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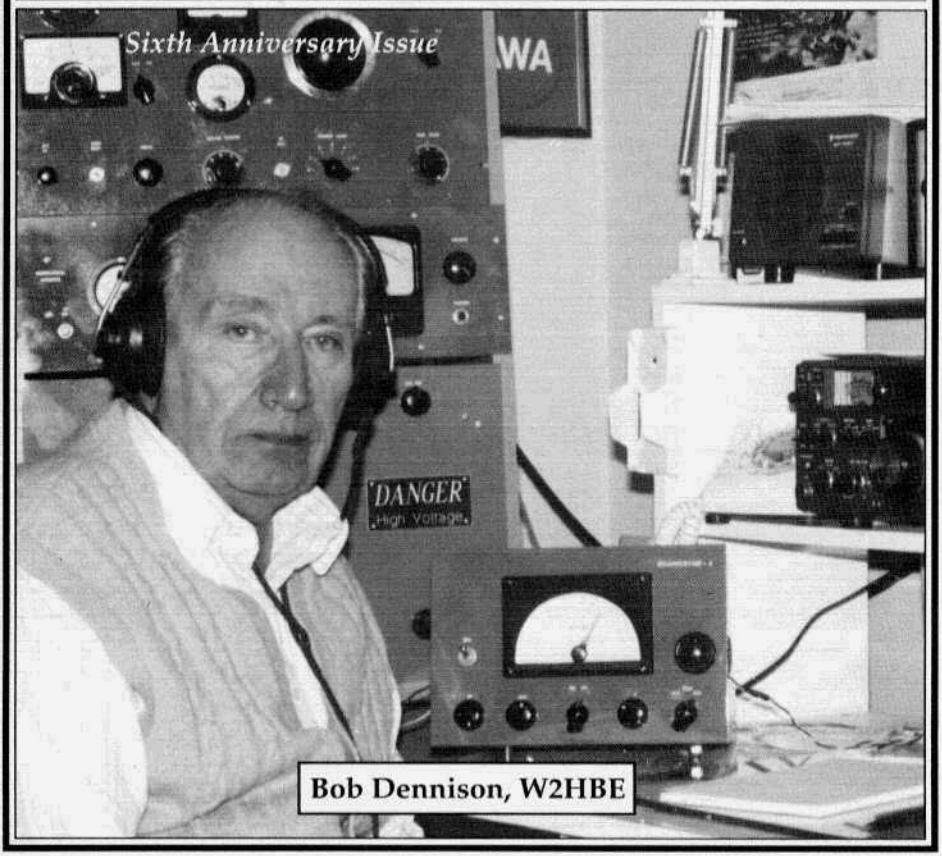
ELECTRIC RADIO

celebrating a bygone era

Number 72 April 1995



Bob Dennison, W2HBE

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; John Staples, W6BM; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Jim Musgrove, K5BZH; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Dick Houston, WØPK; Andy Howard, WA4KCY; Skip Green, K7YOO; George Maier, KU1R; Albert Roehm, W2OBJ; Mike O'Brien, NØNLQ, Steve Thomason, WB4IJN; Don Meadows, N6DM; Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS

Paul Maikranz, KB2MUQ, might be the first AM'er to achieve WAS-AM. Recently we received cards confirming his first 25 states. He is the first to send us cards for an endorsement toward WAS-AM. Our congratulations go out to Paul. Here's the list of stations he worked for his first 25 states: W1AW, W8VYZ, WB1EYE, WC1X, WB3HUZ, K6HQI, KC4CFE, W2IQ, WA2AXT, K8TFD, W8VUR, KE3KB, WA4WRJ, KQ4UN, KW11, K3JLY, N2UAJ, W9BZ, K9RJ, W1VZR, N3DAN, K4CUI, KØBS, WB9YWQ and N2SIB. All but two of his contacts (K6HQI and KC4CFE on 20 meters) were made on 160, 80 or 40 meters and all the states he's worked, except for Calif., are on the east coast. Paul was hoping that the ER 15 Meter Contest on April 1 and 2 would provide some west coast states but as we all know the band was very dead that weekend. We'll reschedule that contest some time in the future.

It has been suggested to me by a number of vintage/AM'ers/collectors that I mention 147.51 as a possible national 2 meter simplex frequency for our group. On the west coast this frequency has been in use by AM'ers at hamfests for some time. Maybe at Dayton this year those of you who carry 2 meter gear can coordinate on this frequency.

Speaking of Dayton I'd like to remind everyone again that Shirley and I will be there at Booth 316, the same booth we had last year, celebrating our sixth anniversary. We will have all of our "ER Store" stuff out there again - back issues, books, compendiums, T-shirts, hats, etc. - at slightly reduced prices. We invite everyone to drop by and say hello. **N6CSW/Ø**

Please note that our area code has changed from 303 to 970 effective immediately.

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Cover: Bob Dennison, W2HBE, frequent ER contributor, at his operating position. In this issue see his construction article, "The Electric Radio Pal".

LETTERS

Dear ER

This may be a bit hard to believe so close to April 1st, but Western Electric's manufacturing and export division, Westrex, has begun the manufacture of their famed 300B triode tube in response to a high demand for them by audio equipment manufacturers. The start up of their tube lines is just a beginning - they plan the manufacture of a number of audio tubes over the next several years including audio workhorses such as the KT-88 power pentodes and a number of rectifiers.

WECO has prevailed on the services of several former tube engineers in their employ as well as internationally renowned Bell Labs scientists William Nutt and John Plewes in their development of this entirely new product line. The tubes will be produced in the USA from original Western Electric tooling, materials, engineering specs and manufacturing processes. The tubes will be boxed in the classic WECO manner in boxes marked with the old "flash" logo and will be subject to the same quality controls as the original WECO tubes of years ago.

These "WECO, The Next Generation" tubes will, of course, not be sold at giveaway prices - even in the heyday of vacuum tubes, they were never cheap, but they were a bargain when one considers the famed reliability and extremely long service life of a genuine Western Electric tube. It will certainly be great to have an option to buying the often inferior off-shore produced power tubes we have to buy today at what I consider to be ripoff pricing! (I wonder about paying what is probably 3 months' wages in China for one of their 6146s - someone is making an awful lot of money somewhere. . .) The WESTREX tubes will be sold through dealers and OEMs only - don't call them with your VISA card number. In any event, the new 300Bs will be available through distributors summer of 1995. Hooray!

For further details you can contact:
Western Electric
Westrex Corporation
AT&T Promenade II
1230 Peachtree St.
Atlanta, GA 30309-3575
404-874-4415 (FAX)

Thanks to Joe Roberts and *Sound Practices* magazine for this information.
Bill Kleronomos, KDØHG

Dear ER

Shortly after my experience with the January 1995 T-368 modifications I've had some component deaths whose solutions might be useful for T-368 owners.

1. The speech amplifier driver transformer finally opened up after many months of intermittent behavior. Fair Radio had no spares so. . .called Antique Electronic Supply and gave part no. PT-20A14 a try. Weighing in at $17.95 and three times the physical size of the original it deserved consideration. Guess what? It works better than the original transformer without any shielding (original was potted in tar in a heavy metal cylinder)! I mounted it without drilling any holes, using washers and nuts only over the round hole of the original.

2. One 4 uF, 4500 V filter cap opened up. Fair Radio has 35 uF 4500 V GE capacitors in exactly the same form factor as the original T-368 parts. The original mounting brackets work perfectly. I can now fully modulate 600+ watts without any plate current dips on voice peaks - into a dummy load of course!
Randy Best, WA7CPA

AM International Update

by Dale Gagnon, KW1I, President

Northeast Region Report - WB3HUZ

There has been plenty of AM activity on 160 meters this winter. Signals are often heard as early as 4:00 PM EST with several QSOs continuing throughout the evening. Some nights there are 3 or 4 QSOs at once from 1885 through 1945 kHz.

Frank, WA1GFZ has completed his solid-state Pulse Duration Modulation (PDM) transmitter. It is capable of the legal limit on 160 meters and uses MOSFETS. This is the first transmitter of its kind on the ham bands. Who said AM isn't high tech?!

Mobile mania has broken loose. There are currently 10 or more active 'mobileers' on 75 meter AM. Much antenna experimentation is ongoing with Tom-K1JJ, Dean-WA1KNX, and Rich-K1ETP leading the way. Others who have been on the mobile scene for years include WA1HLR, NY2H (who also has 160 meter mobile capability), KW1I, N2QEI and KF2VM. Several guys are currently using kilowatt linears with several more soon joining the ranks of high power AM mobile.

Canadian AM activity continues to grow. Long time AM'er VE3NCC joined by VE3VJA, VE3AJM and VA3ES. Several more Canadian AM'ers are on the way. Of course, Eddie, VE3CUI, is active on 160 meters almost every morning with the AM group on 1888 kHz.

Al, N2SHG, reports 6 meter AM activity in Upstate New York, Vermont and the New Hampshire area.

AM activity on 75 meters is still expanding. Most weekday afternoons there will be several QSOs in progress on the band and on the weekend the number grows. Sunday afternoon generally yields 6 to 8 AM QSOs covering the band from 3825 to 3890 kHz. AM activity continues almost around the clock with QSOs throughout the evening hours and several early risers picking up around 4:30 AM and continuing in the morning hours. That's all the news...Hope to see you at Dayton.

AM Forum at the Dayton HamVention

The AM Forum will commence at 1:15 PM on Saturday, April 29 in Meeting Room #2 in the Hara Arena. The meeting will start with an AM International Update followed by a presentation on broadcast transmitter conversion tips. This presentation will feature a slide show and participation by several notable amateur service BC transmitter operators. The final segment will be a panel discussion where the audience gets to participate. Directions will be given to the restaurant where we will continue our AM discussions over pizza after the flea market closes later in the early evening.

Armed Forces Day Operating Event

All day Saturday, May 20, 1995 we will be commemorating our Armed Forces with an operating event. Some stations will be using military radios either in the field or from home. Whether or not you are using a piece of military gear, get on and work as many stations operating this event as possible. Here are some target frequencies to look for each other on. To demonstrate how broadminded AM'ers can be we will designate 3670, 7045 and 14045 as CW frequencies. 3870, 7285 and 14286 will be the target phone frequencies. Send results to AMI headquarters. Logs will be judged for number of different military radios used or contacted, number of sites of military significance worked, number of contacts and best overall yarn connected with the event. Recognition certificates will be awarded. This AFD will be the 50th anniversary of the ending of WW II. Make sure you're on the air. That's an order!! ER

A Universal DC Power Supply

by Walt Hutchens, KJ4KV
3123 N. Military Rd.
Arlington, VA 22207

So you just bought the most interesting little radio. First step -- blow out the dust, check the tubes, and make ohmmeter checks for shorts. Second step -- hook up a power supply, bring the voltages up slowly, and see if it plays. . .

Ooops! If the set didn't come with a power supply, you have to buy, build, or improvise one. Since there's always the chance that this is an 'instant parts radio' because of hidden but fatal damage (which the seller somehow forgot to mention) you hate to put much money or work into a power supply. But particularly for small military sets, you may need an assortment of strange voltages and if the radio was battery operated, there may be three or more independent grounds.

I'd been handling the problem with haywire and clip leads for several years, always promising that one day I'd 'do it right' -- but I was always stumped when I pulled out the pencil and quadrille paper by the problems of building what amounted to several independent power supplies, with controls, connections, and metering, in a compact, safe and reasonably attractive package. Then, as often happens someone else solved the problem, so I stole his answer!

It was at the 1994 Flagstaff hamfest that I saw on an estate sale table one of those rare nicely made pieces of homebrew gear. Some time about 1975 (to judge from the parts) the builder had taken a 3" x 17" x 8" aluminum chassis, turned it upside down and filled it with simple low voltage power supplies. One side of the chassis was used as a front panel and had three small meters, about a dozen banana pin connectors, a 100 watt variac, and a lifetime supply of slide switches, most of them wired to 120 VAC outlets on the back. Obviously this had been a combination station control and utility power supply. For my purposes it wasn't quite right: I needed much less station control and much more power supply -- and none of the DC supplies was regulated or adjustable. But the hard part -- the idea and the basic construction -- was done. Breaking my rule about never willingly paying the seller's price, I pulled out a $5 bill, and -- Ughhh! -- tucked the unit under my arm.

Overview

Propagation has been poor this winter, but the good news has been that some long put-off projects have gotten done. Over a three month period, I gradually reworked the supply to provide:

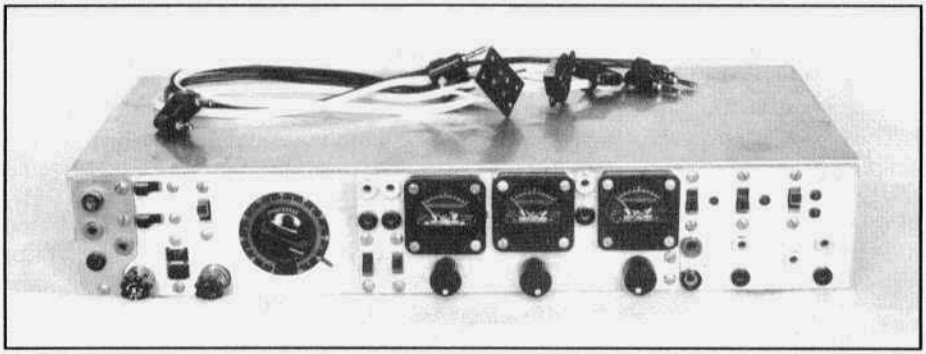
0 - 135 VAC at one amp from the variac, connected to a 2-pin line connector on the front panel and a 3-pin connector on the rear.

Two unregulated 0 - 250 VDC at 100 mA supplies. These can be fed either from the variac or directly from the line and are connected in series.

One supply furnishing 1.3 - 8 VDC at up to 3.5 amps for short periods. This supply is regulated, adjustable and metered on the front panel. A separate regulator on this supply furnishes a fixed 6 VDC at 1 amp. These two outputs have a common ground and the total current is 1 amp continuously.

One supply furnishing 40 - 160 VDC at 100 mA, regulated, adjustable and metered.

One supply furnishing 1.3 - 30 VDC, regulated, adjustable, and metered.



The utility power supply. The meters are connected to the 1.3-8, 40-160 and 1.3-30 VDC supplies respectively. Paint dots on the banana pin jacks follow the RMA color code -- black, red, orange, etc. from left to right; putting matching dots on adapter cable plugs makes wrong connections less likely. The slide switches on the left are the master switch and the two controlling the variac supply, the two just left of the meters control the outlets on the rear, and the three at the right, the three regulated supplies.

With the regulator heat sinks I used, this supply is limited to about 10 amps at 24 volts, 5 amps at 12 volts and 2 amps at 6 volts. A separate regulator supplies a fixed 26 VDC at 10 amps for a few minutes and up to 25 amps for dynamotor starting surges. These two outputs have a common ground.

A supply furnishing +12 VDC at 1 amp and -12 VDC at 1 amp, both regulated and sharing a common ground.

Except where noted all the grounds are independent so the supplies can be connected in any combination. All voltages are available at banana pins on the front; the jacks are spaced 3/4" so a duplex plug can be used. The two dual supplies have three jacks on a 3/4" triangle layout so a duplex plug can pick up either voltage or the two in series, depending on how it is inserted.

A 1-9/16" 12 VDC fan mounted on the right side provides ventilation. Ripple on the regulated supplies is negligible; on the unregulated high voltage supply it is about 100 mV at full load.

About Three-Terminal Regulators

Almost any power supply project these days will use these handy solid state devices so we'll look at them first.

Although there are hundreds of designs, most are basically the same. One terminal, called 'INPUT' is connected to a source of unregulated voltage. An 'OUTPUT' terminal delivers the regulated output. A third terminal, marked 'GROUND' or 'ADJUST' is connected somewhere else -- more of that in a moment.

Internally, the circuit between INPUT and OUTPUT can be thought of as a variable resistor (actually it is a power transistor) controlled by a very high gain amplifier.

The amplifier is so connected that it adjusts the resistance from INPUT to OUTPUT to maintain a constant voltage between the OUTPUT and ADJUST or GROUND terminal. If the OUTPUT to ADJUST voltage is too low, the resistance is reduced to raise the OUTPUT; if it's too high, the resistance is increased. However, there is a minimum INPUT to OUTPUT voltage, called the 'drop out voltage' and typically around three volts; if the difference goes below this value the output will sag, that is, regulation is lost. As long as the input stays high enough, ripple will be removed along with other voltage changes

continued next page

meaning that in many applications a single filter cap with a regulator chip can deliver better DC than many pounds of choke/capacitor filtering.

The two most important device characteristics are the maximum INPUT to OUTPUT current and voltage. Commonly available regulator chips will furnish from 100 mA to around 5 amps; for higher currents you use a booster amplifier to pass the extra current around the regulator. All the common chips have elaborate internal protective circuitry; under reasonable conditions (which don't always occur!) you can short circuit the output without damage.

The INPUT to OUTPUT voltage limits are 30 to 40 volts for most of the low voltage regulators; the TL-783 high voltage regulator will handle up to a 120 volt difference.

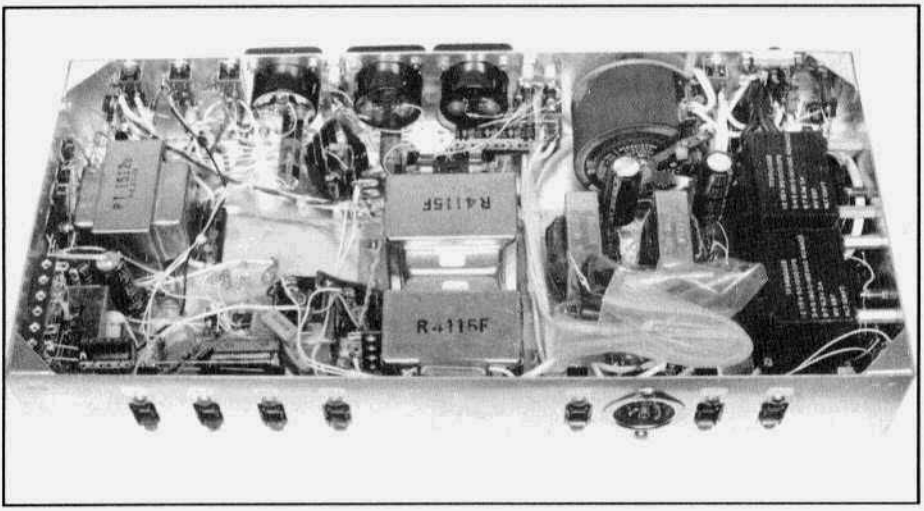
Some regulators are described as 'fixed voltage' and others as 'adjustable', but there is no basic difference between the two types. A regulator called 'fixed' is designed to have the third terminal grounded (it is called GROUND on these devices) and the output voltage will be given with respect to this terminal -- thus the 7805 chip will supply +5 volts with respect to the GROUND terminal at its OUTPUT connection. On 'adjustable' chips the third terminal will be called ADJUST instead of GROUND and the OUTPUT-ADJUST voltage will be quite low -- typically about 1.25 volts. These chips are specified by a range of output voltages set at the high end by the INPUT to OUTPUT voltage limit and at the low, by the OUTPUT to ADJUST voltage for which they're designed. Adjustable chips are used with a voltage divider which feeds back part of the output voltage to the control terminal. Thus (roughly, the actual formula is a bit more complicated) if you feed back 1/10 of the output voltage to the ADJUST terminal, the regulator output will be 12.5 volts.

But if you take a 7805 and connect its GROUND terminal to a voltage divider which feeds back 5 volts at the desired output voltage you have an adjustable regulator (although the output will only go down to five volts), and if you ground the ADJUST terminal on an LM-317, you'll get a 1.25 volt fixed output. Using a 'fixed' regulator in an 'adjustable' application is the most practical case; since nearly every piece of computer junk you see will have a 7805 (the 7905 and 7812 are also quite common) you can often get these for pennies.

The reason for the two series of devices is mainly in the relative convenience of having a specified output voltage without external parts in some applications and the flexibility of wide-range output voltage adjustment or ability to cover many output voltage requirements with a single type of device, in others.

