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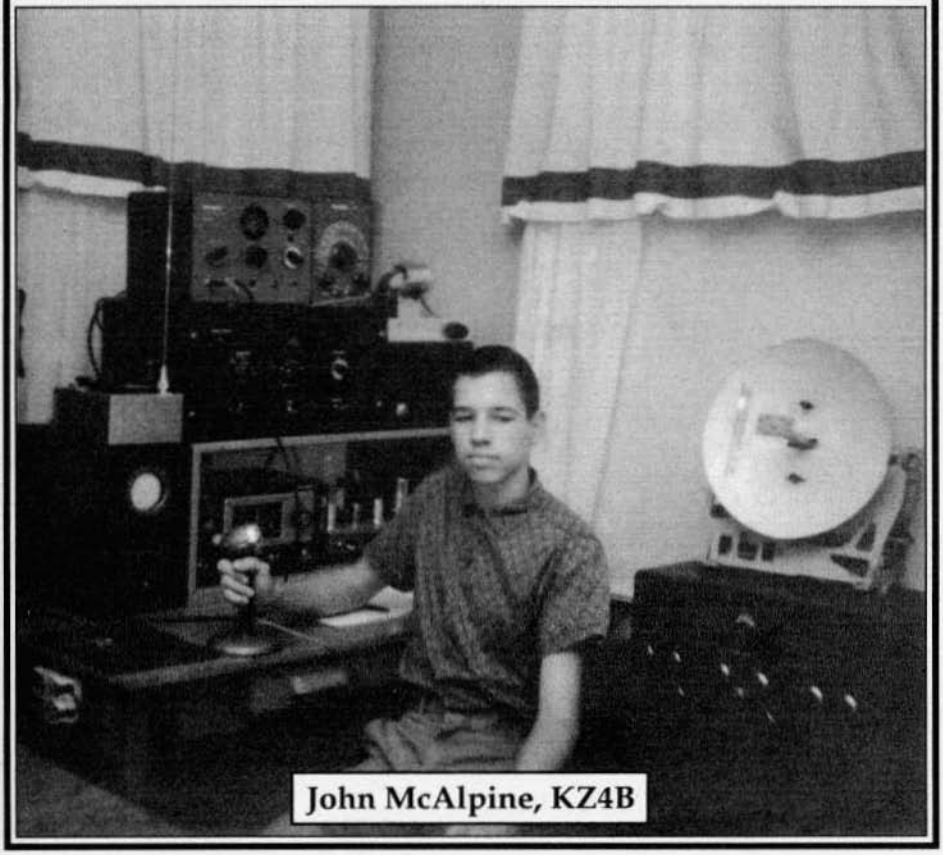
ELECTRIC RADIO

celebrating a bygone era

Number 98 June 1997



John McAlpine, KZ4B

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

By the time that most of you get this issue, the First Annual ER Sponsored Vintage Field Day, June 14-15, will be history. If I get some reports in time, I'll have a preliminary report on the event in the July issue and then a complete report, with the winners, in the August issue.

I'd like to receive comments from all participants regarding VFD. If there's enough participation this year to warrant VFD #2, I'd like to know what revisions in rules would make it better. I've already received some comments (see Letters on page 38) that suggest changes for next year. Once I get all the reports in and once everyone has had time to comment, I'll announce the rules for next year, if in fact there is going to be a VFD next year.

I have been receiving encouraging reports on 10-meter activity recently. Apparently there have been some openings - mostly north/south - and some of the AM'ers (and vintage CW ops) have been getting on and making contacts for the first time in several years. I've been listening occasionally (maybe I should be calling CQ too) but have not heard any activity. I'd like to hear directly from those of you who are monitoring 10 regularly, as I'd like to keep everyone updated on the improving conditions. I'm hopeful that this fall we'll all be enjoying AM on 10 meters again.

And it's about time that I reminded everyone again of the ER Parts Directory and to encourage everyone to put their parts rigs on the list. Someone out there needs some of your parts to make their rigs complete - a knob, a transformer, a meter, just about anything that is left on your parts rig. Just send in a card with the rig that you have, your name, call, address and phone number. I'll be happy to add your information to the Parts Unit Directory. N6CSW

TABLE OF CONTENTS

Cover: John McAlpine, KZ4B, back in the early '60's when he was a novice with the call KN4ESJ.

Looking Back

by Lew McCoy, W1ICP
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I got a letter the other day from Rod Newkirk, W9BRD. For years, Rod was the heart of DX in QST. He wrote and described what was going on in DX in his monthly column-called "How's DX." And I might add that Rod did a masterful job. His letter got me thinking back about the Sisson Sots - a group in which he was a member in 'very good standing'. Some of the readers of this column have written or told me that they enjoy hearing about the "human" side of some of the famous hams I have either worked with or known in my career. I would be very remiss if I did not tell you about the "SISSON SOTS."

Shortly after I went to work at ARRL, I had met and started to pal around with Joe Moskey, W1JMY. And Joe asked me one day if I liked pizza and I related to him that I had pizza long before, in Chicago, when I was a boy. Just for the record I better tell you about that. My sister, who was quite a bit older than me, used to drag me around with her and we went one day down to Taylor and Halsted streets to an Italian neighborhood to a restaurant. In this restaurant they served a flattened dough with tomato sauce on it and it was called "pizza." Now that was in the twenties-long before Pizza Hut came into existence. So I had a really early acquaintance with pizza.

Joe took me to a place called the Sisson Tavern which was a typical bar with pickled pigs feet in jars and hard boiled eggs-sawdust on the floors-you get the picture. But they had a chef that made the very best pizza I had ever had. So it became a hangout for Joe and myself. And every Tuesday, for lunch, we would get a bunch of the Headquarters guys together and go there and eat pizza and have a beer. Ham radio, DX, girls, and pizza were the main topics of discussion. Many, many of the rigs you people have built and used were conjured up in those sessions. The antenna and DX discussions you would not have believed!

I recall quite clearly that the tavern had a pin ball machine which we all took a shot at and Rod was by far the very best. He could hit and bang that machine to within a gnat's eyebrow without getting the tilt sign. If one got a high enough score you would win a free game. Many the days we went back to work leaving 10 or 20 free games on the machine-mostly due to Rod's skill.

One other note about Rod-he was strictly a CW man. He also used very low power and what surprised me, he and his family lived in an apartment on the first floor and his antenna was a rain gutter that came down on an enclosed shaft from the roof. But he sure could work out from that spot.

Getting back to the Sisson Sots, as we proudly called our group - we managed to get into some bad trouble with the League. One Tuesday, a whole bunch of us, including John Huntoon, who was Asst. General Manager and other "important" hams, all went to the Sisson Tavern. As it turned out, it so happened to be World Series time so someone suggested that we go over to New Britain, Connecticut to some place called the "Blue Grotto" as they had a large TV screen; so off we went.

No one said anything about the time but we got engrossed in the game and it was about three or four in the afternoon when we all went back to ARRL HQ. We walked across from the parking lot and there at the front door was Budlong--the general manager with a big scowl on his face. I am sure that if we all had not been together a bunch of us would

continued on page 40

AMI Update - June

by Dale Gagnon, KW1I, President

Dayton Hamvention - The trip out from New England with my brother Dean, KK1K was fast, but not as much fun because HF propagation was off due to solar activity. I had recently downsized from the full-size van to a minivan, but had packed as if I had the old van. The axle was pretty close to the road. One of our bulkier items was a Collins 30J cabinet I had agreed to carry out to Dayton for pickup and subsequent transportation to Texas. Our schedule left us with only two hours at Fair Radio in Lima, Ohio. Not enough time to rationalize buying a large item, but we did pick up a few small trinkets.

We arrived in Dayton Thursday evening. Don Chester, K4KYV met us late that evening at our motel room. I was sleeping so soundly when he arrived that I never awoke to the scream of his miniature air mattress inflation pump.

Friday turned out to be a great weather day as did most of the rest of the weekend. Because the forecast had been pretty good, I felt more of the flea market spaces were occupied than in earlier years. Deals on vintage gear were there of course, but prices tend to be high because buyers, especially some serious collectors from overseas, tend to outnumber sellers. Word has it that two Hallicrafters SX-88s were sold for a four figure sum. A record number of about a dozen 75A-4s were on display from $700 to well over $1000. They did not sell very quickly, at least on the first two days. Friday evening my son Philip, N1HHG flew in from the Air Force Academy in Colorado Springs.

Saturday evening over forty AM'ers and vintage radio enthusiasts gathered at Marion's Restaurant in Dayton to enjoy pizza and conversation. After dinner we had an AM program in the private banquet room which included a few words from Don Chester and a slide show of "AM Operators and their Military Radios". We had an enjoyable time and especially appreciated the good turnout of Collins Collector Association members. For next year I will try to get the AM Forum back in a prime schedule slot at the Hara Arena.

I left Dayton with a World War II Scott RCH receiver and a dirty, but basically complete T-195. Two boat anchors to balance the minivan on the way home!

Estate Valuation and Disposition of Radio Equipment - Rick, K8MLV/Ø recently suggested the creation of a service to survivors of Silent Keys to help them evaluate and dispose of radio gear after the amateur's passing. I thought this was a good idea and have had opportunity in the last couple of months to contact two families that had equipment disposition problems. Two problems are common. What price should I ask for the equipment and how do I get rid of it? I propose that AMI can act in the following ways:

(1) Encourage amateurs while they are still operating their equipment to catalog it, evaluate it and even enlist a trusted family member or friend (ideally an amateur) to help the family dispose of it someday.

(2) Do a rough valuation of equipment on lists sent in by a Silent Key's family and include a list of advertising contacts and some tips on advertising radio gear.

(3) After evaluating their equipment list, refer a Silent Key's family to someone known to AMI that can be trusted to help dispose of the gear.

Ideally AMI Regional Directors and their designees will be able to help implement this program. Your feedback on this service idea is appreciated.

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

The National HFS Receiver

Technological Dream Flops in the Amateur Marketplace

by Robert E. Grinder, K7AK (1)
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"To get amateurs interested in the V.H.F., National is now putting the HFS receiver on the market" ("Advertisement", 1948c). A decade earlier, the National Company had manufactured the One-Ten for the same avowed purpose - to encourage exploration of the very high frequencies. The One-Ten resulted in a successful, enduring product (Grinder, 1997). National thus assumed that in the post-WWII era, a new, state-of-the-art communications receiver would enable the Company to re-assert its eminence among amateurs involved in VHF reception. Consequently, in April, 1948, it introduced the HFS to the amateur community ("Advertisement", 1948a).

The National One-Ten constituted a prototype for the HFS. The HFS was developed for the low-end amateur market - $125.00 plus external 5886 power supply. It also featured the PW micrometer dial for bandspread tuning, a calibration chart on the front panel, and plug-in coils. Variations include both a speaker and a rack for storing the coils inside the receiver cabinet (see Figures 1 and 2).

The National Company designed unsurpassed versatility into its HFS, hoping, thereby, to acquire a competitive edge over potential challengers. Applications of the HFS were heralded as "ideal for the amateur, laboratories, fire and police departments, news services, airlines, and others". Although housed in a moderately-sized steel cabinet without handles (8-1/2"H x 10-1/2"W x 16-1/2"L), it was declared to be suitable for mobile and portable as well as stationary settings ("Advertisement", 1948a).

The receiver [HFS is apparently an acronym for "High Frequency Superheterodyne".] is a seven-tube superheterodyne--superregenerative receiver-converter. A particularly noteworthy aspect of the operational versatility of the HFS is its capability of receiving four types of signal--modulated oscillator AM, crystal - or VFO-controlled AM, FM, and CW--from 27 to 250 MHz. Furthermore, the HFS will function as a high-frequency converter, at an IF frequency of 10.7 MHz, ahead of a conventional communications receiver. National engineers were convinced that the converter aspect of the HFS represented a technological coup ("Advertisement", 1948b; "Advertisement", 1948d)!

Whereas the One-Ten enhanced the reputation of the National Company, the HFS proved to be an embarrassment. The One-Ten survived in the amateur marketplace for over 10 years; the HFS was withdrawn by mid-1949, barely a year after it was first advertised. What happened? Specifically, what led the National Company, in the first place, to manufacture the HFS? Secondly, what led the Company to pull it from the market after making extravagant claims about its extraordinary uniqueness? To address these issues, let us review briefly (1) the dynamics of amateur-radio activity during the immediate post-WWII years; and (2) the effectiveness of the operational features of the HFS.

Figure 1. The HFS receiver with 'doghouse' power supply. Note the built-in speaker. ***Photos by Clyde Watson.***

The dynamics of post-WWII Amateur Radio

President Harry S. Truman announced the end of WWII on the evening of August 14, 1945. Although amateur radio had been suspended in the United States since December 8, 1941, fear of enemy air raids led the FCC to establish, under the auspices of the Office of Civilian Defense, the "War Emergency Radio Service." Participants, including both amateurs and non-amateurs, operated on the amateur 2-1/2 meter band (112-115.5 MHz.)

W.E.R.S. nets blanketed the nation to ensure that communications would be available to communities should an emergency arise. Operators, amateurs and civilians alike, fashioned fixed, mobile, and portable gear from prewar, commercial equipment or whatever could be reclaimed from junkboxes and trashed broadcast receivers.

As a consequence of the thriving W.E.R.S. program, a hugh cadre of amateurs was poised at the end of WWII to resume operating on 2-1/2 meters. On August 15, 1945, The American Radio Relay League (ARRL) petitioned the FCC to reopen the band, and a few days later, August 21, 1945, the FCC authorized amateur stations in good standing before the war to operate temporarily on 2-1/2 meters. A few weeks later, the FCC announced that on November 15, 1945, the W.E.R.S. program would close, amateur operations on ten and five meters would be restored, and importantly, the 2-1/2 meter amateur band would be shifted permanently to 2 meters (144-148 MHz.)

While amateur radio was being reactivated, a Committee on Propagation of the National Defense Research Committee issued a three volume summary of wartime research into tropospheric propagation. The report indicated that further research was necessary to understand such matters as atmospheric reflection, long distance propagation in the 100 to 200 MHz region, and tropospheric propagation over various types of terrain and water surfaces ("Advertisement", 1948c).

The report suggested to the National Company that, perhaps, "the future of radio lies in the very high frequencies" ("Advertisement", 1948c). National reasoned, too, that amateurs were positioned uniquely to address the complex

continued next page

The National HFS Receiver from previous page

issues raised in the report. Since amateurs were located throughout widely scattered sections of the country, National noted that they could add to the knowledge base by making simple geographic comparisons. The Company resolved, therefore, to manufacture the HFS. First, it intended to stimulate the research capabilities of amateurs. As in 1936, the National Company envisaged that amateurs would lead the scientific world in VHF exploration.

Second, it aimed to capture a sizeable proportion of the burgeoning cohort of amateurs who might purchase a sophisticated, reasonably priced, very high-frequency receiver.

The effectiveness of the HFS

HFS engineers intended to capitalize on the desirable features of both superheterodyne and superregenerative systems. The practicality of linking them in a receiver was well established (Brannin, 1941; Hyder, 1949; Hull, 1935). The former offered increased gain, image suppression, greater selectivity, and easier antenna coupling. The latter offered noise suppression, a semblance of automatic gain control, simplicity of adjustment, no radiation at the signal frequency, and comparatively economical manufacturing costs.

As finally configured, the HFS tube complement utilized a 6AK5 first detector, 9002 HF oscillator, 6SG7 IF. amplifier, 6SK7 superregenerative second-detector, 6J5 converter isolation stage, 6J5 first audio, and 6V6GT audio output. The HFS tuning assembly so impressed National engineers that the company offered it to amateurs as a two tube, intact unit (6AK5 first-detector and 9002 high-frequency oscillator) for $39.50, including one set of coils. Extra coils were $3.24 per set ("Advertisement", 1949).

As shown in Figure 2 the HFS uses six plug-in coil sets, which cover, respectively, 27-42 MHz, 41-60 MHz, 56-80 MHz, 80-120 MHz, 120-180 MHz, and 178-250 MHz. Figure 1 also shows on the front panel, from left to right, five controls, not including the tuning dial: B+ on-off switch, volume control, antenna trimmer, regeneration control, and internal-external IF switch. A headphone jack and pilot light are also mounted on the front panel. Power is switched on-off at the external 5886 power supply.

