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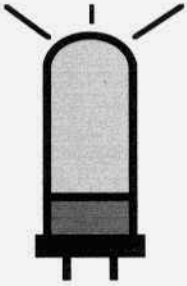
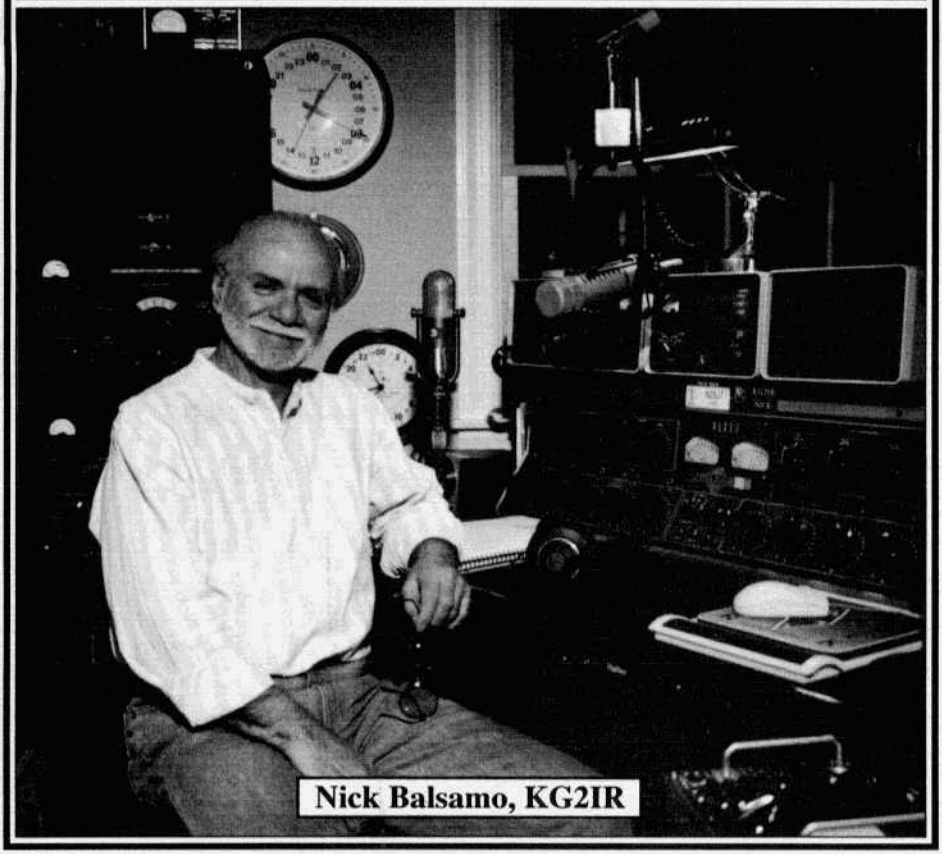


ELECTRIC RADIO

celebrating a bygone era

Number 97 May 1997



Nick Balsamo, KG2IR

ELECTRIC RADIO

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY and others.

EDITOR'S COMMENTS

The response to my mention of an ER sponsored Vintage Field Day (VFD) in my comments last month has been encouraging. Quite a number of AM'ers and also vintage enthusiasts who operate CW have given me a firm commitment that they will participate in the event so we're guaranteed some activity.

Bud Williams, KE7IP, wrote a very encouraging letter with information on the first field day from the June, 1933 issue of QST. The article in QST, titled "International Field Day - June 10th-11th", started out, "Clubs, 56 mc operators, *all* hams with licenses for portable stations, attention!! Starting Saturday at 4 p.m. local time (June 10th) and ending Sunday at 7 p.m. local time (June 11th), all U.S.A. and Canadian station owners are invited to schedule "field activities," excursions with concentrated operation of *portable* transmitters and receivers. Only portable stations, actually in the field, away from the "home" address are eligible to submit field day scores." The article laid down all the rules for the event and ended with this paragraph: " Besides offering an opportunity to get out in the open in this fine spring weather, the real object of this contest is to test "portables" wherever they may be available. If successful we want to make it an annual affair".

And if our VFD is successful I would like it to become an "annual affair" as well. We will take over the original date, the second weekend of June. At some point over the years the date for the ARRL sponsored field day was changed to the 4th weekend of June when it now occurs.

So the First Annual Electric Radio Vintage Field Day will be on the weekend of June 14th-15th. And we'll start at 4 p.m. local time (on Saturday, June 14th) and end it all at 7 p.m. local time (on Sunday, June 15th) just like they did at the first field day.

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Cover: Nick Balsamo, KG2IR, a recording engineer by profession, at his operating position. ***Photo by Paul Courson, WA3VJB***

Looking Back

by Lew McCoy, W1ICP
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I just got the word that Ed Tilton, W1HDQ, has passed on to the VHF/UHF area up above. Ed was without a doubt one of the major contributors to the hobby of Amateur Radio. I am sure that most of the readers of Electric Radio have memories of Ed, and his many accomplishments.

I first met Ed in Milwaukee at the ARRL National convention back in 1948. Ed was not an outgoing type of ham and one had to push him to get him to talk and relax. I had called him from Illinois to West Hartford, Conn. to talk about Yagi element spacing in beams. In Milwaukee, I saw him standing to one side and I had to goose up my courage to go over to talk to him. I wouldn't say he was a snob but I found it difficult to get into a conversation with him.

When I was hired by the League, and came up to West Hartford to go to work, I had been informed in no uncertain terms that everyone - with one exception at ARRL - were dedicated to CW types - there were no phone men there - ah - but excuse us - we do have one phone man but he doesn't count - that is Ed Tilton who only works VHF--!!!

Ed had already become a legend in that he had some unusual records that he had achieved. He was the first ham to work across the Atlantic on 6 meters. More about that in a moment. He instituted WAS on VHF and then proceeded to work them all - then 48 - before anyone else. He wrote the first VHF manual-which was always very popular. He was an excellent builder of gear and experimenter. In our technical department he was a loner. Ed just went on doing his thing. While he built and described gear for as low a band as 10 meters, he pretty much stayed to 6 meters and higher.

I have pointed out before that George Grammer was the technical director but he left Ed pretty much alone. I do remember quite clearly when television sweep tubes came along and George called me into his office and told me he wanted me to build a 6 or 2 meter amplifier using sweep tubes. I asked if that project was OK by Ed Tilton but Grammer gave me a stare and said HE was the technical editor and to do as I was told! I did but caught hell from Ed for invading his territory (!). I went to George and George simply shrugged his shoulders and told me to forget it. (Nobody argued with George!)

Another incident that happened concerned the ARRL museum. We had a museum, a very fine museum, that was in the lobby at Headquarters in Newington. Roland Bourne, W1ANA, was the curator and a darn fine one. (Roland had been chief engineer for Hiram Percy Maxim - one of these days I will do a column about Roland.) I remember Roland had to make room in the museum and that meant some of the stuff had to go. One of the items was the transmitter that Ed Tilton had built and used for the first 6 meter contact across the Atlantic. I remember that the final tubes were a pair of 25G's. In any case, no one wanted the unit so I took it home - after all to me it was a very historic piece of equipment. A few years later the museum was increased in size so I donated the rig back to the museum. I recall that the card describing the rig said what it was and that it was donated by Lew McCoy. Ed Tilton of course blew his stack but I pointed out to him that I didn't write the card nor did he make any claim to the rig a few years back when it was discarded.

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AMI Update - May

by Dale Gagnon, KW1I, President

Amplitude Modulation International hit the 1000 member mark during April. We are now up to AMI Certificate #1015. The AMI bank account is bulging at over $200.

AM Night on the Collins Collector Association Net on April 17 was a great success. See the article by Rod Blockstone, KØDAS elsewhere in this issue describing the AM operation at the Collins Amateur Radio Club under license WØCXX, AMI Certificate #1000.

Armed Forces Day Weekend Operating Event is May 17 and 18. See April Electric Radio, page 18 for more information. Certificates will be awarded for logs submitted.

The Dayton Hamvention is also the same weekend May 16-18. AM operators, family and friends will be gathering 7:30 Saturday evening at Marion's Pizza at Interstate 75 Exit 57 north of Dayton. This year we have been promised their private banquet room. We'll enjoy our usual pizza and AM conversation. We'll also have a slide show on AM'ers and their Military Radios.

An "Alternate Programming" Strategy to Combat AM QSOs with Objectionable Material or Inconsiderate Behavior:

I recently received two letters and one e-mail in one week on roughly the same topic. Two of the letters asked the question. "How to respond to other AM'ers who have very conspicuous off color discussions or inconsiderate operating practices at prime listening times." If this happens while you're in the QSO, I suggest quietly bowing out. Don't exhibit a "holier than thou" attitude. That adds fuel to the fire. Now the important part. Find another frequency far enough away that will not be bothered by the first QSO and get another QSO started and change the subject. If you are just listening to an objectionable QSO and you disapprove and want to do something about it, then you to should start or join an alternate QSO.

In the case of scheduled nets with predictable objectionable material, we need groups of individuals to band together and run alternative net programming on the same band. Don't wait until the first net is done and then run an "anti-net". Pick out a neat aspect of AM or amateur radio in general and make it more interesting than what is happening on the other frequency.

This alternative programming is important for several reasons:

1. New AM operators will have a choice of programming. The new AM op has a tremendous desire to check in somewhere and start exercising his gear. Let's make sure there is a positive alternative.

2. The general amateur population, amateur radio policy makers and maybe government regulators are listening and forming an opinion of our branch of the hobby.

3. We need to have good QSO material to tune into that we can hear all over our shacks and workshops and into the other parts of our houses where our families can overhear. Many of us like to listen to the band while we are puttering away on projects or doing paperwork. It's like listening to a ball game. We need to be able to walk away from the rig without worrying about what will be said next.

This strategy will not do away with irresponsible AM operating habits, but it will lessen its impact. Some people on the fringe who could go either way will hopefully drift away from the objectionable programming toward more wholesome fare. ER

To join AMI send $2 to:
AMI
Box 1500
Merrimack, NH 03054

Origin of the Collins 302C-1 Directional Wattmeter

by Warren B. Bruene, W5OLY
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As three of us were ending our lunch hour discussion, Art Collins came by and asked that we send someone out to repair his Micromatch. He had burned it out - again. (He was using a Collins KW-1 modified for SSB.) Someone said that they would take care of it. Then I volunteered that I could build him one that wouldn't burn out. It wasn't long before a project was assigned to me to develop it.

Actually, I wasn't sticking my neck out as far as it sounds because I had already tried the basic concept quite some time before. This is just one of many times that I stuck my neck out to do something that hadn't been done before. Fortunately, I never failed to come through, which helped me gain Art's respect.

My interest in this subject started in 1946/47 when Collins purchased a Jones Micromatch SWR meter. I then built one using the Jones basic circuit but for 72-ohm coax and 10 watts in a cast aluminum meter case (used to hold meters on the lab bench). I used it to measure the SWR in the coax between the Collins 310A Exciter and the 30K 375/500 Watt Ph/Cw transmitter I was developing.

In Jan '50 I made extensive notes on ideas for a power and SWR meter for the new 430 series transmitters we were planning to develop. It needed to be capable of 3 KW continuous. One idea was to sample the coax current with a small multi-turn rectangular shaped coil inserted into a slot cut in the outer conductor of 1-5/8 inch coax. My goal was an instrument to read RF Power and SWR directly.

Other engineers developing phase discriminators for automatic antenna tuners were using a powdered iron core toroid around the center conductor to sense the phase of the RF current. I borrowed this idea to sense the RF current phasor for the directional wattmeter in Aug '53. In Mar '56 I recorded the complete dual circuit concept and a sketch for the physical construction of what became the 302C-1. It embodied shielding the toroid from capacitive coupling to the center conductor, very short leads, sampling the voltage physically close to the toroid current sensor, and minimizing discontinuity in the coax.

I drew various charts to graphically determine SWR from forward and reflected power readings. I even sketched a device like a small circular slide rule to calculate SWR. The chart that prevailed was the one I published in my article "An Inside Picture of Directional Wattmeters" in April '59 QST. Bird picked this up and made durable plastic charts for different power ranges to give to customers.

The 302C-1 circuit was quickly turned into a product and marketed in 1956, both as a separate instrument and as part of the Collins 312A-2 Station Console. The meter was scaled for 1000 watts P_f and 100 watts P_r. When the FCC changed the rules to allow 1500 watts PEP for SSB, the scales were changed to 2000/200 watts in the 302C-3 and the 312B-4 for the S-Line.

Theory

The concept of forward and reflected voltages in transmission line equations had been in text books for some time. Apparently M.C. Jones was first to rec-

The Collins 302C-3 Directional Wattmeter

ognize a way to measure forward and reflected voltage separately. The phenomenon which makes this possible is that the reflected current is always 180 degrees out of phase with the reflected voltage, whereas forward current is always in phase with the forward voltage.

Jones obtained a voltage sample representing the magnitude and phase of the line current by placing 1 ohm of resistance in series with the line. Two amperes of RF current would thus generate 2 volts of RF. He used a capacitive voltage divider to get a sample of the RF voltage across the line. These two sample voltages must be equal and in phase when the line is terminated in its characteristic impedance. Adding these two voltage phasors provides an RF voltage representing the forward voltage. Subtracting one from the other gives a voltage representing the reflected voltage. In the original Micromatch SWR Meter, reversing the phase of the current sample was accomplished by reversing the input and output RF connections to the SWR Meter. This sum (or difference) RF voltage was rectified with a 1N34 germanium diode.

To measure SWR, first connect the instrument to indicate the forward voltage. Then adjust the sensitivity control to place the meter pointer over a mark at the end of the SWR scale. Then reverse the terminals and read SWR directly. One equation for SWR is:

$$SWR = (1+V_R)/V_F)/(1-V_R)/V_F)$$

Setting the V_F sample to the same value with the sensitivity control made it possible to calibrate the meter scale directly in SWR.

This basic instrument was converted into a directional wattmeter by installing two detector circuits to provide rectified samples of both the V_F and V_R voltages to two separate meters simultaneously. The meters were calibrated display P_F and P_R directly. Some instruments provided separate meters but most switched the outputs to just one meter.

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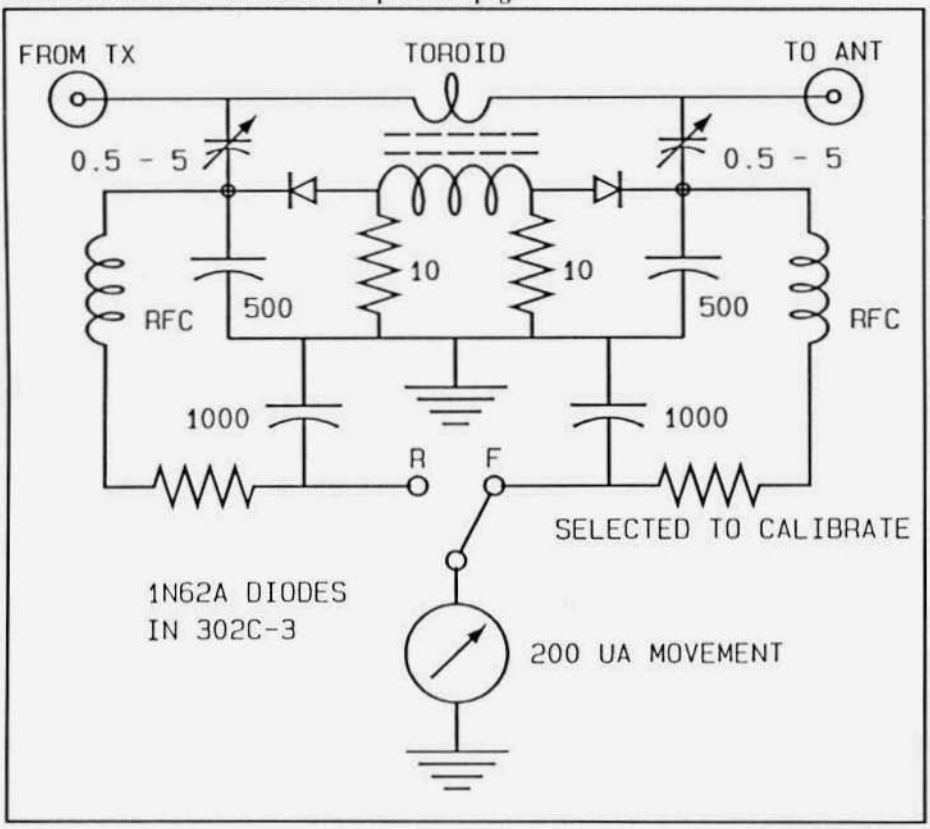

302C-3 schematic

Theory of the Toroid Current Sensor

The primary of the toroid transformer consists of one turn - the wire passing through the center plus the return path around the outside of the toroid. The secondary consists of 60 turns of #30 enameled copper wire. It is terminated with two resistors of 10 ohms each. The junction between the resistors is grounded. The voltage induced into the secondary is:

$e = I(-jwM)$

where I is the line current and M is the mutual inductance between the primary and secondary. When the secondary winding is short circuited, the current in it is:

$I_S = I(-jwM) / (-jwL) = I\,M/L$

where L is the inductance of the secondary winding. Note that I_S is in phase with I and that its magnitude is independent of frequency. An interesting property is that reducing the number of turns by half doubles the coil current because the induced voltage is reduced by half but the inductance is reduced to $(1/2)^2$ or 1/4th of the previous value.

Fairly accurate voltage samples representing +I and -I are obtained by connecting 10 ohm resistors from each end of the secondary to ground. These low value resistors cause approximately 1 degree of phase error at 3.5 MHz. The amplitude error is negligible. A point which I completely missed was that this phase error could be compensated by placing resistors (on the order of a couple thousand ohms) across the larger (500 pF) voltage

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The End-Fed Wire Antenna

by Don Meadows, N6DM
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The end-fed wire antenna is a single metallic conductor, usually copper, of varied length. One end connects to the transmitter. The other usually terminates close to an area where birds may feel at home. The wire couples RF energy into free space. The wire also extracts from free space some RF energy launched great distances away. It is the simplest of all antennas, by far the cheapest, and even today is often amazingly effective on the low-frequency ham bands.

The end-fed wire exhibits the fundamental principle of all transmitting antennas - that if the antenna will accept power, then some of this power will be radiated. The very earliest transmitting antennas were end-fed wires. These vertical wires often terminated in a canopy of horizontal parallel wires whose capacity to ground made the signal go farther. Today, we understand this configuration as the top-loaded vertical. It proved rather effective on the long wavelengths used in the early days.

The problem is how to make the wire - or sometime other metallic conductors - accept power, but more about this later. Over the years, one has caused sundry metallic objects to be activated. There are references in the literature to rain gutters, flagpoles, soldered stacks of empty beer cans (back when they were made of steel, not aluminum), TV antenna guy wires, barbed-wire fences, umbrella supports, shopping carts and even bed springs - the latter perhaps stated facetiously. Using such unconventional objects for antennas of course produces varying results. Perhaps the ultimate definition today of poor end-fed radiator is a wet noodle. This definition, patently absurd, is nonetheless quite rational. A noodle has finite length but is normally non-conductive when dry. Even when wet, its electrical conductivity, relative to copper wire, will be mediocre. If end fed with RF, a wet noodle will still fail as a radiator on HF because it is much too short. Coupling wet noodles together end to end to approach a quarter wavelength on any HF ham band is a mechanical challenge so far unanswered by engineers. So far, no one has published a successful antenna design based on wet noodles. No one needs to, because copper wire does the job much better.

The point, once again, is that any conductor that accepts RF power will radiate some of it - maybe a lot, maybe very little - but it will radiate. Basically, the problem with end-fed conductors is how to make them accept power. The power source is the transmitter. One must make the radiator and transmitter understand each other. One learned long ago that transmitters without intervening networks particularly favored end-fed wires whose electrical length bore at least a quarter-wave relationship to the frequency of the transmitter. This was because the transmitter, one side of whose output was firmly tied to Mother Earth, could sense a harmony called resonance between itself and the friendly wire waiting for power.

