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ELECTRIC RADIO

celebrating a bygone era

Number 26 June 1991

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

Electric Radio magazine and the U.S. Postal Service; how we get the job done...or how we don't get the job done, in answer to some recent enquires.

For at least the last year, the magazine has been delivered to the post-office on either the 11th or the 12th of the month. I deliver it all - Second Class, First Class and Foreign Airmail - all at the same time. It leaves the post-office here in Hesperus, all on one truck at the same time. From here on what happens to it is a mystery.

According to the post-office, Second Class and First Class mail have the same priority. I would expect that to mean that Second Class and First Class would reach a destination in the same period of time, but, we know that isn't the case. Where a First Class magazine reaches California or the East Coast in about four or five days average (sometimes it takes considerably longer..like forever) it might take about a week to ten days average for Second Class. Somehow to me that doesn't seem like they enjoy the same priority!

I sort the Second Class according to Zip code and everything for a certain state goes in one bag. From Hesperus the bag goes to Durango where it should just be shifted to another truck that takes it to Denver; this should take one day. At Denver the bags are sorted and sent on their way to state distribution centers. Each state has one such center. They should reach these centers in another day. At these centers, my bags are opened and the bundles are sent to the various Zip codes around the state. This should take another day. The following day the magazine should be delivered. But something is happening to delay mail along the way. Recently, I understand, the Postal Service, has hired a consulting company to track mail and find out where it's being held up. Let's hope they find the problem.

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Cover: This is the station of Charles Boegel,W9CVU, a former Collins employee. This photo which was taken in 1940, shows the 32G transmitter which was the successor to the 32F. It had a pair of 6L6's modulated by a pair of 6L6's. The receiver is a National NC101X.

Reflections Down the Feedline

by Fred Huntley, W6RNC
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Nevada City, CA 95959

Ham Ticket – "Passport to Adventure"

One thing always leads to another – and so it is with Ham Radio. Prior to WW II and also into the 1950's, most people in radio communications started out as hams; then acquired their FCC commercial license. Some of them studied by themselves; others went to radio schools, such as RCA Institutes. Also, some commercial ops. came directly from the military.

In those days, before the advent of automation, there were operator and technician jobs in AM broadcasting, police and fire departments, ocean-going ships, deep-sea tugs and fishing boats, yachts, airlines (flight and ground), U.S. government (FAA/CAA and many more), communication companies (RCA, Mackay/ITT etc.), Alaskan canneries, Firestone Tire & Rubber in Liberia, Aramco Oil in Saudi Arabia, etc. Some companies such as Pan American Airways and Tropical Radiotelegraph Co. had radio station networks overseas which were mainly staffed with U.S. personnel. Not to be overlooked were occasional exploration and scientific expeditions. Of course there were many opportunities also in radio manufacturing.

In my own case, I got my Class B ham ticket in 1936; my Class A in 1937. Then, after studying Kaufman's Q & A manual, I acquired an FCC Radiotelegraph 2nd and Radiotelephone 1st commercial license in 1938. That was when you had to draw from memory, the diagram of a complete 1kw AM broadcast transmitter. Incidentally, in those days hams had to draw diagrams, too.

In 1939, in W2-land, I qso'ed a W3 station on 40 M. CW. He was with Pan American Airways in Baltimore, MD, and said that they were hiring. So, that's how I got into doing radio maintenance work on the Boeing 314 trans-Atlantic flying boats and the Sikorsky amphibians that went to Bermuda. It was at the time that the first commercial flights were being made.

When PAA moved it's whole operation from Baltimore to New York City, I stayed with them awhile, and then in 1940, went with another interesting outfit--as a banana boat operator in the United Fruit Co. Their subsidiary, Tropical Radiotelegraph Co., was an early pioneer in radio communications and had stations throughout Central America, the Caribbean, and in Boston, Miami and New Orleans.

Sailing with the "Great White Fleet" was an enjoyable experience. In the banana business, radio communications were of vital importance. Hence, in this company, ship radio operators were called "Mr."–not "Sparks", and the radio equipment was top notch. On the freighter I was on, the radio shack was all by itself, on the top deck behind the smoke stack. The operator was king of his own little domain; sailing the Caribbean, eating with the passengers, handling a little message traffic, and free to go ashore as soon as the ship docked.

Every afternoon at sea, in the tropics, the room steward would bring to the radio room a bowl of fresh fruit and refill the thermos pitcher with icewater. Man, that was the life! It was better than being a passenger, because we got paid for it!

In 1952, 26 ships and 7 companies later, I swallowed the anchor and came ashore in the San Francisco Bay Area, at Berkeley, California. But that's another story for another time..... •

Society For The Promotion Of Amplitude Modulation
Dayton HamVention Survey Results

by Dale Gagnon, KW1I
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Bow, NH 03304

One of the topics covered in the SPAM forum at Dayton was titled,"Building Enthusiasm For AM". It was a short presentation of some possible new program initiatives coupled with a survey of the forum attendees.

Over the past year there has been significant discussion whether SPAM has been too low key and whether it should be more visible and vigorous in promoting this great segment of amateur radio. This survey project was an effort to identify constructive directions to aid future SPAM programs and organizational development.

Fifty-five surveys were turned in. Six of the respondents did not operate AM. It is interesting to note that an AM program will generate interest in non-AM operators! Most of the respondents operated AM less than five hours per week, there were nine who operated over ten hours and a few that operated 20 hours or more per week.

Less than 40% of those surveyed were SPAM members. The survey responses from the non-members showed a high level of interest in SPAM. Approximately 70% would like to see a SPAM newsletter at least four times per year. Half of those would like to see monthly SPAM news. This need could probably be met by regular columns in the magazines that already serve the AM community. 60% of the survey favors a varied schedule of SPAM operating events. Only 13 of the 55 had ever operated in an AM Jamboree. Over 75% indicated interest in participating in a regularly scheduled SPAM net. Friendly, informal, but well run SPAM nets can generate a lot of AM interest. They are good for disseminating information, getting technical help and opening up frequencies for AM use.

This strong response suggests that work must be done to recruit and prepare net managers to meet this need. Over 90% of the respondents would like to tune into regularly scheduled SPAM bulletins featuring information on the organization, operating events and personal news. One way this could be implemented would be by utilizing a national coverage SPAM net like the one on 14.286 Mhz each night. The ability to communicate quickly to a large percentage of the AM population may be necessary for us to quickly respond to future ARRL and FCC actions. Almost 85% of the surveys were in favor of developing SPAM promotional materials like a brochure and amateur radio convention booth display kits and economically developed AM video programs. 87% were willing to pay dues to raise funds to pay for worthy SPAM programs. The average figure these amateurs were willing to pay was 5-10 dollars per year.

If SPAM were to expand it's activities along the lines surveyed at Dayton we suggested a more formal organization with articles of incorporation and elected officers may be necessary. Although there was no opposition to this, 20% of those surveyed were strongly in favor and 50% were neutral to this idea.

Several of the respondents wrote in additional comments. Copies of all survey forms and comments have been sent to Norm Scott, WB6TRQ, SPAM president.

Remember, expanded programs require volunteers to implement them. As changes in SPAM ultimately unfold as a result of member feed-back, think about what you can do to help make them successful in your area. •

ELECTRIC RADIO IN UNIFORM

by Walt Hutchens, KJ4KV
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Arlington, VA 22207

"The BC-474 Transmitter-Receiver"

Editor Barry Wiseman had been clear enough when he offered me the set, "It's in poor condition, stored in a damp basement probably since the war." But the note he stuck on top of the case was more to the point: "Walt -- Here's a real challenge!"

Sure enough, corrosion of the aluminum front panel has forced the meters out, breaking some corners from their cases, in places the pitting goes halfway through the panel and chassis, and the receiver tuning knob seems to jam near the low end of the dial... Marie (XYL) says, "Maybe you'd better stick with that portable set you were planning to write about this month". She's right, of course, but the pieces are all there, the set is unmodified, and the wiring looks nice. Is it even possible for a true fanatic to pass up 'a challenge'? And so began the saga of the KJ4KV (ex-N6CSW) BC-474.

Overview

The BC-474 is a low power portable AM/CW transmitter/receiver built at the start of WW-II. The transmitter is an MO-PA (Master Oscillator-Power Amplifier) unit of about five watts output using three 6-volt tubes; it covers 3.5 to 6.3 Mcs. The receiver is a superhet using four 1.4-volt tubes and covering 2.3 to 6.5 Mcs. There's no bandswitching.

The unit measures 9-1/2" x 18" x 8" (H x W x D) and weighs 23 pounds without battery or accessories. The controls are those of a very simple set -- receiver, transmitter, and antenna tuning, volume control, and various function switches. There is no provision for remote control and no push-to-talk; a rotary switch on the panel selects transmit or receive operation.

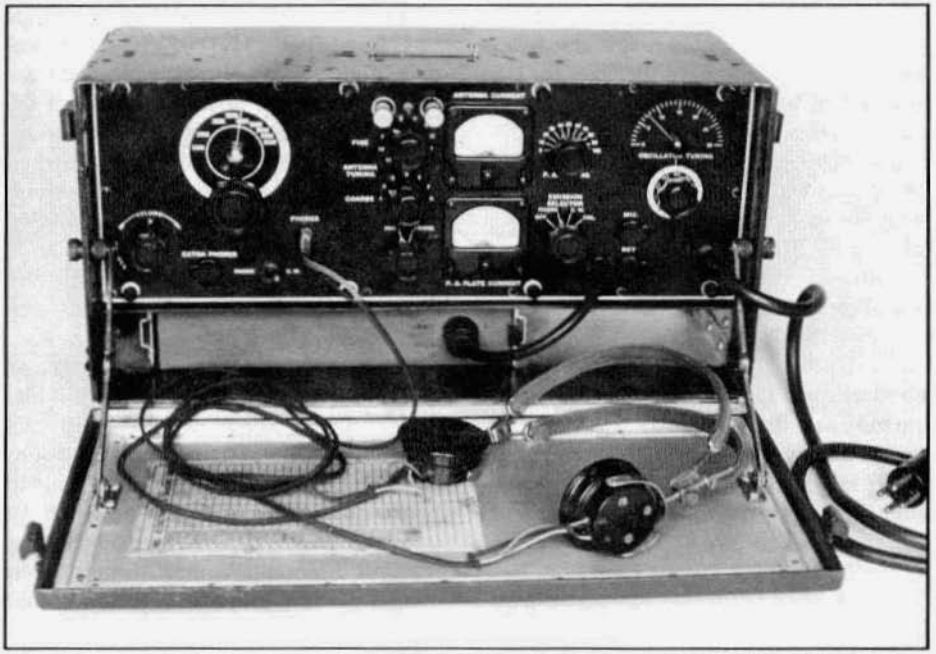
The receiver is directly calibrated in frequency. The transmitter MO (Master Oscillator) dial is marked 0-3000; an individually made calibration chart is mounted inside the front cover.

The transmitter is powered by a GN-44 hand crank generator and the receiver by a BA-48 dry cell battery or (through the FL-10 filter accessory) by the generator. There's no provision for other types of power supply.

There are brackets on the case for legs which hold the radio about a foot off the ground and the front folds down to act as an operating table. A 35' wire with a counterpoise is recommended as an antenna.

History

From its beginnings in WW-I through the early 30's, the U.S. Army viewed radio as a way to extend and support wire communications. But as the world learned the word 'Blitzkrieg' (Hitler had smashed across Poland in only 18 days) it began to be clear that wire couldn't do the job. The new warfare demanded radio, including sets which could move with troops covering tens of miles a day



The BC-474-A. The receiver is the left 1/3 of the set; the transmitter is the right 2/3. The BA-48 battery is in the lower compartment, connected to receiver by the short diagonal cable. The longer cable at the right connects the transmitter to the GN-44 hand crank generator, usually via filter unit FL-JO which would be in the compartment at the lower right.

and which could be ready to go within minutes at a new location. Most Americans however, felt that a European war was none of our business. And design, procurement, and even operation of Army radios was the job of the Signal Corps -- a small but rigid bureaucracy whose motto might have been "we will field no radio before its time". Development of a better small HF radio began but not too quickly.

By 1941 the Army had a group of heavy but feeble 1920's pack sets (5CR-1 31, 161, and 171) in service, a small but heavy vehicular set beginning delivery (the BC-223 and BC-312 of SCR-245) and a more modern set (the BC-654 of SCR-284) 'almost ready' but not to be available until 1942. War could come at any time -- what to do? As luck would have it, RCA was producing a small field radio for Sweden; the U.S. Army took over the contract and the radios, designating it the BC-474 and the equipment (including accessories) SCR-288.

The 'Swedish radio' is based on the low-powered RCA AVR and AVT-series civilian aircraft radios of the late 30's. The BC-474 receiver is essentially the AVR-20 with the four 6-volt tubes (6S7, 6K8, 6F7, 6B8) replaced by roughly equivalent 1.4 volt types and the crystal control provision removed. The transmitter is most likely a disguised AVT-15. (Can some reader provide info on this set?). If it is, the BC-474 could almost have been designed over a lunch hour.