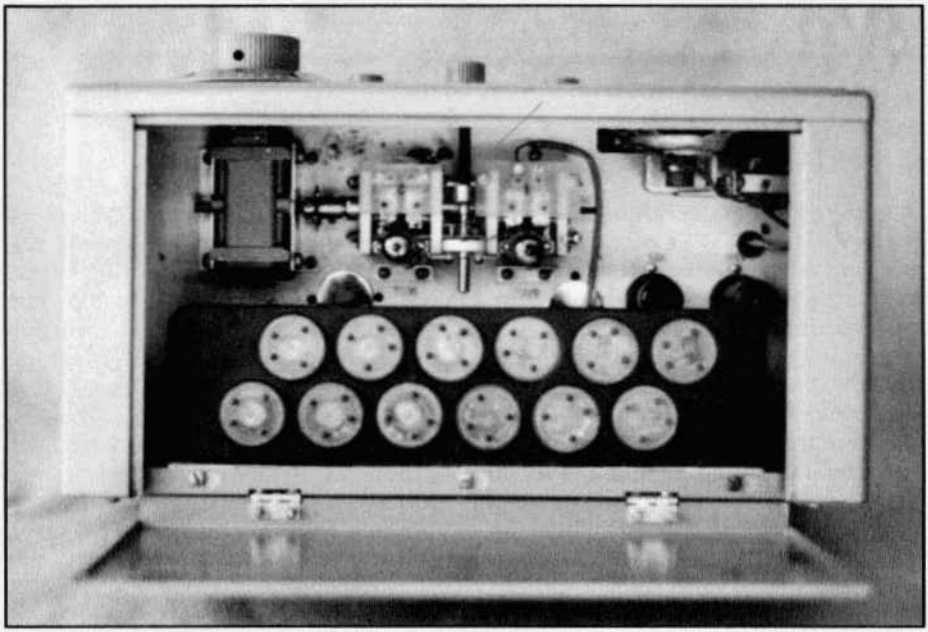
A converter output jack, converter output control, antenna input plugs, and terminals for an external B+ on-off switch or relay are mounted at the rear of the receiver.

The regeneration control, which adjusts the second-detector plate voltage, provides for three modes of operation when the receiver is operating as a superheterodyne. When the voltage is relatively low, the second-detector is in the regenerative-non-oscillating mode; as the voltage is raised, the detector enters its regenerative-oscillating mode; when plate voltage is relatively high, superregeneration occurs.

Superregeneration takes place from markers 4 to 10 on the regeneration control. This condition is easily recognized because background noise becomes highly audible. Superregeneration is best for receiving AM and FM (via slope detection) signals. AVC and noise-limiting actions are most effective when the superregeneration control is set at the point of maximum quieting.

The mid-range, regenerative-oscillating condition, between markers three and four on the dial, produces a whistle on CW signals. When advancing the regeneration control, the start of the regenerative-oscillating condition is indicated by a click and an increase in background noise.

To use the HFS as a converter, the internal-external switch is set at external. The controls for regeneration and audio volume are now inoperative. The dial setting of the communications re-



HFS with top cover open showing the 6 sets of coils in the coil rack.

ceiver is set at the center of the IF passband of the HFS, which is about 10.7 MHz. Resonance is indicated by a sharp increase in receiver background noise. The output control at rear of the HFS is then adjusted for best reception.

A slight reading on the S-meter of the communications receiver serves as a good indication for the proper setting of the output control.

The HFS copies AM, FM, and CW signals as specified, but its reception of these signals falls short of expectations. It is more selective than a simple superregenerative receiver, like the One-Ten, but it is about the same in sensitivity. The absence of an RF stage, perhaps omitted to reduce manufacturing costs, impedes sensitivity when copying signals; moreover, the inherent instability of the high-frequency oscillator causes an annoying chirpiness on CW signals. Slope detection in the FM mode, relative to that provided by a high-deviation FM discriminator, greatly compromises fidelity.

In spite of its impressive frequency range and its multiple functions, the HFS flopped financially. Production ceased by mid-1949. First, police and fire departments, news services, and airlines, etc. were disinclined to purchase the HFS. None could imagine its use in portable applications! Second, the scientific research community failed to share the zeal of National engineers for encouraging unsystematic propagation reports from amateurs. Third, amateurs tended to concentrate their attention on a particular VHF band. Indeed, they could either build or purchase equipment, which was designed particularly for their needs, that was more efficient than the HFS in either its superheterodyne or converter functions.

Although the defects of the HFS are substantial, the receiver warrants recognition as a unique contribution to the domain of communications receivers. It is an exemplar among those associated with catastrophes in engineering

continued on page 41

The HA-1: A Hollow-State Keyer

by Rob Brownstein, K6RB (ex-NS6V)
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Around 1958 Hallicrafters began offering its HA-1 "TO Keyer," a six-tube, self-contained product. It featured a mercury-wetted relay, built-in side tone, balance control and weight control. And it became a popular item in many shacks because it represented an evolutionary step forward.

Like other telegraphers, hams started out literally pounding brass. We sat there rapidly depressing the knob of a manual key and producing an interesting variety of CW styles. Next, the semi-automatic key gave us some dot relief, be we still had to pound out the dashes. A hefty swing of the dot paddle produced a mechanically repeating series of dots which we complemented with manual dashes. Again, we hams produced an interesting variety of styles.

Fully automatic keyers promised to "homogenize" the sending of Morse Code by forcing us to produce evenly spaced dashes and dots. However, if we thought that keyers would produce a generation of "perfect" CW fists, we were wrong. Just have a listen sometime on the lower end of your HF bands. But that's subject for a different article.

Electronic Keyers

Automatic keyers can be made with electro-mechanical devices (e.g. relays), but precise control and consistency are hard to achieve. So, we turned to the vacuum tubes (aided by RC networks) to make those precise, consistent, dots and dashes for us.

In most ham radio applications, vacuum tubes are biased to behave as amplifiers - class A, B or C. In some cases, output is regeneratively fed back to produce an oscillator. But in the first generation of computers, vacuum tubes were set up to conduct, or stop conducting, at very high speeds. In other words, they were used as high-speed, voltage-controlled switches. Two such triodes cross-coupled with RC circuits will produce a continuous, oscillatory, squarewave switching pattern (called an astable multivibrator). Two other triodes, cross-coupled differently, will produce an output squarewave waveform with twice the period of an input squarewave waveform (called a bi-stable multivibrator or "flip-flop"). These two "circuits" - astable multivibrator and flip-flop - are the core design elements of the HA-1.

HA-1's Design

The HA-1 uses four 12AU7s to create continuous, self-completing, dot and dash generators; drive a keying relay; create a side-tone oscillator; and translate paddle states into appropriate keyer inputs (see schematic).

One 12AU7 triode pair (V1A and V1B) is used for the astable multivibrator (dot generator). Another 12AU7 triode pair (V3A and V3B) is used for the bi-stable multivibrator (dash generator subsystem). When a dot paddle was pressed and held, the multivibrator produced a continuous series of dots.

When the dash paddle was pressed and held, the bi-stable multivibrator, in tandem with the first multivibrator, produces a continuous series of dashes by generating a three-dot-long "on" state. A quick tap on either paddle side sets in motion a series of events that produces a completed dot or dash.

A third 12AU7 triode pair (V2A and V2B) is used as electronic switches to translate paddle "states" into multivibrator and bi-stable multi-vibra-

The HA-1 keyer on top of a HQ-170 receiver. The transmitter on the left is a Johnson Viking Ranger.

tor inputs. And a fourth 12AU7 uses one triode as a relay driver (V4A), and the second (V4B) as a side-tone amplifier.

The power supply uses silicon diodes as rectifiers to produce half-wave rectified positive (+150) and negative (-105) voltages. The grids of V2A and B are biased negatively until the keyer paddle is closed for dots or dashes, respectively. For dots,V2A's grid bias is removed momentarily allowing V2A to conduct. V1A's plate goes positive and provides a positive feedback (through R16) that keeps V2A conducting even though the key paddle has been released. The result is a self-completing dot. The output from V1A is applied to the grid of V4A, which then conducts and pulls down the mercury wetted relay.

To form a dash, the key lever is momentarily closed on the dash contact, which causes V2B to conduct and "set" V3. Simultaneously, diode CR1 begins conducting to start a self-completing dot. The leading edge of the negative-going dot from V1B's plate (through C3 and R12) creates a negative "trigger" pulse applied to V3. V3B's plate flips positive, keying V1 again though diode CR1 until the leading edge of the second dot "resets" V3. The sequence produces an "on" state that lasts from the first self-completing dot, through the (dot-length) space that follows, and through the second self-completing dot. The plates of V1A (through R15) and V3B (through R14) drive the grid of V4A positive, holding the relay in for the three-dot-long duration.

How It Performs

The HA-1 offers three operational modes - low (speed range), hold (continuous key down), and high (speed range). The speed ranges are determined by switching in a pair of 2.2 M (fast) or 5.6 M (slow) resistors. Actual speed is then adjusted by the setting of a 100 K potentiometer. A "weight" ad-

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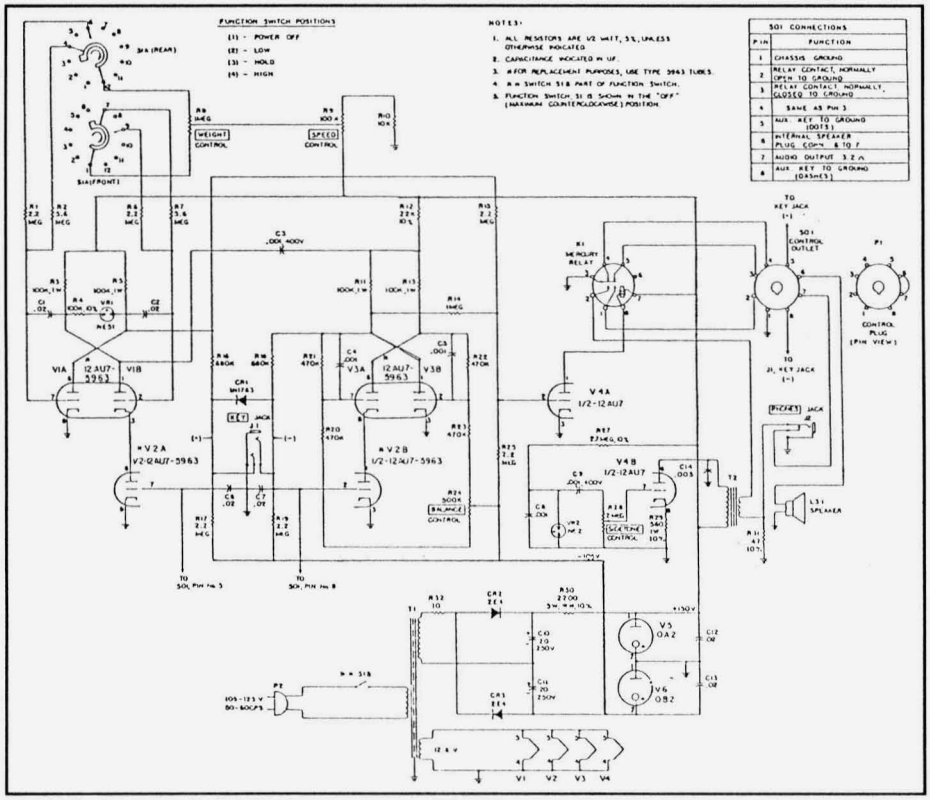
An advertisement from the April, 1960 issue of QST.



Model HA-1 schematic diagram.

justment potentiometer allows you to set the dot-to-space ratio at, above or below a ratio of one-to-one. Varying the weight control can give the code sequences a distinctive pattern.

An HA-1 can produce a range of speeds from less than 5 to more than 50 words per minute. Since there is no input buffer, it is possible to outrun the HA-1 by manipulating the paddle too quickly, particularly at slower speeds. When this happens, you can lose one or more dots or dashes.

The HA-1 uses a mercury-wetted relay to key the transmitter. That means an HA-1 will key whatever you have - cathode or grid-blocked keyed unit. And there will be no contact bounce. One aspect of this, however, is that you cannot lay the unit on its side to test its operation. Doing so causes the relay to malfunction.

Using the HA-1

To connect the HA-1 to the transmitter you use an octal plug connected to its rear octal socket. Pins 1 (gnd) and 2 (normally open relay contact) are connected to the transmitter's key input. A normally closed contact (pins 3 and 4) is also available for controlling other gear in conjunction with keying. The dot and dash key paddle inputs can be connected to pins on the rear octal plug (pin 5 for dots; pin 8 for dashes), too. And a rear phono jack provides speaker muting and earphone output. The keyer paddle may also be connected to a stereo phono jack on the front panel (tip for dots, mid-shaft for dashes).

continued on page 41

The Cosmophones - Part One

In Pursuit of the Cosmos

by Brian K. Harris, WA5UEK
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Plano, TX 75075

It was the Spring of 1994. My mind was occupied with climbing rocks and driving race cars, hobbies just waking from their winter's rest. Oh, I was licensed, and had been for some twenty-six years, but my passion for Amateur Radio disappeared more than a decade earlier and I developed other interests.

Despite being radio-inactive, I was aware of the increasing interest in vintage radio, as I watched the growing collection of my close friend, Dennis Petrich, KØEOO.

With almost a ten-year head start in ham radio, his knowledge of vacuum tube gear vastly exceeded mine. When a business associate asked me to appraise some equipment he inherited, I naturally turned to Dennis for help. With one exception, nothing the SK left behind was difficult to evaluate. The exception was an odd-looking transceiver. Neither of us had seen one like it before, nor did we have a clue about its worth. Dennis' only comment was, "I think they are fairly rare."

That description, along with my associate's decision to sell his inheritance and a slight desire on my part to reenter Amateur Radio, prompted me to purchase the entire package. After minimal negotiation, I scribbled a check and, almost instantly, I had a modest vintage radio collection. In it was a Cosmophone 35.

Little then could I have predicted how this obscure transceiver would win my heart and capture my attention.

Information Please

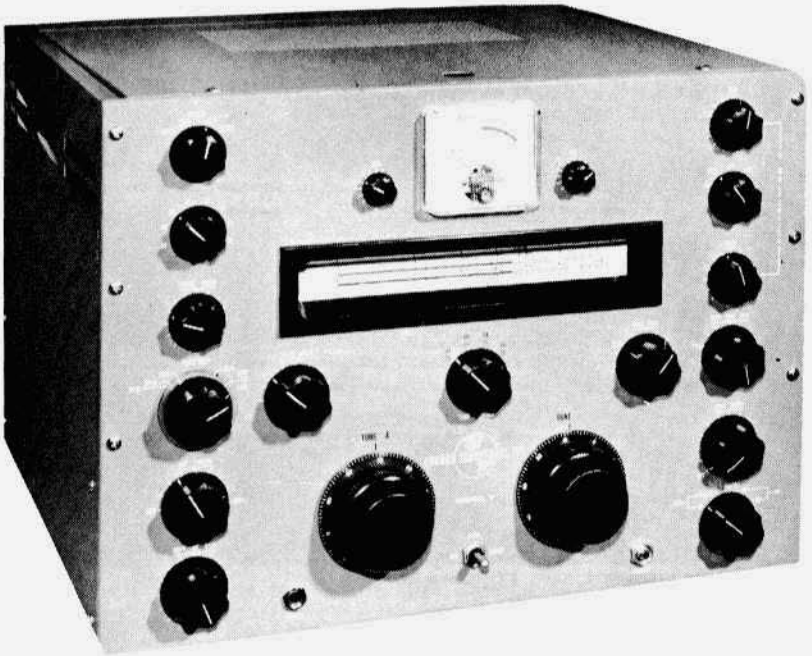
What exactly did I have here? When was this rig built? Who designed it? Why hadn't I heard of one before? Was it really rare? Did I just happen to have a low serial number (#17)? Was it worth restoring? How would it perform?

Dennis remembered that Colin Lamb, K7FM, was looking for a Cosmophone and gave me his phone number. Colin felt they were a limited production radio, with perhaps less than one hundred built. Could this be true? He was quick to provide me with copies of magazine reviews of the Cosmophone 35 (QST June '58 and CQ February '59) and the Cosmophone 1000 (CQ October '59). "Hmm, there was more than one model."

All three reviews provided significant technical information and were interesting to read. Furthermore, they approximated when the two units were introduced. Several months would pass before I realized the first CQ review named persons involved with the Cosmophone development that might provide me with valuable information.

Did I mention I didn't have a manual? A query of popular manual suppliers came up empty. Besides not knowing anyone else that had a Cosmophone or a manual to copy, the company that built the transceiver no longer existed. How would I ever find anybody with real knowledge about the radio? Things were not going well but, being stubborn and tenacious, I continued looking.

My luck changed later that summer when I checked in the Vintage SSB net. There I learned Gary Reiss, WAØJRM,



The Cosmophone "35" Bilateral Transceiver. The two large knobs are for tuning the two separate vfo's and the switch near the center of the two controls the function of each vfo. The controls grouped at the right are for the receiver and those on the opposite side are associated with the transmitter. The "35" uses a 6146 linear amplifier output stage.

had a Cosmophone. Upon contacting him, I found that, along with a Cosmophone 35, he also had a manual. Less than a week later a copy was in my mailbox. His Cosmophone (#65) was given to him with the understanding he would restore it for eventual placement in a museum.

The former owner apparently felt it was worthy of care and recognition.