By increasing the number of parallel horizontal wires in the overhead canopy and their length, early experimenters discovered that for a given height the end-fed wire would dump out a better signal from their spark transmitters. Perhaps without realizing it, they were making their wire electrically longer; at

continued next page

least they were causing more current to appear in the vertical wire. But these old-timers weren't too concerned about resonant lengths, because spark transmitters didn't radiate on discrete frequencies.

After spark finally gave way to CW, hams paid more attention to the concept of resonant wires. Now that radiation occurred on discrete frequencies, the end-fed wire's length could easily be cut for resonance on these frequencies. Two approaches found favor. One could resonate a quarter-wave wire against ground. Or one could simply cut the wire about a half-wave long on the lowest-frequency ham band of intended use. A half-wave wire was self-resonant without a ground connection, which provided a fun bonus because the wire would also accept power on the harmonically related higher-frequencies bands. Decades later, these harmonic-friendly wires would dump some of their output into early television sets.

The end-fed half-wave wire, a high-impedance antenna, was once commonly known as "voltage fed" because its connection to the transmitter was at a high-voltage point on the wire. It readily accepted RF power. Some of this power often floated around the shack and, like an undisciplined, naughty sprite, unpredictably made hot some metallic objects assumed to be at ground potential. Sometimes inactive light bulbs in the shack would glow dimly in cadence with the transmitter's keying. Sometimes strange chirps and hum would modulate an otherwise pure signal when some stray RF found a home in the oscillator stage.

Prior to the TV era, the end-fed wire was often coupled directly to the transmitter's final tank coil. It was tapped directly onto the turn which loaded the transmitter best. This tapped turn was usually close to the end of the coil hot with RF, because an end-fed half-wave wire always shows a high impedance to ground. Literature of the time recommended a series blocking capacitor to remove DC plate voltage from the wire.

Sometimes this capacitor was omitted, especially for maximum circuit simplicity for short-term use, as on ARRL Field Day. But this omission could have consequences. One ham club near Los Angeles once known for its flamboyant style, according to a respected authority, once ran out a long end-fed wire on Field Day, a wire many halfwaves long, across a cow pasture. Being a very, very long wire, it didn't need too much effective height to exhibit gain - a desirable characteristic of long-wire antennas in general. This particular end-fed-wire was minus the blocking capacitor. The wire gave the club a respectable score. But when the contest was over, the guys reeling in the long wire found a dead cow, obviously electrocuted, lying before them. The group got together and dug a burial pit for the cow. The pit was a bit too shallow. The replaced earth still didn't quite cover the cow's four legs which were left pointing skyward - like four short tree trunks poking from the earth.

Today, the end-fed copper-wire antenna encounters more sophisticated solid-state RF power sources. These sources have tunnel vision, seeing only a 50-ohm resistive load in clear focus. To transfer power, one doesn't tap on tank coils. One spends money on a commercial transmatch or perhaps homebrews something equivalent at a fraction of the price - if one has the parts. Finding such parts today can be a big problem, especially locating the variable capacitors. The idea is to translate the high impedance of the end-fed wire into a language the solid-state transmitter can understand. With today's 50-ohm technology, feeding an end-fed wire will always require some kind of transmatch or network.

The problem is both to tune out reactance and to provide a 50-ohm resistive load to the transmitter. Fortunately, a simple parallel-tuned tank circuit link coupled to the transmitter will do the job. One simply taps the end-fed wire onto the inductor's proper turn, empirically determined, and/or adjusts the link's turns or coupling to make the transmitter's 50-ohm output requirement see its equal as confirmed by the usual SWR monitor in the coax line feeding the tuner. A bonus feature of such a link-coupled tank circuit is that harmonics are attenuated by tens of decibels. Alert old timers will note that ads for today's commercial transmatches - devices that match just about anything - never tout the products harmonic suppression. A simple L-network will do the matching job almost as well and with mechanical simplification. One needs only one capacitor and one inductor. No link is required. But harmonic attenuation is somewhat reduced.

Today's commercial transmatches do a fine job. But a close examination of their circuitry will show that many of them are basically high-pass filters. In other words, they match well at the fundamental but have little attenuation for harmonics. They get by because today's commercial solid-state transmitters already have enough built-in harmonic attenuation to be FCC approved.

Experience has shown that an end-fed wire around 90 feet long (about 3/8 wavelength) is a very effective radiator an 80 meters. If at least 20 or 30 feet of it can run in the vertical plane, it will produce many contacts, perhaps even some DX. It works with good efficiency because its radiation resistance is high enough to offset the fixed resistive losses of a station's usually mediocre earth ground. Yet the wire's moderate feedpoint impedance usually averts the problem of RF in the shack and can be matched easily with most transmatches.

In city environments today, how does one find room to string out an end-fed wire? Here the creative imagination comes into play. Once, one could load up guy wires of a tall TV antenna. But today's TV cable access and aesthetic sensibilities together with deed restrictions have all but abolished tall metallic residential antenna structures. The higher limbs of a landscaping tree might offer support for an end-fed wire. A flagpole offers great possibilities, but how many tract homes include flagpoles in the price? Erecting a new flagpole in today's tract neighborhood might conflict with deed restrictions and might also require a special building permit.

It used to be fairly common practice in urban neighborhoods to attach the far end of the wire to a convenient power pole, a brown wooden hulk, once a former 60 to 100-foot once-living tree now shorn of limbs, a dead tree trunk embalmed in creosote. But today, power poles have all but disappeared from residential neighborhoods developed during the past 30 years. Yet there is still hope.

The end-fed wire can be routed just about anywhere. Its length, even more than its height, determines its effectiveness on the low bands. It can bend in random directions, as long as it doesn't double back on itself. The wire even in weird configurations will radiate well if long enough. Even if its far end is grounded, it can still radiate effectively if at least a half wave long. This principle in expanded detail is already on record. (World Radio, September, 1994 page 60). A random length end-fed wire, even with bends in the horizontal and vertical planes, elevated only around 20 feet at the highest point will often throw an amazing signal out to 1000 miles provided that it is at least 3/8 wave long at the lowest frequency used. On higher harmonics, its distance record should improve.

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A Letter Regarding the GRC-109

by John Liner, N2WHT
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Rochester, NY 14610

Dear ER

Recently, Don WA2ELD sent me a copy of Jim Kearman's article on the GRC-109, from the October 1993 issue of Electric Radio. I'd like to provide a little additional information and maybe clarify a couple of items. It might be of interest to those lucky owners of the GRC-109 set.

I was a member of the US Army Special Forces from 1968 until I retired in 1992. Originally trained as an SF radio operator (MOS 05B4S) I was assigned mostly to A Detachments, but worked occasionally on B Teams.

Some Special Forces teams in Viet Nam were sometimes tasked with providing various types of support for CIA sponsored operations, intell support and so on. There were also occasional joint operations with people contracted to the CIA. But Special Forces was never under the direct control of the CIA. Being an Army unit, it was always directly controlled by the Army. There were certain classified projects run directly or indirectly by the CIA and the individuals that manned some of these projects were volunteers from Special Forces units. But they remained in the Army and were merely assigned or detached to them for a specific period of time.

Anyway, when I first joined Special Forces, the primary means of communications on the A Teams was the GRC-109. In those days, the GRC-109 was manpack radio. (Some teams also had the old GRC-87 radio). When we jumped, the T-784, R-1004, G-43 generator and seat, several batteries and lots of wire all went into a CEWI bag (similar to a duffel bag but about twice as big) which was strapped between the radio operators legs, with the rucksack strapped on top of that. The radio operator was usually the first in the door. The other team members had to help him stand up and literally dragged him to the door prior to jumping. I was often pushed out as I was so laden I could not shuffle nor jump out. When exiting from a C-130, C-123, C-119 or C-47 the procedure is to spring vigorously into the prop blast. But the radio operator was so heavy that all he could do was merely lean out when the jumpmaster said "Go". On a few occasions, I was smacked into the side of the aircraft as it went by, suffering bruises and sore muscles for a week afterwards. This was not an unusual occurrence among my fellow radio operators. With radio gear, weapon, fully loaded rucksack, web gear, canteens, ammo and ammo pouches, it was not unusual for an SF radio operator to go out the door with over 200 pounds of equipment strapped to him. Add the additional weight of a 40 pound main and reserve parachute and harness, and we usually came out of the sky and onto the ground at considerable speed. Regardless of where the radio operator stood in the stick he was *always* first on the ground, though rarely the first on his feet after landing. I normally laid on the ground, staring up at the night sky, waiting for the stars that were swimming before my eyes to go away before I felt good enough to struggle painfully to my feet.

Once on the ground the commo gear could be divided amongst the other team members. But going out the door

with it was considered the radio operator's responsibility, and regardless of whatever else he had to carry, the radio operator ALWAYS humped the G-43. Since he rarely had to crank it, it was considered only fair for him to carry it once on the ground. Team members that volunteered to carry it for you were rare indeed, and it was worth naming your first born after the saintly demolitions man or medic that would voluntarily take it off your shoulders, if only for a few hours. I grew to truly hate that generator like nothing else in life and I am convinced that the back of my head is slightly flattened because of the countless times it crashed into my skull as I squatted and bent over to clear low branches and thick vines in Camp Mackall or up in the Pisgah and Uwaharrie Forests of North Carolina. Likewise, a radio operator that was overly long in tuning up the T-784 could earn the undying hatred of the poor unfortunate soul that was cranking it. Team leaders that wrote really long messages to be transmitted also earned a great deal of enmity from weary team members. Everyone took a turn at cranking the G-43. The GRC-109 was truly a "manly" radio system, not for the faint of heart nor weak of arm.

But it was rugged, nearly indestructible and the tuning circuit would load virtually anything. I once loaded a rusty set of jeep seat springs I found in the woods, and sent CW traffic from Pisgah Forest (in western North Carolina) back to Fort Bragg. An instructor in SF Commo School once drove a nail into a pine tree and connected a piece of WD-1 steel wire to it. He too sent traffic back to Bragg. From Alaska!

The GRA-71 high speed keyer was used often on deployments and real-world missions during the 60s and into the 70s. Some of these missions were clandestine, some in urban areas in Europe. A lot of them were conducted throughout Africa and South America. I can't recall ever using the GRA-71 during normal commo exercises in North Carolina and elsewhere. The philosophy in those days was that you were first and foremost a CW operator. You had to graduate from commo school with a minimum 18 wpm or you didn't graduate. Most teams required all members to be able to do at least 10 wpm and practice periodically to maintain proficiency.

Use of the GRA-71 required a manned receiver site, usually a GRC-26 van with a bank of R-390 receivers and reel-to-reel tape recorders. There was one at Bragg, and each overseas Group (e.g. 10th Group at Bad Tolz, Germany, 1st Group in Okinawa, 8th Group in Panama) had a receiver site. Firm contact times, base station schedules and round the clock operators had to man these sites. Using burst was not exactly a trivial affair, and was usually utilized to support teams deployed for a major exercise, (such as Flintlock, in Europe) or teams that were on actual real-world missions. Like I said, we mostly used manual CW.

I never used a keyer in Viet Nam. I think they may have been used in the very early days of our involvement over there. We had scheduled contact times several times a day, including the SITREP every evening, admin and resupply requests, in addition to the Spot Reports that went in whenever a team or its CIDG companies were in contact, or the camp was getting hit. Very few A Teams were within VHF range of the B and C Teams, so most traffic had to go via HF. Every camp was issued a FRC-93 (you may know it as the KWM-2A) and sideband was used extensively for voice traffic, air support and artillery requests. But you still had to send a lot of mandatory traffic using the DIANA one-time encryption pads. This meant lots of CW work. For some teams in Laos and parts of Thailand, the GRC-109 or GRC-87 was all they had for HF comms until the very late 60s.

continued next page

A Letter Regarding the GRC-109 from previous page

Most SF nets in Viet Nam operated routinely at 25 groups per minute or greater. In my net, consisting of 5 A-Teams, a B-Team and the C-Team, we all used Vibroplex bugs. Woe be to the newby from Stateside, fresh out of school who could only manage 18 gpm.

Sorry, I'm getting off the track. Like I said, each team had a FRC-93. But each team also had one or two GRC-109s as backup in case the camp's generators failed. Which they commonly did. There was always an emergency commo shack, in case the main one was damaged or destroyed. (My entire camp burned down during a siege). And yes, we were also required to have an underground antenna. Towers, antennas and coax cable were all subject to damage and destruction. When that happened, you still had to get your requests for help through. The only way to do that was with an antenna buried in the ground. The signals were almost impossibly weak. But we were young, with excellent ears and we took a great deal of pride in being able to copy code of any signal strength through the worst monsoon thunderstorm. Guys (usually newbys) that could only copy signals down to merely "weak and unreadable" were treated with scorn and derision. A lot of us could copy signals so weak that to the layman it sounded like slight variations in the roaring static. I know that sounds like a gross exaggeration, but when you copy a few thousand five-letter groups every single day, several times a day, you get to be pretty sharp. I only wish I were half as good today.

We exercised the emergency systems monthly. I was fortunate enough to be in Viet Nam during a decent period of the sunspot cycle. I was there in 1969-1970 and HF comms were OK, given the conditions. Very high levels of static, with horrendous thunderstorms every afternoon and into the night but at least we could propagate.

The KWM-2As often went down due to the environment they were in. Hot, very high humidity, and most of us rarely followed the correct procedure for tuning up. There is a shortcut to tuning the KWM-2 that only takes a few seconds, but guarantees about a month lifespan before you burned it up. (I cringe when I think of how horribly I abused mine). But the GRC-109 always worked. Always. I never had one quit. It was amazing.

Years later I was stationed in Berlin. We did lots of "urban" work in those days, and we always communicated from our city locations back to the base using the GRC-109. Its ability to load anything really came in handy when we used antennas taped onto walls, or wire coiled around a broomstick and placed near a window. A buddy of mine once loaded the steel banister running up the stairwell of a 10 story apartment building. He made 100% of his contacts. We also cached radios all over the city, and down in the forests of southern Germany. I'll bet there are still a few residing in the walls of various apartment buildings in Berlin, or in cache cans in the Schwabian and Bavarian Alps.

The big power supplies were almost never jumped in, not humped in a rucksack. Too heavy. But if you were going to operate from, say a barn or an apartment, then normally the power supply was used. It was either dropped in on a subsequent resupply, or taken with you in a suitcase if you were doing urban sort of stuff (in civilian clothes).

Tuning the GRC-109 could be an adventure, and you could usually identify the team radio operators by the tiny little white RF burns on their fingers and thumbs. One of the knobs was right next to the antenna post and you normally managed to touch it at least once every time you tuned up. I've still got little scars on my right thumb from that.

Jim mentioned that a crystal was

sometimes plugged into the receiver. I only saw it used that way once, and I'm pretty sure that method was pretty rare. Typically, while in isolation, the radio operator was escorted out of the isolation area and taken to the Signal Office where he was issued the crystals to be used during the exercise or mission. We were given our primary and alternate freqs, daytime and nighttime, but never crystals to be used for the receiver. It may have been done in earlier times, but never in my experience. I did like the R-1004 receiver, however. I remember many nights sitting up listening to Radio Australia from some mountain top in North Carolina during my watch while the rest of the team slept. And catching hell from the Team leader the next morning for running down the batteries.

And Jim's account of the siege at A Shau is accurate. The camp was totally destroyed, some team members killed and the rest wounded. The only means of commo left was the GRC-109. Similar incidents, by the way, happened at several other camps throughout the war. I believe they used the 109 to communicate when Lang Vei was overrun by tanks. I used mine when my camp (A-245 Dak Seang) was besieged and my generators destroyed. All I had to rely on until I was air dropped another generator was the GRC-109, and VHF relays through FACs supporting my camp.

The GRC-109 had a very distinctive sound on the air. It was somewhat chirpy and, depending on the strength or exhaustion of the poor guy cranking, would vary its tone slightly upward on the final dah of a character. To this day I can instantly recognize the rare GRC-109 that I occasionally hear on the air, and it never fails to carry me back for a few moments to more exciting times.

I've often thought about getting my own set and since talking to Don, and then reading Jim's very interesting article I believe I will. I showed the article to my boss (John, WB2BYP) who is a real boat anchor/vintage radio fanatic. He owns a GRC-109, as do two other guys in my company. One of them has been talking about selling his. I will probably take him up on his offer.

Many thanks to Jim Kearman for writing the article. It was very good and I thoroughly enjoyed reading it. I have never been able to get a complete story on the origin and history of the radio. I've heard several versions. One says that the radio was originally designed in WW II for use by Resistance forces in Europe, and meant to be booted out of low-flying planes at night. Don't know if that's true, but it does make a good story. I do know for sure that the radio has been around for a very long time, at least since the mid-50s. The old NCOs that trained me as a young operator talked of using it in the 77th Special Forces Group in Bad Tolz, Germany, back in 1954.

Again, thanks for the article. It was well written and brought back a lot of interesting times. And to KR1S, WA2ELD, and WB2BYP, I'll be listening for the chirp of your 109s on the air.
73 and all the best to you,
John, N2WHT ER

HE FOUND AN OLD VINTAGE RADIO AT THE SWAP AND FELL IN A CULVERT ON THE WAY BACK TO THE CAR.

R-725, R-389, R-390 and R-391 US Military Contract List

by Thomas Marcotte, N5OFF
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This is the second in a series of articles which will begin to document the list of US military orders for Collins receivers. The R-388 was covered in the last installment. In this issue we will cover the R-725, R-389, R-390 and R-391.

The R-389 is a low/medium frequency radio designed and built by Collins. It was described in great detail in a series of excellent articles in this publication, so I will dispense with a complete description, and simply list the known order information. The order information is very brief as far as I know, in that all R-389's were built by Collins.

R-389
Collins 14214-PH-51-93 Hi s.n. 856

This order covered many of the early Collins receivers of this family, including the R-390, R-391, and very early R-390A's. The R-389 can be distinguished by its single large tuning knob, and low frequency range of 14 Kcs-1505 Kcs.

The R-390 and R-391 radios are HF receivers with the same basic function as the R-390A, that is, 500 Kcs-32.0 Mcs, AM/CW/RTTY. They are very similar to each other, except that the R-391 has provision for the famous Collins autotune used on the ART-13, ARR-15, and many other rigs.

Externally, the R-390, R-390A, and R-391 look quite similar. The external differences between them are illustrated in the photo. It seems to be a common occurrence today that front panel tags on used radios are missing. If you see a 390 family radio at a flea market and it has no front panel tag, here is how you tell the difference between them.

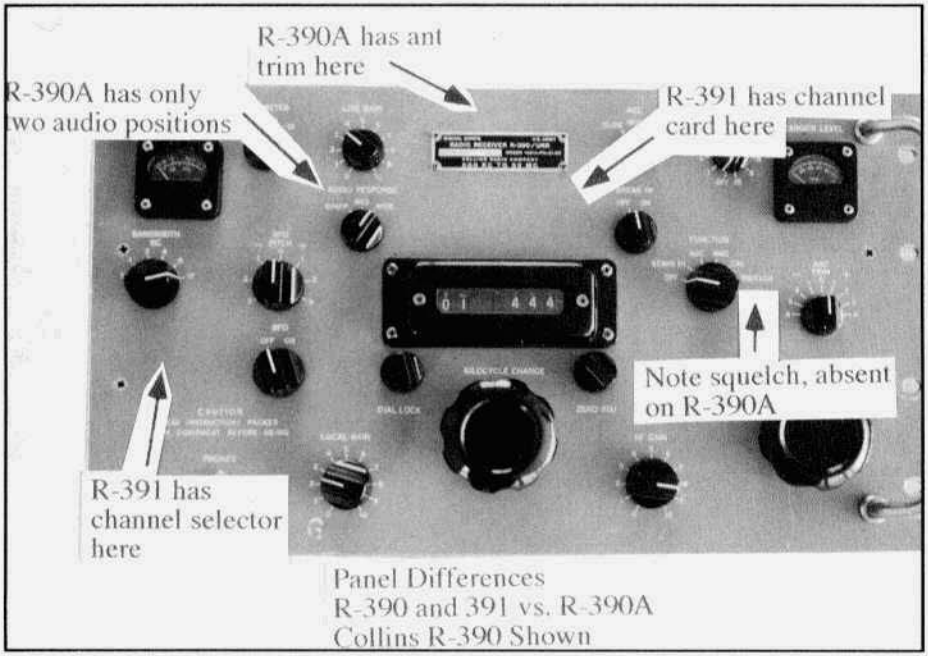
The R-391 looks nearly identical to the R-390, except that it has a channel selector knob in the position shown as part of the autotune mechanism. The R-391 will likely have a data card above the frequency indicator which documents the preset frequencies. Both the R-390 and the R-391 will have a squelch position on the function switch, and have three audio response positions. And finally, the R-390 and R-391 will have the antenna trim knob on the middle right, while the R-390A will have that knob at the top center of the panel.