Notice that all the voltages are measured between the three terminals of the device. If you follow the rules for these, you can use any chip to regulate any output voltage which is higher than its OUTPUT-ADJUST voltage! Thus, for example, if you have a plate supply which under no-load to full-load conditions swings from 950 to 810 volts, using a suitable voltage divider circuit and two TL-783s in series would give you a rock-solid 800 volts. The design of such circuits isn't trivial -- what happens when power is switched on or off? What about frequency response? How 'bout when the load is keyed or the bleeder resistor opens up or . . .? But there are many possibilities for improving performance of vacuum tube gear by feeding it better power using these devices.

So what are the disadvantages? Well, there are a few. The extra power (INPUT to OUTPUT voltage times output current) is dissipated as heat, so efficiency is lower than with switching-type regulators and a heat sink is re-



Inside the utility power supply. The plastic bag at the right has extra cables and connectors. Finned heat sinks for the 26 VDC supply have since been mounted on the rear corners and the remaining three two-prong outlets replaced with the three-prong type.

quired in most applications. They're tough but not indestructible -- a slip with a test probe or a problem somewhere else in the circuit will probably mean hauling out the soldering iron. The gain inside that piece of black plastic is very high, so in some applications (not all of them belonging to the other guy!) you can have stability problems. The high gain also makes RFI a real problem. With even fairly low-power RF applications it is best to start with careful bypassing to avoid strange behavior. On most units one of the terminals is connected directly to a metal mounting tab so insulation is required when they're installed on a chassis.

Overall, however, these are handy things to have in any shack. They are cheap, almost any type you can imagine is around, the most common ones are available everywhere (Radio Shack carries the LM-317 and three of the 78/79 series) and they save you a bundle of time on design and construction of good power supplies for interesting hollow state gear.

Design

You won't start where I did and probably won't want exactly what I wanted, so a complete diagram would not be useful. However, almost any unit will use the same basic circuits so a few less-obvious points are worth discussing.

The low current adjustable supplies (1.3-8 and 40-160 volts) use LM-317T and TL-783 regulators respectively. The adjusting pot for the high voltage supply will have up to 120 volts across it and thus dissipate about 1.5 watts; a wire wound unit is essential.

The high current variable supply (1.3-30 volts) needs one or more transistors across the regulator to boost the output current. With an LM-317T and a single boost transistor this will work up to 5 or 10 amps depending on the heat sink, the transformer output voltage and the ratings of the other parts. Up to about 20 amps you can use an LM-350T regulator with two or more MJ2955s or similar PNP-Si devices in parallel.

If you expect a supply to start a dynamotor then it must handle a starting surge of about three to five times the full load

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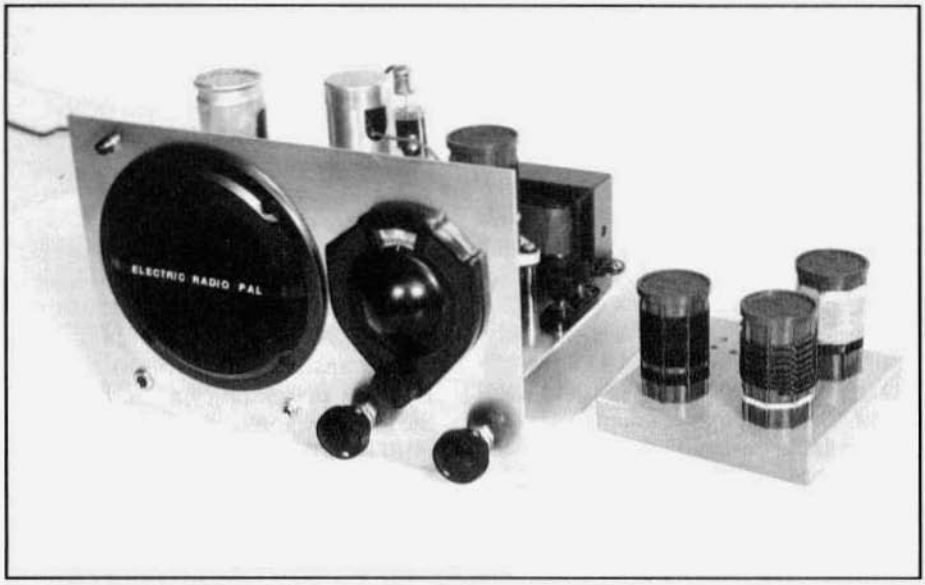
The Electric Radio Pal

A 1934 Style 2-Tube AC-DC Short Wave Set

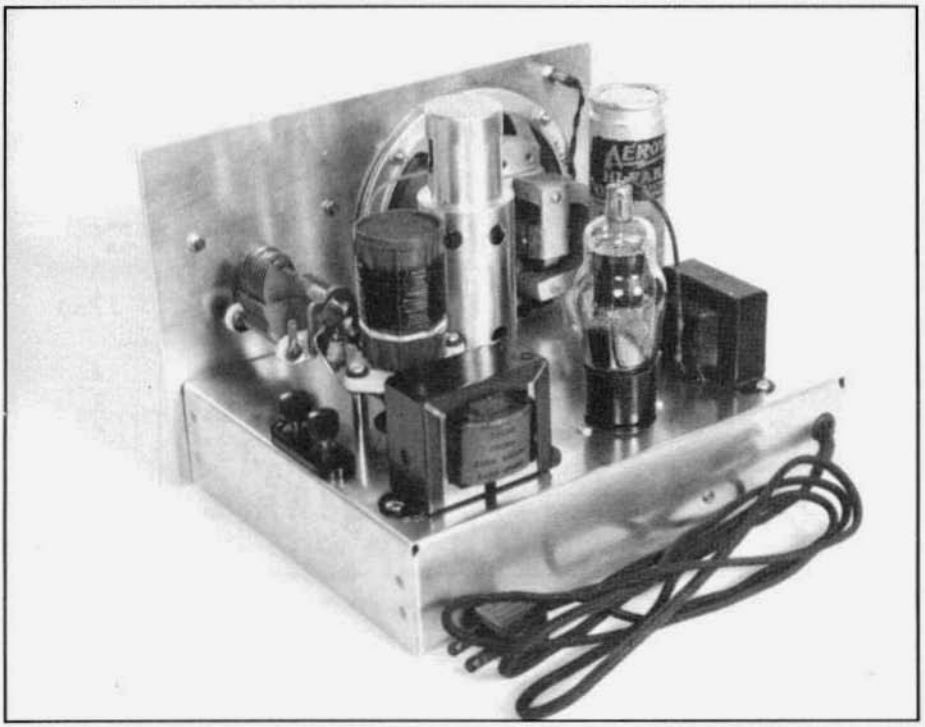
by Bob Dennison, W2HBE
82 Virginia Ave.
Westmont, NJ 08108

The early 1930's saw the introduction of multi-unit vacuum tubes and radio set designers lost no time finding applications for them. First came the dual triodes. Most of these were designed for use as push-pull class B amplifiers. I have built a nice little radio using one of these tubes and *ER* will be publishing it in a future issue. In 1933, the 6F7 (triode-RF pentode) and the 12A7 (power pentode-rectifier) appeared and made it possible to build a 2-tube AC-DC receiver giving loud speaker operation. Several references to applications of one or both of these tubes are given at the end of this article.

When I was a kid in junior high school I admired these sets and thought it would be great fun to build one. So, during the last few years, whenever I saw a component used in one of these sets, I bought it and stored it away for future use. I found a Premier 5" magnetic speaker about five years ago at an AWA meet in Canandaigua, NY. It was new in the box and was stamped with a 1935 date. Then a few months ago, I bought a little kit radio using three '76 tubes and it supplied the resistor line cord. Now I had everything except the 140 uuF Hammarlund tuning condenser. Actually, I had one but I'm saving it for another project. So I modified a 200 uuF variable by removing plates.



Front view of the 2-tube 'Electric Radio Pal'.



Rear view.

The Circuit

To secure maximum sensitivity, it was decided to use the pentode of the 6F7 as a regenerative detector with high impedance plate load and use a 1:3 audio transformer between the triode and the output pentode. The wiring diagram is shown in Fig. 1. Bias for the triode is provided by two AAA alkaline cells. Jack J1 disables the speaker during headphone reception. The early 5" magnetic speakers tend to have exaggerated high frequency response with a resultant 'tinny' sound. Condensers C8, C11 and C12 roll off the high frequency response to produce nearly normal sounding audio.

An old, dried out, triple-8 uF electrolytic was rehabilitated for use at C14 as follows: The top was opened by carefully prying up the rolled over top edge. Then the old condensers were pulled out. It was first necessary to heat the can in the oven so as to soften the asphalt sealer. After the inside of the can was cleaned, the new electrolytics, with lead wires attached, were taped together and secured in the can with beeswax. Next the top was reclosed and the edges peened over. Finally the whole can was cleaned and made to shine like new by going over it with 0000 steel wool. Since modern electrolytics are very compact, it was possible to squeeze in a lot more capacitance than was available in the thirties so there is no trace of hum.

The speaker grill is an item found last year at a flea market The center band of unperforated metal which carried the original logo was painted over and the new 'Electric Radio PAL' logo added with dry transfer letters. These were covered with a protective coating of clear Krylon. A three inch Kurz Kasch vernier dial was found to be the best size dial to balance the panel layout.

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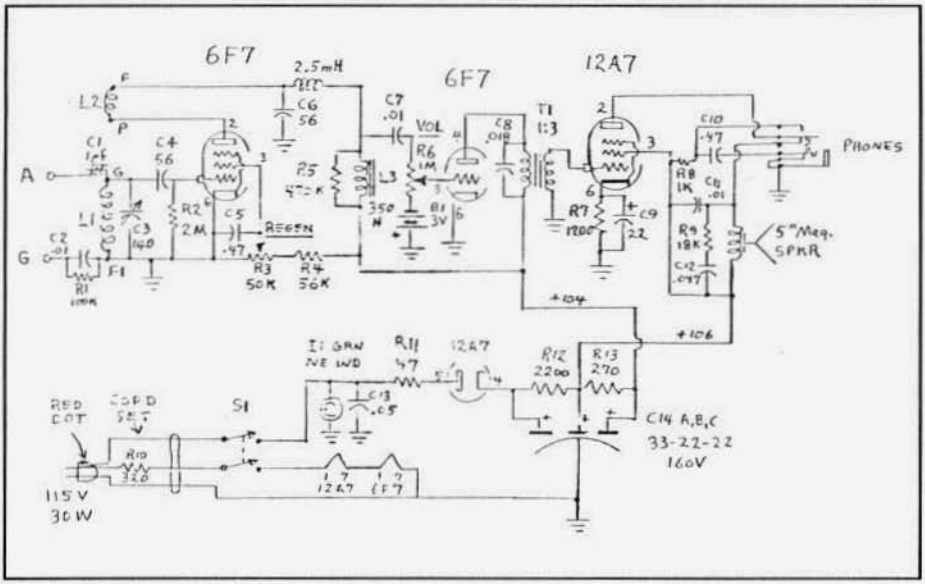
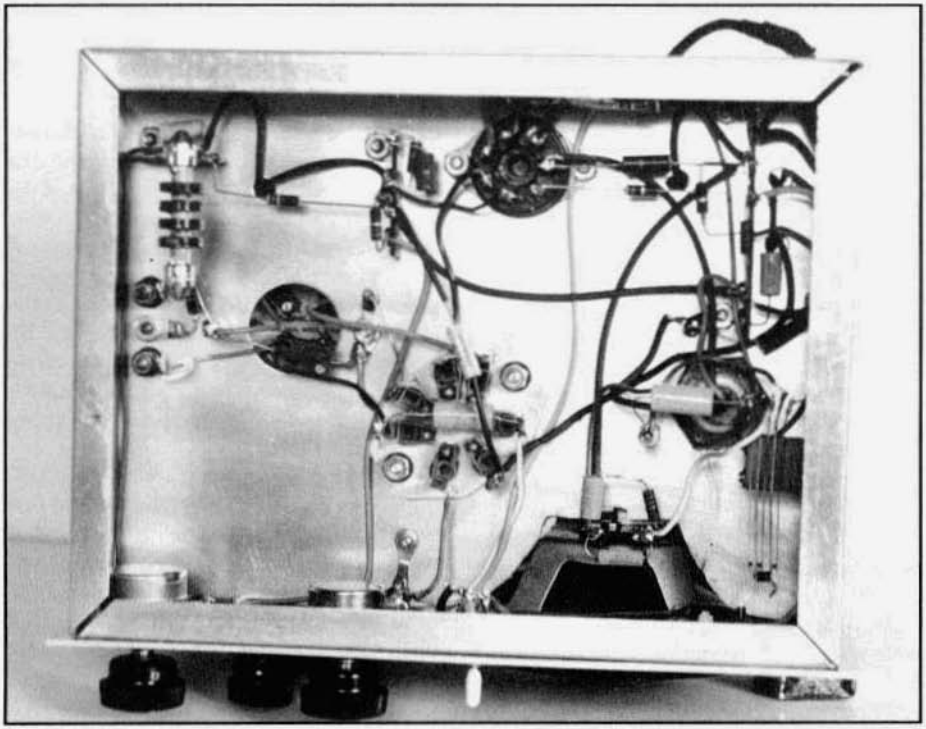


Figure 1, wiring diagram.



Underchassis view.

Bottom view. Proper polarity of windings.

Coil	Freq. Range-Mc	L1 - Grid	L2 - Tickler
1	9.43 - 24.6	7.75 T #16 E	3.75 T #26DC
2	4.04 - 10.6	18.75 T #20 E	3.75 T #26DC
3	1.65 - 4.35	49.75 T #24 E	9.75 T #28E
4	.56 - 1.46	See text	See text

Note: Except for coil 4 (see text), all grid coils are 1" long. Ticklers are close-wound .125" below L1. Coil form dia. is 1.375". Start and finish of each coil is aligned with corresponding prong.

Figure 2, coil winding data for the ER Pal.

A bright red dot painted on the line cord plug identifies the prong which should be inserted into the narrow receptacle of the standard AC outlet. Observing this precaution ensures that the chassis is connected to the neutral side of the AC line. In many houses there is a slight AC potential between neutral and the radio shack ground. Normally this doesn't cause any problem but to be safe I added R1-C2 between the ground post and chassis. The line cord resistor dissipates nearly 30 watts so it runs fairly warm. In a few of the early home-made AC-DC sets, a 40 watt lamp was substituted for the line-cord resistor.In one article, they provided a socket on the receiver into which a small table lamp was connected. A 40 watt lamp is just right to use with three 6.3 volt or one 6.3 and one 12.6 volt tubes. Where there is a will, there is a way.

Coil data is given in Fig. 2. The ribbed coil forms I used are rather small so it was necessary to use a progressive winding on the broadcast band coil. The first 120 turns were bank wound as follows: Wind two turns; then the next two turns are wound on top of the first two turns. Now repeat until 120 turns or 30 groups of 4 turns have been wound. The last 15 turns are single-layer wound. Wire on L1 is 19/44 SNE litz. A slug of ferrite (1/4" dia. x 3/4" long) was cemented inside the coil form to bring the low end of the band down to 550 kc. Tickler L2 is 1/16" below L1 and consists of 22-3/4 turns of No.32 E. The winding length of L1 is 1-1/8".

Conclusion

I live just a few miles east of Philadelphia so there are lots of strong BC signals. Station WCAU (1060 kc) is especially near and tends to cover some of the other signals so I use a wave trap on this band. It consists of a 500 uH coil shunted by a small BC variable. With the trap in place, I can separate about 10 local stations. On the short wave bands there is no shortage of excitement. You

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Hunting For Heathkits: The Rarest of the Rare

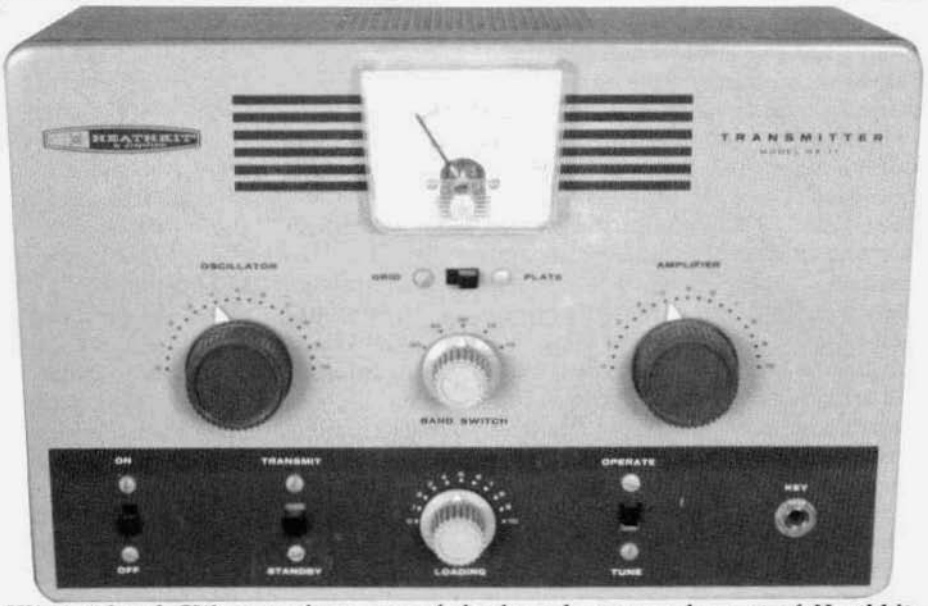
by Chuck Penson, WA7ZZE
Box 2414
St. Paul MN 55102

Collecting vintage ham radios has, for many hams, become something of an obsession over the last few years. And while publications like *Electric Radio* and the *Yellow Sheets* provide excellent vehicles for finding and buying older rigs, absolutely nothing compares to the visceral experience of a hamfest. To hold a boatanchor in your arms, to twist its knobs, to stroke its smooth baked enamel. Collecting vintage radios is not a hobby, it is a state of mind, an experience to be savored. The thrill of the hunt. The rush of adrenaline. The smell of burned transformers. Ahhhh...Heaven.

The Dayton Hamvention provides a unique opportunity in collecting. Here, on a few crowded acres of asphalt, lies the stuff of legends. Boatanchors of all description. Vintage rigs of every shape and size. Pieces so obscure no one really remembers much about them except that a friend of a friend of his uncle might have had one back in the '50s.

My specialty is Heathkit and Dayton is always a thrill for me. Each year dozens of the old green boxes turn up at Dayton, and in just the last few years, vintage Heathkit rigs have begun to catch the eye of the collector. Heath made some wonderful and very collectable rigs. Many are familiar: the Apache, the Marauder, and the DX-100, for example, are well known and highly sought after. But while these can be considered rare, they are by no means the rarest Heathkits to be found.

Heath made a number of kits with relatively short production lives. Many of these were smaller products - primarily accessories - as opposed to transmitters and receivers. Their short production life meant that comparatively few of them were ever sold to begin with, and that means that fewer still



HX-11, 6-band CW transmitter, one of the least known and rarest of Heathkits transmitters.

remain intact today. Some are sufficiently rare that in ten years of collecting I have seen only one, and in a couple of cases I have never seen the piece in question. Yet they are out there. In basements, attics, garages, and in boxes with contents long forgotten. No doubt this article will coax a few from their hiding places.

Whether or not you collect Heathkit, here are a few pieces you may want to look for. These are the among the rarest of the rare.

AT-1: 6 Band CW Transmitter.

Manufactured 1952-56, original price $29.50

The AT-1 was Heath's first serious entry into ham radio, and as a result it is the unit most often targeted by the collector. Inspired by the creation of the Novice class license in 1952, the AT-1 radio stormed the novice market and set Heath on a course for fame and fortune. It is a simple three-tube design (5U4, 6AG6, 6L6). The final input power is from 25 to 35 watts, depending on which ad you read, with coverage from 80 through 10 (including 11) meters. When looking at AT-1s particular attention should be given to the knobs and the meter. The original knobs used were black Collins-like knobs. There is some debate about the authenticity of AT-1s fitted with gray, DX-20 style knobs. While AT-1s are sometimes seen with these knobs, no advertising photo showing the rig with these knobs has ever been found. With respect to the meter, it is important to note that the panel meter used on the AT-1 is not the same one used on the DX-20 or DX-35 transmitters. The AT-1 meter has no zero adjustment, has a small "hump" that covers the pivot point, and does not say "Heathkit." It is not uncommon to find AT-1s with other meters installed. AT-1s in good, unmodified condition are rare.