Wanting More

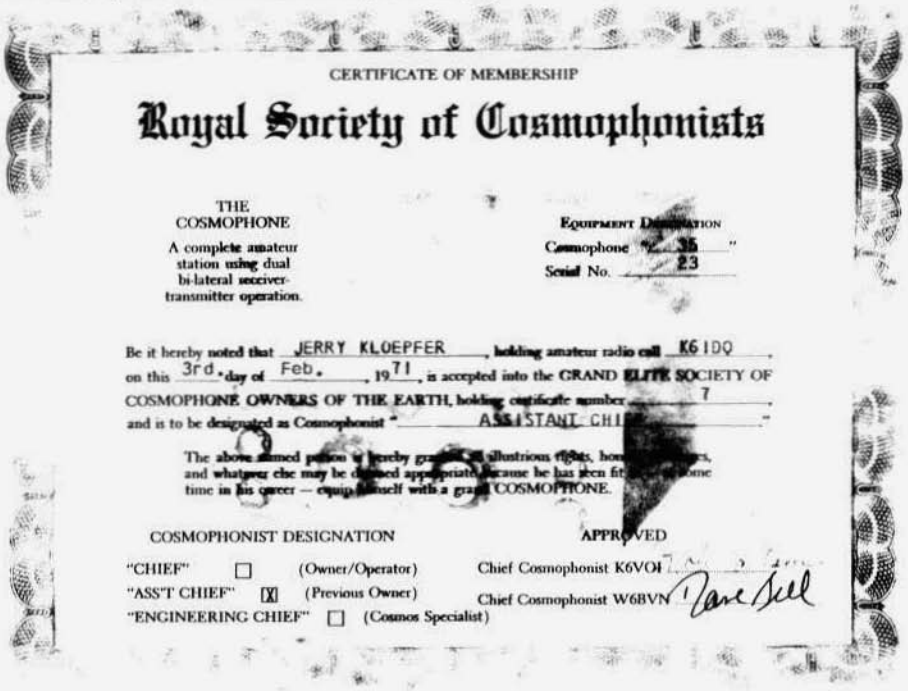
Although the receiver in my Cosmophone worked upon arrival, the transmitter was not so cooperative. Rather than battle a complex circuit without a schematic, I elected to shelve it until I obtained a manual. Now that I had one, I could easily tackle whatever ailed it. In a short time I had the transmitter working well.

In fact, I was so impressed with the overall performance of the Cosmophone that I decided I would like to have another one. Smile if you can relate.

From my ER "Wanted" ads, I learned of another Cosmophone 35 that had been recently purchased by a Palo Alto dealer. I had the occasion to see #10 before I knew its history. When I wouldn't agree to the asking price, it quickly made its way to Japan. Should the current possessor of #10 read this article, and care to trade it for a nicer one please contact me.

I later learned of another dealer on the opposite coast that had two

continued on next page



CERTIFICATE OF MEMBERSHIP

Royal Society of Cosmophonists

THE COSMOPHONE

A complete amateur station using dual bi-lateral receiver-transmitter operation.

EQUIPMENT DESIGNATION
Cosmophone "2 35"
Serial No. 23

Be it hereby noted that JERRY KLOEPFER, holding amateur radio call K6IDQ on this 3rd day of Feb., 1971, is accepted into the GRAND ELITE SOCIETY OF COSMOPHONE OWNERS OF THE EARTH, holding certificate number 7, and is to be designated as Cosmophonist "ASSISTANT CHI[illegible]"

The above named person is hereby granted all illustrious rights, hon[illegible]rs, and whatever else may be deemed appropriate because he has seen fit [illegible] some time in his career — equip himself with a grand COSMOPHONE.

COSMOPHONIST DESIGNATION

"CHIEF" ☐ (Owner/Operator)
"ASS'T CHIEF" ☒ (Previous Owner)
"ENGINEERING CHIEF" ☐ (Cosmos Specialist)

APPROVED

Chief Cosmophonist K6VOI
Chief Cosmophonist W6BVN

Certificate of Membership in the "Royal Society of Cosmophonists"

Cosmophones. Although he didn't know much about Cosmophones, he was convinced they were rare, and had them priced accordingly. One was different from the other, in that it had two finals instead of one, yet both were Cosmophone 35's. Curiosity got to me and I bought both, sight-unseen. Upon their arrival, it was apparent one (#88) had seen better days and the other (#15) had fallen victim to a well-done "improvement." A definite two digit serial number trend was developing.

A Breakthrough

In mid-November I got a call from Jim Musgrove, K5BZH. He also noticed my ER ads looking for Cosmophone information and had some from research he had done for a book. One item I got from Jim proved essential to my pursuit. It was the address of Butch Mason, W6KAG (ex-W3MGG), the man credited with creating the basic concepts used in the Cosmophone.

In our first telephone conversation, Butch, a retired U.S. Naval officer, shared much with me. He became involved with SSB in the late forties and, during the early fifties, he designed and built a rig called the "Portsider." Its circuitry, although highly modified, would later be applied in the Cosmophone. The differences in the two radios were obvious when I compared his detailed Portsider engineering notebook to the actual Cosmophone 35 schematic.

The Jackpot

Along with his notebook, Butch sent two certificates to me that were issued to him by Bob Carlson, K6VOI, and Dave Bell, W6BVN, who formed "The Royal Society of Cosmophonists" in 1970. It seems there were Cosmophone enthusiasts back then too. On contacting Dave, I learned he donated his Cosmophone 35 (#91) to the ARRL museum in 1993. Bob had long since sold

The second shelf from the top holds just part of the author's collection of Cosmophones.

his to Joe Haddix, KA2SNF. Both Bob and Dave added second final tubes in their rigs. The modification was Bob's creation. Imagine our mutual surprise when we realized the two-final rig I bought had belonged to Bob!

You qualified for the society and a membership certificate if you ever owned, operated or were technically involved with the Cosmophone. Bob convinced then ARRL Assistant Secretary Morgan Godwin to promote the society in a "QST Strays" entry. Along with the membership certificates, operating achievement certificates were issued to anyone who contacted two or more Cosmophonists while using their own "grand and elite Cosmophone SSB TRANSCEIVER."

Fortunately for me, Bob kept the society records, which included members' names, calls and some addresses. He also kept detailed notes on his final modification and a cassette tape he recorded of an on-the-air conversation with Butch Mason on December 24, 1970. During this QSO, Butch also discussed the Portsider development and the Cosmophone history. This having occurred twenty-four years earlier, Butch provided more detail in the QSO than he did on our phone call. To aid my research, Bob kindly sent me everything he had concerning the Cosmophone, including original blank society certificates.

Hooked

It didn't happen all at once, but as winter approached I found myself so enamored with Cosmophones that I decided to try to locate all that exist and document everything I could find about their history. With Bob's records, I had a good starting place and thus I began what may be a lifelong campaign. During the next two years I would write many letters and make hundreds of phone calls.

Not counting the originators, there were thirty-nine members of the Cosmophone society, most of whom owned a Cosmophone. Others gained

continued on page 42

Leo Meyerson, WØGFQ, at the podium after receiving the "Amateur of the Year Award" at this year's Dayton Hamvention. *Photo by Jim Walsh, W7LVN.*

Jim Jorgensen, K9RJ, at his workbench.

Rosario DiPeri, AA2CB, at his operating position. His station consists of both vintage and modern gear. Some of the vintage gear includes: a 75A-2 behind him; a Johnson Ranger in front of him to the left; a Hallicrafters SR-500 (under the callsign) and a Swan 240 under the SR-500.

Len Denner, K2UZG, with his vintage gear. This photo is from a business-size card he sent in along with a letter. On the back of the card is his name, call and address. I think this is a neat thing to do. It's something that can be sent along with correspondence instead of a QSL card.

Meter Modification Made Simple

by Andy Howard, WA4KCY
105 Sweet Bay Ln.
Carrollton, GA 30116-8519

How many times have you wished that the meter you recently found at a hamfest would read 50 mA or less instead of the 200 mA or even higher value? We all know how difficult it is to monitor a grid circuit that should draw 20 mA with a meter designed for 200 or 300 mA full scale reading. With the cost of new meters now at over $50 each the incentive to modify older meters is more attractive than ever.

Here is the simplest method that I have seen for meter modification. It came to me in the middle of a sleepless night (one where you lie there staring at the ceiling and solving the world's problems). I got up immediately and put the general idea down on paper so as not to forget it by morning. It requires no mathematical formulas, internal resistance calculations or other difficult to acquire information. All you need is a 1-1/2 volt dry cell (preferably the large kind with the binding posts on top), a low value pot, some low value resistors or a decade box if you happen to have one. Arrange the pot, a couple of resistors, the battery and meter in a series circuit. Use jumpers with alligator clips to hook everything together. Always start with a lot of resistance and then remove it until the meter starts to draw current (you will start to get a reading on the meter). Adjust pot and resistors until meter reads what you want the finished product to read. If you are working with a 200 mA meter and want to convert it to 20 mA adjust resistance until the meter reads 20 mA full scale.

Disconnect the meter but leave rest of circuit intact. You will need it later. Open meter and locate internal resistance wire. It will usually be a cotton covered wire wound into a loose coil and running between the terminals of the meter input. Unhook this wire at the input terminal and add enough resistance in series with it to cause the meter to draw more current. Put meter back into your original circuit. Continue adjusting shunt resistance until the meter reads full scale. You may have to cut the wire a bit to get it just right. With the meter reading full scale you will now have a meter that is drawing 20 mA instead of 200 mA The process can be reversed to make low value meters read higher. Ideally meters should read about 2/3 of full scale in actual use at their maximum expected reading. In other words a meter than will be expected to read 70 mA should in fact give a full scale reading of 100 mA.

With some dry transfer lettering and a meter face with the right calibration lines you can make up a meter to read anything you want. If you have a scanner for your computer this really makes it simple. The important thing is the calibration marks.

Just white out the original numbers, rub on the new readings and copy on a copying machine. Glue this to the old meter face using a glue stick and you now have your new meter. Trim with a sharp razor blade around the edges. I keep a meter file with common calibration faces that I have salvaged from old meters with bad coils, etc.

I hope that you find this method helpful. I have converted numerous meters for myself and others using the technique. I am not sure if it is new or not. I probably rediscovered something that the old timers have known all along. The moral of the story is that there is a solution for most problems if we give them enough thought. Good luck in changing that next meter! ER

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 oldest!- 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 Heathkit GR-81 Regenerative Receiver

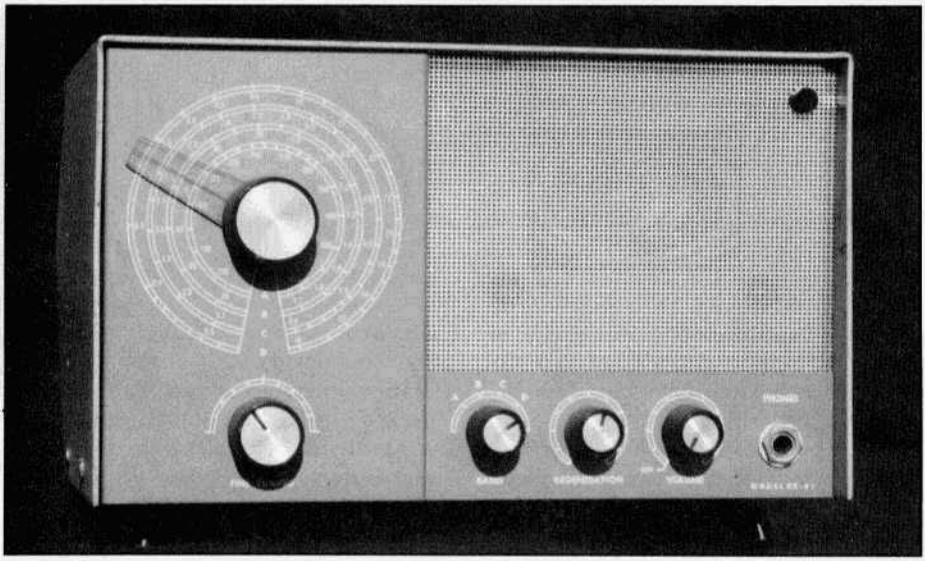
by Jim Hanlon, W8KGI
P.O. Box 581
Sandia Park, NM 87047

I was wandering through the aisles of our local Electronic Surplus store a couple of months ago when I happened to spy a familiar Heathkit-green panel peeking out from the pile of used test equipment on one of the tables. Closer inspection of that panel and its knobs revealed it to be a bandswitching regenerative receiver with four ranges on its dial spanning 140 kHz through 18 MHz. A peek through the opening in the rear of the coffee-with-double-cream beige top cover showed that everything seemed to be in place except for two of the set's three tubes which were missing. My trusty Swiss Army Knife provided the screwdriver I needed to open the bottom cover, doesn't everybody carry one? And lo and behold things seemed to be all present and accounted for under the deck as well. The price sticker said it was only $19.95, so what the heck ... I convinced the counter man to take my twenty before I could think better of it, and a few minutes later I became the new owner of a Heathkit GR-81, serial number 622 8419.

As anyone who's ever twiddled the dials of an Ocean Hopper, SW3 or their cousins can tell you, a regenerative receiver is just plain FUN. In the case of the GR-81, there are only three tubes between your ears and the antenna, a triode regenerative detector, a triode first audio amp and a power pentode audio output stage that will drive either your earphones or the set's own built in loudspeaker. In contrast to your garden variety superhet, it takes a little skill and a fair amount of semi-constant attention to capture and hold a CW signal on a regen; but it can be done and it's really a thrill. This particular variety of receiver with no RF amplifier stage and its detector directly coupled to the antenna is very much like the simple, two tube receivers that were being used by hams back in the 1920's and the early 1930's. I happened upon a critique of two tube regens by George Grammer in the June 1934 QST, and it very much applies to my "new" GR-81, even though it was built a good 3 decades after the article appeared.

George made several points about what these receivers have to offer, small cost, ease of construction, good sensitivity, and wide coverage without a regiment of plug-in coils. But they do come up lacking in both selectivity and stability. As far as selectivity is concerned, George differentiated between the "local" and the "distant" varieties. Said George, "Signals from near-by stations working on frequencies considerably beyond beat-note audibility with the desired signal can and do cause serious interference of a most annoying kind. So-called 'shock' excitation of the detector by a local signal will cause interference-producing spurious harmonics on higher-frequency bands than the one on which the signal actually exists. The reverse can happen, too; harmonics of the oscillating detector can beat with a local signal on a higher frequency band to produce a second type of interfering signal which is not the fault of the transmitter. Also the transmissions of nearby broadcast stations often will be bothersome, especially on the 1715 and 3500 kc bands.

"Distant selectivity for CW reception can be defined as the ability of the re-



The Heathkit GR-81 3-tube Regenerative receiver, across the bottom are Fine Tuning, Bandswitch, Regeneration, Off/On Volume, and Phone Jack.

ceiver to separate two signals of moderate strength operating on frequencies within audible beat of each other. The comparison between the two-tuber and practically any other type except the Single-Signal for this kind of selectivity is not so unfavorable. The detector-audio set is every bit as good as the tuned-RF receiver (like an SW-3), and generally speaking is as good as the ordinary '10-kc' superhet. The actual separation of the signals must be done by the ear through its ability to distinguish between different tones..."

George goes on to rate the two-tuber on stability. With reasonable coupling between the detector and antenna, any change in the "constants" of the antenna, such as swaying in the breeze, will be reflected as a change in the detector's oscillation frequency. Strong signals tend to pull the detector, operating just beyond the threshold of oscillation, into synchronous lock with themselves; so a signal subject to fading will tend to pull in the detector when it gets strong, and thus the note you hear may waiver or even disappear entirely! Changes in plate supply voltage due to bounces in the AC line will affect the frequency. And if this weren't enough, "instability of a fourth type is peculiar to the oscillating detector coupled to an antenna, and evidences itself in the form of 'body capacity' at the tuning controls. It results from coupling the detector to an antenna system which is approximately resonant, through the capacity of the receiver and power supply to ground, at the operating frequency, and is especially likely to be encountered at 14 Mc and higher frequencies... The tuning controls and chassis of the receiver accordingly assume a potential different from that of the operator's body and hand-capacity effects result, often accompanied by an AC hum if the antenna is near power wiring..."

For a circuit, George recommends the use of a screen grid detector tube with regeneration being conveniently and smoothly controlled by varying its screen voltage, and he uses a tapped cathode "Hartley oscillator" circuit for feedback with a large value bandset capacitor across the entire coil and a

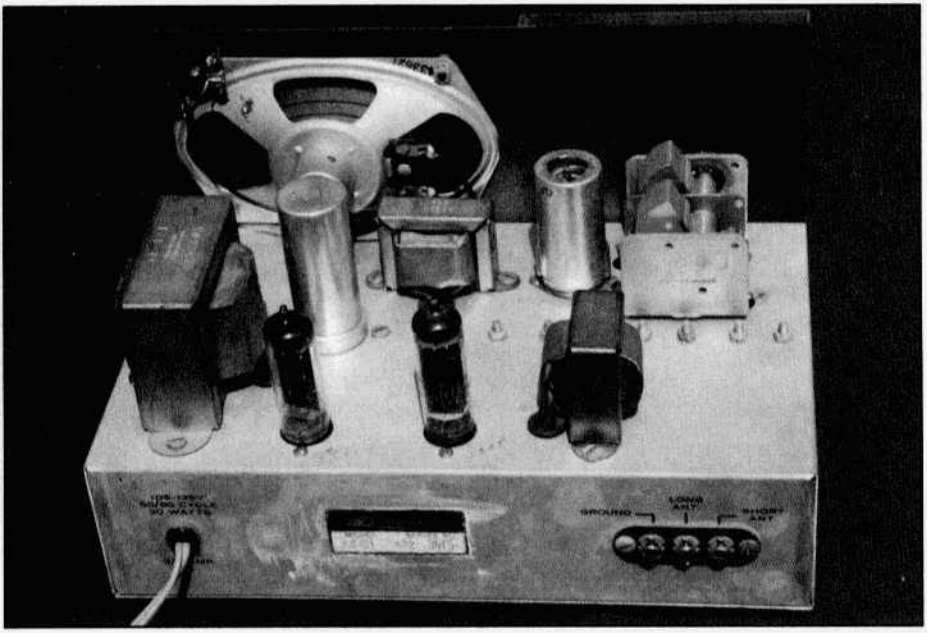
continued next page

small value bandspread capacitor tapped down on the coil. He includes a single triode for an audio amp, saying that a power pentode would be better but at the cost of more plate current and an audio coupling device to "avoid burning out the phones."

