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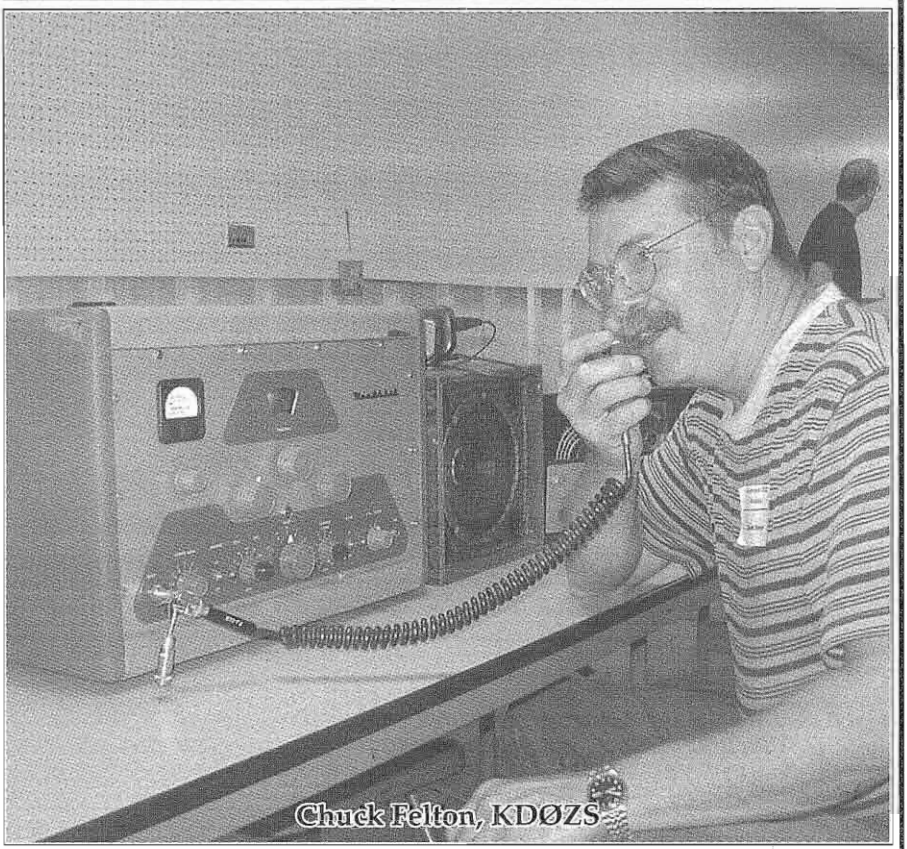
ELECTRIC RADIO

celebrating a bygone era

Number 159 August 2002



Chuck Felton, KDØZS

ELECTRIC RADIO

published monthly by Electric Radio Press, Inc.
14643 County Road G, Cortez, CO 81321-9575
Periodicals postage paid at Cortez, CO

USPS no. 004-611
ISSN 1048-3020

Postmaster send address changes to:
Electric Radio
14643 County Road G
Cortez, CO 81321-9575

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

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

Regular contributors include:
Bill Breshears, WC3K; Bob Dennison, W2HBE; Dale Gagnon, KWll; Bob Grinder, K7AK; Jim Hanlon, W8KGI; Brian Harris, WA5UEK; Tom Marcellino, W3BYM; Ray Osterwald, NØDMS; Chuck Teeters, W4MEW; Bruce Vaughan, NR5Q.

Editor's Comments

Military Meet Info Wrong in July Issue

Something happened (a senior moment?)that caused me to post the wrong info in the July issue for the Military Radio Collectors Association Meet. My apologies to the meet organizers. Please see page 42 of this issue for the correct information.

