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ELECTRIC RADIO

celebrating a bygone era

Number 213 February 2007

Jon, K6JEK and John, W6MIT

ELECTRIC RADIO

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Editor
Ray Osterwald, NØDMS

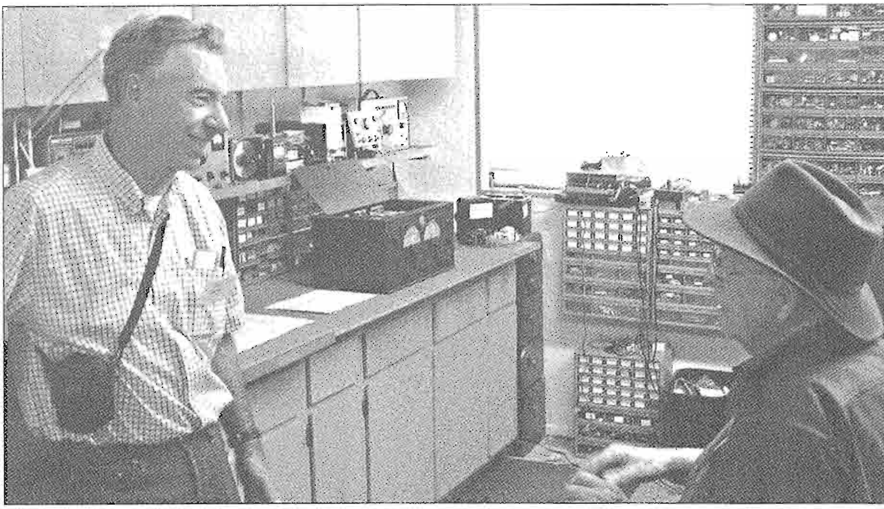
Editor Emeritus
Barry R. Wiseman, N6CSW

Electric Radio is all about the restoration, maintenance, and continued use of vintage radio equipment. Founded in May of 1989 by Barry Wiseman (N6CSW), the magazine continues publication for those who appreciate the value of operating vintage equipment and the rich history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders. It is dedicated to the generations of radio amateurs, experimenters, and engineers who have preceded us, without whom many features of life, now taken for granted, would not be possible.

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

Regular contributors include:
Chuck Teeters (W4MEW), Jim Hanlon (W8KGI), Tom Marcellino (W3BYM), Gary Halverson (K6GLH), David Kuraner (K2DK), Bruce Vaughan (NR5Q), Bob Grinder (K7AK), Bill Feldman (N6PY), Larry Will (W3LW), Dave Gordon-Smith (G3UUR), Dale Gagnon (KW1I), Brian Harris (WA5UEK)

Editor's Comments



Bill Feldmann, N6PY, SK **(Photo courtesy Brian Thompson, NI6Q)**

On the morning of Tuesday, January 2, 2007, I received a phone call with some sad news. I was shocked to learn that Bill Feldmann passed away suddenly while he was out riding his bike the day before, on January 1, 2007. His memorial services were held January 14, 2007, in Palmdale, CA. He is shown above, on the left. Bill was born November 9, 1937 in Los Angeles, CA, held an Extra Class license, and was a recently-retired mechanical engineer. Since his retirement, Bill was actively involved in many amateur radio activities.

Bill was a regular contributor to Electric Radio. For years he was a net control station for many amateur radio operations—such as with the Collins Collector's Association and the Military Radio Collector's Association. He had hundreds of

(Continued on page 9)

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Cover: "That's not a *real AM* transmitter," says a skeptical John Svoboda (W6MIT), right, as Jon Kannegaard (K6JEK), left, points to his latest AM transmitter, a "K7DYY Jr!" Jon's new rig has 200 watts carrier power & weighs only 2 pounds. The Collins 30FXC behind Jon also has a 200 watt carrier, but is much heavier! (Photo composition courtesy of Gary Halverson, K6GLH.)

The Collins 75A Revisited, Part 1

By J.B. Jenkins, W5EU
1380 Bryson Lane
Midlothian, TX 76065
jenkjb@cnbcom.net

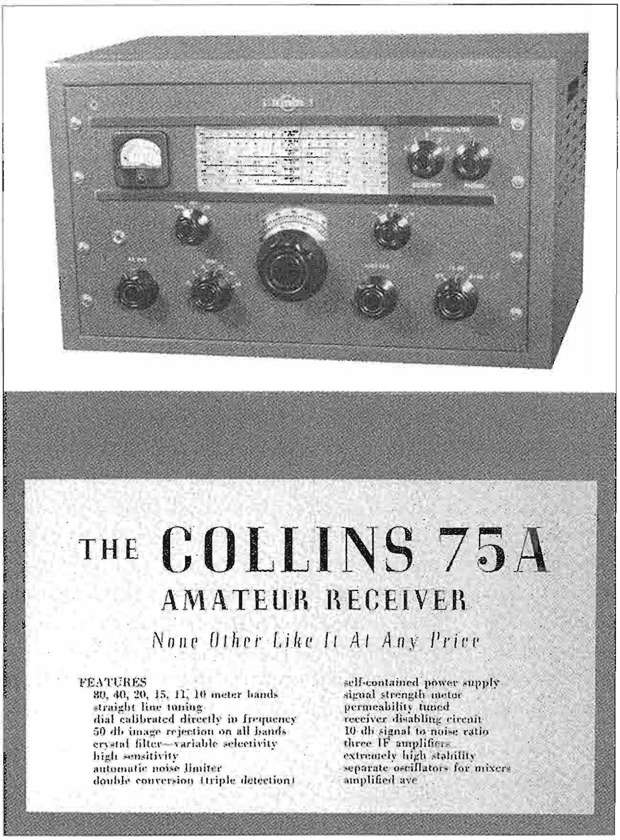
It has been fourteen years since Electric Radio published the series of articles titled "The Collins 75A-Series Receivers: A Legacy of High Quality."[1] They continue to be an excellent historical and technical commentary on the Collins "A-line" receivers. Since that time, additional information has surfaced which the writer believes will provide a measure of answers to the questions that surround the Collins 75A receiver, and some new conclusions will be presented.

Included in this article is a chronology of events that cover some of the engineering and production stages. A prototype 75A receiver has been found, as well as finding the owners of a few early receivers. Let's begin with the Collins Column magazine.

The Collins Column was a monthly magazine published "specifically for Collins employees as a means of providing information about their company." It solicited written contributions relating to any Collins activity. Under the heading of "Plant Static," there were reports from every area of operations. A special section called "Ham Chatter" reported the activities of amateurs for the past month, and at least one station was featured in some of the issues, complete with a picture of the shack and operator. This magazine gives us a rough time line and provides some additional insight about the production of the 75A receiver.

In the September 1946 issue of the Collins Column, L. W. Couillard announces a new receiver[2]. He writes, "The 75A Receiver is one of several units at

The Prototype Collins 75A As Seen Today



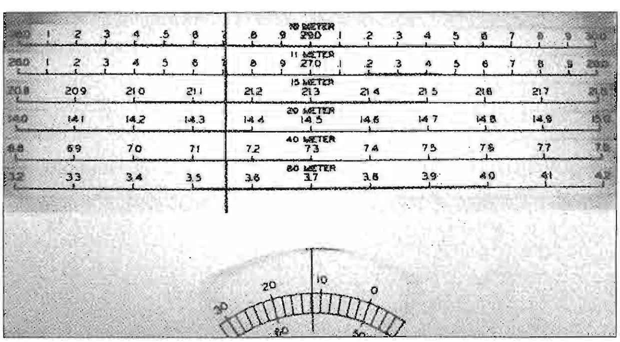
The First of Two Product Descriptions, Dated August 1946

Collins that have resulted from ideas which were shaped up for military applications just before the war. Recently there has been developed at Collins a new variable frequency oscillator with such greatly improved accuracy and stability that when used in the 2 to 3 Mc range, a definite frequency may be set and held within a few hundred cycles. To use this accuracy for higher frequencies, precision crystals may be used to mix or beat with the high frequencies, resulting in lower frequencies within the range of our accurate receiver. These two steps, (1) the use of crystals to convert the high frequencies to low and (2) the use of an accurate, stable low frequency oscillator, are combined in the 75A receiver to make what we believe is the most stable and accurate receiver being built." Mr. Couillard continues to write, "To get some idea of just what could be done with this receiver in actual operation, models have been tried at several of the local ham stations."

The 75A Receiver was also announced in The Collins Signal, "...a semi-technical magazine which is published chiefly for outside audiences."[3]

The first of two "Product Descriptions"[4] in the form of a four-page brochure was released in August of 1946. It was titled "The 75A Amateur Receiver," followed by the words, "None Other Like It At Any Price."

Most notable were two tuning dials controlled by a single knob. The kilo-



The unlighted dial assembly as first used on the prototype 75A. Note how the band titles are in meters.

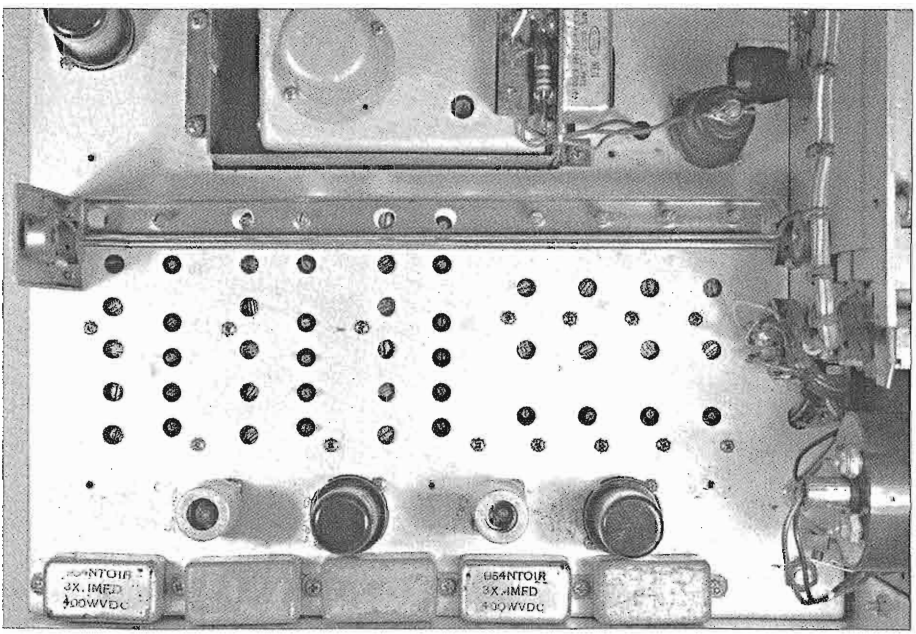
cycle dial peered through a square hole with an arch at its top. The slide ruled dial displayed the frequencies in *Megacycles*, while the bands strips were titled in *meters*, matching the markings on the band switch. A brief description of the circuit, controls, specifications, and features followed.

The second "Product Description[5]" was released in May 1947. The cover of this brochure featured a receiver with a new lighted dial assembly. The QST ad for March 1947 proclaimed "The Collins band-lighted dial gives you *Added Pleasure*," followed by the statement, "The band lighted dial is further proof of Collins' interest in amateurs."

There were other changes: The kilocycle dial now peered through a double-arched window, just as we see today. The band switch is numbered 80 through 10, in a clockwise direction, instead of 10 thorough 80 as seen on the first product description. A new "S" meter is shown with factory markings, supporting a white face that is red lined above S9. Again, two inside views were included. The top view now has a cover for the coil assembly while the bottom photo remained the same. Two statements in the circuit description were changed or deleted. The signal-to-noise ratio was changed from 1 microvolt for 10 dB signal-to-noise ratio, to 6 dB signal-to-noise ratio. The statement, "There is no loss in gain by use of the crystal filter" was deleted. Other changes not so evident will be discussed next.

Rare and unusual items are often "for sale" on the on-line auction sites such as eBay. One such item was a 75A receiver that was purchased by the writer a few years back. Upon arrival, it was obvious that this old receiver had not been operational for many years. Several points of identification proved (at least to my satisfaction) that it is the prototype pictured in the second product description.

There are many differences between this receiver and the production 75A-1.



The 75A Top View

A list of differences is discussed below, and important changes have been underlined:

1. There are no ventilation holes in the side panels. As we will see later, all 75A-1 receivers beginning with serial number "1" have ventilation holes in the side panels.

2. The front panel is engraved rather than silk screened. Included in my collection is a 250-watt, AM desktop transmitter, the only prototype which was made. It was intended to be sold as part of the KW-1 product line, and it too has an engraved panel. The lab tech[6] who built the model told me it was common for the prototype panels to be engraved at that time. A close look will reveal the engraver forgot the spacer between the number "11" on the band switch.

3. The receiver is wired with colored wire which has plastic insulation.

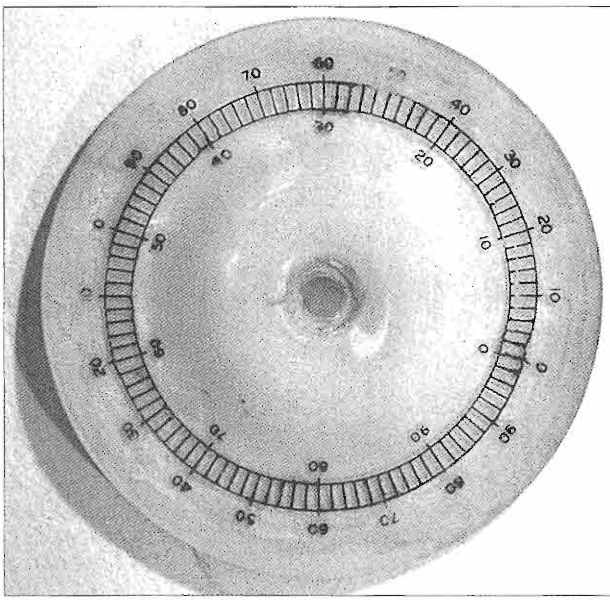
4. The 6AK5 crystal oscillator tube location is almost equidistant between the 6SA7 1st mixer and the 6SK7 IF amplifier. In the production 75A-1 receivers, the 6AK5 is moved very close to the 6SA7 1st-mixer tube. The hole shown between the 6AK5 and 6SA7 tubes was absorbed by the oscillator tube socket. It was one of three screw holes which held the left side of the top cover assembly to the chassis.

5. The fifth bathtub capacitor, missing from the chassis of the production 75A-1, has three sections. They are connected to one side of the filament, B+, and the cathode of V1 to ground. The bypass capacitor for the cathode of V1 was later moved to the circuit board, and later still was shunted with a small capacitor directly from the tube socket to ground.

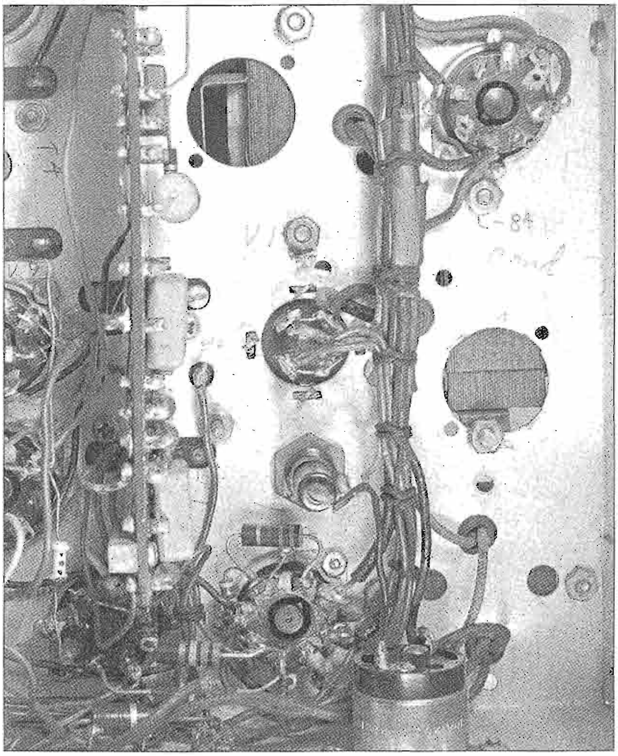
6. A square hole was cut by a hacksaw to clear the turn-stop washers, which were added to the shaft of the PTO.

7. The kilocycle dial was drawn by hand and then sandwiched between two thin layers of plastic. The backside of the plastic dial was painted white, and the dial was cemented directly to the shaft with Duco® cement.

8. The power supply components had already been moved to the location as seen in the 75A-1 today. The holes are still located in the chassis shown by the layouts in the original product descriptions. Part designators are written in pencil by the empty holes on the chassis. The components were moved to reduce the heating effect of the rectifier tube on the BFO and PTO frequencies. While frequency change caused by temperature change can compensated for with component selection, the greatest effect of temperature is on the mechanical structure of the oscillator. For a better expla-



Original Dial from the 75A



Bottom View of the 75A

nation of oscillator drift and compensation, see the excellent article written by Ted Hunter[7].

We can see from the bottom view that C84 was once a plug-in electrolytic capacitor and is now a twist-lock capacitor. It has been moved next to the BFO can. The rectifier, V1, has been moved to the edge of the chassis where it can be ventilated. The former socket hole for VI is covered by choke L29, and choke L28 covers the hole left by C84. The output transformer, T5, is rotated 90 degrees and a fuse holder is added between C84 and V12. These changes can be seen in all 75A-1 receivers today.

9. A power disconnect is handy for a prototype, as power must be applied and removed many times during optimization of a new design. For the production 75A-1, the power cord is permanently attached.

10. There is no name plate or badge on the chassis, or any drilled mounting holes in the chassis.

11. The noise limiter is functional at all times. The noise limiter switch and its associated hole are not present in the front panel. The 47-k resistor, R37, used only when the 75A-1 noise limiter is in the "off" position, is present on the circuit board of the prototype receiver but is not wired.

12. There is no zero-set knob or pointer adjustment for the kilocycle dial. The pointer consists of a red line that has been glued to the backside of the dial glass.

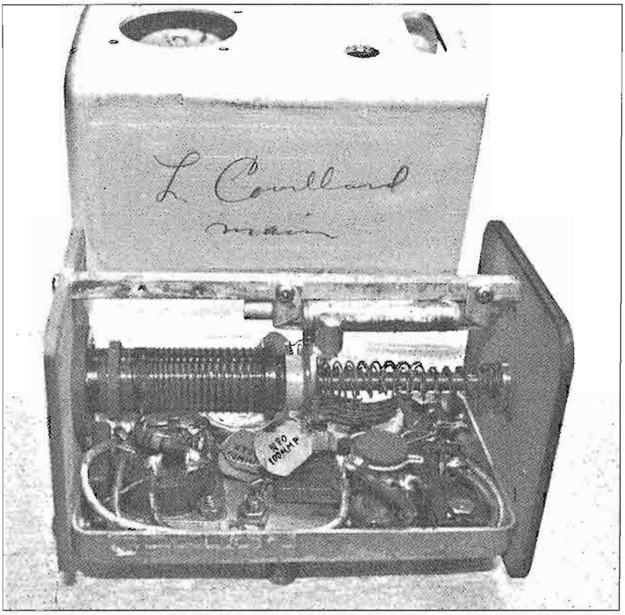
13. The IF transformers and BFO cover are painted gray with their part numbers stamped on top.

14. The aluminum shield between the power supply and IF stages has not been added.

15. The aluminum "stiffener" between the dial assembly and chassis is not present.

New Life for the Prototype 75A

The receiver was received without a cabinet, and the cover for the slug rack assembly was missing as well as the bottom cover for the band switch. The kilocycle disk as shown above had buckled and the tuning knob could not be turned. The front panel was removed and the dial was replaced with one drawn with Autocad and then, printed out on a clear Mylar sheet. The silk screening was removed from a spare 75A-2 dial and the Mylar replacement was glued to its face. While the front panel was removed from



Here is the PTO shown removed from the prototype 75A receiver. The inside cover has been removed. Note the name "L Couillard," followed by the word "main." Whether this means "main receiver" or "main plant" is not clear.

the receiver, the audio and the radio frequency gain pots were replaced with new Allen Bradley potentiometers

After the filter capacitor was replaced, the receiver was slowly powered up with a Variac. As the receiver warmed up, a light hiss could be heard in the speaker indicating that some of the IF stages were working. The S-meter was unstable due to a dirty pot and it was also replaced. A signal generator was lightly coupled to the grid of the second mixer and plenty of gain seemed to be available through the crystal filter and intermediate frequency stages. This was not the case with the variable IF and the front-end stages. Only the strongest signal could be forced through the receiver by the signal generator. The receiver would also break into oscillation as the band switch was turned.

The metal partitions which hold the individual band switches and coil assemblies have silver-plated contact strips attached to their sides. Close inspection revealed metal migration on the silver contacts had occurred, and the partitions were not able to maintain good electrical contact with the sides of the aluminum box. All of the partitions were removed from the receiver and cleaned. The wafer switches were also removed from the partitions and their contacts were cleaned. The partitions were then placed back in the receiver. At this point, all stages of the receiver were functional.

As alignment began, the PTO calibration was found to be poor. Using a frequency counter, it was discovered that ten turns of the dial fell about 50 kilocycles short. Oscillations ceased as the frequency trimmer capacitor in the PTO was adjusted. Hoping for a quick fix, the tube was replaced with a new 6SJ7. The PTO now refused to oscillate with the trimmer capacitor in any position. The PTO was removed from the receiver. On the side of the PTO was written (in pencil), "L Couillard Main." The PTO covers were removed and power was applied. The problem was quickly found to be low screen voltage on the 6SJ7 oscillator tube. All of the resistors were checked for proper values and were out of tolerance by several hundred percent. The PTO was heavily loaded by 30k of resistance. The 100-k load resistor (R003) had been bridged by a 40-k resistor inside the oscillator assembly. All of the resistors were replaced, and the 40-k resistor was removed. Now, the oscillator was completely functional and ten turns of the dial now fell about 5 kilocycles short. The 25-pF trimmer capacitor was at its minimum value. C002, a capacitor selected during production, was removed. The PTO could then be tracked perfectly.

The PTO was placed back into the receiver and the alignment continued. It was soon apparent that none of the other trimmer capacitors would peak or tune. It was determined that the silver plating on top of the trimmer capacitors had broken away from the solder connections. All of the metal partitions were again removed and each ceramic trimmer capacitor was replaced. Not wishing to remove the partitions a third time, all of the mica capacitors were also replaced with brown dipped-mica capacitors.

