just ask for the Summer Extra parts flyer. Large SASE appreciated. Steve, NW2F, Two Fox Electrix, POB 721, Pawling, NY 12564. (914) 855-1829

WANTED: Collins 51J4; WRL 755 vfo; Speed-X bug; complete SW-3; FBX; Pilot Wasp; FT-243 crystals. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

WANTED: National HRO-500 or 600 rcvr. Also HRO-60 coils sets: A, E, F, G, H, J, AA and AC. John Chenoweth, W8CAE, 9130 Yankee St., Miamisburg, OH 45342. (513) 885-2566

WANTED: Audio driver xfmr to drive push-pull 100TH's; 10v CT, 10 amp filament xfmr. Stan, WA2NPL, 108 Wilson Ave., Blackwood, NJ 08012. (609) 435-8975

FOR TRADE: Any or all of: 3253, 312B-5, 312B-3, 516F-2, CC cases (2) KWS-1s (need screen xfmr). Trade for: 75A4, 32V3, speaker/console. Bob, WS1J, Box 391, Simsbury, CT 06070.

FOR SALE: 275 W. Matchbox w/SWR bridge - $100; Hammarlund HQ-100 w/spkr, like new - $150. Don, W7KCK, (503) 289-2326

FOR SALE: Central Electronics scope; Eldico SSB-100A; Elmacs - AF-54, AF-67, AF-68, PMR-7, PMR-8; Hammarlunds - SP-400, HX-50, HQ-129X, HQ-140; Harvey Wells - TBS-50A, TBS-50C with vfo; Heaths; Johnsons - Rangers, Valiants, Vikings, others; Lakeshore Phasemaster II; Meissner exciters; old Millen exciters; Nationals - HRO's, old rack HRO's, more; SBE-33 &34; Swan 240 & 240C; WRL - Grobetrotter, AC & DC power supplies, Galaxy III, screen modulator. SASE. Tom Raymond, W5JM, 2320 S. "O" St., Fort Smith, AR 72901. (501) 783-8848

WANTED: 5867/AX9901 tube; information on Rohde & Schwarz SK 040/31A1A3 HF AM xmtr. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

FOR SALE or TRADE: QST complete 1931-81 - $500 or HF gear or xcvr. 250 mile free delivery, Youngstown, OH or shipped collect. K8SJ, (216) 545-9632

FOR SALE: Vibroplex, Bencher, Kent, Hi-Mound, Signal keys; old xmtr tubes - 861, 849, 204A, 250TH, 100TH, 852, 807. Tom Waters, 3703 Bonview Ave., Baltimore, MD 21213. (301) 488-5356

FOR SALE: Receivers, transmitters, tubes, parts etc. 71 years accumulation. What do you need? Glenn W. Ritchey, W7SAB, 219 Naval Ave., Bremerton, WA 98310. (206) 373-9631

FOR SALE: Vintage amateur and military equipment. Send SASE for list. **WANTED:** QRP tube transmitter plans. No calls. Thank You. Dave Mantor, W9OCM, 2308 S. Fairlawn Way, Anderson, IN 46011.

CLASSIFIEDS

WANTED: Spy radios. Buying military radios beginning with "SS"; (example SST-1,)! Also M-209 cipher machines! Trade items available! Keith Melton, POB 5755, Bossier City, LA 71171. (318) 747-9616

WANTED: 1937 Gross Radio CB55 amateur transmitter schematic/manual needed for restoration. Will pay/trade for any replication costs. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528. (914) 691-6247

FOR SALE: Books: RCA Air-Cooled Transmitting Tubes, cpw. 1938 - $11 ppd; All About Telephones, cpw. 1978 by Van Waterford, mint cond. - $7.50 ppd; Experiments With Electronic Music, cpw. 1974 by Brown and Olsen, mint cond. - $6 ppd; The Book of Electricity by Parker, cpw. 1928, vg - $10; Television Simplified by Kiver, cpw. 1946, like new - $7.50 ppd. I will soon start manufacturing replacement coil forms for the National SW-3. These will be made from phenolic grade XXP with exact pin size and spacing as originals - $7.50 each plus $2 per order for shipping. James Fred, R1, Box 41, Cutler, IN 46920.

WANTED: Navy RBC receiver, RBB or RBC manuals. Bill Strangfeld, WB8YUW, 254 Elm Ave.,Cincinnati, OH 45215. (513) 651-6833 days, (513) 948-1071 nites.

WANTED: Receivers: Squires Sanders SS-1R; 51S-1; ARR 15; R-388/388A; G1 33. Mitsugu Shigaki, JA6IBX, Jozan Kamidai Machi 2825-2, Kumamoto, Japan 860.

WANTED: Manual for Collins ARC-2 HF xcvr; AR-88 or similar model RCA HF rcvr. Don Cossaart, N4KYK, 2119 47th St., Pl W., Bradenton, FL 34205.