The ER Photo Book

Although entries for the book are coming in I think it's going to be an enormous challenge to get the 500 that I consider necessary to make the book idea work. I'm encouraging everyone that has sent their material in to really get on to their friends and make sure that they get their material in too. I talk to (and e-mail) a large number of people regularly. I think I'm in danger of becoming a terrible bore by always swinging the conversation around to the book. I see no other way to get this job done but by constant reminding everyone just how important I think this project is and how important it is to me. I have this vision—maybe I've shared it here before—of this picture book becoming a great treasure for us all. What could be nicer than having a book containing photos and information on all our vintage radio friends.When we get old—and most of us are getting there—how great it will be to look back with this book. If you haven't sent your material in please do so ASAP and encourage your friends to do likewise. Snapshots via regular mail or JPEGS via the internet are equally OK.

The ER Parts Unit Directory

It's time again for everyone with units in the ER Parts Unit Directory to review their listing info and let me know if it's all still current. In the next couple of months we'll be deleting listings from those who I haven't heard from. It's a valuable resource for all of us who repair and restore—we have to keep it up to date. N6CSW

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Cover: Chuck Felton, KDØZS, operating a DX-100 at the July 20 Superfest in Loveland, Colo. *Photo by Orlin Jenkins, aka 'OJ', KØOJ.*

Summer Radio Fun in New England

by Dale Gagnon, KW1I
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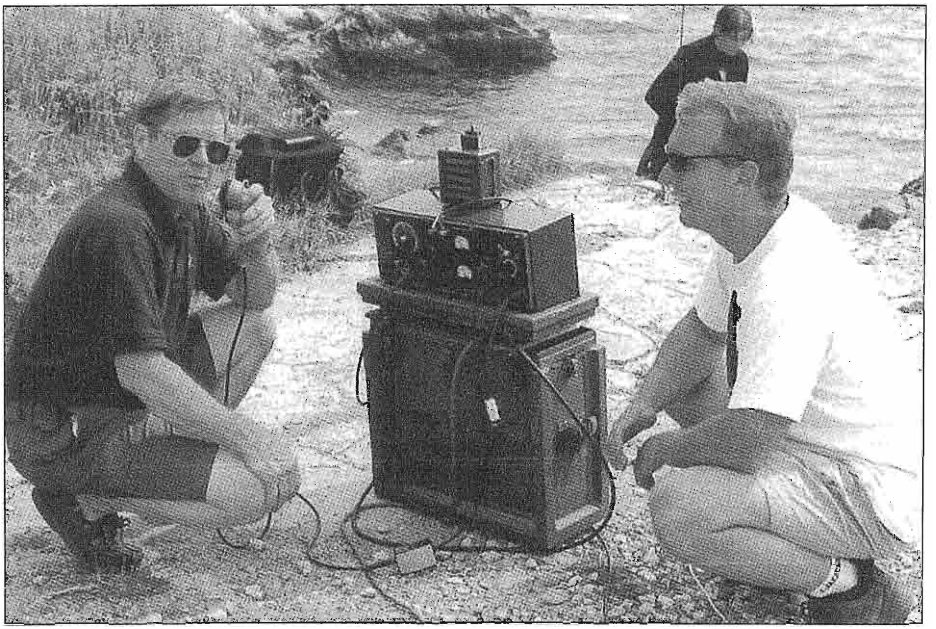
We've had a lot of fun with two radio operating events in the "field" this summer, and one more is scheduled early in September. The field events have been centered on the use of vintage military field radios. Military field radios are ideal for outdoor vintage operation because you get all the fresh air and camping aspects, and you enjoy the nostalgia of running these radios as they were originally used by our Armed Services.