George Goldstone (W8AP, then W8MGQ) served as Division Radio Officer of the Third (Army) Division from April 1942 when the division was in training in the U.S. through the invasion

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of North Africa and the Sicilian campaign. The division had had the SCR-288 for several months at the time he joined and used it in amphibious training exercises at Ft. Lewis, Washington, and Ft. Ord, California. By the time the Third Division landed at Casablanca (November 8, 1942) it had exchanged the '288 for the SCR-284.

The SCR- 284 wasn't altogether an improvement. Mr. Goldstone recalls that a radioman could go down the cargo net into a landing craft with the BC-474 on his back, but the BC-654 (several times the bulk and more than twice the weight) had to be lowered on a line.

The BC-474-A was available in surplus after the war, but not in the quantities of other sets of this size and type. My set is S/N 395; collector Henry Engstrom has S/N 661. These numbers suggest a very small production run, perhaps as few as 1000.

Design

The BC-474 is of the simplest possible design -- a wide front panel with separate receiver and transmitter chassis spot welded behind it. The radio is held on a flange in the case by thumbscrews and is made splash (and dust) resistant by rubber gaskets around the panel and felt washers around the shafts.

Electrically too, the design is extremely simple. The transmitter uses a 6V6 in a Hartley (tapped coil) oscillator with the screen of the tube as the plate of the oscillator. Since the screen is grounded for RF, only the electron stream passing through to the plate couples the oscillator to the load. This arrangement is often called an electron-coupled oscillator or ECO; it gives nearly the load isolation of a separate buffer stage without an extra tube.

The PA is also a 6V6. RF is taken from a tap on the tank coil through a series loading coil and RF ammeter to a pair of binding posts on the panel. 'COARSE' and 'FINE' rotary switches on the panel allow selecting loading coil taps in steps of 1/2 and five turns respectively to resonate almost any capacitive (short) antenna. One must take care to select the lowest frequency dip (or use the setting from the chart in the front cover) when tuning the final; any others are harmonics of the frequency you were planning to use.

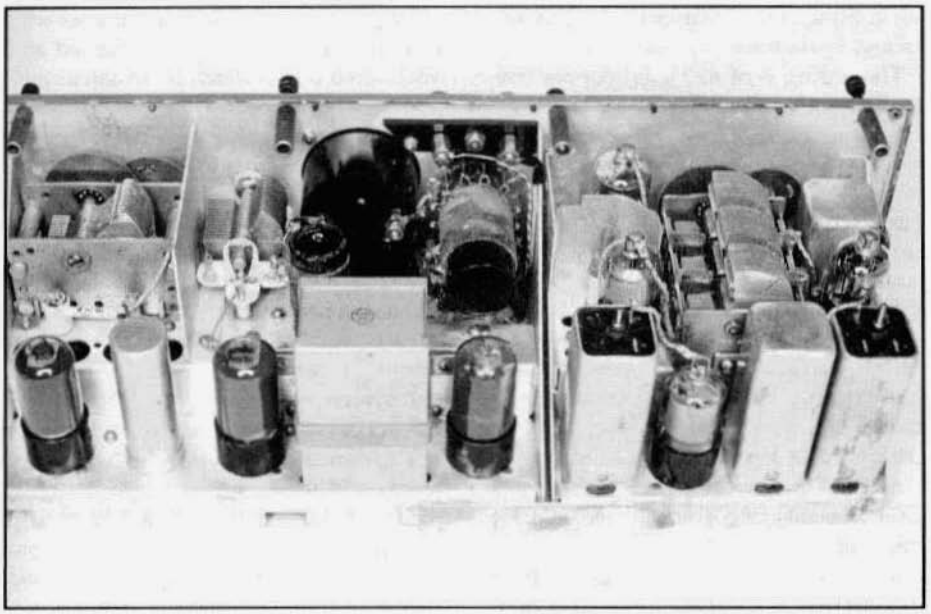
A third 6V6 serves as a plate and screen modulator and is driven through a transformer by a carbon mic.

The receiver consists of a 1N5 RF stage, a 1A7 converter, a 3A8 (triode-pentode) BFO and IF, and a 1D8 (triode-pentode) first and second audio. The audio output is transformer coupled to a pair of phone jacks on the panel; a switch on one (marked 'PHONES') turns off the receiver filaments unless something is plugged in. The second jack marked 'EXTRA PHONES' has no switch.

This is neither a very clever nor very conservative design. For example, there is no decoupling between the B+ lines to the various stages -- they all tie together at a common bypass capacitor. The plate and grid leads from the RF amplifier are twisted together for a short distance, evidently in order to provide some regeneration to improve RF selectivity and reduce images -- not negligible with only two tuned circuits and an IF of 455 kcs. Keying is in the PA cathode so the key is 'hot' (about 90 volts on my set); the entire plate voltage would appear on the key if a short occurred. There's no real key click filtering just a .05 cap across the key. There's no noise limiter, no calibrator, and no lighting of the controls or dials.

Receiver and transmitter share almost nothing but the front panel; the only interconnections are through the transmit-receive switch located in the transmitter section.

Almost all the parts in the BC-474 are conventional receiver types and qualities, for example the receiver tuning cap is



BC-474-A rear view. The rectangular unit at the rear of the transmitter chassis is the combination mic and modulation transformer. The coil assembly at the center is the transmitter loading coil. The second item from the right on the rear of the receiver chassis is the 'capacitor pack' -- five bypass capacitors in a wax filled can. The dark blotches on the IF cans, rear of chassis, and elsewhere are corrosion.

the typical three section receiver variable with paper base phenolic insulation, the fixed caps are either black Bakelite molded units or cardboard cased tubulars, and the tube sockets and transmitter coil forms are black Bakelite.

One item I had never seen (though it is probably familiar to those who have worked on RCA sets of the 40's) are the receiver trimmer caps. These are ceramic tubes mounted upright on the chassis with a brass tube at the upper end and an insulated brass plunger which you push or pull from below to vary the capacitance. Because the capacitance range is small, these work fairly well for the RF and antenna tuned circuits but getting the local oscillator just right by yanking or pushing a plunger is worse than tricky. There's a special tool for these (RCA No. 12636) with a hook on one end to engage the hole in the plunger and a socket for the lock nut on the other.

The transmitter tuning caps are typical low power ham or commercial grade units.The tuning dials are just spring steel pointers mounted over calibration markings on the panel. Stamped anti-backlash gears on both receiver and transmitter tuning give a tuning rate of about 175 kcs/revolution. A temperature compensating capacitor is used for the transmitter oscillator padder but the receiver isn't compensated.

The transmitter function switch lets you choose OFF, PHONE, CW, or CAL. The PHONE position completes the modulator cathode circuit. In CAL position, the MO is turned on to allow zero beating a received station.

There's a separate PHONE/CW switch for the receiver. In PHONE the receiver AVC is enabled, and the usual audio potentiometer arrangement is used for volume control. When CW is selected, the AVC is disabled, and a second section of

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the volume control varies the bias on the RF and IF stages.

The wiring is of #20 solid copper covered with a wax impregnated double cotton braid. I don't know why such heavy wire was used command sets, for example, are wired with #22. Perhaps this was RCA practice; in 1941, copper was not yet in critically short supply. It's a neat job, with corners squared and most wires tied in cables.

To save space and minimize congestion, a bypass 'capacitor pack' is used; many other small parts are inside the IF and RF coil cans.

On The Air With The BC-474

A complete survey of the problems of a set like this one always reveals a lot that you don't want to know -- for example, the receiver tuning was jammed because two plates of the tuning cap were filled in solid with corrosion. This was definitely going to be a challenge.

I removed the knobs (three of them were so solidly rusted up that they had to be split off with a cold chisel), took out the meters, and repaired the broken cases. The antenna current meter thermocouple was burned out but there was room inside the case for a command transmitter unit and -- amazingly -- the calibration was perfect. When I tried to balance the meter movement, the balancing arm crumbled to dust; I glued on another and balanced it with a drop of solder. The plate current meter sticks at about 5 Ma but after the experience with the RF ammeter, I decided to learn to live with it.

The front panel was sanded to clean up the corrosion and then repainted. Since the markings are slightly raised, this is easier than it seems: you spray on just enough paint to 'hide' and then carefully sand the lettering (400-grit WetOrDry paper on a small metal block under a trickle of water) until it reappears.

I washed out the bottom of the set with a non-water cleaner spray, scraped and vacuumed out as much corrosion as possible and hooked clip leads to the bench supply. The transmitter quickly passed its 'smoke test' -- after about two minutes, the .05/400 HV bypass cap started to smoke and dribble wax. With that attended to, the set put out about four watts at 300 volts and an indicated 35 Ma of PA plate current. There was a random drift of a few hundred cycles per minute; replacing the oscillator filament and screen bypass caps fixed this.

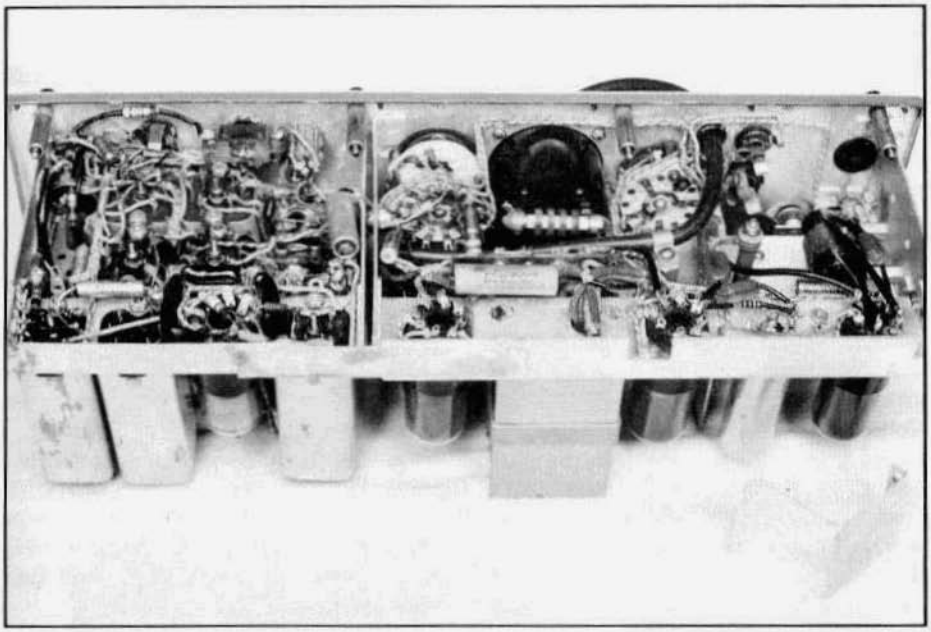
The receiver was a lot more work.

The corrosion between the tuning cap plates had to be dug out with a dental pick and cleaned up with a folded strip of fine sandpaper. The spring in the on-off switch on the volume control had rusted through, leaving the receiver permanently 'on'. Throughout the set, most paper caps were leaky. Many resistors were out of tolerance; some were more than double their marked values.

The sensitivity was very poor and the antenna circuit could not be peaked. One lead from the antenna coil secondary (inside the shield can) was soldered to a lug with no other connection. From the diagram in the manual, this connection should have been a tap which is unused in the BC-474; evidently the rest of the winding got left out. Adding 8 more turns brought the coil to resonance.

Since there was no sign that the coil had been replaced, this suggests a couple of quality control problems -- one when the defective part was made or accepted by RCA and the second when the set passed final inspection with sensitivity about 20 db below specs.

Sensitivity was still poor -- and getting worse. After a couple of hours of looking, I found that the output transformer secondary was almost open. The transformer was sealed in tar; I melted it out and replaced the insides with the transformer from a junked command receiver.



Under chassis view of the BC-474-A. The shield cover over the MO coil (at right) and the transmitter power cable were removed for this picture. This is definitely a 'high C' design -- the MO coil has only 15 turns on a 1" form! You gotta like any radio which uses an RF choke wound with green SSC (Single-Silk-Covered) wire like the one behind the meter case.

While replacing the transformer I discovered that the lead from the RF coil to the tuning cap stator was hooked through the lug but had never been soldered.

During the process of fixing the other problems, the receiver developed a 1000 cps oscillation in the audio section. Change 1 to the tech manual (TM 11-250) says the problem can be solved in the field by shielding the 1D8; evidently capacitive coupling between the plates of the two audio stages in this tube is the culprit. Adding a 3.3 meg resistor between the plates (negative feedback) eliminated the oscillation in my set.

After fixing these problems and replacing a couple of weak tubes, my BC-474 is within the sensitivity specs, giving enough audio for good headphone copy with about a 5 microvolt signal. With careful bending of tuning capacitor plates, the calibration was brought to within a fraction of the pointer width over most of the tuning range.