After the partitions were placed back into the receiver, the alignment was successfully completed. During alignment the following problems were noted.

1. The slugs of L13, L14, L15, and L16 peaked with the slugs almost all the way in. This problem was corrected in the production 75A-1 with the addition of C31 and C35.

2. The 6AK5 tube in the high frequency oscillator circuit is very hot to the touch. The plate current was measured to be 17 mA, indicating the tube is running at its maximum plate dissipation. A RF choke is in series with the cathode to ground, without a bias resistor. This choke can be seen on the bottom views found in the first "Product Descriptions." The problem was solved in the production 75A-1 receivers by replacing the choke with R17A and R17B.

3. The PTO is not sealed against moisture. In his QST article[7], Mr. Hunter writes, "There is only one good way to eliminate humidity effects completely, and that is to design the oscillator so that moisture cannot enter. However, the cost of producing a unit sealed against moisture is not justified in amateur applications." By 1948, all 75A-1 receivers had hermetically-sealed PTOs.

4. Receiver standby is accomplished by lifting the power transformer center tap above ground. This will be discussed in detail later in the article.

With the restoration and alignment completed, an antenna was connected and an evening of enjoyment was spent tuning through the bands. The noise limiter functioned very well and there was little distortion evident on the strongest signals. A production 75A-1 was placed by the 75A prototype and provisions made such that the antenna and speaker could be instantly switched between the two receivers. The audio from the 75A appeared to be higher in pitch because of the noise limiter. It is likely that the .002-µF capacitor connected across the audio gain control accounts for this.

References:

1. Osterwald, Ray, NØDMS, "The Collins 75A-Series Receivers: A Legacy of High Quality," Electric Radio #41, September 1992
2. Collins Column, "The 75A Amateur Receiver, September 1946
3. The Collins Signal, "The 75A Amateur Receiver," January 1947
4. Collins Brochure, "The Collins 75A Receiver, August 1946
5. Collins Brochure, "The Collins 75A Amateur Receiver, May 1947
6. Ray Ruggiero, "Collins Prototypes" conversations, September 2000.
7. Hunter, T. A., WØNTI, "Permeability-Tuned Oscillators, A Comparison with Condenser-Tuned Circuits," QST, August 1946
8. Ibid

[Editor's note: JB's article is running in multiple parts so that I can present all of his fine illustrations. It continues in the March 2007 issue.}

ER

(Comments, from page 1)

friends all across the country, and in his home state of California he was known as a very active amateur and a source of encouragement to AM operators and anyone interested in vintage equipment. Bill was a determined radio technician and an excellent experimenter. My wife and I met him several years ago when he was in Colorado on vacation, and we had lunch at a small restaurant. We were discussing his upcoming articles on the Hallicrafters SX-28 receiver, and I enjoyed meeting him and getting to know his warm, personal style. In the years since then I had come to know him better through our many conversations. Bill had an unusual ability to solve long-standing electronic problems that he found while restoring and working on his equipment. When he found a problem, he would never give up until it was solved to his satisfaction, and the quality and depth of his articles in Electric Radio reflects that ability. Many times, he would tell me that the answer to a problem came to him when he was out hiking or biking.

He had recently become interested in high-performance receiver design, and was applying it to electron-tube receivers. He had almost completed a 2-part article on intermodulation distortion in the R-390 and on general IMD testing. This article will be running in upcoming issues as soon as I can be sure that it will be presented as Bill would have wanted it. There is no telling what he might have come up with had he not been taken from us too soon.

Farewell Bill, you will be missed by all of us.

Electric Radio Subscription Rates

On **April 1, 2007**, the subscription rates will be increasing, as I mentioned last month. Here are the new yearly rates:

- Periodicals: $34.00
- 1st-Class: $45.00
- Canadian: $54.00
- Overseas: $70.00

This is a modest rate increase. It is unfortunate—but necessary—in order for us to keep Electric Radio in print. The cost of everything is going up, and the increase has been caused mainly by the post office rate increase in all categories that will take effect during May, 2007.

Information about the post office rates is available on the Internet at their URL: http://www.usps.com/ratecase/welcome.htm

Heavy Metal Rally, 2006

The winner of the 2006 Heavy Metal Rally was Bob Raide (W2ZM) with a point total of 253, congratulations Bob! We will be shipping the prize trophy during February.

Here are the point totals from the other *six* logs I received:

Steve Ickes (W3HUZ), 133 points
Bill Ramsey (KA8WTK), 121 points
Rod Perala (W5CZ), 99 points
Dennis Petrich (KØEOO), 80 points
Larry Harrison (K3JRR), 78 points
Keith Ericson (KØKE), 6 points

Thanks to everyone for sending in logs and participating in this year's event! I hope that 2007 will be even more fun than 2006. From what I heard that night, there was more participation than ever.

January 2007 Electric Radio Mailing

Due to severe winter weather in Colorado during December and January, the January issue of ER was not mailed until January 11. We were snowbound for 6 days before Christmas, and 4 days just after New Year's Day, and could not get the copy sent to the printer on our normal schedule. Also, January 15 was a postal holiday. This amounted to a 5-day delay in the mailing of that issue.

I would like to remind everyone that I always post news about the monthly mailing on the Electric Radio web site home page at www.ERmag.com and readers with Internet access, or friends with access, can always check the status of each issue.

73, Ray, NØDMS

ER

A Transmitter for the Novice: The DS-40, Part 2,
The Matching RX-40B Receiver

By David Kuraner, K2DK
2526 Little River Rd.
Haymarket, VA 20169
k2dk@comcast.net

In a previous article, I described the obsession with building a transmitter in a surplus 30-caliber ammunition can. The idea was based on a magazine article from 1960. The challenges of building a homebrew (HB) receiver are daunting and very few people actually attempt it except for simple regenerative circuits or perhaps a very simple superhet. Add the requirement that it match a particular style and fit in a matching cabinet for another piece of equipment, and you really have a challenge on your hands.

A review of the construction articles of the vacuum tube circuits provided everything from a simple superhet to a rather involved double conversion device that would never have fit in the desired cabinet. It became obvious that a 30-caliber ammo tin would never do, and a 50-caliber ammo tin was chosen so there was a chance for something reasonably functional to fit inside. I felt that if I was going to the trouble of building this thing, it should work well by being sensitive and selective, have good audio and, at least, should cover 80 and 40 meters. Mechanical stability and thermal designs would also be a challenge. It should have

Front View of the RX-40B, Top, and Power Supply, Bottom

a pleasing panel layout as well, which would complement the companion transmitter and modulator units.

Originally, I was going to power the station from the Heathkit HP-23 power supply. But, when I realized that this companion receiver could only be housed in the larger ammo can, a matching speaker/power supply housed in the same large-sized ammo tin became essential for station symmetry. Four boxes, two large and two small, of identical size, would be very pleasing. The end result would be something to be proud of and I would have the bragging rights to say that the entire station is HB!

Hunting Up the Parts

Since I didn't have a time machine to go back to "Radio Row"—Cortland Street in NYC, pre-World Trade Center—I and anyone else not blessed with a stash of NOS parts must hunt everything down. The most expedient source, aside from a well stocked junk box, is from poorly built, defective, or butchered Heathkits. Another source is defective and already cannibalized equipment.

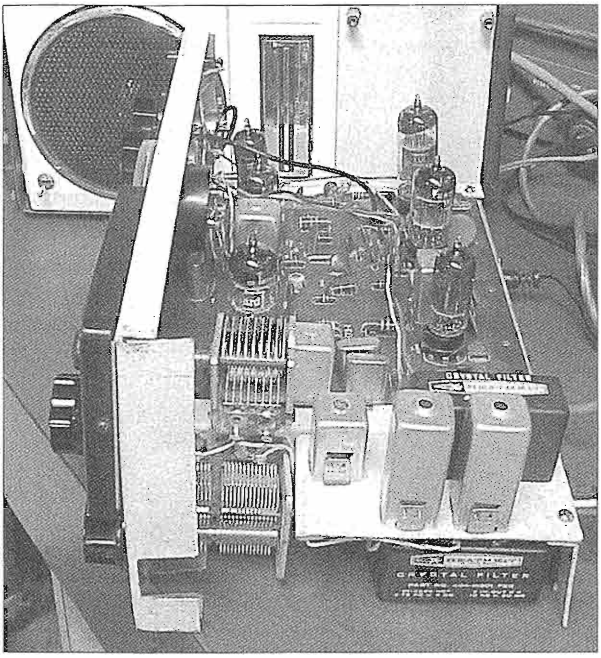
One of the more interesting designs from the later 1960s ARRL handbooks showed a two-band (80 and 40) single-conversion receiver using a 3.3 MHz IF. It also showed a front-end preselector, which covered both bands with one coil and thus required no band switch in the front end. As I continued investigating and preliminary planning, I realized that many Heathkit models also used an IF around 3.3 MHz, 3.395 MHz. Also, filters were made and commonly available for various bandwidths for AM, SSB and CW. They were described in ER #210, November 2006. These filters are readily available from Internet sources and came from the HW and SB-series equipment. Discrete crystals used by this series of equipment can also be used to build crystal filter circuits, as was shown in ER #211, December 2006, for AM reception in Heathkit sideband transceivers. There will be more on this later.

I had several defective devices that could provide parts for this project. One was a cannibalized HQ-145. The other was a Heathkit HW-16 CW transceiver. The HW-16 has a separate receiver printed circuit board which uses the common Heathkit second IF of 3.395 MHz. It is double conversion and contains many of the parts and circuits already mounted on a printed circuit board. But, it's not a complete stand-alone receiver, and suffered from several design flaws. It needed a power supply and preselector, and if AM were to be received, modifications to its quasi-product detector and IF band pass would also be needed. It would also need an AGC circuit and "S" meter.

For the preselector, I found two coils from the front end of the HQ-145 which originally covered 4 to 10 MHz. Using them with a double-ganged, 365-µµf variable solved the problem of the front-end tuned circuit. I now had a double-tuned, front-end circuit covering both 80 and 40-meters with no band switching. The HW-16 uses the transmitter's PI network for front-end tuning, and is notorious for overloading and images.

For the IF bandwidth issue, I first experimented with the original two-pole crystal filter which uses discrete crystals. I found that an acceptable AM filter was obtained by substituting the carrier generator crystals from the HW-100/101 or SB-400/401. The frequencies are 3396.4 and 3393.6 MHz. They are 2.8 Hz apart and result in a pleasing and appropriate band pass. Since I wanted to have selectable bandwidths and I primarily operate phone, I eventually chose to use the two phone filters and the original filter with the SSB carrier crystals.

One of the design requirements of the equipment using these filters is that the input be shielded from the output to avoid signal feed-through. In my implementation for the selectable bandwidth switch, complete isolation is impossible to achieve. There is some feed-through, which is not too objectionable. But, most of it appears to come from the fact that



Side View, Showing the Component Layout

the first conversion goes through a bandpass filter covering 300 kHz and is an original design issue. The receiver uses a crystal-controlled first oscillator to convert the incoming signal to a signal between 5.295 and 5.545 MHz. Once through the bandpass filter, it is converted to the 3.395 MHz IF. The second oscillator covers the range from 1900 to 2150 kHz and is reasonably stable.

Converting the Receiver Board for AM

With the issue of the selectable bandwidth resolved, there were still two other issues. One was to convert the CW detector to AM. The other was to move the local oscillator and other tuned circuits so the receiver board would cover the phone portion of the bands. (With the new expanded 80-meter phone band, this may not be necessary.) The HW-16 only tuned the first 250 kHz of the bands.

The first experiment to disable the BFO was to remove the associated crystal (3396.4 MHz) at V5. It worked perfectly. The rudimentary product detector became a perfect AM envelope detector and very acceptable AM audio was reproduced. However, it was quickly found that to energize the BFO for SSB or CW, running wires to a switch on the front panel, which was intended to remove the ground on the crystal, did not work. The capacitance of the long leads permitted the crystal to continue to oscillate. The solution, as every receiver manufacturer knew, was to remove B+ from the BFO tube.

The local oscillator coil, L-7, is simply retuned to its maximum range. The AM window (pre-expansion) is easily tuned for both 80 and 40-meters. Next, the coils L3, L2, L6 and L5 are peaked for the AM window. The printed circuit board is now tuning the original phone portion of the bands with selectable IF bandwidths. It is fully is functional for AM, SSB and CW.

The only two things now needed to make this comparable to a commercial receiver were AGC and an "S" meter. AGC was almost a necessity, while the meter was nice to have. A simple AGC rectifier circuit was built and tested, see **Figure 1**. The AGC developed up to 3 volts negative on strong signals. This is perfect for the AGC loop.

There were several stages that could accept the AGC voltage. The first, and most important, was the RF amplifier, and it was the easiest. All that was necessary was to lift the 100-k grid resistor from ground and apply AGC there. Later, I lifted the 10-k resistor from the first mixer and fed the AGC to it through another 100-k resistor. It worked perfectly. Because of its original design, no additional stages could be added into the AGC loop, although that would improve performance.

The standard meter circuit can not be

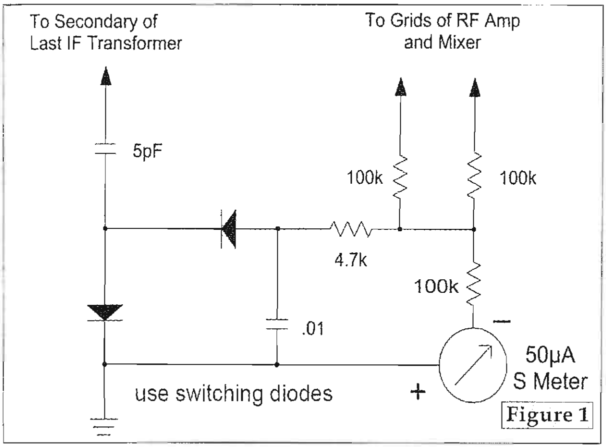


Figure 1

implemented with only the first two stages controlled by the AGC. A different approach was needed. A sensitive voltmeter, using a 50 micro-amp movement through a 100-k resistor, is used to monitor the AGC without loading down the AGC voltage, and thus it will substitute as an "S" meter. It responds exactly to the actual voltage being developed by the AGC detector. It's very interesting and really helps to avoid overloading of the RF and IF stages.

The board also covered 15 meters. For the moment this is not used, although I may try to use this for 10-meter AM at some point in the future.

The Speaker-Power Supply

Since I wanted the power supply to run both the receiver and transmitter, I had three possible choices. One was to use the Heathkit HP-23 for everything and just mount a speaker in the second 50-caliber ammo tin for symmetry. The second was to use the power supply components from a defunct SB-401 transmitter. The third was to use the components from the HW-16 which "donated" the receiver circuit board.

Option one would provide the 12-volt filament needed for the transmitter but not 6 volts for the receiver. Option two would be just the opposite and wouldn't provide the several lower DC voltages for the receiver. This would be true of option one as well. Option three, using the components from the HW-16, would provide everything but the 12-volt filament needed by the transmitter. Thus option three was chosen and a second 12-volt filament transformer was added. Everything just squeezed into the 50-caliber ammo tin.

The speaker came from a long-since discarded stereo. I found that it fit the ammo tin perfectly as to height and cleared the power supply chassis with ease. It didn't quite have the width, and an approximate 3-½ inch panel had to be fabricated to fill in the gap. Behind this gap is empty space. Here is where a potential converter or other accessory can reside.

Converting the HW-16 for AM

Should you have a working HW-16 and would like to turn it into a low-power AM transceiver, you now have the recipe for the receiver. A no-hole modification is possible by removing the BFO crystal, changing the filter crystals and retuning, if needed.

For the transmitter, again, a no-hole modification would be to employ the series-cathode modulator as described in ER #191. This gives grid-bias modulation via the cathode circuit.

- Disconnect the cathode circuit of the 6GE5 final.
- Disconnect the VFO coax cable from the rear jack.
- Connect a wire from this jack to the cathode of the 6GE5, pins 4 and 10.
- Remove the two 22-k resistors (R8 & R9) going to L14. This is the RF choke (L14) which goes to the final grid.
- Connect the two free ends of the resistors together.
- Place another 22-k, ½-watt resistor from the bottom of the grid choke, L14, to ground.
- Remove the neon bulb from the side tone generator, and finally, peak coils L10 and L11 once you have plugged in a

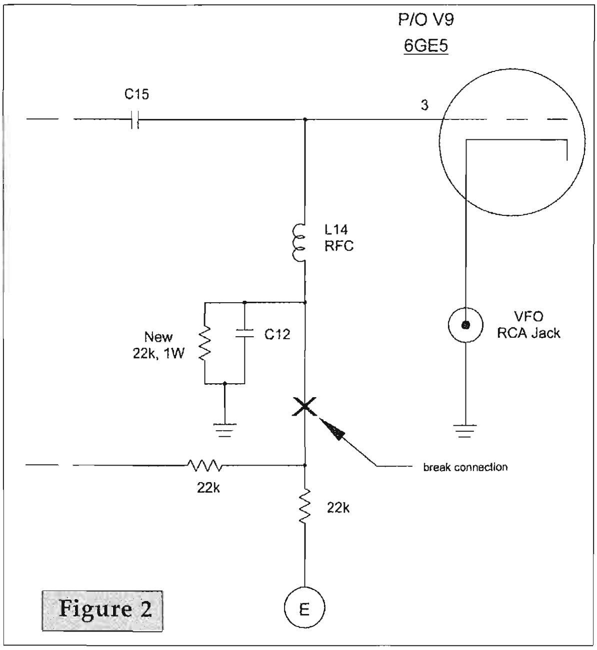


Figure 2

The major difference with HB is that you get to choose the circuits, the parts, the chassis and panel layout. You design around available components. You get to bend, drill and blast aluminum. And, you get to mount it all and wire the components together to bring *your* creation to life.

Years ago, we had ready access to new components. At the beginning of the 21st Century, it is even more challenging. We have to work with whatever is available and not what used to be ordered from Lafayette or Allied Radio. Still, it can be done. Not everyone can produce works of art like Bob Dennison (W2HBE, SK). Not everyone has access to a

crystal for your favorite AM frequency. See **Figure 2**. (The VFO input can be retained if you are willing to mount an additional RCA jack on the back panel.) The modulator is connected to the RCA jack. The original key line is now the PTT circuit and needs to be switched by the relays in the external modulator. With this modification, you loose the VFO input and the plate-current meter. You would tune for maximum on the transceiver's output meter. With the modulator in series with the final, there is no danger of drawing excessive plate current.

Conclusion

This project has greatly increased my respect for the receiver manufacturers of our beloved boat anchors and what design choices they made with component selection and layout. Now, you can argue that all I did was rebuild the HW-16 receiver. But, even 75 years ago, you would effectively be doing the same thing. You're building the same commercial circuits with the same new or salvaged parts that the receiver manufactures used.

metal shop and NOS components. I used hand tools and scrounged. It's not professional, but I am truly proud to say, "OM, the entire station here is completely HB."

Footnote: A recent article in QST (Oct. 2006) showed a HB modern receiver design using IC and transistor technology in a circuit with some very close-tolerance components. The author made a special point of expounding the virtues of HB bragging rights. If you were to procure the parts individually, it would consume huge amounts of time and money. A parts kit was offered including the printed circuit board. Effectively, you are buying a kit and producing someone else's design as a HB product from this kit of prepared special parts. This just illustrates that even with modern designs you are subject to the same problems of practical and economic acquisition of components. Correction: The schematic in ER #212, p. 21, should have a full line between the right side of the .001 plate coupling cap and the grid of the 1625 PA.

ER

Simple Upgrades to the TV7-Based Vacuum Tube Curve Tracer, Part 2

By Paul A. Bernhardt, KF4FOR
5704 Ridge View Dr.
Alexandria, VA 22310

Screen Voltage Switch for the Converted TV-7

A separate screen voltage is required to test tetrode and pentode vacuum tubes. In the previous modification of the TV-7 by Bernhardt (Electric Radio #210, November 2006), this voltage was derived from the 5Y3 screen-and-bias rectifier in the TV-7. This voltage was filtered by a 27-k ohm resistor and 560-µF, 200-VDC electrolytic capacitor before being applied though a switch to the screen of the vacuum tube. Depending on the screen current, the screen voltage was provided at a value between 100 and 140 VDC. Many pentodes require twice as much screen voltage for proper operation. Consequently, the TV-7 is further modified to provide a selection between low voltage (LV with 100 to 140 VDC) and high voltage (HV with 150 to 280 VDC) for the vacuum-tube screen.

The updated schematic for the modified TV-7 is shown in **Figure 7**. The cathodes of two 1N4007 diodes are attached to pins 16 and 18 of T101 on the 330-VAC, CT winding. The anodes of the diodes are wired to the HV pole of a SPDT switch and the center tap, pin 17, is attached to the other LV pole of the switch. The common of the switch is connected to the cathode "K" pin jack on the modified TV-7. Switch SW2 changes the minus side of the full-wave rectifier from a center tap to a bridge design in order to double the screen voltage. The positive side stays attached to the 2.7-k ohm resistor and the filter capacitor is changed to a 200-µF, 450-VDC electrolytic. This filter capacitor is large enough to provide a fixed screen voltage, even as the curve tracer varies the plate and grid voltages on the vacuum tube under test.

Assuming that the TV-7 modifications described by the earlier paper (Bernhardt, Electric Radio #210, November 2006) have been made, the first step in the next conversion is to drill a hole for the new SPDT switch. **Figure 8** shows the positions for all the additional holes in the front of the TV-7 needed to mount the switches and tip jacks for the curve tracer interface connections. The new hole is near the plate (P) tip jack on the panel. Precise placement of the holes is required to prevent interference with the existing components on the TV-7. **Figure 9** shows the front panel of the tube tester after the holes are drilled and the new SW2 is added.

The next step is to remove the 560-µF capacitor and then unhook the wire from pin 17 of the transformer and the CT pin for pole "A" of the 4PDT switch. This was the connection in step 10, discussed in the introduction of this paper [Part 1, ER #212]. Instead, connect this wire to the LV pin of SW2 (SPDT).