AC-1: Antenna Coupler

Manufactured 1953-56, original price $14.50

The AC-1 is a simple "match box" and was released as a companion product for the AT-1 transmitter. It is designed to work with random wire antennas and covers from 80 through 10 meters. Two versions of the AC-1 have been noted. The earlier version used black Collins-like knobs and has complete circles for dial markings. Later versions used small gray knobs and dial markings without the complete circles. Both versions are very rare.

HX-11: 6 Band CW Transmitter

Manufactured 1961-63, original price $43.50

The HX-11 was released in November 1961 and was sold for only about a year and a half. As a result of its short production life the HX-11 qualifies as one of the rarest and least known of Heath's early transmitters, rarer even than the much-sought-after AT-1. The HX-11 is an exact copy of the transmitter it replaced - it is a DX-20 in new clothes. The HX-11 is painted in two-tone "Heath green"- the colors that by this time had become one of Heath's trademarks. HX-11s in any condition are very rare.

HW-19: 10 Meter AM Transceiver, AKA the "Tenner"

Manufactured 1960-62, original price $39.95

The famous "Benton Harbor Lunch Box" series of transceivers were so called because in size and shape they bore a striking resemblance - right down to the handle - to the metal boxes full of sandwiches and coffee carried to work by millions. The series includes the HW-19, HW-29(A), and HW-30, but began in 1959 with the CB-1 CB radio. Sales of the 10-meter Lunch Box languished and it was pulled from production in 1962. The 6- and 2-meter versions did much better. Check for the white and gold plastic Heathkit emblem on the front panel. Some units have a license holder on the right side of the cabinet. A common (and benign) modification was to fit the rigs with an SO-239. Another

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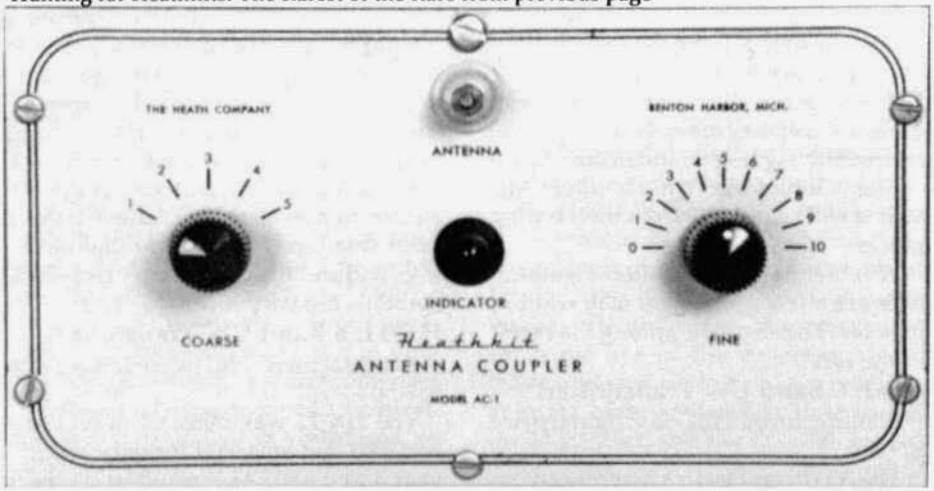

AC-1 Antenna Coupler. Heathkit released this product as a companion to the AT-1 transmitter.

mod to watch out for is a change in the mic connector that would permit true PTT operation. The paint style is a wrinkle finish brown cabinet and smooth finish light brown (advertised as "mocha") front panel. The knobs are the same brown color as the cabinet and have gold-colored, inset faces. All versions came with a small desk/hand ceramic element microphone (made by Turner) and are not complete without it. Lunch Boxes used to be very common at swap meets, and it used to be that you couldn't give them away, but in recent years they have become quite rare. Among Lunch Boxes, 6-meter (HW-29A) and 2-meter (HW-30) units are seen most often. However, because of their short life span, 6-meter (HW-29), 10-meter (HW-19), and CB (CB-1) units are exceptionally rare in good condition. Many Lunch Boxes have been subjected to a variety of other unfortunate modifications. Beware.

CA-1: CONELRAD Alarm

Manufactured 1957-60, original price $13.95

The Cold War was a treasure trove for manufacturers offering all kinds of "protective" devices. Heath sold this clever gizmo designed to shut down your station at the first hint of "incoming." The CONELRAD system was designed to thwart attempts by enemy aircraft to home in on broadcast stations. CONELRAD is an acronym for CONtrol of ELetromagnetic RADiation. In times of war, hams and most broadcast stations had to go off the air. The CA-1 is placed in the line between the power receptacle and equipment to be controlled. It was then attached to any AC or DC broadcast band radio, provided the radio had an AVC. When the monitored broadcast station went off the air (this is how the CONELRAD system worked) the CA-1 would cut power to whatever it was connected to, and would light a red warning light. The CA-1 is extremely rare.

VX-1: Electronic Voice Control

Manufactured 1958-60, original price $23.95

Although we now take VOX for granted, in its day the VX-1 was regarded as something of a luxury. The VX-1 is painted in a silver and gray style to match the DX-100, AM-2, and others. The top and sides of the cabinet are perforated to provide ventilation. The VX-1 is one of the rarest Heath products ever made and finding one will require a special effort.

CA-1 CONELRAD Alarm is extremely rare.

AM-2: SWR Bridge

Manufactured 1957-62, original price $15.95

I know what you're thinking. You're thinking that you see these things all the time. How could they be rare? Next time you see one take a closer look. Three distinct versions of the AM-2 have been identified. The very earliest units used black bakelite meters like those used in the GD-1 series grid dip meters and are very rare. In the second version the bakelite meter was replaced with a more modern looking meter made of plastic, having a scale calibrated all the way to 6:1 with no red "danger" portion, and in which the reflected power scale is calibrated all the way to 100 percent. Curiously, the meters of those early units are marked so that a 3:1 SWR corresponds to 50 percent reflected power which is, of course, wrong. This is an example of one of the rare mistakes Heath let slip out the door. The third version is the one you see most often. It is identical to the second version except that the meter scale has been corrected. Having all three versions in your collection would be better than topping the DX honor roll.

PM-1: Field Strength Meter

Manufactured 1958-59, original price $12.95

The PM-1, with its mirror-like front panel, is a simple, self-powered field strength meter, and its design is oddly out of place in Heath's product line. By the time it was released in 1958 Heath was firmly committed to a design that included baked enamel two-tone green paint and metal cabinets. Here then is a small black plastic box with a shiny front panel. It is not clear why Heath chose this design, but it was produced for just under two years before being replaced by the PM-2, which conformed to the basic amateur products design philosophy. It is important to note that the plastic box is not the same one used in the CO-1, CR-1, and substitution boxes. The PM-1 is also the only Heath amateur product to use the blue and white oval nameplate sticker seen on the front panel. The panel meter is a Simpson unit and reads relative power on a 0-10 scale with the Heathkit name. Very rare.

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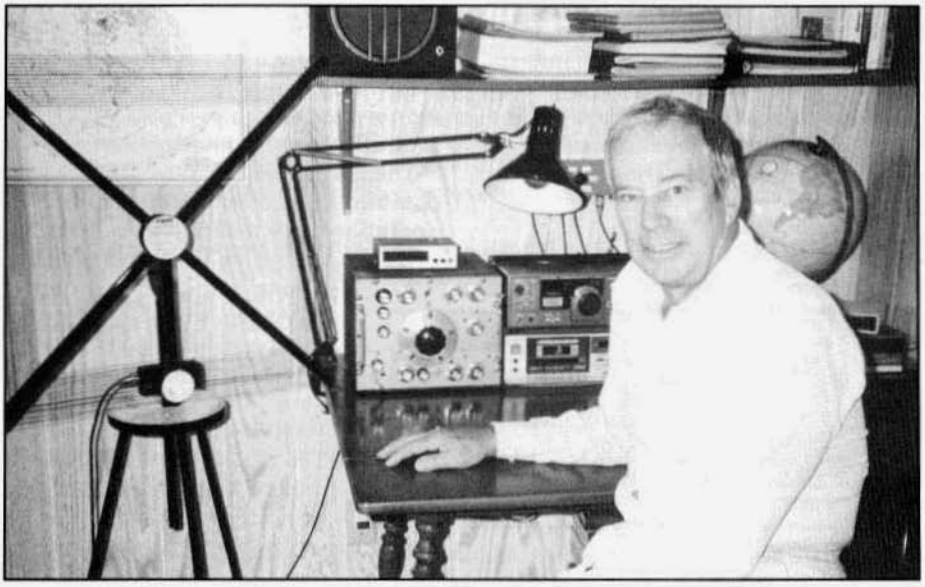
A QSL card from Mike Ferraro, K6ZSR. He is working toward WAS-AM.

Berk Berkemeyer, WØREP, author of last month's article on a Taylor tube transmitter.

Fred Chandler, KFØOW, in his vintage hamshack. Most of us here in the west are very familiar with Fred and his always loud AM signal.



Ray Moore, author of "Communications Receivers, The Vacuum Tube Era: 1932-1981" in his SWL station. Currently he is working on a similarly styled book on vintage transmitters. This book should be available this fall. The receiver on the left is one that he homebrewed for MW DX'ing.

R-390A Contract/Order Number Update

Number 2

by Les Locklear
1122 36th St.
Gulfport, MS 39501-7116
(601) 864-8384

In the early sixties at a U.S. Naval Intelligence station in Germany, 3 new R-390A's were received. After unpacking the R-390A's, the unusual name of Helena-Rubenstein on the nomenclature tag was noticed by one of the intelligence officers.

This gentleman had been involved in the development of the R-390 and R-390A. He contacted an engineer friend at Collins Radio for further information.

The U.S. Navy had put out a small contract for bid for 80 R-390A's in 1959 or 1960. Helena-Rubenstein was aware of the lucrative government contracts at that time and became the low bidder.

Suddenly, they were in a quandary, not having any expertise in this area of manufacturing, they turned to Collins Radio. A deal was made to produce 80 receivers under the Helena-Rubenstein name.

Nomenclature tag for the Fowler's Industries 1984 R-390A.

Walter Chambers said at that point in time the Signal Corps was placing large orders and the U.S. Navy was placing small orders.

U.S. Navy publications numbers for the 1985 R-390A manuals are as follows:

1. EE 125-AB-OMI-010
2. EE 125-AB-OPI-010

It is a 2 manual set, one is operation/maintenance, the other is spare parts list.

What a tremendous response to the R-390A contract/order number update in the March 1995 *ER*!

I have received many telephone calls and letters with information and R-390A stories, all of which I'm sure are true.

Best of all, thanks to Dennis Gibbs, we now have a contract number for the 1968 Dittmore-Freimuth order.

The owner of the 1984 R-390A has obtained publication numbers for 1985 operation and maintenance manuals from the U.S. Navy publications center in Arlington, VA. No word yet on price and availability.

The reason the U.S. Navy still uses these "LEGENDARY" receivers is due to the extremely high RF fields on ships larger than a frigate that tend to severely overload the front ends of solid state receivers.

Many of the records are nonexistent from manufacturers. We have to rely upon ourselves within the radio community to research and share these items of interest and history.

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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: Wednesday nights at 8 PM PT 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 4 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.
Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control is Les, K6HQI.
Arizona AM Net: Meets Sundays at 3 PM MT on 3860. 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 3875 Monday, Wednesday and Friday 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.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Westcoast Military Radio Collectors Net: Meets Sat. at 2300 local on 3885 and Sun. at 1600 local on 3885. Night net control is Andy, KD6TKX, and daytime net control is Tom, WA6OPE. AM is the mode used at present. It is not necessary to check in with military gear.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
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 14.050, Saturdays at 1 PM PT. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Chuck, N5SWO. The group meets on 14.293 at 1 PM CT, Sunday afternoons.
Collins Users Net: The oldest of the 'users nets'. It meets on 14.263 Sunday afternoons at 2 PM CT. The net control revolves. This group also gets together for an informal ragchew on 3805 Tuesday evenings at 7 PM CT.
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.
Heath Users Net: A new net started by Marty, WB2FOU/5. Net control is shared by Fred, AA5LW. It meets on 14.275 at 4 PM CT Sundays. Check in on either AM or SSB.
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 has been meeting since 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.
Westcoast Broadcast Equipment Net: Tuesdays on 1959 at 9 PM PT. Anybody is invited to join the group, but the emphasis will be on broadcast equipment. Moderator is Mike, W6THW.

Plate Modulating That Novice Rig

by Rob Brownstein, NS6V
3881 Winkle Ave.
Santa Cruz, CA 95065

With more hams voicing interest in vintage AM, and fewer AM rigs in circulation, it just might be time to consider plate modulating one of those CW novice rigs that are still floating around. And, even though you may have a DX-35, DX-40 or DX-60, with built-in controlled-carrier modulation, a plate modulator will make that rig sound 100 percent better. So, what are the options? You could try finding an Eico 730 modulator or a Globe UM-1 (lots of luck), or you could take a whack at rolling your own.

Picking Your Modulator Tubes

To plate modulate a transmitter you need to be able to provide an amount of audio power equal to half the transmitter's final amplifier input power. For most novice transmitters that means you need to provide 25 to 35 watts of audio. A pair of 6L6s in self-biased AB1 can produce about 25 watts of power with a plate voltage of 360 volts and a screen voltage of 270 volts. A pair of 1614s can put out 50 watts with about 530 volts on the plates and 350 volts on the screens. A pair of 807s can drive about 120 watts of audio with 750 volts on the plates and 300 volts on the screens. The tube tables in the back of a 1950's or -60's ARRL Handbook can provide you with a lot of possible tube choices and their requirements. A self-biased AB1 design makes things a bit simpler by eliminating the need for a negative voltage bias supply, but in many cases you can implement a bias supply using a lower voltage winding, a silicon diode, and simple RC filter.

The tubes you choose will determine the primary impedance requirements for your modulation transformer, and your transmitter's final amplifier will determine the secondary impedance. The plate-to-plate load impedance of your modulator tubes can be gotten from the tube tables. The 6L6s require 9K ohms, the 1614s are 7.2K ohms, and the 807s are about 7K ohms, for example. You can easily calculate the secondary impedance by dividing the transmitter final amplifier tube's plate voltage by its plate current when loaded. A Viking Adventurer's 807 final has a voltage of 450 volts and a current of 110 mA when fully loaded. Its plate impedance is therefore 450/0.11, or about 4K ohms. A 6146 final operating at 500 volts and 150 mA has an impedance of 3.3 K ohms. The modulation transformer for 6L6s and an 807 final is 9K-to-4K or about 2:1. The modulation transformer's power rating should be sufficient to handle the peak power requirements - 25 watts in the case of the Viking Adventurer.

The Speech Amplifier

You have a lot of choices for speech amplifier designs. A 12AX7 driving a 12AU7 or 6C4 is fairly common and will provide enough drive for 6L6s, 1614s, even a pair of 6146s. There is a table in the ARRL Handbooks (circa 1950 through 1960) called *Resistance-Coupled Voltage-Amplifier Data*. This will give you some values of grid and cathode resistors, cathode bypass capacitors, and so on for a design based on a 300 volt plate supply. If your supply is higher or lower, you can apply a proportionality constant to the values. For example, a plate supply of 400 volts would mean multiplying the resistance values by 400/300 or 1.25. You can play with the

Front view of the homebrew modulator.

values of the coupling capacitors to tailor your audio response to the way you like it. The higher the capacitance, the more low frequency amplification. Values from 0.01 to 0.1 are common.

Supplying The Power

You will need to supply filament and plate voltages for all your tubes, plus screen voltages where required. If the highest plate voltage needed is 350 volts, and you plan to build a full-wave, tube-rectified circuit, you'll need a power transformer with a center-tapped secondary of at least 700 volts. The most common tube rectifiers (5U4G, 5Y3, etc) require their own 5.0 volt filament supply, too.

A good design will have minimal fluctuation in the screen voltages applied to the modulator tubes. You may get away with using a voltage dropping screen supply if you use a choke-input filter, but a better solution is to design in a voltage regulator, or series of regulators, to keep the screen voltage reasonably constant under varying loads. You should also have some means of turning the plate and screen supplies on and off. By lifting the power transformer's secondary center tap off ground through a high resistance, the plate and screen voltages will drop to nearly zero. A switch to shunt that resistor can act as a high voltage on-off switch.

Controlling The System

Assuming you want to operate both CW and AM with your transmitter, you should have a way to shunt the modulation transformer's secondary when operating CW. You should also have a way to key your transmitter (and VFO, if VFO controlled), mute your receiver, and turn on your modulator's plate and screen voltages using just one switch. A combination of DPDT switches and relays can provide the switching functions you'll need. Making the transmit/receive switch operate the modulator's high voltage and the control relays will provide that single-switch operation. A second switch, for switching between CW and AM modes, can provide the modulation transformer shunt and hold

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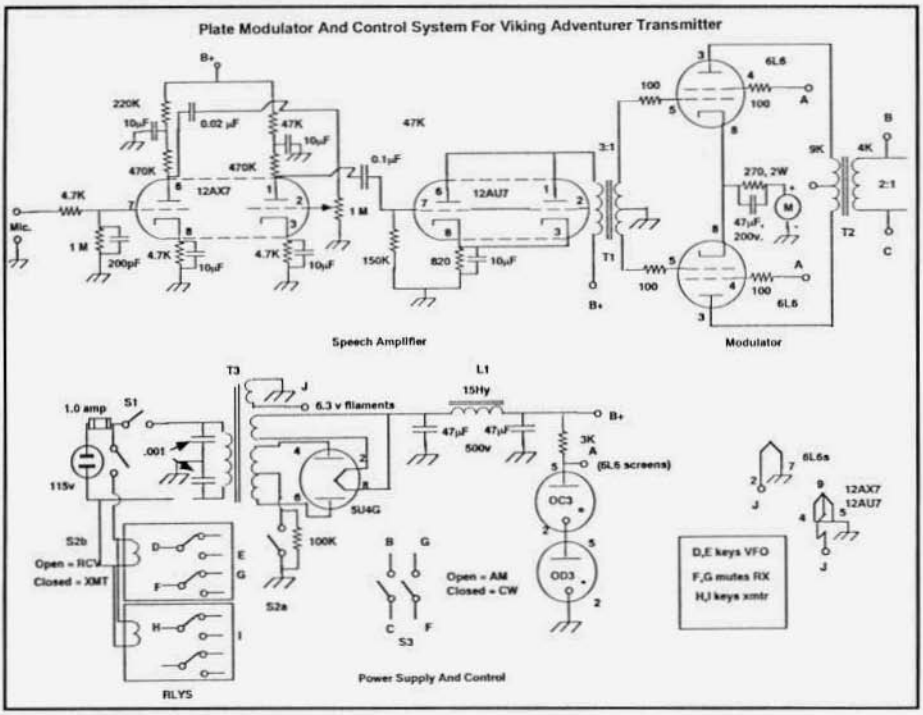


off the receiver muting during CW operation so you can monitor your signal.

Construction

Building your modulator is fairly straightforward. Keep the audio sections well separated from the power supply and control section relays. Make sure the microphone input and first tube's signal leads are kept short and shielded. This first amplifier is very susceptible to both 60 cycle hum and stray RF, so the better the shielding, the better the hum-free result.

Finding The Parts

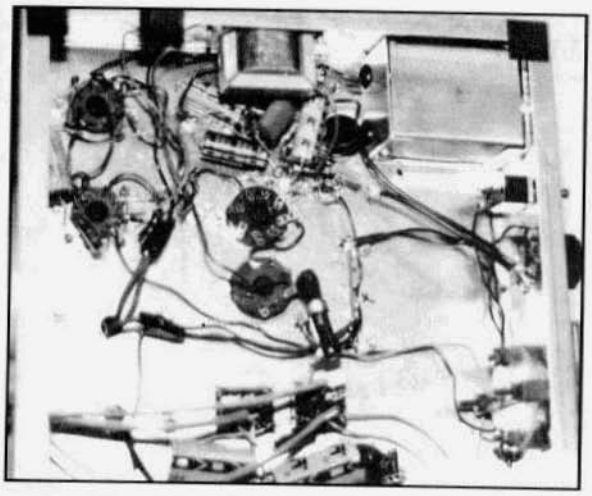
Probably the most difficult part to find will be the modulation transformer. If you can find a UTC S-19 multimatch modulation transformer, you're way ahead of the game. Alternatively, if you can locate a hopelessly trashed Viking Ranger, the modulation transformer is a good one. So is the one in an Eico 730 modulator. Both of these transformers contain tertiary windings which are a superb way to inject negative feedback into a preceding stage. For example, if you connect that winding in series with the ground and the preceding stage's grid resistor (as is done in the Ranger), it will help reduce distortion.