WANTED: Vibroplex Lightning or Champion bugs in good condition. Call days leave message if unavailable. Ron Bramhall, KQ5A, 7877 S. Magnolia Way, Englewood, CO 80112.

WANTED: Receiver ARR-15; IFF BC-966; R-61/ARQ-5; calibrator control for ARC-2 (100 Khz, octal base). Also British WW II radios. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707. (714) 540-8123

WANTED: Direction finding equipment and information. Brian Harrison, KN4R, 420 Proctor St., Denver, NC 28037. (704) 483-5679

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

ER Parts Unit Directory

At this point the directory has 170 units in it and it's growing daily. If you need a part for a vintage restoration send $1 and an SASE for the list. If you have a parts unit consider putting it on the list. Your dead unit can help bring others to life!

CLASSIFIEDS

TWO NEW COLLINS INSTRUCTION BOOKS

- **Collins Service Modification Compendium S-Line and KWM-1/2/2A Series**
- **Collins Service Modification Compendium KWS-1, 32V and 75A Series**

These new Vista Publications contain the Rockwell/Collins authorized service information letters and/or service bulletins released for the equipment series. Both publications are packaged in attractive custom three-ring binders (Collins Grey/White or St. James Gray/White) and are indexed by Model number.

The price for the S-Line and KWM-1/2/2A Series is $40. plus $3.75 shipping and handling. The price for the KWS-1, 32V and 75A series is $25. plus $3 shipping and handling. Send check or money order to:

VISTA TECHNOLOGY INCORPORATED
3041 Rising Springs Ct.
Bellbrook, Ohio 45305
(513) 426-6700

FOR SALE: Transmitting/Receiving tubes, new and used. Some 304TL, 35T, 203A, 811A, 833A. LSASE for list. I also collect old and unique tubes of any type. Looking for Taylor and Heintz-Kaufman types. Maybe you have something to trade? **WANTED:** Large tubes and sockets from the old Eimac line; 450T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: Military radio manuals (original) for GRC-19, TM11-858 (R-392 rcvr), TM11-2651 (antenna AN/GRA-12), TM11-274 (AN/GRC-19),etc. Tom Mackie, WB2ILA, Rd #2, Harbor View Rd., Oyster Bay, NY 11771. (516) 624-2178

WANTED: Collins 516F2 or PM-2; TRC-77 (RT654); TCS; SBE 33 or 34; T4X; Atlas 180. Write don't phone. Darryl L. Dippel, WA5AAO, Box 335, La Grange, TX 78945.

WANTED: KWM2A/516F2; 51S-1; R-388; KWM-1; ART-13; ARR-15; 75S3C. All must be mint. Mitsugu Shigaki, JA6IBX, Jozan Kamidai Machi 2825-2, Kumamoto Japan. FAX Japan-096-329-4601.

WANTED: Specs on UTC S-74 plate xfmr; specs, tap data for Thordarson 300 W multimatch modulation xfmr. Jack C. Shutt, N9CT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

FOR SALE: NC-183 - $135; B&W 6100 - $275; Meisner Signal Shifter - $85. Steve Harmon, N9HGF, 4340 N. Congress Ave., Evansville, IN 47711. (812) 474-0842

WANTED: Schematic for Millen scope model 90903. Mike, WA1MTZ, 605 Loomis St., Westfield, MA 01085.

WANTED: Heath AC-1 and 2'er DC supply. C. Schiotz, K2PGB, 15 Runyan Mill Rd., Ringoes, NJ 08551. (212) 272-8131 days

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WANTED: National HRO-500 or 600 rcvr; also HRO-60 coil sets - A,E, F, G, H, J, AA and AC. John Chenoweth, W8CAE, 9130 Yankee St., Miamisburg, OH 45342. (513) 885-2566

FOR SALE: National HRO rcvr, mint - $60; Astatic D-104 w/amplifier - $20. Milton Levy, W5QJT, 539 McCarty, Apt. 507, San Antonio, TX 78216.

WANTED: Manuals for General Radio 1210-C audio osc. and 1603-A audio Z-bridge; old parts catalogs including Radio Master thru 1951. Mike Carroll, NI4N, 108 Wessington Ct., Hendersonville, TN 37075. (615) 822-0082

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

CLASSIFIEDS

TRADE: Exchange copies of my Collins "Signals" and schematics of pre-WW II Collins transmitters for yours. SASE for list of vintage gear. Parker, W1YG, 87 Cove Rd., Lyme CT 06371.

FOR SALE or TRADE: Central Electronics 10B w/ARC-5 vfo - $65; Johnson Adventurer - $50; S-38E - $30. Clem Duval, W8VO, 33727 Brownlea, Sterling Heights, MI 48312. (313) 268-2467

WANTED: Collins 310A or B exciter. Who else owns or is operating Collins 30K transmitters? Fenton Wood, 109 Shoreline Dr., S.H., Malakoff, TX 75148.