George also cautioned his readers to avoid "the use of a makeshift audio coupler between the detector and the amplifier. While audio transformers often have been pressed into service as coupling impedances, a good many of them show a pronounced tendency to produce fringe howl... Trouble of this sort can be sidestepped by acquiring a coupler made especially for the job of coupling a screen-grid detector to an audio amplifier." And his QST receiver uses a National Type S-101 coupler which includes a 500 Henry audio choke feeding B+ to the detector and capacity coupled through 0.01 mFd to the 0.5 megohm grid leak of the audio amplifier.

Heath didn't quite follow George's advice in designing the GR-81. As a matter of fact they made one of the compromises that he cautioned against and I think the performance of the GR-81 suffers because of it. Their circuit uses a triode detector, half a 12AT7, with the traditional separate tickler coil for feedback and with a pot controlling plate voltage for the regeneration control. Main tuning and bandspread are provided by a pair of capacitors across the entire coil. The main tuning cap is a dual broadcast variable, I'm guessing 365 pF per section. Both sections are used on band A to tune 140 to 550 kHz, and only one section is used on the three higher frequency bands. The bandspread cap has only four widely spaced plates and is probably about 10 or 15 pF fully meshed. There are two antenna coupling points provided, one for "long" antennas which is a link coupled to the "cold" end of the coil, and one for "short" antennas which is capacitor coupled to the grid end of the coil. Four coils are bandswitched into the circuit with a three section rotary switch. Heath in particular departed from Grammer in that the detector output is R/C coupled to the grid of the other 12AT7 triode without benefit of that 500 Henry audio coupler, and sure enough the set does sport "fringe howl" on 20 meters and above. In case you've never experienced it, as I had not with my properly designed SW-3, fringe howl is a noise that sets in as the regeneration control is advanced toward the detector oscillation point. It sounds like a rapidly interrupted audio oscillation, and it sure doesn't help when you're trying to copy weak CW signals! The first audio stage feeds a 50C5 power pentode amp which is transformer coupled to the internal speaker and also to your headphones when you plug them in. Strangely, plugging in phones does not disable the speaker. Heath supplied a power transformer which drives both the filament string and a 35W4 half-wave rectifier. The transformer allows the GR-81 chassis to be isolated from both sides of the power line, so Heath advertised the set as "shock proof" according to Chuck Penson[1]. The power supply filter is a respectable C/L/C pi-section. And for bells and whistles, there is even a panel-mounted neon pilot bulb that runs on the DC supply and lights up eventually after you turn the set on with the AC power switch on the audio gain control. Last but not least, there is a wired-in fuse in series with the power transformer primary under the chassis.

Two things I particularly appreciate about the GR-81 are its calibration and the vernier drive on its main tuning dial. In contrast to most other regens where you simply have to plug in a coil and go fishing across the dial for the band you want to listen to, the GR-81 is reasonably well calibrated and easy to tune. The ham bands are all pretty easy



Chassis topside; 12AT7 detector/first audio up front, 35W4 and 50C5 in the rear. And as many transformers as tubes!

to find, just set the bandset control a bit above the bottom edge and tune around with the bandspread and there you are. Also, the amount of bandspread coverage on the ham bands is small enough so that tuning on 80 and 40 is really quite convenient. An entire half-turn rotation of the bandspread dial covers 49 kc on 80 and 37.5 kc on 40. On 160, on the other hand, the bandspread dial covers only 12.5 kc, making it more nearly a "fine tuning" than a bandspread control. On 20 it spans 313 kc making tuning pretty dicey. That combined with a nasty tendency to break out into multiple oscillations several kc apart when the regeneration control is advanced just a little ways above threshold and an increased propensity to drift around makes 20 meter listening pretty marginal on the GR-81.

Other than that, I must report that things haven't changed too much between 1934 and 1997 when it comes to detector-audio regens, and most of George Grammer's admonitions and then some still apply to the Heath GR-81. There is so much "AC hum presence" in the GR-81 that the weaker signals disappear into the hum rather than into the antenna noise as they do with my three tube, TRF/regen detector/audio amp SW-3. The amount of hum isn't decreased by added filter capacitance in the power supply either, so perhaps it is the antenna-induced hum George was talking about, or more likely it's just coupled in due to the relatively high AC voltage on the tube heaters. (The SW-3 uses 2-1/2 volt tubes.) Detuning due to "hand capacitance" is not noticeable even on 20 meters, likely due to Heathkit's well shielded cabinet and bottom plate. (The carefully shielded SW-3 doesn't have this problem either.) The "local sensitivity" tendencies due to strong amateur signals are there, but local BC stations don't bother me even when I'm trying to listen to AM on 160. Also on 40 in the

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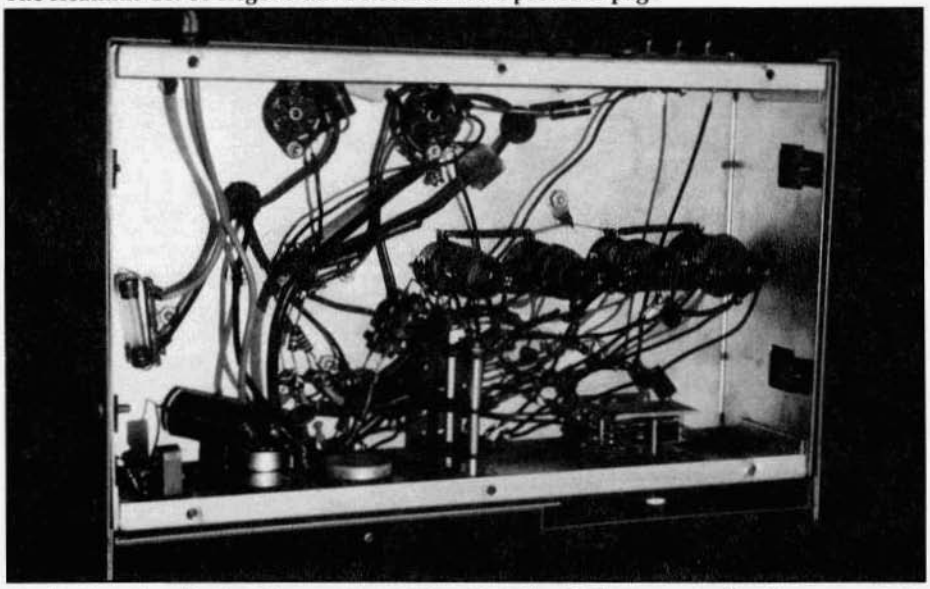
The Heathkit GR-81 Regenerative Receiver from previous page



Under the chassis; bandspread capacitor, bandswitch, regen and volume controls across the front, coils for each band in the middle, and lots of wires.

evening, there is background audio spread everywhere across the dial from the foreign BC stations. But fortunately I live out in the boonies, far enough away from other hams on the HF bands, so I don't have too much trouble overall with "local sensitivity" problems. I'm using an antenna that's pretty well tied down to avoid wind warble. And I learned how to concentrate on one signal in the presence of many back in 1952 on the 80 meter Novice Band, so I still find the GR-81 to be amazingly useful (in the same sense that the S38 was the radio that "amazed the experts") in spite of its regenerative idiosyncracies.

At first I didn't have much hope, but I actually got on the air with the GR-81 and had four quite decent, solid copy 40 meter CW QSOs. One of the first problems I experienced was finding my transmitter frequency on the GR-81. Even my VFO spot signal is so loud that it locks the regenerative detector to itself over quite an expanse of the bandspread tuning dial. In the good old days of the 20's and 30's that wasn't a problem. Guys were happy just to tune up their transmitters so that they were inside the band, anywhere inside. Someone who called CQ would tune not just around his frequency but across the entire band looking for a reply. But today we are expected to call someone on his frequency. To solve that one I cheated a little, locating the regen detector's oscillation frequency with my NC-303 and then tuning it to my transmitter frequency. Actually, this is something like the old timers used to do when they used a single tube regen receiver built into a shield can as a "monitor." They would tune the monitor until they could hear their transmitter, and then tune their receiver until they could hear the oscillating monitor detector.

Another problem was that the regen sounded like a buzzsaw when my transmitter was on the air, no matter whether it was tuned to the transmitter frequency or not. I finally just slipped my phones off my ears and used the buzz for a keying 'sidetone' while I was on the air.

Despite Chuck Pension's advice that the GR-81 had lousy stability, my on the air experience was that it didn't drift all that much. Besides, with its broad as a barn door selectivity a little bit of drift wasn't that important since all it did was to change the beat note. That impression held until the electric water heater decided to click on. Then my little friend took a real bounce, just as George Grammer had predicted. But even then the signal was still within the passband so I didn't lose my QSO. If I were into modifications, I'd consider adding a 90 volt VR tube to this little guy to keep it more stable under AC line bounce conditions. I've VR regulated my SW-3's power supply and it's quite immune to this kind of thing.

Unlike its SW-3 cousin, the GR-81 definitely cannot hear the weaker CW signals on 40, George Grammer's comments on sensitivity not withstanding. The audio output into either high impedance or 8 ohm phones is marginal, even with two AF stages. I found myself pressing the phones to my ears to squeeze the last couple of dB out of them as my contact's sigs faded down in the QSB. Eventually, the weak signal limiting factor is the AC hum. But there's a small blessing in not being able to hear the weaker ones, at least they don't add to the cacophony that I then have to deal with using my mental signal processor.

Also unlike its SW-3 cousin, it is rather difficult to copy single sideband on the GR-81. The tendency of the regenerative detector to frequency pulling makes it try to lock onto whatever speech frequency is most prevalent in a strong SSB signal, so the result is pretty unintelligible. I was able to improve things by turning the regeneration control up well beyond the point where the detector breaks into oscillation. So adjusted, it had less of a tendency to pull with the SSB signal, but it also lost some sensitivity.

When I first got my GR-81, I didn't know what the detector tube was supposed to be. The other sockets were labeled, but all I could figure about the detector was that it was one of the nine pin, 12A*7 family of dual triodes. Chuck Penson finally set me straight about Heath's choice of the 12AT7, but before I received his reply to my query, I had tried all the types in the family. Interestingly enough, the higher gain 12AX7, for the ham bands, is a somewhat better performer. It doesn't break into multiple oscillations on 20 like the 12AT7 does, and perhaps because of the higher gain in the 12AX7 audio stage hum is not as dominant. It also seems to be somewhat easier to copy SSB when using the 12AX7 detector, because of the lower hum and perhaps because it doesn't pull frequency quite so easily. The one problem with the 12AX7 is that there is not enough feedback for it to go into oscillation on the low frequency end of each dial range. So if you want full general coverage range in the GR-81, go with a 12AT7 detector. But if you want improved performance on the ham bands, try a 12AX7 and see how you like it.

All-in-all, the GR-81 is doubtless the worst receiver I've ever attempted to use on the ham bands. Chuck Penson says [1] "The GR-81's selectivity, sensitivity, and stability are awful." But despite all that, it still works well enough to actually get it on the air and have fun with it. And that is really what boatanchor "Electric Radios" are all about! So if you have a longing to try out a regen receiver and you can't afford the astronomical prices currently being asked for an Ocean Hopper or an SW-3, keep an eye out for a friendly, green, "undiscovered" GR-81. Heath must have sold a big bunch of them for the 11 years they made them between 1961 and 1972, so there has got to be at least one out there waiting for you. ER

1 - Chuck Penson, "Heathkit, A Guide to the Amateur Radio Products," Electric Radio Press, page 70.

The Dennison 3-Tube Superhet

A Modernized Super-Gainer

by Bob Dennison, W2HBE
82 Virginia Ave.
Westmont, NJ 08108

The Jones Super-Gainer

In the February 1997 issue of CQ magazine, Bill Orr, W6SAI reminisced about the 1937 Frank Jones 2-Tube Super-Gainer - a simple superhet designed for the novice radio amateur.[1] Fig.1 shows the circuit. A 6F7 pentode-triode was used as a regenerative mixer and the local oscillator. An iron-core IF transformer couples into the triode regenerative detector (1/2 of a 6A6 dual triode). The other half of this tube provided the audio amplifier.

Jones claimed that this set was an improvement over the one shown in his 1936 Handbook.[2] Actually, the 1936 Handbook shows five different Super-Gainer receivers as follows:

1. A 3-tube Super-Gainer using a 6C6 1st Det, 76 HF osc, 79 dual triode as regenerative 2nd Det and audio amplifier.
2. A similar set using 2.5V tubes: 57, 56 and 53.
3. The original 2-tube Super-Gainer using 6F7 and 6A6.
4. A metal tube Super-Gainer: 6L7 1st Det, 6C5 HF osc, 6F5 2nd Det, 6C5 audio amplifier.
5. An AC-DC Super-Gainer factory built by McMurdo-Silver: 6C6 1st Det, 76 HF osc, 79 2nd Det and audio, 12Z3 rectifier.

Note: All but the last required an external power supply which normally used a type 80 tube (or 5W4 for set No. 4). Thus the total tube count for these sets ranges from three to five.

The idea behind this line of "wonder sets" was that with just a little more effort and a few more parts, the beginner radio amateur could enjoy some of the advantages of a superhet rather than be limited by the shortcomings of the usual regenerative receiver.

The Challenge

In late January 1997, two of my friends were discussing the Super-Gainer article they'd seen in CQ and asked me what I thought of it - was it really workable? Was it a good design? How would Jones do it today? The last question got me to thinking about how I would do it. I started a notebook and each day jotted down ideas and circuits. Soon I arrived at a list of goals to be met in the 1997 Super-Gainer:

1. Bandswitching instead of plug-in coils. 80-40-20 M.
2. High IF frequency to reduce images on 20 M band.
3. Tunable IF so that one dial calibration holds for all bands.
4. Temperature compensated high frequency oscillator.
5. Antenna trimmer.
6. Provision for either 50 ohm coax or 500 ohm wire antenna.
7. Both RF and AF gain controls.
8. Built-in solid state power supply.
9. Take advantage of ferrites where possible (beads, cores, toroids).
10. Set should use 7 and 9 pin miniature tubes.

After a review of the tube manual, several radio handbooks and my personal tube stock, the 6U8A and the 6AK6 were chosen. The 6U8A is a 9-pin miniature containing a sharp-cutoff pentode and a medium μ triode with separate cathodes. Jones would have loved this tube! It seems to be just right for this set.

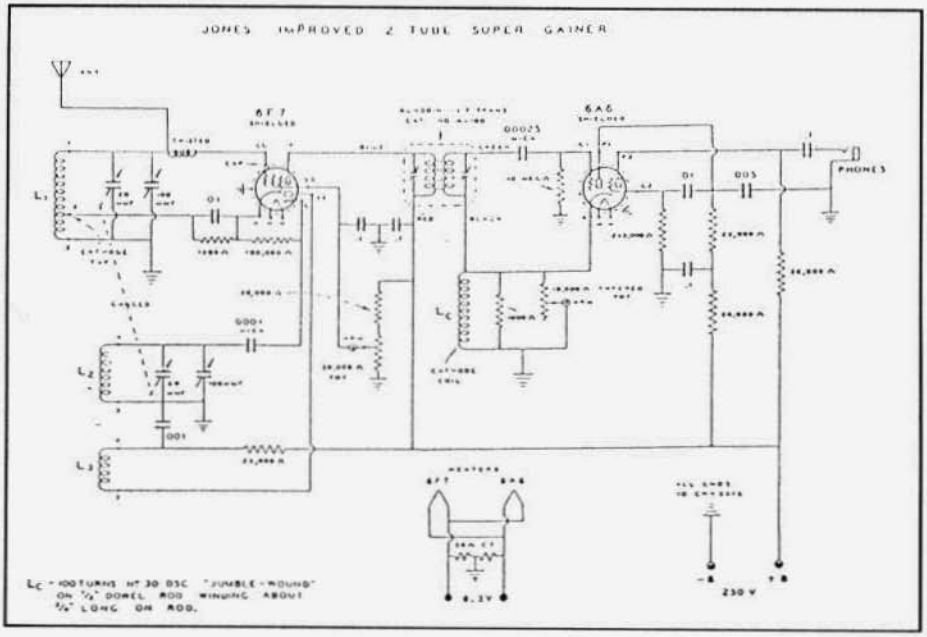


Figure 1. Schematic diagram of the Jones Super-Gainer.