After four minutes warmup, drift of the transmitter of my '474 at 3885 kcs was -400 cps during 30 minutes of four minutes receive/one minute transmit cycling. During 10 more minutes key down, drift was an additional -100 cps. The set, however, was not even close to stabilizing; at this low power level complete warm-up would probably take several hours and would be accompanied by several kcs more drift.

Maximum undistorted modulation is about 70%; above this level clipping begins and you can't get higher than 80%. This is probably a design feature intended to prevent overmodulation which could cause the modulation transformer to arc over.

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THE COLLINS 32F .....a short history

by Barry Wiseman, N6CSW/Ø

A while back I received a letter from Bill Stewart, K6HV, telling me that he was restoring his Collins 32F. He gave me a little of the history on the unit and I thought it would make an interesting piece for ER. Bill agreed and went to work gathering all the info together.

As you may remember from previous articles, Bill Stewart went to work for Art Collins in 1935. Originally, he had only obtained a temporary, 6 week, position but somehow that stretched out to 16 years. He started out doing inspection work - as did most new employees in those days - went on to engineering for a couple of years and then into the sales department. Bill is really a 'people person' with a warm outgoing personality. I'm told that besides sales, Art used Bill wherever a good public relations man was required.

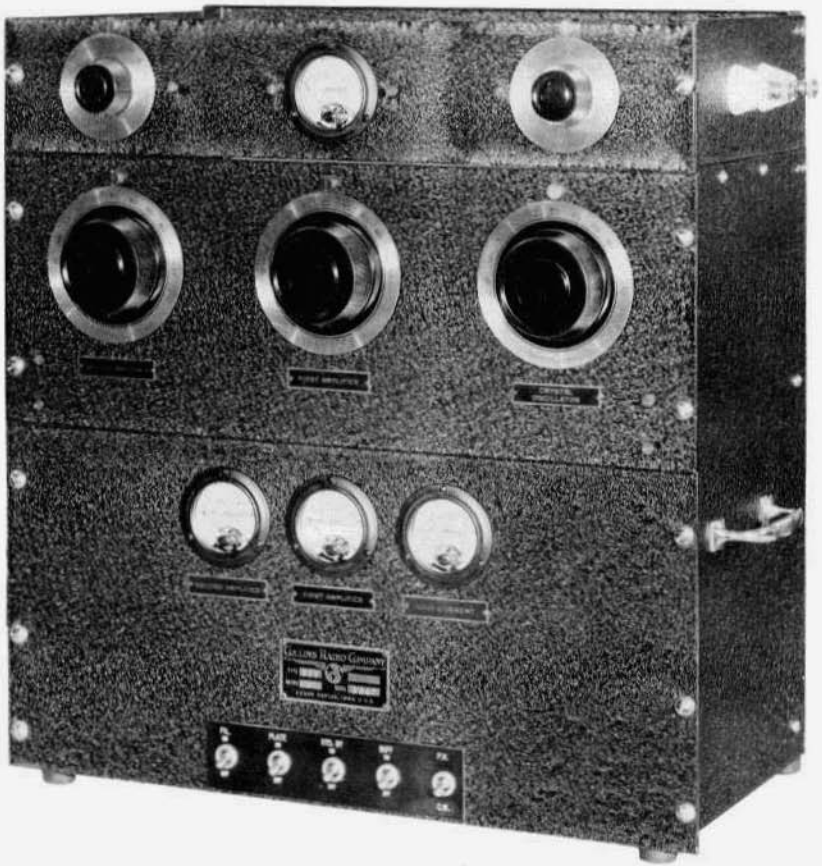
The history of Bill's 32F is as follows: It was manufactured in 1935 and Bill used it in his shack in '36 and '37 until he completed a bigger home-brew rig. It operated on 80,40, and 20 meters. It was designed as a crystal controlled rig of course, but Bill's friend, Roy Olson, WA6THD, built him a vfo to use with it. After the war he loaned it to his brother John, W7NAA. John's log shows that the first QSO he had with Bill, using the 32F took place on November 21, 1947, when he was located in Window Rock, Arizona.

In the early '60's John took it to Yemen, in the Persian Gulf, where he was hoping to use it with a BC-348 that Bill had also loaned him. He was never able to get permission to use it there however. When the '67 war broke out John left in a 'hurry', leaving the 32F and BC-348 behind. It's interesting that the government of Yemen eventually allowed the 32F to be sent to him but not the BC-348. Apparently it was the military nomenclature on the '348 that prevented it from being shipped out. For the next 25 years or so the 32F sat in John Stewart's attic up in Boulder, Colo. Recently John hauled the rig back to Bill's QTH in California. Bill says it looks just like new and works fine except it "won't talk", it has a bad tube or other minor problem in the speech amp.

In his search for information on the rig, Bill called Roger J. Pierce, WØIJY (W9DVS in the '30's), back in Cedar Rapids. Roger was the designer of the 32F. Bill recorded the conversation and sent me the tape.

Roger started work for Art Collins in 1934. He was,"either the fourth or fifth", engineer that Art had hired. The 32F design was really an attempt to modernize the earlier 32B transmitter. One major change Roger made was in the tubes used in the final. He removed the 46's - audio tubes - and put in Sylvania 841's - a zero biased 210. The 841 had graphite plates and were "quite expensive back in '35".

Only about 25 of the 32F's were ever manufactured. Although Art was set to go into production at one point, for some reason - maybe the hard times of the '30's - the rig was never marketed. Incidentally, after the 32F there was a 32G; according to Bill it didn't "take off" either. The photos Bill has - (ER, May, 1991, #25, cover) and the two shown in this issue - were taken by photographer Cliff Lawrence for an advertising brochure that was never produced. The schematic shown here is the only one known to be in existence. In fact, there is only one other 32F known to exist and that is the unit that Roger Pierce donated to the Collins museum in Cedar Rapids.



The Collins 32F transmitter. This is one of two known to exist.

In his conversation with Bill, Roger mentioned that he made his first SSB contact using a Central Electronics 10A exciter and the 32F as an amplifier. He said he got about 10 watts out.

Bill has "promised" to get the 32F on the air "soon". I think we're all going to get a real thrill when we hear it. He says he'll get it on 75 first and maybe later he'll work us on 20. It's something to look forward to.

Footnotes:

I may have mentioned this before but Bill Stewart, K6HV, is really one of my favorite people. I first met Bill, via a letter from David Olsen, W6PSS,about two years ago when I was just starting ER. He had bumped into Bill on the air and thought he was someone I should talk to. I contacted Bill and it was like finding the "mother lode". Not only has Bill been a virtual 'library of information' but he's introduced me to many people - mostly ex-Collins employees - who have appeared in the pages of ER. Roy Olson, WA6THD, was the first I think (see ER #4 and #7) and then Bob Sameulson (see ER #8 and #11) and Ernie Pappenfus, K6EZ, (see ER #10) and Warren Bruene, W5OLY, (next issue an article by Harry Snyder,WØRN, describes Warren's 30S-1 amplifier and in a future issue Skip Green,K7YOO, will have the story on another of Warren's rigs, the Collins 30K transmitter). Bill has really helped me get ER through the first couple of years.

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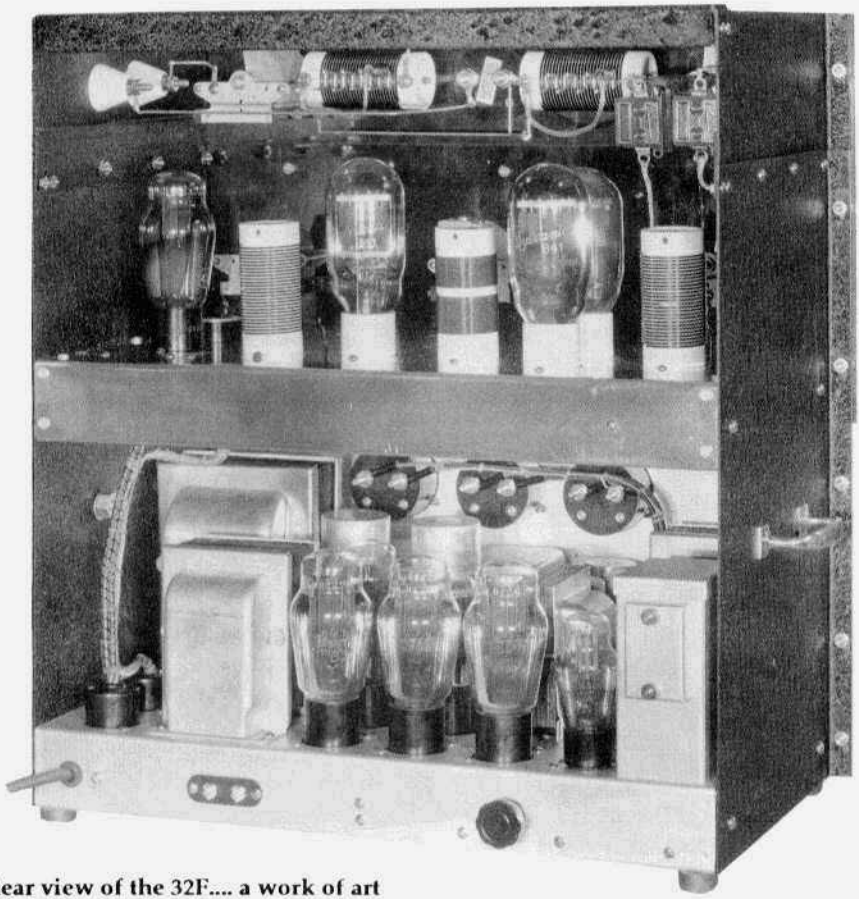
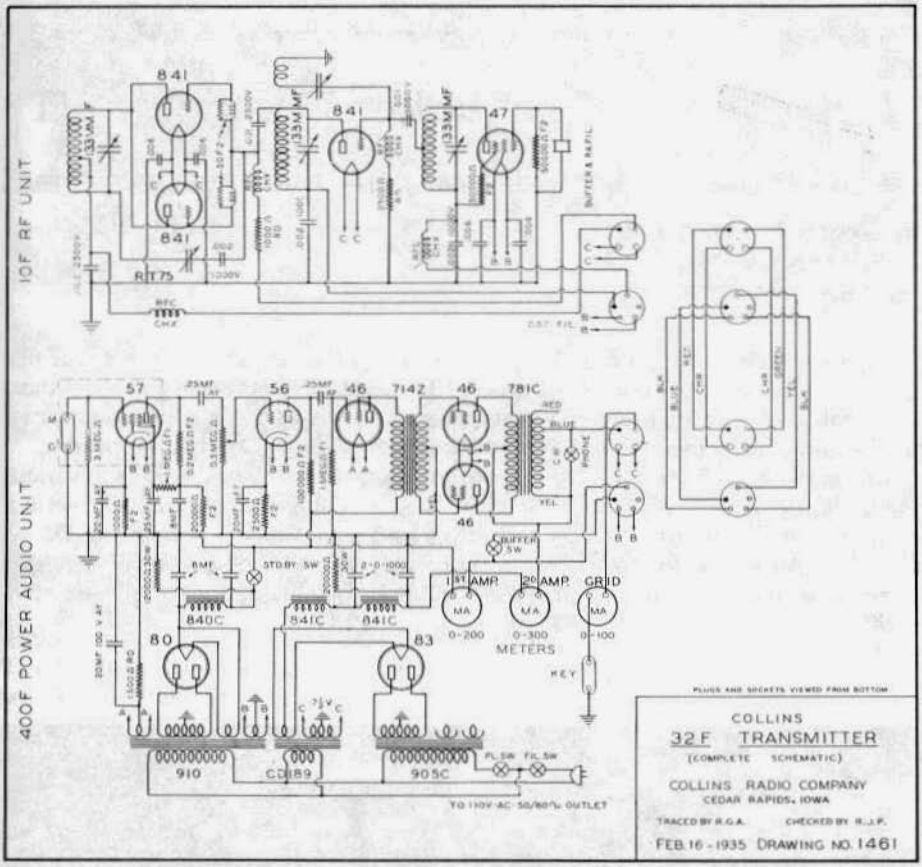


Rear view of the 32F.... a work of art

Roger Pierce, is now retired (he's 80 years old) and lives in Cedar Rapids. He writes extensively for the Cedar Rapids Gazette and the Des Moines, Iowa , Register, mostly on "Socio-Economic issues" and occassionally radio related subjects. Roger worked for Collins from 1934 to 1941. During the war he was at MIT and Harvard, involved in the Radar development project. He worked for Dan Noble at Motorola from 1943 -1946. From 1946 until 1951 he worked in Hawaii for the Hawaiian Telephone Company modernizing/revamping their entire communication systems. He returned to Collins in 1951 and worked on space related communications projects until leaving there in 1964. From 1964 to the present he has been involved in many diverse projects some of them unrelated to radio or electronics. I called Roger to confirm the details in this story and we had a very interesting conversation. I think we'll have more on him in a future issue.

