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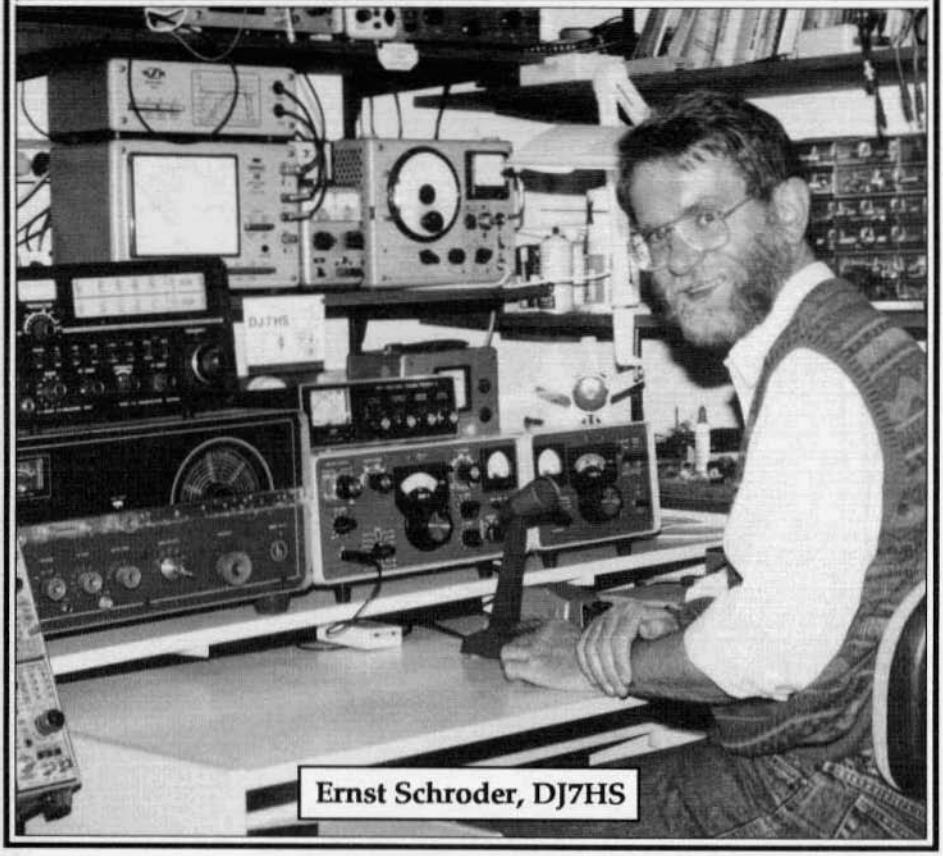
ELECTRIC RADIO

celebrating a bygone era

Number 38 June 1992



Ernst Schroder, DJ7HS

ELECTRIC RADIO

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REGULAR CONTRIBUTORS

WALT HUTCHENS,KJ4KV.....ELECTRIC RADIO IN UNIFORM
FRED HUNTLEY,W6RNC.....REFLECTIONS DOWN THE FEED-LINE
BILL KLERONOMOS, KDØHG.....VINTAGE PRODUCT REVIEWS
DALE GAGNON, KW1I..... AM REGULATION UPDATES

Electric Radio is published for amateur radio operators and others who appreciate the older tube type 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 to-wards 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 CW operator and the SWL. Good photo's 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

Recently, Jim Mann, K1TMJ, called with news that Tim Smith, WA1HLR, had suffered a devastating fire at his home in Skowhegan, Maine. Not only was his home destroyed but all his equipment, parts and vintage gear. A radio station, WHQO, which was located there, was destroyed as well. At the time of the fire, Tim was in New York State. A report in the *Central Maine Morning Sentinel* quotes the Skowhegan fire chief as saying that the fire is "suspicious".

According to Jim, there has been an outpouring of good will towards Tim by the AM'ers in that part of the country. I think we might all contemplate what it would be like to lose everything. For anyone who would like to contact Tim, his address is: RFD #3, Box 3695, Skowhegan, Maine 04976.

More on the ER Parts Unit Directory: A couple of months ago I talked about the Parts Unit Directory in an attempt to promote it. My efforts were only partially successful in that many people ordered the directory but too many people purchased whole units; so many in fact that about 50 had to be taken off the list. Lately I've been asking everyone I talk to - I get a lot of phone calls - if they have parts units they'd put in the directory and we're almost back up to 200 units. But we need more. Please consider putting your junkers or parts units on the list. Not only can you clear out your storage areas and maybe make a few dollars, but you can also really help your fellow collectors/restorers/vintage operators. Drop me a card or call with the units you have for the list. Remember: "Your dead rig can bring others to life !"

Another reminder that subscription rates increase July 1 - see inside the back cover for details. Subscribers that wish to renew - for up to 2 years - may do so at the old rates up until July 1.

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Cover: Ernst Schroder, DJ7HS, with his 'all hollow state' station. He says there are no 'solids' hidden under the table. Although he is operating the Hallicrafters HT-37 on AM, he says he is looking for a 'real' AM transmitter; something like a Ranger.

Reflections Down the Feedline

by Fred Huntley, W6RNC
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Nevada City, CA 95959

Fun on the Run: "Stealing" CW Traffic from NJQ

Down in the Caribbean, atmospheric static on 600 meters is something horrendous. It wasn't unusual to hear ships headed for the Panama Canal repeatedly calling NJQ in vain. NJQ was the U.S. Navy radio station at Gatun, near the eastern end of the Panama Canal. It was a low power station, on medium waves only. In the tropics, 600 meters, with its high static, is not much good except for short ranges, so NJQ was hard to contact.

In 1940, I was sailing from New York to Honduras and Guatemala as radio operator on United Fruit Co. banana ships. UFCO ships all were equipped with short wave transmitters but in those days many ships of other companies had only medium wave equipment with which to get their message traffic through.

After hearing another ship repeatedly calling NJQ, without success, I would turn on my transmitter and send "HR QSP VIA TROPICAL." Tropical Radiotelegraph Co. (TRT) was a UFCO subsidiary that had a network of short wave communication stations covering all of Central America—as well as the U.S. Gulf and Atlantic coasts.

The other ship's operator always gladly accepted the offer to relay, so I would take his message and then send it by short wave to either WNU New Orleans or WAX Miami. These TRT stations were in continuous contact with station HPN, the TRT station in Panama.

In a few minutes, the other ship's message got delivered. The operator on the other ship, as well as his captain, presumably were happy about this. The TRT Co. was happy to get other line radio tolls, which helped the profit margin, and I was happy because at the end of the trip, it added to my little bonus.

When our ship returned to New York, with its load of bananas and docked at Pier 7 North River (Hudson River) not far from Wall Street, I took my radio message abstract records over to Harold Ellis, the UFCO radio accountant at Pier 3. Ellis, himself an ex-ship operator, figured up my message bonus and handed me a voucher. I then went a few yards over to the cashier's window and presented my voucher. The cashier then handed me $3.00 in cash as my commission on the paid messages and other line relays I had generated for the TRT Co.

$3.00 was not to be sneezed at in those days. Freighter radio operators made $135.00 per month and across the street from Pier 7 you could get a basic lunch for 25 cents.

On trips to the Caribbean, I would usually snag relays from other ships 4 to 6 times. It was a pleasant break in the radio-watch routine, and when I arrived back in the home port, the bonus was "frosting on the cake" for me.

As for radio station NJQ, they probably never knew those ships were calling them, so I did them a favor. Over the past 15 years, I have occasionally listened on Sunday mornings, on 40 meter CW to the schedule of a group of ex U.S. Navy ops. who manned NBA and NJQ in Panama before WW II. There was W6ADK and other regulars talking about the good old days--but I never had the heart to break in and tell them this tale about how it used to be down there on 600 meters. (Later referred to as 500 kcs.) **ER**

With The Ready Reserve Fleet

by Marc Guitard, WA4IRE
23380 Carolwood Ln. #3201
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Recently, I returned home after serving with the Ready Reserve Fleet of Military Sealift Command U.S.N. during Operation Desert Storm and Desert Sortie and it's great to be back home after 7 months at sea. We carried ammunition and armored vehicles between Dammam, Saudi Arabia, and Europe.

The U.S.N. Ready Reserve Fleet consists of approximately 80 vessels and all were activated and most were in bad shape. Several vessels lost their power plants and had to be towed. One vessel even sank at the dock. Another was adrift for two weeks after losing its power plant.

Marc, WA4IRE, in the radio room of the S.S. Cape Juby

I was assigned to the S.S. Cape Juby as the Radio-Electronics Officer and as soon as I arrived on the ship they put me to work repairing faulty electronic equipment. The ship had recently been taken out of storage and much of the communication and navigation equipment was inoperative. With a little luck I managed to get all the faulty systems operational again. I stood watch 8 hours a day 7 days a week and after the watch was completed worked on faulty equipment and remained on call during the night for emergencies. There was a large alarm bell over my bed and it was quite effective in getting my attention when my services were required.

All vessels in the Ready Reserve Fleet are completely unarmed with the exception of fire hoses and axes and this fact was well known to Philippino pirates operating in the Southern Philippines. Two of our vessels were boarded and several crewman were badly injured and one was killed. We received no protection from the Navy and we were on our own. As a result, we stood pirate watches between the Philippines and Singapore. We strung lights all around the ship so we could spot anyone coming alongside and if anyone did, we would attempt to repel boarders with the fire hoses and evasive maneuvering. Fortunately, we did not have any incidents on our vessel.

We were told that the pirates were using very fast boats capable of speeds up to 30 knots. Most of the vessels in the fleet could make only 16 to 20 knots and were quite vulnerable. Apparently, the pirates were after the vessels' payrolls. However, they have been known to seize merchant ships and steal their entire cargo.

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ELECTRIC RADIO IN UNIFORM

by Walt Hutchens, KJ4KV
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"Military Miscellany"

Again our 'post' here has become littered with mail, second thoughts, and items too short to be a whole column. We are, therefore, assigned 'police duty' this month and will pick up the assorted litter, scraps of paper and filter tips until the First Sergeant says we're done or until dark, which ever comes last...

More On The SC-901X-A

'Whatzit' number two in the August 1991 column was an SSB receiver-exciter I had picked up at the Indianapolis hamfest in July. At the time I thought the nomenclature was 'SB-901' rather than 'SC-901' because the nameplate on mine is very badly faded.

Though the nomenclature isn't military, the set had had a successful career in the U.S. Air Force; I asked if any reader had information on it. The first answer came from none other than George Selatti, one of the owners of Fair Radio Sales Co.

"...see page S89-40 of our 1989 Catalog Supplement. SC-901XA is a receiver and exciter for SC-908 1KW power amp (and it) is powered by SC-901A power supply. We bought ours from a dealer in Kansas and have seen them on a DRMO (Defense Reutilization Marketing Office, the government office responsible for selling surplus – WH) sale in Grand Forks, ND. I believe they were used at Titan and other ICBM missile installations. We have the book on the SC-901..."

Next I heard from 1st Lt. Jim Dillon, USAF, NØKWA:

"I am a Minuteman missile launch officer... We have the SC-901X installed in our launch control centers. I believe that these units were installed in most ICBM launch control centers in the early sixties..."

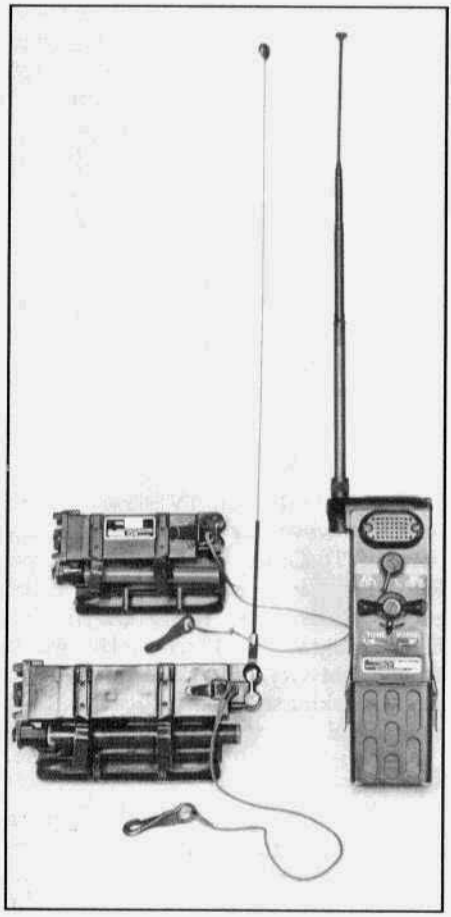
Then came a letter from Capt. Bill Kipping, USAF, KE7KK, which filled in the rest of the picture:

"I was introduced to the 901 in 1967 at Chanute AFB during Minuteman Missile Systems Analyst tech school. I first operated the unit after gaining a commission and being assigned as a Minuteman Missile Launch Officer in 1982.

"General Dynamics was subcontracted by Boeing to mfg. the rig as the HF comm. system for the Minuteman Launch Control Centers (LCC). There were six wings in five states with a total of 95 LCC's, each one controlling 10 remote unmanned launch sites. The production run was about 100 units, 95 installed and 5 spares (1962-1965). Power required was 120 volts at 400 cps from a motor generator set.

"The antenna system was a real gem. A huge 'soft' (not blast resistant) 80 ft. discone with five 'hard' pneumatic pop-up verticals as back-up antennas, to be deployed as needed in a post-attack environment.

"In the early '70's, maintenance of the discone was considered not cost effective and the antennas were removed at all the LCC's except the sites designated as SCP (Squadron Command Post): (this left) 19 sites with the discones. At the other 76 sites one of the pop-up verticals was left for receive only, with the power amplifiers disconnected.



Right, PRT-4 transmitter; Left rear, 'late' PRR-9 (XE-9) receiver; Left front, 'early' PRR-9 receiver. The early receiver is about 1" shorter than the late one. The early unit came from the Timonium (MD) hamfest – too late to make last month's column. Like most PRT-4 and PRR-9 sets showing up now it is a 'high mileage' unit and had been painted with a brush.

"By the early '80's, satellite and VLF comm. systems replaced the need for HF (which) was thought to be useless after nuclear attack anyway. The 901's were removed from all but the 19 command posts that still had XMIT/RECV capability (and even) these were deactivated in 1986-87.

"I operated the 901 on the ham bands quite a lot during idle periods of a 24 hour alert at the SCP at a base in Montana. The discone was a super 40/80 meter DX ant. and I worked many 'rare' ones. I tried the 901 on AM, but the duty cycle of the amp. wasn't up to it and popped the circuit breaker after about a minute. The drawbacks I recall (in ham operation) were the lack of fine tuning/RIT... Also the audio was fed to a communications panel and could be switched to a 4" speaker or handset; the transmit audio suffered due to the carbon telephone handset."

Captain Kipping provided a sketch of the discone antenna; it's a monster all right, 80' tall, 60' in diameter at the top and something like 100' diameter at the bottom.

So Whatzit number two is 'ICBM surplus'. I guess when you think about it, an ICBM launch control center couldn't depend on telephone lines. I got a copy of the manual from Fair Radio; now if I can just find a QTH big enough to hold an authentic 80 meter discone antenna...

More On The PRT-4 and PRR-9

Thank goodness for the other military collectors out there! I noted last month that my PRR-9 (XE-9) helmet receiver seemed to have a defective squelch circuit because the PRT-4 transmitter wouldn't cause the squelch to 'open' even when the signal was very strong. A few days later during a long rambling phone conversation about military FM sets, Arizona collector Dallas Watson said, "Doesn't the (XE-9) have tone squelch?"

(Army FM sets through the 1962 PRC-25 have squelch circuits which turn on the audio when a carrier is picked up; beginning with the PRC-77 the squelch is opened by a 150 cps tone transmitted by compatible sets. The tone is filtered out so you don't hear it in the received audio. When using a tone squelch receiver with a carrier squelch transmitter, you have to turn the squelch off; the VRC-12 series of sets -- our current vehicular gear – have a panel switch to select 'OLD' or 'NEW' squelch operation).

continued next page

ER in Uniform from previous page

Of course Dallas is right. I don't have all the manuals, but the story seems to be that PRR-9 receivers prior to the (XE-9) version have carrier squelch and can be used with any transmitter, but the PRR-9 (XE-9) squelch only works with the PRT-4A, PRC-77, and other tone squelch transmitters.

More On The PRC-77

When we talked about the PRC-25 (ER, September 1990), we noted that its replacement, the PRC-77 (which is identical to the -25 except for the squelch and using a transistor instead of a tube in the final), is still our current military backpack portable, 25 years after it was introduced. After the column appeared, I received the following letter from Mr. Reno Ruggere:

"The PRC-77 is a radio that I am familiar with. I have just retired as a Quality Control Rep for the Dept. of Defense and the PRC-77 was one of my contracts. I spent 37 years as a QC field rep for the Philadelphia Signal Corps and then with Defense Contract Admin Services. You are right: The Army keeps saying that 'This order will be the last' for the last ten years. Sentinel Radio is still producing this set... Tadiran (in Israel) built the sets under a special agreement with the Dept. of State; now they compete with U.S. manufacturers. However, all gov't contracts have 'buy American' clauses in them... (so they only compete with us for sales to foreign governments.)

"The most difficult part to obtain for manufacturers of the set was the four gang tuning capacitor. Not very many people were able to make them to specification.

"I have sent many of these sets to foreign countries. There is no doubt in my mind that even the Russians have had them for many years. One shipment went to Finland... never to be heard from again... no complaints at all. No doubt they were passed on to another government who could not complain."