And the 6AK6 is a 7-pin miniature having low filament requirement (only .15 A) and the B+ drain is only 15 mA. Yet it provides all the power a 4" PM speaker can handle.

Front End Features

Reference to Fig. 2 shows that the 1997 Super-Gainer incorporates bandswitching. Plug-in coils are a major nuisance since you must keep the unused coils handy at all times, they add to the clutter in the hamshack and they waste time when changing bands. Worse yet, the bandset capacitors must be accurately reset when changing bands. Since bandswitching facilitates rapid jumping from band to band, it is a highly desirable feature. Here, bandswitching is accomplished by a two deck, four pole rotary switch (Centralab PA-1013). Only three of the five positions are used. All six coils are wound on Cambion slug tuned forms. Complete winding data is given in Fig. 3.

Some of the front end circuitry is borrowed from a design by Byron Goodman, W1DX [3]. A small variable capacitor, C1, allows the antenna input circuit to be 'peaked' when changing bands or antennas. Antenna transformer, T1, has a 1:3.16 turns ratio and is wound on a small ferrite toroid. FB is a ferrite bead slipped onto the grid lead of V1 as a means of suppressing any chance of parasitic oscillation in the mixer. RF gain is controlled by R1 and has only slight frequency pulling effect on the HFO. This control is labelled ANT.

Capacitor C14 is a 4-30 pF ceramic variable having a negative temperature coefficient of 500 PPM/°C. Its purpose is to reduce frequency drift due to temperature changes. I set it initially to 10 pF and found that warm up drift on 40M was 2.0 kHz after 30 minutes and on 20M the drift was 3.5 kHz. In each case most of the drift occurred in the first 10 or 15 minutes. To date, no attempt has been made to see if this can be improved by a different setting of C14.

continued next page

The Dennison 3-Tube Superhet from previous page

The 1997 Super-Gainer

Tunable IF

In most superhets, the mixer and oscillator are gang-tuned. Here the HFO is fixed tuned and the IF tuning is varied. There is no IF amplifier; instead, the IF transformer feeds into the regenerative second detector, V2A. The primary and secondary are gang-tuned by C_T - C_T. This condenser is an item I found at a swapmeet. Someone had made it by modifying an early style Hammarlund MC-75S variable. By removing both rotor and stator plates and by cutting the stator support rods it was converted into a split-stator condenser (2 stator and 1 rotor in each section) having a $\Delta C = 9.3$ pF. In the usual MC condenser, the rear bearing section is held in proper position by the stator support rods. Since these rods are now cut, it is necessary to carefully align the front and rear sections when mounted on the chassis to insure smooth tuning and to make sure that $C_T = C_T$. I added a flexible pig-tail connection to the rear end of the shaft to forestall any noise due to poor bearing contact. The tuning condenser is enclosed in an aluminum shield and a small brass shield is placed between the two sets of stator plates.

Jones mentioned in his article that he used an Aladdin A-100 iron-core IF transformer that provided for variable coupling. He found that when the primary was tuned to resonate with the secondary, it sucked up enough energy to stop the detector from oscillating unless very loose coupling was used.

The Millen No. 61160 IF transformer used here employs a small variable condenser, C_X, to vary the coupling. This condenser consists of a ceramic tube with two silver electrodes fired onto it and a central screw inside the tube which adjusts the capacitance. I found it necessary to disconnect each end of this condenser and reconnect the two ends to ground. The remaining stray coupling was sufficient.

I also placed a 1/2" high shield below the IF transformer - between its input and output terminals.

The IF response when centered at 1650 kHz is shown in Fig. 4 where it is compared with the typical response of a 2-stage 1600 kHz IF amplifier. It will be seen that the simple regenerative detector is sharper near its peak. The curves

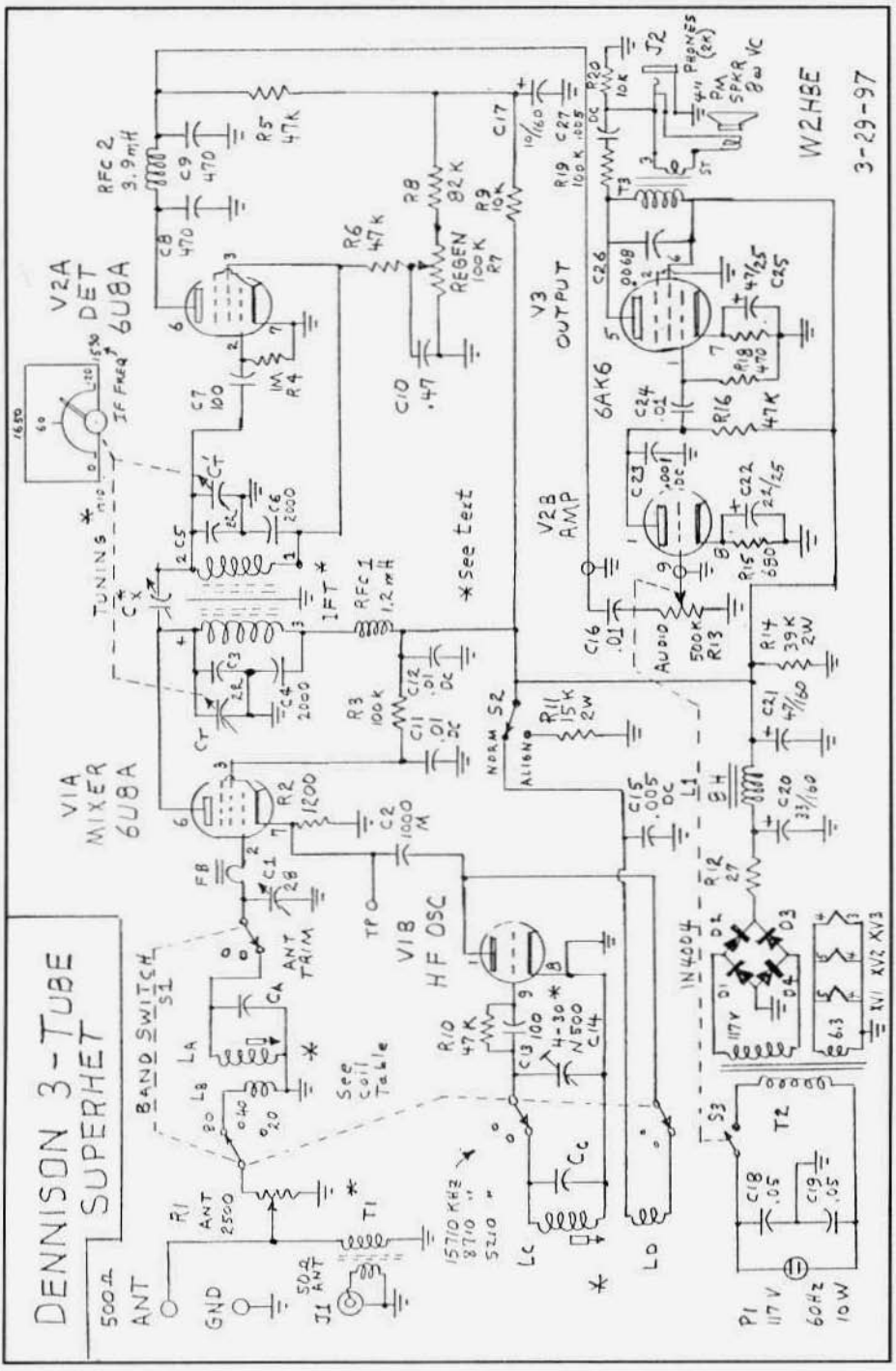


Figure 2. Wiring diagram of the three-tube superhet.

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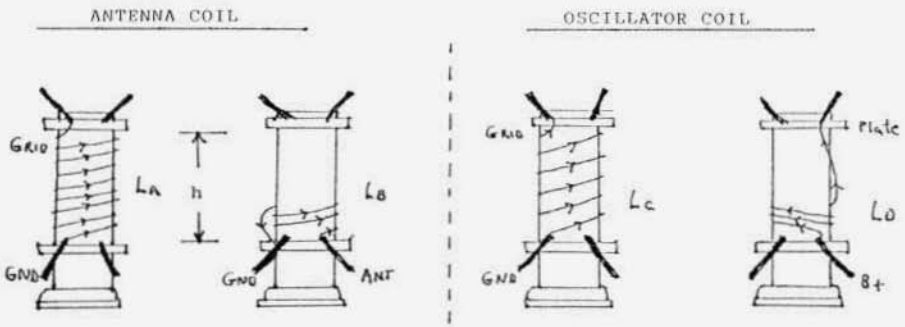

Wind L_A (or L_C). Cover with single layer of cellophane tape.
Wind L_B (or L_D) over bottom end of L_A or L_C.
Note direction of L_D.
Coat with coil dope.

BAND	L_A	C_A	L_B	L_C	C_C	L_D	h
80	L_A=13uH 40 turns of No. 28 E CW Q=50 @ 3.5 Mhz	150	4.75 turns No. 30 E	5.9 uH 25 turns No.28E Q=88 @5.1Mhz	130	6 turns No. 28E	CW
40	L_A = 5 uH 26 T NO. 28E CW Q=84 @ 7 Mhz	75pF	5 turns No. 28 E	3 uH 17 turns No. 28E Q=110 @8.71 Mh	100	5 turns No. 28 E	7/16
20	2.0 uH 13 turns No. 26 E Q=113 @ 14 Mhz	39 pF	2.75 turns No. 28E	1.56 uH 13 turns No. 26 E Q=128 @15.7 Mh	43	4 turns No. 28 E	7/16

Coil forms: Cambridge Thermionic Corp. PLS5-2C4L
with 20063-B slug (1-20 Mhz type).

Figure 3. Coil winding details.

cross over about 8 dB down. At -40 dB, the ratio of bandwidths is a little over two.

Dial Details

Smooth tuning is secured by means of a 6:1 planetary reduction drive. This unit is mounted behind the panel using 7/16 inch spacers and 5/8 inch FH screws. Two flexible couplings and two pieces of 1/4 inch shafting connect the drive to the tuning condenser.

The dial is made of white Bristol board and is protected by a piece of 7 mil clear acetate. These are held in place by two 4-40 binder-head screws. The pointer assembly consists of a thin ring of brass to which the pointer is soldered. A set screw locks this assembly onto the outer or slow-speed shaft of the planetary drive.

Clockwise rotation of the tuning condenser increases its capacitance thus tuning the second detector to a lower frequency which corresponds to a higher front-end receiving frequency. In this set, the second detector tunes from 1710 to 1590 kHz resulting in a HF tuning range of 120 kHz on each band.

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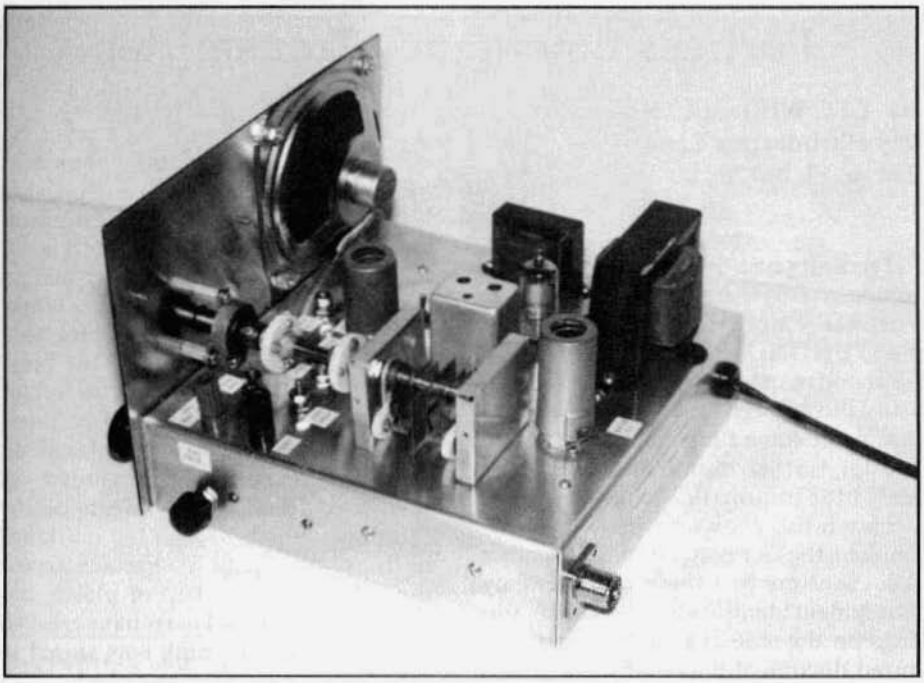

Rear view with tuning capacitor shield removed.

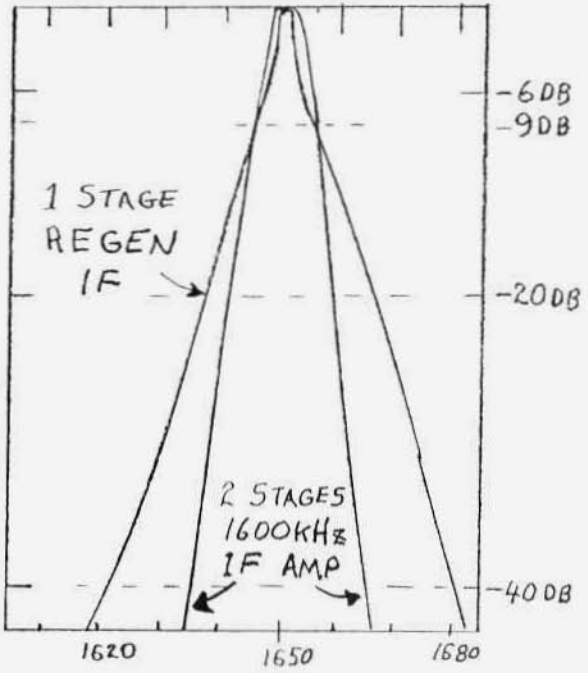

Figure 4. IF response of Super-Gainer.

Fortress Emergency Transmitter

by LTC William L. Howard
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Largo, FL 33770

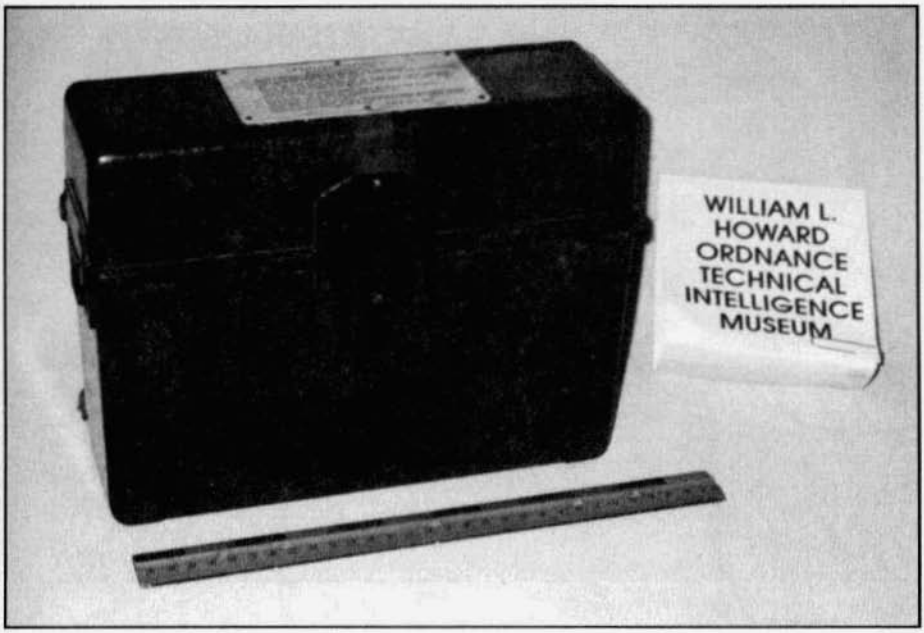
I recently had the opportunity to examine a very rare WW II radio, the Fortress Emergency Transmitter or FESTUNGNOTSENDER b. John Orahood managed to obtain the set and was kind enough to send me some photos. After some time, he sent the set to me for further examination. There is very little information available on the set but it was shown in the 1945 Handbook on the German Army. The set that John sent me had the E.E.I.S. (Enemy Equipment Identification Service) markings on the side and had several captured document tags indicating that it was captured and processed by 1st US Army. In all probability, this set is the one shown in the TM.

In 1933 the German military adopted a new field telephone, the Model 33. This set was housed in a bakelite case and was built on a removable metal frame. On the right side was a small magneto for ringing voltage, in the center was the bell and network and on the left side was a housing for the 4.5 volt DC battery for talking. The handset rests in a cradle on top. This telephone became the basis for the Fortress Emergency Transmitter. Only the case and the magneto were used.