Listening to the taped conversation between Roger and Bill it was very clear that both of them looked back on those early days at Collins with a great deal of fondness. They mentioned that they worked "16 hour days" a lot but that they really enjoyed it. Working for Art was "fun" and "exciting". One diversion they had, that I found interesting, was regular poker games in a room in the back of the Lafayette Cafe. Art always insisted that the winner buy the hamburgers!•



Schematic of the 32F, drawn by Roy G. Austin and checked by Roger J. Pierce

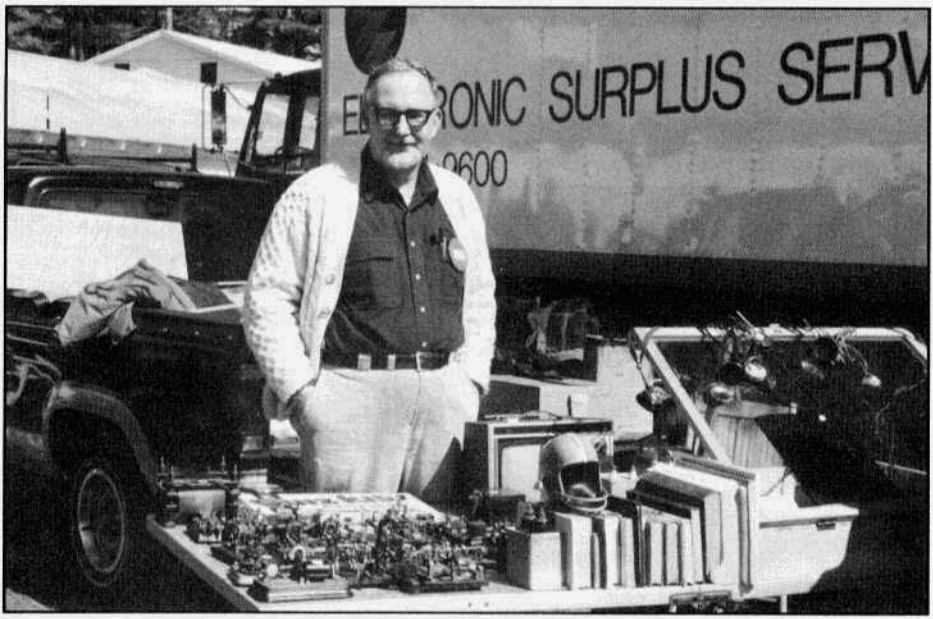
John Stewart, the Collins 32F and Bill Stewart, K6HV

Hoss Traders Flea Market, Deerfield, NH

by George Maier, KU1R
64 Shadow Oak Dr.
Sudbury, MA 01776

It was certainly a reflection of the great spring weather and the gusto for gear that brought people to this semi-annual event. The attendance was quite good and there was a fair (not great) supply of vintage gear. It seems to go in cycles; sometimes there's more gear, sometimes less, but I do get a sense that it's slowly disappearing.

Among the items I saw for sale were: several Rangers, a TBS-50C, HRO's of various types, HQ-100's, 110's, a 140X and several 170's, an S-40B, a crusty 32V, Gonset II's, III's, IV's and G-76's, two Meissner Signal Shifters, some Globe Scouts, a nice DX-40, several 101A's an NC-300 and a 183D. I probably missed seeing some of the other gear that was there. I saw no Valiants or Collins 75A/51J types and only one or two R-390's.



Bill Holly, K1BH, with some of his antique key collection to look at and some for sale. Bill has written and published a very nice book on the history of Vibroplex and telegraph in general.

"The Timtron", Tim Smith, WA1HLR, with a bit of copper tubing that's probably a parasitic suppressor for a new PA that he's working on.

George, KU1R, back in his shack in Sudbury, Mass.

David Olsen, W6PSS, Chula Vista, Calif. in his hamshack. Dave is a very active member of the AM fraternity. He's one of the few people that I've worked on all bands 160 thru 10. And I think that if we have a 'goodwill ambassador' it is Dave. He is always friendly and helpful to anyone he meets on the air.

Left to right. Parker Heinemann, W1YG, Ozzie Jaeger, W6AD and Harry Gartsman, W6ATC

Paul Courson, WA3VJB, and Debra Daigle at the controls in the radio studio at their home near Annapolis, Maryland. Both are broadcast journalists at rival radio networks in Washington, D.C., and have designed this room not only as a replica broadcast station from the 1960's, but also as a working news production studio and tape editing facility.

Paul Kelly, WA2NFF, Huntington Station, New York.

Collecting/Repair/Restoration...Tips

Painting Aluminum

This "Tip" may not address actual 'restoration' per se... still, neophyte homebrewers may benefit from the process. I have found it to be time-proven and it certainly does the job for me.

Specifically, the painting of aluminum is a tricky task. Unless done correctly, the final finish of one's recently completed "pride and joy" will literally flake off in short order under the pressure of assembly screws, abrasion, removal of lettering, etc. etc. I found that maximum adhesion of paint to aluminum is possible, however, provided the following steps are taken, always in a well-ventilated area and at nothing less than room temperature.

1) Prior to the application of primer, give the pre-drilled, formed and lightly sanded "raw" aluminum surface a good wipe with a cloth dampened with mineral spirits; this ensures that the surface is, indeed, clean and won't create "fish eyes" in the painted surface, once applied;

2) Spray the panel with a light coat of galvanized metal primer; this primer is sold under many different brand names. Just be sure that you pick one specifically formulated for galvanized metal and/or aluminum; the "regular" type of metal primer may look great on your aluminum project, but it will eventually lose it's bond and flake off;

3) After a half hour or so, apply a second final coat of primer. The coverage should be just enough to do the job, with no runs, puddling, etc.;

4) Air dry the panel overnight. The next day, pre-heat your wife's oven (preferably with her not home!) to 250 degrees F. Place the panel -- painted side up -- on the middle rack, and let the primer bake onto your panel in the oven for half an hour (vent the kitchen by opening a window, if you find the fumes annoying);

5) Remove the panel, allowing it to cool naturally; and finally,

6) Repeat the above procedure -- starting at step #2 -- for the final top coat of paint.

Baking the panel hastens the drying process and really bonds the primer/paint to the aluminum. It is excellent insurance against the possibility of the solvents in the final coat "crazing" or "lifting" the primer at the time of application of the top coat (the primed surface may feel dry to the touch, but in actual fact it could still be wet enough inside so as to react negatively with the solvents in your paint -- even after several days of "air drying").

I have come to favor enamel spray paints for my projects; the new water-borne sprays are especially free of paint odors both during application and at the time of baking ...

My only regret is that I was unaware of this procedure 14 years ago, when I built my first amplifier and transmatch!

Eddy Swynar, VE3CUI

Editor's Note: If you have a repair resoration tip that you think may be helpful to others please send it in.

AM FREQUENCIES

2 Meters - 144.4, calling freq., activity in most cities; **6 meters** - 50.4 calling freq. **10 meters** - 29.0-29.2 operating window; **12 meters** - 24.985 calling freq.; **15 meters** - 21.400 - 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.

Fall Classic Exchange

I need a favor, a little publicity for the Fall Classic Exchange. Your announcement last year, the only thing we did differently, probably as least doubled our turn out. So let's see if you can work your magic again.

A few interesting facts from last fall's outing; we had by my count 71 participants in 26 states, four provinces and all U.S. call districts. The equipment on the air was a fantastic gathering of Classic Radios.

The best ad I can put out for the September 30, 1991, CX is to invite everyone to crank something up and work the gang again. Things will start as usual at 2000 UTC (3 p.m. EDST) Sunday and run until 0400 (11 p.m. EDST). The most popular frequencies are around 7060 and 3560 CW, though there are active spots on other CW and phone bands too. An SASE to me will bring a copy of the fall CX Newsletter with all the details.

Jim Hanlon, W8KGI
POB 581
Sandia Park, NM 87047

Ten Meter AM Net

Earl Harris, K5FTE, in El Paso, Texas has sent along word that he is starting a 10 meter AM net on 29.000 Mhz, Wednesday nights, at 0200 UTC. Maybe it's a good idea to stay on 10 through the summer, even if our contacts may be mostly local. **N6CSW/Ø**

Vintage CW Nets?

Tracy Reese, WB6TMY, who is a commercial operator at a coastal telegraph station, has written ER an interesting letter wondering if there would be any interest among vintage radio enthusiasts in a "Vintage CW Net".

He say, "Drop me a post card with your comments, telling me what frequencies you would like to operate and at what time you would like to check into a net".

Tracy says he will let me know what sort of a response he gets. I'll report on that next month. Tracy's address is Box 4694, Santa Rosa, CA 954021-4694. **N6CSW/Ø**

Vintage VHF

Recently, I've noticed an increasing interest in vintage VHF gear. A lot of hams are discovering that there was some pretty good VHF gear manufactured back in the '50's and '60's. I wonder if there are any 2 meter AM nets around the country? I know that if I were in an area where there were other vintage enthusiasts I would try to get something organized.

I would like to hear from anyone who might be using vintage VHF gear and from anyone who might be involved in net activity on 2 meters with vintage VHF gear. **N6CSW/Ø**

LETTERS

Dear ER:

I enjoyed Bill's article on the SP-600JX Super-Pro ["Update That Super-Pro" by Bill Kleronomos, KD0HG, ER #20, #21 and #22, Dec., Jan. and Feb., 1991] and thought I would make some comments concerning noise figure and my experiences with the receiver modifications.

As the article suspects, it is incorrect to merely add the equivalent atmospheric noise figure to the receiver noise figure. One way to combine these is to convert the noise figures to noise temperatures which can in fact be added, and then convert them back to noise figures to make the comparisons.

For example, the 15 dB of atmospheric noise converts to 8,874 degrees Kelvin noise temperature using the formula NF (dB) = 10 log (1 + T/290). Similarly, receivers with 1 dB and 10 dB NFs have 75 degree and 2,610 degree noise temps, respectively. Now the total system noise temp is just the sum of the antenna plus receiver temps or T (system) = T (antenna) + (receiver). However, the antenna temperature is not exactly the same as the atmospheric noise temp due to losses in the antenna and feedline. Although I could have neglected this effect I took it into account by assuming 0.7 dB transmission line loss which might represent 80 feet of RG-8/U at 14 Mhz with 1.5:1 VSWR. (Neglecting this effect causes the differences between the two receivers to be slightly less than actual; but in any case the errors are in the tenths of a decibel.) This reduces the atmospheric noise to 7,628 degrees. Thus, the system noise temperatures are 7,703 and 10,238 respectively, which convert to system noise figures of 14.4 and 15.6 dB, a difference of only 1.2 dB.

Conclusion is that extremely low noise figures do not make an appreciable difference when atmospheric noise is as high as it is in the HF bands. Atmospheric noise at HF is mainly the result of thunderstorm activity, and I seem to recall that there are an average of 17 or 18 storms going on at any moment on Earth. Although we may be able to copy weak signals through the static crashes of a "local" storm, the atmospheric noise level is the result of the static crashes of all distant storms within propagation range and hence tends to approach white noise.

My Super-Pro receiver is possibly the last version of the SP-600, a "JX-28" military model. I replaced the 6BA6 first RF stage with a 6AK5 since no modifications are required except that the RF stage must be re-peaked. I found that this made a noticeable improvement in noise figure above 14 Mhz, especially on ten and six meters, although I do not have the measurements.

The only approach to making receiver noise figure improvements is to make S/N measurements as done in Bill's article. My experience has been that most of the articles written in the ham publications over the years... and I have a lot of them... seem to rely on S-meter reading to denote improved sensitivity. Replacing the RF tube in an older receiver with a higher mu tube that has a sharp cut-off characteristic affects the AGC loop and causes the meter to read higher on strong signals, which can be mistake for better sensitivity. A sharp cut-off tube can also increase the intermod products.

An often overlooked way of insuring maximum receiver performance is to make sure that the receiver is matched to the impedance of the antenna. Many of the older receivers were designed for 300 or 400 ohm inputs; some of the later models for 75 ohms, and certain military models for 100 ohms balanced. If one aligns a receiver on the bench by the book, but then uses a mismatched antenna there will not only be a loss of gain but a degradation in noise figure due to the mismatch. I have used broadband matching transformers (Mini-Circuits Lab) to solve this problem. Another technique is to align the RF stage for 50 ohms although this can not always be done properly without removing turns or

changing taps on the receiver's antenna coil. Another trick which often works is to rock-and-gang adjust the antenna trimmer with the RF stage input trimmer and/or slug-tuned coil depending on whether the ham band appears at the low or high end of the tuning range in a general coverage receiver. This provides an optimum match to the 50 ohm signal generator for that ham band.