- Solder the cathodes of the 1N4007 diodes to pins 16 and 18 of the transformer and join together the anodes of the two diodes. Run a wire from this anode junction to the HF pin of SW2.
- Next, connect a wire from the common of SW2 to the CT pin for pole "A" of the 4PDT switch. This is also connected to the "K" pin jack. Finally, wire the negative side of the new 220-µF, 450-VDC capacitor to the "K" pin jack and the positive side of the capacitor to CT pin of pole "D" for the 4PDT switch. The connections should follow the detailed

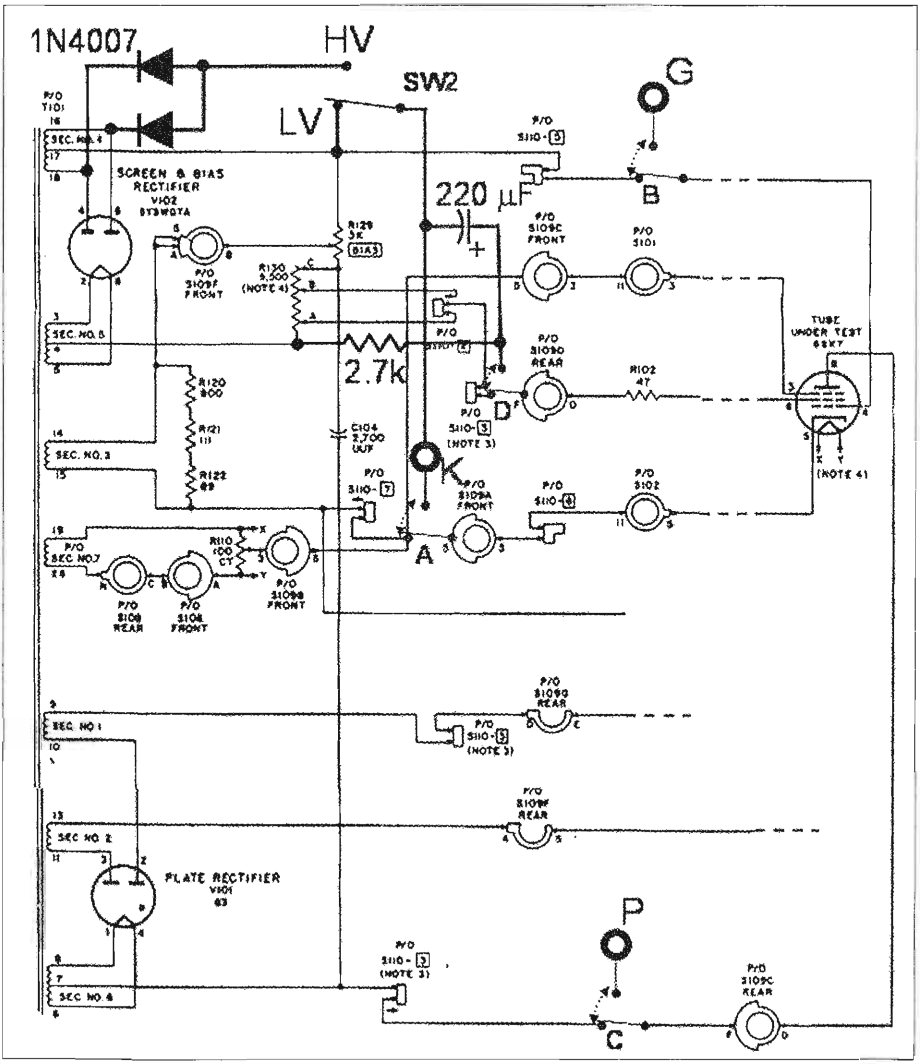


Figure 7. Circuit diagram of the TV-7D tube tester with modifications for connections to a transistor curve tracer. The two 1N4007 diodes and switch SW2 allow two settings for the vacuum tube screen voltage.

schematic of **Figure 10**.

To test this modification, set the TV-7 switches to AB-12345-D. Using a ohm meter, make sure that all the connections match the schematic shown in **Figure 7**. With the toggle switches in the CT and LV positions, determine that tip jack "K" connects to octal socket pin 4, tip jack "G" connects to octal socket pin 1, and tip jack "P" connects to octal socket pin 2. After these checks, plug the tube tester into the 120-VAC power, turn it on, and adjust the AC voltage potentiometer to center the meter. With a DC

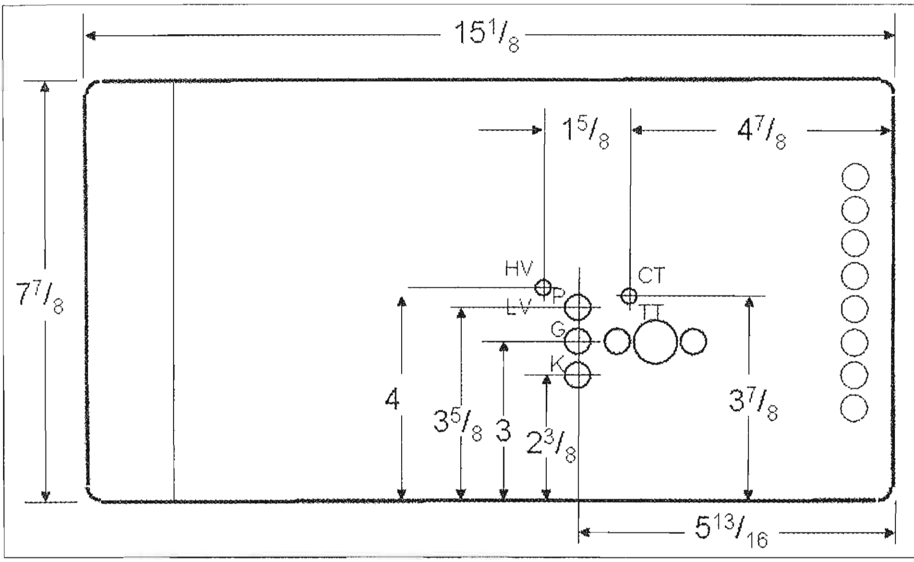


Figure 8. Template for holes to be drilled for the switches and tip jacks needed to modify the TV-7D tube tester. The new hole near the LV and HV labels is for the SPDT switch to control the screen voltage.

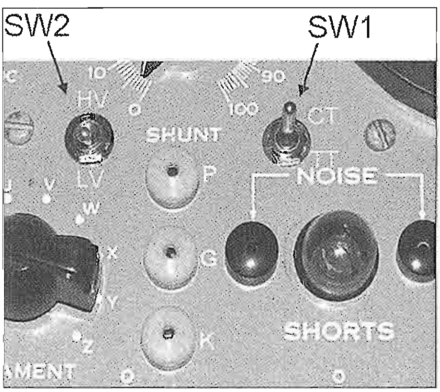


Figure 9. Three tip jacks and two switches added to the face of a TV-7D tube tester for interface to a transistor curve tracer. SW2 controls the vacuum tube screen voltage.

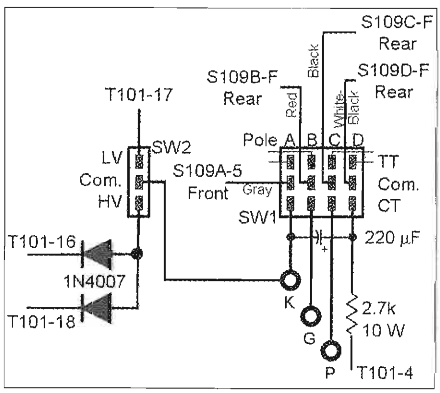


Figure 10. Wiring of the two additional switches and components in the TV-7 tube tester.

voltmeter, check that the voltage between tip jack "K" and octal socket pin 3 is about 140 VDC with the switches in the CT and LV positions. Moving the screen voltage switch to the HV position should show in increase to 280 VDC. Place the toggle switches to the TT/LV positions and turn off the tube tester power.

Illustrative Uses of the Vacuum Tube Curve Tracer

With the added capabilities described above, the plate characteristics of high-power pentodes can be measured over

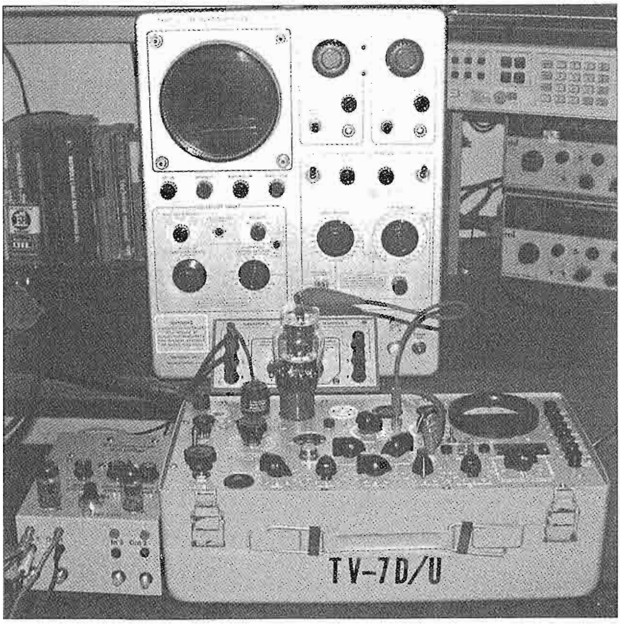


Figure 11. Test setup for characteristic measurements of a 1625 beam power pentode with a TV-7D tube tester and the times-ten DC amplifier connected to a Tektronix 575 curve tracer. The wire connections are given by Figure 1 of part 1, ER #212, page 24.

their full performance range.

The first measurements were made with a 1625 beam-power amplifier. The 1625 vacuum tube is identical to the 807 except for its filament voltage. These tubes are commonly used by hams as power amplifiers, and a pair of 1625s was used by the military in the output stage of WWII ARC-5 transmitters. **Figure 11** shows the TV-7 tube tester, the X10 DC amplifier and a Tektronix Model 575 Transistor Curve Tracer testing a type 1625 tube. For all tests, the DC offset potentiometer on the X10 Amplifier was set to zero.

After connecting the electronic equipment ac-

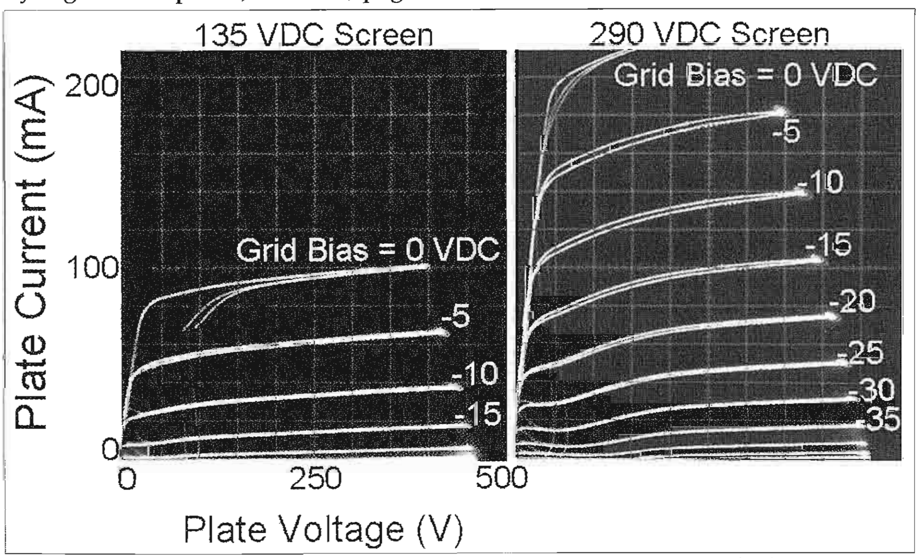


Figure 12. Plate characteristic curves for the 1625 measured with the Tektronix 575 curve tracer with the TV-7 and X10 DC amplifier. The maximum more than doubles with the factor of two increase in screen voltage. The grid voltage is changed in 5-VDC steps from 0 to negative 50 VDC.

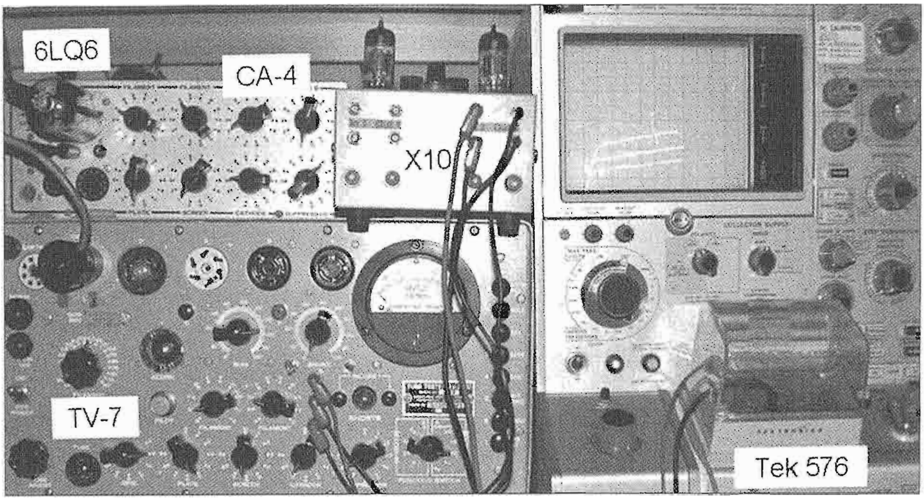


Figure 13. Here is a stack of test equipment used to trace the plate characteristics of the 6LQ6 beam power pentode.

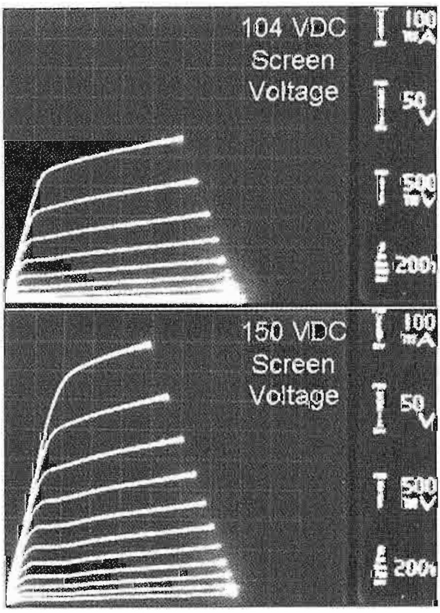


Figure 14. Measured plate characteristics of the 6LQ6 sweep tube. The plate voltage is swept from 0 to 350 VDC and the maximum scale for the plate current is 1000 mA. The grid voltage is dropped from 0 to -50 VDC in 5-v steps. The screen voltage is selected with the LV/HV switch on the modified TV-7D.

cording to **Figure 1** [ER #212, page 24], the 1625 mutual conductance test is made with the TV-7 with the switches in TT/LV positions. Next, the X10 amplifier and the Tektronix 575 curve tracer are warmed up. The transistor curve tracer is set for a 50-volt-per division collector (or plate) voltage, 20-mA-per division for the collector (or plate) current, and 0.50-volt-per step into the X10 inversion amplifier. Use the curve tracer selection switch to feed the TV-7 and X10 amplifier. When the TV-7 toggle is switched to the CT mode a family of curves should appear on the transistor curve tracer screen. Adjust the plate voltage for a maximum sweep of 400 VDC. The plate current and the tube voltage gain will substantially increase when the screen voltage toggle is switched from LV to HV. This difference is dramatically illustrated by the measurements shown in **Figure 12**.

As a last example, a 6LQ6 sweep tube is tested using a Tektronix Model 576 curve tracer. The 6LQ6 was used in the power amplifier final stage of many Swan transceivers and linear amplifiers. To make the characteristic measurements, it was necessary to plug the 9 Novar pins of the 6LQ6 into a CA-4 adaptor. This adaptor was then used with the octal socket of the TV-7. Set the selector switches on the TV-7 to BS-3567-8D. The settings for the CA-4 adaptor are 4520-0138 to match the filament, grid, screen, cathode and suppressor pins of the tube. The plate cap of the 6LQ6 was connected to the "P" tip jack on the CA-4. The TV-7 was used in tube tester (TT) mode, with the bias pot adjusted to give a middle-scale reading on the TV-7 meter. The TV-7 and X10 DC amplifier are hooked up to the Tektronix 576 using the connections shown in **Figure 1** [ER #212, page 24]. A zero-DC offset on the X10 amplifier is, again, used for the measurements. The 576 is operated to provide a 0-to-500-VDC sweep in plate voltage and a plate current range between 0 and 1000 mA. Voltage steps of 500 millivolts are multiplied by negative 10 to give negative 5-VDC steps of grid voltage. Because of a large loading by the screen grid, the screen-voltage switch provides reduced values of 104 and 150 VDC respectively for the LV and HF positions. The resulting plate characteristics (**Figure 14**) show a healthy tube suitable for ham radio use.

Conclusions

The combination of a modified TV-7 tube tester, one tube-type X10 inversion amplifier, and a Tektronix transistor curve tracer makes a powerful tool for measuring a wide variety of vacuum tube characteristics. All vacuum tubes that can be tested with the TV-7, with or without a CA-4 adaptor, can be traced with the setup described here. The only problem encountered with the tests was small oscillations in the characteristic traces for a 829C beam-power tetrode, which could be traced back to the X10 amplifier. The X10 amplifier also required at least a 15 minute warm-up for stabilization of the zero adjustment. The Heathkit-based design of the X10 works very well for the DC voltage application described here.

The primary limitation to the TV-7 based vacuum-tube curve tracer is the inability to measure the plate characteristics of high-power output tubes such as the 813 beam-power tube and the 211 triode. A future paper will present a transistor curve tracer adaptor with sockets for these and other high-power vacuum tubes. The design will use a solid state X10 amplifier and a SCR-based control for the tube filament voltages.

ER

The Last Stancor, the 25B

By Chuck Teeters, W4MEW
110 Red Bud Lane
Martinez, GA 30907
Cteet70@aol.com

About 5 years ago I decided to try to acquire all 15 transmitters, built from kits, and originally sold by the Standard Transformer Company of Chicago. Stancor built and sold transmitter and PA amplifier kits from 1938 until 1952. I succeeded in getting all of them. However, the model 25B, a 25-watt, beginners CW transmitter kit that was sold in 1940 and 1941, was beyond rebuild. The only usable part was the chassis. The $13 kit was the simplest and cheapest transmitter kit sold by Stancor. The plug-in coil, two or three-tube, crystal-controlled CW transmitter would have been called a "novice transmitter" if it had been sold in 1952 because it was intended for the brand new beginning amateur. The 25B kit could be wired for different oscillator and/or amplifier configurations. Stancor recommended that the new ham should try different circuits to see how they work.

While Stancor suggested the newcomer try different circuits, they did not provide any instructions or parts for the circuits. Stancor didn't provide anything like the Heathkit assembly books that many newer hams are familiar with. All of the prewar kits had a one or two-page instruction sheet, along with a schematic and several photos of the top and undersides of the chassis. The two post-WWII transmitters that Stancor sold had more complete instruction books, and the last, the ST-203 book, looked much like a Heathkit book with step-by-step instructions, and fold-out drawings.

The Stancor 25B, has been rewired for 3 tubes, a 6AG7, 6L6, and a type 80 rectifier. It uses a Bud 80-meter coil on the left side of the chassis.

Incidentally, production of the last Stancor kit, the ST-203, ended the same year Heath introduced their first novice transmitter kit, the AT-1.

I decided that since no decent 25Bs survived, to finish my Stancor collection I would *roll my own*, using the chassis I had as the starting point. Stancor built all their kits using only two different chassis. I had the B-1 chassis, which was used for 4 kits, including the 25B. The chassis, the power transformer and filter choke were the only Stancor-produced parts in the 25B, all the others were standard 1940 radio parts. With a well-stocked junk box, it was no trouble to assemble the parts for the 25B, other than the power transformer. My Stancors didn't fit electrically or mechanically, but an off-brand power transformer did fit the specs, and the space, so in it went.

Also, a new filter capacitor with four 450-volt sections fit the mounting space, so it was also used. I found some dog-bone resistors, mica and paper caps, push-back wire, two Stancor red knobs, and some miscellaneous parts, so my 25B kit was ready to build.

I followed the schematic and built up the full-wave power supply using an 80 rectifier and a capacitor input pi-section filter supplying 360 volts at 75 mA. Then, the 6L6 oscillator was wired following the 25B schematic as a regenerative crystal oscillator. The oscillator tank circuit is a commercial 50-watt, air-wound, end-link, plug-in coil combined with a pair of 180-pfd variable caps. The low end of the tank is connected to one side of the link, and the link connections are brought out to a pair of ceramic feed-through insulators. The variable cap connected to the low side of the coil can be shorted, which grounds the coil and makes it a conventional link-coupled output tank. If the cap is not shorted, the output is a pi-section tank. This allows using either a single-ended antenna feed working against ground, or a balanced feed for a 2-wire transmission line. A 150-mA pilot lamp is connected in the B+ lead to substitute for a meter. Overall, it is a nice kit to assemble, with lots of working room. The only thing I had to remember was that the painted steel chassis did not provide a good ground unless the paint was scraped completely away from the intended ground connection.

For the initial test, a 1940 Bliley CM2 160-meter rock was plugged into the 5-pin crystal socket and a Bud 160-meter coil plugged into the plate circuit. A 25-watt lamp was connected to the antenna link output connections. It tuned up fine and lit the lamp to about half brilliance. It also keyed nicely, having no chirps or clicks.

Next, I tried 80 meters, but I used a CR-18 crystal. It tuned up OK, but when I keyed it there was a chirp that would drive the family cat crazy. After about 15 minutes, the output disappeared. When I went to take the crystal out, it was so hot I had to let go. Obviously, the 6L6 was providing more crystal current than the little CR-18 liked. I tried an FT-243 crystal and had the same results, except it took a little longer and didn't get so hot.

Not having any old crystals except my prewar, 160-meter ones, I decided I would follow Stancor's recommendations and experiment. I installed an octal in the extra tube socket hole and wired in a 6AG7 as an electron-coupled Pierce crystal oscillator, driving the 6L6 as a Class-C amplifier. I connected the key line to both the 6AG7 and 6L6 cathodes. Now, when I gave it a test I could even use a subminiature 3580-kHz color burst crystal with no chirp or heating. The output looked about the same, and I measured 12 watts on the Bird wattmeter. So, as many have said, the 6AG7 is a super tube to use for a crystal oscillator. 40-meter operation was about the same, except it devloped a watt or two less output. On 20 meters, the output was only 6 watts, but I had no trouble making contacts.