Internally, the differences between the R-390A and the R-390 are many. A few of the differences are listed below.

	R-390A	R-390/391
Selectivity	**mech. filters**	**tuned circuit**
Squelch	**optional (rare)**	**standard**
Tubes	**26**	**33**
Audio Filters	**800 Hz**	**800/3500 Hz**
Power w/ovens on	**220 W**	**270 W**

In addition to the above differences, the R-390A has seven fewer crystals, and simpler gear train and power supply systems. Some of the minor parts are interchangeable, like meters, some tubes, covers, and knobs, but most parts are not interchangeable. The R-390A cost about 11% less than the R-390 originally. The R-390 was designed for an optional 28V dynamotor power supply, but this was rarely employed, and the option was dropped with the R-390A.

As mentioned in the last article, I have been tracking order data for these radios for a couple of years. This is what I have collected (so far, additions



Panel Differences
R-390 and 391 vs. R-390A
Collins R-390 Shown

welcome) for the R-390 and R-391. All of these orders are for the US military. The high serial numbers shown indicate the highest number reported to me by an owner, not necessarily the number made (but it implies that at least that many were made). A high serial number of zero indicates a known order, but no examples were reported to me.

R-390		Hi s.n.
Collins	14214-PH-51-93	4952
Collins	14226-PH-51-93	1412
Motorola for Collins	14214-PH-51-93	4864
Motorola for Collins	14241-PH-51-93	3449
Motorola	90-PH-52	219
Motorola	26579-PH-52	892
Motorola	13602-PH-53	979
	Total R-390	16767

R-391		
Collins	14214-PH-51-93	753
Collins	11424-PH-51-53	0
Collins	21852-PH-50-93	169
Collins	26575-PH-52-93	316
	Total R-391	1238

The total numbers for the R-390 may actually be lower than I have shown above, as it is not immediately known if Collins and Motorola used separate blocks of serial numbers for the 14214-PH-51-93 order, or if they simply shared blocks of numbers, with a total between the two makers being near 5000.

These production figures compare to over 50,000 units produced for the R-390A, so you can see that the R-390 and R-391 are quite a bit less common than the R-390A.

There were prototype R-391A radios made under order DA36-039-SC-52584, but to my knowledge, there were no production units. The actual model number was R-391(XC-2), but it was essentially a R-390A with autotune. These radios are quite rare, indeed (where are they now?).

And finally, listed below is the data I have so far for the R-725 receiver. As I've reported previously in this publication, this radio is a modified R-390A, a crossbreed between a R-390 and a R-390A. The main difference is that the R-

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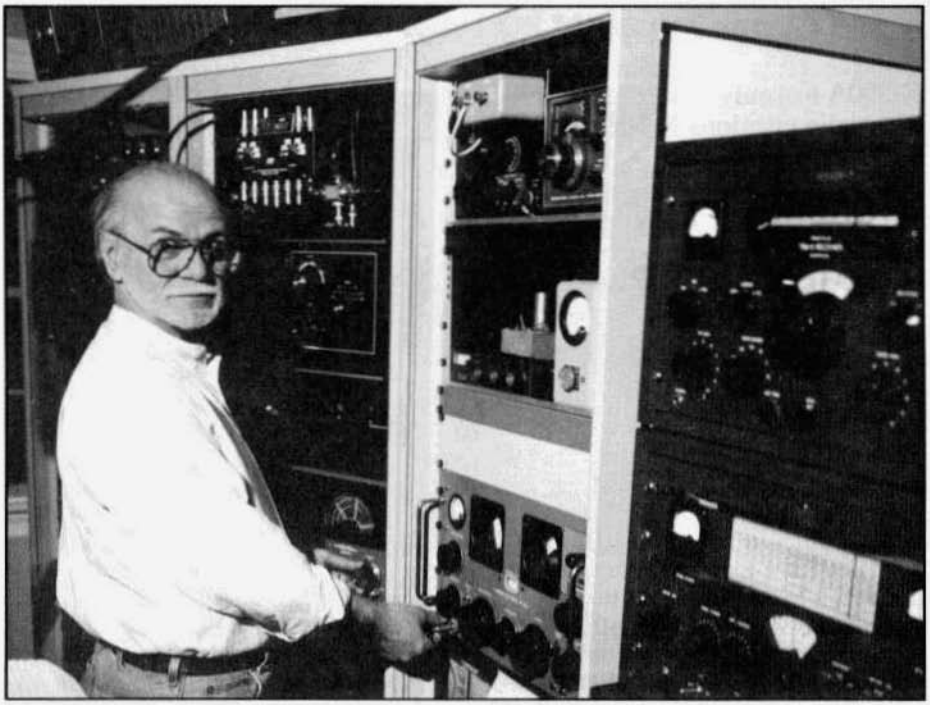

Nick Balsamo, KG2IR, (who also appears on the cover of this issue) at another position in his vintage hamshack. *Photo by WA3VJB.*

Jim Condon, AD4YM, with some of his beautifully restored vintage gear.

Two pictures from Hoisy Hoisington, W4CJL. The top picture shows 87 year old Hoisy at his operating position. (not really)
The lower picture is a more complete shot of his hamshack.

AM Night on 75 Meters

Collins Amateur Radio Club, WØCXX

By Rod Blocksome, KØDAS
690 Eastview Dr.
Robins, IA 52328

The Collins Amateur Radio Club, Cedar Rapids, Iowa recently received Arthur Collins' old call sign, WØCXX, under the FCC vanity call sign program. Club members consider it a great honor to be able to activate this call on the air once again as a tribute to its previous owner and his contributions to communications technology. When operating with this call the response from the amateur community has, at times, been overwhelming. In mid-winter, AMI, through the Collins Collectors Association, proposed an all AM session on the CCA 75 meter net with WØCXX. We agreed, the date was set for the evening of April 17th, and AMI issued us certificate number 1000.

The WØCXX signal needed to come from vintage Collins AM gear. The problem was the company had led the industry away from AM and into SSB many years ago and there was very little Collins AM ham gear to be found locally. Mark, NØJWI, an avid Collins collector, lent the club a 32V-3 and 75A-4 for the operation. Our "Main Plant" club station was being moved to new quarters at this time, so this AM operation was actually the first from the new station. An Alpha 77 1.5kW PEP amplifier and a sloping dipole at 100/60 feet rounded out the station.

The evening of April 17th found Mark, NØJWI; Lee, WTØD; Gayle, KØFLY; Steve, NØYVY; Dan, AAØOJ; and myself assembled for the event. We started early at 0016 UTC as we were aware of the possibility of a large number of sta-

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WØCXX operators, from left to right: Gayle Lawson, KØFLY; Mark Hovda, NØJWI and Rod Blocksome, KØDAS.

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Grey Hair Net: The oldest (or one of the oldestl- 43+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:30 PM EST & EDST. Call-up at 8 PM.
Vintage CW Net: For CW ops who enjoy using vintage equipment.This is not a traffic net; speed is not important. The net meets on 14037 Sundays at 7 PM Eastern. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.

Nets that are underlined are new or have changed times or frequency since the last issue.

The National One-Ten

James Millen's Contribution to Exploration of the Ultra-High Frequencies

by Robert E. Grinder, K7AK
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Paradise Valley, AZ 85253

James Millen served from 1927 until 1939 as Chief Engineer and General Manager of the National Company. He elevated the manufacturing of communication receivers from art to science in his first seven years. He produced regenerative and superheterodyne receivers, including the SW-3, AGS, FB-7, and, in 1934, the incomparable HRO.

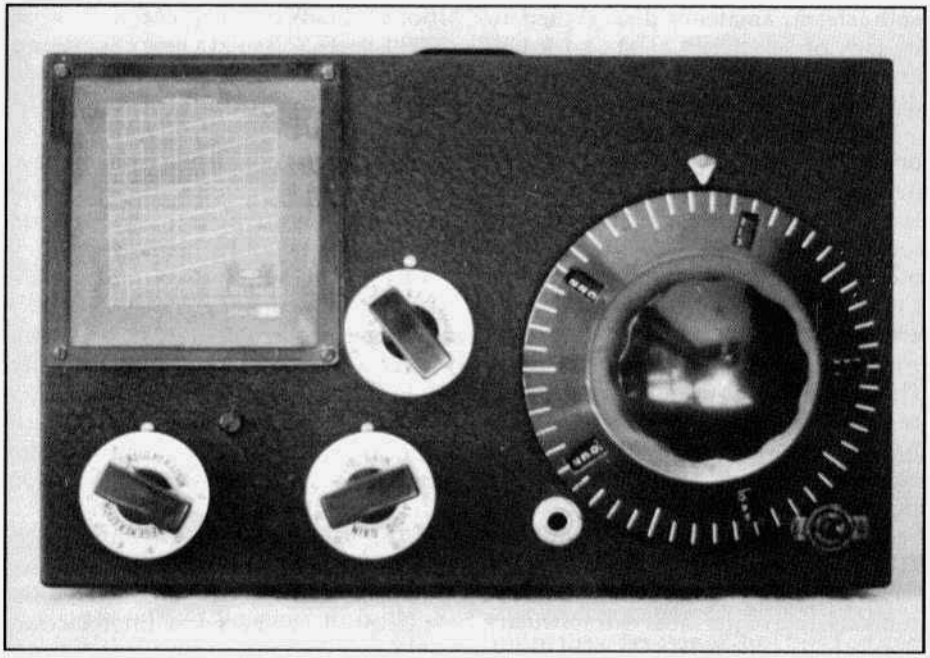
Millen thus attained renown as a visionary in the manufacturing of shortwave receivers. Earlier, he had achieved distinction as a writer. As a college student, for example, he had written articles for Radio Broadcast, in which he addressed readers' technical problems in comprehensible language. Not surprisingly, then, Millen launched monthly, in the March, 1934, issue of QST, a series of one-page, technical advertisements. He ceased writing them when he left National in 1939, but they were continued in QST by others until #292, October, 1966.

Millen used the advertisements as a vehicle for describing in easily understood terms why and how the National Company produced new components and equipment. Significantly, he explained theory behind circuitry and design rationale, discussed technical problems encountered during productions, and reviewed pricing considerations. Whereas extravagant claims for amateur-radio products were common in advertisements during the 1930s, Millen's advertising embodied paragons of information and truthfulness.

Consequently, when Millen announced the availability of the National One-Ten in technical advertisement #27 ("Advertisement," 1936), readers took notice. Millen declared that "the One-Ten was built for those pioneering amateurs who are leading the march to Ultra-High Frequencies. There is lots of room up there." He stated that National endeavored to fulfill a need for an efficient receiver that would cover the ultra-high frequency spectrum from one to ten meters. (During the 1930s, many amateurs regarded frequencies higher than 28 MHz as "ultra-high.") Millen emphasized that the One-Ten was intended mainly for experimenters. He acknowledged that as a four-tube, superregenerative circuit, it could not compete with the HRO or FB-7 on the frequencies which the receivers covered in common; nonetheless, he said, it performed creditably in opening up an enormous, unused frequency spectrum.

Millen's view of the National One-Ten as fundamentally experimental led him to speculate that advances within a few years might render the receiver obsolete. History reveals, however, that the National Company manufactured the One-Ten longer without modification than any other receiver. The One-Ten was in production from 1936 until 1946. It was then altered to cover eleven meters, and it was marketed for another year as the National 1-10A. Although the SW-3 and the HRO were manufactured for about 15 years and 30 years, respectively, models were upgraded continually.

The discussion below thus reviews: (1) why interest in the "ultra-high" frequencies and advances in tube technol-



Front view of the National One-Ten. *Photos by Clyde Watson.*

ogy propelled Millen and National to invest resources in manufacturing the One-Ten, and (2) why the amateur community was attracted for a decade to the One-Ten.

"There is Lots of Room Up There"

Amateurs in the post-WW I era defined success in terms of distances covered. By the mid-1920s, daylight transmissions on 20 meters were spanning oceans. After the Federal Radio Commission assigned amateurs in 1928 the ten meter (28-30 MHz) and five meter (56-60 MHz) bands, they anticipated even more spectacular results. They found that sporadic openings on ten meters indeed permitted contacts of extraordinary distances with relatively low power.

To the dismay of experimenters, tests suggested that the five meter band was worthless except for "line-of-sight" work over distances of a few miles. The primitiveness of radio technology contributed to their disappointment. Conventional tubes and components designed primarily for the new phenomenon of radio broadcasting would barely work at 56 MHz. Transmitters resisted oscillating. Moreover, familiar receiving circuits, associated with TRF and superheterodyne receivers, suffered from poor sensitivity, tuning difficulties, and severe ignition interference. Many amateurs concluded that quality of equipment performance at five meters was disproportional to the complexities encountered.

A breakthrough occurred in 1930 when amateurs realized that Edwin H. Armstrong's superregenerative circuitry functioned especially well at UHF frequencies. The superregenerative receiver removed tuning difficulties because it tuned broadly, which was fine at the wide-open, ultra-high frequencies, and it was immune to ignition-type interference. Armstrong had introduced the superregenerative receiver in 1922, but, after an initial burst of

continued next page

The National One-Ten from previous page
enthusiasm, amateurs disregarded it. Its lack of selectivity at the crowded, lower frequencies and its persistent radiation were too bothersome.

The point of greatest sensitivity in an ordinary regenerative receiver occurs just before its detector starts to oscillate. During superregeneration, the detector oscillates in a "self-interrupting" mode. The interruption rate is known as the "quench" frequency. This process enables the detector to build up the signal to tremendous proportions. Hull (1935) showed how superregenerative receivers can be adjusted so as to enhance signal to noise ratios. The superregenerative receiver seemed so perfectly suited for ultra-high frequency reception that the ARRL handbook (1938) exulted: "It (the superregenerative receiver) was, and remains, one of the most extraordinary pieces of radio equipment ever developed - from the point of view of performance from a given amount of equipment."

Amateur interest in the superregenerative receiver heightened in September, 1934, when the Federal Radio Commission announced that amateurs and all other experimental services were temporarily permitted to operate jointly on all frequencies above 110 MHz. Hull (1934) wondered whether operators could find each other's transmissions, unless "we decide on some particular slices of frequencies for our first work." As a practical plan, Hull suggested concentrating, for the time being, on two bands harmonically related to the five meter band - 112 to 120 MHz, the 2-1/2 meter band, and 224 to 240 MHz, the 1-1/4 meter band. As matters turned out, Hull proved to be remarkably prescient; after extensive study, the new Federal Communications Commission decreed that on December 1, 1938, radio amateurs were to be restricted to 112-118 MHz and 224-230 MHz ("New Regulations," 1938). Subsequently, in April, 1939, the FCC issued a new allocation of frequencies from 30-300 MHz. The amateur 2-1/2 meter band was reallocated to 112-116 MHz.

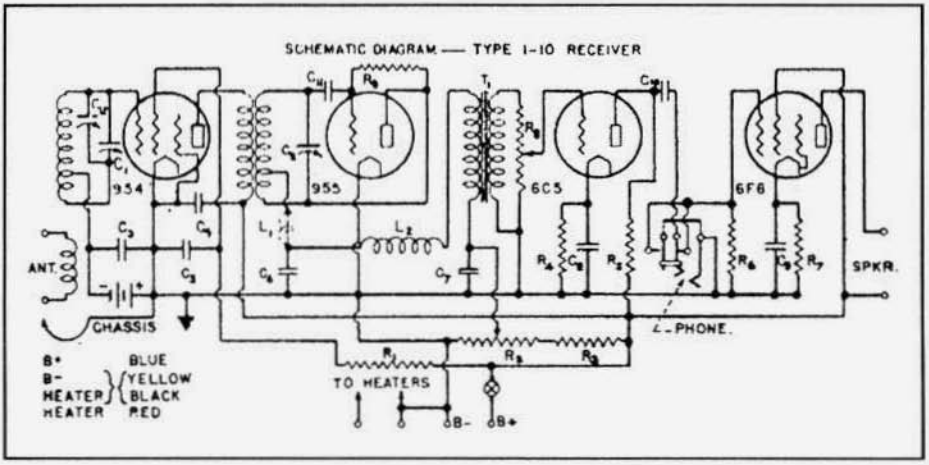
The Advent of the "Acorn" Tube

Once the functional superiority of superregenerative circuitry for ultra-high frequencies was demonstrated, the dilemma became that of finding tubes that would work at even 56 MHz. RCA resolved the problem in 1934; it introduced the 955, a triode "acorn" tube, which it declared would open up new possibilities for exploration and practical application in the ultra-high frequencies above 110 MHz - where conventional tubes will not function.

The 955, no larger literally than an acorn enveloped wholly in glass, may be used as a detector, amplifier, or oscillator. It has very low interelectrode capacitances and lead inductances. Its five terminals (two filament, grid, cathode, and plate) are arranged around the circumference of the tube. Their leads protrude horizontally from its tiny glass base.

Less than a year later, RCA produced the 954 pentode, with the same type of construction and appearance as the 955, for operation as an RF amplifier at wavelengths as short as .7 meters. The two tubes are distinguished chiefly by the fact that the 954 has its plate and control-grid leads, respectively, brought out from the top and bottom of the "acorn."

To realize the potential of the 954 at ultra-high frequencies, RCA recommended that its grid and plate circuitry be carefully shielded from one another. Specifically, RCA advised that its socket be mounted on a metal partition or baffle having a hole so that the grid end of the tube can project through. RCA also said that the hole should be drilled so that its edge is in close proximity to an internal shield at the control-grid end of the tube.



The Enduring Qualities of the National One-Ten

Millen believed that the new acorn tubes would enable National design engineers and technicians to build a receiver that could cover the ultra-high frequencies from 28 to 300 MHz.

As the schematic diagram indicates, the circuit of the One-Ten is deceptively simple. Only four tubes are enclosed in a metal cabinet, 7"Hxll"Lx7"D, finished in black, crackle enamel - one stage of tuned RF (954), to enhance gain and to eliminate radiation, is inductively coupled to a self-quenching superregenerative detector (955), which, in turn, is transformer coupled to a first stage of audio (6C5) that is resistance coupled to a power output stage (6F6). Receiver controls, which are held to a minimum, include audio gain, regeneration, antenna trimmer, and main tuning.

Tuning is accomplished by a two-gang variable capacitor geared to the now familiar PW micrometer dial, which reads directly from 0 to 500. It has a linear scale length of approximately 12 feet. Plug-in coils are used to tune from ten meters to one meter in six tuning bands. The coil sockets, which are readily accessible, are located under the lid of the cabinet. A 3-1/2 inch square calibration chart is located at the upper-left of the front panel. Ten revolutions of the PW dial are necessary to cover each band. The scale length plus the vernier action of the PW dial provides the operator of the One-Ten with the equivalent of continuous bandspread tuning on all bands.

The One-Ten is designed to obtain all voltages from the National 5886 power unit, which furnishes 6.3 volts at 1.6 amperes to the filament circuit and 180 volts at 35 milliamperes to the plate and screen circuits. Two C batteries, mounted in the receiver supply three volts bias to the RF amplifier. An external speaker and output transformer must be provided.