The transmitter is constructed on a bakelite board which has the magneto mounted on the right side; the tube, variable capacitor, coils, internal key and resistors were in the center. On the left were the major components of the power supply consisting of two 2.5 mFd electrolytic capacitors in a can, a 16 mFd electrolytic capacitor, a selenium rectifier and a filament transformer. A neon bulb in the antenna circuit was mounted under a window which allowed the operator to view the neon bulb as he keyed the transmitter. A small bulb in a housing on top provided an indication that the magneto was working. There was also a socket for connecting an external keyer. Two large screw terminals were on the far left for connecting the antenna and counterpoise. The brown bakelite board on which the components are mounted was then covered with a thin white plastic top panel which had all the markings on it as well as the Wehrmach acceptance stamp. This strip of plastic did not hold up well and parts have cracked off. The magneto crank was stored in the top cover along with a clock which had been removed from this set. On the back side was a canvas pouch which held the antenna and counterpoise wires and the supplemental instruction manual. Brief instructions were also on a data plate on the top cover.

The magneto puts out 84 volts AC when cranked rapidly. This AC voltage is applied to the two 2.5 mFd capacitors in a can which in turn were connected to a selenium rectifier and to a 16 mFd capacitor. As the magneto was cranked, the capacitors were alternately charged and discharged through the rectifier circuit and to the storage capacitor. This was a voltage doubling circuit which resulted in the 84 VAC being converted to 164 VDC. The 84 VAC was also fed to a small filament transformer which stepped it down to 2.5 volts AC for the tube filament and for the indicator light.

The transmitter is a Hartley oscillator based on an RE 134 tube. The Hartley oscillator takes some of the energy in the plate coil and feeds it back through the grid coil, almost like a regenerative



The Fortress Emergency Transmitter in its case.

receiver. An interesting feature of the tank circuit is the variable capacitor. It is mounted on a bakelite board just to the left of the magneto. There is an extra set of gears on the magneto and the variable capacitor's bow tie shaped rotor, which causes the rotor to spin through the stator as the magneto is cranked. The rotor spins at a very high rate of speed. This causes the frequency to sweep through the entire range. The internal key is connected between B+ and the tube plate. The external keyer is connected across this internal key. It is labeled "Zeichengeber" which translate literally as signal giver. There may have been an automated signal device used with this set but that is not certain.

To place the set in operation, according to the data plate, first one opens the cover and screws in the magneto crank, then connects the antenna and counterpoise to the terminals on the set. Then one man holds the case steady with his left hand and cranks with his right hand. The second man then operates the key or keyer. The data plate also gives instructions for winding the clock once a week and checking the time and resetting the clock on a daily basis.

This set had serial number 5039 and a date of 39, usually indicating that it was made in 1939, however the magneto had a manufacture date of 1940 so I concluded that the b version was adopted in 1939. There must be an even earlier set but one has not been found. It may be that it was a limited production model and refinements were made and the b version was ready by 1939. With a serial number of 5039, there must be at least 5038 other sets somewhere. Since they look like a telephone, I assume that most GI souvenir hunters passed them by, thinking they were a telephone.

What I found most interesting was that after 50+ years, the tube filament was still good as was the Mazda light bulb that indicates the magneto was working. Testing the various points in the power circuits, the capacitors were still good and so was the filament trans-

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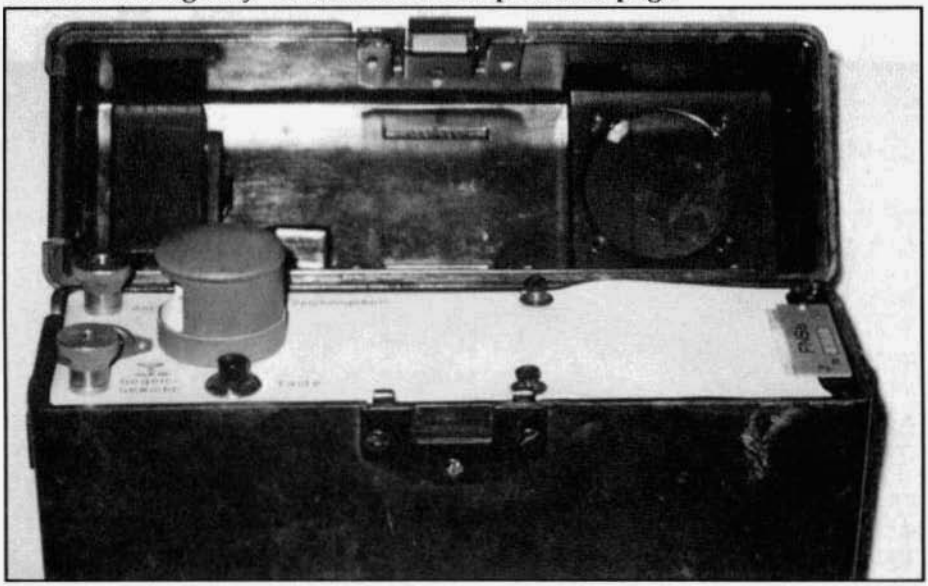
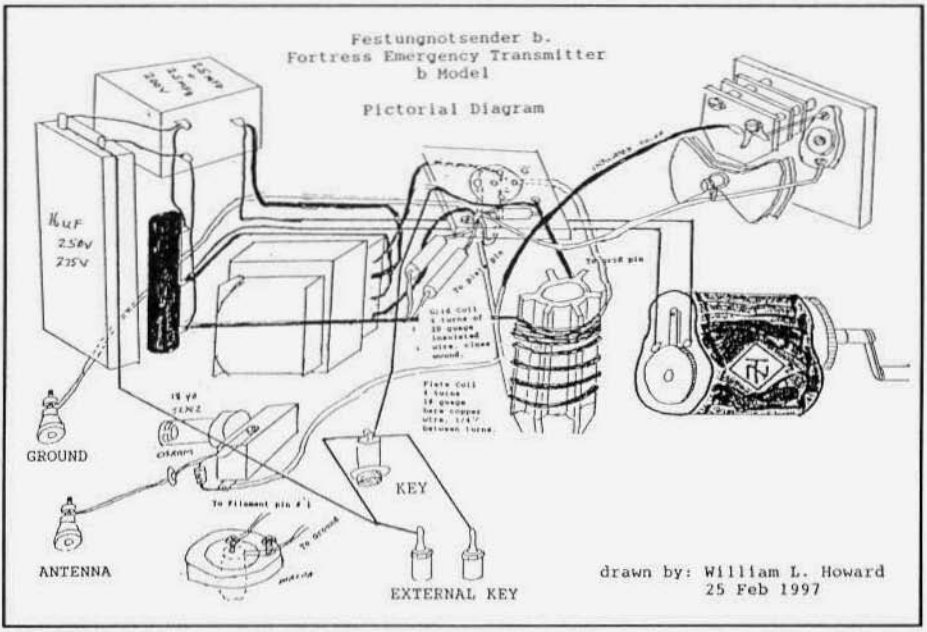
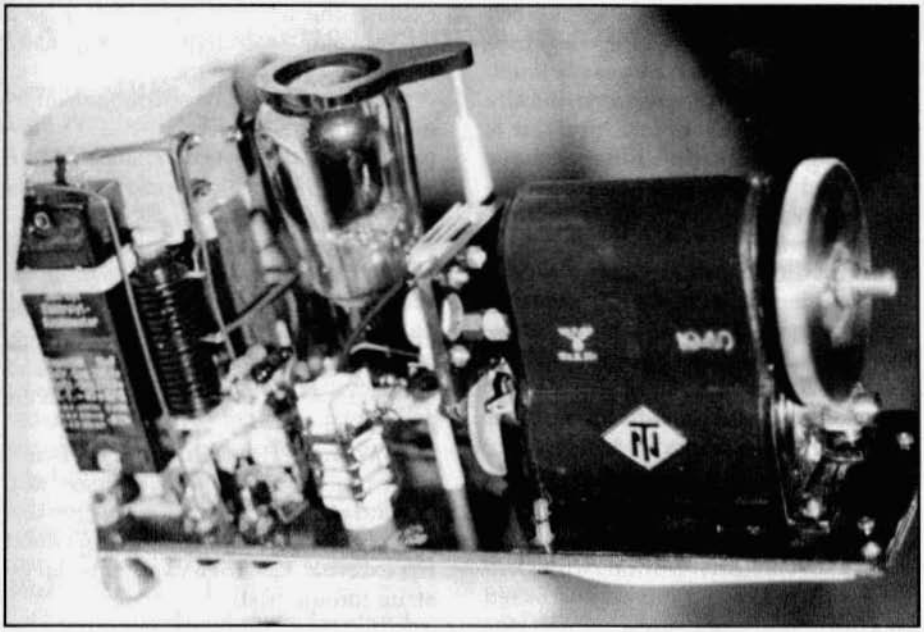
Fortress Emergency Transmitter from previous page

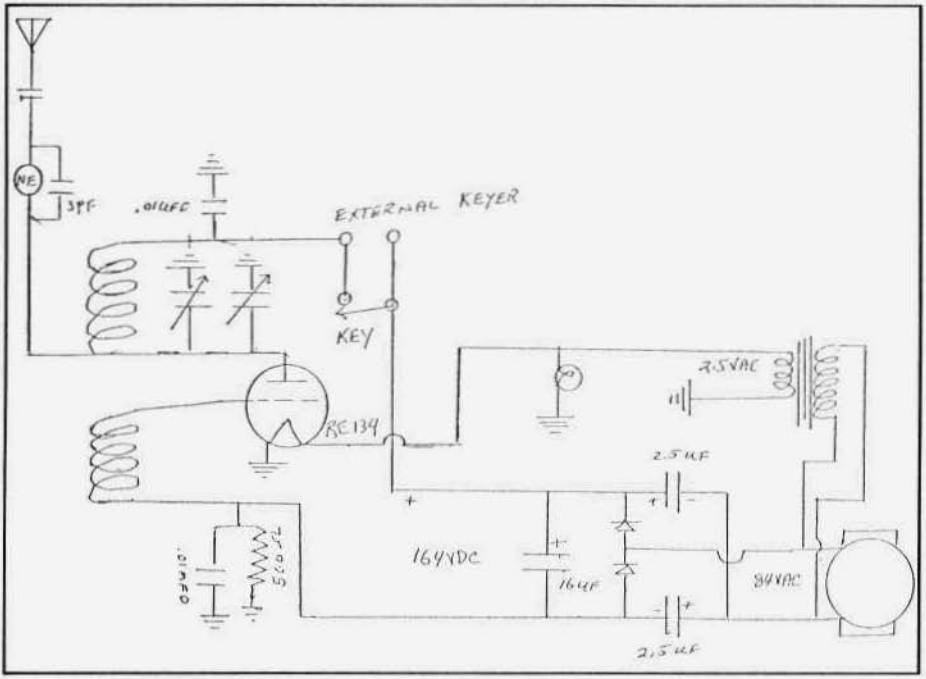


The transmitter with lid open.





The transmitter removed from its case.



Schematic diagram of the FESTUNGNOTSENDER b transmitter.

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former. The only damage to the set, other than the missing clock, was a broken resistor lead which was easily fixed.

Considering that there were literally thousands of bunkers in Europe, it is surprising that more of these sets have not turned up. Unlike most of the radios of WW II this set has little application in ham radio, which is why hams probably did not send them home in large numbers. In fact since it takes two people to operate the set, it is little more than a curiosity to be put on the shelf. The set is however a very unique application of a telephone magneto to power a radio set. As such it deserves a place in any display of WW II radios.

Method of Employment of Fortress Transmitter

After several conversations with Dennis Starks concerning this set and based upon our experience in Vietnam, it was felt that these Fortress Emergency Transmitters were probably made in several frequency ranges, which would account for the designation "b" on the set. Speculation was that "a" was one frequency range, "b" was another frequency range and so on. Until such time as other examples can be located, this will remain a matter of speculation. It would also be interesting to know what the frequency ranges were.

Dennis indicated that standard practice in Vietnam was to have outposts report at specified time. An outpost that failed to check in was then investigated as it was assumed something had happened. The same system was employed by patrols in enemy territory.

This made sense and was probably used in the WW II German defense plans. The fortress (Bunker) would check in every two hours or according to a pre-set schedule and if a bunker was not heard from, someone was sent to investigate. There may have been a pre-recorded message device for each bunker which would explain the socket for the "Zeichen Geber". It would also explain the necessity for a clock as a wrist watch was a luxury and many troops did not have them.

If anyone has any additional information on this subject, it would be appreciated if they would share it. **ER**

From data plate mounted on the top cover, a translation:

1.) Open cover, remove crank handle and screw it in place. Remove antenna and counterpoise from canvas pack and connect. (See instruction manual in the canvas pack)

2.) With the right hand turn the crank, with the left hand hold the case fast. Second man signals by pressing the key, or by using the external key. Connect the external key. (See supplemental instruction manual)

3.) Control lamp must light when the key is pressed. In case of interruption, see the instructions.

4.) Wind clock once a week. Every day set the clock using the radio time. To do this lift the watch stem on the right side and turn in the direction of the arrow.

The Enemy is listening!

Assumption: Zeichengeber is translated as external key.

HE GOT MAD AT THE GUY AND DECIDED HE DIDN'T WANT TO SEND HIM A QSL CARD, AFTER ALL.

A Modest Cosmetic Restoration Project

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With my more than casual interest in the Model 630 VOMs manufactured by the Triplett Corporation in Bluffton, Ohio, I am always on the lookout for examples of these fine instruments. Last year, I saw several of them at the Dayton Hamvention and after carefully looking over what was essentially a pretty sorry lot, I decided to give the man $10 for a 630A, specifically S/N 28277. Buying a used, fairly scruffy VOM is taking certain chance but at that price, I thought, "Oh, what the heck."

After I got it home and carefully peeled off sundry inspection and calibration stickers and making a proper pair of test leads, I found I did well for my money. All ranges worked including the X100,000 ohms range which uses a 30 volt battery. The battery was still good. There is some unbalance of the pointer but if you zero it out when it's lying down, it does its job without fail.

I called Triplett and asked what it would cost to fix the unbalance problem. Regretfully, their fee didn't coincide with the family's hobby budget and I had to do without the rebalancing. No matter.

However, luck was really with me where the scruffy front panel was concerned. While rummaging around at Purchase Radio (Ann Arbor, Mich.) several months later, I found a whole box of assorted Triplett front panels, beat up meter movements, etc. Among them was a flawless, sparkling new front panel for my treasured 630A. I knew it was new because the solder lugs on the test lead jacks had never been touched by solder. At $2.00 I couldn't go wrong.

Careful examination of the instrument quickly revealed that everything was mounted on the front panel. The biggest stumbling block turned out to be removing the 20-position range switch. When I took off the knob, I found the switch was not secured with a standard hex nut but rather a very special sort of nut. At first I thought a snap ring pliers would do the job but to no avail. More head scratching and I quickly realized that I would have to send the instrument to Triplett and have them unscrew the switch. I had one last and desperate idea. I would make my own wrench, socket or whatever it took. Some careful filing of a large brass nut made it into the special tool I needed. The special nut didn't budge. Before leaving my inner sanctum in disappointment, I decided to infuse a tiny amount of thin oil into the exposed threads.

The following night I tried again very, very carefully lest the tiny brass prongs on my homebrewed socket would break. The oil, originally intended for my model locomotives, did its job because I felt things moving. Eureka! I did it. After that, transferring the switch, the wiring, the meter movement and the ohms adjust control and making four solder joints was a piece of cake. Now, even if the pointer balancing isn't remedied yet, I have, for all practical purposes, a brand new 630A vintage 1950 or thereabouts.

Now, this may not have been in exactly the same league as restoring a piece of Collins gear, it gave me considerable pleasure and the satisfaction of completing another project. It also proves that you may find that most elusive of parts when you least expect to. ER

Letters

Dear ER

My husband, Steve Edwards, WB9QED, died in January. He was only 47, but had bravely fought every major complication of severe diabetes for 40 of those years. He wore out and let go. Steve loved ham radio and was excited to become part of the "Electric Radio" family. He became severely ill shortly after requiring his Heathkits last year. Nonetheless, I'd like to think his Spirit can ride any radio wave at any time now.

Jerri McPherson

Dear ER

I really like the idea of a vintage/AM field day held in the original spirit of Field Day.

Would like to make a couple of comments/suggestions for future Field Days (vintage). Just some thoughts, for whatever they're worth.

I think that the contest should include some "multipliers" if it could be done so without making things too complicated.

One would be for power source: 1X for AC power from a generator, 2X for battery power, including recharging system; 0X for being plugged in! Maybe 3X for anyone using a handcrank generator!!

The other multiplier would be for power level: 1X for over 200 watts, 2X for 100 to 200 watts, 3X for 25 to 100 watts, 4X for 5 to 25 watts, 5X for under 5 watts. Power to be measured as INPUT like is was measured in the golden days.

The idea of this would be an attempt to even it out between the guy with an old Forest Service SPF portable (3 watts) and the military collector running his GRC-26 with a 5 KW generator. This would level out the playing field a bit, and provide a great incentive for recapturing the original flavor of the event.