After the first two 20-meter contacts, I connected my 1949 homebrew electronic key. One of the unforeseen hazards of running a 1940 transmitter on CW is trying to explain in a few words what a Stancor 25B is. Most of my CW contacts went much longer than usual as a result. Even a few DXers stuck around long enough to find out. I used both the link output and the pi section output. The PI was very convenient to load a long-wire antenna. I think the 25B, even though it is 17 years older, would be right up there with the Heath DX-20 for being able to load almost anything. The 25B is certainly a more versatile transmitter than Heath's first transmitter, the AT-1, and if you compare it to the other early fifties novice transmitters such as the Ameco, Eldico, Johnson, Knight, or Meissner, other than the band-switching capabilities of some, the Stancor would rate right up there with the best. And, the 25B had that "make you want to try other circuits" that was lacking in the 1950s novice transmitters.

However, the new ham that could build a Heathkit or Ameco transmitter would be asking a lot of questions while trying to build the 25B due to the lack of information provided with the kit. Of course, when the new 1940 ham got his license, he had demonstrated to the FCC his knowledge of transmitters by drawing and explaining 12 different transmitter circuits. The 25B kit was built to draw upon that knowledge and give the kit buyer a vehicle for applying the knowledge.

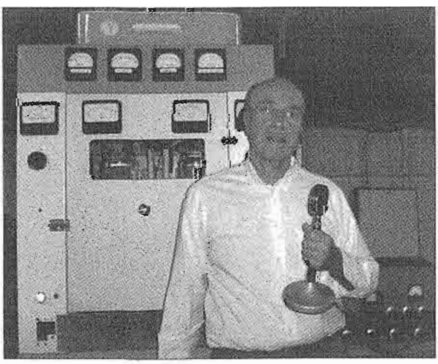
Some hams would call the 25B an example of the "dumbing down" of the present generation in amateur radio; however I think it is more likely the increasingly complex technology of communications, coupled with greater demands on the learning time of our new hams is the cause. Many new hams that are past the "growing up and raising kids phase" have shown a deep interest in learning about old radios and how they work. The success of Electric Radio Magazine is a good example of that interest. Even the staid leaders of the ARRL have added an "Old Radio" column to QST, written by one of those older newcomers that have discovered the joy of working on and using radios like the 25B. Next thing you know, QST will be running articles by Larsen E. Rapp, WIOU, again.

ER

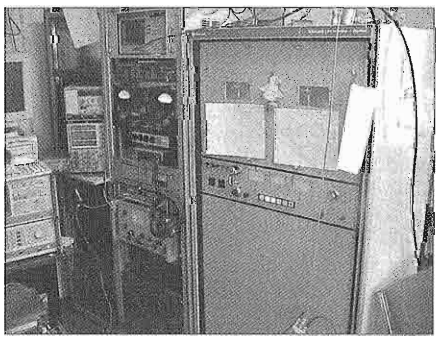
PHOTOS

Editor's Note: "Thank You" to everyone who has recently sent in photos, and please keep them coming so I can run the Photo column on a regular basis!

Greg Pietrucha (W7HRC) operated his station during the December 30, 2006, Heavy Metal Rally, and Greg mentions, "...Maybe my tube corner of the garage is not the "heaviest" or the "metalest" but sure was one of the "funnest" here in the Pacific Northwest, during a big old Heavy Metal Night roundtable on 3870kcs and a number of QSOs on 3880! I'm looking forward the next AM Event."



W2ZM



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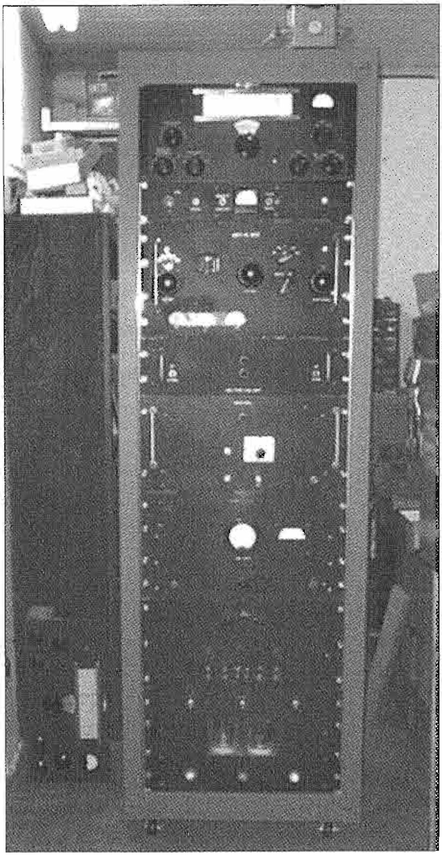
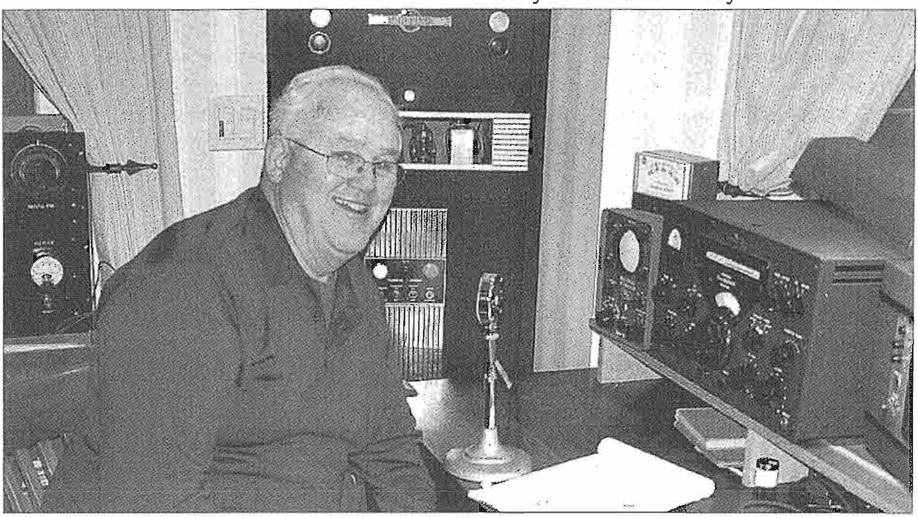


Page 24, bottom left: Bob Raide (W2ZM) was the winner of this year's Heavy Metal Rally. He is shown here with his Continental 314 rig, a.k.a. "The Bruiser." It was used was on 160 for the Heavy Metal Rally and the McMartin "Big Mac" was on 75. Both sets have been written up by Dave Kuraner (K2DK) a few months back.

Page 24, bottom right: Ted Hartston (WA8ULG) used his Collins 820D broadcast rig for the first time during Heavy Metal night. He used a synthsized exciter and an external audio chain, including an Eaton NM-17/27 field strength meter, as an AM receiver. Ted mentions, "...The 820D represents the last generation of broadcast radios using tubes, built from about 1975 to the early eighties. The 820D-2 only has 4 tubes, all 5-500s, two in the final and two push-pull modulators."

Page 25, top: Keith Ericson (KØKE) used a HB rig built by WØVIY (SK) in the 50s for Heavy Metal Night. 4-65As modulated by 838s, 300W out. It was restored by Keith and uses a Collins 310B exciter.

Below: Ken Scott (WØLJV) operated K6GLH during the Heavy Metal Rally. (Photo courtesy K6GLH) ER



The Restoration Corner

Please send in your short restoration topics so this column can run regularly!

Slug-tuned Inductor Failures

By Bill Pancake, WDØX

From time to time during boatanchor RF & IF circuit alignment, it seems inevitable that we run across a slug-tuned coil (an inductor) that has a stubborn powdered iron slug. You know, the type with a hex-key hole in it to allow adjustment up-and-down in the inductor form.

It may be just hard to turn or actually frozen in place. A "call for comments" on the Hallicrafters & Boatanchors Internet email reflectors produced many helpful tips & techniques to deal with a stubborn slug. A summary of that helpful advice follows.

It seems that the general opinion on why the powdered-iron slug is hard to turn, or impossible to turn, is that the thin wax coating that's inside the coil form is the most common problem. As the coil form and threaded slug ages, the wax hardens with ambient temperature changes. A tiny "burr" of wax on the slug threads can cause a lot of trouble.

If a slug is at all hard to turn, *but* you can still *smoothly & easily* back it out of the form, a light coating of silicone grease, talcum powder, or zinc stearite on the threads of the slug will usually keep it from locking up in the future. Unfortunately, backing out the slug and reinserting it usually means doing a realignment to that circuit. Counting the thread turns as you back out the slug might work for noncritical circuits in lieu of realignment.

Everyone seems to agree that *any* type of petroleum-based oil, solvent or cleaner (contact cleaner, DeOxit®, etc.) for lubricating the coil form or slug is definitely to be ***avoided*** as a few folks found out the hard way. It makes the problem worse, not better.

Some folks suggested applying heat to the slug core's hex-key hole with a pencil soldering iron if it is at the point where the slug ***will*** still turn and not yet completely frozen in place. A hair dryer or heat gun can heat it as well.

You'll have to "focus" the heat so as not to adversely effect other components nearby. If the slug is *very* hard to turn or *not* turning at all and you hear a slight "cracking" sound when attempting to turn it, and it is not just "sticking and/or jumping" inside the coil form, it has most likely just *broken* into one or more pieces, yet still seated in place in the coil form. That's what happened to mine. The aged slugs are extremely fragile. It takes almost nothing to break one. As you try to turn it further (either direction) the cracked pieces expand and "lock" themselves to the inside of the coil form. The harder you try to turn it, the more "locked-in-place" it becomes. At this point, it's not going to be your best day.

Drilling out the slug is about the only remedy to remove the broken pieces. Typically you'll have to remove the entire coil assembly form by *carefully* unsoldering the two thin coil wires and pressing on the two finger tabs that hold the coil form to the chassis. The drilling-out process is fairly straightforward, but *delicate*. Using a drill press with a bit that is slightly larger than the slug's hex key hole and drilling at a *slow* speed thorough about half of the slug length will cause the cracked slug to further fragment. At this point a metal dental pick or other slim, pointed tool can pick out the broken pieces. A new slug is usually obtained from salvaging one from a parts chassis.

Interestingly enough, one suggestion outlined using a bit of super glue on all the faces of a metal hex-key wrench. The wrench is inserted into the cracked slug. After letting it dry, the hex-key wrench was able to back all of the pieces of the cracked slug out of the form at the same time. The glue prevented the cracked pieces from expanding as the hex wrench is turned. Once removed, acetone (nail polish remover) is used to release the super glue from the hex wrench. Extreme care must be used when applying super glue. If any of it gets on the inside of the coil form itself, backing the slug out will be impossible.

The "best of all worlds" would, of course, be to just replace the defective slug-tuned inductor with a NOS unit or one salvaged from a similar parts radio. Unfortunately, from my experience, those parts are, more often than not, very hard to find.

Measuring Audio Distortion

By Jerry McCarty

Here is a method to measure audio distortion that doesn't require special equipment. Depending on how good your scope is, you may already have all that you need. Most dual-trace scopes have the ability to add the two vertical channels together. And, these same scopes have the ability to invert one of the channels. You connect the channel 1 scope input to the audio oscillator output. Connect the scope channel 2 input across the audio load. Connect it in such a manner that both signals are <u>in phase</u>. Set the scope attenuators so both signals show the same identical amplitude. Hit the "Ch. 2 Invert" button and the "Add" button. Anything that shows up on the scope is distortion. The slick thing about this method is you can see the distortion products. A run-of-the-mill harmonic distortion meter does nothing but filter out the original tone and then display whatever is left on a meter. If you have a high hum content, it will show up as high distortion, even though hum has nothing to do with distortion at all. You can see this on a scope. You can't see it on a distortion meter unless you also measure the residual hum and noise. If your scope is fairly well calibrated, you could even put some numbers to your result. In other words, the distortion products are so many dB below the signal.

[It might be a good idea to check and see that your scope's vertical channels have the same voltage gain and that your probes are compensated before relying on the display. By using identical X10 or X20 attenuator probes—the styles that have a compensation trimmer cap—each probe is adjusted individually to properly display the scope's calibrator waveform (a fast-rise square wave). You can use the caibrator to adjust the vertical gain of both vertical channels. Then, you know that probe compensation and vertical gain errors are not adding to the problem!...Ed.]

Boatanchor Power Connectors

By James Riff, K7SC

Many old boatanchors and some test equipment found on eBay or at hamfests would be a great asset to acquire except it may be missing one very important item –the power plug! Many hams may have vast collections of multi-pin plugs in their junk box, but as many of us have found out, they may not be exactly the correct pin-out needed. This could result in the loss of a desired piece of equipment that would have otherwise been purchased. Likewise it is a loosing proposition to try and sell a piece of equipment without the power connector. In order to try and satisfy both of these situations a resource for some of the most popular connectors is available. Many older radios used a Jones-type connector to either bring power to the chassis or for interstage connectors. The Jones plugs and sockets are still available under the familiar Cinch product line, now a division of TRW Inc. Their website (www.cinch.com) has all of their designs in a simple pictorial layout that is easy to use. Once you have identified the plug or socket that matches your needs, click on the part number and they bring up companies that have that item in stock. Then, by clicking on the email

RFQ of the company that stocks them, they reply with a quote. I was able to easily locate a 21-pin Jones socket from my 1950s Hallicrafters transceiver, and I had them in hand in a week.

73, Jim K7SC

Central Electronics 458 VFO

By Steve Hobensak, N8YE

I thought I'd pass along some information on a couple good improvements that I recently made to my Central Electronics 458 VFO. There is a nice power supply that will power the VFO instead of stealing power from the transmitter. It is the little antique radio power supply kit at Antique Electronic Supply, part number K-101A, and both the B+ and the 6-volt filament voltage are regulated. (Internet: http://www.tubesandmore.com/) With this power supply, you will be able to remove the big power-wasting resistor on the back and the regulator tube. You still must power the 12-volt filaments from the transmitter. I also made another mod that will make the VFO stable enough for PSK on 7070, USB. I had an old Collins PTO (permeability tuned oscillator) laying around unused. I simply phase-locked the second harmonic of the Collins oscillator to the 458 VFO. The Collins unit was from either a T-368 or T-195 transmitter with output 1.5 to 3 MHz. I found it at a hamfest several years ago. Perhaps other PTOs will work. I powered up the PTO using power supply K101A which also powers the 458 VFO at the same time. To couple the output of the PTO to the 450 VFO, use the "gimmick" capacitor method. Just hook a small insulated wire to the center of the BNC connector on the PTO, then wrap it around the RF output wire of the 1626 tube. Attach the shield to the 458 VFO chassis. You could install a BNC chassis mount connector to make a nice job. The coupling is on the order of just a few pf, but it was enough to achieve phase lock to the 458 VFO. An easy way to assure phase lock is to listen to the 458 VFO output with an auxiliary receiver. Tune up the transmitter to 7070. The 458 VFO should have a fundamental frequency somewhere near 5356 kHz. Turn on the Collins unit. Turn the shaft until its output is near 2678 kHz. The second harmonic will be near 5356. As you are listening, the two signals will seem to lock together as one when you are turning the PTO shaft. When phase-locked, you will notice an apparent backlash in the 458 VFO dial. The output is now being controlled by the more stable Collins unit. I think the R-390 PTO is still being sold at Fair Radio. Its output is from 2555 to 3555 kHz and it should work. It is probably possible to phase lock an old Collins PTO with other VFOs such as the VF-122, VF-1, HG-10 etc.

73, Steve, N8YE

Hammarlund Gray Paint

By Ray Osterwald, NØDMS

I recently needed some gray touch-up paint for a Hammarlund HQ-180A trim ring. I had some matching paint custom mixed at an ACE hardware store with excellent results.

I removed the cabinet and cleaned it with mild soap and water. I took the entire cabinet into the hardware store and had them scan the color. On the 3rd try, they got a color match and mixed up a pint for me. It is an *exact* match, and I can't see any difference between the new color and the original color in sunlight.

Here is the paint formula that was mixed in ACE #191A340 neutral base:

B 1Y12½
L 31
V 1
Kx 1Y3½

To this gray color, I added an additional 1 tsp. of ACE #225A108 "white gloss medium" and 1/8-cup of clean paint thinner, mixed in a clean 8-oz. can. This paint is slow to dry.

For large repairs, Tower Paint Co. will fill custom paint into a spray can. Their contact information is 1-800-779-6520,

922 Oregon Street
PO Box 2345
Oshkosh, WI 54903
www.towerpaint.com

ER

RADIOMAN SCOUT KURTZ REPORTING FOR DUTY!

By Cliff Kurtz, N6ZU
6727 N. Pershing Ave.
Stockton, CA 95207

This is Part 1 of a collection of short stories by Cliff Kurtz (N6ZU) about his experiences as a radioman during World WarII.

July 1941

It Was One Wild Ride!

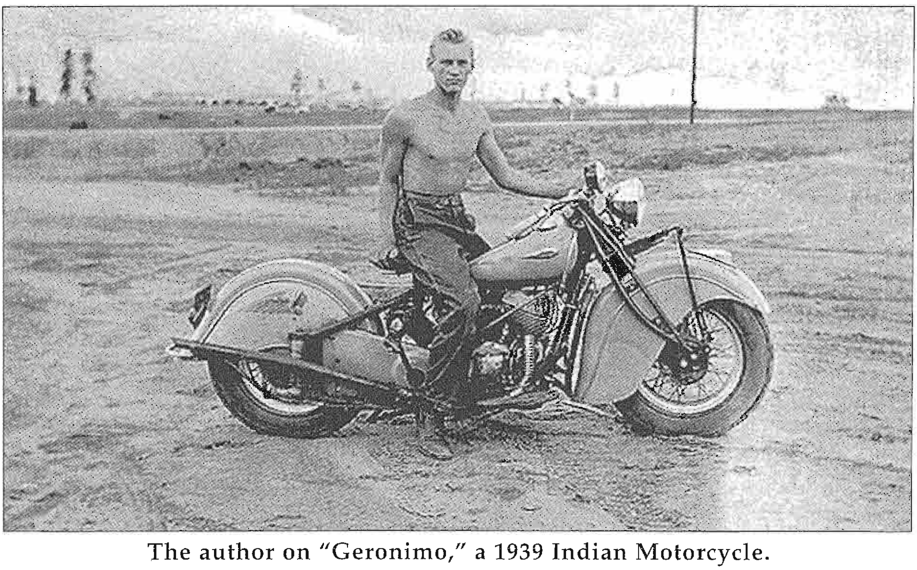
Being in communications can sometimes mean different things. Although I was a radio operator in an infantry regiment in the Army, sometimes we were called upon to do other things, sometimes dangerous things.

During the massive "Louisiana Maneuvers" in 1941, radio communications between moving vehicles were not too reliable, so motorcycle couriers were also used.

Owning my own bike, a 1939 Indian "Bonneville," made me eligible for that dangerous job. I say "dangerous" because at night we could not use any lights because this would give the enemy army information as to our location. This applied to all vehicles. (The Army bike was a Harley Davidson "74.")

Part of my responsibility was to carry messages from the front of a moving convoy to an officer in the rear, or vice-versa. One day we were on a very narrow, dusty road with a thirty-truck convoy which kicked up huge clouds of dust. With goggles pulled down, I started for the front of the column, hardly able to see or breathe, when I suddenly saw another convoy coming the other way! The only thing I could do was to hug my convoy with my right hand by hanging on to the truck next to me and steering with my left and saying lots of prayers that I would not be knocked off my bike and be mangled under dozens of wheels!

We continued like that for about half a mile, when suddenly the road turned to



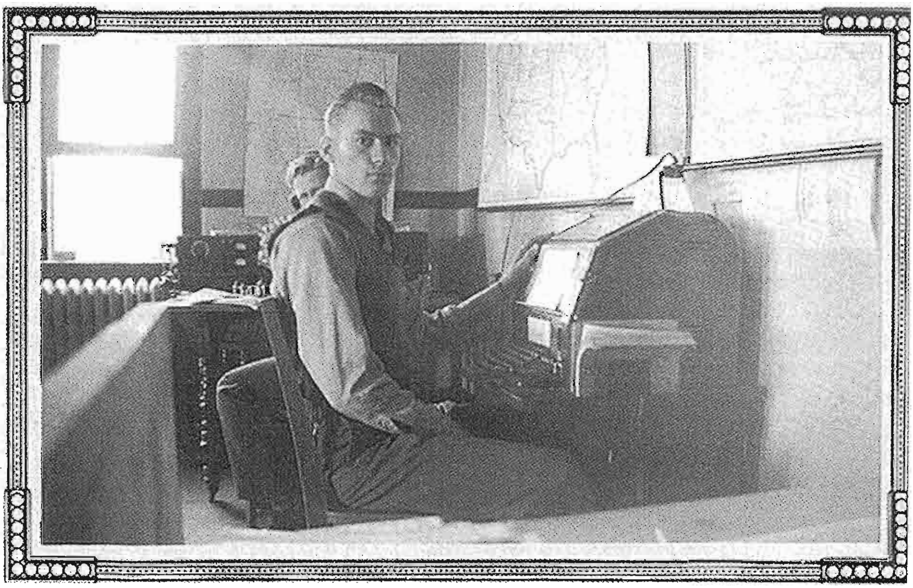
The author on "Geronimo," a 1939 Indian Motorcycle.

blacktop. At the intersection were three MPs sitting in their parked Jeep. I pulled over next to them to catch my breath and one of them said "Where the H— did you come from?" I told him. He handed me a cold bottle of Nehi orange crush soda. I can still taste it.

January 1942

She Said "Let Me See Your Gun"

While my infantry regiment was deployed in the northwestern states very early (January 1942), my job as a radio operator was temporarily changed to teletype operator. The regiment was guarding bridges and tunnels against possible sabotage after December 7. We were headquartered in a National Guard armory in a small city in southeast Washington.



Cliff Kurtz at the Model 15 teletype machine.