By the way, general coverage receivers which will be used with non-resonant random wire antennas can be aligned by placing a special EIA matching network between the output of the low impedance signal generator and the antenna input. This provides best results for general coverage listening especially on the lower frequency ranges. The network simulates the characteristics of some sort of standard (?) random wire antenna.

Shel Rubin, KT2L

Dear ER:

I wonder if you've spoken to "Ozona Bob", W5PYT, lately? During a recent 10-meter AM QSO that I had with him, he told me that he would relate the following small story to you....

Before I start, however, I should tell you that this little event really did occur. It left me wondering what the odds were of it ever happening at all... and Bob was simply beside himself with glee at the coincidence!

Specifically, like you, I guess I've always harboured a desire to find myself a good, vintage RCA AR-88 receiver; the write-up on this classic in an issue of ER merely served to fan the flames of my desire for one. At any rate, I let it be known at our local club that I was interested in knowing of any leads for an AR-88 of my own... and I began to listen for Bob's signal on 10-meters, in order that I might get some first hand information and inspiration on this wonderful 100-pound radio.

About a month ago, early in the week, I finally chatted with the gentleman from Ozona and was fired-up even more for an AR-88 of my own (as you well know, Bob had a bunch of them at the time himself!). By sheer coincidence, late that very night, I was informed by a friend here in town that another friend (!) had heard an AR-88LF being mentioned in a Toronto 2-meter FM 'swap net'. I took down all the particulars and telephoned the owner the very next day.

Two days later, I met with the fellow at his home, in Toronto. He was an older man, and as we walked down the stairs to his basement to see the receiver, I learned that he was first licensed in 1935 and that he had not operated AM in years. The AR-88LF was up and running, he said, for my demonstration... and guess whose voice I heard emanating from the basement as we made our descent...?

You've got it: Ozona Bob's! I could hardly believe it! I told the fellow all about Bob's enthusiasm for the AR-88, and here we were, listening to him on what was to become my own '88! I'm not superstitious, but could there ever have been a better omen?

I gave the owner a deposit on the rig, with my promise that the balance would be paid on the day that I picked it up, just after my birthday (thank you, dear wife!). When I got home, I found Bob, still chatting away on 10-meters and told him what had occurred that morning... he proceeded to tell me that he, too, had just picked up yet another AR-88 (a military version) that same week for his collection!

Needless-to-say, Barry, I can't wait to get mine home and in the shack with me, next to the Ranger I. Believe me, I'll be telephoning "The National Enquirer" poste haste if the first QSO I have using my AR-88LF is with W5PYT (it probably will be too, knowing ..."Ubiquitous Bob"). At any rate, I'll be sure to send you a copy of the front page or photos of the station (as I perennially promise to do!), whichever happens to occur first....

Eddy Swynar, VE3CUI

The R390a Receiver: A Milestone in HF Communications

by Ray W. Osterwald, NØDMS
10679 West Dartmouth Ave.
Lakewood, CO 80227

PART THREE

The "Competition-Grade" R390a

While the debate over modifications to vintage equipment rages on, one fact we can't change is that we are faced with operating in the modern radio environment. I hold in high regard the craftsmen among us who restore vintage radio gear and accept it for what it is. Future generations will appreciate what they do. I use my equipment for regular operations, and have found that some older circuitry must be modified simply to do its job in this era of high-power finals, directional antennas, multi-national pile-ups, etc. Where I draw my personal line is a modification which requires a non-electrical change: holes, new switches, or similar damage. I document every change I make so that another person with electronics skills may remove them if so desired. The parts situation with the R390a is unique, in that replacement modules are both plentiful and relatively inexpensive, so that a person may have both modified and stock sub-chassis, and enjoy the best of both.

This part of the R390a series gives a listing of all of the relevant U.S. military authorized modifications I have, plus simple, un-authorized modifications made by me to the AGC circuitry, and to the RF and IF sub-chassis to get over 120 dB of blocking dynamic range, and a sensitivity which approaches the galactic noise limit around -150 dBm. I agree with KDØHG's arguments in ER #22, and I just don't buy into the reasoning that a noisy receiver is acceptable.

The modifications to be described may be performed on the I.F. and R.F. sub-chassis. If you are not comfortable removing the front panel or the R. F. sub-chassis, then the I.F. mods alone may be made, which results in very substantial improvements. I recommend doing the entire job, and learning to remove all the component subchassis. It is not really very hard, and maintenance is much easier with everything apart. When de-soldering, do the job right by using lots of solder wick and patience, as a failure deep inside the R.F. sub-chassis is frustrating! Also, don't use too much heat around the Teflon tie points on the R.F. sub-chassis, as they are easily damaged.

AGC Modification

This procedure greatly reduces distortion when receiving SSB and CW transmissions, and shortens the attack time enough that the AGC no longer pumps. If no other mods are made, this one is well worth the hour it takes to do it.

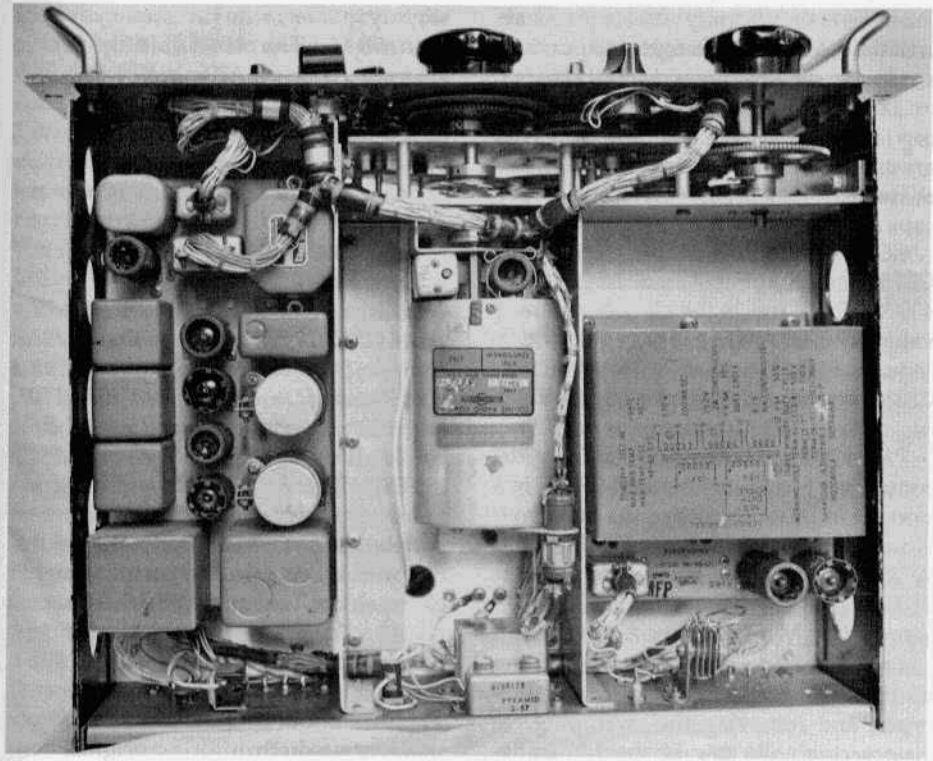
1. Orient the I.F. sub-chassis up-side down, with the switch shaft to the right.

2. Referring to figure #1 and the sub-chassis, remove R546, 180K, which runs from V509 pin #2 to the stand-off post to the right of the tube socket. Replace it with a 1N914 or 1N4148 diode, with the cathode towards pin #1 of V509.

3. Remove R545, 100K, which runs from V509 pin #2 to a ground lug underneath the stand-off post to the right of V509 tube socket.

4. Replace R547, 220K, with 10K. R547 runs from pin #2 of V506 to a binding post to the upper right of the V509 socket. Also on this post is a 2.7 Meg resistor and a white wire with green and brown tracers.

continued on page 24



Collins R390a, bottom view

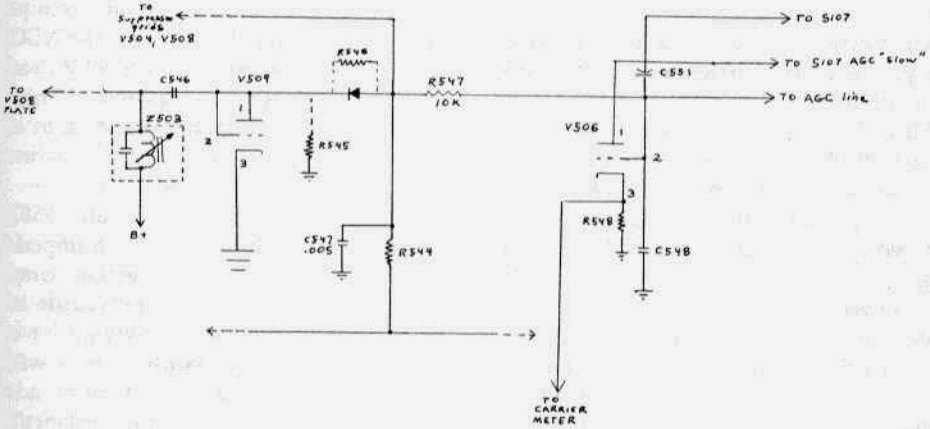


FIGURE 1 AGC modification

Collins R390a from page 22

5. C547 significantly affects AGC attack time. Most of the original paper caps are leaky. Change C547 (.1 500V paper to .005 uF disk ceramic 500 Volt. This cap runs from V508, pin #2, to the ground lug directly beneath it on the chassis divider wall, where two other caps are grounded.

6.Change the BFO coupling capacitor, C535, from 12 uuF to 49 uuF silver mica, 400 VDC (47 uuf is the closest standard value) 49 uuf is an optimum value which reduces BFO distortion to less than 5%. C535 runs from V505 pin #5, to V506, pin #7.

7.Perform the BFO neutralization procedure as given in the manual. This isimportant in order to realize the least possible distortion.Ifonlyperforming the AGC modifications, be sure to re-align 2503 forproper AGC action.I.F.

Amplifier Modifications

The I.F. mods consist of replacing some of the 6BA6 I.F. amplifiers with 6JH6 types, and removing the swamping resistors originally across the I.F. transformer windings. The 6JH6 is a quiet, high performance AGC-controlled I.F. amplifier with a semi-remote cutoff characteristic from the early 1960's. It was designed for use in gain-controlled picture I.F. stages in the last of the tube color TV receivers. As an amplifier, it has an equivalent noise resistance of 1094 ohms, about 3.5 times quieter than the stock 6BA6. Its inter-electrode capacitances are very similar, as is the plate resistance. Plate curves may be found in some late Sylvania tube manuals. Pin outs are different, as the cathode and suppressor grid pins are reversed. This is usually not a problem, as they are frequently tied together. I had no trouble finding lots of these tubes, either on sale or $3.50 new.

The first I.F. amplifier bias is not changed, as increased gain in this stage would likely introduce intermodulation distortion at the mechanical filter input transducers. I use a 6JH6 here as it is slightly quieter, with the gain equivalent to a 6BA6. The 4th I.F. amp is not changed. It is a 6AK6, and while it is fairly noisy, there is so much gain ahead of it that its noise is completely masked by signal. I have found that Philco 6AK6's have higher Gm than the others.

Amplifier Modification Procedure

1. Replace V501 and V502 with 6JH6.
2. Replace V503 with 6JH6.
3. Orient I.F. chassis as before, and replace C543 (.1 uF, paper) with .1 uF disk ceramic, 500 Volt. (pin #7 to ground lug.)
4. Remove the covers from T501, T502, and T503. Locate resistors R511 and R512 in T501, R553 and R554 in T502, and R522 in T503. These resistors were designed to lower the tuned Q of the transformers and broaden their response for multichannel reception. Removed, the I.F. channel can be made much sharper. Avoid soldering on these transformers. Clip one end of a resistor free, and slip a piece of shrink tube over the free end. This will allow for re-attachment if ever necessary to return to the original configuration.

5.Change R541 (AGC I.F. amp cathode bias resistor) to 1000 ohms. It runs between V508, pin #7, and ground. (This change may not be necessary on all of the I.F. sub-chassis, as later ones seem to behave differently. Do it only if the AGC voltage, as measured with a VTVM at the rear panel, is much less than -2 volts DC with the antenna disconnected, or if alignment of the AGC I.F. 2503 has insufficient range.)

6.Realign T501, T502, T503 and 2503 for maximum gain, using a high-impedance D.C. voltmeter across the rear panel AGC-NOR terminals. (The procedure in some of the technical manuals is for a stagger tuned I.F. response, which will no longer be needed.) 2503 may be adjusted by ear for the best AGC "balance": the receiver should not have so much AGC gain that circuit and background noise reduce weak signal levels. Also,

T503 may be tweaked to produce minimum distortion when receiving strong CW and SSB signals. It may be set by ear, or with a distortion meter if available. The optimum position may not be the one which gives the greatest gain, but should be within a half-turn of the aligned position.