Due to my daughter's HS graduation, I can't participate this year but hope to have an AF-67 and G-66B running from the back of my 1967 Land Rover next year. I'll set up on the Continental Divide straddling the Montana/Idaho border, if the snowpack isn't too bad. Great Idea!!

George Babits, WA7HDL

Dear ER

I think McCoy's observations of Ed Tilton may be somewhat negative. I knew Ed Tilton personally from about 1965 on and found him to be one of the warmest of friends.

Perhaps McCoy didn't know how to relate to Ed as a VHF'er might have. I met Ed on numerous occasions and had him as a house guest. I was and still am, an avid VHF and microwave enthusiast and found it easy to relate to Tilton. So, from my view point I disagree with the negative comments re: Ed's personality.

Don Hilliard, WØPW

Dear ER

I wanted to express my support for the December, 1996 article by Carl, WB1EYE, on the 5 watt "cake pan" transmitter. Even though he lives two towns away from me, I do not know him. I did call him on the phone over the weekend to talk about the article, and he was very helpful. So, this is not a case of one of his "buddies" writing in support of his article. In view of the letters of complaint I have seen in OST regarding authors that sell their project, I wanted to counter the same type of letter that you might receive as ER editor. In my humble opinion, ER cannot just be a

magazine which has articles about commercially built tube type equipment. I think it is a great idea to have articles that encourage building using tube type equipment. In these days when some (including myself) may not have the time to hunt around for parts, I welcome the ability to buy a complete kit of parts (or even the finished product) from the author of the article. If someone thinks that the kit price is too high, then they can go buy the parts elsewhere. Just don't deny everyone the ability to make that choice by not publishing the article.

Keep up the fine work with ER. I will look forward to other articles that encourage building, especially the ones that Carl alluded to in his article (the N2ZAB tube type receiver; a screen modulated AM transmitter).

Dick Bean, K1HC

Dear ER

The cover picture of Feb. '97 ER, brought back memories of my days in the Navy spent at "Class A" Electronics Technician School at Treasure Island. When I took the tests at the Navy Recruiter's office I was told that I scored high enough to be guaranteed a "Class A" school prior to enlistment. At an interview in the induction station in Chicago, I said that I had been a novice amateur operator and had built my own transmitter from the ARRL Handbook - not a kit. At this point the interviewer said "C.T.M." (communications technician maintenance) and assigned me to the "Class A" Electronics Technician School at Treasure Island.

The "Class A" Electronics Technician School was twenty-six weeks long. The classes were broken up into two-week segments. We started out with DC - then advanced to AC, etc. The textbooks used, for the first part, were the famous Rider Basic Electricity and Basic Electronics Books developed by Van Valkenburgh, Nooger & Neville, Inc. For the Navy Schools I found a set at a hamfest. They are very unique and were widely advertised in QST in those days. We attended class for eight hours each day and had plenty of homework at night.

I remember when we had the class on receivers. We had to build a five tube radio. We were given one piece of solder about six inches long to do the job. To pass, the radio had to work. Someone mercifully bought some solder at a radio store. I'm glad he did, or I would still be there. We all needed more solder.

The 24th week was the class on transmitters. This would be my last class. Others, who went on to study radar, spent a couple more weeks before graduation. The classroom was large and contained a number of transmitters. One of these was almost as tall as I am. The circuit was quite complex. Our instructor told us that the frequency control contained about 49 tubes. The seven knobs set the frequency, the numbers visible through cut-outs in the panel. I sure was surprised to see the SRT-14 on the cover of ER. I did not spend any time at sea or work on any transmitters. Having seen the SRT-14, I always wondered about it. I have not seen, or heard of one since that class at Treasure Island, long ago. After graduation I received orders to proceed to Adak and was assigned to the maintenance shop at the receiver site. There I learned all about the Hammarlund SP-600 JX17.

These were the days of the cold war. The SP-600 was the receiver of choice for the US Navy and the SRT-14 stood tall in the transmitter class room at Electronics Technician School at Treasure Island. My certificate from this school is one of my most treasured possessions.

Val M. Johnson, K9GAW

The Dennison 3-Tube Superhet from page 30

Audio and Sensitivity

Audio response is flat from 200 to 1500 Hz and is down 3 dB at 150, and 2500 Hz. This is fine for a beginners CW set. I have listened to several Canadian SSB stations and their audio is fully understandable.

Sensitivity leaves nothing to be desired. Maximum loudspeaker power output is 200 mW. Ordinary comfortable listening level occurs at about 20-30 mW. The RF input levels required to give .5V across the voice coil (31.25 mW) are approx. .5 uV on all bands. These measurements were made at 700 Hz audio output beat note.

No attempt has been made to investigate the various kinds of intermodulation distortion that may exist. So far, I haven't heard anything that suggests such problems exist. I had expected to hear spurious signals on 80M because of the presence of many local high-power AM broadcast stations. Early in the design, I decided to reduce the number of turns on the 80M antenna coil to forestall such problems. It was a good decision - no spurious signals have been heard and sensitivity on 80M is all that can be used.

Power Supply

Advantage was taken of the fact that our chosen tubes work well with moderate plate voltage. This allows the use of the popular high capacitance electrolytics rated at 160 volts which helps to keep hum at a low level. Furthermore, this also reduces power requirements so that the set runs cooler and thus there is less frequency drift during warm up. Total power consumption is about 10 watts.

Conclusion

As I said at the beginning of this article, I built this set to show what form the Frank Jones Super-Gainer might have taken if built in 1997. I am well pleased with the way it turned out! ER

References:

1. RADIO FUNdamentals, Bill Orr, W6SAI. A Nifty Two-Tube Receiver, CQ, p. 66-69.

2. The RADIO Handbook, 2nd Ed., Frank C. Jones, 1936. Pub. by Pacific Radio Pub. Co., Inc. San Francisco, Calif.

3. The Simple-X Super Receiver, Byron Goodman, W1DX, p.11, QST, Dec. 58

Looking Back from page 2

have been canned. However, that scowl was enough so that was the end of long lunches!

But, the Sisson Tavern continues to this day and has become more or less famous as an eating place for grinders and pizza.

I doubt that the present day ARRL hams have any idea what great days those were for many of us-we certainly worked for peanuts but we were all very happy.

I suppose this isn't the place to mention this but what the heck-it is my column and Barry is very understanding. Some of you may have heard that I was badly injured at the Dayton Hamvention. What happened was that on Saturday, Paul Carr, N4PC and I were going out to my car and the Hamvention had put up tapes to stop cars from certain parking areas. The tapes had blown down (Dayton had bad tornadoes that weekend). I tried to step across the tapes but the wind whipped them up and I got tangled in them and down I went. I smashed the heck out of my forehead and lost a lot of blood. They took me to the hospital and it required 35 plus stitches to sew up my face. In any case, I was a mess but managed to get home.

So when you see me I will look like a punch drunk boxer with all the scars-but, I am feeling fair now.

I sure hope you people like reading all these recollections - I really enjoy writing about those days. W1ICP

The HA-1 from page 11

Rare, but not unobtainable

I find fewer and fewer HA-1 ads these days, but every now and then one pops up in the ER classified section. Prices vary according to condition, of course, but the average is about $50. I paid about $35 for mine, and it arrived in nice physical condition but without the promised manual copy. It worked, upon delivery, but was acting "schizoid" in terms of speed and code element stability. So, naturally, I had to open it up and have a look.

There were a couple of electrolytics inside that looked suspect, so I swapped them out for some fresh equivalents. The problems vanished, and the unit has worked like new ever since.

I have my HA-1 set up with my Viking Ranger and HQ-170 (see photo) and use it with a Vibroplex keyer paddle (the one with the brass hardware and polished wooden base). The sidetone sounds like a neon-lamp-type oscillator, but it's not objectionable. For those hollow-state gear operators that still like to work CW, the HA-1 is a way to send perfect dots and dashes without having to resort to a solid-state solution. **ER**

IS THERE A SWAP MEET IN FRONT OF ME? I LOST MY DF LOOP ABOUT A HALF-MILE BACK

HFS Receiver from page 7

and marketing. National Company engineers endorsed enthusiastically the HFS as the most versatile communications receiver ever produced. To operate the HFS is to demonstrate how the reputation of a distinguished company can be tarnished when its engineers rush a receiver into production sans extended research.

Where was James Millen, former chief engineer at National, when the engineers for the HFS needed him? Unfortunately, he had left the company nearly a decade earlier. Had Millen remained at National, perhaps his systematic approach to receiver development would have eventually established the HFS as a worthy successor to the One-Ten. **ER**

References

Advertisement. (1948a, April). QST, XXXII, Cover III.

Advertisement. (1948b, April). QST XXXII, p. 73.

Advertisement, (1948c, July). CQ IV, p. 51.

Advertisement. (1948d, August). CQ , IV, p. 53.

Advertisement. (1949, April). CQ , V, p. 78.

Brannin, J.W. (1941, December). An experimental 112-Mc. receiver. QST XXV, 36-38, 78, 80.

Grinder, R. E. (1997, May). The National One-Ten: James Millen's contribution to exploration of the ultra-high frequencies. Electric Radio, #97, 20-25.

Hull, R. A. (1935, November). A new receiving system for the ultra-high frequencies. QST, XIX, 10-14, 100, 102.

Hyder, H. R. (1949, July). A modern mobile transceiver. Radio News , XLII, 41-44, 104-107

(1) Footnote

A brief version of this paper was printed in the California Antique Radio Gazette , vol. 15, May, 1990.

The Cosmosphones - Part One from page 15
membership with borrowed rigs. A few were involved with the development or promotion of the Cosmophone. Bob's record of serial numbers was not totally accurate nor complete, but there appeared to be twenty-eight radios within the society. Of them, I already had three.

A valiant effort was made to contact each member, again using the callbook, and later, the SAM database. Many calls and names were not listed. If they were, I attempted to get a phone number through information. If I didn't succeed, I sent letters to addresses from the society record or the callbook. Although many were returned as undeliverable and others were unanswered, I was successful in contacting just over one-third of the list.

Results

During my research, I was shocked to learn of three Cosmophones that had been destroyed. This news was so disconcerting to me that I vowed to buy any Cosmophones I could. Although my decision could be costly, if I owned them at least they would be cared for. I would learn later, from several conversations with boatanchor enthusiasts, that I could easily find protective homes for any Cosmophones I purchased.

Six of the society members I located still had their Cosmophones and they weren't using them. Most were at the point in their lives of reducing possessions. Some commended me for the project I had undertaken. Others perhaps figured they had a bonafide nut on the other end of the phone ("Why would anyone want one of those old things?") and the best way to get rid of him was to say, "Yes."

The net result was convincing all of them that their rigs should be in my care.

Aside from those Cosmophones belonging to society members, I found several others by advertising and doing a lot of networking. Some of them I was able to purchase. My research would eventually confirm that only 100 units were built.

At this time, I have verified the existence of twenty Cosmophones and I am following up on rumors of two more. Of the twenty, I own thirteen. Only a few of them were obtained easily. The rest took considerable time and effort - not to mention funds.

When I wasn't busy gathering Cosmophones, I was active putting the bits and pieces of their history together. Here again, I was successful. Much of what I learned will be included in Part Two and Part Three, which will focus on the Cosmophone 35 and Cosmophone 1000, respectively. Stay tuned. ER

Special Event Scheduled for August, 1997

August 16-17, Second Annual Edgar F. Johnson Memorial Special Event Station WAØCJU/9ALD hosted by Waseca High School, Waseca, MN, home of E.F. Johnson Co. Qualified licensed amateurs may operate vintage Johnson rigs and receive Operator Certificates. Special QSLs returned for verified contacts. Hours of operation 1300Z thru 0200Z both days, three modes: AM on 3885, 7290, 14286, 21400, 29000; SSB on 3900, 7260, 14250, 21350, 28400; and CW on 3700, 7125, 14050, 21150, 28050 kHz. Tailgate fleamarket Saturday 8 am thru 9 pm CST, and VE testing starts at 10 AM. Talk-in 146.940 (-). Contact Ed Writz, KØBKA, (507) 835-3665.

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WANTED: T368 xmtr. Chuck, W9UB, WI, (414) 679-1721, w9ub@aol.com

WANTED: Hallicrafters SX-18 Sky Challenger II. Charlie Solie, WB5LHV, 1409 Jeanie Ct., Las Cruces, NM 88005. (505) 526-5778

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WANTED: Need S-meter to complete full restoration of Hallicrafters SX-99. Appreciate any assistance w/replacement or repair of mine. Thanks. Richard D. Cohen, 11802 Willow Point Way, Tampa, FL 33624. (813) 962-2460 after 6 PM EST

WANTED: Heath DX-100 construction/instruction manual. Will pay (through the nose if necessary) top dollar or for duplication, prefer orig. Please help! Tom Thomson, KB9IFT, 315 Welhouse Dr., Kimberly, WI 54136. (414) 734-1068.

WANTED: Manual for R105A/ARR-15 rcvr, photo copy OK. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Manual or schematic for ASB-7 xmtr & CPR46ACJ rcvr, orig or copy. Rich, K9RLF, 1140 S. Taylor, Oak Park, IL 60304. (708) 383-4579

WANTED: Linear amplifier 100 watt or larger for legal use in ISM device; antenna tuner w/dummy load, similar to MFJ model 949E or consider what you have to offer. Ellsworth O. Johnson, ex (W7QGX), 364 S. Coeur d' Alene St., Spokane, WA 99204-1063. Phone/fax (509) 838-2161

WANTED: Specific pre-1923 issues of QST magazine for my personal collection. Eddy Swynar, VE3CUI, 3773 Concession Rd 3 RR 8, Newcastle, Ont. L1B 1L9. Canada

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: Gonset DC pwr sply model 3350 for a G76, must be in working condx. Don Hilliard, W0PW, 8630 Nighthawk Rd., Neosho, MO 64850. (417) 451-5892

WANTED: Heath HX-10 & orig manuals for SB-100, HP-23, Warrior, Apache & Mohawk. Sandy Gerli, AC1Y, 500 Country Club Rd., Avon, CT 06001. (860) 675-5566

WANTED: GF12 aircraft xmtr CW52063A & coil sets CW47135, CW47137, CW47138. Prefer orig unmodified condx good. WØBVA, 305 N. Keith St., Scammon, KS 66773. (316) 479-2756

WANTED: CB radio equip. I am looking for all types of old/vintage CB radio, amps, manuals, magazines, mics etc. Walter, CA, (818) 297-7249

WANTED: Collins 312A-1 spkr; 312A-2 console; 516F-1 pwr sply; 312B-2 console; SM-1,2,3 mics; RE 325-3A; Hallicrafters HT-30, HT 32-B, SX-115 w/spkr; Hammarland HQ-180/180A w/spkr; Central Electronics 100V & 200V; Johnson Pacemaker; Viking 500 & Invader 2000; WRL Globe Champ 300A; Heath Mohawk & AK-5 spkr. Top prices paid for quality units. Private collector. Dennis, KC7VXD, ID, (800) 456-9296, leesh@ix.netcom.com

WANTED: EV 605/905/638/641, Hi-Z; Shure 545/707A/520/440, Hi-impedance; R7/R45/R5/R55 elements; mic parts & connectors. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225, Fax 328-4217. 74053.3164@compuserve.com

WANTED: Hallicrafters SX-88, SX115, R-46; Collins complete xtal pack; rack mounts for S-line, 312B5, KWS-1, KW-1 & 516F2. John, W1TX, VT, (802) 775-6732 eves. w1txjohn@aol.com

WANTED: Heath AC1 coupler; HW16; HR1680; HX1681; PS23. Bud, K5IUO, 3201 Adrian Ct., Arlington, TX 76016. (817) 457-0904, nrjd84d@prodigy.com

WANTED: Early Collins radio equip., accessories, promotional items, unbuilt xmtr kits; Vibroplex Zephyr. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (412) 758-2688

FOR SALE: Transmitter, audio, industrial tubes. Dee, W4PNT, 534 W. Main St., Waynesboro, VA 24431. (540) 249-3161, Fax 249-5064, http://home.rica.net/soundnmind/

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: (2) RT18/ARC1, 1 OK, 1 parts - $35; RT19/ARC4 - $35; (1) T67/ARC3 - $25; (1) T23/ARC5 - $25; (1) BC659 RX/TX w/pwr sply - $40; (1) BC639 VHF/RX w/pwr sply - $35; (1) BN RX/TX - $30; 2 sets dynmtrs for ARC 3 - $25 ea. All in good condx, most w/schematics & xtals, shpg extra. Peter Malsch, DJ8UI/WØ, 9979 S. Cottoncreek Dr., Highlands Ranch, CO 80126. (303) 470-9968.

FOR SALE: Untested Riders Chanalyst w/copied manual & 2 test leads - $55 + shpg. L. Schimmel, POB 1234, Spanaway, WA 98387.

FOR SALE: Heath Ham Radio Collectors Guide - $20 + $2.65 s/h; Heath SB-650 - $100; Heath HR-10 rcvr - $65; 10B - $70; Hallicrafters HT-37 - $75; Heath micro processor training course - $40; **WANTED:** Top cover for Heath HW-101, must be mint. Marty, NJ, (609) 466-4519.