Our company had to provide its own Military Police, made necessary in part because of our arrival in town signaled the arrival of "ladies of the night." It seemed that some of our men were late in arriving back at the armory at the appointed hour of midnight, our curfew. MP duties were shared by various members of the company, including myself. We made the rounds of the bars in town to make sure there were no problems where our men were concerned. Shortly before midnight, we made the rounds of the "hot houses," of which there were about five.

One night, my partner and I had made the rounds of the bars while he had been accepting "short snorts" from most of the bartenders and was getting a little loose in the joints. When we got to the last "house" we relaxed and rested our tired feet by sitting on a couple of couches in the "reception room." I had stretched my long skinny legs well out into the room while Jerry sat on the other couch to my right. Several of the girls came out to chat, since they knew the MPs were untouchable.

The girl next to Jerry said "Let me see your gun." Maybe he misunderstood, but he pulled out his Colt 45 automatic. The girl recoiled and would not touch it. Jerry said "It's OK" and pulled back the hammer, aimed the weapon at the floor and pulled the trigger. BANG!! The thing fired, the slug entered the floor two inches from the heel of my right foot! In about two seconds all the girls had disappeared. Jerry, now shaking from head to foot, offered the gun to me and said "You take it." I removed the clip to make sure it was empty, then pulled the slide back to make sure there wasn't another round in the chamber and said "Let's get out of here!"

Being a radio operator can be hazardous to your health!

October 1942

"Fire in the Hole"

"Fire in the hole" has, for decades, meant that the plunger on the detonator was about to be pushed down and the charge would be ignited. I had been trained in demolition just a few months prior to the following event, so it had special meaning for me.

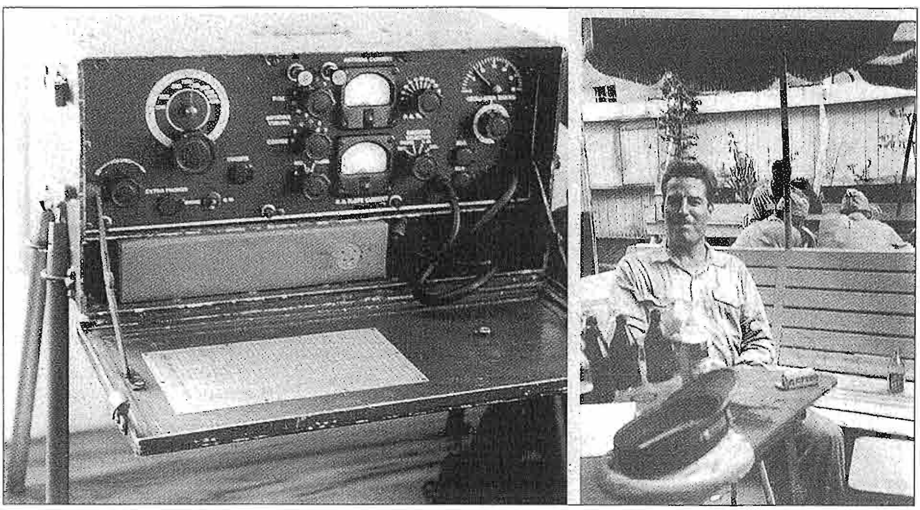
However, this incident had nothing to do with demolitions. Shortly after my regiment arrived on Guadalcanal (the first Army unit to do so), the radio section had dug in so we would not be so vulnerable. We were situated next to the fighter strip (poor location but the rent was cheap). We dug a hole three feet wide, four feet long and four feet deep to hold our radio, generator, and two operators. It was pretty snug but digging was not easy.

One night my partner and I were awaiting our relief crew when the air raid siren started to wail. The relief crew decided they too would occupy our small dugout! We were packed in like sardines.

After a while Al, one of the relief ops, decided to light a cigarette. The smoke, the heat, and the humidity in that small hole were too much. In a nice way I asked Al to "Please put that thing out." He said "I will when I'm ready." After another minute I asked him again to put it out; same response. In about three microseconds my temper went full forward and I lashed out at the burning cigarette (it was very dark in the hole) and I knocked the butt out of his hand. The redheaded Irishman also had a temper and started swinging his fists at me but not landing.

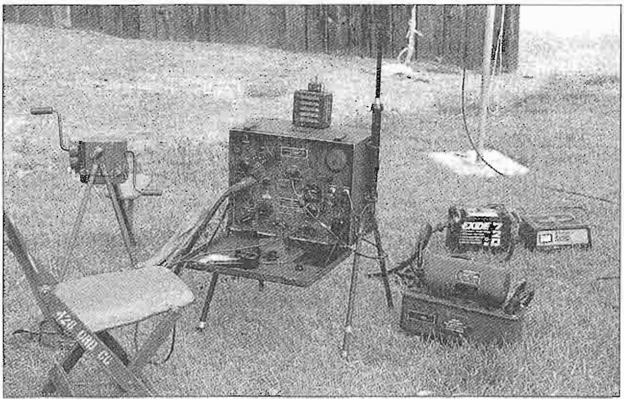
In the meantime the cigarette was bouncing from lap to lap causing all sorts of sounds to be made! It finally landed on the ground and someone stomped on it. By now the flailing fists had stopped and it got rather quiet and tempers cooled down. But wait, there's more to the story!

Al and I remained good friends and after we returned to civilian life, he became a radio operator on merchant ships,



The BC-474 used in the hole, and Al.

and I to a job with IBM in Chicago. We corresponded frequently. One Sunday I had written a letter to him and dropped it into a mail box near my apartment. On my way back I picked up a Chicago Tribune. As I read it and got to the last page I saw a picture of the ship Al had been on. It broke up in a big strong storm off the coast of Alaska, all hands were lost. But, there's more!



The SCR-284 with a PE-103 dynamotor and the hand generator.

I was transferred to Stockton, California in 1954. That was Al's hometown! Now in about 1960 I was having lunch at Denny's when a man came in and sat next to me. I almost fell off my stool! He was a dead ringer for Al! I asked "Is your name Shire?" He looked at me and said "Yes." "You had a brother named Al?" "He was my twin" he replied. Small world.

November 1942

"Simple"

When in jungles in the south Pacific, troops faced many conditions that were foreign to them, in spite of training which took place in other locations. Guadalcanal was such a place. Heat and high humidity, and lots of rain (to say nothing of mosquitoes and other pests) were the main problems. We were close to the equator so conditions prevailed year-round.

Radio operators were sometimes faced with serious problems that had simple solutions. Most of the equipment we used very early on in WWII had surprisingly not been well "field tested." In the jungles of the South Pacific Islands there were conditions not anticipated in the development labs at Monmouth or anywhere else for that matter.

One of the problems was fungus growth on all wiring and solder connections. This was pretty well taken care of later in the war, but we are talking 1942 here. One of our transmitters had blown a fuse when it was turned on in the morning. It had happened several times. When turned on late in the day, it didn't seem to happen. It turned out that the dynamotor was the problem. Actually, not the dynamotor itself, but its "packaging." It was mounted in a "waterproof" metal case with a rubber gasket around the top edge to make it so.

What had happened was condensation would gather in the bottom of this pan and would cause a short when power was applied. While the big thinkers were trying to figure out how to cure this problem, a "lil ole" private from one of the southern states walked up and said "Simple, jes drill some holes in da bottom."

That is just what they did, they "jes drilled some holes in da bottom!" Problem solved. Somebody said, "Why didn't I think of that?"

October 1942

"Why Didn't You Call Us?"

Patrols into enemy territory are always very risky and stressful. Our infantry regiment had formed a recon platoon consisting of twenty enlisted men and one officer. Two of us were radio operators, the rest were riflemen and map-andcompass experts. We went out, only five men at a time, because larger groups were always detected and shot up. Stealth was the answer, not being combative.

My gear consisted of a Thompson machine gun, five drums of ammo, plus four 20-round clips. This baby could go through a lot of lead in a big hurry! (700 per minute.) Still I had no intention of using it unless we had to fight. To make things even heavier, I packed a "portable radio" powered by a 45-volt battery plus a 1.5-volt battery. It had two very old type tubes and was a transceiver! This had to be a first! It also sported an 8-foot shiny aluminum collapsible antenna that could easily be seen from a block away against a green background. Just what a stealth operation needed! (Remember, this was very early in the war and many things still needed to be improved on.)

Going through the jungle with all that gear hanging on was not easy. To add to our gear we had an infrared signaling lamp that was very directional and could only be seen when looking through special goggles.

Well, so how did it go, you ask? The jungle soaked up all the RF this crazy QRP rig put out. Even from a ridge with no foliage I could not raise base camp. So we tried the lamp. No luck either. After all, we needed line-of-sight here and we could not achieve that either.

Was the patrol a failure? We found no trace of the enemy in any number. Nor did we find any piles of supplies and the like. I guess in that respect it was a success. After twenty four hours we made our way back across the barbed wire without getting blasted to pieces by our own troops. That was always a worry. (After all, our radio was not very effective.)

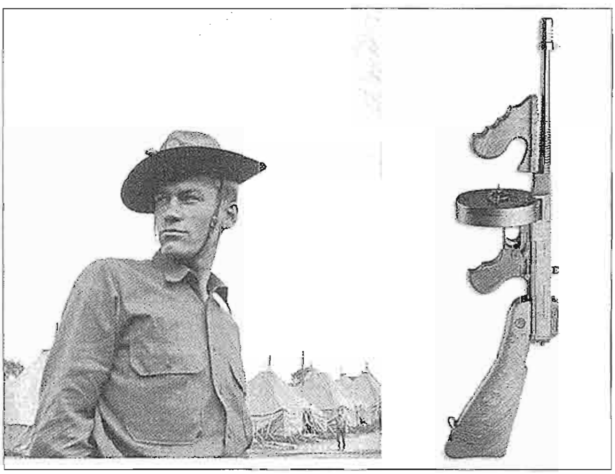
When we were being debriefed, the first thing I they asked was "Why didn't you call us? @#$%^&!!!"

November 1942

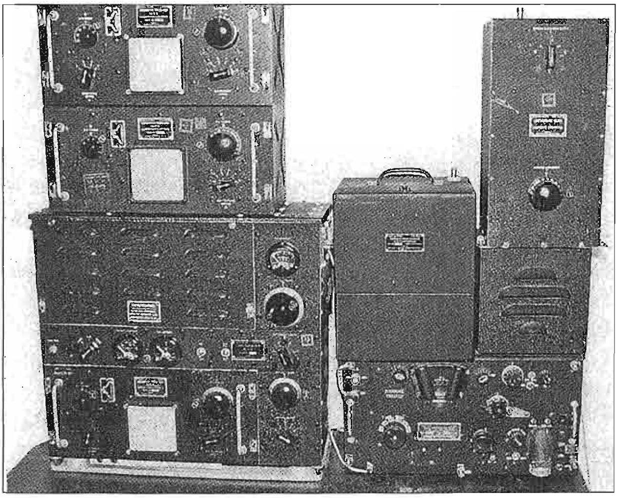
Pete Said "This is not a safe place!"

This battle on Guadalcanal raged on for 28 days. It was called the Matanicau named after the river that bordered it. My radio car was parked within 40 feet or so of an ammunition dump about 12 by 30 feet in size and about 5 feet high. It supplied our regiment with rifle ammo plus grenades and mortar shells. It was a pretty lethal pile of hardware. (Parking spaces and parking lots did not exist in the jungle, we parked where we could!)

One day I was on duty on the radio (a BC-191 transmitter and a BC-312 receiver and other items). This was installed behind the front seat of a "command car" with a long whip antenna mounted at the rear of the car. I sat up front, rereading a letter I had received at the last mail call several days ago. **BLAM!!** A mortar shell landed about 100 feet from me and the ammo dump. I did a half-roll out of my seat and plunged into the fox hole dug beside the car. I bruised my shoulder but was otherwise unhurt. I expected several more rounds, but none came. Just a stray shot, most



The Author — Scout Radioman and His Tommy Gun



Here are the radios that were used in the command car.

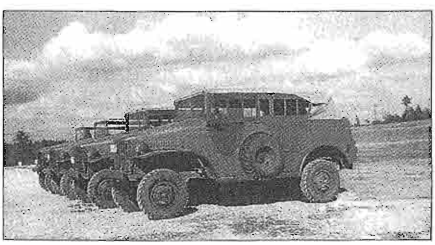
own kind of troubles. We often had the top down, convertible style, and when air raids were sounded we made sure the windshield was in the vertical position so glass would not reflect the sun's rays and give away our position. This particular day it was in the down, or horizontal position, to reduce the chance it would be struck by flying "whatever" (whatever could hurt you real bad!).

The air raid siren was sounded and I decided not to put the windshield up, likely. Perhaps the enemy did not know the ammo pile was there!

Late in the afternoon my good buddy "Pete," also a radio operator, came by and wanted me to join him in his foxhole area up against a hill. He said "This is not a safe place." We discussed it for a couple of minutes and he convinced me to move. We started for his place, and had gone about a city block in that direction when an artillery shell hit the top of a tree about 50 yards ahead of us and killed one of our men. That is just about where we would have been had we not spent perhaps a couple of minutes discussing where there was a "safe place!" We went back to my fox hole. That seemed like it was as least as safe as Pete's.

The Sting

This command car seemed to draw its



Vehicle Type Used for the Command Car

but simply run the front of the car into some brush. That was fine. However, when I went back to get the car, I noticed a LOT of yellow hornets had gathered under the windshield. There were more gathering even as I watched. I knew the car had to be moved. I put on my rubberized raincoat, which probably gave some pretty good protection, and my steel helmet, which was guaranteed by the US Government to protect against *whatever!*

I very carefully slipped the key into the ignition to start the engine when all hell broke loose. The hornets swarmed and flew all over the place the minute the ignition made a "click." One hornet stuck my left upper eyelid three times. Talk about pain! The eye case completely swollen shut within ten minutes and remained that way for about five days. Radio operators were sometimes treated with very little dignity. The guys called me "one-eyed Jack" – I couldn't see a thing with that eye! To make matters worse, I got no pity and no respect, ala Rodney Dangerfield.

To Be Continued...

ER

The Hallicrafters SX-117 Receiver, Part 2

By Ray Osterwald, NØDMS
PO Box 242
Bailey, CO 80421

The SX-117 can hardly be considered a boatanchor in the traditional sense of the word. Weighing just 18 pounds and consuming only 70 watts, it signaled Hallicrafters' change away from heavier and larger equipment which, until then, was thought to represent solid and stable communications equipment. It has advanced circuit design in many areas, and also has some designed-in problems.

This receiver has some operating features that can take a little time to get used to, and that some users find irritating. For example, it has small 1-¾ X ¾-inch windows around the tuning dial and S-meter. Unless you are peering directly into the tuning window, parallax can make it difficult to accurately read the dial calibrations. The window material is plastic, not glass as in earlier Hallicrafters receivers. The preselector tuning scale is marked in meters, but the band switch is marked in frequency! There is no front-panel standby function, and the AGC is always on; you can't shut it off or intentionally change the time constant. The notch tuning control doesn't really turn the notch "off" as the dial indicates, but the notch merely moves to the lower edge of the IF passband. The IF-derived noise limiter can only be turned on or off, and there is no depth adjustment as is common in audio limiters. When using headphones, there is a lot of 60-cycle residual hum present because of the power supply design.

When I acquired this receiver, it was basically clean and functional and still had 9 original Hallicrafters-labeled tubes. There were a few problems noted. The S-meter zero pot was very noisy and difficult to set. The notch filter was completely ineffective. The S-meter was nearly dead and hardly ever moved from the zero mark, and strong signals on any band caused a lot of audio distortion. The AGC didn't seem to be working at all, the BFO would not zero, and the WWV band did not always work. Without touching the main tuning knob, changing the IF bandwidth made signals disappear, indicating the need for a good IF alignment. The audio and RF gain controls were noisy, as is usual for old equipment. It was not very sensitive, having a CW minimum discernible signal (MDS) of about -90 dBm, or about 7 microvolts.

Normally, when I restore a receiver the tuning system is disassembled and everything gets cleaned, inspected, and lubricated. This receiver was in good condition to begin with and did not need the standard treatment. Tuning was smooth, without backlash. All I did was flush clean the wipers on the tuning condenser with DeOxit®. The bearings in the tuning system were lubricated with light synthetic oil. The 16-gauge aluminum chassis was just dusty, having no corrosion or unauthorized holes. It needed only a wipe with a damp cloth to start gleaming again. The power transformer paint was still shiny black. The tube socket receptacles were cleaned with DeOxit® and a small bristle brush in the usual manner. The potentiometers were just dirty and fortunately not worn out. They responded well to LPS® spray contact cleaner.

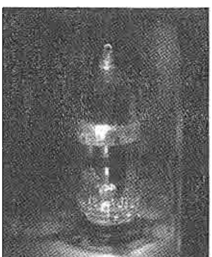
Electronically, the chassis is uncrowded and the components are easy to get at. I found 12 out-of-tolerance carbon resistors, which were replaced. Nearly all of the capacitors in this model are disk ceramic types, which are very reliable. There are a few paper capacitors that Hallicrafters used in the bandwidth-determining circuits, and elsewhere. They are very high quality, made by General Instrument, and none of them showed any current leakage. I left them alone. The power supply electrolytic capacitor had current leakage within tolerance for its capacity and voltage rating. It turns out that nearly all of the performance problems I noted were caused by defective tubes, dirty controls, and poor alignment. For example, the AGC and S-meter problems were caused by a gassy 6DC6 RF amplifier. Gas in a tube will cause grid current to flow, and in this case a positive bias was induced on the AGC line.

The intermittent WWV band was caused by oxidation on the crystal socket recepticles for that band. Oxidation kept the oscillator from starting at times.

The cabinet was in nice condition. It was not bent or dented, and only had some light scratches on one side. These late-model Hallicrafters units have a textured gray paint finish, and I don't have the artistic ability to duplicate the original methods. I am planning to have the cabinet color scanned at Ace Hardware, and they will mix a pint of matching enamel color for me. I'll touch up the scratches with a fine-pointed brush.

RF Preselector

The first stage in the receiver is a well-designed IF trap that is used to reduce feed-through interference of signal voltage in the 6-Mc shortwave range. This is important because the first IF is 6 to 6.5 Mc! The trap consists of L1A and L1B, separate coils wound on a common 5/16-inch cardboard form with iron tuning slugs. L1A is a close-wound, single-layer coil, parallel-tuned with C1, and is in series with the signal path. It acts to block passage of 6-Mc energy. L1B is a pi-wound coil, and is a series-tuned circuit via C2 that makes a low-impedance path to ground for 6-Mc voltage that gets past L1A. It is necessary to exactly follow the alignment instructions in the Hallicrafters manual to align these coils. The 1st-IF rejection in the SX-117 is at least 107 dB when properly aligned, and the receiver needs all the 6-Mc rejection it can get because signals in the 49-meter shortwave band are quite strong.



Low-frequency signals below 3 Mc are switched around the preselector when the band switch is in the "LF" position and are coupled into the first mixer grid. The 1st-mixer is a low-noise triode design, and it adds insignificant noise to signals below 3 Mc. It is necessary to use fairly efficient LF antennas, or an external preamp when listening to the LF bands. The HA-10 low-frequency tuning accessory has no gain; it only has tuned circuits in a box.

The actual RF preselector (amplifier) stage is used from 3 to 30 Mc. It consists of the grid coils (L3 and L5), the 6DC6 amplifier tube, the plate coils (L6 and L8), and the 2-section preselector tuning condenser. The primary of L5 is the antenna winding. The secondary of L5 and the secondary of the L6 plate coils are tuned by the preselector control and fixed padders. Bandswitch sections S1A and S1B successively switch tapped portions of L3 in parallel with the L5 winding, and L7 in parallel with the L6 winding. As the coil sections are added in parallel, the total inductance goes down, and the tuned frequency goes up. The problem with this design is that the RF resistance in the coils goes up as tuned frequency increases (because there is more wire), and there is a limit to the amount of "Q" that can be obtained above the 40-meter band. I feel that this stage is the biggest weakness in the SX-117 design, and it was probably done this way to save costs.

When properly aligned, the 6-dB bandwidths are: <u>80M</u>, 77 kc; <u>40M</u>, 140 kc; <u>20M</u>, 750 kc; <u>15M</u>, 1 Mc; and <u>10M</u>, 1.2 Mc. Its 80-meter performance is reasonable, but is inferior above 40 meters.

The RF alignment procedure in the book is difficult to follow because you are instructed to obtain 9.5 and 18-Mc crystals for use in the auxiliary crystal oscillator. The reason for using these two specific alignment frequencies is to avoid making a double-peaked response in the preselector tuning. These crystals are getting expensive and difficult to find, but I have developed an alternative alignment that works just as well. You will still need an accurate signal generator that can be AM modulated. (If you have these crystals, there is no change in the alignment procedure.)

Terminate the antenna terminals with a 47-ohm carbon resistor. Remove all crystals from the auxiliary crystal oscillator, and connect your signal generator to the rear-panel "Xtal Osc Out" RCA jack. Leave the front panel "Xtal Selector" switch set to anything but the "Normal" position. What you will be doing is using your signal generator to replace the two crystal frequencies that are called for in the alignment procedure. The 100-kc markers from the crystal calibrator will provide the RF signals necessary to do the alignment. The markers will work, unless your SX-117 is missing the calibrator or the preselector has been damaged or tampered with. In case the calibrator is missing, you can use any other receiver that has a 100-kc calibrator; just couple the antenna terminals back-to-back with a .001-µF capacitor.

In Step 1 of Hallicrafters' instructions, set your signal generator to 9.5 Mc and modulate it with a 1-kc tone. Don't worry about an impedance mismatch because in this application a known generator level is not important. Where the book mentions "set generator frequency to 3 Mc," this signal will now be provided by calibrator harmonics, so be sure the calibrator works and is turned on. Set the generator RF level to about 700 microvolts and move the SX-117 main tuning dial slightly until you hear the 1-kc tone. Use an output AC voltmeter across the speaker terminals as an alignment indicator. Tune for maximum voltage with the adjustments, L5 and L6, as explained in the book.

In Step 2, set your modulated signal generator to 11.5 Mc and again, follow the directions. They are accurate and easy. You will need to remove the receiver from its cabinet to gain access to trimmers C3B and C3D.