Recently I heard of yet another contract for PRC-77's; evidently SINCGARS -- (Single Channel Ground Airborne Radio System, under development since the early 1970's as the replacement for all our portable, vehicular, and aircraft FM gear) is still not ready to be deployed. Does any reader know what is going on there?

'Secret Agent' Gets It Right

Military radio enthusiasts who watch war movies and spy thrillers are routinely disappointed in the portrayal of radios which figure in the plot. Usually when the hero (or villain) takes mike in hand it is connected to an unrecognizable pile of electrical junk. Even when a real radio is used, the directors often seem to go out of their way to get it wrong. In the recent film about the famous B-17, 'Memphis Belle', a received signal is tuned in on the BC-306 antenna tuner!

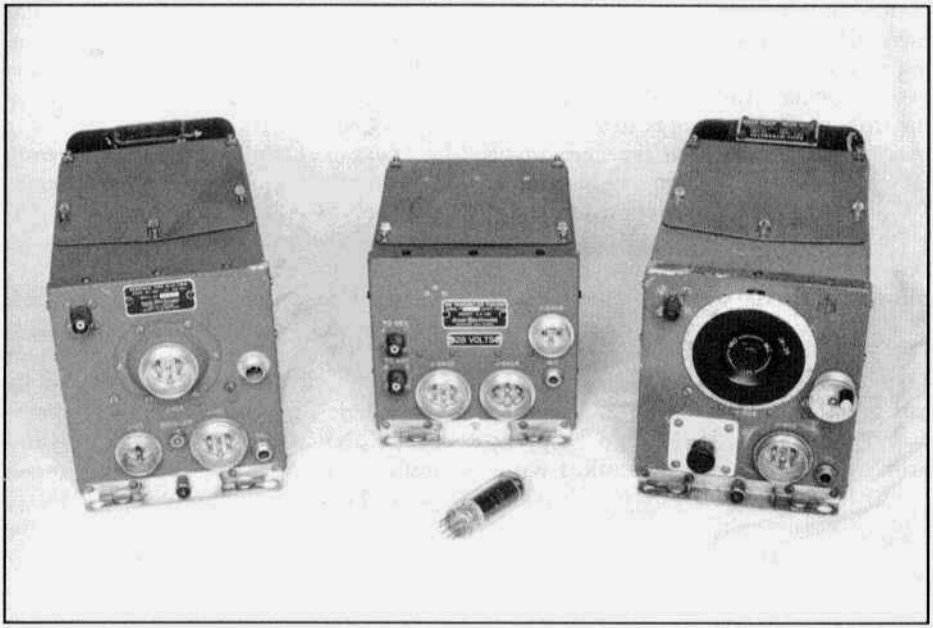
The 1960's British TV series 'Secret Agent', however, is a rare exception: in the episode 'To Our Best Friend' when the Russian spy is unmasked, a panel slides back to reveal -- a No. 19 Mk II! (The British designed No. 19 set was covered in ER for February, 1991). With its Cyrillic panel markings (and considering that it was actually supplied to Russia during the war) the No. 19 isn't a totally impossible spy set.

In another episode, agent John Drake is under cover with a group of mercenaries in the African bush; in one scene there's a brief glimpse of a BC-611 handie-talkie; again, a plausible piece of equipment for the situation.

Ah Spring...

When the daffodils and dandelions bloom, and the new Fair Radio Sales catalog drops through the mail slot to destroy your chances of getting any work done for at least one afternoon. (My XYL, Marie, says, "Ain't that the truth"!) This year's edition has a few real gems for the military collector:

- **The BC-1306.** This set came between the BC-654 and the AN/GRC-9; it is quite similar to the 'Angry 9' in power level and general design, but has only one band (3.8-6.5 Mcs) and is somewhat smaller. Most of the GRC-9 accessories were actually developed for the BC-1306; that's why



Some ARC type 12 sets. Left to right: R-15 receiver, T-13A transmitter and R-19 receiver modified as described in the text. This transmitter uses 5763's as oscillator, multiplier, final, and modulator; earlier models used 6AQ5's and delivered about 2 watts of output. The transmitter gets plate power from the receiver dynamotor.

the spare parts box, for example, is BX-53, rather than having modern 'CY-xxxx' nomenclature.

-**The GRC-9.** Both NATO surplus transceivers (made by French and German companies; workmanship on those I've seen is excellent) and an amazing range of accessories are available. The GRC-9 has become the most popular set for hams wanting to get their feet wet in WW II military radios. Fair also has extra receivers; this battery operated unit is used by several military set enthusiasts as a vacation takealong or bedside radio.

- **The GRR-5 receiver.** This U.S. Army general-use communications receiver covers 1.5-18 Mcs in four bands and has a RF gain control and a BFO but no crystal filter. Power supply (6, 12, 24 VDC, or 115 VAC) and loudspeaker are built in. Ideal backup for any WW II or Korean War-era HF setup.

-**TM 11-487A.** "Directory of Signal Corps Radio Equipment, Radio Communications Equipment", (Department of the Army, August 1950), full repro., 246 pp. Brief summary info with photos of many ground radios of the WW II period. A lot of this stuff isn't very interesting (there are a lot of large commercial transmitters with military nomenclature, for example) but this is the best one-volume reference available.

-**TM 11-310.** "Schematic Diagrams for Maintenance of Ground Radio Communications Sets", (War Department, 1943), part repro. Schematic diagrams and other essential maintenance info for 32 field and vehicular radios of the WW II era. In addition to all the common ground radio sets (BC-312, BC-654) this has some truly rare units – where else would you find a diagram of the BC-148 or BC-745? Also noteworthy are the 'Common Faults and Corrective Measures' and 'Locating Trouble' sections, which go far beyond the "Fila-

ments not lighted – check tubes and filament power supply" type of troubleshooting info in most manuals; this is handy even if you have the manual for the set. In the front of the book are both a VT-number to commercial tube type crossover table and one going from commercial to VT-numbers as well as other useful data.

Both of these manuals are good quality xerographic copies (even the photos are clear) with the diagrams in TM 11-310 reproduced in one piece on 11"x17" fold out sheets where necessary. Unfortunately, because they are not ground sets, the SCR-274N command sets and the BC-348 receiver aren't covered in either book. I wonder if the Army Air Force published similar volumes for aircraft radios?

- **The FRR-59A Receiver.** The answer to the question, "What weighs 300 pounds, covers 2-32 Mcs and is fully synthesized using miniature tubes?". This is one of the best (and certainly one of the most complex) vacuum tube receivers ever built. A 'must' for the truly fanatical collector of National Radio Co. equipment. We had one (under 'AN/WRR-2' nomenclature) aboard the U.S. Navy ship on which I served in the early '60's; it was used for copying the classified fleet broadcast because our R-390's were not stable enough to work reliably with the automated decryption gear.

- That hard-to-find connector for the R-392.

As usual, some of these items are 'quantities limited' and may not be available by the time you read this.

A Note On The ARC Type 12 Receivers

Not to be confused with the AN/ARC-12 (a UHF transceiver and a different animal altogether), these sets were developed by Aircraft Radio Corp. (hence 'ARC') around 1950 and look much like the famous command sets. They were used both in civil aviation and by the military in helicopters and other light aircraft. The system includes tunable receivers for 108-135 Mcs, 118-148 Mcs, 190-550 kcs and 520-1500 kcs, two small five-channel crystal controlled voice transmitters for the VHF part of the frequency range and many accessories.

These sets have had little attention from hams. In the case of the receivers, that is probably because they had no 'local' tuning dial, being used only with remote control boxes connected by a flexible shaft.

The construction of the receiver panel and tuning capacitor, however, is enough like the command sets that the command receiver parts can be installed. You must drill the necessary holes in the capacitor frame and mount the gears and dial taken from a junked command receiver tuning cap. (The holes must be drilled very accurately or the gears won't mesh correctly.)

Remove the connector in the center of the panel to allow room for the dial. An RF gain control can be mounted on a small plate replacing the connector at the lower left of the panel; power connections are made to the remaining six-pin connector. Then calibrate the dial; any of the knobs used on the command receivers will work. The result is a handy receiver for civil aviation frequencies or AM use on two meters; by tuning slightly off center it works pretty well on ham FM signals as well. These sets turn up regularly at 'fleafests' and the usual surplus dealers; they're common enough and of such limited historical interest that I have no trouble suggesting a conversion.

An 'Official' Source for Military Manuals

In the June 1992 issue of QST, the 'Lab Notes' column (devoted this month to sources for documentation) are the directions for obtaining copies of manuals for military equipment manufactured between 1940 and 1979 from the National Archives. It's complicated and (at $0.25/page) not cheap, but for the really rare ones this might be your only choice. Check the center of page 68...

Six specialized military radio test sets. Clockwise from front center: ID-292/PRC-6, the channel alignment indicator used when installing a new crystal to change the channel in the PRC-6 handie-talkie; GRM-55 used to localize trouble to a particular module on the PRC-25 backpack set; ID-1189/PR, the channel alignment indicator for the PRT-4 and PRR-9; ME-61/GRC, a field strength meter for use with sets such as the GRC-9 and GRC-19; IE-36 test set for the SCR-522 VHF aircraft set and the PRM-32 GO/NO GO tester for the PRC-90 survival radio. I usually try to get test sets for the most interesting military radios but collecting this equipment could be a hobby in itself.

The Old Military Net

Been wondering where to find fellow military set 'nuts'? The answer is 3885 kcs, every Saturday at 0500 Eastern Time. 'Regulars' include Ted, W3PWW, with an SCR-188 (BC-191 transmitter, RA-34 power supply, and BC-312 receiver); Pete, WB2JWU, with a restored SCR-274N command set station; Charlie, KA1GON, usually with a T-368; Steve, KJ8L, with a GRC-9 (Yes you can hear a 6-watt AM signal from Ohio, when conditions are good); Chris, AJ1G, with a GRC-9, and a No. 19 Mk II; Dennis, WA3YXN, with a restored ARC-5; and Brown, WA1MZR, with an assortment of modern sets including a URC-32.

Net participants are asked to zero beat closely and keep transmissions short but a military set is not required -- only an interest in military gear. There's hardly a set that hasn't been seen by someone on the net; every week brings an exchange of advise, sources for parts (sometimes offers of the parts themselves) and help in identifying at least one black, olive drab, or aluminum box. And you will never hear complaints like "Sorry, OM, you need more power" or about your audio not having that 'east coast sound' -- a main purpose of the net is to provide a home for those weak carbon mic signals and after all, we all run the same kind of gear. **ER**

The HT-6 and HT-9: Hallicrafters' Chevy and Buick

by Mike O'Brien, NØNLQ
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Two of the earliest successful commercial ham transmitters grew out of a business philosophy that might've been expressed as: "What's good for General Motors is good for The Hallicrafters Co."

In the late 1930's, Hallicrafters was the sales leader among American manufacturers of serious shortwave receivers and was making inroads in the ham transmitter market as well.

Bill Halligan had lured young engineering whiz, Bob Samuelson away from Collins Radio in Cedar Rapids, Iowa, to head up Hallicrafters' transmitter design team in Chicago in the spring of 1938. (See "Recollections of a Radio Engineer," ER No. 8 and 11.) Samuelson promptly produced the HT-1, a 100-watt CW, 50-watt phone rig. He followed up with the more powerful HT-4, better known as the military workhorse, BC-610.

However, Halligan was a shrewd businessman as well as an enthusiastic ham, and both traits left him wanting another transmitter.

"Bill's marketing approach took a cue from the automobile industry," recalls Samuelson, today living in comfortable retirement in Phoenix, Arizona. "Bill wanted a lineup of models with one to fit the pocketbook and needs of every ham. And he wanted to bring out new models to make use of the latest components and techniques."

The HT-1 was priced around $200, a good match for Hallicrafters' SX-17 ($140) and SX-23 ($120) receivers. The HT-4 cost about $750 equipped with the HT-5 speech amplifier, and Hallicrafters offered a magnificent mate for high-roller hams— the DD-1 dual-diversity receiver, with a price tag of $550.

However, most hams' budgets could be stretched only far enough to allow purchase of the S-20R Sky Champion ($49) or the SX-24 Skyrider Defiant ($69). "An obvious conclusion was that the transmitter line needed a low-price leader to go with those receivers," says Samuelson. "I said: 'Lets shoot for $100.' Bill came back with: '$99 sounds better.' "

Thus was born the HT-6. If the HT-4 was Hallicrafters' "Cadillac" transmitter in 1939, the HT-6 would be its "Chevy."

Samuelson was given virtual free rein in his design work at Hallicrafters. During his three years in Cedar Rapids, he had worked in the formidable shadow of the legendary Art Collins. "Art was a genius," acknowledges Samuelson. "He'd accept orders to do all sorts of crazy things, and somehow we'd manage to get most of them done. Art gave us quite a bit of freedom, but he didn't hesitate to get his nose right into the middle of what we were doing. If we were having a problem, he'd look it over and then say something like: 'Let's try a condenser at this point here.' And quite often, he was right."

Bill Halligan, on the other hand, "Was more interested in the appearance of his products," Samuelson says. "Of course, he demanded good performance; he was a ham and he knew what the radios ought to do, but he pretty much left it up to the engineers to figure out how to make the radios do it. Bill attracted good people. He knew everybody in the plant by name. He had a helluva sense of humor. He could be tough— he could chew us out one guy at a time, or as a group. But he was fair, and he created a great work atmosphere. We all felt tremendous loyalty toward him."

Halligan concentrated his efforts on business matters outside the plant. "There were many days when Bill didn't come in 'til noon because he'd been out in the bars on Rush Street with customers the night

Dr. R.E. (Bob) Samuelson

before," Samuelson says with a chuckle. "And he treated suppliers really well, too, so we usually got first crack at new components as they were developed."

Up-to-date components were utmost in Samuelson's mind when he began to sketch circuitry for the HT-6: "I had been intrigued with the new 807 beam power tetrode, along with its cousin the 6L6. Calculations showed that I could count on the 807 to deliver a good clean carrier output of 25 watts with clean 100-percent modulation from a pair of 6L6's in class AB. For grid excitation to the 807, a single 6L6 tuned crystal oscillator was adequate, at least down to the 20-meter band."

However, a transmitter covering 160 to 20 meters fulfilled neither the design nor the sales goals. Despite the price constraints, Samuelson and Halligan wanted a true "all-band" rig, one that would tune all the way to 60 mHz to include the 5-meter band.

"To be on solid ground in designing for the higher frequencies, I set up a breadboard test circuit with a 6L6 driving the grid of an 807," Samuelson recounts. "Tests confirmed that the 6L6 wired as a conventional crystal oscillator was a bit tricky with a 10-meter crystal. With a simple addition to the input crystal coil set, the 6L6 was wired as a 'tri-tet' oscillator, with a 20-meter crystal doubling in the plate. This worked fine for 10 meters, but a similar test with a 10-meter crystal doubling to 5 meters again was too tricky. So I made provision in the coil set for extra contacts to add a 6J5 as a 10-meter crystal oscillator doubling in the 6L6 for 5-meter operations only."

A 6F5 microphone amplifier, a 6J5 audio amplifier and two 5Z3 rectifiers completed the tube lineup. Convenient band-switching was a Hallicrafters hallmark, but the HT-6's modest price tag imposed limits. Samuelson settled upon a scheme whereby coils for three bands could be plugged into chassis sockets and selected by a rotary switch on the front panel. Each ceramic coil form sprouted braided leads used to tap an integral pickup coil for antenna matching. The output circuit was designed to match resistive loads from 10 to 600 ohms. A pair of insulated feedthrough terminals on the side of the chassis served as antenna feedline connections.

It was determined that a cabinet 20 inches wide, 9 inches high and 15 inches deep would be required to house the assembly. The exterior was painted in gray enamel. Three hefty Stancor transformers helped boost the weight to 65 pounds.

A 0-200 milliammeter was switched to monitor plate current on the oscillator, modulator and final amplifier tubes or grid current on the final. Other front-panel features included an audio gain control; a phone/CW switch; a knob and logging dial to adjust the variable capacitor used to resonate the final tank circuit; and power on/off and transmit/receive toggle switches.

"The first ad for the HT-6 appeared in the May 1939 QST," notes Samuelson. "We must have done something right, because the ad in the August issue four months later boasted that production of the HT-6 was in its fourth release (production run)."

True to Halligan's target, the price was listed as $99 (although soon thereafter it rose to $110). However, again as in automobile marketing, there were extra-cost

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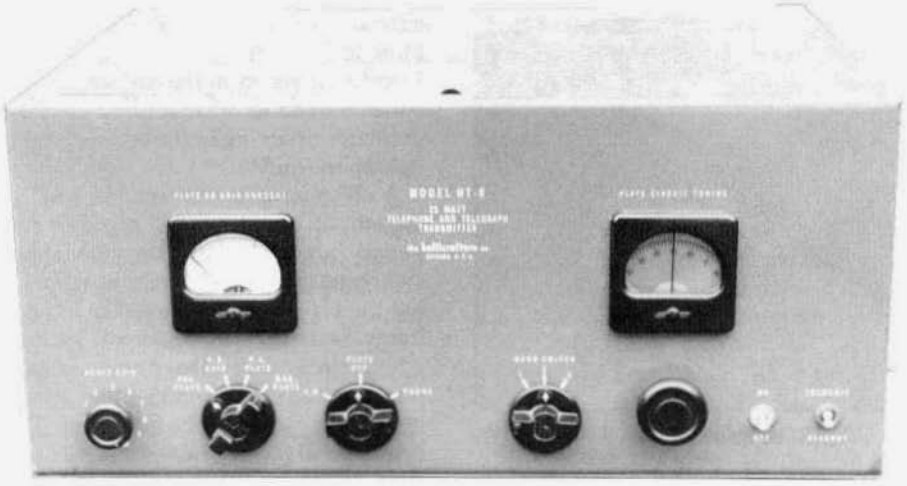

The Hallicrafters HT-6 (Chevy)

options. For instance, coils weren't included in the base price. Coils for 160, 80, 40 and 20 meters were available at $4.95 each. The special coil sets for 10 and 5 meters cost $6.95 each.