7. Perform the I.F. gain adjustment.

Filter Alignment Procedures

The crystal filter alignment procedure in the manual is ambiguous. An alternate procedure is given below:

1. With the power off, remove the cover from the crystal filter. Remove the crystal and clean the pins and socket with residue-free contact cleaner. Re-install the cover, and warm up the receiver. Tune in any calibrator marker, and reduce the RF gain to produce a fairly weak signal. Connect a VTVM across the rear panel AGC terminals, set the AGC to "fast".

2. With the bandwidth switch in the 100 cycle position, slowly tune through the calibrator signal. Note the filter response on the VTVM. If there are two peaks, peak the receiver up on the lesser of the two. Adjust the trimmer, C520 (top of can) until the peak is minimum. Double-check this step by "rocking" the receiver across the calibrator signal. Peak up again on the calibrator signal.

3. By carefully tuning across the calibrator signal and watching the VTVM, adjust C520 until the response falls off evenly on both sides of the peak (a symmetrical bandpass).

4. Turn the bandwidth control to 1 Kc. Check that the response peak occurs at the same frequency as it did in the 100 cps position. If not, re-peak the receiver in the 100 cps position, and without changing frequency, change back to 1 Kc bandwidth, adjust L503 (top of can) for a peak. Repeat steps 3 and 4 until no further improvement may be made.

5. Change to 100 cps bandwidth, and re-peak the receiver. Change to 2 Kc bandwidth and without changing frequency, peak the mechanical filter input and output trimmers.

6. Step 5 may be repeated for the other three mechanical filters.

When completed, these steps will get the R390a as selective as possible.

The results of the I.F. modifications are as follows:

A. Minimum Discernable Signal: -130 dBm at 2 Kc. bandwidth, or a 3.6 dB improvement.

B. 10 dB S/N ratio: .2 uV

C. Single-tone blocking dynamic range: 105.2 dB. (33.1 dB improvement)

D. Two-tone blocking dynamic range: 82.8 dB. (30.1 dB improvement) These are significant improvements, but we are not done yet!

R.F. Sub-chassis Modifications

These changes involve modifications to the RF amplifier bias resistors so that ultra-low-noise frame-grid tubes may be used, and a different mixer is installed which is 8 times quieter than the stock 6C4.

The frame grid was invented around 1958 and was a structure which approached the "ideal grid" configuration of electrical characteristics without physical dimensions. As such, the grid to cathode spacing is much smaller and is controlled by "centerless ground" rigid support rods and cross-braces. Hence, the plate to screen current ratios are much higher and higher Gm is possible. Microphonics are reduced. The grid wires are made very much finer, which eliminated some space-charge problems.

The bias changes allow the use of the 6GU5, 6GM6, or the 6JK6 as the R.F. amplifier. These tubes were described by KDØHG in ER #22. I ran sensitivity and dynamic range tests on all of them, and found that the quiet one is the 6GU5, but the one which produced the greatest sensitivity was a 6JK6. The dynamic range is within 1/2 dB on 2 of them, with the 6GM6 being 1.5 dB better. The 6GM6 is a semi-remote cutoff type and does a

continued next page

little better job matching the R390a AGC characteristic. The 6GU5 is a heptode design, and due to its internal connections, the R.F. gain control doesn't have much effect on cathode bias. This is not really a problem, as the AGC still has sufficient range. My suggestion would be to use what you can get, but look for 6JK6.

The mixer type I use is the 6HA5 triode. This is another high performance tube designed at the end of the hollow state era, and was intended for use as a VHF R.F. amplifier in TV tuners. Internally shielded, it has a VHF noise figure of about 4 dB, an equivalent noise resistance of 888 ohms. Among triode mixers, only Nuvistors and some ceramic types have lower ENR and noise figures. It was also designed to minimize intermodulation distortion. Its inter-electrode specifications are much different than the 6C4, so I was skeptical at first of having any success with it. Also, no plate curves were available. I breadboarded the 6HA5 using the same circuit values and voltages as in the R390a and found it to be much more linear than the 6C4, and it runs cooler!. This tube is also very easy to find, and cheap. Try to get the RCA variety which is just a 6HA5 and not the 6HA5/6HM5 combination produced by others.

Bias Resistor Modifications

1.Refer to figure #2 and orient the R.F. sub-chassis with the gear train to the left.

2. Remove R233 (470K) and replace it with 3.3 Meg. 1/2 Watt. This resistor is connected between V2Ol, pin#1, and the Teflon post to the left of the socket. Be careful of this standoff, as too much heat will damage it.

3. Remove R20l (270K) and replace it with 3.3 Meg. 1/2 Watt. This resistor is connected to two other Teflon standoffs to the left of the V20l tube socket, and is connected at each post to white/orange wires.

4. Add a 3.3 Meg. 1/2 Watt resistor (R233a) from the junction of the new R233 and C255 at the Teflon post to a ground lug on the left sidewall.

5. Add a 1N914 or a 1N4148 diode across the new R201, with the cathode toward the AGC line (away from V201 socket) at a Teflon feed-thru.

Mixer Modifications

1st mixer V202 is not changed. To do so would require making up new mini-coax cables which run all over the sub-chassis. Other work necessary to change the mixer would likely degrade the shielding integrity of this section.

2nd Mixer

Refer to figure #2.

1. Remove all components from the V203 tube socket. Do a neat job, using plenty of solder wick. Completely remove the heater by-pass cap, C302, between pin #4 and a ground lug.

2. Remove the tube socket and rotate it 180 degrees. This is not as bad as it sounds, as everything is easy to get at.

3. Install the 27 ohm grid bias resistor (R214) to pin #1.

4. Install 2.2K (R215) and .005 uF (C287) to the cathode, pin #2. This is the 2nd L.O. injection.

5. Ground pin 3 (heater return) to the center sleeve.

6. Solder a new wire to L203 (10 uH heater choke) long enough to reach around to pin #4. Insulate the lead with shrink tubing and solder to pin #4.

7. Solder C302 (heater by-pass cap) between pin #4 and the tube socket center sleeve with very short leads.

8. Solder the lead from the Teflon standoff to the plate at pin #5.

9. Solder pin #6 (internal shield) to the center sleeve.

10. Do not connect pin #7.

3rd Mixer

1. Refer to figure #2.

2. Remove the plate lead from V204, pin #1.

3. Remove the 27 Ohm grid resistor (R230) and solder it to pin #1.

4. Solder an insulated jumper from pin

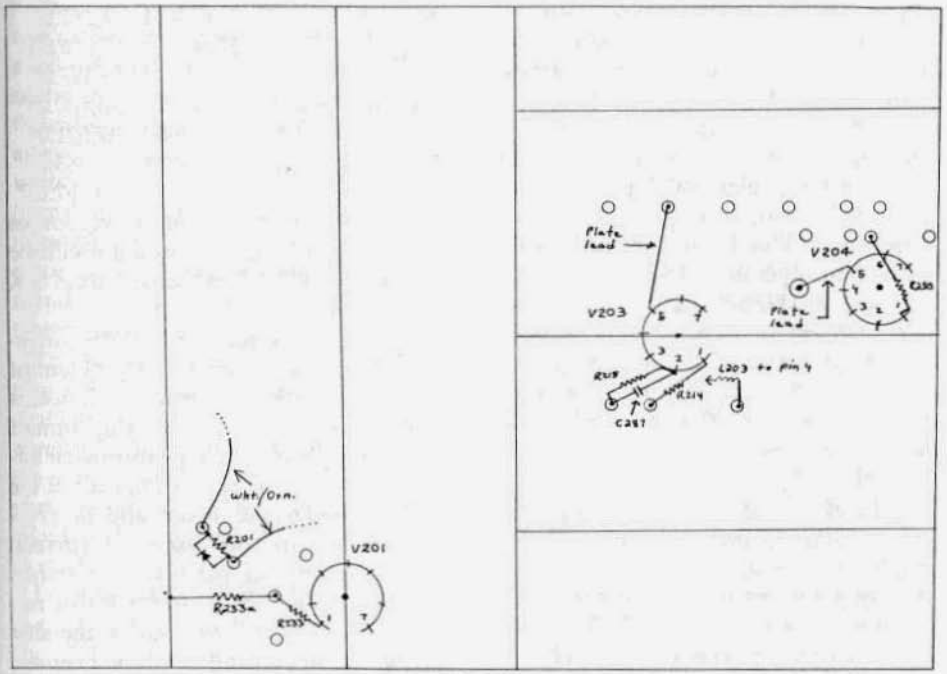


FIGURE 2

#2 to pin #7.

5. Solder the lead removed in step #2 to the plate at pin #5. The wire needs to be shortened a little bit.

6. Solder a wire from pin #6 (internal shield) to the center sleeve and ground lug.

The performance results are as follows:

A. The minimum discernable signal is now less than -150 dBm. I say "less than" because the measurement is now limited by my test equipment leakage!

B. 10 dB S/N ratio: .022 uV.

C. AM sensitivity: .1 uV at 4 Kc I.F. bandwidth.

D. Single-tone blocking dynamic range: 123.5 dB.

E. Two-tone spurious-free dynamic range: 101 dB at 20 Kc. signal spacing, and 85 dB at 10 Kc. spacing. Dynamic range measurements are also limited by equipment leakage, so the numbers are probably conservative.

This level of performance in a tube receiver takes a little getting used to! Weak signals jump out of the quiet background, as there is no receiver-produced digital QRM. Strong signals sound clean and undistorted. Intrestingly, a solid-state rig needs balanced diode ring or FET mixers to equal it, usually at the expense of sensitivity.

Government Service Notes

The following are portions of NAVSEA R-390a/URR bulletin 0967- LP-000-0010 which details Navy modifications and hints.

1. Tests at 55 discrete frequencies, using the unbalanced antenna input and long runs of coax resulted in a 42 dB degradation of received signal strength. The recommended fix was to use an adapter, UG-970/U, and re-connect the antenna to the balanced input. This adapter grounds one side of the balanced input.

2. When the zero-adjust knob is turned too far clockwise, the clutch disk may break loose from the shaft. A procedure is given to have a machine shop repair

continued next page

R390a from previous page

the damage. If this part is not available from Fair Radio Sales, an SASE to the author will bring a copy of the procedure.

3. When in calibrate or standby, the antenna input terminal is grounded. When using antenna patch panels, every thing else also becomes grounded, which apparently caused confusion among the Navy radio operators. Their solution was to use the AN/SRA-12 antenna switch to disconnect the R390a.

4. Type 328 panel lamps have a service life of 1000 hours. They may be replaced with type 381 with a life of 20K to 30K hours, but are not shock resistant. Use them only while ashore!

5. Field Change #6 outlined replacing the vacuum rectifiers with silicon diodes. This was done to a large number of the receivers, but resulted in the plate voltage on 6AK6's V603 and V604 (audio amps) increasing 20 to 35 VDC. This increased plate to cathode voltage to between 200 and 215 volts, causing internal short circuits and damage to the cathode bias resistors. The fix is to install a power supply B+ dropping resistor. If you need the dropping resistor procedure, please SASE. I do not have the diode rectifier change #6.

6. In installations where the receiver is not easily removable, a procedure was given to mount the carrier level adjustment pot on the front panel, as this was a monthly interval adjustment.

7. For use by the Naval Security Groups, a list of internally generated spurious responses was prepared. In the following list, frequencies marked with an asterisk are responses resulting from parasitic oscillation in the RF amp. The others are generated in the VFO via harmonic mixing. Note that only 28.7.55 Mcs falls inside our bands!

910.13	5,637.8	10,318.7	13,712.51
1,500.24	6,303.1	10,763.9	13,864.34
1,635.0*	6,999.76	10,945.96	16,122.0*
2,368.0*	7,841.07	11,068.84	17,381.0*
2,727.75	8,376.0*	11,564.04	18,626.0*
3,227.2	8,591.2	11,746.02	19,397.0*
4,000.6	9,340.95	12,364.01	25,680.08*
4,970.13	9,568.3	12,546.0	27,621.0*
5,357.0*	10,091.19	12,627.0*	28,755.0*
			30,392.00*

The cure for these spurious responses is to change R-210 (1st crystal oscillator screen) and R702 (VFO screen) from 56K 1/2 Watt to 220K 1/2 Watt.

8. A radio operator on the USS Forrestal reported a solution to a problem of continuing lack of sensitivity. It seems that vibration on board his ship caused the tuning slugs to change from their adjusted position. This, in turn, caused the tank circuits of the mixers and 1st crystal oscillator to draw excessive current. The cathode and plate resistors then overheat, and in some cases, fail. The recommended fix was to re-align the slug racks, and put a drop of Glyptol cement on the adjustment threads. It was noted that all of these resistors should probably have their wattage value increased, but that since the R390a was being replaced with the R-1051/URR it would be too costly. While the average ham shack does not vibrate like the Forrestal does, a little Glyptol on the slug threads after alignment is still a good idea!