The 3:1 interstage transformers are available, new, from Antique Electronic Supply. I used the one that cost less than $10.

I scrounged the power supply transformer and choke from a chassis carcass I bought for $5 at a ham swap, and the rest of the parts are common enough in most people's vintage-gear junk boxes.

Putting Theory Into Practice

I built this plate modulator (see photo and schematic) for my Viking Adventurer. As I mentioned, all the parts were either already in my junk box or gathered by scrounging, except for the chas-



Underside view showing minibox shielding of mic connector & 12AX7 socket.

sis and the small aluminum minibox I used to shield the microphone input and 12AX7 socket (see photo).

The minibox shield is probably the most novel aspect of this design. I reasoned that if the partial shield used in the Ranger and Valiant do a decent job of keeping hum out of the 12AX7, then a fully shielded tube socket and mic connector should do even better. Therefore, I mounted the minibox inside the chassis and punched out the holes for the microphone connector and 12AX7 socket through both chassis and box. Two holes were drilled in one end of the box for bringing in the signal and power leads. Once the hardware was mounted and the wiring was completed, the shielding is completed by putting the other portion of the box in place and tightening the sheet metal screws. It forms a quasi-Gaussian shield around the pins of the connector and tube socket, and the wires that are attached to them.

The meter I used is a 50 mA junk-box meter, with an appropriate shunt, connected in series with the 6L6's cathode resistor-to-ground circuit. The range of measurement for this case was from about 70 mA, resting, to about 100 mA or so with 100 percent modulation voice peaks. If you have a monitorscope, the meter is unnecessary, but I enjoy watching meter needles swing.

The modulator was tested using a 4K ohm, 25 watt wirewound, first, and found to be operating as designed. Voltages were as expected, the VR tubes were lit, and the resting bias current was about 80 mA. With the Adventurer connected to a 50 ohm resistive dummy load, and the modulator in place, I connected a D-104 and monitored the AM signal. There was no hum and a reasonably distortion-free sounding audio. I felt the modulator was ready for the real test.

I put the modulated Adventurer on the air, on 75 meters, for the first time on January 29, and again on January 30. I received good audio reports from four Northern California operators the first night, and equally good reports from a mix of California operators plus K8MLV/0 in Pueblo, Colorado, and W8VYZ in Ashtabula, Ohio. The conditions were exceptionally good that second night or the 25 watts of carrier would certainly not have done well to Ohio. But on 20, 15 and 10 meters, when conditions allow, that 25 watt signal should provide some solid QSOs to the East Coast and Pacific. I'll keep you posted. **ER**

The Meissner Signal Shifters

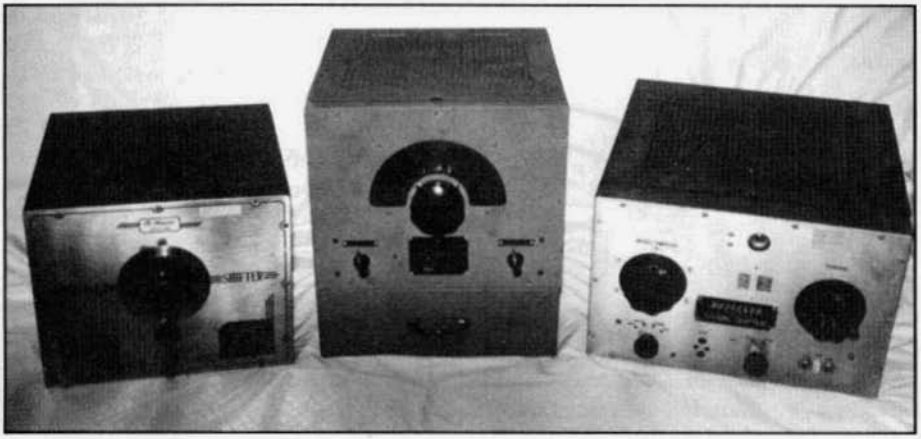
by Jim Hanlon, W8KGI
P.O. Box 581
Sandia Park, NM 87047

"Hey Jim, you know about old stuff. I got this thing at the swap fest. Can I make a transmatch out of it? It's got a lot of coils and capacitors in it." I looked at what my friend was planning to destroy, and quickly convinced him to sell it to me instead. It was a pre-war Meissner Deluxe Signal Shifter, far better suited for the AWA Old Time Equipment Contest and the Classic Exchange than for making his transmission lines SWR safe for his Japanese radio! And that was how I acquired my first Signal Shifter.

Back in the 20's and early 30's, most hams used single stage, self controlled oscillator transmitters, some of considerable power. An O1A stolen from your parent's BC radio would run 1 to 3 watts from 135 volts of battery supply; a 45 ran 15 watts. 10's were quite popular among hams of moderate means, and could run 30 or more watts with 500 volts on their plate. My 1931 ARRL Handbook shows an oscillator with a pair of 852's in push pull, 1500 volts on their plates, running 150 watts on 80 through 10 meters. Even the ARRL station, W1MK ran a pair of UV-204A's in a push pull, tuned grid tuned plate oscillator, capable of a kilowatt input on 80 and 40 CW, in those days. Handbook tune-up instructions included an admonition to make sure that the oscillator frequency was inside the band - anywhere inside - before you coupled it to the antenna. Chirps must have been fantastic! No wonder crystal control was welcomed with enthusiasm.

But by the later 30's technology had made rapid advances. Regenerative receivers had given way to stable, sensitive, selective superhets, and hams were looking for more than just the ability to operate on a couple of spot frequencies, often far away from the signal they were trying to work. Thus entered the tetrode or pentode "ECO," a low-powered and much more stable self controlled oscillator - much like that developed for the superhet receiver's local oscillator - with the signal generated between the control and screen grids and "Electron coupled" to the outside world via the continuing electron flow on to the plate.

Around 1938, the Meissner Company of Mount Carmel, Illinois offered the first of what was to be a decade-plus long line of ham band VFO's, the Meissner Signal Shifter. Designed primarily to be a low powered driver for existing, crystal controlled transmitters, it employed a 6F6 Hartley ECO driving a 6L6 doubler with a 5X4 or 5U4 rectifier and VR105 and VR150 regulators in the self-contained power supply. The 6F6 oscillator also doubled in its plate circuit, so the basic oscillator ran at one fourth the output frequency, providing better stability and immunity from higher power stages feeding back into the oscillator. Plug-in coils in the oscillator grid, 4 pins, the oscillator plate, 5 pins, and the doubler plate, 6 pins, allowed band changing. All tuned circuits were tracked and gang tuned by the three-section variable condenser that my friend thought he might use in his transmatch. Hams could buy coils for 160, 80, 40 and 20 meter output. The tuning capacitors were tapped down on the coils to provide appropriate bandspread on each band, and there was one set of variable padder condensers mounted on the chassis to ad-



A trio of Meissner Signal Shifters; 1941 Deluxe, 1942 150B Exciter and 1948 EX.

just coverage and output. Meissner-made coils for the different bands were all compatible with one setting of the padders, but the ham who wound his own coils to cover a new range had to do some inductance tweaking via coil squeezing to get his coils to match.

I have two of this first series of Signal Shifters, the 1941 Deluxe which I rescued, and a 1942 model which served as the exciter for Meissner's 150B transmitter. The 1938 model started with an "airplane dial" and a crackle finish cabinet and panel. By 1940 and the model 9-1027, the panel was lacquered, polished brass with black painted features, and the frequency control was an external, pinch-drive vernier. This model is advertised at $44.95 in *QST* and $47.50 in the Radio Handbook. A little later that year, the model 9-1028 also offered an 9-1044 add-on "Signal Spotter" crystal oscillator. My 1941 Deluxe has the same external appearance as the 9-1028, but its model number has been revised upward to 9-1057 through 9-1060 for units which came with coils for 160 through 20 meters. Coils could, of course, be purchased to cover the other bands at $3 per set. The 1941 Deluxe also added a red-jeweled pilot light, perhaps the Deluxe feature.

By April 1941, with World War II already going in Europe and US amateurs restricted from working DX, the Meissner ad in QST was touting its Signal Shifter as a complete QRP transmitter. "With DX out of the picture for the present, it may surprise you to hear that the Meissner Signal Shifter - with 7-1/2 watts output - is actually running rings around some of the 'big boys'!

"Originally designed merely as the best variable frequency exciter that we knew how to make, the ability of the Signal Shifter as a transmitter in its own right was soon discovered. Its crystal-pure note, unfaltering adherence to frequency adjustment, PLUS the all-important faculty of being able to place that signal in the RIGHT spot on the band, very shortly proved that super-power was NOT a necessity for consistent contacts in the U.S.A.

"Coast-to-coast contacts have been made with such regularity as to make them commonplace - using only the Signal Shifter as a transmitter! WAS certificates have been issued to hams with no other transmitting equipment than this versatile exciter unit! Why not get into the 'low power' field and find out for yourself what new thrills await you there - with only 7-1/2 watts, CW?"

Well, so much for Ten-Tec or Heath

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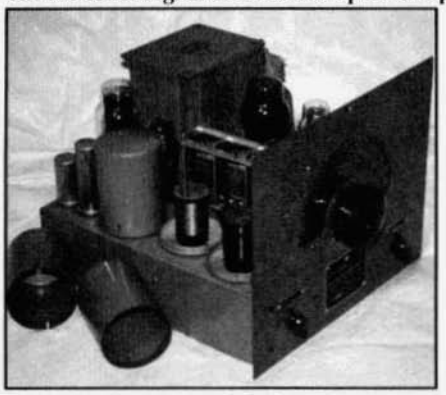

Interior of 1942 model, showing two of the plug-in coils with their shields removed.

inventing QRP. Maybe I'll try to be the last ham on record to make WAS with a Meissner.

In 1942, the Signal Shifter went to war as part of the Meissner 150B transmitter. Still the same basic 6F6-6L6 circuit, it became a general coverage VFO from 1.36 to 12.7 megacycles, grew an inside, calibrated dial driven by a National Velvet Vernier, and added a lower drawer to hold a complete set of 18 plug-in coils. Its cabinet and panel were finished in a no-nonsense gray crackle. My 1942 Meissner was a gift in 1984 from Jack Jewett, W1JUM, a Classic Exchange friend, who didn't like its somewhat chirpy note. New oscillator and VR tubes have helped it out quite a bit. Thanks, Jack!

There are still more versions of this first series of Signal Shifters out there. I've seen *QST* pictures of one that looks like the 1940 model, except that it has a pilot light in the bottom center where the 1940 has a switch for the Signal Spotter XCO. And K5SDF in Bosque Farms, New Mexico, has one that looks like a further evolution of the 1942 model, internal calibrated dial, ham band coverage, brass and black painted panel, and no coil drawer. This one still uses the basic 6F6-6L6 lineup and the same, plug-in coils.

The post War Signal Shifter went through a major redesign. Instead of plug-in coils, Meissner installed a turret equipped with coils for 80, 40, 20, 15 and 10/11 meter output and with one blank position where coils for 160, 75 phone, 20 phone or 6 meters could be added. The RF lineup changed to a 6V6-807. The front panel became burnished aluminum with black decals. Frequency readout lost its direct calibration and went to a two-window counter dial instead. You could now switch the internal VFO to become a crystal oscillator with no added accessories. There was a green "magic eye" tube on the panel that monitored the 807 grid drive. And you could buy an FMX modulator which would fit inside the box in place of the power supply and which would put you on FM phone. This second series also came in several versions. The initial model, number 9-1090 I believe, had only one 0D3 regulator tube. The later model EX added a second 0A3 VR and changed from the traditional Hartley oscillator to one where the cathode was link coupled into the oscillator coil for feedback. The EX was also available in kit form. You could build your own Signal Shifter for only $64.75 (according to Bob Henry's ad in July 1950 *QST*) rather than pay the full $99.50 (per the Henry Radio and WRL ads in April, 1948 *QST*) for an assembled EX.

I've had two personal encounters with a Meissner EX. As W4VIV in 1953, I ran a borrowed EX with an FMX modulator on 10 meters. It worked all over the Greater Cincinnati area from my Fort Thomas, Kentucky QTH. One day I worked a mobile all the way from Cincinnati to Columbus, about 100 miles ground wave. Not bad for 5 watts from an 807!

My present EX showed up at the Findlay, Ohio Hamfest around 1978. It looked pretty forlorn there on the ground with its nice aluminum panel covered by sloppy black spray paint. I

think it may have even whimpered in embarrassment when it recognized me as a friend. I bought it for all of $10. Fortunately, paint thinner cleaned up the panel without removing the original control labels. And the only thing that was missing was the internal coil strip for 15 meters. (Does anybody out there have one they could spare?) It now works well, on its own and as a driver for my 1948 Globe King.

By the early 1950's, Signal Shifters were fading from the scene. Home brewing hams were using $5 Command transmitters as VFO's and exciters or building their own into BC-375 tuning units. Commercial rigs such as the Collins 32V series and Heath's DX-100 had built-in VFO's, or like the Viking I and II offered their own add-on VFO's at less cost and in a smaller package than the Meissner. You could buy a Heath VF-1 for $20 or a kit VFO from Knight/Allied for about the same that would give you 160, 80, and 40 meter output. The big, clunky, 5 watt output Meissner no longer fit into a modern, 1950's ham shack.

On The Air With A Meissner Signal Shifter

As a "classic" rig, the Signal Shifter is pretty good news. Judging from my hamfest wanderings, there are a fair number of them out there. They are not "fashionable" and correspondingly overpriced. They aren't full of TVI like so many of their contemporaries. And they can still go on the air and do a decent job with little or no modification. Basically, all you need to do after an initial clean-up and inspection - and perhaps replacement of a few weak tubes or leaky bypasses - is to plug it in and attach its link coupled output to your transmatch. (Since the final stage is a doubler, a transmatch is good insurance against unwanted harmonic output.) I'd advise consulting the Meissner manual for keying options, there are several. If you don't get at least 5 watts out, something is wrong and you need to do some more service work or perhaps to install a low power, 4 to 1 balun to make its nominal 300 ohm output happier with your coax line.

The early series, plug-in coil models in particular earned the nickname "Signal Drifter." They have a long thermal warm-up time before they become reasonably stable, despite the previous hype in the *QST* ad. So if you have one of these, turn it on for an hour or so before you put it on the air. The post-war series is much better in this regard.

I ran my 1941 Deluxe in the AWA Old Time Equipment Contest last winter, and I worked coast-to-coast just like Meissner said I could on both 80 and 40 CW with its mighty 5 watts out. From the reports in the AWA Journal, there were three other Meissners in the contest as well, one other '41, a '39 and a '38. Since then I've wound and tweaked up a set of 20 meter coils for it as well on a set of original Meissner forms that I got a few years back from Fair Radio and squirreled away. Watch out for me on 20 in the next AWA contest.

I've also used the '41, '42 and EX Signal Shifters on the Classic Exchange, both barefoot and as VFO's for other rigs like the Globe King and a Millen 90800. They do a good job both ways.

So . . . if you ever run into a Meissner Signal Shifter, I hope now that 1) you will know what it is and 2) you won't turn it into a transmatch! Beg, borrow or if necessary even buy it and put it on the air. You'll have a great, classic QRP rig that will still pay you back with lots of fun. **ER**

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The Hallicrafters SX-140

by Dave Ishmael, WA6VVL
1118 Paularino Ave.
Costa Mesa, CA 92626
714-979-5858

The Hallicrafters SX-140 was introduced in November '60 and was available in kit form as a Halli-Kit (SX-140K) for $94.95 or assembled for $109.95. It is a 5-tube, 6-band, 80-6M amateur band receiver that was a match for the HT-40 transmitter. The tube line-up consists of a 6AZ8 RF amp/crystal calibrator, 6U8 osc/mixer, 6BA6 1650 KHz IF amp, 6T8A AVC/det/ANL/1st audio amp, and 6AW8A meter amp/audio output.

A 2" x 3/4" edgewise meter is used as an S-meter and the front panel controls are as follows:

* 4-position FUNCTION switch; OFF, STAND BY, AM, and CW-SSB
* 6-position BAND SELECTOR; 80 - 6M
* CAL slide switch
* RF GAIN adjust
* ANL slide switch
* SELECTIVITY/BFO adjust
* AUDIO GAIN adjust
* MAIN TUNING
* CAL RESET adjust
* ANT TRIM adjust

The SX-140's power supply uses a full-wave voltage doubler using two silicon diodes. The doubler uses two 40 uF 150V electrolytic capacitors. The output of the doubler provides 225V to the 6AW8A audio amp. An additional RC filter with a 40 uF 250V electrolytic cap provides 175V to the rest of the SX-140's circuitry.

Based on the date codes on the tubes and several parts under the chassis, this receiver appears to have been built at the same time as my matching HT-40 transmitter, possibly mid '62. In spite of using a variac to bring up the receiver, I still lost one of the 40 uF 150V output caps - it shorted, taking out R45, a 10Ω series-limiting resistor, and one of the diodes. I ended up replacing all of the electrolytic caps in the receiver, both diodes, and R45. The transformer's primary is NOT fused.

The SX-140 is housed in a 7-3/16"H x 13-3/8"W x 8-1/4"D light-gray wrap-around steel cabinet - the same size as the HT-40 transmitter. The front panel is dark-gray with light-gray silkscreened lettering. Unlike the HT-40, the back of the receiver's cabinet is open. The receiver weighs about 14 pounds. Like the HT-40, the cabinet had been repainted, but had been nicely done.

I spent several hours "detailing" the SX-140. The tubes were checked and a very "flat" 6U8A was replaced. The front panel was rubbed out with several coats of Meguiar's Car Cleaner/Wax and the meter face was cleaned up with Novus #2 Plastic Polish. The chassis had no corrosion and like the HT-40, cleaned up very nicely. The transformer's rusty laminations were painted.

I used a 1650 KHz FT-243 crystal ordered from CW Crystals plugged into the cal crystal socket to align the 1650 KHz IF's. This is a recommended Hallicrafters alignment technique and works quite well. The IF alignment was "way off" but may have been just the difference between my crystal frequency and the last generator used for alignment. I was hoping that the IF alignment would tighten up and improve the SX-140's selectivity but the improvement was very minor. I suspect it was pretty close to begin with.

Front view of the Hallicrafters SX-140 6-Band receiver.

Referencing the under-chassis view, the SX-140K appears to have been a bit tougher to build than the HT-40K. Even though there are two preassembled wiring harnesses, there's more parts and mechanical assembly required than the HT-40K. The 31 page assembly manual is well written with plenty of Heath-sized foldouts.

The SX-140 was intended as an entry-level novice receiver. At an assembled price of $109.95, the SX-140 competed with the Hallicrafters S-107 ($94.95) and S-108 ($129.95), Knight kit R-100 ($104.50), Gonset G-33 ($89.95), and the Lafayette HE-10 ($79.95), just to name a few. The Heath Kit HR-10 receiver was still two years away. In evaluating and using the SX-140, you have to keep its "mission" in perspective. Once I got the hang of using the -140, I made the following observations:

* The -140's 5-1/2" long dial-scale is more than adequate, especially when compared to general-coverage receivers like the Hallicrafters S-53A and S-107 (or how about an ARC-5 receiver). It takes 11 turns of the 1/5/8" dia. MAIN TUNING knob to cover the 40M band.