As the top-view picture shows, the two acorn tubes, the two plug-in coils, and the two sections of the ganged tuning capacitor are optimally placed, just as RCA prescribed. The picture fails to convey, however, the endless attention to detail that was necessary to make the One-Ten cover the frequency range from one to ten meters. Millen admitted that the One-Ten proved far more difficult to develop than his staff had anticipated. The technicians discovered, in contrast to other National equipment, that all parts had to be placed for electrical efficiency without regard for

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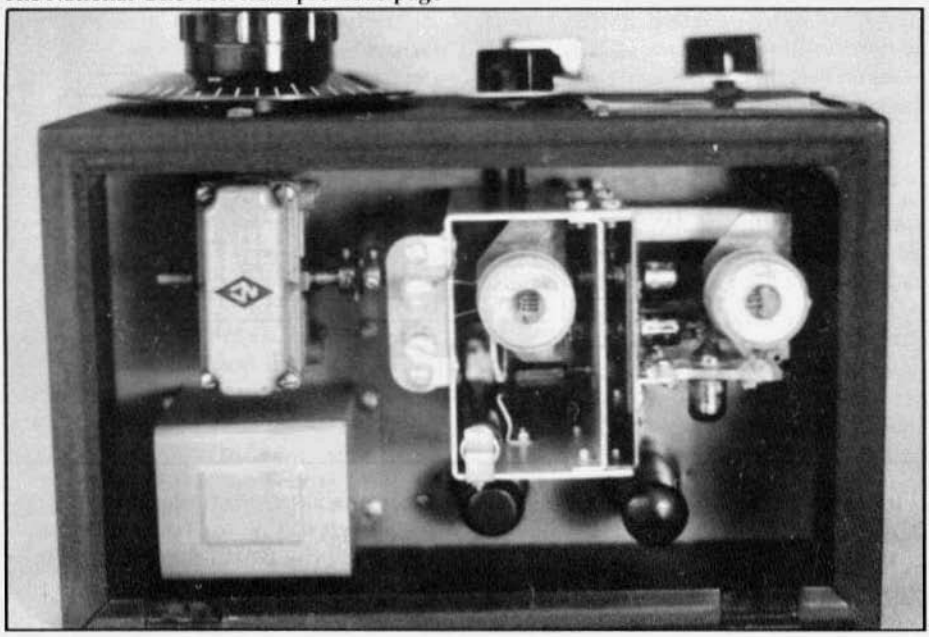
The National One-Ten from previous page



Top view of the One-Ten.

manufacturing convenience. Every piece of hook-up wire functioned as either a capacitance, an inductance, or an antenna. When the laboratory model worked at one meter, it would not work at ten meters; when it worked on ten, it would not work on one! The technicians thus went back and forth as they faced the vexing problems of keeping the detector oscillating and the RF stage from oscillating.

The painstaking effort of National technicians eventually paid off. They created ultimately a receiver that would operate as effectively at nearly 300 MHz as at 28 MHz. Success, however, was more a corollary of serendipity than design. In the instance of the One-Ten, National had indulged more in the realm of art than that of science. Millen even counselled experimenters not to ask him to explain why the tuning unit worked. Neither he nor anyone else knew the answer.

Once the stubborn problems were resolved, the National Company began to market the One-Ten, as a low cost receiver (about $50), for exploring the ultra-high frequencies. The One-Ten, given the objectives for which it was developed, has proven itself to be one of the more durable, reliable, and effective receivers ever manufactured. A One-Ten is likely to work today exactly as it did when it was manufactured a half-century ago.

The One-Ten survived in the marketplace without modification for a decade partly because none at National dared to change any aspect of it. Further, the technicians who initially assembled the One-Ten held it from production until it met their standards of excellence. Their ultimate result was so outstanding that no other company during the 1930s so much as attempted to manufacture a comparable UHF receiver. ER

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The End-Fed Wire Antenna from page 9

Even if one is able to route the end-fed wire adequately, its appearance may still offend sensitive eyes. One solves this problem by using small-gauge wire. Number 18 enameled copper wire probably won't elicit protests unless it's seen reflecting sunlight on a clear day, when it looks like a golden streak against the blue sky. Going down to number 26 wire should solve this problem completely. Only birds will know about the wire and may try it out for a perch, which may stretch the wire a bit but shouldn't break it. QST Magazine back around 1948 published one case history where the wire was number 40 taken from an audio transformer's winding. Even birds' eyesight missed this one until their flight path accidentally bumped into it. Number 40 copper wire, by the way, radiated RF well at legal amateur power, according to this article.

The end-fed wire antenna is cheap but effective on the low bands. Today, its use will always require a transmatch, a component now present in most stations. Within a given physical environment it is about as effective on the low bands (160 and 80 meters) as the G5RV antenna which needs both a transmatch and a feedline. The end-fed wire is its own feedline. A single strand of copper wire feeding RF to the sky is a simple unsophisticated thing, perhaps out of fashion. But it worked at the beginning and still works even today. ER

Editor's Comments from page 1

After consulting with many AM'ers and CW ops I've decided to limit the modes of operation in the contest to only CW and AM. Allowing SSB would detract from the spirit of VFD and just cause too much confusion. There will be separate events for AM and CW. There will not be a mixed category.

Operation on any band is OK, however I think most of the activity will occur on 20 (14.286 plus or minus), on 40 (7290 - 7295) and on 75 (3870-3890). Scoring will be as follows:

1 point for each contact with another AM or CW station. (But no cross-mode contacts.)

2 points additional for each contact with another field day station.

I'm going to require that all logs that are sent in must be accompanied by a photo of the operator (or multi-ops) with a short report on equipment, antennas, power source, etc.

Here's what constitutes a field day station:

1) You must be powered by something other than the main AC power lines; generators, dynamotors, batteries, solar power, wind, are all OK.

2) You must operate tube-type equipment to be a VFD participant although you are allowed to work modern solid-state stations for points (provided of course that they're operating AM or CW and not SSB).

All logs must arrive at ER before July 15 with accompanying photos and reports. The winners First, Second and Third, in the two categories AM and CW will be announced in the August issue. I'll also print as many of the photos and reports as we have room for.

Prizes will include an award certificate (suitable for framing) for all the winners.

I sure hope we can pull this off and that VFD will become an annual event. Please start making plans to participate. It could be a great way to spend a weekend in June - "fine spring weather, etc.". N6CSW

Dynamotor Refurb the Easy Way

Part 2

by Michael Hanz, KC4TOS
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This is a continuation of last month's discussion on rebuilding dynamotors. This month we'll focus on reassembly and painting.

Lubrication: As far as lubing goes, the old greases called out in the TMs were never that good for longevity. There's a much better product out these days - a synthetic based product by Mobil that is designed for electric motor bearings, called Mobilith™ SHC™ 100. There might be something better...but I've searched for a long time. It comes in a standard grease gun cartridge, should be less than $6. If you can't find it anywhere else, call MSC at (800) 645-7270 and ask for ordering number 60002623. Buy a new (cheap) grease gun and dedicate it to this duty.

The grease is only half the story. You have to get it into the clean bearing. Lord, I've tried hand-packing bearings every which way from Sunday, and there are spaces you just can't seem to force the grease into, no matter how much you try. I finally made a miniature version of the larger industrial packers (shown in figure 1) and it's easily replicated if you or a friend have a lathe. You might even be able to make it out of something from the hardware store (a small plastic funnel and grease fitting, perhaps?)...that part's left as an exercise for the student. This design forces the grease entirely through the bearing by mounting it between a male and female cone, and I've never had a subsequent bearing failure using this method. (I won't tell you how many bearings I've gone through that have been packed by hand.) If you do have to handpack, use a kneading motion and don't be in a hurry - spend some time working the grease through the bearing, turning it frequently as you knead. Some dynamotors like the PE-73/BD-77 (BC-375/191) use an interference press fit, which frequently results in destroying the bearings if you remove them for cleaning and relubing. With these types you are well advised to clean and repack on the armature, always a pleasant and delightful experience, excellent for building character. I employ the same packing tool for the job, but use only the female cone half to do it.

Try to force grease through the bearing so that you can see it beginning to come out the other side. This takes a bit of turning of the bearing and a smidgen of patience, especially if the bearing has a single-sided dust shield (open one side, thin metal shield on the other). With the integral dust shield type, place the open side toward the female cone - the grease will still work through the bearing properly because the shield isn't air-tight. If you don't want to go to the trouble of making a tool, fellow restorer Tom Bowes has an ingenious solution that doesn't require building a packing tool: put a bearing end plate back on one of the bearing cages and place a healthy gob of grease in the resulting cavity. Then force the bearing (mounted on the end of the armature) into its normal "home". If you've put enough grease in the cavity, it will get forced through the bearing by hydraulic pressure! Again, watch carefully - turn it a few times as you're pressing, and stop pressing the bearing toward its cage

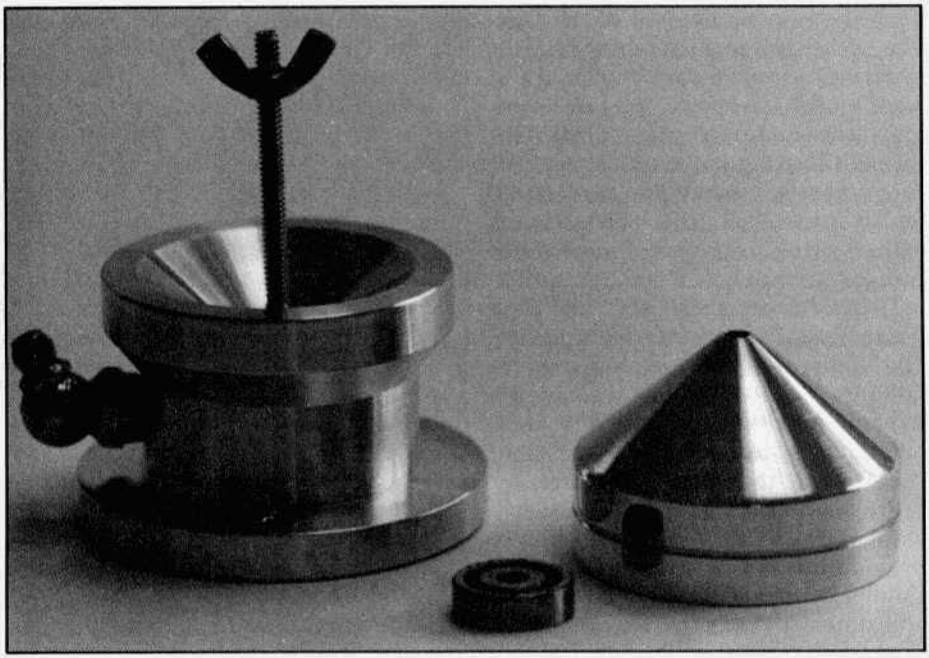

Figure 1. A miniature version of the larger industrial packers. It's easily replicated if you or a friend have a lathe.

when you first see grease emerging on the grease slinger (inner) side, then pull off the end cap and clean any excess out. Be sure to also clean any excess off the inner side next to the commutator before you fire up the dyno.

After installation, you shouldn't need any more grease than what's actually in the bearing and a little in the cavity - try to go by what you saw when you opened up the bearing end plate. Check the end bells after a couple of hours of operation - if it's throwing grease, you put too much in the cavity under the end plate and it's expanding through the dust shield as the dynamotor heats up.

Reassembly: Installing the bearings on the armature shouldn't be a problem (it says here in the fine print.) If the bearings were bad, or if the old bearing was a bear to get off, I always spin the shaft with an electric drill or lathe and hone its diameter down a thousandth or so. Use 600 grit wet or dry sandpaper and WD-40 until the old bearing is a "firm" slip fit rather than tortumongous (hmmm, wonder why the spell checker flagged this - it looks right...) If the bearing's too loose on the shaft, Loctite™ and Permatex™ make shaft locking compounds that'll cure the problem, but you'll have to heat the end of the shaft (as described last month) to break the bond if you need to get the bearing off in the future. The common types should just slip on, or at most require light tapping with a soft mallet, but check for burrs and clean any grease off of the bearing bore and shaft with solvent before putting them on...I use acetone. You want the bearing surface to be the balls or rollers, not between the shaft and inner race! Start the new bearing onto the shaft with a light tap from a plastic mallet. If the bearing doesn't seat all the way with a few taps, then continue with a small socket (from a socket wrench set) in a press or a vise to

continued next page

push the bearing the rest of the way. The socket (or small scrap of pipe) is necessary to make sure you only put force on the inner race. Just use common sense and don't put any pressure through bearing balls, outer races, or commutators - you shouldn't ever transfer any force through the balls or rollers of the bearing, nor any part of the armature except the shaft.

The end cages go on next, and then it's another six hand exercise to get everything seated and the long cage retaining screws all the way through the dynamotor without puncturing the stator winding. Slow and easy, constant checking are the watchwords here.

Pre-loading the bearings is entirely another discipline - the purpose is to provide the right running clearances. Common approaches include screw adjustments, lots of little ...arggggh... shims, and large nuts. Pre-loading isn't always used (thank goodness), so you have to follow your TM carefully on this activity - just hope that you don't have to worry about it. (You did remember to record any shims when you took apart the dynamotor, didn't you?) As you assemble the dynamotor you may notice the armature tighten up and not spin freely. This is generally because you're putting a (temporary) preload on bearings which may not be designed to be pre-loaded.

Once the long end-cage screws are tight, tap each armature end lightly with a small mallet (or hammer with a piece of wood or plastic) to center the bearings. Without the brushes the armature should then turn quite freely by hand. If it doesn't, take it apart and find out why not...could be a cocked bearing, a pre-load pressure caused by a forgotten shim, or a burr in the end-cage bearing bore. The bearing retaining plates go on then, usually with two small screws in each plate. There's sometimes a little paper gasket inside the plate, but you shouldn't need it with a good grease like the SHC-100. The gasket was placed there to reduce dripping with the wide variation of viscosities that WWII greases exhibited going from cold to hot, not to mention their separation into liquid and solid when they were left sitting for long periods. No need to remove them unless they were damaged in disassembly, but I wouldn't go out of my way to make a replacement unless you're really into internal originality. If you did much more than polish the commutators a little with sandpaper, you'll need to break in the dynamotor with a couple of hours of running at no load before putting it into full operation. This allows the brushes to adjust to their new home and increases the contact surface area. Neglecting to do this could cause brush overheating and failure.

Finishing touches: You might have noticed that dynamotors come with all kinds of end bells - sealed, slotted, louvered, circular vents...some don't even have any covers at all! If you want to be original, then the decision is easy. However, if you want extended life, then you want to look for a vented pair of end bells, as long as the environment in which the motor runs is reasonably clean. The brushes, commutator...well, just about everything will last longer if you keep them both cool and clean. The Navy shipboard proclivity (before OSHA) for running without covers was a logical extension of this approach...there are not too many dust storms inside a battleship.

Heat and brush carbon dust just don't help things if they're retained inside the motor housing.

Now, if you want to simulate the -30° F of a B-17 radio compartment at 25,000 feet in your shack, then you've taken care of the cooling part of the problem, but you'll still need to periodically blow out the carbon dust with an air hose to ensure a long life. Vented end bells just make life simpler, if not exactly origi-

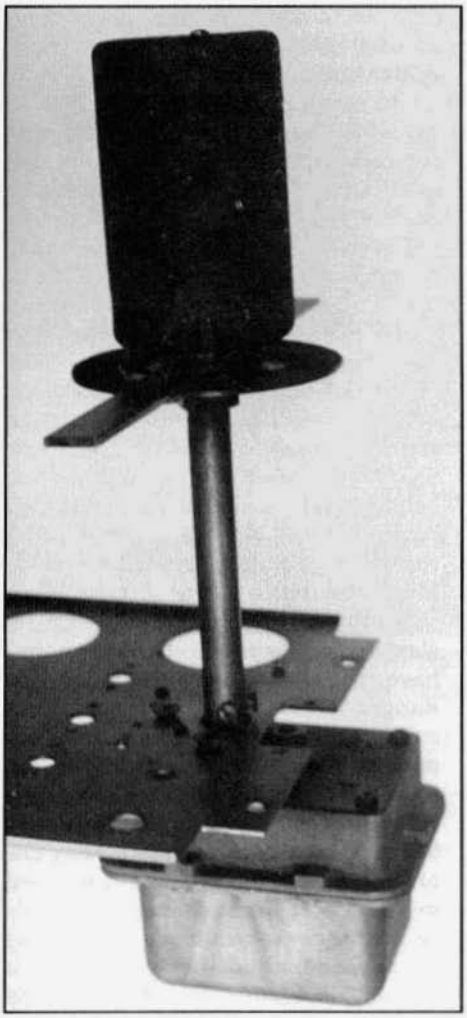

Figure 2. Homebrew rotating fixture that spins the just-painted dynamotor. This prevents runs.

nal. I scrounged vented covers for my 28 volt sets from 12 volt dynamotors, which are more likely to have them due to higher operating currents, but a lot of the post-war units had them as well. With yearly cleaning of the carbon dust (which is highly abrasive) and use of the Mobilith grease, 10,000 hours before you have to turn the armature or replace a bearing isn't unreasonable.

If you have badly dented end bells, don't throw them away. With patience you can do some impressive restoral work. You'll need a couple of small ball peen hammers, a bucket of damp sand, a block of soft pine, and some time. With a little practice, you can straighten all the dents with steady, light tapping on either the wood block or with the sand as a support. I usually use a piece of thin cardboard or rubber to cover the sand without losing its conforming, supporting ability. Don't go overboard with force here - steady, light tapping is all you need. Also remember that aluminum stretches as you hammer it, so too much working will cause ripples.

Just use common sense and practice on a really bad sample if you're not sure what you're doing at first. Also remember that black wrinkle paint will cover a whole lot of sins.

That brings up the final subject - painting. I generally fill little dents and ripples and prime exactly as I would on a car, using spray cans and body putty. However, most of these dynamotors and inverters were painted with black wrinkle paint, which is a real PROBLEM. If you get enough paint on to wrinkle properly, it drips and sags like a champ on anything vertical!

I finally gave up on all the other alternatives and made a rotating fixture (figure 2) that spins the dynamotor between five and ten rpm. The motor was from a furnace damper control, bought at a hamfest for a dollar. A heat lamp or two to warm things up and you can get a beautiful wrinkle finish without runs or unwrinkled areas. Some polishing of the nomenclature tag, perhaps some black acrylic paint from an artist/hobby store to repair the background on etched tags (a rubber squeegee works well here), and you're done! The finished product is shown in last month's article.

All right, now! Maybe everyone will leave me alone and I can go back to puttering with my countermeasures junk... ER

A Letter To ER

by Tom Rousseau, K7PJT
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I am enclosing some photos hopefully for your enjoyment as well as possibly the ER readers'. What started out to be simply sending you some photos has turned out to be a recital on my own observations and opinions of some of the radios that were a part of 'our' developing youth. It was a relaxing and satisfying exercise to write these notes, as I enjoyed just thinking about their history, their creation and their lives; also, I now have a written document of some thoughts to which I can return, further contemplate, and expand.

The first photo is a copy of a print where I was operating my station in 1963. I was a high school student in Spokane, Washington at the time. The center of the station was a modified Hallicrafters SX-101, flanked by EICO kits: 723 50/60 watt transmitter with a 730 modulator and a 722 VFO. The piecemeal kit approach allowed me to build up a station gradually from my paper route income. I still remember the awesome feeling I first had towards the SX-101 (having stepped up from a Heath AR-3 and later an SX-28), but I still could not keep my hands out of it to make it better yet! The EICOs replaced a homebrew 6AG7/6DQ5 rig I built from the '61 Handbook. Barely visible on the left of the picture is a homebrew 2-meter rig, an 8 Mc crystal oscillator multiplying through three stages to a 2E26 final; and a downconverter to the 10-meter band for receiving. The console below the equipment included accessories such as a monitor scope, antenna switching, SWR bridge, phone patch, etc. Those were very memorable days for me, given the camaraderie we enjoyed though our high school clubs and activities (lots of homebrew, transmitter hunts, field days...).