Acknowledgements:

Mr. Norm Litsche, KA2TYT, (Air Navigation Industries, Inc., P.O. Box 191, Canandaigua, NY 14424) provided the Navy technical bulletins and much information about R390a production history and the support equipment. He is an excellent source of information and supply for these receivers. At this writing, he has available government rebuilt PTOs in the original sealed packing, all of the component sub-chassis, plus complete receivers. His pricing is very reasonable.•

ER in Uniform from page 9

This is a fun set to use; with an electret 'carbon' mic (E.R., August, 1990) and a full wave horizontal loop antenna I had no trouble making AM contacts during the early morning hours, and got reports as good as you could expect with four watts of output. But the best report was from Marie when I was taking the pictures for this column: "Is that really the piece of junk I helped you unpack last month?"

Conclusions

The BC-474 didn't start life as a military radio and it may not seem fair to evaluate it as one. However, when compared to other small military radios of the time it doesn't look half bad. It is particularly interesting as an example of adapting low priced civilian radio gear to military use.

Looking first at design problems, push-to-talk and lighting for the tuning dials should have been provided. Separate PHONE/CW and ON/OFF switches for the receiver and transmitter are 'tacky'. Mounting small parts inside hard-to-remove coil cans doubles or triples the time to replace them. The tuning knobs turn counterclockwise to increase frequency -- very poor human factors.

Putting the antenna loading control so close to the antenna binding posts is distinctly unfriendly; George Goldstone taught his operators to load the antenna in the dark by tuning for the longest arc from the binding post to a pencil and you could get one just as long to a finger. High voltage on the key is more of the same.

Lack of a provision for crystal control may also seem to be a design mistake, since without it the radio isn't stable enough to guard a channel. However, in 1941 almost the entire U.S. supply of quartz for crystals came by sea from Brazil. The supply was expected to be a fraction of the actual need for full mobilization and only a handful of companies had experience at turning the raw material into finished crystals. Considering the many types of equipment which would not work at all without quartz crystals (VHF sets, frequency calibrators, and 'handhelds' like the BC-611, are examples), it would not have been sensible to provide a crystal control feature in the BC-474.

The BC-474 is badly made -- the cardboard tubular caps, Bakelite MO coil form and 'howling' problems are leading examples. Finding three quality control problems (the unsoldered connection, antenna coil, and final inspection mistakes) in a radio this simple is worse than suspicious.

Many of the problems come from the differences between a civilian design and military needs. Others are probably the result of hurry-up production. On the positive side, the BC-474 is compact, simple, light in weight, and fairly easy to use. It is trick-free and surely cost only a fraction of what similar U.S. Army--designed sets did. Overall, it is a much better radio than you'd expect from its 'stopgap' beginnings.

Besides the not-yet-available BC-654 (SCR-284), the BC-474 can be compared to two other radios of the 1941 time period, namely the USN/USMC TBX and the British No. 19. The BC-474 is ahead of the TBX in nearly every category I can think of; we'll visit this comparison again when we get 'orders' to that set.

The No. 19, on the other hand (E.R., February 1991), is smaller (especially when you consider just the HF portion) and easier to operate. It has push-to-talk, there's a single function switch, and one knob tunes both transmitter and receiver. A calibrator was available as an accessory. A meter switch lets you check supply voltages, tune up, and read the received signal strength and relative transmitter output with one meter; panel meters were in critically short supply in 1941-42.

It's a shame that the Army was not

continued next page

ER in Uniform from previous page

able to fold the good features of the BC-474 and No. 19 into its HF field portables. A BC-474 "B" model with instant heating tubes in the transmitter, and fixes for the other problems listed above could have been a fraction the size and weight of the '654 with no sacrifice in performance. And if that set had (in turn) been redesigned with miniature tubes and a watertight case, the result would have been far better than the BC-I 306 (of SCR-694, the replacement for the SCR-284). Adding the No. 19's single knob tuning and metering features would have given our troops a really outstanding small HF set.

But none of that happened. We had started so far behind that the entire war was spent playing catch-up ball. The BC-654 was rushed to completion; it was grossly overweight, splashproof rather than watertight, covered only part of the frequency range the Army was using in 1942, and arrived full of octal and 'G' tubes more than a year after miniature tubes were available. The BC-I 306 was miniaturized and fixed some problems but had important technical troubles (instability, awkward controls) because it too was a rush job. The GRC-9 (RT-77) was more stable and had extended frequency coverage but kept the '1306 awkwardness and added some of its own.

Then the war ended... and nothing happened. The GRC-9 picked up a campaign ribbon in Korea and went to Vietnam but so did a variety of stopgap sets. •

YUP, RUFE, THEY TELL ME I CAN'T RUN A FULL GALLON NO MORE !

Editor's comments from page 1

Sometimes I get calls - usually two or three a month - from subscribers complaining about having not received their magazines. If it's been over two weeks for Second Class or a week for First Class since I've mailed that issue, I'll send another magazine First Class. Usually I receive word that they did indeed receive the first magazine but sometimes a week or two after I had sent the second via First Class mail. It's hard to understand.

On the plus side for the U.S. Postal Service: a while ago I received a call from an employee at the post-office in Springfield, Missouri. The lady said that one of my subscribers had had his magazine badly damaged by the post-office. She said that if I would provide another magazine they would provide the charges to over-night it to my subscriber. I was delighted to hear this. They even went one step further and called the Post Master here in Hesperus and apprised him of the situation and told him which forms to use and how to handle it all. Good news!

Sometimes subscribers that are particularly interested in the classifieds get upset because they think that the West Coast gets the magazine before the East Coast. Maybe that's true, but I really don't know what I can do about it. If I sent the West Coast bags a day later would that be the answer? Then what about Florida versus Washington State and Colorado versus New Mexico? It seems to me that there's nothing much I can do about this disparity. If anyone has suggestions,I'm interested.

You'll notice in the classifieds that ER is selling another book,"Fixing Up Nice Old Radios" by Ed Romney. I meant to give it a full blown review this issue but I just couldn't find the space; maybe next month. But, let me say that this book is a very good one for anyone interested in the repair and restoration of vintage radios. Although the book is oriented more towards those interested in early broadcast sets, that same information - troubleshooting, alignment, cabinet restoration etc. - is useful to those of us more interested in later communications receivers and ham transmitters. It's also an enjoyable 'read'. Ed Romney presents the material in a way that everyone should find entertaining. I guarantee you'll enjoy it... money back!

By the way, the move to Durango hasn't happened yet; we're still on the farm. On to #27.....

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 25 word- ad per month. **Extra words are .15.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word.** Your name, call, address and telephone number count as **6 words.** Hyphenated words count as **2 words. Please count the words in your ad and if you're over 25 words send payment for the extra words.**

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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: Parts by mail since 1954. Vintage parts available. Send stamp and request "Vintage Flyer". USA only. Bigelow Electronics, Box 125, Bluffton, OH 45817.

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: (2) HRO Jr. coils - .5-1.0 Mhz, .9 - 2.05 Mhz in the broadcast band. **WANTED:** Early Nationals, Hammarlunds and similar rcvrs. P. Currie, Box 738, Chuhuota, FL 32766-0738. (407) 365-9305

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

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

FOR SALE: Hallicrafters SX-96 - $100; National NC-303 - $150; Hallicrafters HT-37 - $125; Collins 75A-4, SN 2500, 4:1 drive, 3.1 SSB filter - $350. Steve, KE4MN, (904) 327-4179

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

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FOR SALE: National NC-100, needs work - $50; Gonset G66B w/12 v ps, needs work - $15; RCA DX-77 ribbon; HRO-50 w/coils, spkr - $225; mic - $50; Hallicrafters SX-23 with PM-23 - $200; ART-13 w/ps, restored - $200; 833A - $20; (2) 4-1000 tubes - $75 each. Jeff Garrett, 2822 W. 55th Ave., Denver, CO 80221-1616 (303) 455-5658

WANTED: BC-342 rcvr, must be complete and unmodified. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

WANTED: Collins 30K; KW-1; Ranger I crystal holder; tubes - 4-125, 1614, 5AR4, 26Z5, 6000, 6082. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429.

FOR SALE: Collins 75A-4 with 3.1 and 6 kc filters and manual - $375; 4H4C tube, NIB - $15. **WANTED:** R-47 speaker. Evan Haydon, NØGMR, 4308 N. 15th, Lincoln, NE 68521. (402) 435-4083

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FOR SALE: Drake R-4B w/manual, very nice - $125 plus shipping or trade for IRE Proceedings. Bill Cheatwood, AB4SJ, 736 Spring Valley Rd., Montgomery, AL 36116. (205) 281-0970

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

WANTED: Globe Chief model 90 and WRL screen modulator model SM 90. Tracy Reese, WB6TMY, (707) 527-8124

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

WANTED: WW II military radio equipment: BC-966/SCR-695; ABF; ABK. Also want British and German WW II radios. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707. (714) 540-8123

WANTED: 5 mmf and 50 mmf vernier (Standard) capacitors for Boonton type 110-A QX Checker. Steve Kalista, HC-1, Box 137, Jim Thorpe, PA 18229.

WANTED: Matching speakers for 75A-4 (270C3), NC-303 (?), S-76 (?), 51S1 (?); HRO-60T w/ABCD coils, calibrator and speaker. Carter Elliott, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

FOR SALE: Eico 720 with 722 vfo, excellent - $90 U pay shipping. Gary Elliott, NO5H, POB 295, Epps, LA 71237.

WANTED: Matching speaker for NC-183; Knight T-50; Heathkit VF-1 and AR-3; RME-69; Globe screen modulator. Jack C. Shutt, N9CT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

WANTED: Table cabinet for R390a receiver, panel 19" x 10.5"x 14.5" depth. Robert Haworth, 112 Tilford Rd., Somerdale, NJ 08083. (609) 783-4175

FOR SALE: Hallicrafters receivers: S-85 - $75; SX-115 - $350; S-108 - $95; S-20R - $70. All with original manuals, ultra mint condition. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

FOR SALE: Hewlett Packard 330B distortion meter - $75; 206A audio generator - $50. Both excellent with instruction books. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405. (503) 345-2169

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.

WANTED: Tube test cards for I-177 tube tester later than 1952. Also data for TV-7U later than 1962. Copies fine. Earl Harris, K5FTE, (915) 592-9185 evenings, collect.

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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: 6L6GC, 6CA7/EL34, 6550A, 7027A and transmitting tubes of all types. Send list to Bob Booker, KØNT, 2120 S. Brownell, Joplin, MO 64804.

FOR SALE: Do you need meters for your vintage equipment? We have Triplett, Weston and Simpson 2" and 3" round and square meters in many ranges, also meters for VOM and tube testers. Write your needs, most are $10 each plus shipping. James Fred, R 1, Cutler IN 46920.

WANTED: ARRL Handbooks, most years 1932-1954. Tattered condition or missing cover o.k. I use not display. Thanks. Tom French, W1IMQ, 120 Great Rd., Maynard, MA 01754. (508) 897-2226

FOR SALE: Hammarlund HQ-180AC, not mint but works fine - $125; Collins 75A-4 vernier tuning knob - $100. Dan Radcliffe, KF9IP, 8201 Plainview Pkwy, Sussex, WI 53089. (414) 255-9165

WANTED: Bakelite square window for Viking I or II; manual for Viking I, copy ok. Louis Rodenbeck, WE9M, 245 E. Washington St., Mooresville, IN 46158. (317) 831-2712

WANTED: BC 191/BC 375; ARC-5 or SCR 274N xmtrs covering 2.1 - 3.0 Mcs or lower freq.; GRC-13; DX-100 xmtr; mica xmtr caps 100, 500, 1000 pf @ 1200-2500 v; Delco 5300 xcvr. John Freeman, POB 238, Hornbrook, CA 96044.