FOR SALE: Viking Ranger, good condx - $175; Heath Warrior amp, exc condx - $250; Drake MN2000 antenna tuner, exc condx - $150. Bob, W7ZSB, UT, (801) 943-7721.

FOR SALE: RME VHF-152 converter & DB-22A, both VG condx. w/tables & manuals - BO or trade for a Multi-Elmac AF-67 w/ps in VG condx. Richard, W1SUJ, 2447 Yates Dr., Augusta, GA 30906. (706) 798-7279

FOR SALE/TRADE: Mod 28 TTY RO, parts NIB. Dave McClure, KB4AI, 2531 Garrisonville Rd., Stafford, VA 22554. (540) 752-0760

FOR SALE: Fil xfmr 5V CT, 120 PRI, 16 amp, new - $35. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: Drake RV-4C late SN, brass gears, VF - $150 ship. Earl, K5FTE, TX, (915) 592-9185.

FOR SALE: Frequency meter TS186, 1-10 GHZ - $95; VTVM TS375A/U - $35; Collins 51J - $195; dynmtr DM 21 for BC312 - $35. Van Field, W2OQL17 Inwood Rd., Center Moriches, NY 11934. (516) 878-1991, Fax 878-5528

FOR SALE: New Collins 500 kHz filters 2.75 kHz wide, plugs into 51J-4 for extra 12 dB gain - $125. Walter M. Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

FOR SALE: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: (3) Hallicrafters HT-32's, all exc mechanically - $500; Collins 75A1 - $600; 75A3 - $600. WA9IYF, IN, (812) 273-5379

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, WAØAKG, NE, (402) 464-8682.

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

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: National parts, TMC10ØD dual capacitor; XR13 coil forms; PB5 plugs & XB5 sockets. Wayne, NØTE, 1212 17th Rd. NW, New Strawn, KS 66839. (316) 364-5353

WANTED: Schematic for Dow Key DKC-TRP TR switch; Meissner 14-1412 oscillator coil. A.J. Bernard, POB 690098, Orlanda, FL 32869-0098. (407) 351-5536

WANTED: NC-183 manual & main tuning knobs; Heath MT-1 Cheyenne manual. James R. Shank, W3CNS, 21 Terrace Ln., Elizabethtown, PA 17022. (717) 367-3149

WANTED: B&W phase shift network module 2Q4. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: Huge Navy equipment: shipboard & shore radio, radar, & sonar, mint thru junkers. William Donzelli, 3045 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, 55G1, 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. gregfzh@aol.com

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 625-1; 399C-1; 515-1; 302C-3; KWM-1; KWM-380; also buy estates. Leo, KJ6HI, CA, Ph/Fax (310) 670-6969.

WANTED: Desperately need schematic & manual for RF amp mfd. 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: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: WW II Japanese military radios of any kind; pre-war Japanese QSL cards. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, 246 Japan. Fx 011-8145-301-8069. taka-doi@kk.iij4u.or.jp

WANTED: S-Meter for Collins 75A-1 or any 75A series, or HRO-5, NC-200/240. Gary, W7FG, OK, 800-807-6146 eves only

WANTED: SX-73 dials & bezel of good photo copy of same. Don Gibson, 35 Ouzel Way, Reno, NV 89506. (702) 677-9321

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-50065. 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 commercially built ham gear. Dean Showalter, WA6PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

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: 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: B&W 5100B schematic, will cover costs. Earl, TX, (915) 592-9185, collect.

WANTED: For Star SR700A rcvr: manual &/or schematic, spkr, other Star rcvrs. Harry Blesy, N9CQX, 95740 Clarendon Hills Rd., Hinsdale, IL 60521. (630) 789-1793

WANTED: ID plates for RAL rcvr, BC611; need schematic for TCS 15; AC sply, CKP20309. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625-1233. (716) 671-0776

WANTED: Swan NS-1 noise silencer; junker Hallicrafters SR42A two meter xcvr, need meter. Al Norton, K7IEY, 1008 Liberty St., Lynden, WA 98264. (360) 354-4622

WANTED: Good, working, S-meter for Hallicrafters SX-28A rcvr. John, W3QCL, PA, (412) 274-4734.

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. capallen@frontier.net

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; Hamunarlund SP600-JX21A; TMC GPR-92. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Tube charts for the Superior Instruments model TC-55 tube checker; manual for the Heathkit model CR-1 xtal radio, photocopies are fine. Michael Runyan, KK7F, 1117 S. Fiske, Spokane, WA 99202.

WANTED: Drake 7 & 4 line equip.; back issues of ER. Dave Siegel, KF8ID, 41537 Sunnydale, Northville, MI 48167-2046. (313) 420-2612. dts@oeonline.com

WANTED: Gonset G-76 xcvr, good working condx. Ron, WØOIZ, KS, (913) 268-5973. arongv@aol.com

WANTED: Hallicrafters HT-32B, mint. Rich, K1MD, RI, (401) 732-4026, eves

WANTED: Pwr sply or xfmr for Collins 516F-2 for KWM2A. Frank Bridges, R1, Brevard, NC 28712. (704) 885-2470 eves.

WANTED: Drake C-4 station control in exc or better condx. Jeffrey Hopkins, WA2DPK, 2482 Remington Rd., Elizabeth, CO 80107. (303) 646-0139

WANTED: National pwr splys: spkrs, coils & parts. Sorry if I didn't get back to you yet or missed your call but I've had a 'won't quit' cold. I still love National. Sylvia K. Thompson, N1WVJ, 33 Lawton-Foster Rd., Hopkinton, RI 02833. (401) 377-4912

The Radio Finder©

11803 Priscilla, Plymouth, MI 48170
TEL/FAX 313-454-1890
e-mail: thurtelljh@aol.com

June Specials:

AMATEUR RECEIVERS: COLLINS 75A-4; 75A-3; 75A-2; 75A-1; 51J-4; R-388; 75S-3B; 75S-3; 270-G-2/3 speakers; **DRAKE** R-7; **HALLICRAFTERS** SX-88; SX-73; SX-101A; SX-17; S-40B; R46/R46B speakers; **HAMMARLUND** SP-200; SP-600; HQ-170; **NATIONAL** HRO-500; HRO-60; NC-300; early 1935 HRO, complete; NC-183; National speaker; Scott SLR-F.

MILITARY RECEIVERS: R-390; R-390-A; Miltronix R-725, R-389, R-390, R-390-A; complete R-391; R-392; FRR-59A; R-1051B, R-1051E; CEI 354; **WATKINS-JOHNSON** DMS 105A.

TRANSMITTERS: T-368-F; **JOHNSON** Desk KW; Invader 2000; Valiant; Thunderbolt; **COLLINS** KWS-1K; 32S-3; 32S-1; 30L-1 amp; 516F-2 AC; **HEATH** DX-100; **CENTRAL** 100-V; 200-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; **HALLICRAFTERS** SR-150; **HEATH** HW-100; SB-100; HW-16; Twoer; **NATIONAL** NCX-1000; **SBE** SB-34; **YAESU** FT-101-EE complete line w/FL-2100B amp, remote VFO, monitor, Landliner, digital readout.

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: NIB 4-125A's - $100; RCA 811 - $15; Eimac 4CX250B - $95; 250TL's - $75. Frank S. Law, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415

FOR SALE: 14-volt to 28-volt, 20 amps, rotary converter; Carter BSX2820PV dynmtr, mint, very few hours, orig box, w/control box & starting relay, ready to run - $200. A heavyweight, 47 lbs, PU or you ship. John von Sneidern, K2GTY, 125 Bennett St., Fairfield, CT 06432. (203) 374-1800.

FOR SALE: Knight Kit T60 w/manual, nice - $75; 14 issues of QST from 10/23 to 6/28, individually wrapped in plastic - $100; instuction manual for Drake TR-4 - $8; 5 volumnes of Navy Electronics Course - $12; Army Technical manuals, Channel Alignment Indicator (TM11-5059) & Generator Set (TM5-5263), both - $10. + shpg. Dave Mantor, W9OCM, POB 1, Fairmount, IN 46928-0001. (765) 948-3014

FOR SALE: Hallicrafters HT37, SX101A, R47, Dow Key, D104, manuals, G-esc, prefer PU - $350 for all. Ken Poe, KB9JUM, 484 Moccasin Rd., Greenwood, IN 46142. (317) 882-8193

FOR SALE: Zenith Transoceanics H-500 - $75; Royal 1000D - $60; Lampkin freq. meter - $20; Heath AR-3 - $50. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383. celliott144@aol.com

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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: 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: Collins orig 50th year book; 32V-2, 651S-1, 750 IC's circuit boards; Hammarlund Comet Pro; Fisher 800C rcvr. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933.

FOR SALE: Collins 75A-4 & S-line filters; CP-1 xtal pack & 312R-4 spkr/control. Bill Mills, KC5PF,GA, (912) 452-2957 after 7 PM EST. wmills@gmc.cc.ga.us

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FOR SALE: Johnson Viking II xmtr w/manual - $275; SX28 rcvr, working, w/manual – $275; National 303 rcvr, spkr, calibrator, working, clean w/manual - $350. Stuart T. Carter II, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904-1995. (407) 727-3015

FOR SALE/TRADE: RCA military shipboard spkr 17" Dia. w/line xfmr, 35lbs -$35 + shpg. **WANTED:** HRO coils. R. Haworth, 112 Tilford Rd., Somerdale, NJ 08083. (609) 783-4175

FOR SALE: Hallicrafters SX-111 amateur bands parts unit - $45. Frank, KS, (316) 856-3220.

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: Hallicrafters SX110 SW rcvr - $75 + shpg. Frank, KS, (316) 856-3220.

FOR SALE: Morrow Conelrad CM-1 works great; RME MC55 80/10 converter untested - $20 ea + shpg. H. Mohr, 1005 Wyoming, Allentown, PA 18103.

FOR SALE: Eldico TR-75TV xmtr, nice shape - $110; Harvey Wells Bandmaster Deluxe w/ matching VFO, good looking, orig - $195; National RAS, 7 coils, working badly, no pwr sply - $175; SCR-284 (BC-654) w/vehicle mount & most accessories - call or e-mail; BC-654 w/electrical mod, nice looking - $270. Don, N3RHT, PA, (412) 234-8819, EDST weekdays. 71333.1446@compuserve .com

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FOR SALE: Heath SB200, manual, exc-mint - $315; DX60, HR10, HG10B, manuals, G - $160; prefer PU. Roger Lowary, W9BZ, 465 Lacy Dr., Greenwood, IN 46142. (317) 881-7466, lr-j@juno.com

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FOR SALE: ESPEY581; BC-728-A; DM21CX; BC306A antenna tuning unit; TCS-14 antenna loading coil; AN/URC-4 manual; Gonset Comm. II; Eimac AF67/PMR7 & pwr splys; HQ150, exc; KWM2A. PU only, will be at Flagstaff hamfest. George Shute, W4BDG, 2910 Virginia St. NE, Albuquerque, NM 87110. (505) 298-7347

FOR SALE: Dynamotors: DM34D, PS225, CW21215A; tubes: 304TL, 810, 829, 814, 803. Howard Hood, 5670 SW 44th St., Port Orchard, WA 98367. (360) 674-2179

FOR SALE: Large WW II military catalog #11, will be out this fall. Check future ads. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: Hallicrafters HT-37, manual copy - $80; Drake R4B, manual copy - $150; Mark S. Rauber, POB 1077, Minden, NV 89423. (702) 782-3596

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: AC instructograph, no tapes, good shape - $25 + $7 shpg. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699

FOR TRADE: Heath HG-10B VFO w/complete manual for Knight VFO or T-60. Robert Polhamus, 1107 2nd Ave. Apt 608, Redwood City, CA 94063-4041. (415) 367-1660

FOR SALE: Collins mechanical filter F-455 2.1 kHz 526 9427 00 - $65; National HRO5 rcvr, rack mount - $130; Military 19 set, Mark 3, very clean, running - $200; Heath HD10 keyer - $35; HD15 patch - $35; HM102 SWR/PWR meter - $30; AM2 SWR bridge - $25. Larry, VE3RF, Box 509, Ayr, Ont N0B 1E0, Canada. (519) 632-7921 eves

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FOR SALE: Radio Magazines, 1936 to 1942 issues. Chronicles ham radio's 'Golden Age'; homebrew rigs, reports of first efforts to achieve DXCC & WAZ's beginning. Dan Knipe, W7IGE, 3750 Highgrove Ln., Nampa, ID 83687. (208) 888-9575

FOR SALE: GPR-90 - BO over $300; excellent Hammarlund HQ-150 w/calibrator - $250; Johnson Adventurer - $70; Heath AC-1 antenna tuner - BO over $90; PMR6A rcvr - $50; mint Conar 400 xmtr - $60; National xtal calibrator for HRO-50, 60 - $70; Eico 722 VFO manual - $10. Shpg extra. All w/ manuals. **WANTED:** SX-115; Johnson Navigator. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881.

FOR SALE: SX-99 - $100; SX-111 - $165; HQ170AC - $195; Ameco TX-86 - $95; Johnson SWR - $75; Knight VFO - $60. New list, free. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (201) 728-2454

FOR SALE: Eimac copies: Build Your Own Transmitter Guide plus 45 more pgs of 1947-1954 Eimac tech bulletins by John Reinartz, K6BJ, photocopy set - $8.50 including postage; magazines: (some complete years, mostly single issues, all around - $1.50 per issue): QST 1934-1969; CQ 1948-1972; Radio News 1933-1951; Radio Craft 1933-1947; Ham Radio Vol 1#1(1968)-Vol 9, complete - $150; 73 Magazine Vol 1#1(1960)-1975 complete, under $20/yr except early yrs, ARRL Handbooks, 1933: $48; 1934 (water damage) - $24; 1940 - $28; 1942 - $28; 1943: $24; 1945 - $23; 1953 - $25; 1956 - $25; 1968 - $18; 1971 - $6; 1978 - $8; much more. Send 2-stamp LSASE or e-mail for list. Don, N3RHT, 47 Hazel Dr., Mt. Lebanon, PA 15228. 71333.1446@compuserve.com. No calls on literature please.

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FOR SALE: Globe/WRL extremely stable V-10 VFO - $85. **WANTED:** Gonset G-76 xcvr. Ron, WØOIZ, KS, (913) 268-5973. arongv@aol.com

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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: Globe King 400B restored w/80 & 40 meter coil sets - $700 + $125 for spare V70D's; Drake R-4B - $150; Lafayette 750 6-meter AM - $60; Siltronix 1011C w/parts rig - $110; BC-348 modified 115 VAC & panadapter - $175 for both. John, NC, (910) 686-4236. ae4en@aol.com

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FOR SALE: National NCL-2000 - one owner in near mint condx - $650, plus shpg. Charles J. Stinger, W8CFA, 404 Ross Ave., Hamilton, OH 45013. (513) 867-0079

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FOR SALE: Hallicrafters SX-17 Super Skyrider exc condx, w/manual; Heath Mohican, vg condx. Robert (815) 226-6123 or rbtr@snds.com

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

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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: 6AZ8 tubes for KWM-2's, NIB - $3.50; 4D32's (32V), NIB - $29. Lowell, K6KC, CA, (209) 227-1605.

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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: Harris HFL1000, SG70exciter, manuals - $1500; lots more gear. V. Vogt, 330 SW 43rd St. #247, Renton, WA 98055. (206) 382-5571

FOR SALE: Have dozens of meters for military radio equip, send wants & SASE for reply. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

FOR SALE: Over 700 military radio equip TOs (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: Kenwood TS 520, manual, exc. - $250 shpd. Jim, KB0WVL, ND, (701) 852-4809.

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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 or TRADE: BC-654-$250; R-105A, ARR-15 - $125; R-100 - $90; BC-456, ARC-5 modulator - $85. John Richardson, KBØUPL, 1163 Highland Place Dubuque, IA 52001. kbØupl@aol.com

FOR SALE: Fiberglass rods, 5/8" dia., 13' long, UV resistant, good standoff insulators, twinlead spreaders, ten ppd - $10. Ron, K5YNR, NM, (505) 327-5646.

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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: Three Collins ART-13's, most accessories, BC-348R w/shockmount - make offer, PU only. John P. Tiedeck, WA2SDE, 212 Grandview Rd., Media, PA 19063. (610) 566-8049

FOR SALE: Ancient RCA tester, 100-1000 kc Piezo-Electric calibrator, 955 tube - $30 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

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FOR SALE: Swan 400E & 400C - $75 ea; Siltronix model 80, looks like Swan VFO - $20; Johnson 223, very good - $50; Lafayette Comstat 25A - $30 + UPS. Mervyn Ellsworth, 2309 N. 25th St., Boise, ID 83702. (208) 345-6878

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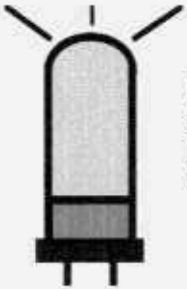

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