My preselector had obviously not been aligned in many years, and when I finished I could hear low-level signals that were not audible before. I measured 24 dB of increased sensitivity.

Another factor affecting sensitivity is V1, the RF amplifier. RCA 6DC6s have lower gain, and a more remote cutoff characteristic, so they respond better to AGC control voltage. I prefer them. Sylvania and ECG/Phillips 6DC6s have higher gain and a sharper cutoff, which can be useful in weak-signal work.

HF Crystal Oscillator

In a classic design original to the Collins 75A receiver, incoming signals hetrodyne into a tunable IF range by the use of V3, a 12AT7 HF crystal oscillator and a mixer. The oscillator uses a Butler series-mode, cathode-coupled design, noted for high stability, low noise, and ease of use on harmonic frequencies. The same Butler circuit was used in the Collins 75A-4 receiver and in the SX-115 with excellent results. In the SX-117, Hallicrafters increased the Butler oscillator's basic stability with a unity-gain buffer amplifier (V2B) to isolate the oscillator from load changes. Load isolation also provides some amplitude stability in the oscillator, improving mixer performance. (The SX-115 didn't use a buffer stage.) The HF crystal oscillator does not use any voltage regulation on the oscillator plate, but due to the buffer stage and the best possible component selection, drift in this stage is difficult to find.

My receiver did not need a crystal oscillator alignment, but the instructions are conventional and should be accurate and easy to use.

The SX-117 features a 5-position "Xtal Selector" switch that also controls an optional 6EA8 crystal oscillator. Crystals could be obtained for general coverage reception between 85 kc and 30 Mc. With the cost and availability of low-frequency crystals in 2007 being a problem, there are probably better ways to get general coverage these days.

First Mixer

Following the lead provided by the Collins Radio Company 12 years earlier in their R-390 design, Hallicrafters chose to use a semi-triode first mixer at V2A in the SX-117.

Triode mixers are noted for low noise and fairly high dynamic range if biased properly. V2A is biased nearly the same as in the Collins S-line receivers, with the exception of a 470-ohm resistor between the screen and plate terminals of the 6EA8 pentode section in the SX-117. There is no RF voltage divider at the input gid, as Collins used. The voltage divider increases mixer dynamic range.

6 to 6.5 Mc Tuneable IF Stage

V4 is the 6BA6 6-Mc IF stage. T1 is a shield can containing the first mixer plate circuit. T2 is a shielded, tuned coil that is the plate circuit for V4. Both T1 and T2 are gang-tuned by two sections of the 3-section main tuning capacitor, C15, providing a tuneable IF stage. The passband of this stage is sharply peaked, 88-kc wide at 6dB down, across the entire 500-kc IF when properly aligned. This selectivity provides the low noise response and image rejection that this stage needs for high performance. The factory alignment instructions tend to produce a double-peaked response. A swept alignment of T1 and T2 will produce a sharply-tuned passband, but not everyone has such equipment. If you take your time and do the alignment carefully per the book several times, the results will be reasonable.

The VFO and 2nd Mixer

The VFO in the SX-117 is a superb example of a stable, free-running HF os-

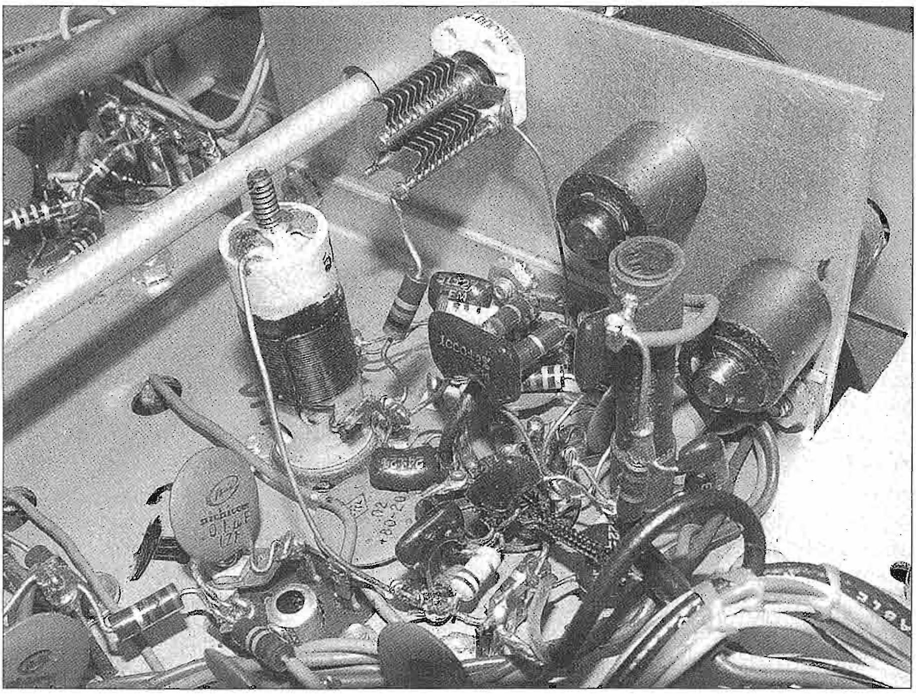


Figure 1: The VFO electronics are securely mounted on a thick aluminum subchassis. The large ceramic form near the left center is L16, the slug-tuned VFO tank coil.

cillator that was mass produced. From a cold start, it drifts up 38 cycles in 5 minutes. Over 15 minutes, it drifts down 94 cycles. The longer it's on the more stable it becomes, and after an hour it will slowly start drifting back to the cold-start frequency, and aftar a 1-½ hour warmup the VFO is 17 cycles low. Over another hour it is 13 cycles low.

This stability is caused by the VFO circuit design and careful mechanical constructon. The VFO tube, a 6EA8 pentode section, the VFO cathode follower (triode 6EA8 section), and all of the associated electronics are built on a sturdy 13-gauge aluminum plate, bolted separately to the main chassis. Also on this plate are V4, the 6 Mc IF amplifier tube, and T1 and T2, the transformers for the 1st variable IF. By mounting these stages on a common, rigid platform, vibration and microphonics are nearly eliminated. Any twisting or vibration on the main chassis will cause the VFO/buffer/1st-IF to move as one unit. See **Figure 1**.

The VFO circuit is a series-resonant, electron-coupled Clapp oscillator that tunes 500 kc, from 4350 to 4851 kc. In the early 1960s, the Clapp was a fairly new circuit, and was designed specifically for high stability with respect to tube variations. Without going into great detail about it, basically capacitors C41 and C42 are included in the current path for the series-resonant condition. There is a large RF voltage drop across them that helps maintain oscillation. In the Clapp circuit, the larger in capacity these two capacitors become, the lower the coupling between the oscillator tank circuit and the tube becomes. This isolates the oscillator tank from anything going on in the tube which might cause frequency chages. Electron coupling of the output by L18 just about eliminates the possibility of external changes causing changes in oscillator frequency. If that was not enough, Hallicrafters also used a buffer amplifier, V6B, to completely isolate the VFO from the rest of receiver. There is only one N-750 temperature-compensating ceramic capacitor across the main-tuning condenser, and no voltage regulation of any type is used! There is 140 VDC on the VFO plate, which further increases stability. L16, the VFO tank coil, is an air-cooled ceramic form, 9/16" in diameter, mounted vertically on the thick VFO plate. It is similar to the VFO coils in the SX-101A and SX-115. The coil turns are cemented in place, and it uses an iron slug for alignment. I have read elsewhere that iron tuning slugs make the inductance adjustments unstable, but I don't believe it.

Another 13-gauge plate is bolted vertically to a bend in the front of the plate holding the VFO electronics. Staked to this plate are two stout brass journals that carry the main tuning shaft and a shaft for a double-pinch roller. The main tuning condenser carries a split gear on its tuning shaft. This meshes with a larger fixed gear that's staked onto the circular brass plate that has the dial-scale calibrations painted on it. The double pinch roller accepts motion from the tuning shaft and transmitts it to the dial scale, which moves the tuning condenser. Mechanically, this is a simple, rigid, backlash-free tuning system that is an integral part of the VFO electronics.

One more unusual feature of the VFO is its ability to be crystal-locked on specific frequencies. Mounted on top of the VFO plate is a ceramic crystal socket. If a crystal of the proper type is inserted, the VFO becomes a crystal-locked oscillator and will make the receiver stay on a specific frequency within a few parts per million. The VFO tuning system can be used as a variable crystal oscillator to move the locked frequency within a certain range.

The tuning dial on my receiver is accurate to 1 kc, and the VFO did not require any re-calibration.

2nd Mixer and 1650 kc IF

V5, a conventional 6BE6 pentagrid mixer, and V7, an AGC-controlled 6DC6 IF amplifier stage and the associated IF transformers make up the 1650-kc IF

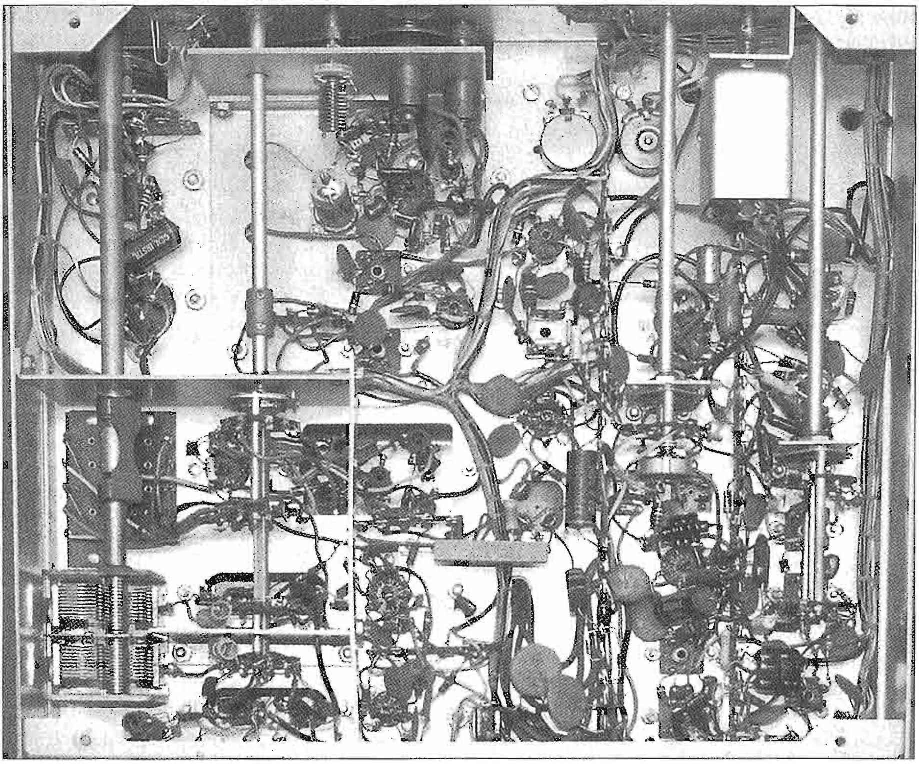


Figure 2: A view underneath the SX-117 chassis shows the preselector tuning condenser and bandswitch in the box at the lower left. The bandwidth switch is attached to the long rod a the right side, and the BFO coil is in the can at the top right. In contrast to so many vintage receivers, component layout is not at all crowded and the circuitry is easy to work on.

stage. The circuitry is conventional, and alignment was covered in ER #199. The S-meter reads the cathode current of the V7 IF amplifier. Although R19 is labeled "factory gain," when it is adjusted per the alignment instructions for a meter reading of S9 on the 20-meter band, this will equal a 50-µv RF input signal and the receiver will have the prescribed amount of IF gain. R19 interacts with R21, the "meter zero," so be sure both pots have been cleaned, and do both adjustments several times because they interact.

3rd Mixer

This stage uses another 6EA8 at V8A and V8B. The pentode section is the mixer, and the triode section is a conventional Colpitts crystal oscillator. The oscillator's output is taken from the cathode for increased stability and because the mixer section has the oscillator injection at the cathode, a low-impedance point. Cathode oscillator injection also reduces oscillator noise somewhat.

When the function switch is in the AM position, a 1700-kc crystal is selected, and the product detector, V11, is turned off. When the function switch is in the USB position, V11 turns on, the 1700-kc crystal is still selected, and the AGC decay time increases to nearly 1 second because R83 and C107 are switched in parallel with existing AGC R-C components. In the LSB position, the 1600-kc crystal is used to select that sideband.

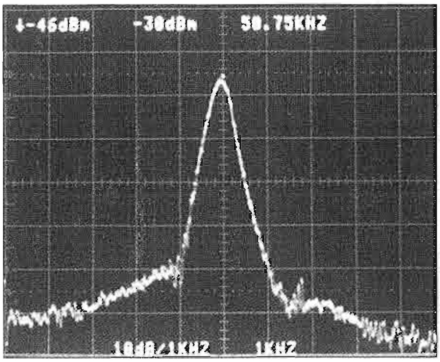


Figure 3: Swept IF response in the CW position is 500 cycles wide at 6dB down. (Vertical scale is 10 dB per division in all photos.)

AGC decay time is the same in both sideband positions.

The 50.75-kc, 3rd-IF stage is nearly identical to the same stage in the SX-115 and is based on Hallicrafters' selectible sideband system that I described in ER #196. The SX-117 does not have selectible AM sidebands as does the SX-115 and SX-101A

The schematic in my manual has an error where it shows the components associated with the selectivity switch. The positions of C108-C109, and C110-C111 are reversed! I have no idea if later schematics corrected this error, but be aware of it if you need to work on these parts.

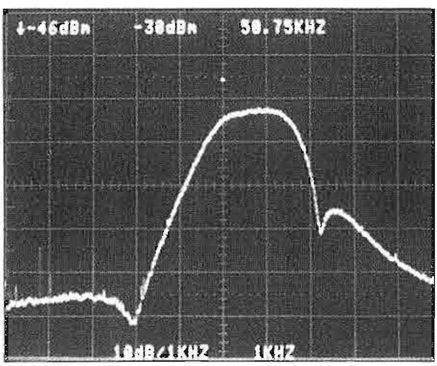


Figure 4: IF response in either LSB or USB positions is 1.9 kc wide at 6 dB down. The notch filter is on the high side in this photo.

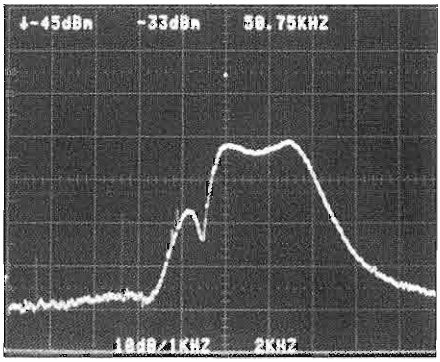


Figure 5: The AM response is 4.2-kc wide at 2-dB down (2-kc/horiz. div). The notch response is at the left, distorting the AM passband.

The 50.75 IF alignment can be made much easier by following the revised Hallicrafters service bulletin procedure that I described in ER #199.

The ideal way to align any low-frequency IF stage is with a sweep generator and an oscilloscope because you can see what you are doing while you are doing it. An excellent homebrew sweep setup was described by Jim Hanlon (W8KGI) in ER #177.

If a sweep setup is used, the slug in T4 affects the passband flattness in the 2.5 and 5-kc bandwidth positions but has almost no effect at 500 cycles. The other transformers affect center frequencies and skirt steepness.

Although the selectivity switch says the SX-117 has a 5-kc bandwidth, in reality it has slightly over 4 kc at -6dB, see **Figure 5**. While not sounding as good as a receiver that was designed specifically for AM phone, it still sounds OK to me. All the fundamental voice frequencies are present, but what's missing are the harmonics that make voice sound natural. It is possible to make the AM position wider with a sweep setup, but the amplitude of the other two bandwidths will be greatly changed, and all three positions with have much different center frequencies.

Figures 3, 4, and 5 show the passband shapes that result when the 50.75-kc IF is

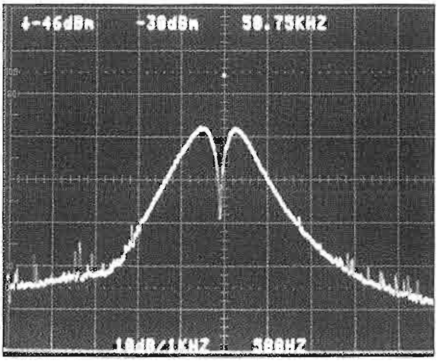


Figure 6: The stock SX-117 notch depth is only 22 db down from the peak.

aligned per ER #199.

An IF-derived noise limiter is used and it has fairly good action. Because it's in the IF, its main purpose is to keep noise pulses from reducing receiver gain by triggering the AGC circuit. The noise limiter diodes have no cross reference to modern part numbers.

Notch Filter

A variable notch filter follows the first stage of selectivity established by transformers T5 and T6. This notch filter is identical to the filter in the SX-115 and is very similar to the SX-101A circuit. In the '101A, a switch was provided that was ganged with the front-panel "Notch Depth" control so that the notch could be bypassed when "off." In the SX-115 and SX-117 there is no switch, but the notch merely moves to the low side of the IF passband. This was probably done for economy, but it produces distortion in the AM bandwitdh, see **Figure 5**.

Although the SX-117 50.75-kc IF design is identical to the SX-115, the notch does not work as well. Maybe this is due to an unfortunate arrangement of parts, I'm not sure. All the components in my receiver checked out OK, yet no combination of adjustments would produce a notch depth greater than 22 db, see **Figure 6**.

This problem is caused by too much resistance in the shunt branch of the notch circuit. It can be fixed by replacing R54 with a 6.8-k, metal-film resistor. This change allows R55, the notch depth adjustment, to be centered in its range while producing a more normal 46 dB notch depth.

Perform all the 50.75-kc IF transformer alignment procedures before doing the notch depth adjustment. This is because there is interaction between the notch depth and the adjustment of transformers T5 to T8.

When adjusting the notch depth pot, don't use a strong signal as the book recommends. Instead, use a weak signal from the calibrator by detuning the preselector until an S3 or S4 level is reached on the meter. Go to one of the sideband positions to produce a beat note, and alternately adjust "Notch Freq." and R55 for a null on an AC voltmeter across the

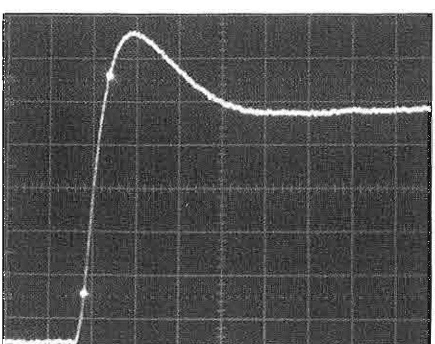


Figure 7: The stock AGC response has a long rise time and excessive overshoot on the leading edge.

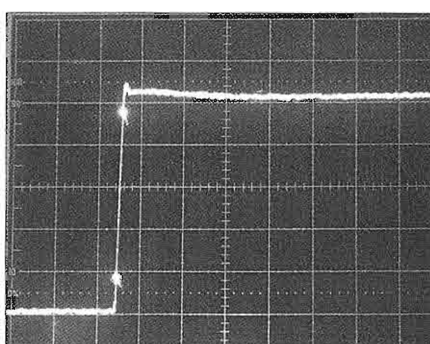


Figure 8: The modified AGC system has a fast-rise characteristic and a minor amount of overshoot.

speaker terminals. The notch frequency control should be centered near "51" on the scale when you are done.

When using the receiver in the AM position, fidelity will be improved by leaving the notch fully CCW.

AGC

The SX-117 uses amplified AGC on the RF amplifier, V1, and on one 2nd-IF stage, V7. In the stock configuration, the AGC system has a long AGC attack time and excessive overshoot on the leading edge that causes problems with popping and snaping in the presense of strong signals, see **Figure 7**.

V10A is the AGC amplifier tube. It is a broadband, untuned, RC-coupled voltage amplifier. This stage is deceptively simple when you read the schematic, but it's actually a very careful, smart design choice. Known as a video amplifier, the untuned plate circuit avoids the phase shift normally seen in a tuned plate circuit and the resulting decrease in amplifier rise time. Careful selection of the plate load resistor (R22) value and cathode bypass capacitor value have produced an amplifier with the right amount of gain and the shortest possible risetime without overshoot.

Unfortunately, this careful attention to detail did not carry over into the rest of the AGC system design. In Figure 7, the AGC attack-time waveform at the AGC bus side of R1, the RF amplifier AGC decoupling resistor, is shown. In this photo, the attack time is nearly 1 second, and there is almost 1 volt of overshoot that lasts for 14 mS. The AGC can't react quick enough to prevent a strong signal from causing distortion somewhere else in the signal chain.

The receiver uses a positive delay bias voltage on the cathode of V10B, the AGC detector. This is provided by a voltage divider across the B+ line through R63 and R64. The voltage chart in the manual claims there should be +24 VDC on the cathode pin. This is an error. If there were 24 volts at that point, the AGC would be completely turned off.

The actual delay bias in the stock receiver is 4.9 VDC. This bias prevents the AGC from acting until the input RF signal rises above 11 microvolts, which is really a very strong signal on the bands.

Two simple modifications will completely cure the AGC problems in this receiver. First, replace R64 with a 20-Megohm, ½-watt, metal-film resistor. This will produce a delay bias of 1.5 VDC, which means that the negative AGC bias voltage will not start rising until the input signal exceeds 2µv. This is a typical AGC delay in many good receivers.

Secondly, place a 1N914 switching diode across R1, with its cathode pointing away from the V1 grid. This will considerably speed up AGC attack time.

Now the SX-117 has excellent AGC, with an attack time of 537 µs, faster than nearly any other electron-tube receiver, and all traces of AGC-produced distortion are gone! See **Figure 8**.

Audio

A 2-stage, single-ended audio output stage is provided. Hallicrafters chose to use a 6GW8 triode / pentode tube. There is audio inverse feedback from the output transformer secondary winding to the first audio stage. Inverse feedback widens the audio response and reduces hum and distortion.

The 6GW8 was a popular tube in the early 1960s for use in portable record players and tape recorders. If at all gassy, they will produce a lot of distortion. With inverse feedback and a 6GW8 with a hard vacuum, the SX-117 has 3.8% total harmonic distortion (THD). With only a slight amount of gas in the tube, the THD will be over 25%.