The HT-6 was designed for crystal frequency control. However, the Hallicrafters ads also spoke of "electron coupled oscillator units" to replace crystals and allow frequency to be shifted at the twist of a knob. ECOs were listed for 160, 80, 40 and 20 meters at $3.85 each. Samuelson doesn't believe many ECOs actually were produced. "I let a young engineer named Norm Foot play around with an HT-6 and he came up with the ECO," Samuelson says. "All it really was, basically, was a trimmer in a can. I know we made some, but I think most hams used crystals. Just because the ECOs were mentioned in the ads didn't mean they were actually being produced in great quantity. We wouldn't allow something to be put into an ad unless we knew it was possible to do, but we may not have actually done it yet."

Early HT-6 ads also mentioned the RK39 as an optional substitute for the 807 final amplifier tube. "That puzzles me," Samuelson confesses. "The transmitter literally was designed around the 807, and as far as I know 807's were installed in every unit that left the factory. I guess it's possible that at some point 807's were hard to get and we figured out something that would fit in its place – but I honestly don't remember that."

HT-6s still were being manufactured by Hallicrafters as late as 1945. No official production totals are available, but Samuelson is certain that at least "several hundred" of the sturdy little transmitters were built.

Not long after completing the HT-6, Samuelson turned his attention back to his first creation for Hallicrafters, the HT-1. "Somewhere along the way, probably back at Collins, the idea had been drummed into me that good engineering was a matter of taking something that works and making it better," Samuelson explains. "The HT-1 developed a good following with hams – a great value for $199.50, with a cabinet design acceptable in many households. However, as soon as it was in production, I began to see changes that could offer improvements."

Although Samuelson had been licensed as W9RAD, he was not active on the ham bands. He worked long hours, and when he did manage to get time away from the

The Hallicrafters HT-9 (Buick)

plant, he preferred to devote his attention to his wife, Marcy, and their daughters. Eventually his ham ticket lapsed. Nonetheless, Samuelson frequently heard from operators who were using his creations. "I took their input seriously," he notes, "and their comments often proved useful."

When suggestions from hams and Samuelson's own observations began to jell into proposed improvements for the HT-1, Samuelson initially was told by Halligan, "In no uncertain terms that I was not to interfere with production" of the popular transmitter. So, he says, "I retreated to my notebook with ideas for simpler circuits, newer tubes, better plug-in tuned circuits, etc., and waited for a proper time for a new, modernized model."

The "proper time" came on the eve of the new decade. "The war began in Europe and it was obvious that the best radios possible would be needed in emergencies," Samuelson recalls. "Bill finally agreed with me that a modernized HT-1, to be named the HT-9, would be our new 100-watt leader."

Positioned between the HT-4 "Cadillac" and HT-6 "Chevy," the HT-9 became Hallicrafters' "Buick."

Samuelson discarded the HT-1's RK47 final amplifier tube in favor of the newer, more efficient 814 beam power tube. A pair of 6L6s replaced the 6A6 driver tubes. Most of the HT-1's power supply and audio circuitry was retained, including the use of four 6L6 modulators connected in push-pull parallel. Fourteen tubes were employed altogether in the HT-9, including a 6SJ5 first speech amplifier, a 6J5 second speech amplifier, and five rectifier tubes – two 5Z3s, two 866s and one 80.

At Halligan's insistence, the HT-1's bandswitch had included all tuned circuits, including the high-voltage final tank circuit. Careless switching while RF was flowing meant burned contacts and a costly repair job. Samuelson successfully lobbied for a simplified band-switching scheme. Thus the HT-9's five-position bandswitch selects low-voltage oscillator and exciter circuits, but the final tank circuit employed plug-in coils. As in the HT-6, antenna matching was accomplished by tapping a coupling coil that was wound around the final tank coil. Coils were available for any frequency between 1.5 and 18 mHz, plus the 10-meter band.

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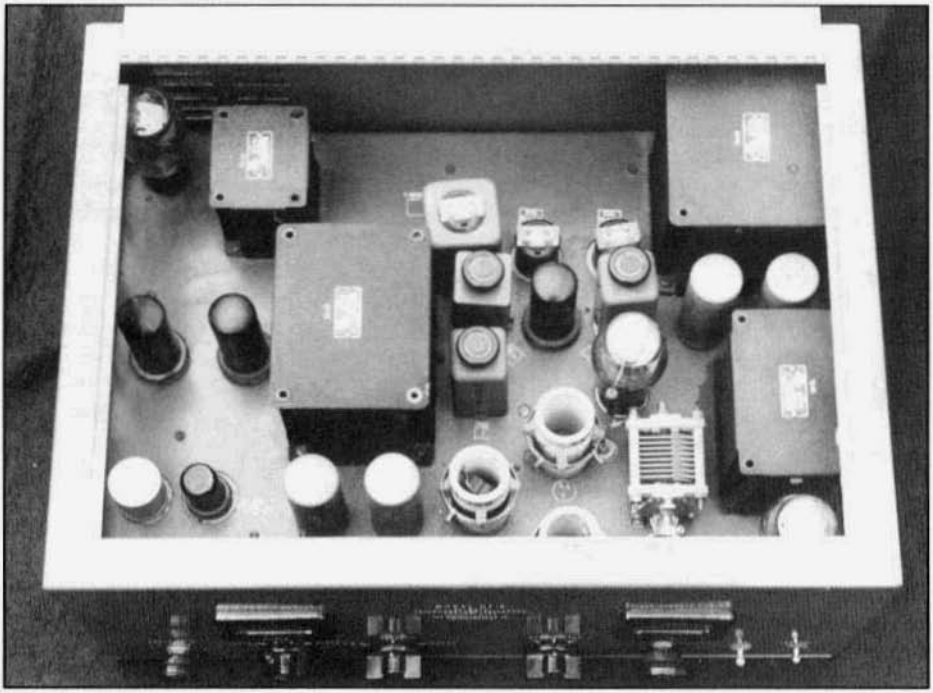

'Under the hood' of the HT-6

The HT-9 abandoned the HT-1's art deco styling and chrome trim in favor of a no-nonsense rectangular cabinet. However, the transmitter's dimensions remained substantial for a table-top rig: almost 30 inches wide, a foot tall and 20 inches deep. Weight was a hefty 120 pounds.

A good share of that weight was concentrated in the seven transformers mounted on the HT-9 chassis. However, even they weren't sufficient to supply total power requirements. A 45-volt dry-cell battery also was needed. "That was the easiest way to get good grid bias on the 814 and really clean keying," Samuelson explains. "We keyed the oscillator and had to keep constant bias on the final, and a battery was the simple way to go." A two-year life was predicted from the battery under normal use.

The HT-9's front panel featured an impressive lineup of three milliammeters. Two constantly monitored the 814's grid and plate current. The third measured cathode current in the exciter and modulator stages.

The HT-9 was announced in early 1940 at an introductory price of $199.50. Coils were extra, at $9.75 each. When America entered World War II the next year, the military put many HT-9's to use. The Army Signal Corps designation for the rig was T-173/FR.

Production continued throughout the war years. In the 1942 edition of the ARRL Handbook, Hallicrafters advertised the price of the HT-9 as $225. Hallicrafters literature indicates manufacturing of the HT-9 ceased in 1945, but the transmitter continued to be marketed for another three years as "a real ham rig, with medium power and maximum flexibility." The advertised price in 1947 was $250, and by 1948 it had climbed to $350. By 1950, the new HT-20 was filling the 100-watt market niche for Hallicrafters, with more modern tubes and effective TVI shielding.

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LETTERS

Dear ER

Noting that inflation has caught up with you, and wishing to live up to my name [McDonald], I will be an eternal optimist and renew at present rates. Reason for declaration of optimist is that I am right nigh to 77 and hope to have to renew in two years...nuff said.

I really enjoy your mag, being an ole receiver man, in more ways than age alone. First became interested in radio during highschool years in early thirties, and when I joined USN (to eat) back in '35, was fortunate enuff to show some signs of gumption, so had choice of the schools offered at termination of boot camp. From process of elimination, I chose Communications Clerical, hoping to not get stuck pushing pencils. Was lucky, if you can call stuck at desk with pair of heavy fones stuck to your ears and code coming out faster than you cud copy, dinning itself in for hours at a time. Finally escaped and went into fleet aboard USS Truxtun DD229, one of the two WW I era four-stack destroyers with so called patent anchors, the rest of that class being configured for Navy anchors (kind on CPO hat)...from there on it went from one thing to another, until I ended up at NPM receiving station, Radio Wailupe, until our Japanese friends caught us "Asleep at The Switch" as my friend DA Yetter sed...

However, during latter portion of tour at NPM was lucky enuff to get assigned to Materiel gang, which duties covered keeping the twenty or so HF and IF receivers, as well as the space diversity system operating. Also got to climb 70 foot poles, which task I did not care much for... from then on; got ticket in '39, K6SDM. Had KH6JL for about year or so after war, then when returned to states, got old call back, except for a W prefix. Alla time playing around with receivers, building or trying out commercial units, including BC 348R (had it 40 years, selling it only when I fixed up basket case 348Q which seemed to be somewhat better from dial readout accuracy, less drift, and very good operation of xtal filter, considering how most of them worked).

I follow articles on trouble shooting tips with interest, and find out things I had never run into. However, I have had interesting happenings also, such as positive voltage at diode load resistor (caused by breakdown in the plastic insulation materiel used in the IF transformers, allowing B plus to leak over to diode load terminal) ...had that happen twice in short period of time, and never again, so guess mfr must have caught problem...

Enjoyed meeting W6HDU, and enjoyed his article on AR 88, since I sold him the first one I had, and went right down and bought another one... never have regretted that... An old TV serviceman told me once that RCA stood for Real Crappy Apparatus (back in the days of the infamous TS 630 RCA TV set) and while I tended to agree with him up until I got first AR 88, with no identifying marks on it, and still am not convinced that all products bearing that logo are of superior quality, I will say that I am impressed with the AR 88.

Had occasion to pick up gear train (spare parts box) for AR 88, and it was impressive. 100 to 1 ratio, each spring load split gear having balls at each end of hub, with a fine threaded adjustment at one end, to allow absolutely no backlash, even as the receivers tune. Unsurpassed by any other receiver, I think, for ease of tuning and freedom from backlash. No matter how good receiver is electrically, if the tuning aggravates you, it is a pain in posterior. Black mark for Collins, with feel of 'stick transmission in January' feel to the tuning. Of course, having had a Canadian AR 77 receiver by RCA, can say even more vehement things about them, with their string actuated mask operated hunks of tin, shaky feel to everything, so I cuss 'em all out at times... worst thing about AR 88 is weight.

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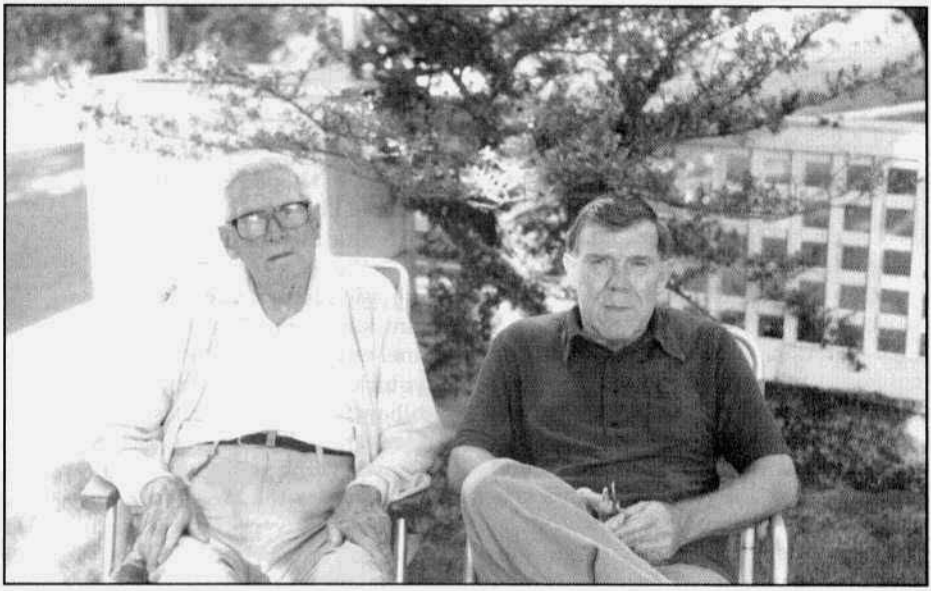
Ozzie Diaz, WB6ICM, one of the regulars on the 14.286 AM net. The station shown consists of a Johnson Viking II, 122 vfo and National NC-300 receiver.

Ron Reu, WBØLXV, sitting at his Johnson Desk KW. He's modified this transmitter for use on 160, using W7FG's mod. He also uses it as an amplifier with a CE 10B SSB exciter. Ron is very active working all bands 160-10.

Merle Crowley, W1GZS, with his Johnson Desk KW. Also shown is a 75A receiver, 32V transmitter, National NC-300, Ranger II and a Johnson Valiant.

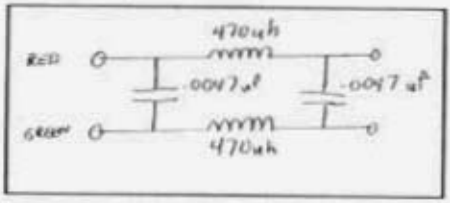


James Millen, W1HRX, and Bruce Kelley, W2ICE, ex-W8ACY. This may be one of the last pictures of Jim Millen, W1HRX, of National Company fame, who became a Silent Key in 1987. Millen designed National receivers until 1939 at which time he formed his own company. A description of W1HRX's high power AM transmitter, now in the AWA Museum, will be featured in a future issue.

Collecting/Repair/Restoration...Tips

Telephone Filter

This is a nice telephone filter I have used with great success here in Erie. I heard someone describing it on the air, so I don't know who first came up with it, but I have four of them around the neighborhood and it keeps my Valiant out of the phones! I enclosed the entire filter in one of those dual female 4-conductor modular splices, with a 6 inch modular-to-modular cord to go right into the neighbor's phone. This way, there is no direct modification to the phone itself, and the filtering is done right before the phone.



The caps are standard disc caps and the 470 uH chokes can be purchased from Mouser Electronics, part number 43LQ474, for less than $1 each.

Steve Miller, WA3JJT

4H4C Ballast Tube Replacement

The following information is contained in National Bulletin number FSN-41 dated November 23, 1956.

"In instances where the 4H4C current regulator tube [used in the HRO-60 and NC-300] repeatedly fails, our Engineering Department recommends that the customer discard the 4H4C altogether and replace it with a 6V6GT previously recommended as a temporary substitute.

"The additional drift caused by this substitution will not exceed 250 to 300 cycles at 29 Mcs, which is negligible."

Robert J. Murray, W1FSN
Service Manager

Tom Rousseau, K7PJT

KWM or S-Line Touch-up Paint

I got this from Doug Morgan, KH6U. If you want to touch-up small nicks or scratches on your KWM or S-Line series front panel, Doug found an exact paint match. It is made by Testors Model Paint, available in 1/2 oz. bottles at model and craft shops. It is called "Testors Model Master, Custom Enamel System #FS16081 Navy Gloss Gray" enamel. This is a high-gloss paint and you may want to knock it down a bit, especially if your panel is old and has lost some of its luster. I wait until the paint is tacky and then just barely touch the repainted area with the tip of my finger. This will dull it up enough that you will never see the retouches. You can also buy some very nice, inexpensive, touch-up brushes made by Testors. They come in three sizes to a pack for about $1.50.

Pete Brown, KH6IRT

R-390A Front Panel Restoration and PTO Repairs

I read with interest Dave Metz's tips on restoring the R390A frontpanel. While he certainly has a good method, perhaps readers would be interested in a quicker way.

Antique Electronic Supply [see their ad inside the back cover] has available "lacquer stick" in various colors. These are paint sticks which may be rubbed into panel engravings and knob index marks to quickly and easily restore the original brilliance. Since the paint is semi-dry, any excess around the engraving lines can be removed with a paper towel. It takes about two days for the lacquer to completely dry, and afterwards the new surface may be waxed or "Krylon'd".

I've also been in correspondence with Dave regarding R390A PTO repairs. He has come up with a really good way to calibrate the PTO and I would like to pass it along.

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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. AM Swap net Thursday nights, 7:30 PM on 3885; **160 meters** - Gray Hair net every Tuesday at 8:00 PM EST on 1945. Mostly sporadic summer-time activity but during the winter signals can be heard anywhere on this band.

From the Editor:

15 Meter AM Net Report

Bill Kipping, KE7KK, who announced the beginning of a 15 meter AM net last month, sent in the following report: "I'm happy to report we are off to a great start. On Memorial week end, Saturday, the following stations were present with the group: K4DEE, Jim (FL); K1GUP, Jerry (ME); KH6RIT, Pete (HI); N5LZB, Chris (TX); W1CKI, N5QVQ, Ed (TX); WDØIRU, Ken (MO); K5ATT, Tom (TX) and N7MCC, mobile/4, Monty running 4 watts (NC). Although conditions were only fair, we were able to keep things moving and had a fun time. There is life on 15 meter AM!