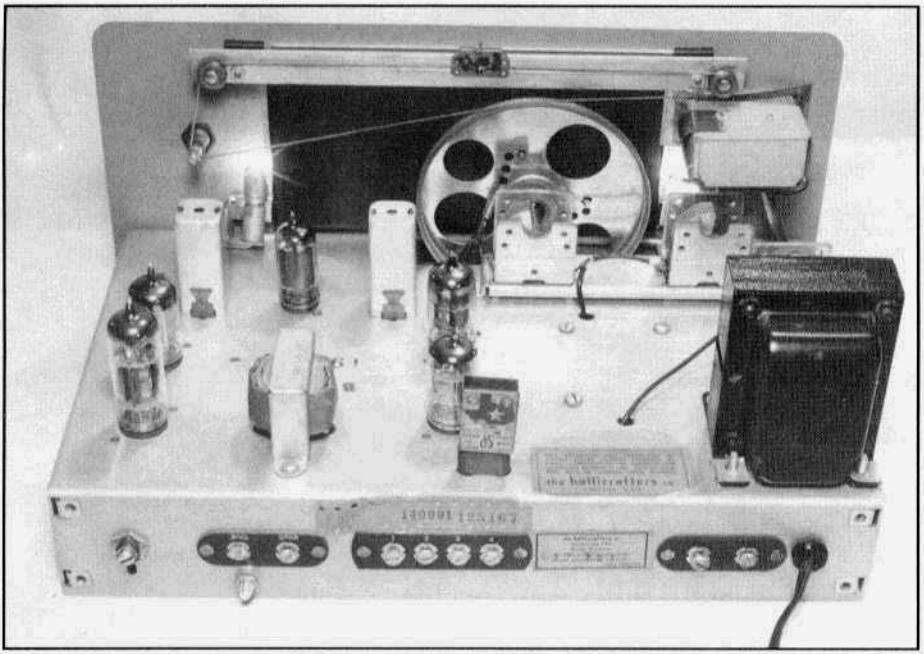
* The cal crystal is a 3.5 MHz FT-243 crystal that provides markers at 3.5, 7.0, 14.0, 21.0, 28.0, and 52.5 MHz. While adequate for single-point calibration, it leaves something to be desired with the nonlinear 5-1/2" long dial scale. As a plus, any 80 or 40M crystal can be used as a cal crystal for a specific cal point.

* The -140's MAIN TUNING and CAL RESET capacitors are about the same value. As a result, setting the cal point using the relatively small 9/16" dia. knob is a bit of a "chore" since it has about the same range as the MAIN TUNING.

* The S-meter wildly "oscillates" from end-to-end with changes in carrier level(s) and noise and only operates in AM. The "AVC is reduced for CW and SSB reception" and the S-meter "is disabled to prevent damage by a strong signal." The function switch shorts out the S-meter in CW. The best thing the S-

continued next page

The SX-140 from previous page



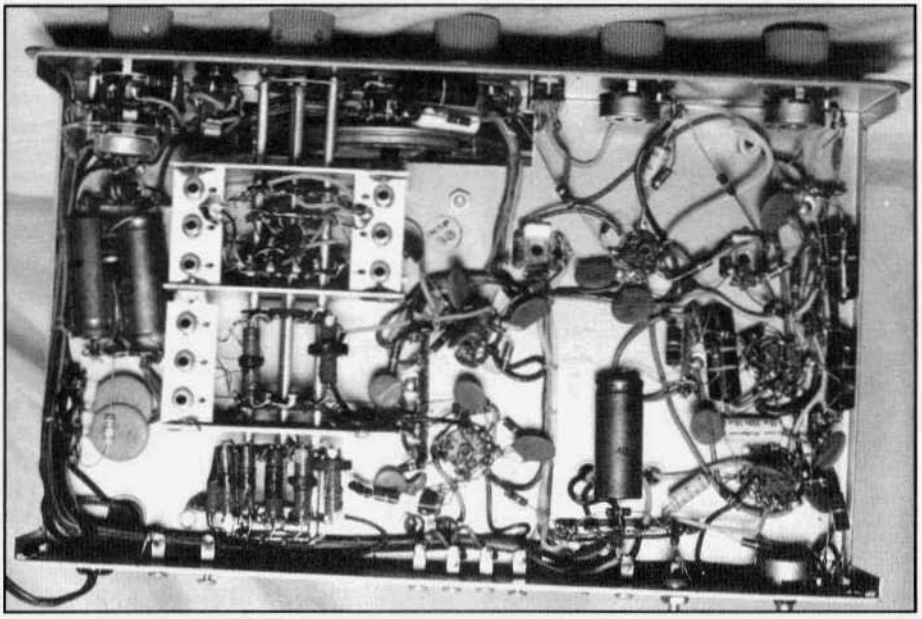
Rear view of the SX-140.

meter does is allow you to cal the receiver in AM!

* The front-end is effectively blocked by strong signals, especially those close to my QTH. After turning the RF GAIN control all the way down, the ANT TRIM has to be used to detune the front-end in the presence of strong signals.

* The SELECTIVITY/BFO control is a 2K pot located in the 6BA6 IF amp's suppressor grid circuit. This pot controls the regeneration of the 6BA6. As the control is turned clockwise (CW), the 6BA6 starts oscillating, doubling as a BFO. As Mike, AB5L, pointed out in a recent letter, "I love the 'pop' when it goes into oscillation". Advancing the pot past the point of oscillation controls the BFO's pitch. If you've been used to single-signal CW reception, you're going to have to get used to tuning through zero-beat and hearing the signal on both sides. This control also improves the selectivity about 2:1 with the widest selectivity at its fully CCW position. The -140's manual indicates a variable selectivity of 8 KHz to about 2 KHz as the control is turned from its fully CCW position to its CW position just below the point of oscillation. My -140 didn't perform anywhere near that well nor was the selectivity "variable". I changed 6BA6's just to see if it was tube related with no changes in the selectivity and there are only four components, including the BFO/Selectivity control in the suppressor circuit and they were OK. I have no explanation for the differences in performance.

* I spent several evenings listening to the Westcoast AM net on 3.870 MHz. The -140's AM performance is OK with one exception - selectivity (or lack of it). While listening to Bernie, WA6HDY, from Arroyo Grande, CA, his usually strong signal was audible over 20 KHz wide and easily "clobbered" by adjacent SSB QSO's. One evening was very pleasant with a minimum of interference for the duration of the net. The following week, the -140 was absolutely useless because of the "interference"



Under chassis view of the SX-140.

from strong adjacent SSB signals. I have a similar problem with my standard AM receiver, an original dynamotor-powered BC-348-O so the criticism of the -140's selectivity might be a bit unfair. However, it is clear that the -140 is not very usable in crowded band conditions.

* The mechanical and oscillator stability is good enough to routinely monitor SSB signals. I spent one Saturday monitoring the Westcoast 7.240 MHz swap service with just an occasional "tweak" to the MAIN TUNING.

After using the SX-140 for several months, I like it better than I did, but you HAVE to get used to its idiosyncrasies. Since most of my time is spent on CW, I prefer this receiver on CW. The SX-140 is a very serviceable novice CW receiver in the absence of strong adjacent signals. But having said that, I can easily understand why my boyhood friend traded in his SX-140 for a National NC-270!

Send me a #10 envelope w/SASE and I will send you the schematic and parts list of the SX-140 with above and under chassis views. **ER**

Selected References:

1. "Recent Equipment - SX-140K Receiver", *QST*, Dec. '61, pgs 58-60.

2. "The Hallicrafters Story, 1933-1975", Max De Henseler, HB9RS, Antique Radio Club of America, Inc., 1991, pgs 198-200.

Hunting For Heathkits: The Rarest of the Rare from page 15

CO-1: Code Practice Oscillator

Manufactured 1959-67, original price $7.95

The CO-1 was the first of three code practice oscillators, and like the PM-1 it didn't match any other Heath amateur product in size, shape, or paint scheme. The unit is enclosed in the same black plastic box used with the small resistance substitution boxes as well as the CR-1 crystal radio. The CO-1 has a white front panel and a cloth grill over the speaker. The unit is powered by two "C" cells (check for leak damage), was supplied with a key and features a switch-selectable tone or blinking light. In spite if its long production run the CO-1 is very rare.

Unbuilt Kits

Unbuilt kits are the 'Holy Grail' for Heath collectors. Last year at least three were found at Dayton, and they are not always easy to spot. Sometimes they are disguised as just another junk box. If you find one and buy it, you will be faced with a terrible decision - whether or not to put it together. Don't. Rare or not, there are plenty of examples of whatever you have found that are already assembled. An unassembled kit, on the other hand, is an artifact frozen in time. Unassembled kits are finds of historical significance because they are a direct link to the past. When assembled, the link is irretrievably broken. Unlike assembled pieces which endure, unassembled kits, once assembled, are lost forever and without them the idea of Heath "kits" becomes a mere abstraction.

Wait...There's More!

The products listed above represent only a tiny fraction of Heath's total amateur radio product line. There are many more, some rarer than others, that would make a fine addition to any collection. Perhaps some of them can be addressed in a future article. And there are other products not directly related to ham radio that are very rare and highly collectable. Among them are the K-1 and K-2 "all wave" radios, the AR-1, 2, and 3 series of shortwave radios, and the CR-1 crystal radio, to name only a few. Heath's General Products group also made some pieces that are now very rare, and even some of Heath's test equipment has collectable potential. Who'll be the first to collect a full set of Heath's VTVMs? There were 24 in all.

Keep an eye out for some of the smaller less conspicuous Heath products. These are the gems most often overlooked, and you won't get a hernia carrying them back to your car! So put down the classified ads, put on your walkin' shoes, grab your back pack and head for the hamfests. There you'll find boatanchors in all of their knob twisting, baked enamel, and burned transformer glory. **ER**

R-390A Contract/Order Number Update from page 18

As of now, the "NEW" contract/order number genesis is as follows:

YEAR	MANUFACTURER	ORDER NUMBER
1954	Collins	14214-PH-51
1954	Motorola	363-PH-54
1954	Collins	375-PH-54
1955	Collins	08719-PH-55
1956	Motorola	14-PH-56
1958	Motorola	14385-PH-58
1959	Stewart-Warner	42428-PC-59
1960	Stewart-Warner	20139-PC-60-A1-51
1960	EAC	23137-PC-60
1961	Capehart Corp.	21582-PC-61
1962	Amelco, Inc.	35064-PC-62
1963	Teledyne/Imperial	37856-PC-63
1963	Stewart-Warner	DA-36-039-SC-81547
1966	Communications Systems	FR-11-022-C-4-26418 (E)
1967	Clavier Corp.	DAAG05-67-C-0016
1967	EAC	FR-36-039-N-6-00189 (E)
1968	Dittmore-Freimuth Corp.	DAAB05-68-C-0040
1984	Fowler Industries	N00024-84-C-2027

On an unrelated item, I have located the original manufacturer of the Hammarlund SP-600 cabinets! Sadly, the original hole perforating dies are not available. However the side panels are louvered and the original color and finish is available.

Premier Metal Products Co.,381 Canal Place,Bronx, NY 10451. (718) 993-9200

Cabinet No. DCR-18100, Color Code 561 "charcoal gray". Call or write for a catalog. Price $110.52 + $10 shipping.

Many thanks to all of those who called and wrote. It's been a lot of fun! ER

ER Pal from page 11

hear a station talking about something you read about in the morning paper and then the station ID says you have been listening to Stockholm or Praha. One day after the Kobe earthquake I listened to Radio Japan for 1-1/2 hours as they gave out the latest details of the disaster. During this broadcast, I turned on the speaker so that my wife could also hear the news. Several of my friends have confirmed my discovery that you get more complete coverage of world news on the short wave bands than you do on local radio or TV. This little radio has helped me remember some of the fun I had back in the thirties when I was just starting to learn about short wave radio. ER

References:

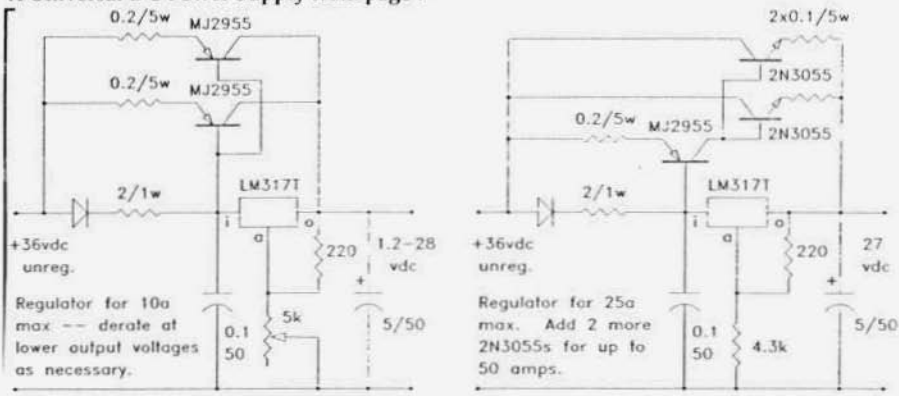
1. The Victor 2-Tube Superheterodyne Receiver, L.J. Victor and H. Mitchell, Short Wave Craft, Dec. 1933. (6A7 converter, 6F7 IF amp & det.)

2. The 1934 Pal 2-Tube Portable, H.G. Cisin, Short Wave Craft, Mar. 1934. (6F7 & 12A7, pentode is TRF amp, triode is non-regen det, then AF fed back (reflexed) to pentode as AF amp, 12A7 output plus rect.)

3. The 2-Tube UDAR AC-DC Receiver, Art Gregor, May 1935 Short Wave Craft, (6F7, 12A7, pentode UTRF amp, triode regen det, 12A7 output plus rect.)

4. Midget AC-DC Set Works Speaker, H.G. Cisin, Short Wave Craft, Dec. 1935. (6C6 regen det, 37 AF amp, 12A7 output plus rect.)

5. A Two-Tube Receiver With Multi-Purpose Tube, 1936 Ed. ARRL Handbook. (6F7 det, AF amp, 41 output.)



Regulator circuits for use in a "utility" power supply.

running current. I wanted the 26 volt fixed supply section to start a command transmitter dynamotor with a full load running current of 7 amps; this required an LM-317T with two stage regulator boost circuit consisting of an MJ2955 PNP amplifier and two 2N3055 NPN emitter followers. This sounds like 'overkill' but current gains of power transistors operating near maximum current ratings and minimum collector voltage can be much lower than the 20 or more specified near the center of the operating area. In this form the supply output drops to 15 volts while delivering the starting surge of 25 amps but that's enough to bring the dynamotor right up to speed. This won't work for all sets at this power level because on some the dynamotor start relay will drop out at this voltage but it will handle command sets.

Small computer transformers used in supplies like this can be operated at two or sometimes three times the rated power level for periods of five minutes or so if they can deliver enough voltage. You can boost the input voltage if necessary. For example, the transformer on the 26 VDC supply is rated at 30 VAC at 4 amps load. This is a continuous commercial rating and probably assumes a surrounding air temperature of 130 degrees F. In this supply it operates continuously with little temperature rise at 120 VAC input, 5 amps output. At 10 amps the output falls several volts on 120 VAC input but a 'high current' position on the panel switch uses an autotransformer to raise the primary voltage to 138 VAC so full power is available. A three-position (OFF-ON-ON DPDT) slide switch is ideal for this. The temperature rise in five minutes is reasonable.

Obviously common sense is required with this technique. Though it is possible to pull a stage coach with mice if you use a big enough whip, excessive whipping wears out lots of mice. If you start to smell the transformer varnish, stop immediately because the next step is burning out the winding. Since they usually fail shorted, this will test your line fuse -- you did use a line fuse, didn't you?

The 'continuous' (but not the 'high current') rating of the transformer can be increased significantly if you provide ventilation. The two high voltage transformers and the high-current 26 VDC unit are mounted with the windings over 5/8 inch holes in the bottom of the unit through which the cooling fan pulls in air.

The input voltage trick can be used the other way too. Extra volts of DC input to the regulator mean extra watts of power to be dissipated. With some combinations of transformers and output voltages, a low power switch setting would be a big help.

Most 'computer' power supplies are

Table One -- Common Three-Terminal Regulator Chips

Number	Type	Voltage	Current	Case Type
78xx	Fixed	+'xx'V	1 amp	TO-220
7809, 7812, 7815. . .				
79xx	Fixed	-'xx'V	1 amp	TO-220
LM-317L	Adj.	+1.2-33V	100 mA	TO-92
LM-317T	Adj.	+1.2-37V	1.5 amps	TO-220
LM-317K	Adj.	+1.2-37V	1.5 amp	TO-3
LM-350T	Adj.	+1.2-33V	3 amp	TO-220
LM-338K	Adj.	+1.2-32V	5 amp	TO-3
LM-337T	Adj.	-1.2-37V	1.5 amp	TO-220
LM-723	Adj.	+2-37V	150 mA	14-pin flat
TL-783	Adj.	+1.2-125V	700 mA	TO-220

designed so that if the current becomes more than the limit, output voltage drops to near-zero and stays there until the load is removed -- this is called fold back current limiting. For use with dynamotors, the limit current would have to be so high that it would be of no use so I use simpler methods. The regulator chip limit currents are not much more than enough to drive the following stages to full output. The transformers are no larger than needed (so winding resistance limits how much they can melt) and they are fused in the transformer primary and rectifier output lines.

All of the regulated low voltage supplies should have a small capacitor (1 uFd or so) across the output to improve handling of sudden loads. An electrolytic should be used so the Q isn't high enough to lead to instability when connected in a high gain circuit such as this. Don't, however, connect these caps until you're sure the regulator is stable. If it isn't you may be delivering a 1000 cps 20 volt square wave at 20 or more amps across that capacitor. While it is interesting to see what's inside a modern electrolytic, it takes almost forever to get all the little bits out of the chassis.

Within each supply and regulator, return all grounds to a common point. Oscillation and bizarre other effects are likely if you don't. For example, I spent an hour hunting for the reason that I had 100 mv pulses at 120 pps on the 1.2-8 volt output. I discovered that I had wired this circuit so the voltage drop in a 2" piece of wire caused by the current pulses in the diodes was in series with the voltage adjustment potentiometer return. Moving this connection to the other end of the 2" wire made the pulses vanish.

Conclusions

Though in the end I replaced all but two of the original six transformers and almost all of the other parts and wiring, this 'make-over' turned out well. The original builder's scheme of putting all the parts inside an upside-down chassis and using one side as a panel makes building and troubleshooting simple. The resulting supply is much safer than the usual breadboard arrangement because there are no exposed voltages. Many of the radios you use with a supply like this one can be set on the large flat top surface so it takes up no 'floor space' on the bench or operating table.

The flexibility is outstanding. There almost isn't a small military set up to the power level of a command receiver/transmitter combination that can't be powered by this supply! And with a few external parts it will meet many other utility requirements around the shack such as reforming electrolytic caps and charging an oddball battery.

continued next page

Improvements

Starting from scratch there are things I'd do differently. With continuously variable voltages you can vaporize every filament in that rare set instantly if you accidentally hit a knob. Using multiturn pots helps and knob locks would be even better; best of all would be a set of common voltages selected by a rotary switch, say 1.4 - 2.8 - 4.2 - 6.3 - 7.5 - 13 - 26 VARIABLE. Since this switch just picks a tap on a chain of 1/2 watt resistors, it would add little to cost or complexity. It must have 'shorting' contacts (always connected to something) or the output voltage will go to the maximum value when it is between contacts!

A small loudspeaker driven from a solid state amplifier would be handy when testing receivers. If you work with military sets another solid state amp with a connector for your station mic could be used to deliver output at 'carbon mic' levels to a PL-68 plug.

An output current meter would be handy -- one that could be switched to shunts in the various circuits would meet most requirements.

Miscellaneous

The only connection to the chassis in a unit of this type should be the green (ground) wire of the line cord. If you provide utility outlets they should all be of the modern three-wire type and you should be careful that they're wired right. A 120 VAC neon indicator connected from the neutral to the chassis ground will then light up if something outside the unit is wired wrong -- either the wall socket to which it is connected, or something plugged in to one of the utility outlets.

The transformers and chokes should be mounted along the edges of the interior 'floor space' so they won't cause the bottom to buckle if the supply is dropped a couple of inches. Mounting them with the frame vertical and connected to the sides of the chassis with screw spacers and also to the bottom with L-brackets is a good idea. Even with these steps, a supply of this type can't be thrown around if it is built with an aluminum chassis. Adding a fifth foot right under one of the center transformers helps.