I increased the values of C93, C94, and C112 to .015µf and changed them to 630-volt Mylar types. This results in increased bass response due to less reactance and less treble distortion due to the construction of Mylar capacitors. Larger values are not recommended because the hum level will increase as the reactance near 120 cycles goes down.

Power Supply

The SX-117 power supply uses a solid-state, full-wave rectifier working into a resistor-input RC filter. It does not have a filter choke, and the residual hum level across the speaker is an unpleasant 6 mV. This hum level makes weak-signal work with headphones difficult. The ripple on the B+ line is 140 mV (nearly 10%) and is an excessive amount for an otherwise nicely-designed receiver. A well-designed receiver power supply should have .02% ripple or less, and a conventional choke-input supply is prefered in receiver design. I paralled a new 100-µF, 450-volt electrolytic across the B+ line and it really didn't make much difference in power supply ripple.

The power supply uses old-style "top hat" silicon rectifiers. The old-style diodes are not as resistant to surge current as are modern diodes, and it would be a good idea to replace them. One failed during power-on in the first few hours of use, and both were replaced with 1N4007s.

Performance Data

The VFO stability over one hour, from a cold start, measured –3.7 parts per million, which is outstanding. When receiving WWV, it will stay nearly zero beat for as long as I have it on. This is the cumulative stability of the crystal oscillator and the VFO. It is not quite as stable if WWV is zero beat in one of the sideband positions because the BFO has a slight amout of unstabilized drift. Actual drift in the BFO was not measured. Sharp blows on the test bench with a hammer do not cause frequency shifts. Lifting up on one corner of the cabinet and dropping 2 inches doesn't change the beat note frequency—the tone just wobbles a little.

2-Tone Dynamic Range, 14 Mc:
5-kc spacing: 44 dB
20-kc spacing: 62 dB
3rd-Order, Dynamic Range, 14 Mc:
5-kc spacing: 53 dB
20-kc spacing: 90 dB
Image Rejection: 107 dB
IF Rejection: 125 dB
CW Minimum Discernable Signal:
80 Meters: –121 dBm
40 Meters: –122 dBm
20 Meters: –132 dBm
15 Meters: –130 dBm
10 Meters: –126 dBm

Audio: 3.8% THD was measured at 938 milliwatts output into 8 ohms with a fresh output tube. Audio response is within 3dB from 160 cycles to 20 kc.

Comparing the dynamic range numbers with comparable numbers for the SX-101A, ER #199, show how the SX-117 has worse 2-tone blocking dynamic range. This unfortunate result is due to the SX-117 preselector design. The 3rd-order dynamic range is better than the SX-101A at 20-kc signal spacing. This is due to the triode 1st mixer. 3rd-order IMD is worse at the 5-kc spacing, again, due to the preselector design.

Sensitivity on the 10-meter band can be easily be improved 10 db by using 6BZ6 tubes at V4 and V9. No wiring changes are necessary, but be aware the increased gain will lower the dynamic range and change how the AGC works, and will change the overall gain distribution.

Audio distortion can be reduced by lowering the value of the feedback resistor, R78. I suggest trying 6.8k, but lower values may destabilize the feedback loop and could cause oscillation. With an efficient loudspeaker, there should be enough audio gain reserve to allow an increase in audio feedback.

Conclusion

If Hallicrafters had used a higher performance preselector, reduced the power supply hum, and finished the AGC design, this receiver would have really given its competition a good run. Selling for nearly half of what the Collins 75S-3 was getting, it represented a very good value for amateurs during that period. It still represents a good value today for somone looking for a fine vintage receiver for every-day use. I hope to use mine for many years to come. *ER*

VINTAGE NETS

AM Carrier Net: Sunday mornings, 8:30AM local Eastern time, 3835 kc. QSX W2DAP. Friendly format.

Arizona AM Nets: Sat & Sun: 160M 1885 kc @ sunrise. 75M 3855 kc @ 6 AM MST. 40M 7293 kc 10 AM MST. 6M 50.4 Mc Sat 8PM MST. Tuesday: 2M 144.45 7:30 PM MST.

Boatanchors CW Group: QNI "CQ BA or CQ GB" 3546.5, 7050, 7147, 10120, 14050 kc. Check 80M winter nights, 40 summer nights, 20 and 30 meters day. Informal nightly net about 0200-0400Z.

California Early Bird Net: Sat. mornings @ 8 AM PST on 3870 kc.

California Vintage SSB Net: Sun. mornings @ 8AM PST on 3860 +/-

Colorado Morning Net: Informal AMers on 3875 kc daily @ 6:00 to 6:15 AM, MT. QSX KØOJ

Canadian Boatanchor Net: Daily 3725 kc (+/-) @ 8:00 PM ET. Hosts are AL (VE3AJM) and Ken (VE3MAW)

Collins Collectors Association (CCA) Nets: Sunday, 14.263 Mc @ 2000Z. Informal ragchew net Tue. evening, 3805 kc @ 2100 ET, Thu. 3875 kc. West Coast 75M net, 3895 kc 2000 PT. 10M AM net 1800Z, 29.05 Mc Sunday, QSX 1700Z. CCA First Wednesday AM Night each month, 3880 kc starting @ 2000 CST, or 0200 UTC.

Drake Technical Net: Meets Sun. on 7238 kc, 2000Z. Hosted by John (KB9AT), Jeff (WA8SAJ), and Mark (WBØIQK).

Drake Users Net: Check 3865 kc, Tue. nights @ 8 PM ET. QSX Gary (KG4D), Don (W8NS), and Dan (WA4SDE)

DX-60 Net: Meets on 3880 Kc @ 0800 AM, ET on Sun. QSX op is Mike (N8ECR), with alternates. The net is all about classic entry-level AM rigs like the Heath DX-60.

Eastern AM Swap Net: Thu. evenings on 3885 kc @ 7:30 PM ET. Net is for exchange of AM related equipment only.

Eastcoast Military Net: Sat. mornings starting 0500, 3885 kc +/- QRM. QSX Ted, W3PWW. It isn't necessary to check in with military gear, but that is what this net is all about. Late checkins are welcome.

Florida AM Group: A large group meeting every Sunday, 7:30AM ET, 3875 kc and pre-net checkin 7:00AM ET, 3675 kc. QSX Maury, N4GUI. Also, Florida vintage SSB net "AFLAC" meets Wed., 3910 kc, 9PM ET. QSX Warren, W1GUD.

Fort Wayne Area 6-Meter AM net: Meets nightly @ 7 PM ET on 50.58 Mc. Another long-time net, meeting since the late '50s. Most members use vintage or homebrew gear.

Gulf Coast Mullet Society: Thu. @ 6PM CT, 3885 kc, QSX control op W4GCN in Pensacola.

Gray Hair Net: One of the oldest nets, @44+ years ,160 meter AM Tue. evening 1945 kc @8:00 PM EST and 8:30 EDT. Also check www.hamelectronics.com/ghn

Heathkit Net: Sun. on 14.293 Mc 2030Z right after the Vintage SSB net. QSX op W6LRG, Don.

K1JCL 6-meter AM repeater: Operates 50.4 Mc in, 50.4 Mc out. Repeater QTH is Connecticut.

K6HQI Memorial 20 Meter Net: Flagship AM net 14.286 Mc daily for 25+ years. Check 5:00 PM Pacific Time.

Lake Erie Boatanchor CW Net: Sat. mornings, 7143 kc, 10:00 Eastern time. QSX op Steve (WA3JJT) or Ron (W8KYD).

Midwest Classic Radio Net: Sat. morning 3885 kc @ 7:30 AM, CT. Only AM checkins. Swap/sale, hamfest info, tech. help are frequent topics. QSX op is Rob (WA9ZTY).

Mighty Elmac Net: Wed. nights @8PM ET (not the first Wed., reserved for CCA AM Net), 3880 +5 kc. Closes for a few summer months. QSX op N8ECR.

MOKAM AM'ers: 1500Z Mon. thru Fri. on 3885 kc. A ragchew net open to all interested in old equipment.

Northwest AM Net: AM daily 3870 kc 3PM-5PM winter, 5-7 PM summer, local. 6M @50.4 Mc. Sun., Wed. @8:00 PM. 2M Tues. and Thurs. @ 8:00 PM on 144.4 Mc.

Nostalgia/Hi-Fi Net: Started in 1978, this net meets Fri. @7 PM PT, 1930 kc.

Old Buzzards Net: Daily @10 AM ET, 3945 kc in the New England area. QSX op George (W1GAC) and Paul (W1ECO).

Southeast AM Radio Club: Tue. evening swap, 3885 @7:30 ET/6:30 CT. QSX op Andy (WA4KCY), Sam (KF4TXQ), Wayne (WB4WB). SAMRC also for Sun. Morning Coffee Club Net, 3885 @ 7:30 ET, 6:30 CT.

Southern Calif. Sun. Morning 6 Meter AM Net: 10 AM on 50.4 Mc. QSX op is Will (AA6DD).

Swan Nets: User Net Sunday 2200z winter 14.250Mc ±QRM. QSX op rotates Jim (WA5BDR), Jay (WB6MWL), Norm (W7RXG), Bill (W4WHW). Tech Nets: Wednesday 2300z 14.251Mhz / Saturday 1900z 7235 kc QSX op Stu (K4BOV)

Texoma Trader's Net: Sat. morning 8:00AM CT 3890 kc, AM & vintage equip. swap net.

Vintage SSB Net: Sun. 1900Z-2000Z 14.293 & 0300Z Wed. QSX op Lynn (K5LYN) and Andy (WBØSNF)

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Brian (NI6Q), Skip (K6LGL), Don (W6BCN), or Vic (KF6RIP)

Westcoast Military Radio Collectors Net: Meets Sat. @ 2130 Pacific Time on 3980 kc +/- QRM. QSX W7QHO.

Wireless Set No. 19 Net: Meets second Sun. monthly, 7270 kc (+/- 25 Kc) @ 1800Z. Alternate 3760 kc, +/- 25 kc. QSX Dave (VA3ORP).

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Deadline for the March 2007 issue: ☞ Saturday, February 24!

SERVICE FOR SALE: Repair and restoration on all vintage equipment; over 50 years of experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. 303-770-5314

MANUALS FOR SALE: Military Radio manuals, orig. & reprints. List for address label & $1. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, wa5cab@cs.com

SERVICE FOR SALE: JOHNSON "TURBO" RANGER, Valiant, Viking 500, Viking II, includes panel and cabinet refinish. Hammarlund 180(A), National 300, 303, R390(A). http://w4pnt.8k.com Patty & Dee's Marina: 534 W. Main St. Waynesboro, VA. 22980 w4pnt@highspeedlink.net 540-249-3161 Cell: 540-480-7179

FOR SALE: Complete rare bound set of QSTs 1915 to now. Best offer by 3-17-07. K8CCV, 330-427-2303

FOR SALE: Hammarlund clock reproductions, 12 hour (easier to read) or 24 hour, specify, $35 each, shipped. Rob Hummel, WA9ZTY, 202 Midvale Dr, Marshall WI, 53559-9616

FOR SALE: Nice RME Fifty in original case with manual. Has NBFM unit. Also! Somewhat rare matching VHF 152A unit 28-148 mc. HRO 50 with coil sets. HRO Sr. a/o 5 with coil sets. DZ-2 B17 receiver Millen 92101 preselector with coils. LearRadio portable Nav radio. Pair Abbott TR4s. Sell for cash or trade. See wanted this issue. Always Buying: Vintage broadcast/communication mics, stands, tube pre's, compressors, amps. Ward Kremer, KI4 JHA, 1179 Petunia Rd., Newport, TN 37821, ph/fax: 423/625-1994, email: witzend99@bellsouth.net, website: http://www.radioattic.com/kremer.

FOR SALE: MacKay 3023A rcvr, same as Drake RR@, mint, $500 + shpg. Earl, 603-434-8326


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FOR SALE: TR-3 w/MS-4 speaker and Heath HP-23 supply, package only $350 you ship. Ken Sands, K8TFD, 734-453-7658 home, 734-564-0316 cell

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FOR SALE: 3502µF 330V capacitors, great for pwr supplies, .50 ea. Johnson 6N2 converter. Two Carter rotary inverters, 110 VAC 60 Hz output. One 12VDC in, 90 watts, other 24 VDC in, 350 watts. Great for emergencies! Rudy, W2ZIA, 716-937-9279.

FOR SALE: Hallicrafters HT-40. Drake 584A Phone Patch. Simpson 215 VOM. Simpson 50u center scale meter N.I.B. Knight P2 SWR/POWER meter. Heathkit A7 tube amplifier. Telex C1320 head set. Heathkit N.I.B. KitIT-1121 Semiconductor curve tracer. BC-669 crystals, DC34, DC35 boxes, over 100 crystals. W.E. 0-60DB audio pads. Orignal Military TM's. Old radio books. Military equpment. Tubes. National MB-40-DL. Heathkit HDP-242 desk microphone. Lots of parts! Jerry Fuller, PO box 363, Forest Ranch, CA 95942, jefuller@juno.com 530-343-1131

FOR SALE: Much of my premium old radio collection! Includes Collins, Drake, Hallicrafters, etc. Large SASE for list to: Harry, 680 Auburn Ave, Sierra Madre, CA 91024

FOR SALE: Unmodified big iron powerhouse for 2 mtr AM. 3-drawer FAA? Force air cooled 832 final & two 807s plate modulation. 15+ tubes. Spare RF drawer for step to HF. $300. Houston pickup, or? Tom, N5ACA, 281-996-5835 or tomN5ACA@juno.com

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FOR SALE: Collins 20T 1 kw AM broadcast transmitter, circa 1945. Complete w/original manual & circuit schematics. 833 final and 833 modulator. Pictures & specs available. Have many spare tubes & transformers. P.U. only in N. CA. $1,500 firm. W7WGB, 707-227-5686 or radiowiz@cwnet.com

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FOR SALE: Technical Books & CDs. Harold Kinley (WA4GIB), 204 Tanglewylde Dr., Spartanburg, SC 29301 www.radiotechnologies.net

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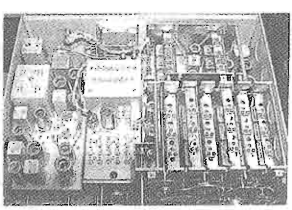


FOR SALE: Parting out SP-600 JX-21, no front panel. Send inquires to K1MBI, 21 Freestone Ave, Portland, CT 06480

FOR SALE: New, universal power supply for Elmac, Gonset, Harvey Wells, others. SASE for brochure. Harold Smith, W4PQW, 1435 Bush St., Pensacola, Fl. 32534 850-476 8107 w4pqw@cox.net

FOR SALE: Chinese Army type 65 hand crank generators for 102E radio sets. Ken, KD6B, kd6b@bendbroadband.com 541-923-1013, POB 310, Redmond, OR 97756

FOR SALE: Clean Hallicrafters HT -40 $90 & Drake 2NT $100. Plus shipping. Edward Sauer, 787 N. Peterman Rd., Greenwood, IN 46142, 317-881-1483.

FOR SALE: Estate sale, K5KTX: HRO-500 and LF10, book, $500. Hercules 2, matching PS, $1000. Henry 1KD5, $600. MFJ 901B $20. TS930S, 3 mil s/n, CW filter, $400 and 3 mil s/n parts unit $200. AEA MM1, looks new, $25. Metron MA1000, $600. Transworld amp $800. HP23 modified to fit KWM2, $100. TS930S, 8 mil s/n, $450. Jones Micromatch $50. FT902M, looks & works great, $400. SP901 $50. RV4C $100. SP20 icom $100. Johnson 257W matchbox, rough, works, $100. HW16, $50. HO11 Q mult $20. MFJ 986 kw tuner $125. GD12J Q mult $20. Utica 650 VFO, not working, looks great, $50. YD148, $25. Autek QF1, $20. Items guaranteed. Prices FOB Houston Don, K5AAD, 713-942-9747

FOR SALE: For Tektronix 550-series scopes: 2 ea 067-521-00 1M1 w/book, $100 for pair. 3 ea 1A1, $50 ea. 1 1A2 $40. 1 Type L, $20. 1L10 1-30 Mc spectrum analyzer $100. Call Charlie 941-747-2082, k4zks@tampabay.rr.com

FOR SALE: Heath semiconductors: Over 200 unique, new, OEM Heath part numbers. Card or email for list, or just tell me what you need. JeRB, K8WPI, 9549 N. 17Th St, Kalamazoo, Mi. 49009, 269-226-8873 Oldbugger@earthlink.net

FOR SALE: "Unique Radio Parts", LLC. www.wa9tgt.com (Replacement parts for "Drake" radio equipment)

FOR SALE: Collins KWM2 Festival! KWM2, 9.9, with after market speech processor installed (1963), $900. KWM2, cabinet scratches, 1961, gone thru by N6HT, noise blanker installed, $850. KWM2 RE, Waters Q Multiplier, $800. Items guaranteed. Prices FOB Houston Don, K5AAD, 713-942-9747

FOR SALE Sprague Orange Drop capacitors New/NOS. Many values/ voltages. 50% off retail. Mix or match values. eMail for complete list. gg136@aol.com

FOR SALE: Swan 350, HP-606A. WANTED: manual for Hickok 810 signal tracer, manual for Swan 700 CX, manual/ top lid for Hickok 580 tube tester. Carter Elliott, 1460 Pinedale Rd. Charlottesville, VA 22901, 434-979-7383.

FOR SALE: Dynamotor, DM32A, NIB dated 1943. 28 VDC $40. Contact Clyde, N7IOK, AZ, n7iok@juno.com or 520-323-1120

FOR SALE: AF-67, A-54H, HQ-110C, BC-221, BC-342N, DM-65A. George Babits, 167 Highway 93 South, Salmon, Idaho 83467. 208-756-4147 gbabits@salmoninternet.com

FOR SALE: KWM-2 CDs. All original material, not a copy of the manual. High resolution color pictures which will really help locate parts, plus much more. For more information visit my web page at http://www.heavymetalradios.com/ or E-Mail me at boatanchors@comcast.net, DW Holtman, WB7SSN

FOR SALE: Shure Model 51 "Sonodyne: microphone, $50. Heath AM-1 antenna impedance meter, $25. Norbert C. Wokasch, WAØKJE, 3312 W. Bijou, Colorado Springs, CO 80904. 719-633-5661.

DRAKE OWNERS: New Sylvania 6JB6, same date code, tubes for sale. Price: $23 ea. Call Dick at 207-490-5870

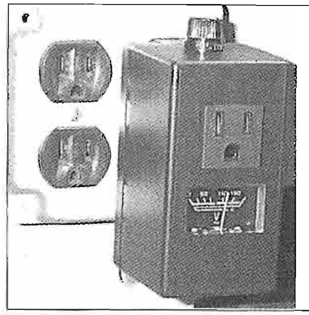
ZIM ELECTRONICS INRUSH CURRENT LIMITERS

Inrush Current Limiters are now available from the Electric Radio Store or on-line! These inrush limiters were reviewed in the September 2004 issue of Electric Radio and are available in three versions:

Model AB-1M, (With Voltmeter) $34.95
Model AB-300M, 300 watts (2.5 amps x 120 VAC) with meter $39.95
Model AB-1 (With Pilot Light) $29.95
Shipping, each limiter $5.45

(4 or more limiters are shipped free for US orders. Overseas customers please ask for shipping quotes.)

The Inrush Limiter provides a gentle, slow startup for your valuable vintage radio equipment. They also reduce the line voltage closer to original design values due to the voltage drop across the limiter element. AB-1 and AB-1M are 150W. All models come with a full money-back guarantee.



Model AB1-M

Electric Radio Store
720-924-0171

FOR SALE: Transformers, chokes, meters, tubes, (other parts, ask), consider offers plus shipping. E.F. Hayes, WØJFN, 3109 N. Douglas Ave, Loveland, CO 80538-2548

FOR SALE: Atwater-Kent dual speed tuner repair kit. Complete details at www.adamsradio.com Adams Manufacturing CO., POB 1005, Lincoln Park, MI 48146

FOR SALE: Galena crystals and/or parts to make your own crystal radio. Also have radio tubes. Len Gardner, 458 Two Mile Creek Rd, Tonawanda, NY 14150, radiolen@att.net

FOR SALE: Telephone Filters, suppress >1MHz interference, plug in, 1/$7, 2/$11, 3/$14, 4/$16.75, shipped U.S. Brian Harris WA5UEK 3521 Teakwood Lane, Plano TX 75075 brian.k.harris@philips.com 214-763-5977

FOR SALE: Military whip antennas $40 ea. plus shipping. Superior TV-10 tube tester, call. Bruce Beckeney, 5472 Timberway, Presque Isle, MI 49777, 989-595-6483

DRAKE PARTS FOR SALE: New spun inlays for the B Line or TR4 main knob. $6. Also sell new pointer knobs. Alan, KC9YS, 630-879-1132 after 7pm.

FOR SALE: Naval Receivers RAK, RAL, RAO, RBA, RBB, RBC, RBL, RBM. Some checked, pwr splys available. $75-$450 depending on condx. Many other types. Carl Bloom, carl.bloom@prodigy.net 714-639-1679

This is possibly a long shot, but I would like to obtain an unrestorable SX-88 for parts. A chassis with missing unobtainable parts or a complete receiver in very rough condition is preferred to prevent breaking up an otherwise restorable unit. I am willing to pay above-market for the right chassis or parts unit and I will make it available to others whom might also have a project SX-88 on hold due to needing parts.

Greg Gore, WA1KBQ
10291 Kendan Knoll Dr.
Charlotte, NC 28262
704-503-5952
WA1KBQ@AOL.COM

QSLs FOR SALE: Your old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, nz5m@arrl.net

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SERVICE FOR SALE: Let's get that old radio of yours working again! Antique Radio Repair - All Makes- Also Transistor Radio Repair. Tom Senne, N5KCL, 937-865-5213 http://tomsradiorepair.bizland.com

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FOR SALE: DRAKE TR-7/TR-7A/R-7/R-7A service kit. Includes 13 extender boards and digital jumper card. $63.85 includes postage. See http://pweb.amerion.com/~w7avk, Bob, W7AVK, 807 Westshore J28, Moses Lake, WA 98837, w7avk@arrl.net 509-766-7277.