The 15 meter AM net meets Saturdays at 2000 UTC on 21.415.

Letter to the Editor from Walt Hutchens, KJ4KV

Dear Barry:

I checked into the vintage SSB net this past Sunday, with the NCX-5 and came away wondering why I bothered. Don't know what connection you have with that, but since you have been promoting it, I will express my thoughts to you.

Part of the problem is the nature of 20 meters; I was rarely able to hear anyone but net control. However, this feeds a larger problem, which is that there's absolutely nothing interactive about this net. You check in, give your info, and ... bye-bye. This is not wrong (anyone who wants to run a net has the right to do it as he pleases) but it isn't much fun.

What I would have liked to see is something closer to the military net where participants do most of the talking and have a chance to get to know each other, discover who has the same interests, and share problems and solutions... I, for example would like to have found other NCX-5 (and now WRL Duo-Bander II) owners.

As I say, this is partly just the spotty nature of 20 meters, but it is also partly the way this one was run. There may be no choice (there may be too many checkins to allow any sort of roundtable) but I'm not sure what the point is, if it has to run this way.

When we get to this point on the military net (next season, I expect; we average 12-14 checkins now and it takes us 1 1/4 to 1 1/2 hours to get around twice), we will either start a second section or begin earlier and suggest that some early checkins go to listen mode. I have raised this as an issue several times on the net; we have no decision, but awareness has been raised and when we need to do it, we will.

Maybe the vintage SSB net should be a couple of nets on 40 – one on each coast or something like that. That would both let more players hear each other and reduce the number in each group to a more manageable level. A vintage SSB net sounds like a great idea, but my impression is this isn't it.

73, Walt, KJ4KV

The Howard 438

by Jim Hanlon, W8KGI
P.O. Box 581
Sandia Park, NM 87047

"The Howard Radio Company of Belmont Avenue in Chicago was a long time manufacturer of broadcast receivers. From 1938 to 1942, Howard offered a full line of communications receivers. They had a full-page advertisement in the 1946 ARRL Handbook promoting a post-war line of quality receivers but were never heard from again. We believe they never did produce a post-war receiver." Such is the report by Raymond S. Moore in Communications Receivers on Howard Radio.

But even though they did not survive after the war, Howard did produce an interesting and innovative series of radios in their day, some of which can still occasionally be found today. Their "Progressive Series" of receivers "enables every amateur to start with a modest investment and ultimately become the owner of receiving equipment that will fulfill his fondest hopes," according to a 1940 QST ad. The model 435, at $29.95, was a basic, 6-tube superhet similar to the Hallicrafters S19R. It could be returned to the factory and upgraded to the model 436 for $12.75, adding a noise limiter, a "new 8-inch bandspread micrometer dial, and the exclusive new HOWARD INERTIA KNOBS." When another $17.05 could be found, the factory would transform it to a model 437, adding a stage of RF, a second stage of IF, and a crystal filter! A S-meter was also available for these receivers, and one could also buy an external preselector with two RF stages and a directional loop antenna, a Monitor which "assures exact frequency measurements on all amateur bands," and an external speaker.

My first experience with Howard was around 1954, when one of the guys in my scout troop who was working on his novice ticket turned up a 435. It would light up, but sensitivity was next to nothing. I went troubleshooting and found that all of the antenna links had been burned out- did a former owner try to use the 110 volt line for an antenna? We rewound them, and darned if the old Howard didn't play about as well as the new S38C one of my high school buddies had. Little did I think then that this would be the first of many times I would enjoy myself bringing a vintage radio back to life.

It was quite a while until I met my next Howard. At the 1978 Dayton Hamvention, my very first visit to Mecca, I ran across an old man in the flea market, Bob Blum, ex W8DDI from Bucyrus, Ohio. Bob had a funny little black box for sale that rang memory bells immediately as one of the Howard family. "It covers 160 meters and comes with the original manual," he said hopefully as I was giving it the eye. Twenty dollars later I had a Howard 438, the third vintage receiver of what is now a collection of twenty five.

My Howard 438 was made in 1939 and sold new for $49.95. It is a typical, non-fancy, general coverage plus electrical bandspread, 8-tube superhet with a 6K7 RF stage, a 6K8G converter, two 6K7 IF's, a 6Q7G detector, avc and first audio, a 41 audio out, a 6C5 bfo and an 80 rectifier. It tunes from the bottom of the broadcast band to 43 mHz. The crystal for the IF filter was a $10 option that Bob had not exercised when he bought the receiver new. Fortunately, Fair Radio had a Hammarlund crystal for a BC779/1004 which fit the Howard and worked well.

In its $50 price range, the Howard 438 didn't quite have the right combination of features to be a decent competitor. It never quite made it against the much more popular Hallicrafters S20R Sky Champion and SX24 Defiant. The bare bones Howard without the crystal for the IF filter lacked the 6H6 noise limiter of the S20R which was 45 cents cheaper. And if you dug down for the extra ten bucks to buy the crystal, you were only $9.50 short of the

Howard 438 with QST ad from 1939

SX24, which included calibrated ham-band bandspread, a noise limiter and a S-meter. Howard also offered an outboard S-meter for another $10, but with that added, the 438 was still more expensive and offered fewer features than the SX24.

The Howard 438 was a much better buy than the NC44, which lacked a filter, a noise limiter and an RF stage. Even the NC8OX and NC81X at $88 had no RF amplifier. Looking up the scale, Hammarlund's HQ120X at $129 and the RME 69 at $134.90 offered "bells and whistles" like a S-meter, a noise limiter, a third stage of IF and more flexibility in filter bandwidth. They also were of much more solid mechanical design and construction than the Howard or Hallicrafters receivers which were built largely out of parts available from the AM broadcast receiver industry. When it came down to basic CW operation, however, the Howard 438 equipped with a crystal, played almost as well as these considerably more expensive receivers. And you could buy it cheaply at first and add to it later, a feature that must have been of at least some worth in the later days of the great depression.

The Howard 438 had some real drawbacks, however, that were not shared by its competitors. Most glaring to me was its lack of an RF/IF gain control! The RF and IF stages were cut back by AVC voltage on phone, but ran wide open on CW, causing even moderate signals in 1978 to "block" reception. That deficiency I easily fixed by substituting an RF/IF gain potentiometer with a switch for the ON/OFF rotary switch on the left of the front panel. The Howard's cabinet design is rather irritating, too. It has an open bottom, but solid top, sides, front and back. To get in to the top of the chassis to make an adjustment or change a tube, requires taking all the knobs off the front and squeezing and shaking the chassis out of the bottom of the cabinet. Some of the components are a bit cheap, too; like the slide switches across the bottom of the panel in contrast to the toggle and rotary switches used by other manufacturers. And the BFO pitch control is just a knob on the shaft of the tuning

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Letters from page 15

I'm an old man, and 80 lbs is lot heavier than it use to be... Which is why my RAO, acquired via junker route, is up for sale. This is late issue, not having S meter, but having the second stage of RF stuck on back. Works fine, up until top end of ten meters when background drops considerably. This is with stock 6K7 in RF stages, and 6J7 in mixer...no attempt made to hop it up, like I do most of old klunkers that come this way (if they show potential; I cannot make silk purse out of sow's ear, and a lot of receivers fall in this category, no matter what name is stuck on front). I personally never saw a National with gray paint that was worth doodly squat. When Millen left, so did engineering. Hammarlund, post war, especially after they moved down to moonshining country, built some stupidly laid out stuff, such as HQ-180, with power transformer right next to tuning capacitor assembly, no shock mounting between tuning capacitor and chassis, and to top it off, they put the output transformer right under the tuning capacitor, so you cud get microphonics from that source. On low end of top band, which covered 18 mHz, if you used speaker, it howled like a banshee if you ran across an unmodulated carrier of any great amplitude, but was okay higher in freq at 21 mHz, since there was lot less flimsy plated C in circuit from tuning cap assembly. Sold mine, even after pointing out why I disliked the unit.

And some SP 600's have disconcerting habit of the 6BE6 mixer going into oscillation (in the mixer portion, not oscillator). Comes about when going higher in frequency on some of the top bands covered. Drove me nuts; it acted like bad switch contacts, but finally discovered that if you went higher up by one band, then came back down, receiver wud always go back to operating status, while going from low to high, but stopping on desired band, receiver wud be dead... not all models of the SP 600 did this, but it happened on two that I worked on, and while I did not have time to check out the first one, the second occasion was on another basket case, where the tuning knob shaft had not been mounted correctly, leading to not enuff friction to be able to tune the receiver. A 2500 dollar doorstop, in other words. Emergency repairs: took off front panel, reversed the heart shaped hunk of steel thru which were drilled two 1/4" holes. One for band change switch, and one for tuning shaft. This made the band switch stick out at something other than perpendicular, but the critical shaft, the tuning shaft, was in right place, to where tuning now worked.

I well remember a Lafayette with wrong values in 6BE6 product detector, and it was awful. Finally replaced Rs with what I took to be somewhere near right, and it worked mo bettah. Think they had a 500 ohm R between injection grid and ground, thus short-circuiting the oscillator to ground pretty well, and making for lousy operation as product detector.

Have had other Lafayettes that were anything from fair to excellent, with the HA 700, one of last tube type receivers being very good for cheap receiver. It had single thickness PC boards, tubes, and ceramic filters in IF strip, and you better by Gawd get on the right IF frequency if you wanted any sensitivity. Even as is case with receivers having xtal filter. The RAO I have was aligned on 450 kc, and as result the filter made very good attenuator and filter action was absent...much better with IF on xtal frequency, whatever it might be...

So much for the meandering of an Ancient Mariner. First 20 years are the hardest, as we used to say, when lying down for short siesta after noon meal in The Old Navy...when it was "dogs and sailors keep off the grass". Sure changed when WW II started, tho...

So, keep up the good work. With demise of Ham Radio, lost good mag, and what is left is not much of interest to this ole codger.

Ole McDonald [John L. McDonald, W6SDM]

Dear ER

I have been an enthusiastic Drake addict since I bought a used Drake TR-3 in 1966 from a US Navy serviceman stationed in Yokohama. Now, I have 1-A, 2-B, 2-C, R-4A, R-4B, R-4C, SW-4A, R-7, T-4X, T-4XB, TR-3, and TR-7. I have absolutely no other makes including Japanese rigs for HF amateur radio use. I use SP-600JX-17, R-390A (Collins made, with serial number 2408), and a Sony radio for shortwave broadcast listening. My current setup at my shack is T-4X/R-4C for CW, RTTY and a TR-7 for SSB.

Many people are talking about Collins, - well - that is okay, but I believe Drake had been one of a few pioneers who believed in the future of amateur SSB communication, with the clear product concept of providing amateurs utmost satisfaction focusing on SSB with reasonable and affordable price. In this sense, Drake never had their customers disappointed with the only exception of the fact that they quit their amateur radio business. This is the reason why I love Drake so much. My dream is to visit Drake in Miamisberg, Ohio, some day in the future, and see the factory in which there used to be a production facility for the Drake 4-Line. For the past year, I've really enjoyed every single line of each ER, especially the series of articles about R-390A written by Ray W. Osterwald, NØDMS, and the story about W8CAE and the R.L. Drake Co. by K5FZ. I am looking forward to more stories about Drake.

Makoto Takazawa, JA1XS

Dear ER

As you probably remember I am interested in Ribbon mikes. Back last fall I found an Electro-Voice V-2A at the local swap meet. Hank, W2IQ, Jim, W4PNM, and I went by Ten-Tec to pick up some metal that Jim had ordered for an amp he is building and I had a chance to meet Al Kahn, the Chairman of Ten-Tec. He was talking with Jim and mentioned that he used to own Electro-Voice. I asked about the V-2A and showed him the picture of mine. He said that he wanted to tell me a story about it. In 1936, Electro-Voice had fallen on hard times because of the depression and he had even had his phone turned off. He said that at the time all ribbon mikes had a hum in them when the level was turned up. The idea came to him how he might solve the problem and he came up with the first V-2A. After getting in touch with several potential customers he was contacted by Webster Amplifier Co. After a demonstration they ordered 35 microphones. That was the first year that he was able to pay himself a salary and the company made a nice profit for the year.

Andy, WA4KCY

Dear ER

What fun it is to rummage through your pages and find that there are others who aren't ashamed to admit that in these days of plastic money, plastic radios and plastic relationships, they still appreciate the real radios of the past. My TS-940s sits on a shelf collecting dust while I chew the rag on 40 CW with my old S-Line. And my restoration of a venerable old Valiant is nearly complete! At last, kindred spirits...

Jon Balch, W3KG

JOHN ALWAYS SAYS IT TAKES AN HOUR OF WARM-UP BEFORE HE CAN USE HIS OLD RADIO. IMAGINE HOW SURPRISED HE'LL BE TO SEE I'VE ALREADY WARMED IT!

Lee Faber, W7EH...Radio Pioneer

by Barry Wiseman, N6CSW/Ø
4 Aspen Place
Durango, CO 81301

We finished up Part One last month just as Lee was getting on the air with his first rotary spark gap transmitter in 1917.

Part Two

To further quote Lee:

"The rotary spark gap was very much superior to my previous transmitter. Its operation was quite interesting. The rotor was fastened to the shaft of a motor and all around the rotor - from the center out were bolted strips of copper on an insulating disc, twelve strips to be exact. On opposite sides of the rotary wheel were what we called fixed electrodes. When the rotary wheel was rotated the spark would jump between the fixed electrodes and the rotating electrodes and if you used a synchronous motor - one that ran in a multiple of 60 cycles like 1800 RPM - you could adjust the position of the fixed electrode so that you'd get what we'd call a synchronous spark and it sounded like a real powerful 120 cycle tone!

"Later we created quite a sensation by driving the rotary spark gap with a round sewing machine belt. We put about 4 inches of metal door spring in the belt. As the belt would go around the pulley it would slip and we had a 'Wow, Wow, Wow' effect. For a long time 9EH was famous for that particular tone. I wouldn't tell anyone how I did it because then someone else would copy it.

What Stations Did He work Back Then?

"I worked mostly 8's and 9's back then as I recall; not very much DX, although I did receive a report from a ship off the coast of South America that I had been heard. I figured the distance out at 1800 miles. That was the best I ever did during that period as far as I know."

A Description of Lee's Station In 1917

An article in the *"Lee County Times"*, a local newspaper, had this write-up:

"Considerable interest is being taken in wireless telegraphy all over the country by young boys and several here seem to be more or less interested. Leon Faber has had an outfit for some time and is adding improvements frequently. The young man is becoming quite proficient in the work and following is his description of the station:

" 'The station consists of a transmitting and receiving set. The transmitting set having a range of about 100 miles under good conditions and under the same conditions the receiving set can pick up messages within a radius of about 1200 miles. The transmitting set consists of a 1 KW Thordarson transformer which outputs over 10,000 volts, a Sayville rotary spark gap of about 4000 revolutions per minute, a condenser of the correct capacity, a Murdock oscillation transformer or tuning Helix, a Standard wireless key which has No.6 coin silver contacts, and a meter to tell when the station is out-putting the maximum amount of energy. A Murdock double pole double throw switch is used to secure a quick and positive change from sending to receiving. When the blades of the switch are put in a downward position the rotary stops and the station is ready to receive. The receiving set consists of a Navy type receiving transformer or tuner, a type aa crystaloy detector and four mineral detectors, two Murdock fixed condensers, a variable condenser, a 3000 ohm headset made by a reliable firm, a constant amplitude buzzer and all necessary switches.

Aerial and Ground Connections

" 'The aerial is composed of four No. 14 copper wires sixty feet high at one end and about forty at the other. It is about 85 feet

Lee's medal from the first ARRL convention in 1921 at Chicago. This medal was available to all 1200 hams who attended, for about a dollar, as Lee recalls.

long and the lead-in, composed of two No. 14 copper wires, is taken off about the center which makes it a type T aerial. The type T aerial is the most efficient of all the aerials designed. The station is protected from lightning by a single pole double throw switch. When the blade is in an upward position it connects the aerial to the instruments and when it is in a downward position the aerial is connected to the ground by a No. 4 copper wire. The ground wire for the instruments is a No. 8 copper wire soldered to a water pipe which makes the best ground connection possible. The station is open to visitors at any time.' "

During And After WW I

Lee continues:

"A lot happened in 1917 other than getting my first ticket. I also got my High School diploma by default because I joined the Navy. I did not do one constructive thing by being in the Navy. I had a free ride all the way. I went to school and earned 12 credits at the University of Illinois in Mechanical Engineering because that was easier.

"We were all off the air during the War. All the hams had to send in a notarized statement saying that all their gear was all boxed up and nailed shut. I remember explaining it all to a fellow at our bank who notarized my statement.

"After the War, I got back on the air as soon as I could. I think it was 1919. My new call was 9AMK. At this time you had to renew your license every year. I forgot one year. I got involved with dating quite heavily and I forgot to renew 9AMK and was given W9DAX, which I kept up into the fifties I think. Incidentally, I was on the air illegally for a couple of years between the time my 9AMK expired and the time I became aware of it.

"For a while I worked for a man named Frank C. Lenihan, who owned an electrical appliance store and there sure weren't many of those back then. I started building broadcast receivers for him and he sold a few of them. I had built a radio controlled submarine during the war which was on display in his streetfront window. He set fire to his building one night and burned everything.