I mounted the lower-dissipation boost transistors through the bottom of the unit. This makes a good heat sink but if the supply will be used on a conductive surface, or metal tools might roll underneath, insulating covers over the transistors are a good idea.

Don't even think about using old-style carbon composition resistors. You want meters you can trust and voltages that stay put; the 'vintage' resistors are inaccurate and 'drifty'. Go down to Radio Shack and buy assortments of 1/4 and 1/2 watt carbon film resistors. They're marked 5% tolerance but most will be under 2% from now till the cows come home.

When reworking an old piece of homebrew gear you'll almost always find some big holes in the wrong places. I make aluminum cover plates and epoxy them on. You get a great looking panel that is also stiffer than the original -- a real plus on a heavy project like this.

A Warning

If you use military meters with black faces and light gray, brown, or yellowish green markings, **do not under any circumstances** open them up. These dial markings on these are **radioactive**. The amount of radiation which gets out through the sealed case is negligible but inhaling a dust particle from inside can be fatal if it gets stuck in a corner of your lungs. Because they're sealed, the inside isn't likely to need cleaning; the outside can be cleaned with no risk. If the meter doesn't work right, seal it in plastic and throw it away, following any local procedure for disposal of low level hazardous wastes.

Finally . . .

This supply has already saved me a lot of work, operating small sets on the Old Military Radio Net. I should have built it years ago. But I had to wait for an old timer I never even knew to show me how. ER

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FOR SALE: RF sig. gen., AN/URM-25D, 10 kHz - 50 MHz, clean - $85; RME 4301 SSB adapter - $50. Bob Zimmer, NV1X, 205 Brigham Hill Rd., Milton, VT 05468. (802) 879-7235

FOR SALE: Hammarlund HQ-180A (X) in very good condx - $365 plus shpg. Tony Zalocki, WB2VFN, NJ. (201) 835-0528

FOR SALE: Viking Ranger II, exc.; also 4D32 tubes. Bill, NØZX, 11608 Davenport Pl., #23, Omaha, NE 68154. (402) 330-6562

FOR SALE: Collins 75A-2, manual, exc. - $375; Drake 2B w/2BQ, calibrator, manual - $165. Bob Needleman, KD4ZN, 395 Meadowbrook Rd., North Wales, PA 19454. (215) 661-9283

FOR SALE or TRADE: R-1134/WRR3 VLF rcvr, fair condx - $125. **WANTED:** Control cable between T-827 and AM-3007, and manual. Dave, WA, (206) 748-0511

FOR SALE: NC-300 rcvr - $175; SP-600 - $145. PU only. **WANTED:** NC-303. F.W. Nicholas, W7KBF, Phoenix, AZ, (602) 864-9987.

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 22075. (703) 822-5643

FOR SALE: Hammarlund HQ-180 w/spkr, mint - $380; HQ-170 w/spkr, mint - $280; NC-300, mint - $225; SX-115 - $425; DX-160 - $100; Heath Mohican, as new - $125; Heath matched set, Mohawk, Apache, SB-10, Warrior - $550; HW-16 & HG-10, very good - $130; SB-310 shortwave/ham - $130; NM-20B FCC monitor rcvr, .5-32 Mcs - $100; Drake TR4 w/spkr & pwr sply, outstanding - $325; R4-B, T4-X, MS-4, as new - $375; 2B rcvr & 2BQ - $225. Carl, KS, (913) 681-9875.

FOR SALE: Military rcvr, R190TRC1. Charles Harper, 2000 Jackstown Rd., Paris, KY 40361. (502) 769-0404, after 6PM EST

FOR SALE: Drake B-Line - $295; HQ-170 w/clock - $125; RME 4350 - $125; Drake T4XB, w/speech processor - $125. I'll answer all inquiries. Vern, WØVV, Box 187, Lehr, ND 58460.

FOR SALE: Heath HW99 unbuilt kit - $325; HW16 - $60; IO12 scope - $50; Knight TR106 - $40. Donzil Q. Worthington, WS0F, 9842 Juniper Cir., Prescott Valley, AZ 86314. (602) 772-1297

FOR SALE: Kenwood T599 xmtr, Hickok 533A tube tester. Gene Schraut, N6GA, UT, (801) 635-7343

WANTED: RME DM36 converter. Matches RME69 rcvr. Trade nice RME VHF152A converter or money. Bill, WC7O, 12405 Ranchette Dr., Tucson, AZ 85743. (602) 682-7285

WANTED: CQ Magazine issues - May 1945; Sept. 1945 and Feb. 1946; also good to exc. Ranger II. Brian, K9RA, IL. (800) 225-0256 ext. 14733

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: My friends tell me to get on 160, but I use Swan gear. Isn't there a Swan 160X out there somewhere. Eric Kutzli, KBØXP, Box 98, Stanton, IA 51573. (712) 829-2446

WANTED: SC-101; SC-301; KW-1; 30K-1 thru 5; 302C1; 75A thru 75A-4 rcvrs and spkrs, any conds. Purchase entire estates, pick up 48 states and top $ paid. Rick, (800) 462-2972

WANTED: Harvey-Wells equipment. Randy, KE7TV, 2350 W. Mission Ln., #7, Phoenix, AZ 85021. (602) 841-2645 (d), 482-6565 (n)

WANTED: Two bayonet tube sockets for 810 or 872. W6OJU, 529 Kevin Way, Placentia, CA 92670. (714) 528-5652

WANTED: Impedance charts for UTC CVM-4 and RCA CRV-301442 mod xfmrs. Harlan, K6JFW, POB 2925, Saratoga, CA 95070. (408) 257-8811

WANTED: E.F. Johnson catalogs showing Speed-X straight keys 302, 305, 306, 312 & 326. John Elwood, WW7P, 5716 North 34th Dr., Phoenix, AZ 85017-1911

WANTED: TMC GPT-750 exciter SB-2 or AM modulator. Don Gies, K4GJT, FL, (904) 475-3306

WANTED: For my xtal collection - Bliley VF-1, HF-2, CF-1, CF-3, AX-2, AX-3, any 160 meter, crystals and holders from Peterson, Monitor and others prior to 1950. Will pay more than a fair price for manual from Stancor with construction/coil data for the 10P and 20P xmtrs. A copy would be acceptable. Dean Showalter, WA6PJR, 7816 Redberry St., NW, Albuquerque, NM 87120. (505) 899-9376

WANTED: Johnson gear, all models, any condition. Please state asking price. Wen Turner, AD7Z, Box 451, Cal-Nev-Ari, NV 89039-0402

WANTED: Manual on maintenance & operation for Lafayette C.R. Analyzer Model TE-25. WØBVA, Box 121, Scammon, KS 66773. (316) 479-2756

WANTED: Hallicrafters Sky Buddy S-19, repeat S-19. Also National SW-4. Best trades or cash. Robert Enemark, W1EC, POB 1607, Duxbury, MA 02331.

Manuals for Amateur, Audio and Radio Related Equipment. Lafayette, Heath, etc. included. Over 3800 Available. Highest Quality Guaranteed. Catalog, two $.32 stamps. Pete Markavage, **Manual Man**, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

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

WANTED: Viking II CDC and other items related to civil defense, bomb shelters, etc. Jeff, N9INW, WI, (414) 962-6383 after 9 PM CST.

WANTED: T-195/GRC-19 xmtr. Greg, WA2ORO, 39 Myson St., W. Islip, NY 11795. (516) 661-2846

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

WANTED: National 1-10, 1-10A, VFO-62, SM-57 (signal meter for NC-57), CRR and CRU scopes. Wayne Childress, 1903 Jerome PL, #3, Helena, MT 59601. (406) 443-7255

WANTED: Collins console w/spkr, light & wattmeter that matches the Collins 75A-4. Bob Kemp, POB 470, Lake City, MN 55041. (612) 345-5345

WANTED: Manuals/schematics for following items - RCA AR-77 rcvr, Supreme Model 562 Audolyzer, HP-411A RF millivoltmeter, HP-313A tracking oscillator, Tektronix 1840A time base. Bob Smith, 14779 Kogan Dr., Woodbridge, VA 22193-3314

WANTED: Collins KWS-1 and 75A-4 w/CW filter. George, KG6GA, VA, (703) 757-2810

WANTED: Schematics/manuals for RCA WV-77C VTVM, WR-49B sig. gen., Hickock 188X sig. gen.; Precision E200C (6U8, 6AU6, 5Y3) sig. gen. Jack Bertholf, WA4CSM, 8109 N.W. 58 Ct., Tamarac, FL 33321

WANTED: Mics - RCA 44, 77, Astatic 600S, 820S; tube audio console; WE 300B, KT88; triode tube amps; NCL 2000; Valiant II; 55C1; SC-101. Michael Behar, WM1O, 17 Gerlach Pl., Larchmont, NY 10538. (914) 834-7678

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WANTED: 455 kc marker crystal for RCA WR-50B sig. gen. Aloha. Itsuo Yano, 80 Lehua St., Kahului, HI 96732.

WANTED: KWS-1; HF-380; 6251; R-389 and SP-600JX. Need exc. conds. Mitsugu Shigaki, JA6IBX, 2825 -2 Jozan Kamidai Machi. Kumamoto. 860 Japan. FAX Japan-96-329-4601

TRADE: Military BC-222 walkie-talkie; BC-639A and AC sply; TBY-7 xcvr; shell for #19 key; BC-454-B & BC-453-B rcvrs; TBX key. **WANTED:** BC-342 rcvr; BC-669 pwr sply & manual; TBY key; ARC-5 rcvrs - R-23, R-24, R-27; black FT-230A; DY-2A dynamotors; BC-325 manual; WS #19 Mark II remote control box (es) & cable. Don Merz, 47 Hazel Dr., Pittsburgh, PA 15228. (412) 234-8819

FOR SALE: Homemade galena crystal radios, detectors and galena crystals. $1 regular, $2 super. Radio parts. What do you need? L. Gardner, 458 Two Mile Creek Rd., Tanawanda, NY 14150.

FOR SALE: Receiving tubes, new and used; multi-section twistlock electrolytic caps to 500-VDC; SAMS photofacts. Send stamp for lists. Turner Electronics, 16701 Main St., Ste. 121, Hesperia, CA 92345.

FOR SALE: Drake R-4C - $190; TR-4C w/AC-4 - $300; Eico 717 electronic keyer (collectible), manual - $65; Johnson 6&2 VFO, NIB - $70. Bill, WA1APX/8, MI, (810) 781-9717

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FOR SALE: BC-1306 complete, fair condx - BO. Dean, KK1K, 20 Jackson Hts., Essex Jct., VT 05452. (802) 878-8293

FOR SALE: Paperback, "South African Radar in World War II", 1993, 229 pages - $12 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (708) 679-8641

FOR SALE: 40 + radios & parts. SASE for list. Mel Dykstra, KB8GP, 655 East Ellis, Muskegon, MI 49441.

FOR SALE: National NC-300; Hammarlund HQ-129X. Both units work well - $100 each. **WANTED:** BC-610 coil #C-388-C (75 meters); BC-342 rcvr; freq. meter set SCR-211-( ). Marc, WC1X, RI, (401) 849-8531

FOR SALE: Central Electronics 600L linear amp, companion to 100V/200V series xmtrs - $200; Butternut HF4B "Butterfly" beam antenna, complete, never assembled, box opened - $200; Sultzer 5P laboratory freq. standard - $125. All above w/manuals. Plus shpg on all. Ray, N0DMS, CO, (303) 838-3665.

FOR SALE: AN/GRR-5 & pwr - $125 plus shpg. **WANTED:** Case for TCS ant. tuner. Ken Kolthoff, K8AXH, 5753 David Pl., Fairfield, OH 45014. (513) 858-2161

FOR SALE: Heath SB-401 - $60; Hallicrafters SX-117 - $50; Multi-Elmac AF-67 xmtr, PMR7 rcvr, pwr sply - $30. Shpg not included. Craig, WA, (509) 453-5492

FOR SALE: AM-3007 (part of URC-35) - $250; AT-272A & base (part of PRC-8, 9, 10, 28), new, in package - $12 each. Mike, CA, (619) 444-7717

FOR SALE: Crystal radio kits and parts. Send SASE for brochure. Carl & Grace Ent., 5636 Romeyn, Detroit, MI 48209.

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FOR SALE: RCA rcvg tube manual, RC 16, 1950, good condx - $10 + $2 shpg; dual 1995, UX - $3 each, UV - $5 each + $2 per order shpg; dual WX-12 - $5 each, 2 to sell, 2.5V fil. xfmr 5.0D to 1.0D, same for 6.5V and 5V + $3 shpg per order; SW-3 replacement coil forms - $7.50 each; WD-11 adapters - $5 each + shpg. James Fred, R1, Box 41, Cutler, IN 46920. (317) 268-2214

FOR SALE: New Collins PJ-068 mic plugs for S-line/KWM-2 - $8 each. Clint Hancock, KM6UJ, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: "The find of the decade". (2) BC-611's in the orig. box! Serious offers please. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (602) 624-8029

FOR SALE: DX-60B - $55; HB-10 - $45. **WANTED:** D-104; DowKey relay; Hallicrafters S20R; Globe 755 VFO. Ron, WB0IZ, 10701 W. 54th St., Shawnee, KS 66203.

FOR SALE: Complete GRC-19 with mount, antenna bag, spares, documentation, cables, extra R-392 and T-195, 24V sply. Xmtrs not loading, pick up lot - $650 firm. Tom Mackie, WB2ILA, RI, (401) 423-2474

FOR SALE: Vintage parts. Send stamp and request "Vintage Flyer". USA only. 40 years of mail order electronics. Bigelow Electronics, P.O. Box 125, Bluffton, OH 45817

FOR SALE: Johnson KW xmtr, pedestal model, nice w/Ranger exciter and KW Matchbox. 160 modification 80% completed. Dick, MO, (417) 469-3347.

FOR SALE: Mic plugs: 3/16, 3 conductor - $4, 2 conductor for Heath - $6. $1 each shpg. PA add 6% tax. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Johnson speech amp - $100; Hallicrafters SX-73 & National HRO-60 w/manuals, spkrs & coils - $700, PU only; Central Electronics Sideband Slicer w/manual - $75; Gates Solidstatesman AGC - $75; pwr sply for Heath HW-7 - $35; Zenith Trans-Oceanic Royal 3000-1 w/manual & AC adapter - $150. All equip. in very good condx. Steve, KA9QLF, IL, (217) 243-3920

FOR SALE: "The Vail Correspondent", key collector's quarterly journal. Free ads. $10/yr. USA; sample $2. TVC, Box 88-E, Maynard, MA 01754.

FOR SALE: NC-88 rcvr in very good shape - $50, U-ship. Al, AI4U, FL, (407) 222-0007 (d), 298-3493 (n).

FOR SALE: Collins built TCS-5, complete, like new, unused - TX, RX, control box, cables, noise limiter, unopened dyno sply, antenna coil - $359; also have TCS-12 rig in exc. used condx - $319; unopened, mint TCS-12 spares chest 2 (of 2-chest set - mostly dyno spares) - $59; TCS AC sply PP-380/U, cosmetically rough, untested - $39. Don, N3RHT,PA, (412) 234-8819

FOR SALE: Ship's compass, beautiful antique 9.5" diameter, gimbaled, brass compass made in 1943 by Lionel Corp., NY. US Navy BuShips No.1, Mod 1, SN/12587. Comes with mating Azimuth Circle, Mark 3, Mod 2, BuShips NO/8246. Mint, Mint, in orig. wood case - $1100. Tom Austin, Jr., K4OTM, MI, (616) 679-5191

FOR SALE: 18 BC-610 tuning units, various condx, frequency, manufacturer and price. SASE for list. Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), POB 697, North Cove, WA 98547. (360) 267-4011

FOR SALE: Central Electronics 20A w/QT1, PS1 and 458 VFO in deluxe matching cabinet, w/manual, both in nice condx - $150; Tapetone XC50N 6M converter, exc. - $50; J-38 key - $30. Includes shpg. Don Moth, W2MPK, POB 73, Chittenango, NY 13037. (315) 687-6453

FOR SALE: Collins 32V-1; shockmounts for BC-348 and RBL - $20 each; new Eimac 4X150 tubes - $25 each. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

FOR SALE: Heath grid dip meter model 1250, new in kit form - $75 OBO. Frank, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415

FOR SALE: BC-610H, w/BC-614, BC-939, 122 VFO, Lambda sply and xtra coils, 250TH, 100TH & pwr xfmr, manuals - $525. Larry Wright, N9HRQ, IL, (708) 658-7328

FOR SALE: T-368A; Globe champ 300A, nice; Viking Ranger; Ranger II; rebuilder Globe King 400B. **WANTED:** Junker HQ-170. Dick, MO, (417) 469-3347

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For more information contact Leo Meyerson, WØGFQ at (402) 392-1708, May-Nov.; 619) 321-1138, Nov.-May.

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

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

WANTED: All items in WW II B-26 radio compartment, BC-461 antenna control box, clock lamps, oxygen, chair, etc. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. Msg. (707) 523-9122

WANTED: Eddystone 850/4 rcvr. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252

WANTED: For Globe King 400 - 160M coils, any make; for SW-54 - plastic bandspread knob. Chas. J. Graham, 20335 Casa Loma Rd., Grass Valley, CA 95945. (916) 273-6847

WANTED: Schematic/service manual (copy OK) for Panoramaoscope, model SA-3 T200 (panadaptor). J. Thomas, (719) 481-4564, Colorado, 4th ring answering machine.

WANTED: Eddystone general coverage rcvr; Drake 2B, R4B, R4C, exc. please. James Geer, WB5LXZ, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Control box for ARC-1 xcvr. Scott Johnson, KC7BGE, AZ, (602) 413-3302 lve msge.

WANTED: Hallicrafters HT-9 oscillator/antenna coils and crystals. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

WANTED: Johnson Viking Valiant, clean to near mint, willing to pay good price. Clint, KB5ZHT, 107 Forest Oaks Ln., Lake Jackson, TX 77566.

WANTED: Manual or schematic for National R-115 rcvr (copy OK); IM-84/URM-50 field strength meter; Send LSASE for 7 page list of radio/electric books, manuals and catalogs. Wayne Childress, 1903 Jerome Pl. #3, Helena, MT 59601. (406) 443-7255

WANTED: Broadcast station modulation monitor such as General Radio 193/A or equivalent. Ted Bracco, Quincy University, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

WANTED: Drake MS7 spkr in exc. or better condx; 75A-1 in very good condx and/or NBFM adaptor. Phil Green, POB, 1592, Beaverton, OR 97075. (503) 524-7685

WANTED: Information on a Johnson 6N2 transverter to match a Valiant II. I may have the one and only? Chuck, WØIUH, 9917 Irving Ave., So., Bloomington, MNB 55431. (612) 888-7104

WANTED: Instructions for the 75A-4 noise blanker that uses four 6U8A tubes. Don Hilliard, WØPW, Rt 5, Box 219, Neosho, MO 64850. (417) 451-5892

WANTED: Hammarlund matching spkr for HQ-129X, HQ-215, SPC-10 SSB converter. Charles P. Jedlicka, N9SOR, IL, (708) 515-1836

WANTED: Front panel overlay for Collins 30L-1, must be exc. Larry, W5VHP, 4212 Beacon Ct., Bartlesville, OK 74006. (918) 333-2891

WANTED: Info on Bendix Marine ADF100 auto direction finder. Also to buy RBA, RBB, RBC rcvrs. John Hartman, 11 Woodhenge Cir., Londonderry, NH 03053. (603) 437-2819

FOR SALE: Military WW II Navy TBX radios - TBX-5 & TBX-8, exc, looking, untested - $190 each; TBX-8 AC pwr sply (EAC) - $99; EF-8 gas generator for TBX-8, like new - $110; TBX telegraph key available (prefer trade). TBX-6 "Representative Type Test Data" report on 1944 Navy TBX testing, photocopy - $7. Don, N3RHT, PA, (412) 234-8819

FOR SALE: Collins 32V-3 & 75A-1 - BO; BC-610E w/BC-614, BC-939, BC-221, etc. - BO; Invader 2000 - $875; Invader 200, as-is - $250; Viking II - $225; NC-300 - $175; HQ-140-X - $175; SX-101 Mark IIIA - $175; SX-62A w/R-46B spkr - $200. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/FAX (313) 453-8303

FOR SALE: National HRO-7 A, B,C,D coils, spkr, pwr sply - $350; National NC-183D - $400; RME 6900 - $300. All exc. condx. Shpg xtra. Greg Richardson, POB 405, Gallipolis Ferry, WV 25515.