FOR SALE/TRADE: Manuals: Eico, Globe/WRL, Heathkit, Allied/Knight, Lafayette, Morrow, Millen, PACO, Archer/Realistic, Central Electronics, others. NI4Q, POB 690098, Orlando, F1 32869 407-351-5536 ni4q@juno.com

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FOR SALE/TRADE: Transmitting/Receiving tubes, new and used. LSASE or email for list. WANTED: Taylor 204A, 211, TR40M and Eimac 500T. John H. Walker Jr., 13406 W. 128th Terr., Overland Park, KS. 66213. PH: 913-782-6455, Email: jwalker83@kc.rr.com

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SERVICE FOR SALE: Repair, upgrade, performance modification of tube comm. & test equip. Accepting most military, all Collins & Drake, & better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, 1115 S. Greeley Hwy, Cheyenne, WY 82007. 307-634-5858 feltondesign@yahoo.com

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FOR SALE: 160m FT243 CRYSTALS: 1885, 1900, 1915, 1925, 1930, 1945, 1970, 1977, 1985 kHz. See: http://www.af4k.com/crystals.htm or call Brian, AF4K, at 407-323-4178

FOR SALE: FT243 CRYSTALS: 3500, 3505, 3515, 3520, 3546, 3548, 3558, 3645, 3686, 3702, 3805, 3825, 3830, 3837, 3855, 3875, 3880, 3885, 3890, 3983, 5355, 5360, 7000, 7025, 7030, 7035, 7037, 7040, 7044, 7045, 7047, 7050, 7060, 7125, 7146, 8025, 8400, 10106, 10116, 10120, 12500, 14060, 14286kHz. See: http://www.af4k.com/crystals.htm or call Brian, AF4K, at 407-323-4178

BOOKS FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hi-fi, parts. Send 2 stamp, LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857. ka1edp@juno.com

BOOKS FOR SALE: Lots of old radio & related books. Please contact Eugene Rippen, WB6SZS, www.muchstuff.com

HALLICRAFTERS SERVICE MANUALS: Ham, SWL, CB, Consumer, Military. Need your model number. Write or email. Ardco Electronics, PO Box 24, Palos Park IL, 60464, wa9gob@aol.com 708-361-9012 www.Ardcoelectronics.com

DRAKE INFO FOR SALE: Drake C-Line Service Information. Hi-Res Color photos of boards and chassis with parts identified. CD also includes Hi-Res scans of R-4C and T-4XC manuals, various version schematics and more. Garey Barrell, k4oah@mindspring.com 4126 Howell Ferry Rd, Duluth, GA 30096. 404-641-2717

FOR SALE: Radio parts and hardware. Some are 60 years young! Free flyer, USA only. Bigelow Electronics, POB 125, Bluffton, OH 45817-0125

DRAKE SERVICE FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covelli, WA8SAJ, Telephone 440-951-6406 or email: wa8saj@ncweb.com

FOR SALE: QRP transmitter kits. Step-by-step instructions. Wood model, up to 5 watts 40/80M $15. "Tunatin" one watt 40M $10. You furnish crystal and power. Robert Larson, 1325 Ridgeway, Medford, OR 97504 w7lng@arrl.net

FOR SALE: Tubes tested good globe 200A $8.50, 201A $14, 226 $8, 227 $9. Write or e-mail: tubes@qwest.net for price lists or see www.fathauer.com. Slightly weak tubes guaranteed to work in early radios 1/2 regular price. George H. Fathauer & Assoc., 123 N. Centennial Way, Ste. 105, Mesa, AZ 85201. 480-968-7686 or toll free 877-307-1414

SERVICE FOR SALE: Repair of tube and solid state 1930 to 1975 radio equipment, auto, shortwave and older amateur gear. Please contact Ken Hubbard, KA9WRN, at 608-362-1896 or write Vintage Radio Service, POB 792, Beloit, WI 53512-0792.

SERVICE FOR SALE: Authorized repairs and sales of all types of amateur radio, communications, and test equipment. Please call Land Air Communications, 718-847-3090, visit our web site: www.landaircom.com. We have over 3,000 items in inventory and carry all types of communications parts.

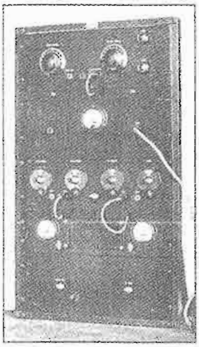
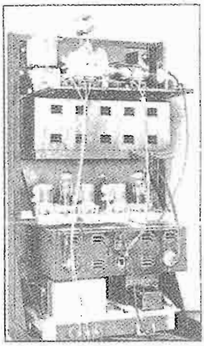
JOHNSON PARTS: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig.-$17.50 ppd. Bruce Kryder, W4LWW, 277 Mallory Station Dr., Ste. 109, Franklin, TN 37067. b.kpvt@provisiontools.com

ACCESSORIES FOR SALE: KWM2/S-line metal logo pins. Meatball or winged. Excellent replica of the original. Put one on your hat, badge, or replace a missing logo on your panel, $6.25 shipped. W6ZZ, 1362 Via Rancho Pkwy, Escondido, CA 92029. 760-747-8710, w6zz@cox.net

FOR SALE: Vintage electronics at Alameda Antique Mall, 9837 Alameda Genoa in Houston. Visit www.RadioWorld-OnLine.com Carl Blomstran, POB 890473, Houston, TX 77289

ACCESSORIES FOR SALE: Spun Aluminum Knob Inlays for most Boatanchors. Collins Dial Drum Overlays. Dakaware Knobs. Charlie Talbott, 13192 Pinnacle Lane, Leesburg VA 20176-6146. 540-822-5643, k3ich@arrl.net

PLANS FOR SALE: Build your own "Midget" bug replication by KØYQX, ca 1918, featured by K4TWJ in CQ Magazine, May '98. 10 detailed blueprints. FAX: 507-345-8626 or mobeng@hickorytech.net

REWARD – WANTED!

Will pay $1000 for a 1930s National type LRR 36" relay rack pictured to left. It is identified by its ¾" wide top and bottom crossmembers with a red "National Co.; Malden, Mass" decal on the top crossmember. Greg Gore, WA1KBQ; 10291 Kendan Knoll Dr.; Charlotte, NC 28262

704-503-5952
wa1kbq@aol.com

NOTICE: Visit Radioing.com, dedicated to traditional ham radio & vintage radio resources. Let's Radio! Charlie, W5AM. www.radioing.com.

ACCESSORY FOR SALE: RIT for Collins KWM-2/2A; No modifications needed. $79.95 SASE for details. John Webb, W1ETC, Box 747, Amherst NH 03031 w1etc@adelphia.net

FOR SALE: Used back issues of ER Magazine. Complete sets for years 1996, 2003, 2004;20 per year + $3 postage. Phil Wilson,1355 Big Otter Drive, Blue Ridge, VA 24064 k6cra@arrl.net

PARTS FOR SALE: Aluminum heat dissipating plate and grid connectors for all 3, 4 and T series Eimac tubes including 3-500Z, 4-1000, 304T's and others. Alan Price, fixer7526@wmconnect.com

WANTED: Original meters for T-195 Transmitter OR two 0-1ma identical military 1.5" panel meters Thanks VE3BE rwboyd@gta.igs.net 613-722-4098

TREASURES FROM THE CLOSET! Go to www.cjpworld.com/micromart to find some unique items many hams would lust for! Gus, WA, 360-699-0038 gus@wa-net.com

SERVICE FOR SALE: I build hot-rod receivers: R-390A, SP-600, R-388/51J. NC-183D and transmitters: Valiant, DX-100, T-4X-A-B, HT-32, AF-67. 51J-4 filter replacements, R390A Hi-fi AM $245.00 ea. Chuck Felton, KDØZS, Wyoming, 307-634-5858, feltondesign@yahoo.com

WANTED: AT-317/BRR antenna manual NAVSHIPS 92182. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453

WANTED: Capstan and headwheel servo amplifier chassis, & low band headwheel assembly for an RCA TRT-1A VTR. This is a genuine restoration, not an audiophile project. Jay Ballard, W1JHB, 39 Boston St., Middleton, MA 01949, 978-774-4041, TK41C@aol.com

WANTED: Manual, schematic, other info on J.L.A. McLaughlin MCL-10VBX SSB converter. Made about 1952, similar to TMC CV-591 SSB adapter. 202-955-2609 or acomarow@usnews.com Avery, W3AVE

WANTED: Mixer coil (perpendicular to front of the chassis) of a Hallicrafters S-19R. Spencer Cromwell, K6VRS; 2150 Ridgebrook Dr., West Linn, OR 97068. 503-329-4737 K6VRS@Hotmail.com

WANTED: WRL Globe Scout 680A, Heath DX60, meter for Heath AT-1. Paul Geerdes, K8JJC, 616-891-8891 or email k8jjc@iserv.net

WANTED: VX1 VOX for Swan radio. Bob, 916-967-7552.

WANTED: Webster tri-polar magneto. Frank, 828-855-2470

WANTED: Rack mounted 5" scope such as Millen 90905, pictured on cover of ER 206. Bob, 516-754-1763

WANTED: Hallicrafters SX-25 1-5/8-inch knobs. The SX-24, S-22, S-21, S-20, S-18, S-17 and S-16 knobs are identical. W9STB, telegrapher@hotmail.com.

WANTED: Racal RA-17, RA-117, or RA-71. Need manuals for same. Ward Rehkopf, K8FD, 1417 E. Bradley, Shawnee, OK 74804

WANTED: Collins service bulletins for 651S-1 HF receiver. Contact: mmoss@mindspring.com

WANTED: manual for Hickok 810 signal tracer, manual for Swan 700 CX, manual/top lid for Hickok 580 tube tester

WANTED: Potter & Brumfield mercury wetted contact relay P/N JM1-119-11 for a HA-1 keyer. Thanks, Tom, KØGIE, 719-488-8164, dtgill@msn.com.

WANTED: Manual for Navy GP-7 transmitter, Chip Owens NWØO, 1363 Tipperary St., Boulder, CO 80303, 303-673-9019, owensj@ucar.edu

WANTED: Dead or dying National NCX-1000, also Sylvania 6E5B pilot lights. Ed Rehm, 847-566-9312

WANTED: Collins 62S-1 6 & 2 meter transverter. Non working unit OK. Jeff Bishop, W7ID, 208-459-7502

WANTED: James Millen plug in oscillator coils for Millen 90881 linear amplifier, Millen parts #s 43011, 43015, 43021, 43041 and 43081. Gary K2PVC; gschonwald @earthlink.net 917-359-8826

WANTED: Technical Materiel Corp (TMC) power supplies PS4 (low voltage and bias) and PS5 (high voltage) for the TMC PAL 1K kilowatt linear amplifier, also known as the RFD or RFA. Gary K2PVC; gschonwald@earthlink.net 917-359-8826

WANTED: Radio News, Radio Craft, Radio Electronics 1938-1963. Richard Peterson, 319-377-9126 or dottielee526@juno.com

WANTED: DY-28 dynamotor for BC-348, contact Mike, VE7MMH, at mike46@shaw.ca

WANTED: Squires-Sanders SS-1R and SS-1V. Bob, WØYVA. 703 450 7049; robert@isquare.com

WANTED: Dynamonster DY12 DY 17 for ART 13 transmitter. Info and crystals for Conco CDA-T crystal oscillator for same. Coils for National SW3 SW5. Case for Hammarlund Super Pro SP 200/BC 779. ID tag or scan of same. Tag or scan for Collins R-388. Info on RDF1/direction finder unit L 1130 A. Also cross ref for accompanying tube. I have "Navy type 38233" written on 7 pin base, ST type. This is a twin triode. Will cash or trade on any/all. See for sale ad this issue. Ward Kremer, KI4 JHA, 1179 Petunia Rd., Newport, TN 37821, ph/fax: 423/625-1194, email: witzend99@bellsouth.net, website: http:www.radioattic.com/kremer

WANTED: One of my "KN8GCC" QSLs from the mid-1950s. Tom Root, 1508 Henry Court, Flushing, MI 48433, 810-659-5404, wb8uuj@arrl.net

WANTED: Hallicrafters HT33 with salvageable power supply. The RF section is not required to be useable, need a power supply to contribute to one that is. Gary Schonwald K2PVC. gschonwald@earthlink.net phone: 917-359-8826

WANTED: Will buy SP-600 and some other Hammarlund equipment, working, not, or incomplete. Al, W8UT, anchor@ec.rr.com 252-636-0837

WANTED: Technical Materiel Corp rack mounted antenna tuner and RF /SWR meters to be used with the 350-watt or 1000-watt TMC linear amplifiers. Will consider other TMC transmitting equipment and accessories for collection and on-air use. Gary Schonwald K2PVC. gschonwald@earthlink.net phone: 917-359-8826

WANTED: Need two Westinghouse RT35 0-1 RF amps, 3-1/2" round Steve Bartkowski, 1-708-430-5080

WANTED: Meter movement for Western Electric transconductance tube tester KS-15750. Walter Hughes, WB4FPD, 6 Academy Ct., Berryville, VA 22611 540-955-2635

WANTED: Vacuum Tubes: 279A, 212E, 249B, 258B, 271A, 242A, C120, C100A, 804, RK20, CK70, GL805, C201, ZB-120, 802. Components for rebuilding Collins 30J RF output deck, including Cardwell or equivalent dual section variable 440 pF and 240 pF capacitors. Components for Collins 12H /12N speech input console, including preamplifiers and program amplifiers. Rod, W5CZ, 303-324-2725, rodperala@aol.com

WANTED: Pearce-Simpson manual/ schematics for VHF marine radio, model "Catalina", JR Linden, K7PUR, PO Box 4927, Cave Creek, AZ 85327, jrlinden@usa.net

WANTED: Clean National Select-O-Ject, NC-183DTS and Heath VX-1. Contact Ric at c6ani@arrl.net.

WANTED: ITT-Mackay Marine 3010-C Receiver, late S/N, complete and in good or VG conditions, with original box and manual. The item has to be shipped to a friend in Ohio (not outside U.S.). Send your offer to Paolo Viappiani, Via Valle 7, 19124 La Spezia, Italy, or pviappiani@tin.it

WANTED: Early QSL cards from my Grandfather, Hal Smith (SK). His calls were KH6KA, K6YJR, K6OQE. Gladly reimburse postage plus modest finder's fee! Phil Wilson, 1355 Big Otter Dr, Blue Ridge, VA 24064 k6cra@arrl.net

WANTED: National NTE-30 Transmitter. Any condition, any price! I love National. Sylvia Thompson, n1vj@hotmail.com 33 Lawton Foster Rd., Hopkinton, RI 02833. 401-377-4912.

WANTED: One of my "KN8GCC" QSLs from the mid-1950s. Tom Root, 1508 Henry Court, Flushing, MI 48433, wb8uuj@arrl.net 810-659-5404.

WANTED: Any TMC equipment or manuals, what have you? Will buy or trade. Brent Bailey,109 Belcourt Dr., Greenwood, SC.29649, 864-227-6292, brentw2@earthlink.net

WANTED: Seeking unbuilt Heathkits, Knight kits. Gene Peroni, POB 7164, St. Davids, PA 19087. 215-806-2005

PRESS WIRELESS, NY: Photos, information wanted on Hicksville, Baldwin, Little Neck, Centereach, Northville facilities. George Flanagan, 42 Cygnet Dr., Smithtown, NY 11787 w2krm@optonline.net 631-360-9011

WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, 631-360-9011, w2krm@optonline.net

WANTED: Top prices paid for globe shape radio tubes, new or used. Send for buy list or send your list for offers. Write or e-mail: tubes@qwest.net. See www.fathauer.com or send for catalog of tubes for sale. George H. Fathauer & Assoc., 123 N. Centennial Way, Ste 105, Mesa AZ 85201. 480-968-7686, Call toll free 877-307-1414

WANTED: Manuals, manuals, and manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. 732-238-8964

WANTED: Searching for RME CT-100 or 3R9 xmtrs and info about them. David Edsall, W1TDD, 156 Sunset Ave., Amherst, MA 01002. 413-549-0349, dedsall@crocker.com

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

WANTED: QSL card from W9QLY, Frank (Mac) Maruna, from 1956 or before. WILL PAY TOP DOLLAR. Don Barsema, KC8WBM, 1458 Byron SE, Grand Rapids, MI 49506, 616-451-9874

WANTED: Top dollar paid for WWII radios, PRC-1, PRC-5, AR-11, SSTR-1, SSTR-5, British B2, need pts for PRS-1 mine detector. Steve Bartkowski, 708-863-3090

WANTED: Sonar CB transceiver model J23 mobile set. 23-channel, tube-type CB radios, also 23-channel mobile sets. Ed, WA7DAX, 1649 E. Stratford Ave., Salt Lake City, UT 84106. 801-484-5853

WANTED: TCS & TBY Navy radios. Ken Kolthoff, K8AXH, PO Box 215, Craig, MO 64437. 913-634-3863.

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 900 N. San Marcos Dr. Lot 77, Apache Junction, AZ 85220

WANTED: Looking for a National NTX or NTE transmitter/exciter for use in my vintage hamshack. Any condition, even basket cases or parts, considered. Will pick up in New England, or arrange shipping if outside of area. Paying any reasonable price, and most unreasonable ones! Please email with details or photos, all considered and most likely bought! Thanks! Bruce, W1UJR, 207-882-9969 or w1ujr@arrl.net

WANTED: Harvey-Wells Odds-'N-Ends: Speakers, phones, mikes, manuals, supplies, prototypes, military, aircraft. Kelley, W8GFG, 219-365-4730, 9010 Marquette St., St. John, IN 46373

WANTED: Collins R-389 LF receivers, parts, documentation, anecdotes, antidotes. W5OR Don Reaves, PO Box 241455, Little Rock AR, 72223 501-868-1287, w5or@militaryradio.com or www.r-389.com

WANTED: Incarcerated ham seeks correspondence. w/others on mil (R-390's &backpacks) & tube radios. Also copies of postwar-90's surplus catalogs, backpack specs & photos. W.K. Smith, 44684-083, FCI Cumberland Unit A-1, POB 1000, Cumberland, MD 21501.

WANTED: SCR-602 components, BC-1083, BC-1084 displays, and APS-4 components. Carl Bloom, 714-639-1679

WANTED: Western Electric horns, speakers, amps, and mics. Barry Nadel, POB 29303, San Francisco, CA 94129 museumofsound@earthlink.net

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WANTED: Receivers. Telefunken E1800, Rohde Schwarz, EK-56/4, NC-400, Racal 3712, Hallicrafters SX 88, Collins HF8054A, Collins 851S-1. Manual for Racal R2174B(P)URR 310-812-0188(w) alan.royce@ngc.com

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I NEED INFO!: Radiomarine T-408/URT-12/USCG/1955. Sam, KF4TXQ, PO Box 161. Dadeville, AL 36853-0161 stimber@lakemartin.net 256-825-7305

WANTED: Scott Special Communications rcvr. EA4JL, please call Kurt Keller, CT, 203-431-6850

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. 501-318-1844, Fax 623-8783 www.boatanchor.com

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WANTED: Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. 661-259-2011. FAX: 661-259-3830 jstitz@pacbell.net

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WANTED: Westinghouse SSB Transmitters MW-3 (Exciter, Amplifier, Power Supply). Also, MW-2 (AM). Will pickup anywhere. Gary, WA4ODY, Seabrook, TX 77586, 281-291-7701 myctpab@earthlink.net

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DONATIONS WANTED: Southern Appalachian Radio Museum, Asheville, NC, where others can view your radio treasures. For general information or donations call Clinton Gorman, Curator, 828-299-1276

WANTED: WW-2 IFF Equip FM-80 rack BC-126F RA-105A 1-221, BC-1293. Will pay top dollar. Steve Bartkowski, 1-708-430-5080, 7702 Austin Ave, Burkank, IL 60459

WANTED: Radio correspondence course lessons by National Radio Institute (NRI) of Washington, DC. George Reese, 380 9th St., Tracy, MN 56175, 507-629-4831

WANTED: September 1963 issue of Electronics Illustrated. Louis L. D'Antuono, WA2CBZ, 8802-Ridge Blvd., Bklyn, NY 11209. 718-748-9612 AFTER 6 PM Eastern Time.

WANTED: Parts for SCR-178: Insulator IN-85, GN-37 generator, LM-18, side mounts for IN-85. Robert Forte, rvforte@frontiernet.net 518-696-2400

WANTED: Mint, complete or parts sets. Hammarlund SP-600 JX-28 version, has nomenclature tag R-620, doesn't have name engraved on panel like others, 1937 RCA ACR-111, RCA CR-88B version, RCA AR-8516, TMC CV-1758 SSB converter, and DEI Defense Electronics TR-711 telemetry receivers and modules. Will send custom shipping carton for easy transaction/shipment. Dan Gutowski AB8VM P.O. Box 142 Dexter, MI 48130 734-718-7450. dg16ms26@msn.com

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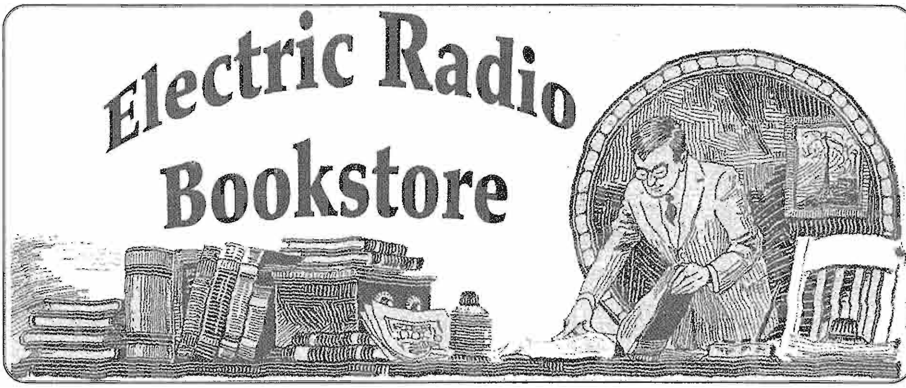

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Heath Nostalgia: Written by Terry Perdue, K8TP, an ex-Heath employee, this 124-page book is a great history of Heath and the Heathkits that we all remember. ------ **$14.95-10% = $13.45**

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