Lee Faber from previous page

I lost the submarine and all my tools and everything else. He collected a substantial amount of money from insurance but I never got anything out of it. I remember we scrounged through the rubbish in the basement where everything wound up and we found two Magnavox loudspeakers that were salvageable. The insurance adjuster found out that we had taken them and made us give them back. So I lost everything. And times were very hard then. This was during the depression of '20-'21.

"About this time I remember listening to programs from WWJ which was in Detroit. And KDKA of course, located in a small town in northern Illinois. Later it moved to Pittsburgh.

"After that I got a job servicing windmills. I did the climbing of the windmills, replacing gears and fans and that sort of thing. One day the fella I worked for dropped a wrench on my head and it cut a hole in my cap and the skin on my head and the blood ran down over my face and I said,'That's it, I'm going home', and I walked home and I never went up a windmill after that. I then got a job painting barns and farm buildings but I got pretty provoked over that too and I quit.

The First Vacuum Tube Gear

"Also about this time I went to a tube-type CW transmitter. This consisted of 210 in a Hartley oscillator circuit. Later that year we changed that to a tuned grid tuned plated circuit. And then I changed the tube to a 203A which had about 50 watts of plate dissipation. But I still used the rotary spark as well.

"I also got a tube type receiver. It was a CRL Paragon made by Zenith. I had to build my own amplifier for it. R.H.G. Mathews (9ZN) was the owner of the company. I think he started the Zenith Corp. and incidentally he was the first to put up a gold plated antenna. It was made of no. 12 copper wire, gold plated.

"A year or two after I purchased the Paragon, I acquired a Grebe CR-8 and used the same homebuilt amplifier with that. It was a much finer receiver than the Paragon.

"I can remember at this time that I used to come back from a date at 1:00 or so and then get on the air until about 4:00 in the morning or so. Dating didn't interfere with my ham radio activities."

In 1921 Lee Attended The First ARRL Convention

From *QST*, October, 1921:

"Oh, Boy, maybe our first national convention won't be remembered a while! Twelve hundred amateurs from out-of-town, representing every district and almost every state, augmented by several hundred local fellows; four big days so jammed full of amateur radio that nobody could keep up with it; fifty-odd exhibitors in a show so huge that one needed a week to do it justice; two big hotels full of bugs chewing the sock until break o' dawn every morning; so many records for attendance and representation broken, so many friendships made thru personal meetings, so much general good accomplished, that it is impossible to estimate it. These are just a few of the things about the A.R.R.L.'s First National Convention at Chicago, August 31 to September 3, that "stick out". It'll be a long long time before anybody who attended this meeting will forget it.

"At 10:30 on the morning of Wednesday, August 31st, Chairman R.H.G. Mathews called the opening session to order, and addresses of welcome were delivered by N.C. Bos, Chicago City Manager, on behalf of the local organization; Corporation Counsel Sawtelle, representing the mayor of Chicago; Coroner Peter M. Hoffman, speaking for Cook County; Chief Radio Inspector W.E. Terrell, spokesman for Secretary of Commerce Herbert Hoover; and Lieut. Parmeter, U.S.N., of "NAJ" representing the Navy Department. The main address was the formal opening of the convention by our president, Hiram Percy Maxim...."

And Lee still remembers it well: "It was a wonderful experience because I got to meet literally hundreds of hams and also a lot of hams I had worked over the years. And I got to see all that beautiful equipment that I couldn't afford. And of course they were

operating spark transmitters all day and the convention hall was filled with that sweet smell of ozone.Incidentally, this was as far away from home as I'd been in a while. Travelling back then was a big deal."

Recently, Lee received a plaque from ARRL in recognition of his over 70 years of membership. He has always been a strong supporter of that organization. In one of our early conversations I made some remarks critical of the ARRL and Lee became a little agitated, "You can gripe about ARRL all you want Barry, but just think where amateur radio would be without them", he said. I think Lee made a very good point.

A Short Career As a Radio Op Aboard Ship

Lee continues:

"In 1923 I received my Radio Operator First Class Commercial License. This was the highest license you could get at this time. In order to get the license I went to school at Dodge's Radio Institute in Valparaiso, Illinois, for about 6 months. I became personal friends with C.M. Dodge the owner of the institute. He gave me a card which stated that I could return to his school at any time for refresher courses; I never took advantage of his offer however. I went as a radio operator aboard the S.S. West Totant which was a grain ship sailing between the Gulf of Mexico and the Mediterranean Sea. I made one trip and was seasick for a month after I got off the ship so I quit.That spelled the end of my radio op days at sea.

A Career With a Power Company

"About this time a friend of mine who worked for the power company in Mendota, Illinois, about 20 miles from my home, found out that I was available and he knew that I was a ham radio operator and that I knew something about electricity so he called me and asked me if I would go to Earlville, 8 miles away and work for the power company - Illinois Northern Utility Co. - I stayed with them, finally becoming District Superintendent over about 10 towns some twenty years later."

Lee's Logbook

The only logbook in Lee's archives is a very deluxe hardbound volume. It's interesting that facing pages are used rather than a single page. The left page has the heading "Record of Transmission" and the right page has, "Record of Reception". His first entry was made July 23, 1922. At the top of the page under 'Weather' he has indicated 'clear and warm'; 'QSS' - 'none'; QRM - 'none'; QRN - 'bd'.The station he worked at 1:00 PM was 9BUO who was using a spark transmitter. Under the heading Wave he indicates '200' (wavelength - 200 meters), and under Audibility he indicates 'B' which I would guess means 'bad'; under Character of Sigs he has 'Stdy' which is obviously 'steady'. I looked in a list of 'Q' signals to find what 'QSS' stood for but could not find it. Lee says it means fading. I wonder why that disappeared from the list of Q signals. On the "Record of Transmission" page he has 'spark' under the heading "Transmission" and 'sink' (synchronous) under the heading "Method"; under "Power" he has '500' and under "Remarks" '120 sink'. It's all very strange and different. That day he worked four stations.

Perusing further into the log, I noticed that his next entry was the following day, the 24th, when he logs 9 stations on the "Record of Reception Page" and nothing on the "Record of Transmission Page". He doesn't indicate transmitting until August the 11th when he worked 3 stations, all '9's. On Christmas day, 1925 he comments, "everything white with snow and a bright day - a duck and a chicken in the oven." That day he worked about 9 stations; starting at 9 AM and shutting down at 7:55 PM.

In 1925, I met the gal that was to become my wife. Her name was Ruth Mattick. She was a telephone operator. We were married on June 11, 1925. I might comment that she was a wonderful woman, very encouraging to me in everything I did or tried to do. **ER**

Part Three next month

The R-392--A MINIATURE R-390

By Eugene Senti WØROW
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Cedar Rapids, IA 52402

Barry Wiseman, E.R. Editor, can be very persistent. Ever since he found out that I had been part of the Collins team that worked on the design of the R-390 and R-392, he has been after me to fill in some of the details regarding this design project.

The whole Military H.F. Design Department was headed up by Ernie (Pappy) Pappenfus, K6EZ (see article E.R. #10). Lou Couillard (deceased) was in charge of all H.F. Receiver design, including the R-388, R-389, R-390, R-391, and the R-392. The Project Engineers were Ed Hogue on the R-390 and 391, Ed Andrade, WØDAN, (see article ER #28) on the diversity combiner, Bob Griswold and Wynn Williams, mechanical engineers, on the very precision gear and cam mechanisms and myself on the R-392.

My assignment was to shrink the size of the R-390 receiver down to a cube about one foot on a side. It had to be very rugged for use in a Jeep and had to be capable of complete immersion in water. This required gaskets and O-Ring seals on all panel controls as well as waterproof plugs and connectors. The panel had to mate with a gasketed, waterproof case.

Also, even though the R-390's temperature controlled ovens were eliminated in the R-392 to save space and power, a high degree of frequency stability and calibration accuracy were to be retained. This was accomplished by using the double-conversion frequency scheme used in the R-390 with crystal controlled 1 m.c. bands and a sealed PTO (Permeability Tuned Oscillator) using temperature compensating capacitors in its tank circuit. Frequency stability and dial calibration were comparable to the R-390 at room temperatures but suffered somewhat at extremes of the Mil SPEC temperature range.

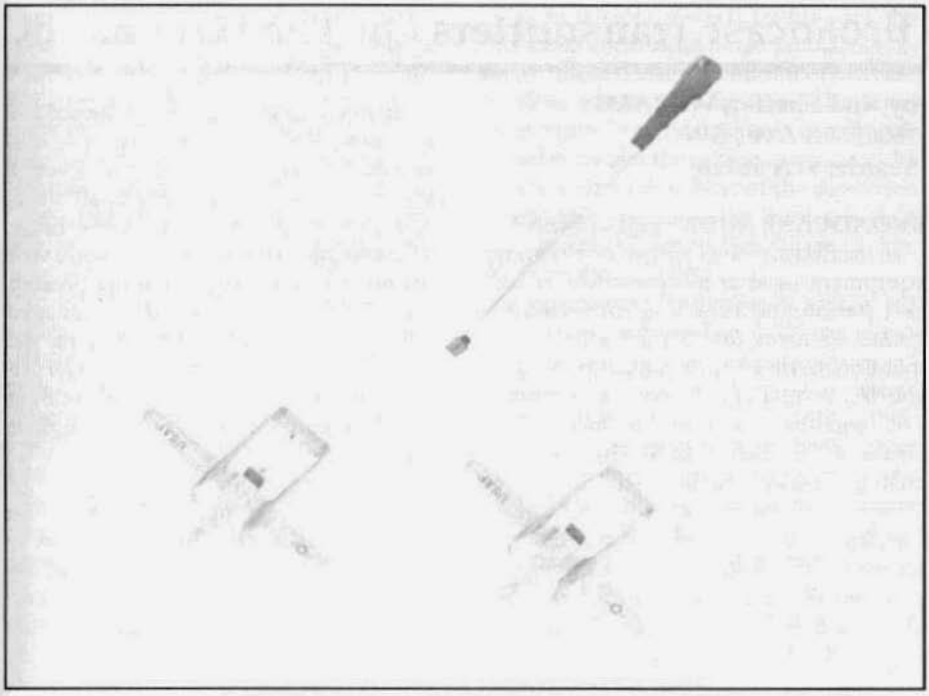
Probably the most fascinating part of this design was to use a line of tubes that operated with +28 volts on the plate, screens and filaments. The Signal Crops had backed the development of this line of tubes by some major vacuum tube manufacturers and was anxious to see them incorporated in one of their design projects. This eliminated the usual dynamotor or vibrator power supplies that were in current use at that time. Also, power drain was reduced. Eliminating any major units such as a power supply in a field deployed radio was considered a plus by the military.

I have read and reread the three excellent articles by Ray W. Osterwald, NØDMS, on the R-390 (see ER 24,25,26) and the equally well written article by Walt Hutchens, KJ4KV, on the R-392 (see ER #20). Both articles covered the circuits and block diagrams so well that it would be redundant for me to go over them again. Also, their descriptions of the precision mechanical gear train were very accurate.

The highlight of the whole project was when I was invited to see some of the field testing of the Prototype R-392 and its companion transmitter, the T-195 at Ft. Bragg, North Carolina. Included in these tests was an air drop of these units, mounted on their shock mounts, in a Jeep.

The two photos show (#1) the Jeep and parachute leaving the cargo bay of a military transport plane; (#2) the military test crew along with me (second from left) inspecting the equipment for possible damage. None was evident so the radios were turned on and we talked back to base!

As the project neared the final phase and was about ready for the first production run, I was suddenly pulled off of the R-392 job and assigned to an even more exciting project. It was to be Collins' first SSB Receiver, the 75A-4. **ER**



#1

#2

Broadcast Transmitters On The Ham Bands

by Rod Sheffer, WA7AMI
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BROADCAST AUDIO EQUIPMENT

In the first article I touched on the audio equipment used at a typical AM broadcast station and how it is connected together to form the "Audio Chain". As mentioned, the chain is made up of audio sources, a mixing console, and a limiter. That was the typical audio chain before about 1965. Since then things have changed, especially the cost! The current "Hot Setup" consists of a 5-band equalizer, an AGC amplifier, a compressor, a limiter and a section for correcting "Tilt and Overshoot" problems associated with older plate modulated transmitters. This stuff is all in one rack mounted package and sells for around $4500.00. Due to technology advances there is a lot of older equipment out there not being used. Some of this gear would work well for ham use and can be had very reasonably. The effect of feeding your mic through compressors and limiters etc. and changing the audio characteristics is now called "Audio Processing". I will give you some ideas on how to do some audio processing and get the most out of your newely acquired broadcast transmitter or for that matter any AM transmitter. Our goal will be to increase the average level of modulation thus sounding louder. Audio processing is quite subjective in that your "On Air" sound is adjusted to be what you like. This is done with an equalizer and your choice in microphones, compressors, etc.

THE MIXER OR MIC PREAMPLIFIER

The mic preamp amplifies the audio from the mic, which is quite low in level, up to line level (0 dBm). (Refer to the first article). The mic preamp can be a broadcast audio console or a home brew two stage preamp. The preamp must have an input impedance that is compatable with your mic and a transformer output that matches a 600 ohm line. The output level should be around 0 dBm, or .775 volt. If you can get one of the older small broadcast type consoles so much the better. More on audio consoles later. If you wish to build a small mic mixer or mic preamp, see RCA receiving tube manuals or Sams Photofacts for some ideas. I think this would be an interesting project. The preamp can be as simple as a dual-triode like a 12AX7 wired as a two stage amplifier with a transformer output.

THE EQUALIZING AMPLIFIER

An equalizing amplifier is an amplifier with adjustable frequency response. In other words the amplifier has the ability to amplify some audio frequencies more or less than others. The typical equalizer has the audio spectrum broken into "bands" that can be adjusted for more or less gain in that particular frequency band. The best equalizers are called "graphic" equalizers. And the best graphic equalizers are the 1/3 octave type. These equalizers have the audio spectrum broken into about 30 small bands making equalizing adjustments very precise. Equalizers are usually set up for little or no overall gain, obviously if much equalization is dialed in, the output level will vary depending on what frequencies are going through the equalizer. The equalizer should have balanced input and output and match the 600 ohm line.

COMPRESSOR AND LIMITER AMPLIFIERS

A good compressor and limiter amplifier will do more to improve your "on-air" sound than any other part of the audio chain. This, of course, takes into account you have the microphone you like and it has a good frequency response at least through the voice range. I will deal with compressors and limiters together as their function is similar. The limiter amplifier has been used in broadcasting for many

years just ahead of the transmitter for the purpose of keeping audio peaks from causing the transmitter to over modulate. The compressor or combination compressor-limiter became popular when radio got competitive, that is, two stations in the same town playing the same type of music going after the same audience. Beside "play lists" and "air personalities", there was competition as to who could sound the loudest while just barely staying legal. Now instead of just the limiter keeping the negative peaks under 100% something was needed to increase the "average modulation" level. This "something" is the compressor amplifier. Time for a couple of definitions.

A compressor amplifier is an amplifier whose gain decreases as its input level is increased. The compressor functions as a regular amplifier up to the point where compression takes place. This point is called the "threshold" of compression. As the input is increased beyond the threshold the output continues to increase, but at a lesser rate. For example, at the threshold point if the input level was increased 10 dB and the output level only went up 5 dB the amplifier would be compressing the signal 5 dB. Or in other terms the amplifier is said to have a 2:1 compression ratio. "compression ratio" is how most compressor amplifiers are rated. Suppose we increase our input level 20 dB? The output level will only go up 10 dB as the compression ratio has not changed. Compression ratio is set up in the compressor's circuitry. It can be changed by changing values of parts. The better compressor amplifiers have adjustable compression ratio. Compression ratio is something that has to be experimented with to get the most out of the compressor and to get the "on air" sound you want.

A limiter amplifier is an amplifier whose output level remains constant, regardless of its input level. The limiter functions as a regular amplifier up to the point where limiting takes place. This point is also called the "threshold" of limiting. As the input is increased beyond the threshold the output stops increasing. In reality there is a small amount of increase (a dB or so) in most limiters. The input level control on the limiter is usually adjusted such that the limiter is well into the limiting range but short of the distortion point. The output of the limiter is then adjusted to the desired level to modulate the transmitter 100%.

Lets consider the compressor and limiter in your audio chain. The audio from your equalizer or mic pre amp if you don't use an equalizer is your voice! Voices don't have a lot of modulating power like music does. The typical voice waveform has a lot of peaks and not much average level. The compressor takes this low average audio signal and squeezes the signals into a much narrower dynamic range. By compressing the signal this way the average level is increased considerably. Average level is relative to compression ratio. The higher the compression ratio the higher the average level and the lower the dynamic range. As the average level increases so does the loudness of your "on air" signal. If you increased the average level of the audio going to your transmitter by 3 dB you will double the average power in your sidebands. These numbers are dependent on a lot of things such as the ability of the modulator and power supply to withstand the increase, but the point is you will sound louder! Understand, the transmitter is not being overmodulated, we are just holding the average modulation percentage at a higher level. The compressor should be followed by a limiter. The limiter is adjusted so that the already compressed audio drives the limiter just hard enough to limit or stop the audio peaks that would overmodulate the transmitter. This is done by bringing up the input level control on the limiter while observing the meter on the limiter. Limiting should only occur on high peaks while showing very light limiting on normal speech. The output control on the limiter is then adjusted to a level that will modulate the transmitter 100%. Most good

continued next page

quality compressors and limiters have 600 ohm balanced inputs and outputs.