The second photo is a recent view of my work bench. Lots of test equipment for radio work. The rack on the left (K7PJT) includes two Hammarlund Super-Pro SP-600s (the upper one is a VLF version) and an LTV surveillance receiver (really a 51S-1 in new skins). I believe that the overall performance of the SP-600 probably makes it the finest dual conversion, switched range variable HFO, professional grade receiver ever produced in quantity. The rack on the right holds the Hallicrafters S-36, SX-28A, Collins R-388 and R-390A that belong to my wife Sandi, WB7NED. This combination of vintage radios provides receive capabilities from 10 Kc to 145 Mc at the bench. I spend a lot of my radio time at this bench restoring old classics and listening. In this photo I have just started work on a Johnson Ranger.

The third photo shows one of the operating station locations, which I call Studio D (left side) and Studio E (right side). All of these radios are functional, but right now I can only select any one of six stations. One of the many planned projects is to build a more elaborate switching console that might allow any station combination to be selected (not a trivial task when you stop to think about all the routings that must be switchable while retaining RF fidelity at transmitter power levels). Most of this gear is of special interest to me in one manner or another for interesting historical reasons.

For example, the Hallicrafters FPM-200, which was announced in 1957 and became available a few years later, is a tribute to their engineering prowess at the time as well as an example of over extending technology to an absurd level of difficulty! I'm sure that Hallicrafters never saw the light of day for financial break-even on this program. This was

The author operating his station in 1963. The station consisted of a Hallicrafters SX-101 receiver and EICO transmitter, modulator and VFO.

the world's first HF communications transceiver that was mostly solid-state; it had two high stability and high accuracy VFOs with tracking electronic tuning for all the interstage RF circuits; the RF power amplifier ran a pair of 6146 tubes driven by a 12BY7. The design and construction were quite innovative for its time, including a built-in switching power supply for the high voltage, double-sided circuit boards, and a plug-in interconnect scheme to eliminate most point-to-point wiring. It is thought that perhaps only about 50 of these were made, and development never really left the prototype stage. The FPM-200 is a striking contrast to its contemporary but comparatively 'mundane' and popular Collins KWM-2. While the FPM-200 was conceptually 15-20 years ahead of its time, the available components and technology compromised the performance in the receiver's ability to handle strong signals. The FPM-200 price in the early sixties was more than that of a complete Collins S-line, including the 30L-1!

The Drake 1A is another favorite. While it is perhaps one of the homeliest looking radios ever sold, its performance is commendable even by today's standards. Its pleasing audio and smooth tuning make it a joy to listen to. Its sound and efficient design fundamentally lived on in the 2A/B/C series, as well as the earlier 4-line to a lesser degree. This is the radio that launched Drake into more than 20 years of amateur radio market success with it's superbly balanced products (balanced in the sense of performance, price, reliability, and value to the customer). The 4-line was arguably the finest performing tube amateur equipment ever produced (even compared to S-Line). Drake must have worked hard to develop the 7-line, which was the market's first fully realized high performance solid-state equipment to be introduced (nearly 20 years after the FPM-200), but was too

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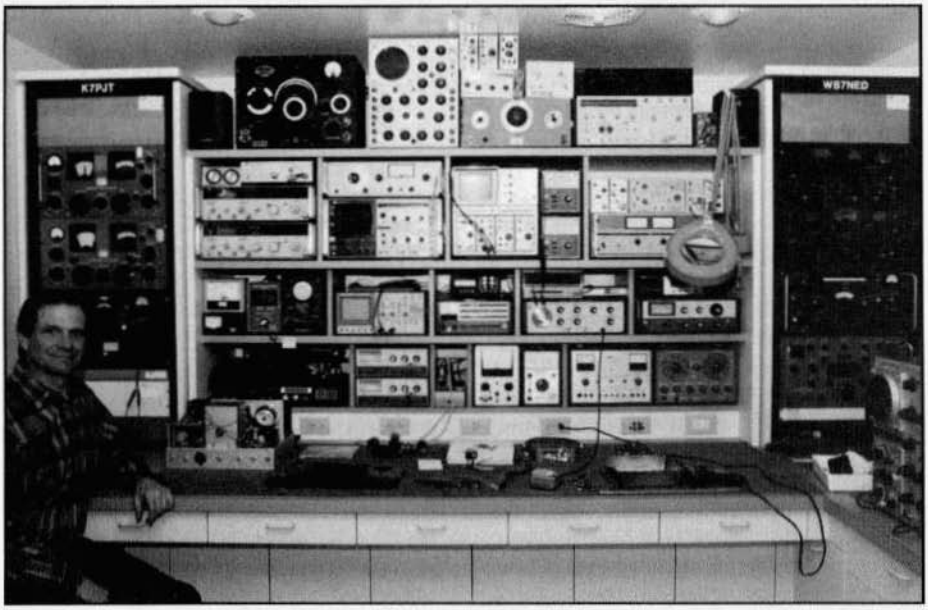
late to fend off the fine Japanese competition. I always appreciated Drake's bias towards performance and value, even though most of their equipment ended up with a slightly cheap feel.

The Hallicrafters SX-88 is one of the prettiest and smoothest tuning receivers ever produced. It is remarkably stable for a switched range variable HFO radio, and it has selectivity options that exceed anything available today including comparable filter shape factors. Combining this fabulous IF section with the excellent audio section (hi-fi including a pair of 6V6 output tubes) makes this is a wonderful AM SW radio. Probably its only serious operational fault was the way in which it handled SSB: sideband selection was achieved by requiring the user to adjust the BFO appropriately along one skirt of the passband or the other, and then readjusting the tuning; this procedure became more tedious when changing selectivity positions, as the skirt relationships changed (these problems were later fixed in the SX-96 and its descendants..... except the SX-122, which reverted back to the SX-88 technique). There was no product detector for SSB either; SSB detection was 'improved' by activating a BFO amplifier to drive the envelope detector to a higher level, attempting to reduce distortion with a higher BFO to signal ratio. Recognizing the time the SX-88 was marketed, we need to remember that this receiver came out early in the transition period to SSB, and manufacturers were still experimenting with the best techniques with which to handle the new media; the SX-88 was the first amateur receiver to be marketed as having SSB capabilities!

The SX-88 'no-compromise' receiver was available from Hallicrafters for only one year, 1954. Shortly after it went out of production, Hammmarlund announced its version of a 'no-compromise' amateur receiver, the Pro-310. The Pro was a strangely balanced design, having an innovative and well designed front-end befitting a high-end radio; but, oddly enough, it was united with a disappointing IF and AF chassis which was more in keeping with a mid-range (SX-96 class). The front end featured a mechanically derived, calibrated-anywhere bandspread (unlike most receivers of the day, which were electrically derived and calibrated only on the ham bands); it also was the first significant application of circuit board technology in an amateur product of which I am aware. This product was available for about three years, by which time Hammarlund hit their stride with better balanced designs in such classics as the HQ-170 and HQ-180. The SP-400 was a beautifully constructed receiver that was a joy to use, and it represents the best of the post-war era (as expected in the Super-Pro tradition). The HQ-215 was a last attempt to impact the amateur market by Hammarlund in the late sixties. This all solid-state receiver used Collins mechanical filters and would even connect to a 32S-1 for transceive operation. The radio didn't create the market interest Hammarlund needed, so the presumably planned mating transmitter never materialized and they quietly disappeared from the amateur market.

National, too, had it's 'no-compromise' amateur receiver in the fifties. The NC-400 came out in 1959, and was available for about five years. It was generally a well balanced high-end design and actually preformed nicely, although amateurs were more interested in ham band only receivers by this time (the NC-300/303 are distant cousins to the NC-400). While it didn't have the superb audio of the SX-88, nor quite the IF selectivity selections and steepness (the last IF of the NC-400 is 455 Kc compared to the SX-88's 50 Kc), it was an excellent overall performer, including SSB reception. Although the IF stage performed well, it was an unusual and



The author at his workbench. His wife Sandi, WB7NED, has her own rack on the right.

somewhat inefficient design, as it used two redundant and parallel paths, one for SSB and the other for remaining modes. The venerable HRO receivers were always benchmark performers, but becoming long in the tooth by the fifties, when the HRO-60 was produced (dual conversion was introduced to the architecture); however, the plug-in coil concept had long out lived its one-time benefits. This may have been what lead to the NC-183D, which is a bandswitching HRO-60, in many respects. National went on to stun the professional world in the mid-sixties with the all solid-state HRO-500 synthesized table-top radio (previous synthesized radios filled most of a six foot rack). One cannot think of National without recalling the remarkable PW tuning dial that graced every HRO for over thirty years as one of the most beautiful icons of radio history as well as an engineering masterpiece (even Collins copied the PW concept with the 'floating' numerals of the S-Line VFO dial).

The SX-115 receiver, HT-32B transmitter, and HT-33B linear amplifier were Hallicrafters' last boat anchors. These units were big and heavy, and were eventually replaced by smaller radios (SX-117, HT-44, HT-45) in the trend established by Collins and Drake (smaller, lighter weight, transceive). However, the SX-115/HT-32B/HT-33B were a pleasure to use: they performed very well, were pleasing to the eye and sensuous to the touch. The transmitter featured an extremely stable and accurate VFO (the adjustable differential temperature compensation circuit could be adjusted for much less drift than even Collins was providing). The asymmetrical 4.95 Mc filter provided sideband suppression and a soft roll-off of the audio response for a very satisfying sound. Also, the Hallicrafters heterodyning scheme precisely preserved the carrier-to-filter relationship and sound quality in either sideband mode (unlike the S-Line, which demonstrates noticeable differences). The receiver's archi-

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tecture shared many characteristics with its popular protege (SX-101, SX-100, SX-96, S-76) with some nice refinements to improve its robustness, performance and quality appeal. It used the HT-32B fixed range VFO (though would not transceive with the transmitter), had a crystal HFO, converted to a tunable first IF, and had an effective but simple noise limiter; it was also a good radio for pulling out weak signals.

The Central Electronics 100V was probably the ultimate transmitter of the fifties. Its performance exceeded all else offered, and the operating convenience was an almost unbelievable breakthrough for its time. Most adjustments were 'set and forget' and only two controls required adjusting to operate on a new frequency (band switch and VFO tuning) in an era where exciter and preselectors had to be peaked, drive levels set and pi-networks dipped and loaded. All stages were broadband tuned, including the final (it 's interesting to note that Central Electronics chose a more innovative broadband tuned circuit approach to interstage coupling as compared to Hallicrafters electronically tuned tracking in the FPM-200; both were attempts to simplify the usability and mechanical construction of their radios). The VFO was a technological art form, with its easily setable linearity corrector and ultra-high stability (<25 cycles drift). The precisely designed phase shift networks provided sideband suppression as good as the filter rigs, but with much more pleasant audio. The 100V provided every imaginable operation mode for the fifties techie (SSB, DSB, AM, CW, PM, FSK). The 100V was a remarkable culmination of Central Electronics SSB development which began with the popular 10A in 1953. The 100V was a very expensive rig to produce, and ultimately broke Central Electronics, who was absorbed by Zenith. Zenith cost reduced this transmitter but preserved the price and essential performance characteristics, reissuing it as the 200V. By the late fifties, however, market preferences had shifted towards the trends established by Collins and Drake so the 100V/200V followed the same path to obscurity as many other fine boat anchors (B&W 6100, Hammarlund HX-500, Heath Marauder, Gonset GSB-100, etc).

I have the 100V paired with the Collins 75A-4, which was the ultimate amateur receiver of the fifties. The 75A-4 could certainly be outperformed in certain aspects (many other receivers were quieter and could pull out very weak signals better, and some had improved AVC systems and sounded more pleasing), but the 75A-4 was without a doubt the best balanced high-end radio of the period, considering stability, selectivity, accuracy, and general ease of use. In particular, the passband tuning feature was highly innovative and very effective. Many hams were disappointed to see this capability disappear with the S-Line introduction; I suspect that Art Collins placed a higher value on simplicity of operation over functional flexibility (as demonstrated in the emasculated 75S-1 receiver which replaced the 7SA-4; evidently, Collins later became aware of their poor judgment, as some of the necessary features returned to the S-Line as they evolved through the 75S-3 series).

The Collins KWM-1 was the forebearer of amateur radio equipment as we know it today: compact, lightweight, a complete station in one package with transmitter and receiver sections sharing a majority of the circuitry. It was announced only a few months before the FPM-200 in 1957, but started shipping years before the excessively ambitious Hallicrafters unit (was this an example of marketing exuberance falling fate to technical reality?). The KWM-1 was an austere looking three band radio (20, 15, 10 Meters) and saw limited popularity with only somewhat

Studio D (left side) and Studio E (right side). All these rigs are fully functional and Tom can select any one of six stations.

over a thousand units produced. However, it was incredibly successful in that it led the way to the future in ham equipment; it was the 'prototype' of the S-Line and KWM-2, as well as the Drakes, Hallicrafters, and Nationals to follow in the sixties, and the Japanese products of the seventies and beyond. The KWM-1 set the stage for a generation of Collins radios with a relatively narrow VFO tuning range in order to balance cost and performance, as the cost of producing the 75A-4 style VFO was very high. The S-Line followed-up on the KWM-1 experience to replace the 75A-4/KWS-1 as the flagship SSB station, but the KWM-2 won the hearts of the amateur world in its near perfect implementation of what a transceiver should be. It was promoted as a complete station in a suitcase, a truly amazing accomplishment at the time when you consider that most well-heeled hams were still using the likes of a Valiant/HRO, or SX-101/HT-32 at five times the weight and size (the rest of us were using S40/DX-20 class rigs)!

Speaking of the Valiant, it is an excellent example of the fine Johnson engineering, which had a tendency towards brute-force solutions rather than innovation. The Vikings, Rangers and Valiants were renowned for their high integrity towards performance and reliability. However, like Hammarlund, they had a weak vision for the future and were late in adapting to the new trends and requirements of the market. The Pacemaker, Johnson's first SSB transmitter, was truly an odd design in that it implemented a bandswitched phasing system operating at the crystal heterodyne oscillator frequency (similar schemes were used in 'SSB adapters' for AM transmitters, but this was an awful choice for a self-contained SSB rig). The later Invader 200 adopted a more traditional SSB filter generator scheme, but was too big, too expensive, and too late for the market, although its upgraded cousin, the Invader 2000, was a nice accomplishment in terms of a compact kilowatt transmitter; unfortu-

continued next page

A Letter To ER from previous page
nately, it appealed to too small a market segment. The mid-sixties found Johnson experimenting with the solid-state Avenger (an FPM-200 like transceiver), but it was never marketed after a small number of prototypes were produced. I've paired the Valiant with an NC-303, which makes a very nice latter fifties style AM station.

The fifties and sixties was a period of change for amateur radio, as were other times. However, this period is special to many of us 'mid-lifers', as it represents the period in which we started this hobby with an intense level of activity and interest. While most of us started with very simple equipment (S-40 or AR-3 class receivers and home made 6AG7 power oscillator or DX-20 class transmitters), many of the radios in Studios D and E were reality only in our dreams as we paged through the latest Allied catalogs and ARRL Handbook advertising sections. To be sure, while these radios were representative of the higher-end or unusual designs, there were dozens of other very popular radios that played a very important part of the hobby during this period (the Heath DX-series and Indian-series; Hallicrafters S/SX-series, HT-series and SR-series; National NC-series and NCX-series; Hammarlunds, Knight-kits, EICOs and Globes, et al). All the radios of this period are special also because they performed well, and can easily be enjoyed today, both in operation and restoration. Their technology can actually be touched! This is in contrast to today's radios which are certainly a pleasure to operate, but almost impossible in which to become immersed due to the multi-thousand device, 200 lead fine-pitched surface mount IC's and gate arrays!

On a more somber note, not one of these companies is present in today's amateur market. Drake is the only one still existing as an independent company successfully making home satellite receiver systems and commercial cable television products; they are closest to their roots with their sideline of SWL receivers, including the highly acclaimed R-8A. Collins exists today as a subsidiary of Rockwell International as a leader in avionics equipment. Collins fell victim to pursuing Art's vision of the convergence of computation with communications thirty years ahead of the market (a hot trend today), compounded by the collapse of the Vietnam-era military market. Johnson is a component manufacturing subsidiary of Jordan Industries. Hallicrafters, National, Hammarlund, Gonset, RME, B&W, and many others were victims of their own lack of vision. Heath had vision and was willing to experiment with risk, until Zenith sapped their life and technology changed their game. If there is a lesson in any of this, it might be that the world is forever changing; and very few companies survive over the long term with a constant game plan. The elements of survival include vision, timing, balanced implementation, market need, the willingness to change, luck and a cognizant/clairvoyant recognition of all the above!

Barry, I apologize for rambling on about all this stuff. I just 'got going' about a topic of interest to me and wanted to share some of my thoughts and observations with someone else who also lived this period and can look back with thoughtful hindsight. While many of us certainly enjoy restoring and using these relics of another era, I see our primary role as collectors is to preserve this history for future generations so that they can also enjoy and appreciate this fine equipment. My thoughts are based on an American experience, and do not account for what was occurring in Europe or Japan (those would be interesting stories!). If you've read all this thanks for your attention and tolerance of my indulgence. Perhaps we will meet some time to explore

these ideas further. Thanks for your superb efforts and results with ER, and contributions to QCWA. Best to you and Shirley, and 73 ... Tom ER

P.S.

My high school interest in ham radio launched me into a very satisfying career at Tektronix, where I have enjoyed over 25 years of instrumentation development, including the humbling opportunity to work with some truly brilliant people on state-of-the-art products. My time at Tek has given me a perspective about product development and marketing from which I now observe the history of our hobby to draw my own perspectives and conclusions .... right or wrong.

Directional Wattmeter from page 6

divider capacitors. This compensation is independent of frequency and would extend the lower end of the useful frequency range, or permit a reduction in the number of turns in the toroid.

Another source of error is inductance in the 10 ohm resistors which is minimized by very short leads. Inductance in series with the 500 pF voltage divider capacitors was minimized by using disc type silver mica capacitors.

Germanium diode detectors provide better linearity at low RF voltages than do silicon diodes. The 1N34 diodes have some nonlinearity which is minimized by using a sensitive meter movement of 200 microamperes for full scale. The remainder of the error is removed by properly calibrating the meter scale.

The meter is calibrated to indicate RF Power with a CW signal. The meter only kicks up to roughly 1/6th of actual PEP with an SSB speech signal. For a short time we added 4 mFd capacitors across the detector outputs to get a reading about 3 or 4 times higher. Art had us take them out because it didn't read true PEP. Now Floyd Soo, W8RO, manufactures a PEP detecting amplifier to be inserted between the coupler and the indicator units of the 302C-3 to make it indicate PEP With SSB.

Concluding Remarks

This Directional Wattmeter circuit has been called a classic by Doug DeMaw in his book "Ferromagnetic Core Design Handbook". It became very widely used by other manufacturers of ham and CB equipment. In retrospect, it appears fortuitous that Art burned out his Micromatch again and that I was there when he asked to have it repaired. It was the event that triggered the development of the 302C-1, although I knew how a few years earlier. I never heard of one burning out, but I did hear that someone burned out his antenna tuner coil because he tuned for a 1:1 ratio of 400 watts Forward and 400 watts Reflected!

Many thanks to Jay Miller, KK5IM, and Butch Schartau, K4BYM, for their help in preparing this article. ER

US Military Contract List from page 15

725 includes a new production IF deck based on the R-390 (tuned circuit selectivity) design. This modification made it possible to use the new standard R-390A frame for direction finding purposes. The mechanical filters of the R-390A prevented reliable DF performance prior to this modification.

R-725	Hi s.n.
Motorola Inc.	
476-PH-56-91	X2 prototype
Servo Industries	
38-039-N-5-00093(E)	53
Arvin Industries Inc.	
DAAB05-67-C-2338	236
Total R-725	291

Servo Corporation of America is still in business in Hicksville, NY making (what else?) direction finding equipment for marine and aviation use.