FOR SALE: Hallicrafters HT-37 - $65; OS-34 military scope - $25; Triplett sweep gen., 3434-A - $35; RF sig. gen. URM-25 - $15; Ballentine multimeter - $15. Blase, W7BSJ, AZ, (520) 886-3087

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

FOR SALE: Manuals, 600, most major manufacturers, lab test equipment. No list. Best offer lot. S.T. Carter, II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

FOR SALE: NCX-1000 factory new, incomplete, front panel, meter, RF components, knobs, etc. - $75 shpd U.S. George Rancourt, K1ANX, MA, (413) 527-4304

FOR SALE: Tubes/semiconductors/parts/meters/phono needles/radios - LSASE for 20 page list. W.F. Horn, 13110 Marsh Rd., Bealeton, VA 22712. (703) 439-9781

FOR SALE: NC-100XA - $115; R-392 w/ps - $175; T-195, clean but w/o PA - $155; TMC GPT-750 subassemblies all UPSable - PA w/4-400A's, makes 2 KW CCS amp. - $300; oscillator/driver - $75; 5600 VCT @ 600 mA HV xfmr - $75; misc xfmrs, capacitors, plugs, relays, make offer; TMC SBE-2 SSB exciter, w/pwr sply - $200; BC-348M w/AC ps - $70; parting out R-388, BC-348R, TS-382, TCS rec/xmtr. Trades? Offers? U-ship. WA7HDL, ID, (208) 756-4147 after 1730 MST.

FOR SALE: Repair & restoration of all classic & vintage radio equipment, reasonable rates, prompt turn around, 25 yrs experience. Mike McKean, N3HJQ, 726 McClellan St., Philadelphia, PA 19148. (215) 336-6111

FOR SALE: Drake TR3, AC3 - $200; Collins R-388 - $200; Collins/Hamilton CHS2245A xmtr - $100; Swan 350C, AC/DC - $225. Andrew, PA, (717) 749-3631

FOR SALE: Electron tube spring sale, 10,000 + NIB rcvg tubes only $2.69 each, exc. used only $.69 each. Free tube with every 8 tubes ordered. Quantity limited. Offer ends 5-16-95. SASE to Lucas Xfmr, 7113 N. 9 Mile, Lake City, MI 49651.

FOR SALE: Parting out Globe Champ 300. **WANTED:** BC-654. Bob, K6TUY, CA, (818) 790-3870

WANTED: Collins radio equipment, accessories, mechanical filters, related items; old keys & bugs. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

WANTED: Radar equipment, the bigger the better! Also early TV cameras. Allan H. Weiner, 507 Violet Ave., Hyde Park, NY 12538. (914) 471-9500

FOR SALE: Heath Mohican GC1A rcvr, very good condx, shines, w/manual - $85 plus UPS. Mike Sanders, KS0F, 3409 Henry Dr., Imperial, MO 63052. (314) 282-0787

WANTED

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

WANTED: McIntosh and Thordarson amplifiers any condx. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. (414) 545-5237

WANTED: Swan wattmeters WM-3000, also VHF PEP wattmeter; Kenwood BS 8 module for SM220. Craig, WA9HRN, IL, (708) 367-1599

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

WANTED: Telegraphic apparatus and keys by collector, not a dealer. Will pay top dollar. Pete, WB2BYQ, (201) 818-4311

WANTED: 6 meter AM gear - Clegg, Gonset, etc. **FOR SALE/TRADE:** Various Swan gear. Scott, K6PYP, 210 Mantua Rd., Pacific Palisades, CA 90272

WANTED: Junkers or parts for Echophone Commercial receivers, Model EC1, etc. and Heath scope Model OL-1; **TRADE:** Send SASE for list of tubes. C.W. Arndt, KA0TQV, 24400 W. 93rd N., Mt. Hope, KS 67108

WANTED: AN/APA-17 radio DF set components in any condition, antenna drive unit TG10 or PU29, pwr sply PP580, antenna elements AS545 AS186 AS247, manual TO 12P1-2APA17-31/32; manual TO 12R4-2ARR8-1/52/54 and any components in any condx for AN/ARR-8B radio set: IF Main Amp J68330A and IF preamp J68330N for Western Electric Tube type microwave rcvr model TD-2. Robert Bennett, 5675 Shadow Hills Rd., Las Cruces, NM 88012. (505) 382-0148

WANTED: 7094 tube; Tektronix 3A6 & 3B4 Plug-ins; TEK, Swept freq. converter. Don, W7KCK. (503) 289-2326

WANTED: Will someone please sell me an AC pwr cord for a R-1051B rcvr or please send me the identification data off the AC pwr cord connector. Thank you. Don Kelly, 27973 Bush Ln., Scappoose, OR 97056. (503) 543-6548

WANTED: Operate switch for Johnson Invader or Invader 2000. Gary Youney, AA5QT, 18615 Big Cypress, Spring, TX 77388. (713) 355-6153

WANTED: National HRO 2.5 volt pwr sply-spkr & case. See you at Dayton. Chet Cunningham, K8TSR. (513) 767-1122

WANTED: Military radios RT-136/GRC-13, Soviet xcvr R-112, rcvr R-323. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: F455B60 filter for 75A-3; 312A-1 spkr; KWS-1 T/R relay; Drake 2B calibrator; S-meter for RCA AR88. Thanks! Joe, KB9R, WI, (715) 834-4582 eves

WANTED: Trade for my Valiant, late '50's rcvr, clean, working, prefer Natl or HQ. Gene Williamson, K7DBV, 2160 Fairway Lp, Eugene, OR 97401. (503) 683-4164

WANTED: Junkers/parts for Navy sets: CRV-50064 (p/o TBL), DAQ, TBA, TBS, TDE. William Donzelli, 304 S. Chester, Park Ridge, IL 60068. (708) 825-2630

WANTED: Schematic for Galaxy V Mk II pwr sply. Neil Webster, Box 759, Guttenberg, IA 52052. (319) 252-3786

WANTED: A Gonset G-50 (hopefully) with manual. James Chase, K9YXR, Angola, IN (219) 665-6427

WANTED: NRI Communications Course of the 1950's and 1960's including instructional material and built or unbuilt kits. W.J. Klewchuk, POB 927, Wadena, Sask. S0A 4J0. (306) 338-3119

WANTED: Collins commercial radio with remote control head for mobile operation. Wes, WV5I, 3210 Pleasant Grove, Texarkana, TX 75501. (903) 838-0569

WANTED: Hallicrafters R-42 spkr (the one with the 'mouth' at the bottom). Rusted junk OK. Marcus Frisch, Box 28803, Greenfield, WI 53228-0803

WANTED: WRL-70 xmtr; HB xmtrs for display, must be museum quality; thousands of QSL cards to paper walls of Amateur display. Call Leo, (402) 392-1708, Western Heritage Museum, Omaha.

WANTED: Military radios, any URC/PRC, manpack, walkie-talkie, survival, particularly URC-4, 64, 68; PRC-63, 93, 68, 47; RT-10, 20, 60. Pref. working/repairable. Additional contacts appreciated. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Msg/FAX (310) 398-7159

WANTED: Hammarlund manuals, parts, parts units, from the series Comet, HQ, SP. Also accessories, catalogs, spec sheets, memorabilia. Robert, Amateur Radio Surplus, (517) 789-6721

WANTED: Collins 30J, 30FXB/C, other pre-1940 Collins amateur gear for my collection. John Firey, WB5HRI, 14818 Delbarton, Houston, TX 77083. (713) 5615-KW1

WANTED: Vintage tube CB's; pwr sply/modulator for Johnson 500. Send card or call with model you may have. Steve White, WB5UGT, Box 1086, Clute, TX 77531. 800-374-6477 - 9008 (leave message)

WANTED: Uniden CR-2021; (Hickok, etc.) mutual conductance tube tester; Kenwood T-599 xmtr; Radio Shack DX-400; SB-610 scope. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

WANTED: Plug in xtal for National HRO variation two. Stan Tajima, JA1DNQ, c/o Nakagawas, 22942 Cedarspring, Lake Forest, CA 92630. (714) 707-4675

WANTED: Winged emblem and chrome strips from Collins 32V xmtr or 75A rcvrs. Gary, K7MHE, (503) 257-6525

WANTED: RME 4301 SSB adapter for RME 4350 rcvr. Ken, K8TFD, 11152 Edington Rd., Livonia, MI 48150. (313) 522-8645

WANTED: Dead Atlas 180, 210X, 215X and 350XL radios for parts. Dennis Hatch, WAØWAB, (316) 225-3736 (d), 225-2961 (n).

WANTED: Cabinet for GPR-90; SX-42. Only in very good condx. Jose Cangas, EA4JL. Contact in the States Kurt Keller, (203) 431-6850

WANTED: Cosmophone, or related info; Viking 500 ps/mod; B&W coils 2175-2179; Drake 1A vernier knob. Brian, TX, (214) 596-2914

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

WANTED: Teletypes and any other teleprinter machines, parts, literature or information from the 1940's to the '70's. Gary Ashbaugh, POB 2008, Corvallis, OR 97339. (503) 758-8006

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: R-390A operations manual, must be Fowler Industries issue or copy; Bencher iambic paddle; Alpha-Delta sloper. Victor, CA, (805) 581-5317

WANTED: WW II SCR-299 base station radio components to complete K51 vehicle restoration project. Need: BC-729 antenna tuning unit, BC-731 control box, T-50 mic, JB-49 or JB-69-A junction box, phone and spkr control panel, MP-47 mast base, PE95ABC or D generator, FT389-A and FT388-A mountings, SW-199-A (start-stop) switch, CH-89 (seat) chest, JB-60 junction box, DR-4 reel mounts, HS-30 headset w/cord CD-605, air ventilator for truck roof mount made by Keystone #52771 6-volt motor, various cords - CD-556, 558, 560, 562, 557, 559, 561, 563, 564, 565, 566, CO-316, 313, 314, TE-48 tool equipment, electric heater - Arvin Model 201 or Electromode Model AA-15. Any information would be greatly appreciated! Bill Miller, RR 1, Box 35, Vincennes, IN 47591. (812) 882-2437 (h), 882-6690 (w)

WANTED: TMC GPR-92 HF Rcvr. Hank, W6SKC. (602) 281-1681 FAX: 281-1684

FREE: Looking for antique radios, parts, tubes, schematics and restoration service? For free catalog, send 2-stamp LSASE to Howard W. Granoff, 2445 Lyttonsville Rd., Ste. 317, Silver Spring, MD 20910. (301) 585-8776

FOR SALE: Military 'Spy' stuff - RS-6 radio station, no pwr cables, missing 1 canvas bag, otherwise complete and cosmetically air (but no mods) - $179; another RS-6 in same shape missing 2 bags - $159; WW II hand-held Navy RBZ rcvrs made by Emerson, 1.9 - 8 MHz, complete set w/AC sply - $179, rcvr and AC sply only - $99; orig. RBZ manual available for trade (OBO); WW II Navy DAG HF direction finder, one with antennas - $205, one missing antennas and battery box cover - $79. Don, N3RHT, PA, (412) 234-8819

FOR SALE: RT-68 6M FM plus 28 VDC sply on shockmount - $75 + shpg; ARC-2 parts; SX-71 parts; your wants; Motorola 43U series FM 2M, 2 freq. rig, 50's vintage FM gear + manuals, control head & mic - $60 + shpg. Tnx to all for earlier leads on manuals. **WANTED:** H-33 handset or M-29 mic, LS 166 loudspkr for RT-67; manuals for RT-67, Heath IP-17 HV pwr sply, Heath TC-3 tube checker; parting out SB-650 Heath freq. disply or these chips - SN7490N need (6), SN 7441B (6), SN74H103N (1), SN7475N (6), SN7473N (1), SN74192N (6). Bill Bogart, KA9CWK, 4146 S. Goff Rd., Hillsboro, IN 47949.

TRADE: HQ-170 for a comparable general coverage rcvr. Ron Kashner, POB 981, Hayden, CO 81639. (303) 276-3466

FOR SALE or TRADE: New-in-box Mercury tube tester - $35 plus shpg. Fred Clinger, WA8KJI, 417 Beechwood Dr., Galion, OH 44833.

FOR SALE: Drake 2A w/Q-multiplier/spkr, good condx - $200 + UPS. Dave Metz, VA, (703) 885-7914 eves till 10PM EST.

FOR SALE: Two ART-13's, operator & tech manual & 3 remotes. WinCo dynamotor 750V @ .350, 400V @ .750. David, OR, (503) 620-2256

FOR SALE or TRADE: Very good guitar amp for Collins 75A-4, T-368, Johnson 500 or equiv. Make offers Jeff, MI, (616) 381-4133

FOR SALE: Spy station, Rolls-Royce quality, CV-157, R-390A, CV591A, SVT30B, 1510A, REU300C, 350, Harris SG70, HFL1000, manuals - $3000; Collins 75A-4, spkr, manual - $1000; National HRO-50R1, 9 coils - $500. V. Vogt, 300 SW, 43rd St., Ste. 247, Renton, WA 98055. (206) 382-5571

Message: Talk to me at Dayton. Look for the WW II uniform with tech corporal stripes. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244

FOR SALE: Collins manuals (copies): R-390 Maintenance - $20; R-390A Operators - $20; R-390A Maintenance (196 pages!) - $69; R-391 Maintenance (partial) - $45. N1FRX, (207) 834-6273 eves/wknds.

FOR SALE: Collins - PM-2 splies, exc. - $75, good - $60/ea; NIB, KWM-2/S-line freq. dials - $50 ea; MP-1 mobile splies, RE - $75, WE - $50/ea; directional coupler/wattmeters (look identical to 312B-4 couplers), 100/1000W scales - $40/ea; DL-1, w/o cabinet - $40; used 4D32 tubes - $25/ea. Derek, KI6O, callbook address, (916) 965-4904

WANTED: WW II Japanese military radio equipment of any kind; anything Panam China Clipper and Lindbergh related, even a postcard. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, Japan. FAX 011-8145-301-8069

WANTED: Postwar European tube tester with 8 pin miniature and radial pin capabilities. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636, FAX 373-2345

WANTED: National HRO-500TS spkr in mint condn & National NCL-2000. Sam Macy, N9WAF, 486 Glenwood Trail, Elgin, IL 60120. (708) 695-0218

WANTED: Paying immediate cash for old Fender and VOX guitar amplifiers. Frank Czaja, A19T, 8968 W. Forest Home #4, Greenfield, WI 53228

WANTED: Collecting: Pre-1950 commercially built amateur gear; xmtrs, rcvrs & accessories. Dean Showalter, WA6PJR, 7816 Redberry St., NW, Albuquerque, NM 87120. (505) 899-9376

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard, KD6CPE, POB 992, El Toro, CA 92630-0992. (714) 855-4689

WANTED: Help Vibroplex build its Company collection of Vibroplex bugs, keys and memorabilia. Call Mitch, WA4OSR, at The Vibroplex Co., (800) 478-8873

WANTED/TRADE: Will trade or buy Collins 30K series xmtr. Have KWS-1 as trade. Butch, KØBS, (507) 288-0044.

Repair & refurbishment of older tube-type amateur equipment. Fully FCC licensed; 35 years experience. Chuck Banta, N6FX, Claremont, Calif. (LA area) (909) 593-1861

WANTED: HQ-129X main tuning, bandspread knobs; knobs, coils for Millen 90800/6L6-807 xmtr. Jack C. Shutt, N9GT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

WANTED: Nye Viking Model MB-IV (3000 W) and Model 250-23 (275 W w/SWR) manuals. Bill Mills, KC5PF, 16523 Tonys Ct., Amissville, VA 22002.

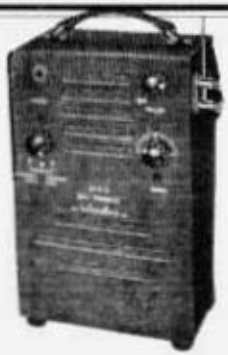
WANTED: Johnson parts - "Speed-X" keyer, meters for Ranger and Adventurer; manuals for Heath SB-401, RX-1, Johnson Ranger, Knight TR-106 and V-107; main tuning knobs for SX-101A, HT-32A, RX-1; also Heath AK-5 spkr and Hallicrafters SX-17 and SX-28 S-meters and knobs. Lee Shumway, WB8ZEY, 2820 Yankee Springs Rd., Middleville, MI 49333. (616) 795-3255

WANTED: Bandswitch section for Hammarlund HQ-110A; rear wafer (antenna switch). Please! Jack Alley, 2100 Miscindy Pl., Orlando, FL 32806. (407) 851-6258

WANTED: Collins 3253 w/ps; Hallicrafters HT-44 ps, non-working OK; other restorable ham gear. Fred Watson, KB8NRF, 581 W. Summit St., McClure, OH 43534.

WANTED: Junker/parts for IFF/radar sets: Navy BN, AN/APX-2A, Army BC-647, BC-689, BC-929. William Donzelli, 304 South Chester, Park Ridge, IL 60068. (708) 825-2630

WANTED: 1960's to 70's Navy ratings manuals "Electronics Technician Communications 3&2"; "Radioman 3&2". Robert Harding, KC5LHR, 1321 Monte Largo Dr., NE, Albuquerque, NM 87112. (505) 291-0950 eves



WANTED: Any condition, Hallicrafters S-35 panoramic adaptor and S-33 Sky Trainer as shown. Chuck Dachis, 'The Hallicrafter Collector', 4500 Russell Dr., Austin, Texas 78745. (512) 443-5027

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

FOR SALE: R1051 rcvrs, exc. condx, cleaned, completely checked, various models to choose from. Shawn Daniels, (314) 343-5263.

FOR SALE: Level meters for Collins R-392/URR rcvrs, new - $35, UPS prepaid. Dennis, WA0WAB, (316) 225-3737 (d), 225-2961 (n)

FOR SALE: 3' x 5' reprint of factory schematic for Collins KW-1. Please send $25 ppd US to Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660. (312) 262-5360

FOR SALE: Drake MN-7 tuner - $150; R-390A IF deck - $100; BC-1306 rcvr - $30; ID-226/APR-9, NIB - $50. Mel, K2AOQ, NY, (716) 671-0776

FOR SALE: Drake 2NT - $75; Heath DX-60 - $60; Globe HG-303 - $45; Globe V-10 VFO - $45. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

FOR SALE: Blue bezel meter movement for RCA Junior Voltohmyst, NIB - $15. Robert Baumann, 1985 So. Cape Way, Lakewood, CO 80227. (303) 988-2089 eves & wknds

FOR SALE: Drake 2B - $75, 2C - $90, 2AQ - $75 ($50 w/either rcvr); Nat'l NC-33 - $45; NC-173 - $85. **WANTED:** Drake SW4A, PS4; manual for 51J2; cabinet CPR-90; SSB adaptor for CPR-90. Doug, WA, (206) 472-3478

FOR SALE: Unmodified BC-348-Q w/dynamotor. Ted Bracco, Quincy University, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

FOR SALE: E.F. Johnson Matchbox (250-23-3), Coupler (250-37), Phonepatch (250-46), insulators, manuals, all exc. - $137.50. Harry Blesy, 9570 Clarendon Hills Rd., Hinsdale, IL 60521. (708) 789-1793

FOR SALE: HQ-110 - $75; HQ-129X - $125; HQ-140X - $150; SX-100 - $150; SX-99 - $95; WRL VFO - $85. Ron Follmar, K5GJT, 332 Camino Real, Kerrville, TX 78028. (210) 896-8830

FOR SALE: Galaxy 5, very clean condx w/VFO & pwr sply - $275; Drake TX4 & R4 w/pwr sply spkr, very clean - $475; Tempo One +, clean - $130; Santec ST222, clean - $120; Hickock 610A sweep gen. - $130; Knight-Kit TV-FM sweep gen. 83YX 123 - $110; Clegg '99er, clean - $125; B&W distortion meter Model 410 - $135. All + shpg. Jim Rupe, POB 697, Grayland, WA 98547. (360) 267-4011

FOR SALE: Gibson girl; SRR-13; Conar scope; Hickok 534; much more. SASE for lists. Joseph R. Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003. (304) 277-3154

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

FOR SALE: Johnson Viking II parts unit, looks rough - $70; Heath twins SB-401, SB-300, front panels are outstanding, spare tubes, CW filter - $225; Eimac 4CX300's, (2) used, (1) new - $65; Palomar QRP amp, 40-10 meters, runs pair of 6LF6's, 5 watts in gives 150 watts out, mint - $225; thrust bearing - $65; Yaesu FV-101B remote VFO for FT-101 series, mint - $135. Lane, KM3G, CA, (619) 462-8730

FOR SALE: Hammarlund HQ-110, good elect., fair cosmetically - $80; Drake 2A in good condx - offers; SX-25 for parts. John Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

FOR SALE: Johnson panel refinishing: Ranger I, Ranger II, 500, Desk KW, Viking I, Viking II. Production runs this summer. Call or SASE for information. Ron, AB5WG, 115 First St., Sugar Land, TX 77478. (713) 491-7823 (after 6PM CST)

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

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

FOR SALE: Heathkit lives on in historical anecdotes by employees. Quality 124-page illustrated book. $9.95 postpaid. Heath Nostalgia, 4320 196th S.W., Suite B-111, Lynnwood, WA 98036-6754.