Some have balanced high impedance inputs. This is fine as long as the previous output is 600 ohms. In other words, you can "bridge" balanced high impedence inputs across a low impedance output of a previous device. Shielded two conductor cable should be used for inter-connecting in your audio chain. The shields of the interconnect cables should be connected to the signal ground point on the individual pieces of equipment. If you have "hum" in your system after you are all hooked up, you might need to disconnect one end of each shield on your cables. After much time chasing hum and RF pickup problems, I have found this to work a lot of the time. By pulling loose one end of a shield, a "ground loop" is broken while still maintaining the ground at the other end. Once again I will stress the "balanced audio" wiring scheme. Most of the equipment mentioned here is set up this way so take advantage of it. You will encounter far fewer problems with RF pickup and hum by keeping all audio gear connected this way. As mentioned, the audio levels between pieces of equipment is around 0 dB except the output of the limiter. This level is adjusted to whatever it takes to modulate the transmitter. It is not uncommon to see an audio "pad" inserted between pieces of equipment in the audio chain. These pads are used to attenuate the signal level and to provide isolation between equipment while maintaining the proper impedance (600 ohms). A chart of the values of resistors and dB of attenuation on pads is in any good audio engineering book.

SETTING ADJUSTMENTS

Start at the mic preamp or mixer and work your way through the audio chain. Keep the output level of the individual pieces at line level or thereabouts so as not to overdrive the next device in line. Use attenuator pads between equipment as needed. If you use an equalizer, use small amounts of equalization. If your mic needs large amounts of equalization to sound good,–think about a new mike! I would not attempt to tell you how to equalize your mic in this article but I will tell you what I have had good luck doing on dynamic mics used in broadcasting. If you are fortunate and find a graphic equalizer cheap, try boosting the 50 to 100 cps range a few dB then boost about the same amount at 400 cps! This will make the lower end sound fuller and reduce the "proximity" effect you run into with working a dynamic mic up close. A few dB of boost in the 2500 to 3000 cps range will add crispness. A note of caution – avoid a lot of boost above 3000 cps as this will be passed on through most broadcast transmitters like you know what - making your signal a bit too HI-FI for ham band operation. As you know, the higher the modulating frequency the wider your sidebands, causing interference to others. The compressor should be set if possible for around 2:1 compression ratio. Much more than this and you will trade off a lot of quality for a small increase in loudness. By the way, that's a good definition of audio processing–"A reduction of audio quality for an increase in loudness".

If you can find a compressor with adjustable attack and release times, this will help you get the loudness you want without "pumping" effect or "clipping". These terms describe undesirable effects a compressor can have on your audio. Remember, go easy and do a lot of listening to your audio.

The limiter is only set up to stop the peaks that would overmodulate the transmitter. The meter on the limiter should show only a little activity with normal speech. Be sure to observe your signal out of the transmitter on a scope to determine that you have the greatest peaks going in a positive direction. Correct, if necessary, by reversing the polarity of the signal at the transmitter input. The things I have mentioned on adjustment are just ideas, you will need to do considerable experimenting to get everything like you want it.

LOCATING EQUIPMENT

AUDIO MIXERS

There are many old tube type mic mixers and audio consoles sitting around that are not being used. Look for equipment with balanced transformer inputs and outputs. Gates Radio Co. made some small consoles that were portable and intended to be hauled out in the field to cover sports events and the famous "GRAND OPENING" live broadcast. RCA also produced small consoles of this type, with 3 or 4 mic inputs, a VU meter, headphone amplifier, and a line amplifier for driving a "leased" line that went back to the station. Any of this type of console, besides looking neat, will do fine. The idea of having several mic inputs is nice, also you can compare mics or set up two, one for a guest. Some of this type of gear shows up at commercial sound dealers also.

EQUALIZER AMPLIFIERS

Equalizers are a rather new idea in broadcasting, that is small user adjusted models. Line equalizers, like those intended for equalizing long broadcast lines, are not as user friendly as the "Graphic" type equalizers. Graphic equalizers show up at commerical sound dealers and music equipment dealers and can be had for a reasonable price. The 1/3 octave type will bring a higher price but do a better job.

Here again, try to find one with balanced input and output. This is usually a sign of a professional piece of equipment. Your local station is probably not the best place to look for an equalizer.

COMPRESSOR AND LIMITER AMPLIFIERS

Compressors show up at radio stations but are easier to find at commercial sound dealers and music dealers. Gates Radio Co. made a gain riding amplifier called a "Sta-Level" that will work with some modifying of the circuitry. The "Sta-Level" is a very slow acting compressor amplifier that was intended to aid the announcer in keeping constant audio levels feeding the limiter. They show up at stations as they are no longer used. The Gates "Level Devil" with modifications can be used in your audio chain. Both of these pieces are long since obsolete and I have picked them up for little or nothing. The Altec Mod 436A is a good choice and these show up at sound equipment dealers. A company called CBS Labs made their "Audio Max" which with some help can be used. There are many other pieces of equipment to consider but I would like to make a recommendation. A company named UREI makes a compressor that has adjusted compression ratio, balanced inputs and outputs, variable attack and release times, and is perfect for this type of use. These show up used for around $150 (don't pass out) they're worth every bit of that. By the way this is a model LA-4 compressor.

Limiters are a little easier to find because they have been around a lot longer, that is in broadcasting use. Look for the Collins 26U-1 or the Gates 39B or the RCA BA6A. These are good quality broadcast limiter amplifiers that will work fine just as they are. The Altec 322C limiter is also a good choice. CBS Labs made their "Volumax" limiter, with some work, these are ok. As mentioned, limiters are more plentiful than compressors and the pieces mentioned can be had for as little as $25. If you wish to spend more, the UREI 1176LN is an excellent limiter, completely adjustable.

SUMMING UP

I've touched on some basics and hopefully given you some ideas. If you wish to read more, get a copy of Handbook For Sound Engineers, by Howard Sams. There is lots of good stuff in there.

I would be glad to hear from anyone who has a question or needs information on putting a broadcast transmitter on the ham bands. **ER**

With The Ready Reserve Fleet from page 3

There are thousands of islands in the Philippines and it is easy for pirates to hide a stolen ship on one of them and strip it at their leisure. Unfortunately, the Philippino Navy is not large enough to patrol the area effectively.

The Saudis were putting a lot of pressure on the U.S. military to leave as soon as possible. We had over 50 square miles of ammunition in the Dammam area and they were breaking every safety rule in the book to get the ships loaded as quickly as possible. The crew was quite concerned about their safety but everyone stuck it out.

The oil well fires in Kuwait were awesome. When the wind was right, the sky over Dammam was black with soot, making it difficult to breath. The soot would also cause eye irritation. However, by October of 1991, the problem had been greatly alleviated.

We visited Singapore several times. This island state is the crossroads of the Orient. All shipping heading East or West enter Singaporian waters. Singapore is very modern and has a skyline not unlike Miami Beach. Millions of dollars are pouring into Singapore from investors all over the world and the expectation is that it will be the new Hong Kong of the Orient. The people are quite industrious. For $4.00 U.S., a beautiful Singaporian girl washed my hair for about an hour before she gave me the best haircut of my life. They also have an interesting criminal justice system. The death penalty is rendered upon anyone discovered with drugs in their possession. Singapore does not appear to have much of a drug problem to the casual observer.

I listened for AM activity on 20, 40 and 75 meters but the AM bands were quiet after we left Pearl Harbor for Dammam, Saudi Arabia. However, we were in almost constant contact with helpful SSB stations back home who ran phone patch traffic for our crew members and passed along football scores and other much appreciated sports information.

All in all, it was a great experience. Unfortunately, upon arriving home I was informed that the position of Radio Officer had been eliminated on U.S. flag vessels by a recent ruling from the Federal Communications Commission. It will be official when the U.S. Congress amends the Communications Act of 1934 and this process could take several years. However, by 1999 Radio Officers will no longer be required on merchant vessels by WARC agreement. The satellite communications people and Exon have been pushing the FCC for a quicker transition away from the traditional Radio Officer to an automated satellite emergency communication system. The FCC has agreed and will now require that at least two members of the crew have a satellite communications operating permit, and that three satellite communications systems be installed on each American flagged vessel. This will allow the shipping companies to eliminate one man from the crew list and save about $100,000 yearly on each vessel.

American members of the International Maritime Organization have taken the position that the Maritime Satellite Communication System does not require a skilled operator and that the use of shoreside technicians to service their shipboard electronic systems (when the vessel arrives at its port of call) is more cost effective than having an on-board service technician on every vessel. All shipboard communications will now be handled by the mates, who will have to obtain a permit to operate the automated emergency satellite system, from the FCC.

The enclosed picture is of me at my station in the Radio Room of the S.S. Cape Juby. The three six-foot racks contained a battery charger, antenna change-over switch, SITOR modem, RF communications equipment covering the entire RF spectrum from 500 kHz to 30 mHz operating in the CW, SSB, AM and SITOR modes. The leftmost six foot rack contained the satellite communications system and just visible above my head is the Okidata MT-

100 teleprinter and associated video display terminal used with the satellite system. If you look closely at the upper-center of the picture you will notice a Okidata microline printer which we used for HF SITOR communications. The HF station had an output power of 1500 watts P.E.P. and kept us in contact with the US throughout the voyage except for a two week period in the western Pacific when we had a very bad solar flare. Judging from the look on my face sea life must have agreed with me.

All of us who served in the Ready Reserve Fleet of Military Sealift Command and entered Persian Gulf waters were awarded the Merchant Marine Expeditionary Medal for supporting American military forces during Operation Desert Storm. All the Merchant Mariners of the Ready Reserve Fleet were proud to serve their country in time of war. **ER**

Editor's Note: Marc - who was a very active AM'er - plans to be back on the air soon with his T-368.

Repair/Restoration Tips from page 18

Dave got pretty tired of the tedium involved in removing the PTO can to tweak the cam stack compensators. He got an old inner cover, and cut a slit (3/16" x 2.5") in the side, just above the stack. He made a hooked plastic tool wide enough to pass through the slit, to be used to move the cam washers during calibration. At the rear of the PTO, Dave made a bracket large enough to firmly and accurately hold the PTO in position on the original mounting hole in the mainframe. He set the tuning indicator to 2.000 kcs and tee'd a frequency counter to the PTO output cable. Then the shaft coupler was loosened and the PTO shaft moved enough to set it 2 kcs below where it should be, or at 3.453 kcs. With the coupler tight again, he checks the full 10 turns to be sure he is still 2 kcs low at every 50 kc point on the dial. The reason he sets it low is so that the plastic tool can reach through the slit and tap the washers down, which raises the PTO frequency. The endpoint adjustment is made next, before the cam stack adjustment, to be sure that the PTO tunes 3.453 to 2.453 in exactly ten dial turns. Then, a chart is made, showing what the actual PTO injection frequency needs to be versus dial frequency (signal frequency), for every 10 kc from 2.000 Mcs to 3.000 Mcs. From the chart, he finds what oscillator frequency is the closest one to an actual frequency the PTO produces. From the chart, the dial frequency which corresponds to this PTO frequency is read, and he sets the dial to that signal frequency. Then, he loosens the shaft coupler and sets the PTO to whatever the exact oscillator frequency should be. Next, he tightens up the coupler, and moves back to the start, to a dial frequency of 2.000 Mcs. Then, all that is left to do is reach in and gently tap the cam down until a PTO frequency of 3.455 kcs is reached. Then he is able to tune the receiver up to 3.000 Mcs in 10 kc increments and tap down on the cam stack to make the PTO as linear as he likes. What a great method: When mine needs it again in 20 years or so, I'll try it.

Yet another PTO tip from Dave Metz: to avoid taking over his kitchen oven for a few days to bake moisture out of a PTO or a silica gel container, Dave got an old metal toolbox and drilled a hole in it, and mounted a light bulb inside. After trying a few sizes of light bulbs, he found the right one to maintain an even 140 degrees inside the box. This apparently has worked very well.

Ray Osterwald, NØDMS

Howard 438 from page 21
slug in the BFO coil rather than a variable condenser.

As received, my Howard played but it was quite drifty, much more so than a S20R which also came from Dayton several years later. Replacing bypass capacitors helped, as did replacing the plate feed resistor to the local oscillator, an old "body-end-dot" carbon composition unit that changed to less than half of its cold resistance as it warmed up. I can now operate the 438 quite successfully on the "Classic Exchange" as a trustworthy CW receiver, though I give it a half hour or more warm up whenever possible. Perhaps one of these days I'll add a neon bulb regulator to the local oscillator feed, a trick that was known by at least the designer of the BC348 at about the time that the Howard was new.

My Howard 438 was made for only one year, and was rather "plain Jane" as the Howard line developed toward 1942. The Howard 460 included a built in "Frequency Meter." The 450 and its successor, the 450A covered 5 meters with a 1560 kHz IF on that band range. And Howard finally offered a "top-of-the-line" model 490 in 1941 with features and price similar to a SX32, the SX28 without the fancy IF noise blanker. I was lucky enough to find a 490 just before I pulled up stakes to move to New Mexico. It works, though the crystal filter and the broadcast band tuning range are both in need of help. But that is fuel for another story.

Howard went on to assemble BC779/1004 Super Pro's during the war, if my memory is correct. My cousin who pounded brass for Uncle Sam in that period assured me that they were not as good as the Hammarlund variety. After the war they just seemed to fade out of the picture.

But don't pass up an old Howard if you happen to see one in the flea market. They can still turn in a quite acceptable performance for you, that is if you are a 'vintage receiver nut' like me. **ER**

HT-6 and HT-9 from page 14
The HT-9 outlived Samuelson at Hallicrafters. He resigned his post as engineering vice president in 1946. By then his long list of credits also included the HT-8, HT-11 and HT-12 marine radio-telephone units. He also had a hand in receiver development, including design of the gear drivetrain for the SX-28.

"The only reason I left Hallicrafters was to fulfill a promise I'd made to myself years earlier that I'd continue my education to get at least a master's degree," Samuelson explains. By 1950, he'd earned not only a master's but a Ph.D. in electrical engineering from Northwestern University. He then signed on with Motorola's government electronics division in Phoenix, quickly rising to the post of chief engineer and, by the time he retired in 1976, division director for research and development.

Today, remarkably fit and sharp at age 80, Samuelson looks back on his years with Hallicrafters as "The best experience a young radio engineer could've had in that era. Bill Halligan let us feel the real joy of creativity. It was an unorthodox place to work in a lot of ways. Nobody kept real track of our time; we came in the door early in the morning and went out at night when we felt we'd done what we could for that day. And every now and then were days when we didn't accomplish too much because Bill liked to throw parties in the plant to keep up morale. We worked hard, but we had fun, too. I cherish the memories of those years."

Samuelson fondly calls the HT-6 and HT-9 "two of my favorite brain-children" and is pleased to know examples are still around and occasionally on the air more than a half-century after he penned the circuits. "I never dreamed they'd last this long," he admits. "I guess we really must've done something right." **ER**

Editor's Note: Dr. Samuelson promises to continue his own "Recollections of a Radio Engineer" series in ER. He's at work presently on a detailed account of Hallicrafters activities during WW II.

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

FOR SALE: Military tech manual listings, largest stock in the world, over 50k - $5 refundable with first order. SASE for inquiries. Lee Frank, POB 10776, Harrisburg, PA 17105-0776.

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

FOR SALE: 3 vg Johnson Viking Rangers - $150 each. **WANTED:** ARRL Handbook, First Edition 1926. Bob Schafer, WA7IIN, POB 442, Aumsville, OR 97325. (503) 749-1149

FOR SALE: SCS-2 and 3 technical manuals (BC-638, 639, 640, 686, EE-99, RC-81, 93 and RM-18, 25). SASE or call for list of these and over 100 other 1940's and early 1950's military technical manuals. August J. Link, 2215 Faraday Ave., Suite A, Carlsbad, CA 92008. (619) 438-4420 Mon-Sat.

FOR SALE: SX-43 - $75; S20R - $40; manual for S-38. **WANTED:** Siltronix equipment: meters, counters, radios. Larry Cozzi, Rt 1, Box 60, Solon Springs, WI 54873. (715) 378-2845

WANTED: Original US military radio technical manuals, vintage 1942-1960. Glanzmann, Impasse 22Bis Ave.,Gros-Malhon, 35000, Rennes, France.

FOR SALE: Johnson Valiant - $175 FOB, $255 shipped. Don Bishop, Box 4075, Overland Park, KS 66204-0075. (913) 381-4359

WANTED: Parts for complete final amp for Collins 30K-1. Jim Schlutz, W3MYK, (717) 854-4782

WANTED: Manual or schematic for AN/URC-54 UHF xcvr. Robert Bennett, 5675 Shadow Hills, Las Cruces, NM 88001.