As always, additional information regarding unlisted orders or higher serial numbers is welcome. ER

The RME DB-22A Preselector and Me--A Reminiscence

by Al Brogdon, W1AB
114 Lyons St.
New Britain, CT 06052

Back when I was a teenager--those many years ago--I became interested in ham radio as a result of listening to hams, mostly on 160 and 75 meter AM, on my family's big old floor-model Farnsworth LW/MW/SW radio. Somehow I became aware of the new Novice license when it came into being in the summer of 1951. I got a copy of the ARRL License Manual and started studying. I took the Novice exam in December 1951, and my first ham ticket, WN4UWA, was issued on January 15, 1952.

My parents bought a Hallicrafters S-38B for me as a surprise gift, and that was the receiver I used for my first five years as a ham. The S-38B was a simplistic five-tube ac/dc receiver, with the antenna going right into the grid of the mixer via one tuned circuit--no RF amplifier stage. It worked fairly well for me on 80 and 40 meters, but I could hear only the biggest signals on 20 meters and above.

After a few years, I bought a used RME DB-22A "radio frequency amplifier and preselector." The DB-22A has two 6BA6 amplifier stages and three gang-tuned circuits. And it did a number for me! I could now hear stations all the way up to 10 meters!

The DB-22A was introduced in 1947; the first ad in QST that mentioned it (as the "new" DB-22A) appeared in the September 1947 issue. The DB-22A is built into an 11x11x12 inch (HWD) cabinet, and provides continuous tunable coverage from 540 kc to 44,000 kc, with 30 dB gain. It has the large half-moon RME dial of that era. It is almost identical in appearance to RME's VHF-152 VHF converter and the HF 10-20 converter (which converted 10, 11, 15, and 20 meters down to 7 MHz).

About the same time that I bought my DB-22A , I read in QST about using the BC-453 low-frequency command receiver as a "Q-Fiver," tuning it to 455 kc and loosely coupling, via a gimmick capacitor, the output of the receiver's final IF stage into the Q-Fiver antenna input. I did this with my S-38B, thus using only the mixer and IF amplifier stages in the receiver

The DB-22A/S-38-B/Q-Fiver combination provided pretty good receiving performance on a low budget, a necessity for a college student.

Later, I replaced the DB-22A with its successor, the DB-23. The DB-23 was much smaller (5 x 7-5/8 x 6, HWD), and had both advantages and disadvantages, as compared to the DB-22A. The DB-23 used three 6J6 tubes as push-pull amplifiers, and claimed "at least 20 dB gain." Significantly, the ads claimed that "Signal-to-noise ratio improvement can be as much as 7.5 db over that of the receiver itself." In other words, the DB-23 had a noise figure that was 7.5 dB better than the typical receiver of the 1950s.

The DB-23 covered only the five ham bands from 80 through 10 meters, rather than providing continuous coverage, as did the DB-22A. Instead of the DB-22A's large dial, the DB-23 had only a small peaking control. (I can't recall with confidence, but I believe the control peaked only one tuned circuit, with the other two stages running as broadband amplifiers.)

Then I graduated college and sold the DB-23, S-38B, and BC-453. I went on to progressively better equipment in my ham shack (my next receiver after the S-38B was a Collins 75A-2--quite a step up!). The years passed, as they tend to do when you're having fun. I was DL4WA while in the Army for a couple of years, then I moved to Pennsylvania to become K3KMO, then back to Germany as a civilian engineer on an Army

continued on page 40

With the New

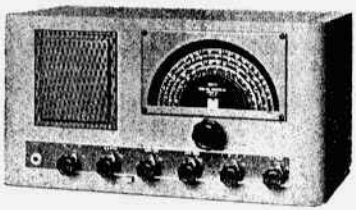
DB22A PRESELECTOR

Because of its advanced preselector design and use of 6BA6 miniature tubes, the new DB22A Preselector has an average overall gain of 30 DB, throughout the tuning range of .54 to 44 MC. Image ratio, too, is phenomenal—better than 50 DB with a communications receiver having a single stage of RF. The DB22A also provides tremendous increase in both gain and selectivity when used with a good communications receiver.

The DB22A is entirely self contained, entirely in a class by itself. Connect it to your receiver just like a good antenna — no extra wiring — no plug-in coils are required.

AVAILABLE IN TWO SIZES

The DB22A is available in two size cabinets: one to match the height of the RME 45, designated as "Standard" and the other to match the RME 84, designated as type "S"



PRECISION BUILT INTO RME 84 RECEIVER

The new RME 84 is a precision instrument — no low priced, "average" components are used anywhere in its construction. Tuning range covers frequencies from .55 to 44 Mc. A planetary drive mechanism, spring loaded to eliminate backlash, makes operating a pleasure. Portability, too, is built into the RME 84. Provision is made for connection to 110 AC, batteries or RME VP-2 vibrapack. Other features include high sensitivity, new series noise limiter and provision for "S" meter.

Write for Illustrated Folders

TIME WILL TELL

RME

FINE COMMUNICATIONS EQUIPMENT

RADIO MFG. ENGINEERS, INC.

Peoria 6, Illinois U. S. A.

The RME DB-22A Preselector from page 38
contract (as DJØHZ, with DXpeditions as LX3TA and M1M on the side), then to Maryland for 25 years.

Eventually, nostalgia for the good old days started to afflict me, and I started thinking about assembling a station that would replicate my ham station of 1956 (by which time I had a decent station). I found an operational and cosmetically good S-38B at the Frederick (Md.) hamfest one Father's Day (probably 1989) and bought it.

Then, about 1991, I heard something that interested me. In the Washington, DC, area, the Foundation for Amateur Radio runs a widows' assistance program that helps the widows of SKs sell their husbands' gear easily and for reasonable prices. I heard that they had a DB-22A from an SK's estate, and I immediately spoke up to buy it for, as I recall, around $20.

When I got the boxed DB-22A in my hands, I immediately became curious. Hmmm...original shipping carton, from Capitol Radio Wholesalers, in Washington, DC. I opened the box...original equipment manual, warranty card, and unused owner's registration card. I took the unit out of the box...like new. Obviously it had been used little or perhaps not at all! What a find!

I asked about its previous owner, and learned that he had operated an electronics measurement lab that he opened after WW II ended. He had apparently bought this unit in 1947 or 1948, and had used it little or not at all.

After carefully considering my next step, I took the lazy approach--plugging it in and turning on the power switch. The dial lights and tubes lit up. Nothing smoked. So I hooked it up to a little SW receiver that was at hand, and found that the DB-22A, sure enough, amplified. Not as much amplification as I remembered--perhaps one of the tubes was soft. But it worked!

The nice thing about the unit's having led such a sheltered life is that it is cosmetically perfect. No dust, scum, or grime on anything. The gray crackle finish is new and clean, without the imbedded dust usually seen in the finish of older units. Its clear plastic dial window hasn't yellowed. The spade lugs at the unit's output (at the end of a length of shielded 300-ohm twisted pair) don't have marks on them from being captured by screws. The unit is a joy to behold.

The only problem with the unit--and a very minor one, at that--is that most of the lubricant has evaporated from the rotary shafts. When I get around to putting my 1955 replica station in action, I'll have to lube the shafts with a hypodermic needle.

So I now have all the pieces for my replica station: The DB-22A, S-38B, and BC-453 Q-Fiver. A Viking Adventurer (thanks to Tony, K4KYO) and Heathkit VF-1 VFO (thanks to Rick, N1RL). And a W9TO keyer circuit that I built (in about 1965) into the cabinet that originally housed my first electronic keyer, an Eldico EE-2 (from 1955). I also have the 1957 antenna tuner that was the subject of my second QST article (Nov 1958, p 42). (My first QST article, Sep 1958, p 22, was about converting the Viking Adventurer for use on 50 Mc. And I have a Heath AM-2 SWR bridge (thanks to W1DG)--which I didn't have back in those days, but which, no doubt, will be handy at times.

Alas, a perpetual lack of spare time has kept me from refurbishing the equipment I've collected and getting it back on the air. But I plan to retire near the end of 1998 and move to the top of some hill (which I have not yet located) in southwestern New Hampshire--to put a lot of wire up high in the air and have fun on CW, mostly on 160, 80 and 40 meters. After that move, and after getting the antennas in the air, I'll have time to do a lot of things I've been putting off for the past 25 years.

At least, that's what my wife Maggie says.... ER

Looking Back from page 2

Another incident worth relating was that I got a call from an antenna manufacturer and they told me that they were being sued because they were using a gamma match on a beam and that this other company claimed they had invented the gamma. I knew that wasn't true because as I recalled, the first time the gamma was ever described was by Tilton, in QST, many years before this argument. I called the antenna company that was going to be sued and gave them the QST issue that described the first gamma. Anything that appeared in QST from ARRL HQ staff was always in the public interest and could not be patented.

Ed was a good antenna man, he was always experimenting with Yagis and describing them and he didn't like anyone else on the staff "treading in his water." I remember I made a 2 meter Yagi out of coat hangers, total cost about $1.50, and Tilton was very unhappy with me.

He also liked 10 meter DX but would never admit it. I have to admit that the guys in the tech department were never very kind to Ed - we used to have a saying about Ed - if he couldn't see 'em he couldn't work 'em. This caused some real problems with ARRL. Ed was put in charge of two meter FM and he really didn't want to push the mode. It caused a real problem because the League got the name of not being interested in furthering FM. This was not true - but we certainly needed someone else at the FM helm. But those were just some of the foibles.

Ed Tilton lived his life for QST and VHF. He really was one of the great legends of amateur radio and amateur radio is worse off with his passing. When they post all those records for VHF worked - 6 meters, two meters, and 450 up in that great hamshack up above - Ed Tilton's name will be prominent on the walls. I keep thinking I will work Ed on 6 meter sporadic E . Rest in peace Ed - you made thousands of VHFers happy--we will miss you. W1ICP

AM Night from page 18

tions wanting to work WØCXX on AM. About 5 hours later we shut down after having completed 126 QSOs in at least 35 states and 2 provinces. We changed operators several times due to "heterodyne fatigue". Two people were at the radio at all times to try to pull as many calls as possible from the QRM. At times we also had to contend with QRN generated in the nearby factory area.

We were impressed by the many varied AM rigs we worked. We did not get everyone's rig in the log, but the logs show working the following of note:

A Collins 32RA
A Collins 30J
Several Collins 30Ks
Seven Collins KW-1's
Several Homebrew transmitters
Many Johnson rigs including several of the kilowatt desks
Twelve Collins 32V-3 transmitters - most common Tx
Twenty-two Collins 75A-4 receivers - most common Rx
The lowest powered transmitter worked was a DX-60
AMI numbers worked: Lowest #1, Highest #999

We are aware there were many stations calling whom we were just not able to work for various reasons. We apologize for the disappointment, but look forward to getting you in the WØCXX log at some future date. The club has a very nice QSL card that was custom designed and printed in the company graphic arts department. We QSL 100% on all cards received. An SASE is appreciated only to cut down on the QSLing labor. Send cards via the club station trustee, Tom Vinson, NYØV, 10211 Hall Rd., Cedar Rapids, IA 52411. ER

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DEADLINE for the JUNE Issue: JUNE 3

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: "AM FOREVER" quality Haynes T-shirts, grey, blue, green & red. Sizes M, L, XL - $15 shpd. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

FOR SALE: Collins 75A4 - $600, 51S1 - $600, w/ manuals; Collins 3.1 khz filter for 75A3, NIB - $80. Fred, W6YM, CA, (209) 296-5990, fhonnold@juno.com

FOR SALE: HT-40, clean - $80. **WANTED:** R-42 Reproducer; 51J or 75A-2/3 series cabinet. Joe Eide, KB9R, 2623 Claire St., Eau Claire, WI 54703. (715) 834-4582, jeide@eau.net

FOR SALE: Jones Radio Handbook, 1937, mint - $50; Radio Handbook (ee) 1939, mint - $50; Popular Science radio annual, 1943 - $20. Gary, W8MFL, MN, (612) 496-3794

FOR SALE: TMC GPR90 - $325, PU only; PMR8 w/ HB AC pwr sply- $80; parting SX28, NC183 & HQ145. Doug, OR, (541) 367-6486

FOR SALE: R-390A orig. 1961 Maint Manual, TM11-5820-358-35, 189pgs - $28 incl. Dom Priority Mail. Aben, POB 4118, Jersey City, NJ 07304. Avidov@aol.com

FOR SALE: Two Heath DX-60B xmtrs and one HG-10B VFO. Working well, w/ manuals - $150 for all. Manny, MN, (612) 699-7932.

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 20176. (540) 822-5643

FOR SALE: Hallicrafters, RME, Gonset, other. Also power supplies, test equipment,VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

MESSAGE: Sorry about the delays. I recently moved. I will answer all in time. William Donzelli, (914) 789-5441, william@ans.net

FOR SALE: Collins KWM-1 xcvr package; 75S-3C rcvr; crystal pack and 75A-4 filters. Bill Mills, KC5PF, GA, (912) 452-2957, after 7 PM EST or wmills@gmc.cc.ga.us

FOR SALE: ARRL Handbooks: 48/49/50/51/53/56/57/58/59 - $20 ea. plus postage. Joe Moraine, W5LX, 3700 Cliffwood Dr., Bedford, TX 76021. 817-281-1128.

FOR SALE: New Ranger 1, Valiant 1 and Navigator plastic dials, 160-10, freq. numbers in green, w/ all holes, like original - $17.50 ppd. Bruce Kryder 4003 Laurawood Ln., Franklin TN 37067. (615) 794-9692

FOR SALE: Collins 75S-3B RE, 32S-3WE, 516F2 - $1200; Drake TR4C, AC-4 - $350. K1BW, MA, (413) 538-7861.

FOR SALE: Repo manuals for R1451, (V)/WLR6(V) - $85 + shpg. Robert Folwaczny, 1701 Westminster Pl., Oklahoma City, OK 73120. (405) 721-7478

WANTED:
In pristine condition: Collins 32V3, 75A1, 30S1, 270G1, KWM1, 30K1, mech filter adapters, 55G1. Not for resale, willing to pay top dollar.

Lee, W9VTC, (847) 439-4700 (d), 726-1660 (n)

WANTED: Still collecting early WW II radar equip. & manuals, what have you. Allan H. Weiner, 97 High St., Kennebunk, ME 04043. (207) 985-7547

WANTED: QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard Coyne, POB 2000-200, Mission Viejo, CA 92690.

WANTED: Marantz, McIntosh, or similar tube audio amplifier in any condition; Heath catalogs. Mike Nowlen, WB4UKB, POB 1941, Herndon, VA 20172

WANTED: HRO-50 "E," "G," "H" coils, dial scales, also "A," "E" scales. Have nice "C" coil to trade. Greg DePrez, 9941 S. Prairie Falcon Ln., Highlands Ranch, CO 80126. (303) 791-1522.

WANTED: Schematic(or copy) for Kenwood KPS-12 pwr sply; Heathkit DX100 or 100B cabinet. Bill Bogart, KA9CWK, 4146 S. Goff Rd., Hillsboro, IN 47949. (765) 397-3860, bogart@glenmar.com

WANTED: Mic preamp module for TBS-50 series Bandmaster. Will consider junker unit with intact preamp. Gary, WA5NCX, TX, (281) 679-5900, Link2G@aol.com

WANTED: Telephonics earphones TH37; short Y cords; ST17, ST19 cords; throat mikes RS76, 37A17. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272

WANTED: Heath gear, unassembled kits, catalogs and manuals. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI 49009. (616) 375-7978, billrobb@net-link.net

WANTED: One to four tube, ham/SWL rcvrs (regenerative), kits or homemade. Bob Mattson, KC2LK, 10 Jane Wood Rd.,Highland, NY 12528-2607. (914) 691-6247, bobmattson@juno.com

WANTED: Goniometer for model DAK radio direction finder; rear panel filter assembly for WRR-3 rcvr. John Richardson, KB0UPL, 1163 Highland Pl., Dubuque, IA 52001. (319) 556-5504, KB0UPL@aol.com

WANTED: Still looking for Drake 2-C plus 2-CQ/2-CS; excellent or better, cash waitin'. Robert Seeber, WB9JPJ, 1044 East Whitaker Ct., Milwaukee, WI 53207-5259

Vintage Manuals Available
Step way up to the finest replicated and original vintage manuals available. Get new Catalog 7, three $.32 stamps. Pete Markavage, **The Manual Man,** 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW 30th, Oklahoma City, OK 73112. (405) 525-3376

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 13280, Maumelle, AR 72113. (501) 851-8783, FAX 851-8784.

WANTED: Vintage AM equipment for personal use, must be collector quality or mint. Prefer Collins, will consider others. Bob Tapper, K1YJK, 5 Polo Club Dr., Denver, CO 80209-3309. (303) 740-2272, FAX 777-6491

WANTED: German WW2 radios. Clandestine sets all periods. Will pay freight. Offering cash/swap. Rag Otterstad OZ8RO, Hosterkobvej 10. DK-3460 Birkerod, Denmark PH: ++ 45-4281 5205. Email: otterstad@mec.dk

WANTED: Exc. R-389; GPR-92; Collins amp 204H-1; meter of SP600JX. Mitsugu Shigaki/ 2825-2, Jozan Kamidai Machi Kumamoto 860 JAPAN. FAX (0)96-329-4601,/ shigaki@mxw.meshnet.or.jp

WANTED: BC-222 or BC-322; pwr sply/modulator for a Clegg Zeus. Joseph W. Pinner KC5IJD, 201 Ruthwood Drive, Lafayette, LA 70503. kc5ijd@net-connect.net

WANTED: Hammarlund HQ-180A for parts, must have dial assemblies intact, unscratched & not warped. Bob, 7340 Furrow Ct., Cherry Valley, IL 61016. (815) 332-9520

WANTED: CV-116B or later model frequency shift converter. Bill Neill, 9978 King St., Westminster, CO 80030-6761.

WANTED: National SW 3 coils - 60-70 series; any National spkrs; NFM 83-50 FM adapter; Doghouse 5886 AB & 5880 AB. I love National radios. Sylvia Thompson, N1WVJ, 33 Lawton Foster Rd., Hopkinton, RI 02833. (401) 377-4912.

WANTED: Collins radio collectibles, Signal Magazines; HRO-60; your retired semi-automatic key (bug). Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (412) 758-2688

WANTED: National HRO 5AT spkr case. Harold Knight, W1SKS, POB 85, Bradley, ME 04411. (207) 827-4283

WANTED: Poly-Comm 2; EICO 730 modulator. Dan, K3XR, 218 Balthaser Rd., Sinking Spring, PA 19608. (610) 670-2980

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FOR SALE: T-Shirts w/Johnson Viking logo - $15, state size. Viking Radio Amateur Radio Society, POB 3, Waseca, MN 56093.

FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. List: $1 (stamps OK). Softwave, 2 Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: B&W 5100/5100B VFO dial overlays, super quality - $10 postpaid. Marcus Frisch, WA9DXP, Box 28803, Greenfield, WI 53228-0803.

FOR SALE: Strong steatite antenna insulators. Lengths from two to fifteen inches. SASE for list. John Etter, W2ER, 16 Fairline Dr., East Quogue, NY 11942. (516) 653-5350

FOR SALE: WACO-5NWX telephone filters. Just plug in. 1/$13.95, 2/$25.00, 3/$34.00. Money back. Cecil Palmer, 4500 Timbercrest Ln., Waco, Texas 76705. (817) 799-5931. W5NWX@juno.com

FOR SALE: HT37 SSB xmtr & manual - $70; PRC-47 HF xcvr, accessories & spare unit - $175. Ed Hammond, WN1I, ME, (207) 336-2858.

FOR SALE: BW lowpass filter, new - $20; Panasonic cassette recorder, RQ4095 - $20; back issues QST. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405. (541) 345-2169

FOR SALE: Very nice Hallicrafters HT37 xmtr w/ orig book, local PU only. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373. (937) 339-1546

FOR SALE: Collins mech filter, new 70 L 40 - $125; Collins time delay relay for KWS-1, new, 20 sec - $40; Johnson Ranger, clean - $150. Marty, NJ, (609) 466-4519.

FOR SALE: Navy surplus special #30 tubes - $3 ea + shpg. L. Schimmel, POB 1234, Spanaway, WA 98387.