FOR SALE: Portion of stored collection FRR-59, SP-600, R-388, 51J4, 75A-4, 30L-1, R-391, 516F-2, 44BX, etc. Will be at Dayton Space 3362-63. John, W4WAW, POB 7034, Rocky Mount, NC 27804.

FOR SALE: Hallicrafters HT-40, fair, manual - $65; Heath coax switch - $18; Heath HM10A tunnel dipper, fair - $20. Dave, W1DWZ, MA, (508) 378-3619.

FOR SALE: Collins 30S-1 HV filter capacitors, 10 uF, 3KV DC, identical case and insulator size as original units, recent manufacture and non-PCB. 5 units available at $25 each plus shpg. Dick, 160 Penfield Rd., Macedon, NY 14502. (716) 377-1354.

FOR SALE: Johnson Ranger I w/keyer mod - $175; Hallicrafters SX-24 - $125. WANTED: TR-4 no ps; 275W Johnson Matchbox; MFJ-949 tuner; SSB filter for my TR-3. Joe, NY5Z, Ogden, UT (801) 393-6840.

FOR SALE: R-390A carrier level meters - $30 each; overhauled R-390A Cosmos PTOs - $30 each. Plus shpg. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721.

FOR SALE: Selling entire collection of vintage radios, rcvrs, xmtrs, amps, keys, test equip., accessories & parts. Many National, Drake, Hallicrafters, Heath, Hammarlund radios included. LSASE brings lge. 3-page list. G. Hawrysko, K2AWA, POB 568, Boro Hall, Jamaica, NY 11424.

FOR SALE: Send SASE for list of vintage & military ham gear and literature. Dave Mantor, W9OCM, POB 1, Fairmount, IN 46928-0001.

FOR SALE: Wandel Gulterman AT-463 spectrum analyzer - $100; Collins Radio "First 50 Years", like new - $30; Hammarlund HQ-105 manual - $15; Daven VH795H attenuator, 75 ohm, 0-111 dB - $50; Peerless 16644 output xfmr - $120. Richard P. Robinson, POB 5055, Woodbridge, CT 06525. (203) 397-5420, FAX 294-1745.

FOR SALE: Heath HG-10, fair condx - $25; PMR-8A, poor but all there - $15; Vibroplex chrome bug, like new, in box - $75; D-104 mic head, exc. - $15; HQ-170C, won't receive on 80 & 160 - $115. U-ship. Mack, KC5AQO, POB 149, Lewisville, AR 71845. (501) 921-5874.

TRADE: 1942 Vibroplex bug with wood box, VG for VG Drake T4XC / AC4. Pete, AA6ZE, 5140 Gates Rd., Santa Rosa, CA 95404. (707) 537-1120.

FOR SALE: HW-12A-HP-23, mic, exceptionally clean, appears new, w/manual - $150; xtal calibrator for HW-12/32 - $35; SP600JX6, brushed aluminum panel, xtal deck, full service manual, very clean & orig., operates perfectly - $300; Meisner freq. standard, model 9-10 76, 100kc, 50kc, 10kc, in nice shape, needs one tube & alignment - $75; B-K model 650 mutual conductance tube tester, lge fold open case, 75 individual tube sockets, even tests 6146 & 2E26 - $100; Johnson Viking II, w/VFO, new caps, no modifications, clean - call for pictures. Dick, W4NFN, WI, (715) 866-8704.

FOR SALE: HS-30 headsets, GI dated 1944, brand new, in sealed, waxed, protective cartons. Extra earpiece, dessicant, instructions, cord, included. Used with virtually all WW II, and many later, combat and clandestine radios - $20. Gene, KD4YIZ, GA, (800) 619-0900.

FOR SALE: Fil. xfmrs 115V, 6.3, 13.0 A; 6.3V, 1.2A, new, cased GE - $15 each; Surplus Radio Conversion Manual, contents BC-321, 342, 348, 522 xmtr, etc. - $9. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: SASE for list of vintage ham parts, equipment and related publications. KC4SJ, 104 Glenwood Dr., Williamsburg, VA 23185.

FOR SALE/TRADE: Transmitting/Receiving tubes, new and used. LSASE for list. I collect old and unique tubes of any type.**WANTED:** Taylor and Heintz-Kaufman types and large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE: SX-100 MK3; HT-44 & SX-117; HA1 TO keyer; Splatter Guard; HT-46&SX-146; SX-115; Heath 8999 CW keyboard; CE-100V; CE-200V; HQ-170C; Hammarlund 4-20 xmtr and 4-11 modulator (orig. box). PU only on biggies. Bruce E. Walther, W9QAH, 3000 McCulloch St., Stevens Point, WI 54481. Phone/FAX (715) 344-9099

FOR SALE: Collins 32V-1 xmtr w/orig. manual & spare final - BO, PU only. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

Message: Meter and WW II aircraft radio collection available for loan to museum. Fairly local, small privately owned museum ideal. Chris Cross, Box 94, McConnell, IL 61050.

FOR SALE: "Vibroplex Collector's Guide". Got the bug? Get the book! 87 pages; $16.95 ppd. Artifax Books, Box 88-E, Maynard, MA 01754

FOR SALE: DX-40 - $40; VF-1 - $20; 4D32, used - $15; Heath capacitor checker - $35; S-53 - $40; HQ-110A - $95. **WANTED:** SX-96, any condx. Joe Sloss, K7MKS, WA, (206) 747-5349

FOR SALE: Hallicrafters SR-2000 - $700; HA-20 - $225; Heath SB-101 - $250; SB-600 - $30; SB-610 - $95; SB-620 - $95; SB-630 - $75, SB-614 - $125; SB-634 - $100; SB-10 - $85; Collins 30S3, 75S-3B, 516F-2 - $1400; 30S-1 w/160M - $2500; Johnson electronic T/R switch - $65. Bill, K7VZP, AZ, (602) 942-6352

FOR SALE: Thousands of Tested Tubes w/Warranty! Send for new list with improved discounts and monthly specials. Both xmit and rec. tubes.I have acquired many common tubes recently. Buy those spare tubes for your tube radio, audio, ham and electronics. Most tubes are used at about 33% of new, many are about $1. I have bunches of octal, older, 7 and 9 pin tubes. All tubes are tested on TV/7D/U tester and then boxed. I give a 30 day warranty. Send wants or SASE with two stamps for list. Daniel Nelson, 1025 E. Desert Ln., Phoenix, AZ 85040. (602) 243-7421 eves

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FOR SALE: 3-stamp LSASE for 14-page list. Heath HA-14 mobile HF amp., HP-24 pwr sply, cables - $325, new, Heath SB1000 linear, kit in unopened box - $800; NIB, J-45 knee keys - $25; Lafayette xtal converters, 2M HE-71, 6M HE-56, 7Mc-11Mc output - $100/pr.; NIB JAN 5814 (12AU7A) tubes - $2/ea.; new, Jennings vacuum variables - 7-1000 pF, 5KV, 1/4"x4" shaft - $65/ea.; like new, Jennings vacuum variables 10-1000 pF @ 15KV, 12 VDC motor driven, beautiful for base/remote ant. tuners (160 meters, etc.) - $125/each; new/unused rack panels (19"), 1-3/4" to 21" - $2.50 to $21; NIB, RCA 807 tubes - $10/ea. Derek, KI6O, callbook address, (916) 965-4904

FOR SALE: Collins - 75A-4 w/spkr, 2 filters & KWS-1 - $2200; 75A-4 w/2 filters and KWS-1 (no pwr sply) - $1200; 212G1 console (has 5-line style knobs) - $650; National package, HB7 & 1-10A, w/pwr sply - $350; Kennedy 110 "Universal Receiver" (ca. 1922) and companion 525 audio amp - $1400; Western Electric Model TP xmtr (ca. 1924, off USS Maryland) - $3800. Gary, WA9MZU, 1751 Michon Dr., San Jose, CA 95124. (408) 266-2218

FOR SALE: Collins 30L-1, WE - $395; project 30LI-1, works but no case, meter - $200. Fred, W6YKM, CA, (209) 296-5990 after 0300 UTC

WANTED: Drake R4C PTO, DSR-2 rcvr; National NC-300 S-meter or meter face. Frank Scutch, WB4AYJ, 11780 NW 24th St.,Plantation, FL 33323. (305) 472-9474

WANTED: B&K model 1801 freq. counter; Fluke 1912A freq. counter; Heath HO-13 Hamscan (455 kHz); Heath IM-18 VTVM. Rick, N6NVG, CA. (510) 687-2719

WANTED: 75S3-B or C. B. Lee Cornwell, KD3KD, HCR #1, Box 95, Mt. Pocono, PA 18344. (717) 839-2710

WANTED: Panel meter for Heath DX-60 xmtr. Frank Dolwick, POB 21, Boyne City, MI 49712. (616) 582-6630

WANTED: Heath HD-1422-A noise bridge; MFJ-8100 regenerative rcvr; manual for RU rcvr. Al Kaiser, W2ZVR, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: '30's Hallicrafters Super Skyriders and Hammarlund Super-Pro's (SP-200, 400, 779); also RCA ACR111 and Breiting. Jim Dillon, 201 Seward St., Juneau, AK 99801. (907) 586-3223

WANTED: To borrow or buy working Geiger counter; someone to repair early transistor radio; SCR-522/574, BC-706 IFF, SCR-578 "Gibson Girl" and other aircraft radios. **FOR SALE:** Hallicrafters stained glass lamp - $69.95 plus UPS. Chris Cross, Box 94, McConnell, IL 61050.

WANTED: A clean Hallicrafters SX-62, must be in good working shape. Will pay top dollar for a good one. Billy, SC, (803) 585-280

WANTED: Power switch and calibrator tube for SX-100; base for EV-664; HO-13 scope; 75A-3 calibrator. Richard Valentine, N1SQJ, (203) 583-8251

WANTED: Hammarlund SP-600 meter, tuning knob; Collins 51J4 mech. filters; Hallicrafters SX-73/R-274 tuning capacitor drive coupling; table top rack cabinet for 10.5" high panel; General Radio Company apparatus, parts, manuals, literature. John Tiedeck, WA2SDE, 212 Grandview Rd., Media, PA 19063. (610) 566-8049

WANTED: Manual/copy of a Hallicrafter SX-96 and a Hammarlund HQ-100; want Gates limiter. Gladly pay all charges. Cecil Palmer, W5NWX, 4500 Timbercrest Ln., Waco, TX 76705. (817) 799-5931

WANTED: Need copy of the manual/schematic for Southcom SC-130 "Patrolfone" military surplus portable scvr. Steve Johnston, 3350 Oakham Dr., York, PA 17402. (717) 755-3920

WANTED: Copy of manual for Heath GD-1A grid dip meter. Will pay costs. Harry Davey, VE7AIJ, 847 Glencoe Dr., Port Moody, B.C. Canada V3H 1G7.

FOR SALE: #19 acc. tube caddy & tubes, telegraph key & fuse acc. box - $100; NC-183D rcvr - $250; NC-183D w/spkr, exc. - $450; Johnson T-bolt - $550; Hammarlund cabinet for SP-600 $75; Collins C6758/TSC26 ant. control indicator - $75. George Rancourt, K1ANX, MA, (413) 527-4304

FOR SALE: Used tube list, good selection and quality, SASE. Bill McCombs, WB0WNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: Vibroplex originals: (old) #104635 w/ switch; newer #377263 - $69 each + shpg. H. Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103.

FOR SALE: Repair of TV-7 tube testers and calibration: I will fix and then verify calibration of your TV-7 tube tester for $40 plus shpg or return it no charge. I now have meters to repair those units with. Daniel Nelson, 1025 E. Desert Lane, Phoenix, AZ 85040. (602) 243-7421 eves.

FOR SALE: Johnson front panels refinished and silk screened. Viking I - $75, 122 VFO - $40. Exchange prices. Turner Enterprises, POB 451, Cal-Nev-Ari, NV 89039-0402.

FOR SALE: National NC-125, exc. - $125; Hammarlund HQ-129X, good - $125. Plus shpg. Carleton Rand, W1PZI, RR1, Box 209, Epsom, NH 03234. (603) 736-9695.

FOR SALE: Ameco AC1 TX & companion R5 RX; (5) Q-multiplier; DX-60B. Joe, K2QPR, 1341 SW Evergreen Ln., Palm City, FL 34990. (407) 220-7362.

FOR SALE: The cleanest Swan 350 you ever saw! AC pwr sply, spotless - $275 plus shpg. Michael Crestohl, 263 Nahant Rd., Nahant, MA 01908-1342. (617) 581-5479.

FOR SALE: Eimac 4CX250B's, 4X150D's, YC-120 socket, 4-400 chimney. **WANTED:** Need Collins spkr, SC-101, 270G-3 or 312A-1. KO6IJ, CA, (714) 643-7930.

FOR SALE: R1051B rcvr, w/matching MT-3114 shock mount, PU only - $325/BO. Dennis Gibbs, 13002 Piney Glade Rd., Herndon, PA 22071. (703) 742-9843.

TRADE: Hammarlund HQ-170 ham band rcvr for National NC-183 general coverage. Hoover, SC, (803) 726-5762.

FOR SALE: FAA red lense tower clearance fixtures - $25; Collins 516E-2, very clean - $150; Collins 75S; Mallory direct replacement filter capacitors (new) - $25; Collins cabinet rubber feet (can't over torque or mushroom) - $150 each; Collins front leg elevators - $7; never used, orig. boxed 813 tubes, each - $25. Ed, W3WDF, 8245 Garden Oaks Dr., San Antonio, TX 78266-1710. (210) 651-9348.

FOR SALE: NC-109, VGC, matching spkr, manual - $175; NC-270, exc., matching spkr, manual - $235; REM 6900G/VGC, manual - $175. Richard Prestor, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454.

FOR SALE: Tube testers - 1-77-B, exc. - $50; TV-7 (0/U's - $65 to $100; call; TV-7 or TV-2 latest tube data updates - $18 ea.; signal gen. - H.P. 606A, exc. - $195; URM-25 (0/(), exc. - $95; surveillance rcvr - L.T.V. G-175F 30-260 MHz, exc. - $195; spectrum display unit - L.T.V. G-186A 21.4 MHz I.F. - $95; new mil-spec Eimac 4-400 tubes - $100 ea.; orig. maintenance manuals - R-390 or R-392 - $50 ea. U-ship. Joe Bunyard, 1601 Lexington St., Waco, TX 76711-1701. (817) 753-1605.

FOR SALE: KW-1, S/N 129, exc. condx. George A. Flanagan, W2KRM, 42 Cygnet Dr., Smithtown, NY 11787. (516) 360-9011, 7-9PM EST.

FOR SALE: Field Day Special - New, aluminum guy stakes from military antenna pole kits, 5/8" dia. by 18" long - $2/ea.; new 3/16" by 33' long army-green guy rope assemblies from antenna pole kits - $4/ea.; 42' long - $4.50 ea.; 52' long - $5/ea.; 140' halynard assemblies - $12.50/ea.; unused, 50' RG-59B/U coaxial cables (75 ohm), male 'N' one end, female 'N' on other - $7.50/ea.; new antenna wire, tinned #14 stranded, $.08/ft., 1000 ft roll - $60; 2000 ft. roll - $110; new, military IL-4/GRA4 center insulators, female 'N' connectors - $10/ea.; new, small ceramic egg insulators - 3/$1; unused 500' rolls tinned insulated #20 stranded wire, great for wire antennas - $7/roll. Derek, KI6O, callbook address, (916) 965-4904

FOR SALE: Drake R4B, T4XB and MS4, clean and operating - $500; Zenith 3000-1, nice - $85; Hallicrafters SR10, very nice - $90; 38D, nice - $70; TU5B tuning unit, like new - $40; Philco T9-126 (like Transoceanic, rare) - $150. G. Stevens, WØATA, Box 704, Longmont, CO 80502. (303) 776-9036

FOR SALE: James Millen xmtr #90800, 50W (6L6 & 807) - $75 plus shpg. Pat, K7YIR, Phone/FAX (206) 487-1230.

FOR SALE: Navy CMX-46159 radio rcvr, 1500 to 12000 kc by Collins. Perfect. Offers? Peyton Ohlson, 8928 Hackney Ln., Dallas, TX 75238-3708. (214) 348-1823

FOR SALE: Tubes, capacitors, sockets, NOS and reproduction parts for antique radios and TV's. Large SASE for tube list or $2 for 20 page catalog refundable with 1st order. Vintage TV-Radio, 3498 West 105 St., Cleveland, OH 44111.

FOR SALE: Mech. filters for 75A-4, F455, 3.1, 1.5, .5, S-line F455, 2.0, F500, 6.0 kHz, Icom FL-3 and FL-30; Collins 3251/3 solid state tube replacements (tubesters) - $75; SW3 w/10, 20, 40, 80, coils and manual; SW3 w/2 sets of coils, manual; SW3 low freq. set of coils; old National HRO spkr - $40; Hallicrafters R46 spkr - $40; Yaesu FC700 100W SWR meter, dummy load and antenna coupler, w/manual - $100; variable inductor 2 KW, edgewound - $30; 304TL sockets - $10 ea.; old double button "New Universal" carbon mic, w/springs, no ring - $20. Roger Faulstick, KD4AS, 210 Mariah Ct., Merritt Island, FL 32953. (407) 453-3312, FAX 453-2258

FOR SALE: Book - "FM Simplified" by Kiver, - $8 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: Heath SB-610 monitor scope, orig. assembly manual, honest mint condx. - $195 or trade for SP-600 JX-17 or higher. Victor, CA, (805) 581-5317

FOR SALE: Collins KWT-6 400W SSB - $650 PU only; E.H. Scott RCH - $250; SCR-522 stuff - send SASE. **WANTED:** WW II Japanese xmtrs and rcvrs (and parts) for restoration and ER articles. Ken Lakin, KD6B, 701 SE Salmon Ave., Redmond, OR 97756. (503) 923-1013, e-mail klakin@aol.com

FOR SALE: Swan 350 (no pwr sply) - $100; 75A-4 filters - 500 Hz - $125, 1.5/2.1 kHz - $110, 3.1 kHz - $60. John Hurst, KU6X, 2512 Euclid Crescent, E. Upland, CA 91784. (909) 981-6759

FOR SALE: James Millen antenna tuner, 2KW w/manual - $200; Electric Radio starting with number 1, all issues up to the present - $200. Art, WA2YBG, NY, (516) 884-8527

FOR SALE: B&W 6100, s/n 1, w/baby blue front panel - BO. Harold Curetsky, K6DPZ, 95-15 108th St., Richmond Hill, NY 11419.

FOR SALE: R-390A/URR maintenance manual, TM 11-5820-358-35, issued Dec. 1961, 189 pgs - $25 ppd UPS. Abe, POB 4118, Jersey City, NJ 07304.

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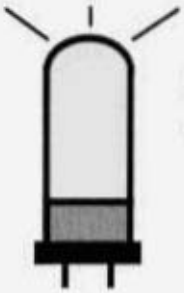

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