FOR SALE: URR-35 UHF rcvr - $65; SP-600 rcvr - $50. More equipment, parts, magazines, books, manuals, long list - $.50 (coins). Joe Orgnero, Box 32 Site 7, SS 1, Calgary AB T2M 4N3 Canada

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FOR SALE: HRO RAS w/ps and 3 tuning units - $125; HRO-W w/ps and 3 tuning units - $125; NC-125 w/spkr - $115; Tectronix 422 dual channel 15 Mhz - $150. U-ship. Michael,K2BN, (516) 599-6207

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WANTED: The big, square, 3-prong xtals that were used in TCS, tx and rx. Prefer SPAM freqs but will take anything, even duds to make adapters. Ted Althof, KA3TVH, 504 E. 9th, Tarentum, PA 15084. (412) 224-0905

FOR SALE: Viking II, good cond., works FB - $150; 75S-3, vg cond., extra xtals - $300; Thunderbold amp, vg cond. except bad plate xfmr - $250. Prefer pick-up. **WANTED:** Junker SX-9. Ron Skipper, 18801 Middleton Rd., N. Benton, OH 44449. (216) 584-2198

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WANTED: Buy and sell all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Road, Hugo, MN 55038. (800) 421-9397, (612) 429-9397, FAX 612-429-0292

WANTED: BFO, xtal and function knobs for HRO-60; also main tuning and band spread tuning knobs for HQ-129X. Al Coil, KO9S, 607 Countryside Lane, Hudson, WI 54016. (715) 386-5284

FOR SALE: Collins mech. filter F455 F21, PN 526-932-00 - $60. Dick Truax, K8GVU, POB 39451, Louisville, KY 40233. (502) 491-0914

FOR SALE: Six/Two meter Heathkit Seneca model VHF-1 xmtr - $120. **WANTED:** Two AX9909 tubes. Jo Sanford, WA6UCI, 5779 N. Date Ave., Rialto, CA 92376. (714) 874-8849

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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: Eico 751 w/AC supply/ speaker console; Eico 752 DC supply and D-104 crystal mike. Mack Fairley, AB4ZF, 506 Tallyrand Ave., Monroe, NC 28112.

WANTED: German PE 06/40, TB 3/750 and QB 3/300 tubes or any data about them. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93940. (408) 373-7636

FOR SALE: Mint SCR 522 WW II vintage, aircraft, transceivers - $50 each; BC 603 FM tank receivers - $40 each; BC 429 w/dynamotor unit - $50 each; 7 and 9 pin miniature tubes - $.99. Milton Levy, W5QJT, 539 McCarty #507, San Antonio, TX 78216.

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

FOR SALE: BC-454B aircraft receiver, unused in sealed unopened U.S. Army box - $50. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244

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.

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

FOR SALE: Boonton 260 Q meter; Collins filters 526-9365-031; Hallicrafters R45-ARR7 (SX-28); Gonset IV 2 meters; Hallicrafters Sky Buddy; T.R. McElroy bug 9/34; B&W T/R switch; Swan 14C; Drake TR7, PS7, MS7, 7077, SP7, P7, Aux 7 and service manual. Bruce E. Walther, W9QAH, 3000 McCulloch St., Stevens Point, WI 54481. (715) 344-9099

WANTED: 6 kc mech. filter for Collins 75A-3. Jim Hollabaugh, W6TMU, 774 Wisteria Dr., Fremont, CA 94539. (415) 651-6100

FOR SALE: Collins KW-1, SN 11, mint condition. Jim Shultz, 28 N. Manheim St., York, PA 17402. (717) 755-4214. Call at 6:00 p.m.

FOR SALE: Tuning units for BC-375 or BC-191. TU-6-B some wiring changes but all parts intact: TU-5-B, TU-7-B, TU-8-B, pristene condition - $20 each plus shipping. Joe Long, NM1V, (508) 664-3362

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 TRADE: My Western Electric tubes for yours. V. Vogt, 330 S.W. 43rd St., #247, Renton, WA 98055. (206) 251-5420 Ex. 247

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

FOR SALE: Babcock Radio mobile ps, input 6 vdc, output 325 vdc at 120 ma; National 1-10A rcvr w/all coils and manual; manual for Harvey Wells Bandmaster Deluxe; Drake C-4 console, R4C, T4XB, ps, SC-6, SC-2, CC-1, very clean. Best offer on all items. Roger Higley, W8CRK, (513) 451-1096

WANTED: Collins 302C-3 wattmeter case; clean Drake T4XC; vernier for 75A-4. Earl Harris, K5FTE, (915) 592-9185

CLASSIFIEDS

WANTED: Hammarlund split stator xmting condensors Type MTCD-100B and 100C; coil sets; B&W 3400 series inductors. Roland Matson, RFD #1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

WANTED: Audio driver xfmr for DX-100; modifications for DX-60; manual for DX-35; HR-10; Globe Scout. William R. Bogart, KA9CWK, RR 2, Box 50B, Covington, IN 47932. (317) 793-4660

FOR SALE: FT-241 crystal 0-79 - $40; ARRL books; over 80 classic rig manuals - SASE. **WANTED:** Military radios and manuals; BC-652; pre-1942 ARRL Handbooks; HQ-120X. Sheldon Wheaton, KCØCW, 14708 Murray Lane, Olathe, KS 66062. (913) 764-5436

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: BC-610 or T-368 xmtr; BC-610 160, 80 and 40 coils, JB-70 control head; R-390 manual. **FOR TRADE:** Johnson 500, new low plate supply from Peter Dahl, new cond. Mike, AA4TW, 1102 Virginia St., SW, Lenoir, NC 28645. (704) 758-4170

WANTED: Heathkit Monoband Mobile HW-22 and DC supply, will consider HW12 or HW32. Gary Elliott, K7OX, (602) 948-4772

WANTED: Manuals for Eldico R104 rcvr, T102 xmtr, P109 ps, S119 system info, copy ok. Gary Norman, AB1I, 17 Ridge Rd., Granby, CT 06035. (203) 653-6373

FOR SALE: Clegg Zeus and Interceptor B, 100 watts out, plate modulated, complete station - $250. Cliff Fleury, AI7Y, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

WANTED: Pre 1940 ARRL Handbooks; vfo for Harvey Wells TBS 50. Bob Schafer, WA7IHN, POB 442, Aumsville, OR 97325. (503) 449-1149

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

WANTED: Manuals for Viking II CD and Johnson 500. Ed Cain, 9702 Clark Pl., #103, Manassas, VA 22110. (703) 369-2703

FOR SALE or TRADE: Hallicrafters SX-117 and HT-44 w/all 10 meter and Warc band crystals for rcvr. **WANTED:** Drake C-Line. Jim Olson, N6IFO, 5820 California St., Apt. #1, San Francisco, CA 94121. (415) 221-1976

FOR SALE: Boonton GDO, no manual - $75; new AR22R rotor w/control - $39. Shipping extra. Henry Mohr, W3NCX, 1005 Wyoming St., Allentown, PA 18103.

FOR SALE: Superb Collins 75A-3, mint cond, cabinet, spinner knob, crystal calibrator, original manual, original paint - $295. Bob Lemanek, K8IVG, 14565 Garfield, Allen Park, MI 48101. (313) 928-6658 after 6 p.m.

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: Driver unit for Amplion horn speaker (Dragongly model); AR 102; set of coils for James Millen Grid Dip Meter type 90651. M. Ruggere, N3FPY, 504 Grill Ave., Shillington, PA 19607.

FOR SALE: German type FUG-11 LF aircraft xmtr with 3 "Wermacht" tubes, circa 1940 - $250; type SCR-522 and RA62V6 ac ps - $100; others. Nick Oland, W3DSE, (215) 378-1411

WANTED: Schematic/instructions for the CW sidetone modification for a Swan 350 transceiver. James L. Monk, W0JJL, 2207 Madison Ave., Norfolk, NE 68701.

FOR SALE: Complete Drake station: TR-4C #35356; MS-4 spkr/ps and RV-4C vfo, excellent condition - $425. Charlie Vaughn, KD4AJ, (404) 396-0276

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

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

FOR SALE: Sweep tubes: 6LQ6's - $11 each; 6MJ6's, 6KD6's - $11 each; 6SJ6's - $12.50 each. All new. **WANTED:** Viking or Globe 250 watt matchbox. Bernie, WA6IDY, 452 Oxford Dr., Arcadia, CA 91007. (818) 445-2891

FOR SALE: Hallicrafters HT-20; Johnson Desk KW w/Ranger. Skip Green, K7YOO, POB 595, Winona, MN 55987. (507) 452-4989

WANTED: Manual for Collins ARC-21 HF xcvr; AR-88 or similar model RCA HF rcvr. Don Cossaart, N4KYK, 2119 47th St., PIW., Bradenton, FL 34205.

FOR SALE: Collins 30S-1 with book and spare final tube. Lee Fouts, K7MBJ, POB 2894, Cody, WY 82414. (307) 587-9506 or 473-8544 after 6 p.m.

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.

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

FOR SALE or TRADE: RME-6900; RME-45; RME-4350; RME VHF 152-A; HQ-129X. All excellent with manuals. Alvin Bernard, NI4Q, POB 690098, Orlando, FL 32819. (407) 351-5536

FOR SALE: Mint HQ-140X w/speaker - $140; Gonset II w/vfo and linear - $125; NC-183 - $65. George Maier, KU1R, 64 Shadow Oak Dr., Sudbury, MA 01776. (508) 443-7083

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

FOR SALE: SX-100, very good - $150; NC-303, near mint, w/2 and 6 meter converters - $300. **WANTED:** Speaker for NC-183D. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 980-7698 days, (804) 979-7383 nites

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FOR SALE: Photocopied manuals for 51S1, 51J4, 75S3C, R4C, SPR-4, R-7A - $15 ppd. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

FOR SALE: T-368, AM/CW xmtr - $495; Johnson Desk KW - BO. Rich Smith, KF6EA, 1122 Via La Cuesta, Escondido, CA 92029. (619) 739-1835

FOR SALE: Brand new drum dial for R-388 - $50; Collins crystals, 42 assorted - $7 each or $200 for all. Bill Jenkins, WA5MWJ, 11916 Donahoe Bend, Fort Smith, AR 72916. (501) 646-3859

WANTED: Matching power supply for Hallicrafters HT-45 amplifier. Sam, N4VIB, (404) 695-5658

FOR SALE: National original manuals. HRO-7, NC-88, NC-109, NC-125, NC-140, NC-270, RDF66, Horizon 20. Ron Carver, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR SALE: Altec Lansing compressor, flat to 15 K - $125; 3 new Eimac 304TL tubes - BO. **WANTED:** SR-150; KWM2; 51J or R390a. Russ Hunt, W9HZD, 14 Siros, Laguna Niguel, CA 92677. (714) 363-8119

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

CLASSIFIEDS

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

FOR SALE: 1 KW PEP linear amp., mil spec, all vacuum caps and vacuum antenna relay, Delcon T-210, with instructions - $400; HQ-180 rcvr - $65; (2) HQ-110s - $50 and $65; Harvey Wells R9A rcvr - $50; Hallicrafters SX-140 - $50; SX-99 - $40; R-46B spkr - $20; Heath Cheyenne xmtr, vfo, AM/SW, w/ps - $50; 60 watt Triade mod. xfmr, M7AL - $25; 2 new variacs, panel mounting, 500 watts - $20 each; 1 variac, panel mounting 1 KW - $35; 5 new GL 813s - $20 each; 15 new 3E29s - $6 each; HRO-5 3 coil box - $15; Ten-Tec linear Model 405, 80-10 meters - $120; parting out a Ranger II. Plus shipping. Will trade for older ham gear. Roger Faulstick, KD4AS, 210 Mariah Ct., Merritt Island, FL 32953. (407) 453-3312

FOR SALE or TRADE: 51 years of QST, 1931-81 - $500 or HF gear or HF xcvr. K8SJ, Box 266, Girard, OH 44420.

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

WANTED: SCR-274N, ARC-5, TCS, ART-13 equipment: racks, mounts, shocks, controls, plugs, dynamotors, etc.; aircraft radio operator/navigator's wall lamp WW II bomber; ARB RX- operator's control; ART-13 TX pilot's control & all plugs; spkr for Collins 75A, 75A1, 75A2; 310 series exciter; 75A, 75A1, 75A2 rcvr w/spkr. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. (916) 623-4520

FOR SALE: Tubes all new in box. Eimac 7203/4CX-250B - $45; Eimac 7034/4X150A - $25; 832A - $25; 6350 - $50; 7854 - $50; 2E26 - $7. Ron Carver, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR SALE: NC 100A (special) - $125. **WANTED:** National MB-40L tank circuit; NC-200 S-meter; National Radio Flyers, catalogs. Neil Wiegand, WA5VLZ, 911 North Bend, Austin, TX 78758.

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.

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WANTED: 6 khz filter Collins mech. filter for 75A-4 (F455J-60); manual, original cabinet and RCA panel emblem for CR-88. Ron Carver, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR SALE: Harvey Wells TBS 50C with orig. vfo but no ps - $100; Heath Seneca 2 & 6 meter xmtr - $75; Collins 32 V series dial and vfo - $35; mod. and power xfmrs for Hallicrafters HT-9 - call; I.F. xfmrs for SP600 - call. Plus UPS. Roland Matson, K1OKO, RFD #1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

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: Conset 6 meter Sidewinder w/ps - $35; WW II FM packset BC-620J - $20; Heath OL-1 scope - $10. Rick Ferranti, WA6CNX, 254 Florence Ave., Arlington, MA 02174. (617) 646-6343

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

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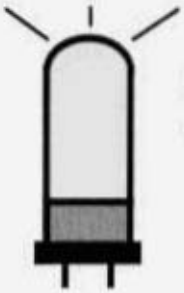

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