FOR SALE: 75A-4, serial 4077, reduction knob, 3 kc filter - $400; Heathkit HX-10 - $100; ARRL Handbooks, 1948, '49, '56, '59 - $14; 1936, 1939 - $30; BC-429 - $90. Mark Hovda, NØJWI, P.O. Box 10091, Cedar Rapids, IA 52410. (319) 364-4048 7-9 PM

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FOR SALE: Used technical books - radio, electronics, military, test equipment, catalogs, etc. List- $1 (stamps ok). Softwave, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: Army portable radar PPS-4. Complete system with tripod and transit cases, very rare - $500. **WANTED:** Early radar, Airborne ATK, AT] TV cameras, pre-war oscilloscopes, pre-war CRT's, early broadcast TV cameras. Allan H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

FOR SALE: Collins 75A-3 rcvr, very clean - $250; Henry 2K4 console linear, very clean - $695. PU only. Jack Elvis, K6EVY, (714) 969-1147

WANTED: Eico 722 (A) vfo, 720 CW xmtr. James G. Herkimer, WB2ANO, 338 Village Blvd., S, Baldwinsville, NY 13027. (315) 635-8016

WANTED: Info/schematic to build linear amp using two 811A tubes. Appreciate lead to Handbook circuit, or pay copying & postage. Also looking for any mods/improvements to Heath HW-20 Pawnee. Thanks. Wayne Arnett, AI7C, 2699 Mazatlan Dr., Grand Junction, CO 81506. (303) 241-3474 days

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FOR SALE: HQ-170AC - $150; DX-100B - $150; Heath Cheyenne w/ac supply - $90. **WANTED:** Old 2-meter FM gear circa 1970. Cliff Fleury, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

FOR SALE or TRADE: Many components. **WANTED:** Hallicrafters SR-150 w/ps or NCX-5. Russ HUNT, W9HZD, 2242-C Via Puerta, Laguna Hills, CA 92653. (714) 859-6428

FOR SALE: B&W 5100B HF xmtr. 100 watts AM/CW, works and looks fine w/51SB-B outboard SSB generator (untested) and manual - $250. Too heavy for UPS. Steve, NW2F, POB 721, Pawling, NY 12564. (914) 855-1829

FOR SALE: "73" collection, mint - cash or trade for mint operating AM/CW xmtr, Johnson, Harvey-Wells, B&W, Davco, Eico, Eldico orWRL. Tom Schlechte, 1021 Hunt Ave., Lakeland, FL 33801. (813) 687-3721

WANTED: HRO-60 coils type "G" and WE/ALTEC 755A spkrs. Barry Nadel, Box 29303, San Francisco, CA 94129. (415) 346-3825

FOR SALE: Lafayette radio operating and service manuals, schematics etc. If I don't have it,they never printed it. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

FOR SALE or TRADE: Viking II w/vfo; Drake 2B w/Q-Mult.; BC-610F w/coils/tuning units; RCA AR-88 rcvr. Joe Perratto, K2QPR, 1341 SW Evergreen Ln., Palm City, FL 34990. (407) 220-2189 anytime

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WANTED: Old books, magazines, Handbooks, White's Radio Log; first callbooks; old writings on early radio; issues of "Radio Magazine". Call, write or FAX. I pay shpg. Please do not throw them away. Donald R. Boland, N1FYX, 28 Faulkner St., Malden, MA 02148. (617) 324-5362, FAX 322-8412

WANTED: RF impedance bridge such as General Radio 1606A. Walt, 225 S. 17th St., St. Helens, OR 97051. (503) 397-1046

FOR SALE: Conset CSB-100 xmtr, clean w/manual - $200; Collins 516E2 - $49.95; 75A-3 Mc dial - $40; DX-100, works w/manual. **WANTED:** 75A-4 Mc dial; gen. coverage rcvr such as GPR-90 or HQ-180. Bill Jenkins, WA5MWJ, 11916 Donahoe Rd., Fort Smith, AR 72916. (501) 646-3859

FOR SALE: Electron tubes, all types, new and used, pre-tested; orig. Sams for vintage radio and TV. Henry Seegitz, 32 Sylvaton Terr., Statten Island, NY 10305. (718) 273-7306

WANTED: Need osc. and final plate coils for Hallicrafters HT-6. If you won't part with yours I would appreciate construction data so I can restore this classic. Also need a junker unit. Thanks. R. Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083. (609) 783-4175

WANTED: AM crazy, looking for xmtr like Johnson Ranger, any condx; 100 Hz xtals HC13/U. Ernst Schroeder, DJ7HS, Pinkenburger St., 25 D, 3000 Hannover 51, Germany. Phone 011-49 511 549 0486

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WANTED: Manual for HP600B; 3TF7 tubes; meters for R390A; TEK 465 or 475 scope, must be in very good cond. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

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

FOR SALE: Knight Spanmaster, exc. cond. - $40 ppd. Herman Gibbs, KD8PD, Box C-3177, The College of Wooster, Wooster, OH 44691. (216) 263-2000 ext. 2212, leave message

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WANTED: 6-meter converter for NC-303. Thomas Loines, W2EAQ, 149A Carlton Ave., E. Rutherford, NJ 07073. (201) 933-9231

FOR SALE: SAMS for hams. Photofacts of vintage ham gear. We also buy used SAMS. A.G. Tannenbaum, WA2BTB, POB 110, East Rockaway, NY 11518. (516) 887-0057

FOR SALE: (2) AN/ARC2A's (no DM's) - $125 each. **WANTED:** R-390 (not the A model) parts unit. I would consider trading for a R390 unit. Dave Metz, 1016 Ridgemont Dr., Staunton, VA 24401. (703) 885-7914 eves 7-10 PM EDT

FOR SALE: Repro drum decal for Collins 75A2/3 - $10. Coming soon repro decals for all Collins equipment. Dave Knepper, Box 34, Sidman, PA 15955. (814) 487-7468

WANTED: Collins product literature and catalogs. Jim Stitzinge, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011

FOR SALE: National NCX-3, NC-240D; Gonset Comm III; Hallicrafters SR-150; speakers - R-47, S-200; manuals - SX-88, S-76, R-274 (SX-73), HQ-129X, SX-100, SX-71, Drake 1A; McMurdo Silver wavemeter. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

FOR SALE: Type 6000 tubes for T-368. **WANTED:** Millen 90801 exciter; 4-400 tubes (pair); Millen VFO. Andy, WA4KCY, (706) 832-0202 or callbook.

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WANTED: For parts - Howard 490 and SX-71; need cabinet for Hammarlund HX-500. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

FOR SALE: Older lab test equipment manuals 1940-1980, reasonable, no list, write needs. SASE. S.T. Carter, II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

FOR SALE: BC-1031-A panadaptor, 455 Khz input - $50; AN/PDR-27F radiation detector w/accessories - $45; more, list - $.50. **WANTED:** Any Collins literature. J. Orgnero, VE6RST, Box 32, Site 7, SS 1, Calgary, AB T2M 4N3, Canada (403) 239-0489

WANTED: Kit building manual and schematic for Knight Kit Space Spanner. Walter Bortree, WA3SWH, 249 Glenn Rd., Camp Hill, PA 17011. (717) 732-5312

WANTED: GDO heads and coils, 59 LF, Boonton. (Thanks, OM, for answering last year; your letter was lost during turmoil after my wife went to Heaven.) N5LTP, POB 465, Los Alamos, NM 87544.

FOR SALE or TRADE: Various Narco, Collins aircraft tube type gear - SASE. **WANTED:** NC-101X and S-35 pan rcvr. Nick Oland, W3DSE, 821 Kenhorst Blvd., Reading, PA 19611. (215) 378-1411

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FOR SALE: SP-110-LF-X, 200 kcs to 20,000 kcs w/xtal filter, circa 1937 in exc. orig. condition, power supply included but not original, Rider manual copy - $250; Collins 30S-1 0-1 amp meter, NIB - $40; S-20-R w/Rider manual - $125. **WANTED:** Rider manuals 1-6 and 13 up. Indexes too. Clyde Sakir, N7IOK, 4243 E. First St., Tucson, AZ 85711. (602) 323-1120

WANTED: Manual (or copy) for Globe King 400C; coils or drawings of coils for 15, 20, 40, 80 and 160 M. Also need PA grid, plate meter with World Radio Laboratories on the face. All for 400C. Blaine Puterbaugh, WB8SSD, 8732 Secor Rd., Lambertville, MI 48144. (313) 847-3367

WANTED: I have a BC-222 with no accessories but otherwise complete. I also have a TBY xmter-rcvr in exc. condition w/orig. mics and headphones. I will trade both the BC-222 and the TBY for a BC-191 in good cond. w/tubes and one tuning unit. Ted Bracco, WØNZW, Quincy College, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

FOR SALE: Collins 75A-4, vernier dial, orig. manual, 2.1 Khz, 1.5 Khz, plus cascaded 2.1 Khz mech. filter, high performance mixers, SN 115 - $550. Joe Holstein, N8EA, 1515 Sashabaw, Ortonville, MI 48462.

WANTED: "Radio Magazines". Trade sixth edition of "Radio" Handbook for fifth or seventh edition, or will buy. Wayne, NØTE, Rt 1, Box 114, Burlington, KS 66839. (316) 364-5353

FOR TRADE: Miscellaneous National AGS (?) and FB7 coils. **WANTED:** SW3 80-meter RF bandspread coil; NC-125 top/bottom covers and knobs. Neil Wiegand, WA5VLZ, 12105 Mustang Chase, Austin, TX 78727. (512) 219-8548

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WANTED: Copy (Xerox ok) "The ARC" (Asheville) August 2, 1939. Also McElroy article January 1937, "Short Wave and Television". Tom French, W1IMQ, "The McElroy Collector", 120 Great Rd., Maynard, MA 01754. (508) 897-2226

WANTED: Hallicrafters SX-100, SX-100A, must be clean, orig. and in wkg cond. Also, need manual (copy ok) and knob (pointer reset) for SX-62. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

WANTED: Mint WRL Globe Scout 65A and/or 755 vfo w/books. Doug Gordon, K6PUN, 2215-A Faraday Ave., Carlsbad, CA 92008. (619) 438-4420 days M-F

FOR SALE: Globe King 400B - $300; V-70D's - $60 ea.; CE 10A w/458 vfo - $60; 304TL's - $40; 500-watt RF, 250 audio mod xfmr - $40. Jeff Garrett, KEØMT, 4622 W. 33rd Ave., Denver, CO 80212. (303) 455-5658

WANTED: Frequency window for Drake 2A/2B, directional coupler for Johnson KW Matchbox, PN 250-37. Jim Allen, KC6VWV, (415) 968-0640

FOR SALE: Collins 75A-4 filters: 6 pole ceramic for high quality AM. 3 bandwidths available: 4, 6, or 9 Khz - $83.50 ea.; single pole CW crystal filters - $88 ea. 10% discount for two filters. Money back guarantee. Calif. residents please add sales tax. Vector Control Systems, 1655 No. Mountain, Ste. 104-45, Upland, CA 91786. (714) 985-6250

FOR SALE: 160-meter variable bandpass filters. Eliminates BC interference for receivers, antenna bridges. Ham Radio Feb. '75. John Oliver, K5UU, 700 Neil Creek Rd., Ashland, OR 97520.

WANTED: Crystal calibrators 8R-1 for 75A-2, HA7 for SX-122, XC-100P for HQ-145A; AM filter for SB-303. Ed Sauer, KC9SP, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483

FOR SALE: T-20/ARC-5 xmtr 4-5 Mhz, mint, never used - $30; Heath HW-16 CW xcvr w/manual and xtals - $50; National NCX-5 xcvr w/spkr supply and manual - $250. U-ship. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, L.I. NY 11758. (516) 798-1230

FOR SALE: ART-13B w/connectors and book - $150; ART-13 parts unit - $50; BC-348R - $85; Sprague TO-6 capacitor checker - $40; 4318 power meter with mount - $85; 6C21 triodes - $50 each. Prefer pickup heavy items & tubes. James Owens, NWØO, 1363 Tipperary St., Boulder, CO 80303. (303) 673-9019 eves.

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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

FOR SALE: Boonton 260-Q-Meter; TMC TAC-1 tuner; TMC BSP-6B bridge amp; Cornell Dubilier BF 60 cap. bridge; Keithly 150A U, V, A meter; Paco G15 GDO; Eico 710 GDO; Heath AM-1 Z-meter; Bud WM 78 wavemeter; Millen 92101 ant. amp.; National NBS1 rcvr; Gonset G63 rcvr; CE MM2; Jackson 648 tube tester; Pierson KE 93 rcvr; GR1611 cap bridge; GR724 wavemeter. Also have large quantity of tubes. Bruce Walther, W9QAH, 3000 McCullock St., Stevens Point, WI 54481. (715) 344-9099

WANTED: Central Electronics stuff (other than 10A, 10B and 20A), junkers, parts or new. What have you? Tom Hoitenga, K8NGV, 3170 Kennesaw View, Marietta, GA 30064. (404) 426-8682

WANTED: Collins F455C-31 mech. filter for 75A-3. Also want DX-100B. Will PU within 250 miles of Joplin. Don Hilliard, WØPW, Rt 5, Box 219, Neosho, MO 64850. (417) 451-5892

FOR SALE: New Collins parts: 30L-1 blower motors - $35; 51S-1 PTO osc., 70K-7, P/N 522-2918-000 - $200; silver plated 30S-1 tank coils - $7. Dennis Brothers, WAØCBK, HC 84, Box 1, Potter, NE 69156. (308) 879-4552

WANTED: Help! I need information about the Multi-Elmac Company. Would like to talk to any former employees. Please contact Lea Salter, KN4JW, 310 So. Park Dr., Spartanburg, SC 29302. (803) 582-8237

FOR SALE: Audio transformers as follows: Thordarson, type 5837, output - $15; Amer Tran, type 993, output - $15; Dongan, Diatonic, output - $10; Selectone by Scott Transformer Co., Chicago, USA, orig. bakelite case with new 3:1 ratio inside - $15; AK 1 3/4" x 3 1/4" round can with new 3:1 ratio inside, cut flange; AK same size with full round flange, new 3:1 ratio inside - $15 ea.; Fada in black bakelite case, new 3:1 ratio inside - $15. Please include $4 each shpg. Benrus solid brass case clock radio, new spkr, filters and bypass caps, very unusual - $100 plus $10 shpg. James Fred, R1, Cutler, IN 46920. (317) 268-2214

WANTED: Viking I; VF-122; Collins SM-2/3 mics; 75A-4/KWS-1's for restoration. Butch, KØBS, (507) 288-0044

CLASSIFIEDS

WANTED: Tempo-One vfo; Knightkit Spanmaster; Eico 720/722/730; Allied Radio catalogs. John Vercellino, WB9OVV, 6921 Springside Ave., Downers Grove, IL 60516-3114. (708) 964-3020

FOR SALE: Collins R388, good/restorable - $125; 814, used - $10. **WANTED:** Viking 500, Globe King in good condition, will pick up. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND (701) 772-6531

WANTED: Manual or copy for Globe Champion 300A xmtr. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: Manual and/or schematic for Sorenson power supply, model STM 12-12. Will pay reasonable fee. Warren Dittmer, K2LXW, 10 Revere Rd., Ardsley, NY 10502. (914) 693-1040

FOR SALE: Model AN/ART-13 and SCR-522-A manuals. J. Glendening, WB6WTJ, 4122 Palo Verde Ave., Lakewood, CA 90713. (310) 421-2171

FOR SALE: Greenlee round radio chassis punches, 1/2", 11/16", 1 5/32" and Pioneer 5/8". All four - $25 postpaid. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (708) 679-8641

WANTED: Data on the 12A6 as a push-pull audio amplifier. Ray Larson, 12241 1/2 Gorham Ave., W. Los Angeles, CA 90049-5214.

FOR SALE: Johnson KW Matchbox, exc. - $250; Central Electronics 600L - $150; Volumax 4000 - $100; Audiomax 4440 - $75. Ed Prior, N2CWJ, 159 Albany St., Clayville, NY 13322. (315) 839-5883

WANTED: VFO for Harvey-Wells Bandmaster and 80 meter coil for prewar HRO. Dale L. Martin, W7LOG, 2021 153rd Ave., SE, Bellevue, WA 98007.

WANTED: 500 Hz filter for HQ-215 and 75A-4. Bob Zimmer, NY1X, 205 Brigham Hill Rd., Milton, VT 05468. (802) 879-7235

ELECTRIC RADIO PARTS UNIT DIRECTORY

At this point the directory has 200 units in it. If you need a part for a vintage restoration send $2 and an SASE (.52 postage) for the list. If you have a parts unit, consider putting it on the list. Your dead unit can help bring others to life!

CLASSIFIEDS

WANTED: 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.

FOR SALE: Repair & refurbishment of older tube-type amateur equipment. Fully FCC licensed; 35 years experience. Chuck Banta, N6FX, Claremont, Calif. (LA area) (714) 593-1861

WANTED: Dead or alive National NC-190 rcvr. Bill Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

FOR SALE: Johnson 275 watt Matchbox w/ SWR meter - $75; HRO-W w/ps, 4 coils & box, sharp, has ANL mod - $155; edge wound roller inductor w/counter - $60; Hallicrafters S-20R - $50; dual capacitor, 150 pF/section, 0.13 spacing - $20; tubes - CWL-860 - $15, CWL-861 - $35; FM sig. gen. 25-470 Mcs, Measurements 560FM - $50; HP 200AM audio osc. - $30. Shpg; xtra. George, WA7HDL, (208) 756-4147

WANTED: Clean and reasonably priced: Who's Who in Amateur Radio ('30's); '30's Handbooks; Command rcvrs and xmtrs (prefer w/ps); Autronic, Elkey and Vibrokeyer paddles; VFO (especially Hallicrafters); high power fixed and variable caps; Collins F455B-60 and F455A-08; Drake R4A or B; SX-111; SX-115; HQ-215; Allied A-2516; PTO adjustment tool for 75A-3. Dave Heil, A22MN (K8MN), Gaborone/Dept. of State, Washington, D.C. 20521-2170.