FOR SALE: Valiant - $275; Ranger - $225; SX-101 - $225; S-76 - $185. PU only. Tom, KD4EMG, E. TN, (615) 791-1355.

FOR SALE: Dial/clock covers. Send bezel, old or drawing, make/model, guaranteed satisfaction - $10 ppd. William P. Turner, WAØABI, 1117 Pike St., St. Charles, MO 63301. (314) 949-2210

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FOR SALE: Magazines, manuals, surplus books, some surplus xtmrs, & other parts. Call your needs. Vic Edmondson, W4MYF, RT 1 Box 2599, Lee, FL, 32059. (904) 971-5580

FOR TRADE: Two good RCA 833A's for one Taylor 833A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455 johnh.walker@alliedsignal.com

FOR SALE/TRADE: Xmtr/rcvr tubes, new & used - 55¢ LSASE for list. Many thousands added lately. I collect old & unique tubes of any type. WANTED: Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455. johnh.walker@alliedsignal.com

FOR SALE: Ampex AG 600 tape deck, including professional (balanced) mic preamps, in portable (heavy) case, includes great manual - $200 + UPS. Request manual sheets. Charles Graham, 4 Fieldwood Dr., Bedford Hills, NY 10507. (914) 666-4523

FOR SALE: Presto Junior record cutter w/manual - $80. **WANTED:** Hallicrafters HT-1, HT-9, HT-31, S-T, SX-11, SX-17, SX-25; Howard rcvrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave, Beaverton, OR 97007. (503) 306-7439, ken.seymour@attws.com

FOR SALE: Collins 32V-1, SN/852 w/book - $175, heavy; Collins 75A-4, 3 filters, SN/541 w/book - $875; BC-348-Q w/shock mount, dynamotor, plug & book - $250; LS-3 spkr - $50. Hank Brown, 4141 W. L-2, Lancaster, CA 93536. (805) 943-2027

FOR SALE: Hallicrafters: S-38D; S-38E; S-94; S-95; -120; WR-600; SR10A - $35 ea; S-41-C; SX-71; S-101; S-111; R-51; HT-41; HA-1; Echophone EC-1; EC-1A. Tom Lucht, 9317 Jaynes St., Omaha, NE 68134. (402) 342-5630 (d), 571-0688 (n)

FOR SALE: Rare piece of History, mint 1944 Submarine radar scope model TS-43AP w/orig carrying case, manual, test leads + keys for case - $60 PU only or can deliver to Yakima Hamfest, May 17th. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699

FOR SALE: Globe Champion 300A w/orig. manual & brand new final tubes, includes spare set of AX9909 finals - $300, OBO. Ed, WA7DAX, 1649 Stratford, Salt Lake City, UT 84106. (801) 484-5853

FOR SALE: 75A-4 MHz drum decals, 20.5 or 20.8 MHz (you specify), buff color, install instructions - $8.50 ppd. W3HM, Rt 3 Box 712, Harpers ferry, WV 25425

FOR SALE: Collins 51J series drum overlay - $10 ea, specify which. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150

FOR SALE: Service. Reproduction dial covers, dock lenses (Hammarlund,etc) old or dimensioned drawing - $10 ppd. William P. Turner, WA0ABI, 1117 Pike St., St. Charles, MO 63301. (314) 925-1307

FOR SALE/TRADE: Kennedy 110 rcvr & 525 amp. **WANTED:** Grebe CR-13, DA-2, or pre-1940 xmtrs. Stu, W2AO, NY, (914) 691-7957

FOR SALE: New PL500 tubes for SBE-33 - $3 ea shpd; Heath ATI, rough - make offer. **WANTED:** Datong, comdel speech processors. Jack, KL7GKY, OR, (541) 839-4423.

FOR SALE: HQ-120 - $150; HQ150 - $145. **WANTED:** Pwr xfmr 3500V 600 mA; B&W L-1000A parts unit. W7RBF, AZ, (602) 864-9987

FOR SALE: Heaths: VTVM IM-11 - $20; DC pwr sply, HP-13B - $50; B&W rotary inductor, new - $25. Frank S. Law, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415

FOR SALE: New Chicago CMS-3 modulation xfmr made by Peter Dahl for KW-1 or Desk KW. PRI:18K/11.6K SEC:6.25K - $175 shpd. Brian, KI5SG, OK, (918) 494-6823 after 5 PM

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), 998 Whipple, Grayland, WA 98547-0697. (360) 267-4011

FOR SALE: Vintage tubes, (833A, VT4C, etc.); assorted radio/wireless telegraph books & magzines, 1880-1935. SASE list. Jan Perkins, 524 Bonita Canyon Way, Brea, CA 92621.

FOR SALE: Collins repair: FCC Licensed Technician, we repair the Collins Gray Line i.e. S-Line, KWM-2/2A etc. & other select models. Merle, W1GZS, FL, (352) 568-1676.

FOR SALE: Xtals 7010 kHz, type CR-1, NOS military - $2 ea, quanity pricing available. WA5THJ, Rt 9 Box 163, Alvin, TX 77511. (281) 331-2956

FOR SALE: TMC GPT-750 xmtr on casters, orig manual, CW/RTTY, legal limit - $1500 + shpg. Roy, N5QQM, LA, (504) 272-2563, Fax- 273-1030.

FOR SALE: Yaesu FT-101S, FR-101S, set - $400; Yaesu FT-401B - $250; Heath DX-60 - $50; Galaxy 1K, Galaxy (4x8975s) - $575. Candyman, CA, (800) 538-0109

FOR SALE: Shure mics & others, commercial & communications, most are new old-stock. Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670. (217) 787-3527 eves.

FOR SALE: Heath ps IP-28, F/C IB-1101, DX-60A, HG-10B, HM102, HQ110, SX-71, R46, S-120. Ray, WA0UKJ, MO, (314) 428-1963

WANTED: Very early Hallicrafters and Hallicrafters/Silver Marshall equipment including Skyriders with entire front panel dull aluminum color, S-30 radio compass, S-33 Skytrainer, S-35 panadaptor, wood console speakers - R-8 & R-12, HT-2, HT-3, BC-939 antenna tuner, parts, advertising signs, paper memorabilia of Hallicrafters. Also want RCA model AVR-11 airport tower receiver. Chuck Dachis, WD5EOG, "The Hallicrafters Collector", 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

WANTED: Visitors and tubes by museum. Old and odd amateur or commercial tubes, foreign and domestic purchased, traded or donations welcome. All correspondence answered. K6DIA, Ye Olde Transmitting Tube Museum, POB 97, Crescent City, CA 95531. (707) 464-6470

WANTED: ARB rcvr complete w/tuning head, working. Chas. R. Filer, 1163 Hawksbill Ln., Sugarloaf Key, FL 33042-3159. (305) 745-1801, machine.

WANTED: Model 3350 DC pwr sply for a Gonset G-76. Don Hilliard, W0PW, 8630 Nighthawk Rd., Neosho, MO 64850. (417) 451-5892

WANTED: WW II Japanese, German, Italian radios & communication equip for display in intelligence museum. LTC William L. Howard, 219 Harborview Ln., Largo, FL 33770. (813) 585-7756

WANTED: Kleinschmidt teleprinter models: 311, 321, (AN/FGC-40, AN/GGC-16, AN/UGC-39...) Tom Kleinschmidt, 506 N. Maple St., Prospect Hts., IL 60070-1321. (847) 255-8128

WANTED: GPR 90, 91, 92; Hallicrafters SX-88; Eddystone rcvr's. James B. Geer, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Mics by Altec, Neumann, AKG, WE, Sony, any vintage; tube compressors/limiters; will trade my rare NOS tubes for mics. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fx

WANTED: Old tube amps & xfmr's by Western Electric, UTC, Acro, Peerless, Thordarson, Jensen, JBL, EV, Altec, WE spkr's. Mike Somers, 2432 W. Fargo, Chicago, IL 60645. (312) 338-0153

WANTED: JW Miller RF coils; IF trans; chokes. Buying JW Miller & Millen parts, esp. need Miller B-727, B-727C; S-27, 912-C2, 912-C4; 912-C5. WA5THJ, Rt 9 Box 163, Alvin, TX 77511. (281) 331-2956

WANTED: Calibrator & AM filter for a Hallicrafters SX146; cabinets for a GPR90 & 51J4. Bill Kipping, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

WANTED: HBR-8, HBR-11, or HBR-16; novice RS-3; BC 453, any condx. Chas Kadesch, 11203 Waycross Way, Kensington, MD 20895. (301) 942-7043.

FOR SALE: New list -hundreds of manuals, schematics and service information. Send 2-stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805. (401) 934-1845

FOR SALE: Nice SX-140 HT40 panels fine, some scratches on cabinets, manuals. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373 (937) 339-1546

FOR SALE: Drake 2B rcvr - $95; (2) EVt64 mics - $35, $55, no stands. W7EGO, WA, (206) 833-3313.

FOR SALE: RCA BTA500R AM broadcast xmtr - $1000; more old tube broadcast equip available. John P. Tiedeck, WA2SDE, 212 Grandview Rd., Media, PA 19063. (610) 566-8049

FOR SALE: Heath VFI-VFO - $30; Shure mic, NIB, 527C - $30. + shpg. Joe, NM1V, MA, (508) 658-6186, before 7 PM EST.

FOR SALE: Regenerative shortwave rcvrs, Hallicrafters S-119 - $60; Heath GR-81 - $45. + shpg. Steve Whited, KE9YA, 3637 W. 71st St., Indianapolis, IN 46268. (317) 298-9967

FOR SALE: T195B, appears new w/meters - $180; GI T-195 operator's; organizational maintenance, depot maintenance TMs - $50; WW II dated HS-30 headsets, NIB w/dessicant, spare earpieces, instructions - $30, $100/5. Military Marketing, Inc, Box 741, Norcross, GA 30091-0741. (770) 729-9315

FOR SALE: Swan 350, 410 VFO, ps - $200 or BO; trade for SX-71. Jay Lyter, WA3ONG, 455 Melrie Dr., York, PA 17403. (717) 741-4270

FOR SALE: G coil for old HRO, 180-430 kc, handles cut off to use in HRO7 - $20 + shpg. Henry Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103.

FOR SALE: Heath QF-1 w/orig manual - $25 + shpg. Earl, K6GPB, CA, (209) 728-8316.

FOR SALE: Used 807 tubes, tested OK, guaranteed - $5 + $3 priority mail. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 748-5968 imq@bellsouth.net

FOR SALE: Heath equip, all exc condx w/ apporiate test leads & orig manuals: RLC bridge IB-5281 - $30; FET/transistor tester IT-3120 - $35; hybrid phone patch HD-15 - $25; grid dip meter GD-1B w/coils & storage box - $25; code oscillator HD-16 - $20. All items + shpg. Roger Snowdall, WØKWJ, MO, (816) 356-0396.

FOR SALE: 100TH, 4E27, 8950, 5692 (red), 7308, 5583, 6HF5, 4-65A, etc; SASE for details. Dan Knipe, W7IGE, 3750 Highgrove Ln., Nampa, ID 83687. (208) 888-9575

WANTED: SP400, RME, EH Scott rcvrs, only in very good condition. EA4JL, contact in the States, Kurt Keller, CT (203) 431-6850

WANTED: Collins KWM2-A labeled on chassis Collins Radio Co of Japan; early KWM2 serial No. below 100. Bill, KD4AF, NC, (910) 699-8699.

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Military sets WS #29 Canadian A set; US DAS-2 Loran rcvr-indicator. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WA0AKG, NE, (402) 464-8682.

WANTED: Medical Doctors Hobbist of Amateur Antique radio, Test Equip. Alan Mark, POB 372, Pembroke, MA 02359.

WANTED: Heath HD-11 Q-multiplier. Spencer Cromwell, K6VRS, 7607 Stevenson Way, San Diego, CA 92120. (619) 582-8280 kvrs@aol.com

WANTED: NC183 parts, emblem upper left corner & knobs; NC300 need bandswitch knob. Harold Sullivan, 15300 Prairie Rd., Andover, MN 55304. (612) 434-3003

WANTED: Early National HRO, coil sets & pwr sply, exc or very good condx. Robert Ungvary, W1KSK, 236 Summer St., Framingham, MA 01701-7903. (508) 879-6955

WANTED: I collect military entertainment radios, manuals, info, photos. Can you help? Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

WANTED: ID plates for Navy RAL rcvr; early HRO coils; manual for AVT112 xmtr. Mel Stroller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

WANTED: Huge Navy equipment: shipboard & shore radio, radar, & sonar, mint thru junkers. William Donzelli, 304 S. Chester Ave., Park Ridge, IL 60068. (847) 825-2630, integrat@usr.com

WANTED: Military electronics, RDF, radar, communications, test, manuals, literature, etc. What have you got? William Van Lennep, POB 211, Pepperell, MA 01463. (508) 433-6031

WANTED: Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135

WANTED: Globe King 500, A, B or C xmtrs, any condx., reasonably priced. Terry Collins, KB9AUP, 18 N. Tomahawk Ave., Tomahawk, WI 54487. (715) 453-3707 d, 453-4633 eves

WANTED: In pristine condx.: Collins 32V3, 75A1, 30S1, 270G-1, 32S3A (RE), 310B3, 30K1, mech filter adapters, 59G1, SP-600X, cabinet, TV-7 tube checker & 75A-4. Lee, W9VTC, IL, (847) 439-4700 d, 726-1660 eves.

WANTED: Hallicrafters HT-1, HT-9, HT-31, S-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attws.com

WANTED: Info/history on WW2 TCS radio system for article. Your help appreciated. Thanks. Greg Greenwood, WB6FZH, Box1325, Weaverville, CA 96093. greg6fzh@aol.com

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 625-1; 399C-1; 51S-1; 302C-3; KWM-1; KWM-380; also buy estates. Leo, KJ6HI, CA, Ph/Fax (310) 670-6969.

WANTED: Mics-EV605, 638, 641; Shure 707A, CR80, CR41, 520/440SL; Turner 34, 5D. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225, Fax 328-4217. Call/FAX 10 AM to 8 PM. 74053.3164@compuserve.com

WANTED: Desperately need schematic & manual for RF amp manufactured by Special Design Products, model SDP 1000L. K1NFE, CT, (860) 675-3333.

WANTED: Ampex 350/351 2 track transport & electronics, 600 ohm repeat coils, VU meters (need up to 8 pieces), limiter plug in for CE 100V. Joe, N4WQC, 1306 Fernwood Rd., Austin, TX 78722. (512) 467-0130. 72411.533@compuserve.com

WANTED: EF Johnson Ranger II, must be V.G to excel. condx.; Hammarlund XC-100P calibrator. **FOR SALE:** Bird 43 and five elements. Brian, IL, (800) 225-0256, ext.14733

WANTED: Manual or copy schematic & alignment for Panadapter "Panalyzor" SB-12/SB-12a type T-100. Walter Treftz, N4GL, 3840 Laguna Loop, Hernando, FL 34442. (352) 637-1755.

WANTED: Orig. tube-type CB radio operating/owners manuals; also tube-type CB radios. Walter Ryan, 7114 Geyser Ave., Reseda, CA 91335. (818) 344-8735

WANTED: Knight equip, all types; ham, shortwave, CB test, etc. Thank you. Walter, CA, (818) 297-7249.

WANTED: Navy xmtrs: TCA, TCE, TCN, TCX, TDE; rcvrs: RAX, RBD, TBM; modulator CAY-5006S. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: Hammarlund Comet Pro parts & parts sets; coils & coils sets; National SW-3 model 1, 2 volt version (32-32-30 tubes); Browning Labs preselector, 1947; Hallicrafters xmtrs: HT-1, HT-4, HT-9, HT-19; Collins 310B exciter; other pre 1950 commerically built ham gear. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: Drake MN-2000 ant tuner working or not; basket case Drake L4B. **FOR SALE:** Viking Ranger - $175. Bob, UT, (801) 943-7721 or 567-8894.

WANTED: B&W xmt'g coils or parts for 40HDVL or 80HDVL. Collin Collier, N4TUA, GA, (912) 988-1276.

WANTED: WW II Japanese military radio of any kind; pre-war Japanese QSL cards. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069

WANTED: Tuning meter for AN/FRR23 RX, same meter as in SRR11-13 series. Al, K7IEY, WA, (360) 354-4622

WANTED: National NCX-3 ps or nonworking NCX-3 & ps; Hallicrafters SR series 500 AC ps; four EL38 tubes. Ron, KS, (913) 268-5973 arongv@aol.com

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265

WANTED: Cash for Collins SM-1, 2, 3; 312A-1, 2; 55G-1; 62S-1; 399C-1; 51S-1; 302C-3; KWM-1; KWM-380; also buy estates. Leo, KJ6HI, CA, ph/fax (310) 670-6969.

WANTED: Condenser, carbon and other early broadcast microphones; cash or trade. James Steele, Box 620, Kingsland, GA 31548. (912) 729-2242

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug-in coils) for restoration & ER articles. Ken Lakin, KD6B, 63140 Britta St., Ste. C106, Bend, OR 97701. (541) 923-1013. klakin@aol.com

WANTED: Still looking for Swan 160, other Swan stuff any condx. Eric, KBØXP, Box 98, Stanton, IA 51573. (712) 829-2446

WANTED: Keyer paddles of all kinds. Cap, WØXC, CO, (970) 247-0088. capallan@frontier.net

WANTED: Military AN/VRC-24 UHF xcvr, must be in good oper. condx. Len Castro, 8716 Lepus Rd., San Diego, CA 92126. (619) 689-2854.

WANTED: Copy of circuit for a Heath Signal Generator SG-6, will pay. Fenton Wood, 109 Shoreline Dr., Star Harbor, Malakoff, TX. 75148. (903) 489-0204.

WANTED: National XCU303 xtal calibrator, spkr for NC303; Hammarlund HC-10 convertor. Dave Humbertson, W3NP, HC86 Box 123A, Fort Ashby, WV 26719. (304) 298-4596

WANTED: Hallicrafters S-38, SX43 & Heath VTVM. Les Mathews, 421 Carvin St., Clayton, NJ 08312. (609) 881-5603

WANTED: Pay up to $1000 for Harvey Radio Labs FT-30 xmtr (Rippon Book, pg. 57). Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331. (617) 934-5043

WANTED: Radio station T-shirts, L-XL only, need C-K-XE-shortwave stations most. Sam Hevener, W8KBF, The Signal Corps, 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

WANTED: Manual for Hewlett/Packard L4 oscillator, 50 Hz to 20 kHz, surplus from telephone company. Allan Lurie, W9KCB, 605 E. Armstrong, Peoria, IL 61603. (309) 682-1674

WANTED: BC-375 or BC-191, have ART-13 to trade; schematic for SRT-502; xtal lattice filter for SR-150. **FOR SALE:** RDZ rcvr - $85. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

The Radio Finder©

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Bulletin: The Radio Finder's Johnson Desk KW, long under restoration, is now working.