FOR SALE: Johnson 6N2 and Model 122 vfo - $45 each; Valiant - $245. Don Bishop, NØEA, Box 4075, Overland Park, KS 66204-0075. (913) 541-6627

FOR SALE: QST 1950's, 60's and 70's - $5 per year plus shipping. Also some single copies and other books. Art Collatz, 2127 Market St., Blue Island, IL 60406. (708) 385-4876

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

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FOR SALE: Tektronix model 535 scope with 53A plug-in - $60 local pick-up only; Tektronix plug-ins - 53/54G - $20, type L - $25, type CA - $30; Datascan model 1400 electronic counter, 10Hz to 1.4Ghz, w/12VDC power adapter - $125. All items in excellent condition. Jerry, AB8U, (513) 426-6700.

FOR SALE: Hammarlund HQ-110A VHF receiver, excellent, w/matching spkr and manual - $150. Charlie, KD4AJ, (404) 396-0276.

FOR SALE: Surplus Radio Conversion Manual, Vol. II - $8; Beitman Radio Books, Vol. 1 thru 5 - $5 each. Plus Shipping. Evan Haydon, 4308 N. 15, Lincoln, NE 68521. (402) 435-4083

WANTED: HRO-60T; SX-88; NC-400; SX-73; HT-32B; manual for 75A1; speakers for NC-303 (NTS2), NC-183D, S-76 (R46), 75A1 (270G). Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, PA 22901. (804) 979-7383

WANTED: Transformer catalogs, copies or originals. Barry, N6CSW/Ø, (303) 247-4935

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

CLASSIFIEDS

NEW 75A4 FILTERS

AM filters with optimized response to eliminate the ringing and distortion caused by the steep skirted mechanical filters. Make your A4 sound like an A1, A2, HRO, etc.

Three models:

455A4-4 khz

Gives a smooth slightly narrower nose than the 6 kc Collins, ideal for crowded band conditions. Non-ringing design. Filter BW = 4 khz @ -6 dB, 16 khz @ -60 dB.

455A4-6 khz

Best for general AM use. Much smoother sounding than the 6 khz Collins. Filter BW = 6 khz @ -6 dB, 16 khz @ -60 dB.

455A4-9 khz

Great sounding audio when QRM is not a problem. Filter BW = 9 khz @ -6 dB, 21 khz @ -60 dB.

Note that above bandwidths are for the filters alone. Nose BW reduced slightly and -60 dB improved considerably when installed in receiver.

New design optimized for best tradeoff between skirt selectivity insertion loss (within 3dB of mechanical filter) and smooth audio quality. Exclusive circuit neutralizes input to output leakage capacitance.

Also available is a CW filter, model 455A4-CW1 to give similar response to the crystal filter in a 75A1 or A2. Single crystal backed up by a ceramic filter. Less insertion loss than 500 Hz Collins.

Prices: (money back guarantee)

455A4-4 khz, 455A4-6 khz, 455A4-9 khz —— $83.50 ppd.
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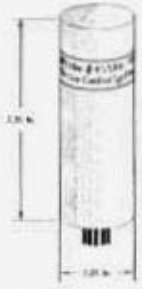

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1655 No. Mountain, Ste. 104-45
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(714) 985-6250

Direct plug-in, no modifications necessary!

FOR SALE: HQ-180AC, mint cond. - $295 firm. **WANTED:** Noise blanker for KWM-2. Cliff Fleury, AI7Y, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

WANTED: Manual for Collins ARC-2; low voltage xfmr for Viking I or II. Don Cossaart, 2119 47th Pl., W, Bradenton, FL 34209.

WANTED: "Understanding Amateur Radio"; "CQ Anthology"; "CQ Surplus Schematics" and "Index to Surplus". Allen Mark, POB 372, Pembroke, MA 02359.

FOR SALE: Collins filters, C/Rockwell 526-934-00. F455FA2.1 (KWM2) - $60; F455Z5-2V2 - $50; F455J31, (75A4) - $60; BC610 w/coils - offers; 60 ARRL Handbooks 1936 thru 83 - SASE for list; parting BC610, BC610 coils, HT37, B&W 5100 and SSB adpt. WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149

FOR SALE: Spy set, British MK123, manuals, accessories, canvas carrying case. Good working condition, 20 and 40 meter xtals - $750. Nigel, KC4TLV, 6735 Valley Ct., Douglasville, GA 30135. (404) 949-1097

A directory of vintage parts unit rigs available to subscribers for $1 and a LSASE. Presently there are 170 units in the directory and it's growing daily. The list of units is by manufacturer in alphabetical order followed by the owners address and telephone number. If you have a parts unit please let us put it on the list.

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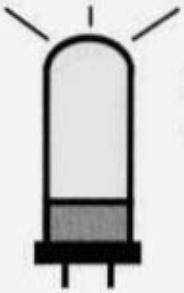

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