FOR TRADE: Clean ARA (LF) rcvr with local adapter or BC-191/375 shockmount plus new TU-7 for your Navy CF shockmount; my G-76 plus AC, Lafayette xcvr HA-1200, Heath SB-310 for approx. equiv. value military gear. **WANTED:** German, Italian, Japanese WW II radio equip., parts, anything in any cond. Also wanted U.S.A. , Canada 1930-1950 mobile radio: AR-6, ARR-16, ARQ-1, ATR-11, BC-310, BC-1209, DAG, DAV, MBM, MSR, PRC-1, PRC-5, SSP, RAX, TCH, YRS-1, Forest Service, Coast Guard, anything build in BC, WA, OR, mobile radio manuals any year, what have you? Thanks, Hugh Miller, 6400 Maltby Rd., Woodinville, WA 98072-8375

WANTED: Drake, Collins, Hammarlund general coverage rcvrs. Consider trades. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

FOR SALE: 19" x 8 3/4" rack panels - $5 ea.; CRT's (SC4679BPSP, 7BP4, SBP1), Silvertone 92104 tube gray plastic portable, Philco 4-tube bat. A/C chassis, AT-5568/ARN-41 search head, Sperry A-2 4-tube amp - $7.50 ea.; Heath V-5, V-7A - $12.50 ea., Mashushita wood case 5-tube (535-1605, 3.7-12 Mhz) rcvr, RG-2/ARC-5 ant. current ind., Lear 108-126 Mhz aircraft rcvr, Weston 779 wood case VOM, Heath GL-7 6 transistor leather-case AM portable, RCA RLM 6781 transistor portable, Drake 1-tube Q-5er, Eico 635 tube tester - $15 ea., 3-4 Mhz unmodified ARC-5 xmtr (no tubes or cover), Heath IM-10 VTVM, Hallicrafters S-38B - $25 ea., Hallicrafters S-120 - $35; RCA Radiola 17 (good tubes, no spkr) - $60; Hallicrafters SX-71; National NC-125 - $85; National NC-183D, Zenith Royal 3000-1 Transoceanic - $100 each; Zenith A-600 Transoceanic - $150. All postpaid. Eric Jones, N4TGC, Rt 11, Box 492, Florence, AL 35630. (205) 764-0675

WANTED: Qty of Johnson ceramic transmitting tube sockets, 4-pin bayonet type for tube display purposes. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE: Hammarlund PRO-310, exc. condition w/manual - $295. No shpg. Doug, N8NHG, 1539 North Rd., Troy, OH 45373. (513) 335-1300

WANTED: AC supply for Elmac AF-68; junker T4XB for parts; bottom plate for D-104; manual or copy for Heathkit DX-60B, HW-12A, B&W 5100B, Elmac AF-68. Al Norton, K7IEY, 1008 Liberty St., Lynden, WA 98264. (206) 354-4622

FOR SALE: Kilowatt amp parts: roller inductors, 300 pF vacuum variables, 4-400s; Collins 618T (HF-101-4) tech. manual. **WANTED:** Accessories for MN-26 & D22 RDF sets (control boxes, cables, etc.); manuals for SRR-13, ARR-15 & D22. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

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

CLASSIFIEDS

FOR SALE: R-390A's, complete units in various stages of tune; partial units; modules; cabinets; repair/restoration service available. LSASE for list. APS, Dept. E, 107 Fayton Ave., Norfolk, VA 23505.

FOR SALE: Special transformers for your vintage equipment. We rebuild transformers for all equipment. Max Kunz, Top Tech Inc., 10811 Fairbanks, North Houston Rd., Houston, TX 77086. (713) 440-9909

WANTED: Ten Tec PM-3; vfo 80-10; Gonset G-76. Chris Schiotz, K2PGB, 15 Rungon Mill Rd., Ringoes, NJ 08551. (908) 782-7414

WANTED: Collins mech. filters for 51J4 rcvr, 800 Hz, type F500B-08 and 3.1 Khz type F500B-31. Also need manuals (or copy of same) for the following equip - Collins 51J4, Heath HW-12A xcvr & IT-17 tube checker, Beco (Brown Inst. Co.) impedance bridge model 250-CA. Will pay reasonable price, please call collect. Paul Castrodale, W0FTN, 10930 Woody Lane, Coon Rapids, MN 55448. (612) 755-1825

FOR SALE: Hammarlund HQ-180AX - $185; Drake 2C - $85; 2AC - $25; Hallicrafters SX-117, HT-44, AC supply, boxes - $295; PM-23 spkr - $30; Johnson 275 watt Matchbox w/SWR - $75. Jerry Tastad, KB7M, POB 127, Laramie, WY 82070. (307) 742-4033

WANTED: R-388, good to exc., will pay up to $200 + S&H or PU within 200 miles; info on the AN/SRT-4A xmtr. Bill Bogart, KA9CWK, POB 81, Covington, IN 47932. (317) 793-4660

FOR SALE: Langevin AM-307 AM BC mixer - $50 plus shpg. **WANTED:** National SM-57 S MYR audio xfmr - HRO-7. Jim, K7BTB, Box 50355, Parks, AZ 86018. (602) 635-2117

FOR SALE: British MK123 spy set, miniature tube rcvr, 2 tube CW xmtr, output up to 25 watts, built in key, xtals, for 20 & 40 mtrs. All in good wkng order w/accessories and manuals. Used bsy British Secret and Special Service in '60's and '70's. Very well made - $425. Nigel, (404) 949-1097 (h), 994-3900 (w)

WANTED: AM BCB ant. coil for National Sixty Special; Regency XR-24; Heath UT-1; XC-6; Swan 350A, B, 140; Drake DSR-1,2; tubes - 9909, 809. Herman Cone III, WB4DBB, 305 Foxwood Dr., Goode, VA 24556. (703) 586-5643

CLASSIFIEDS

WANTED: AC ps for ART-13 xmtr; XCU-300 xtal calibrator. F.W. Nicholas, POB 37094, Phoenix AZ 85069. (602) 864-9987

WANTED: National SW-2, SW-3, SW-4, SW-5; early National literature; coils for National rcvrs. Steve Barnes, K6PFW, 848 N. Silverwood, Upland, CA 91786.

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

FOR SALE: DX-100B w/SSB adapter; Heath HR-10; Drake 2B with 2-AQ; SB-102; RT-91/ARC-2. **WANTED:** Johnson 500 in good to exc. cond.; Hallicrafters SR46A w/vfo; bandspread knob for SX-88; grid/multiplier for Johnson 6N2 T-Bolt; large multi-tap mod xfmr suitable for pair of 4-400s. Barrie, KF7VA, 125 Ben Hogan Dr., Missoula, MT 59803. (406) 549-1921 (h), 728-7637 (w)

WANTED: Clean 32V-2 or 32V-3. Peter Brown, KH6IRT, 5332 Puahia Pl., Honolulu, HI 96821. (808) 373-2792

FOR SALE: R1134B/WRR-3 VLF rcvr 14-600 khz, one fair - $175, one rough - $125, both for $275; BC-224B early version without LF-range, no dynamotor - $130; R-196C/ARW-26Y - $20 ea.; TS-683/TSM crystal impedance meter, 140 Mcs - $50; Electro-Voice dynamic, noise cancelling mic, M92C/U w/PJ-068 plugs - $6 ea.; R1021/ARN-30D w/solid-state ps - $40; BC-1206-CM - $25; SRR-13, fair, complete - $75. Shpg xtra. WW II military equip. manuals, send SASE for list. I will also pay top $ for German and US WW II military equipment and/or manuals in large or small quantities, call or send list with prices. Keith Morton, 3936 E. Orchid Ln., Phoenix, AZ 85044. (602) 759-8233

WANTED: Rider manuals #6 & #7 plus #15 thru #23. S. Kalista Sr., 9 Maple Dr., Jim Thorpe, PA 18229. (717) 325-4120

WANTED: Manual for CV-591A/URR made by Technical Material Corp. John Burgwyn, W4WAW, POB 7034, Rocky Mount, NC 27804. (919) 437-0851 eves.

WANTED: Pierson KE-93 rcvr; manual for Johnson Ranger, copy ok. Howard Hood, WA7QQI, 5670 SW 44th St., Port Orchard, WA 98366. (206) 674-2179

FOR SALE: Globe Scout Deluxe, not wkg - $25; 75A-4 manual - $25. **WANTED:** Knight R100A rcvr. Dan Radcliffe, KF9BP, 8201 Plainview Pkwy, Sussex, WI 53089. (414) 255-9165

WANTED: 1940's and 50's QST magazines; NIB 3B28 and 807 tubes; Hallicrafters R46B spkr. Al Coil, KO9S, 607 Countryside Lane, Hudson, WI 54016. (715) 386-5284

WANTED: 6L6GX or HY6L6GTX tubes. Have cash, manuals and parts to trade. Bob Mattson, KC2LK, 10 Jane Wood Rd., Highland, NY 12528. (914) 691-6247

FOR SALE or TRADE: C-845/U - $45; TV-10 transverter, 225-258 Mcs (ARC-12), mint - $90; BC-348-R, 110V, works - $80. WANTED: Manual for R-1052/FRR. Jay Myers, 1010 Graybar Ln., Nashville, TN 37204. (615) 297-5886

WANTED: Matching spkr for NC-300 rcvr; cabinet for SP-600 rcvr. Tom Jurgens, KY8I, 3920 Jim Dr., Bridgeport, MI 48722. (517) 777-2257

FOR SALE: Hallicrafters S-94, Regency MR-10B, both w/manuals - $25 ea. **WANTED:** AX9901 or 5867 tube. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942.

WANTED: B&W 852 bandswitched tank coil. W1ETC, Box 747, Amherst, NJ 03031-0747

WANTED: Copy of manual/schematic for Poly-Comm 6 meter AM xcvr. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Heath 5 tube superhet AM broadcast radio w/manual. Richard Allen, 361 E. Pinehurst, La Habra, CA 90631. (310) 694-5027 eves.

CLASSIFIEDS

WANTED: Hallicrafters SX-28, SM-40 S-meter; (2) Collins S-Line spkrs; Knightkit Oceanhopper rcvr. Bill Colligan, N1DJR, 35 Quail Run, Hampstead, NH 03841. (603) 329-7879

WANTED: Tube CB rigs for 10-meter project. Steve White, WB5UGT, 1156 Ash, Clute, TX 77531-3814. (800) 374-6477-9008 24 hrs, leave message

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WANTED: James Millen model 90811 RF amp. It's the 829B amp for 20 thru 2 meters. Bob Bricker, K4CSV, 1315 Hickory Terrace, Fernandina Beach, FL 32034-2955. (904) 277-7061

FOR SALE: Hammarlund HQ-100 gen. coverage rcvr - $125. WANTED: Hammarlund HQ-200 or HQ-150. Charlie, KD4AJ, (404) 396-0276

WANTED: RME-4300; RME-6900; 51J4; 75A-1; 75A-2; NC-303; NC-400; HRO-500; HRO-600; 32V-3. All letters returned. Russ Dworakowski, 4112 Lake Pleasant, Erie, PA 16504.

FOR SALE: 500 watt AM xmtr, 1940's vintage, beautifully and profesionally constructed w/ top quality components, using pair of 100TH's in final, modulated by a pair of 811's. Fully metered including all power supplies, speech amp., modulator and antenna matching network in a single 6' enclosed rack cabinet. Front and rear view pictures available at $3 per set. Price - $750. LSASE for my summer for sale list. Parker, W1YG, 87 Cove Rd., Lyme, CT 06371. (203) 434-7783

FOR SALE: Parting out good Collins 32V-3. George Bunce, W5DKC, Rt 1, Box 85, Edmond, OK 73034. (405) 341-6419

FOR SALE: Manuals for military radio, mostly WW II; ham books; tube references; misc vintage radio publications. SASE for list. Huge WW II equipment list coming in August, send want list now to buy before list comes out. Henry Engstrom, POB 5846, Santa Rosa, CA 95402.

FOR SALE or TRADE: Nice HRO-500 w/ manuals and factory invoice for nice quality AM gear. John, WB5OAU, 7605 Roberts, NE, Albuquerque, NM 87109.

FOR SALE: National Radio model HRO-50-R (rackmount) with speaker and all 11 ceramic band-tuning modules. In excellent original working condition. Best offers considered. A.J. Anello, 1915 W. Waters Ave., #1, Tampa, FL 33604. (813) 933-6009

WANTED: Viking I and 122 vfo; 75A-4 spkr; KWS-1; SM-2/SM-3 mics; EV 630/PTT stand; E coil for HRO-60. Butch Schartau, KØIBS, 5361 St. Mary Dr., Rochester, MN 55901. (507) 288-0044

FOR SALE: TMC GPT-750 xmtr; T-368 xmtr. Both in good cond. Also a Racal model RA-253B rcvr w/manual. Dick Wagner, KB2EGC, Pawling, NY. (914) 855-9573

WANTED: Manuals, schematics for Drake 1A and Polycomm 62. Copies ok. Brian Hemmis, K3USC, 7575 Hamot Rd., Erie, PA 16509. (814) 866-2585

WANTED: Manual or schematic for Eico scope model 460. Steve Berg, 609 Woodfire Way, Casselberry, FL 32707. (407) 699-9433

WANTED: Sylvania Gold Shield radio complete with leather case. Important to leave message on answering machine. Mark Grenley, 511 E. Roy St., Apt. #403, Seattle, WA 98102. (206) 323-8481

WANTED: National NC-183D, NC-127 rcvrs; Hammarlund SPC-10; National NCX-5 xcvr; Hallicrafters SX-88 and SX-73 parts. Joe Reda, KC6TXU, 380 Dunster, Campbell, CA 95008. (408) 374-7645

WANTED: Johnson Ranger I. Bob Braeger, WA6KER, (714) 682-5084 call collect.

WANTED: Filter FL-10 for BC-474; information manual for R2A/ARR-3 rcvr; BC-1335 and J-36 CW key. Henry Engstrom, POB 5846, Santa Rosa, CA 95402. message phone only (707) 523-9268

FOR SALE: (3) BC-342 rcvrs, exc. - $100 each; BC-348 - $100; R-390A, Motorola, vg - $250; (2) ARC-4 VHF set w/manual, exc. - $100 for both; ARC-3 VHF sets - BO. Mike Draa, (207) 525-3034

FOR SALE: BC-610 RF deck cabinet. **WANTED:** Sylvania 6JB6 tubes; clean Viking Ranger, preferably Ranger II. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

MESSAGE: Here are two excellent sources for antique wireless/radio work: One of our advertisers, Jim Dill, has done beautiful work for me. Patronize him. He's great. For special transformer work Peter Dahl is terrific. He rebuilt a rare 1915 25,000 volt spark transformer for me. Excellent. And he's very ethical. Paul C. Crum, Chicago, Illinois.

FOR SALE: Johnson Matchbox, 275 W, exc. - $75; National HRO-W w/6 coils - $150; National NC-303 w/cal. & manual - $250; military GRC-26D diversity rcvr - (2) R-390A, CV-116 RTTY combiner, fan, LS-206AU dual spkr - $550; B&W model 52-500A, 500 W dry dummy load and SWR bridge - $75; Heath GD-18 Grid Dip meter w/coils, mint - $45; Johnson low-pass filter, 250-20 - $25; Hallicrafters S-20R - $35; Hallicrafters S-77A - $25; B&W 550A 5-position coax switch - $25. Ron, KC6WTC, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR SALE: Speakers - R48 - $25; R48A, NIB - $35; R42 - $20; SC10 & SC12 - $19 ea.; NC44TS - $25; NC44TS - $10. Shpg xtra. Henry Mohr, W3NCX, 1005 Wyoming, Allentown, PA 18103. (215) 435-3276

FOR SALE: II Morrow FC-20 10-meter AM xcvr - $60; Western Electric 19C audio gen. - $42; military AM 494/GR 2-meter amp - $75; HP200CDRM audio gen. - $38. Richardson, W15D, 1040 Cleveland, Stephensville, TX 76401. (817) 968-3365

WANTED: Drake W-4 wattmeter. Barry, N6CSW/Ø, 4 Aspen Pl., Durango, CO 81301. (303) 247-4935

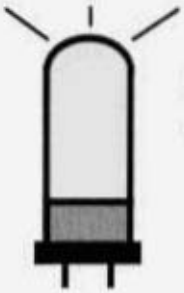
FOR SALE: R-390A's, complete units in various stages of tune; partial units; modules; cabinets; repair/restoration service available. LSASE for list. APS, Dept. E, 107 Fayton Ave., Norfolk, VA 23505.

FOR SALE: Johnson Viking II and Desk KW manuals. Joe, W6CAS, (916) 731-8261

FOR SALE: SX-28 spkr - $50; 310B-1 w/mods - $75 or want 310B-1 or -3 any condx; 75S-1/32S-1/516F2 w/orig boxes, unused past 20 yrs - $575; Johnson Invader - $85; Viking II - $55 as is or part out; Signal Sentry case - $4; manuals for AN/GRC3-8, AN/VRQ1/2/3 and AN/GRC10 - $10 each. POB Joe Sloss, K7MKS (206) 747-5349

WANTED: Power xfmr for Tempo 2020; RME 6902 rcvr; RME 6901 companion spkr for 6900; manual and schematic for Dage Scientific Inst. CM-6 cap meter; manual or copy for Johnson Mobile; manual for Globe HG-303 & companion vfo; dial drums for MR-1 & MT-1 Heath twins. Larry Howe, KBØHIB, 1333 S. Airwood, Springfield, MO 65804. (417) 882-1682

WANTED: For ART-13 restoration: MX128/ART-13, blank LF oscillator panel. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.



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