May Specials:

AMATEUR RECEIVERS: Collins 75A-4; 75A-3; 75A-2; 75A-1; 51J-4; R-388; 75S-3B; 75A-4; 270-G-2/3 speakers; Hallicrafters SX-88; SX-73; SX-101A; SX-17; S-40B; R46/R46B speakers; Hammarlund SP-600; SP-200; HQ-100A; HRO-500; HRO-60; NC-300; early 1935 HRO, complete; NC-183; National speaker
MILITARY RECEIVERS: R-725; R-389; R-390; R-390-A; R-391; R-392; FRR-59A; R-1051B; R-1051E; CEI 354; Watkins-Johnson DMS 105A
TRANSMITTERS: Johnson Desk KW; Valiant; Thunderbolt; Collins KWS-1; 32S-3; 30L-1 amp; 516F-2 AC; Heath DX-100; Central 100-V; Drake T4XC; Hallicrafters HT-32B; HT-32; HT-37; Multi-Elmac AF-67, AF-68; Harvey Wells TBS-50 Bandmaster Deluxe
TRANSCEIVERS: Atlas 210-X w/AC console; Collins KWM-1; 516F-1 AC; 516E-1 DC; 312B-1 speaker; Drake TR-7; Hallicrafters SR-150; Heath HW-100; SB-100; SB-1400A; HW-161; Twoer; National NCX-1000; SBE SB-34; Yaesu FT-101-EE complete line w/FL-2100B amp
FILTERS: 75S-3B/C; 51S-1; 75A-4; 75A-3; SP-600 adapter w/filter; Drake R4C -- 250 Hz

Radio Finder website: http://www.radiofinder.com

Check The Radio Finder's web page -- listings updated weekly

FOR SALE: Satchelle Carbon 524(BC1206) - $25; CE 20A exciter - $100; CE sideband slicer - $70; Eldico SSB 100F xmtr - $250; Browing Visual Freq monitor - $40; BC459A xmtr - $25; Gonset GSB 100 SSB xmtr - $300; Ten-tec 276 calibrater - $20; R.L. Drake Q-Xer A multiplier 592 - $40 ; Johnson Viking 6-2meter conv. 250-43 - $40; Hammarland SP200, no sply - $125; Hallicrafters S-41-G - $25; SX-62 w/manual - $175; SX-99 - $70; HT-9 - $200; HT-37 - $125; R26/ARC5, 3-6 megs - $15; RME VHF-152 - $35; Heathkit AR-3 - $35; Swan 175 SSB xmtr - $125; 240 SSB xcvr - $125; Hickok 600A tube tester - $30; Magnum speech processor for FT101 - $40; Collins PTO for 51J3, NIB - $75. Matt Parkinson, (714) 997-7611, mattradi@themail.net

FOR TRADE: 1994, '95, '96, '97 QST or CQ for 1994-1997 "73" Magazine. A.J. Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

FOR SALE: West Coast Radio Amateurs Handbook, 1936 - $20; W6SAI 17th Ed Handbook - $20; QST 1930-40 - $3 each; have some years in binders - $25/yr; Harvey Wells TB50 xmtr - $45; Heath Lunchbox 6 & 2 meter - $30 ea; Gonset Comm IV, complete - $50; tubes HY69, VO70D - $5 ea. John Kakstys, W2FNT, 18 Hillcrest Terr, Linden, NJ 07036. (908) 486-6917

FOR TRADE: Squires-Sanders SS-1R & SS-1V for 75S-3B & 32S-3 or what have you? Bob, NV1X, VT, (802) 879-7235.

FOR SALE: Tube list, new & used, wide variety audio, ham. Recently expanded. SASE 52¢. Bill McCombs, WB0WNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: At Dayton space 3352: Collins, keys, bugs, military; plenty of old stuff. Send SASE. Bob, 23 Daniluk Dr., Camillus, NY 13031.

FOR SALE: Just released: Send 2-stamp LSASE for latest Olde Tyme Radio Co. Flyer 196A. Olde Tyme Radio Company, 2445 Lyttonsville Rd., Ste 317, Silver Spring, MD 20910.

FOR SALE: Hammarlunds: HQ-140X - $210; HQ-150 - $250; S-100 spkr - $53; Drake 2C - $130; Johnson: 275W Matchbox - $78; T-R switch - $40; 6 & 2 converter - $35; Heath: HW-16 - $70; SB-604 spkr - $35; SB-634 station console - $70; SB-644 remote VFO - $110; CW filter - $40; SB-300 - $120; SB-400 - $90; SB-200 - $335; HM-9 QRP wattmeter - $35; HFT-9 QRP antenna tuner - $35; SBA-300-4 2M converter - $30; HD-1422 antenna noise bridge - $35; TenTec Hercules 444 amp - $660. Shpg extra. All w/manual. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147.

FOR SALE: ZB-2 & R1/ARR-1 Aircraft Radio Homing Adapter - $35; TU-5B xmtr tuning unit - $25; T-20/ARC-5 xmtr - $15; KAAR-37 xcvr, 807 final, 6 volt DC - $45. Mervyn Ellsworth, 2309 N. 25th St., Boise, ID 83702. (208) 345-6878

FOR SALE: Vintage equipment manuals starting at - $5; Hallicrafters, Johnson, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Collins repair. I specialize in S-line equipment. Reasonable, & work guaranteed. Steve, N6HK, Box 1136, Goleta, CA 93116. (805) 967-7466

FOR SALE: Hammarlund HQ 110. **WANTED:** National NC 173 or NC183. Noonan, SC, (803) 726-5762.

FOR SALE: (4) 2 mfd 7500V filter caps - $20 ea. Francis Waggoner, W2FTI, 268 Barben Ave., Watertown, NY 13601. (315) 788-1621

FOR SALE/TRADE: Harvey Wells Bandmaster Deluxe w/VFO, JT-30 mic, dow key relay, low pass filter, cables, homemade pwr sply. PU only or can deliver to Yakima Hamfest, May 17th - $150 or trade for AK BB parts. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699

FOR SALE: Heath HW-12A 75 mtr xcvr w/HB pwr sply - $55; Knight T-60 xmtr - $50; Heath SB-614 station monitor - $75; DX60B - $65. **WANTED:** B&W xmt coils hi & med pwr 75 & 40 mtrs. Norm, W1CIX, POB 402, W. Bridgewater, MA 02379. (508) 583-8349

FOR SALE: Tubes NIB, 1EP1 -$15; 2C39A - 2/$40; 2E25A - 2/$12; 3B28 - 2/$30; 323B - 2/$10; 4X150A - 2/$50; 4X150D - 2/$65; 6L6Y - 2/$50; 10 (VT25) - 2/$110; 807 - 2/$15; 866A - 2/$20; 5881 - 2/$40; 6293 - 2/$25; 6907 - 2/$60; KT88 ex-used - $50ea. Bob Bakinowski, 1524 St. Tropaz, Tucson AZ 85713. (520) 624-8029

FOR SALE: The tubes you need, tube sockets, socket extenders. At Dayton Hamvention look for us under the canopy, west end, at Quad "Tubes" sign. Send SASE for list "U". Fred Schmidt, N4TT, Typetronics, Box 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, Fax 583-0777.

FOR SALE: Valiant w/manual - $250; Globe Scout 680 w/manual - $100; HW-22A - $75; EICO 753 - $75; Viking Messenger - $50; S40A - $45; NC 173 w/manual - $160. **WANTED:** Swan 117XC sply; ARR-41 rcvr; Globe King 500B modulator deck or parts unit. Herb Reich, KØUBK, 1201 8th Ave. S., S. St. Paul, MN 55075. (612) 455-7898

FOR SALE: New orig. PJ-068 mic plugs for Collins S-line/KWM-2A/HF-380 shp'd. in USA - $8 ea. Clint Hancock, KD6H, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: KWM-2 fan bracket - $15 ppd. Dave Ishmael, WA6VVL, 2222 Sycamore Ave., Tustin, CA 92780. (714) 573-0901

FOR SALE: Military radios -- Must reduce collection! Except as noted, following are in good condition with tubes, and were in working condition when last powered on. NT means not tested, W/M, with manual. Plugs and/or cables included with many. *Larger items are pickup only or I can deliver to mid-Atlantic coast hamfests*. T-195 with rare solid-state 'dynamotors', minor internal mods - $200; R-392 - $150; BC-669, w/AC sply, lots of xtals - $100; ARC-39, VG, NT - $75; ARC-39, some internal mods, xtals for several 80 & 40 M AM freqs - $100, (xtals alone worth more!); 2-SCR-522 NT, one US, fair, one EX, Canadian paint - $50 each; 1-BC-223 TX, vg, w/dyn & NT vib sply - $250; 1-BC-348Q, VG, with dynamotor, w/6 holes punched in back of cabinet - $125; 1-BC-224, NT, EX, no dynamotor - $150; 12V dynamotor and base to 'homebrew' BC-224 dyn supply - $25 with set; ARC-4, NT, fair, some tubes out - $25; lot of *rare* ATA/ARA sets, NT, most incomplete and/or mods, most are fair or poor, for restoration project, 8 Tx, 5 Rx, 1 ant relay box - $165; 4-RAX rcvrs, NT, poor condx, mods, for parts or restoration project - $75; PRC-47 SSB xcvr, VG, w/cable - $200; R-648/ARR-41, VG, with rare shockmount - $150; FRR-26 Navy rcvr (one xtal controlled freq), EX, NT - $50; RBU-1 Panadaptor, VG but has internal mods - $50; RAS, VG, NT, w/coils & coil box, p/s has had pwr xfmr replaced, no rack or speaker - $100; APR-4 rcvr w/TU's - $75; ARC-27, bad paint, NT - $25. Walt, KJ4KV, (703) 524-9794, 7:30-9:30 PM ET or WALTAH@DELPHI.COM

FOR SALE: Drake 2-mtr w/manual - $75; Drake 2B & 2BQ w/manual - $150; Hammarlund S100 spkr - $50; National HRO-500 w/manual - $700; National HRO-60 w/9 coils & box - $450; Johnson SSB adapter w/manual, sply & cables - $300; Heath CO-1015 ignition analyzer NIB, unbuilt - $165; NRI home schooling course including unbuilt tube type color TV, unshippable - $200; tubes, many rare, new & used, call, LSASE or e-mail. John, AE4EN, NC, (910) 686-4236, ae4en@aol.com

FOR SALE: Johnson Viking II; Collins 18J-6; 32V-2; 51J-4; 651S-1; orig 50TH Year hard cover; Heath xtal calibrator & keyer. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: Collins filters F455FA 21, F455Z 30F - $75 ea. Lorne, VE7BOX, Canada (250) 675-3338.

FOR SALE: Collins 75A-2 w/xtal filter, looks great, works great, no cabinet - $300 + shpg. Merle, W1GZS, FL, (352) 568-1676.

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FOR SALE: Classic gear - SASE for list. **WANTED:** Vintage rigs. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (313) 454-1890

FOR SALE: Copies. Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip. ham gear. Contact me for prices, availability. Duane Ballew, KB7QZK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

FOR SALE: Rcvr preselector filters. Tight bandpass filter eliminates broadcast band interference on 160 meters. Works especially well with older rcvrs, limited quantity - $54 ea ppd. James Owens NW0O, 1363 Tipperary St. RR#3, Boulder, CO 80303-1621. (303) 673-9019

FOR SALE: Tubes! NOS: 6L6GA, 803 - $15; 829B - $5; 1625, 837 - $4; 8552/6883 - $8; 4CX-250B - $45; 39/44 - $0.50; used checked good: 2E25A, 2E26, 1625 - $3; 807 - $4; 5933, 6159 - $5; 6L6G, 6L6GA, 811A - $8; used, unchecked, look good: 4-65, 4E27 - $10; 422A(WE), 802, C-1A, 803 - $7; 872A - $6; 829B, 832A - $3. U-ship. WA7HDL, ID, (208) 756-4147 after 2330Z.

FOR SALE: Galaxy AC pwr sply - $20; 1966 Allied Catalog - make offer. All + shpg. Don Dillard, 5106 Red Oak Dr., Amarillo, TX 79110-4628. (806) 352-4776

FOR SALE: Hallicrafters SX-99 general coverage rcvr, all orig knobs, realigned, VG - $110. Chase Hearn, 104 Glenwood Dr., Williamsburg, VA 23185. (757) 229-7263

FOR SALE: S-95 - $20; parting SX-96 & S-20R. Heath CR-1 - BO; TO-5 manual - $3. Lysco antenna tuner - $15; Hallicrafters S-meter kit (not the SM-40 or SM-20) - $15; VU meter - $15; unassembled Heath auto alarm - BO; Tetrad 18A frequency standard - BO. Joe Sloss, K7MKS, WA, (425) 747-5349.

FOR SALE: Adapters 12AU7 to 12SN7GT, any triode to WD-11, 1L6 to 1LA6; 22-1/2, 45 & C battery boards; plug-in coil forms for SW-3, Pilot Super wasp & 4, 5, & 6 pin. ARL-USA, James Fred, 5355 S. 275 W., Cutler, IN 46920. (765) 268-2214

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (810) 391-6660, hires@rust.net

FOR SALE: RIT for KWM-2 and S-Line. No modifications for KWM-2. $59.95 tested/42.95 for kit. SASE for details and order info. John Webb, W1ETC, Box 747, Amherst, NH 03031.

FOR SALE: Over 700 military radio equip TO's (tech manuals), for free list e-mail karenski@inreach.com or $2 & mailing label to Ski, WA6AME, 7966 vintage Way, Fair Oaks, CA 95628. (916) 966-4749

FOR SALE: Assorted field coil spkrs, pwr choke, out put xfmrs. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: Hammarlund HQ-180 w/spkr, clock, orig manual, in very nice condition - $300 + shpg. Merle, W1GZS, FL, (352) 568-1676.

FOR SALE: Heath: HW-16 - $125; HG-10B - $75; HR-102 - $40; HR-1680 - $95; SB-614 - $125; Hammarlund S-200 - $80; Ten Tec 252 pwr sply - $115; Turner 251 mic - $35; Gonset Communicatpr IV, 2 mtr - $75; others, free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (201) 728-2454

FOR SALE: NOS Drake model SC-2, 2 mtr converter for Drake R-4A & 2C - $75. Charlie, WB0UTC, NE, (402) 474-4272.

FOR SALE: Yaesu FRG-7; mint Johnson Valiant in orig box - BO. Bob, K2LGO, Box 158, Riverhead, NY 11901.

FOR SALE: HQ180, spkr, manual copy, very nice condition - $300; NC300, spkr, manual copy, RF gain knob not orig, few scratches - $250; HW101, SB600, SB650 dig freq display, HP23A, very clean gear - $295; DX20, immaculate & works, manual - $65. **WANTED:** GPR90 spkr. Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078

FOR SALE: Swan 1200 amp - $150 + shpg. **WANTED:** Xerox of schematic URM26A. K6UU, POB 905, Grover Beach, CA 93483.

WANTED

Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011. FAX (805) 259-3830

FOR SALE: Racal tube xmtrs TA127 & TTA371, rcvr RTA-191, complete & working, spares & manuals, call for full info on these extremely rare items; Millen dip meter 90651, w/coils & box - $65; military automatic HF antenna tuner CU2351, unused/mint - $600; Tadiran TER-100 RTTY terminal, mint/unused - $200; coaxial dynamics directional wattmeter, very good - $100; Heath HD-1410 electronic keyer - $50; Heath HW-99 CW xcvr, not working but physically mint - $160. Nigel, K4UGD, GA, (770) 922-8546 (H), 414-0550 (W).

FOR SALE/TRADE: S-40B; Ranger II; Challenger; Wiretuner; EICO VFO; HG-10B; SASE. **WANTED:** Navigator; SBE-2 manual; PS. Sam Timberlake, POB 161, Dadeville, AL 36853. (205) 825-7305. stimber@worldnet.att.net

FOR SALE: Vintage Heath test equip, parts, more! 2-stamp SASE or $1 for list. Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

FOR SALE: Nice RME 6900 - $200; HTX-100 - $125. **WANTED:** PS for NCX-3 or non-working NCX-3 & ps; Hallicrafters SR series 500 AC ps; four EL38 tubes. Ron, 10701 W. 54th St., Shawnee, KS 66203. (913) 268-5973 arongv@aol.com

FOR SALE: Copys manuals for test equip, ham gear, electronics. Call or write for prices. Duane Ballew, KB7QZK, 6813 152nd St. CT NW, Gig Harbor, WA 98332. (253) 851-4505

FOR SALE: Galena Crystal Radios Deluxe, super sensitive, selective, write. Len Gardner, 458 Two Mile Creek Rd., Tanawanda, NY 14150. (716) 873-0447

FOR SALE: 1625 tubes, new - $8 ea; used, test good - $5 ea. All PPD. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: ARC-5s - call; FRR 502 TMC rcvr, 2-16 MHz, good condx - $200. U-shp. Ken Kolthoff, K8AXH, 5753 David Pl., Fairfield, OH 45014. (513) 858-2161

FOR SALE: National NCX-3, erratic S-meter - $95. K2TRZ, NY, (516) 997-5319, leave message.

FOR SALE: Late EAC production R390A - $650, shp'd Conus. All orig including covers & meters, looks & works like new. Dave, KI6QE, 1020 W. Oleta Dr., Tucson, AZ 85704. (520) 297-4463

FOR SALE: Harris RF-102 & 103. Amps are in MA. PU or can ship - BO. Art Plummer, W6LR, POB 640494, San Francisco, CA 94164. (415) 359-1858.

FOR SALE: RME 1000T, 1 kw AM xmtr, one of 2 in U.S., pictures available, check out www.thebizlink.com/am. Needs some work, xfrms good, cabinet wiring in very good condx, pair of 250TH's modulated by a pair of 810's. Lots of coils for various hambands. Call Fred in eves. KC4MOP, MD, (301) 567-2012 or facmop@erols.com

FOR SALE/TRADE: Command sets 80M RX & TX 40M RX & TX; Q5ER. Call anytime. Joe, K2QPR/4, FL, (561) 220-7362

NOTICE: Stop by spaces 1960-1961 at Dayton. Bring manuals to trade or sell. The Manual Man, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: I would appreciate info from anyone w/personal anecdotes, paraphernalia, including logs, maps, & equip, associated w/the "War Emergency Radio Service (W.E.R.S.)" during WW II. I would like to include these data in a forthcoming presentation at the Antique Wireless Association, Sept. 3-7, 1997. Bob Grinder, K7AK, AZ, (602) 948-2743, Fax, 922-3666. atreg@asuvm.inre.asu.edu

WANTED: Collins S-line, KWM2A, 30L-1, etc. Mark pays the most for clean gear. WD4AAS, FL, (954) 776-5996 (d), 566-0014 (n).

WANTED: Johnson Viking Valiant II; Swan 600R custom; Hammarlund SP600-JX21A; TMC GPR-92. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

FOR SALE: All electronic repairs welcomed. Specializing in ham gear, qualified. Stocking Collins, Heath, etc. Tiki Electronics, 1564-62 Front St., Cuyahoga Falls, OH 44221. (330) 922-8454.

FOR SALE: PRC47 LSB/USB kit - $40; new machined coax antenna panel - $9. All restorable. Jay Craswell, WB0VNE, 321 West 4th St., Jordan, MN 55352-1313. (612) 492-3913.

FOR SALE: Fiberglass rods, 5/8" dia., 13' long, UV resistant, good standoff insulators, twinlead spreaders, ten ppd - $10. Ron, K5VNR, NM, (505) 327-5646.

FOR SALE: Collins meatball lapel pin - $5.95 + $.75 S & H. George Pugsley, W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029.

FOR SALE: Radio & electronics related books, 160 titles, call or write for list. Paul Washa, WØTOK, 4916 Three Points Blvd., Mound, MN 55364-1245. (612) 472-3389.

FOR SALE: Tubes: New: 807W, 829, 832, 865, 872, 4X150A, 4X250F, 3C24, 35TG, 8012, 8020, 1616; Used: 4-125, 803, 813, 4-400A. Keith, W5WBA, NM, (505) 831-2646.

FOR SALE: Globe Scout 680 -50W phone, 65W CW, 80 to 6 mtr, good cond's, w/manual - $75 + shpg. R.F. Haworth, 112 Tilford Rd., Somerdale, NJ 08083. (609) 783-4175.

FOR SALE: Johnson Ranger - $200 + shpg. **WANTED:** Hallicrafters SX101, VG to mint. Rich, RI, (401) 732-4026 eves.

FOR SALE: Collins 75A2 - $425; Viking II w/122 VFO - $175. **WANTED:** Hallicrafters HA-2 & HA-6. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603.

FOR SALE: Hallicrafters SX110 SW rcvr w/R48A spkr, all - $150. Frank Brewster, RR2 Box 201C, Baxter Springs, KS 66713. (316) 856-3220.

FOR SALE: Signal generators, URM25E - $100; URM25F - $130; both exc cond's w/copy of manual. Ed, N5BFW, TX, (210) 684-9754 eves.

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Service Modification Compendium for the S-Line, KWM-1/2/2A series - 260 pages -
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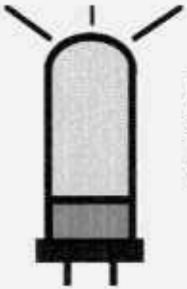

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