A Vintage Field Day operation was mounted on June 22 on Conanicut Island in the middle of Narragansett Bay. The plan was to meet at Brown's (W1NZR) station location at Beavertail Point, the southern tip of Conanicut Island, near Jamestown, RI. Several teams would deploy around the island in a "Harbor Defense Net" on HF early in the afternoon before ARRL Field Day started. After our net we planned to reassemble at Brown's for a tactical communications evaluation in a "social atmosphere". Late morning on June 22 I was able to contact Chris (AJ1G) on his GRC-9 with a whip antenna mounted on his utility trailer with my BC-474 and a portable 30-foot vertical with four radials. My station was at Brown's QTH and Chris was on his way over from his QTH in Connecticut. He made contact from the old Charlestown Naval Air Station location on the south coast of Rhode Island about 13 miles distant. He also stopped at Ft. Kearney across Narragansett Bay about 5 miles from us. In both cases our low-power radios and portable whip/vertical antennas produced loud and clear signals. Later in the day three radio teams set out to man previously identified lookout points around the island. Two of the teams were led by military Jeeps. Dave, K1DT manned the base station at Brown's Beavertail Point QTH. He was using a TCZ transmitter (ART-13 variant) and a RBB receiver. W1NZR's team drove to a northerly spot across from the Quonset Point Naval Air Station. Brown was using a Jeep mounted and powered GRC-9 with a whip. Chris and Glenn (N1SNG) drove to West Ferry in the middle of the island with a great view looking west over the bay. Chris powered his GRC-9 with a PE-162 gas generator. Dale (KW1I), Tom (W2ILA) and Charlie (KA1GON) went to Ft. Wetheril overlooking the eastern approach to the bay. Within 30 minutes after leaving Beavertail Point our stations started to appear on the 75 meter net frequency. The station at Ft. Wetheril was the last one on the air, taking about 45 minutes to come on because the BC-474, AC generator, power supply and vertical had to be carried about 200 yards to the beach from the parking area. We proceeded to have a phone net with plenty of military sounding jargon for the benefit of onlookers at our operating sites. Each station also took a turn at CW. All stations were in contact with each other and base. There were no equipment failures, auto accidents or arrests. After net operations we returned to the Beavertail Point facilities to celebrate our communications success.

The second operating event was a field radio exercise associated with a military vehicle rally in New Hampshire on July 27. Several field radios



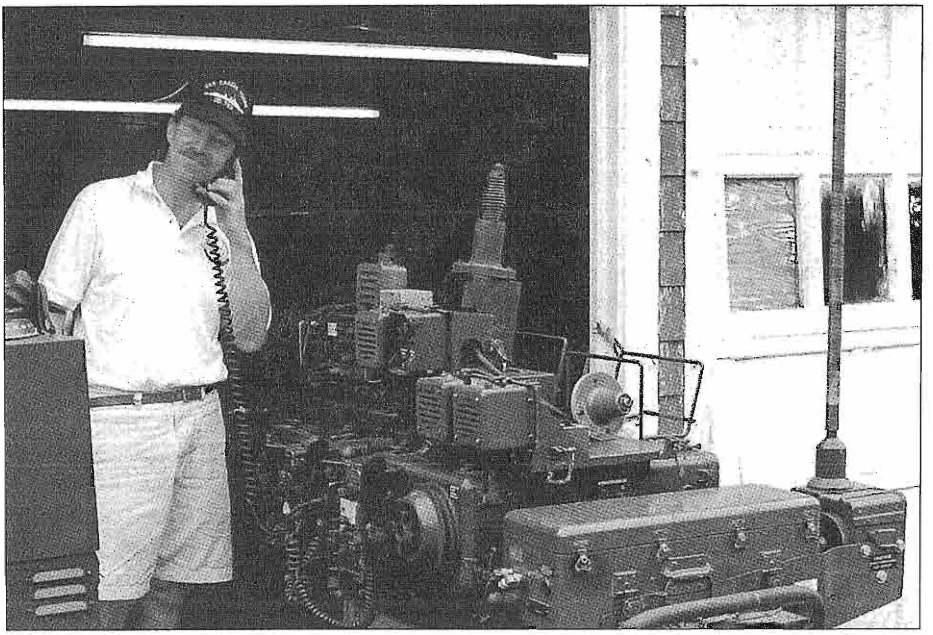
The author with Tom, W2ILA. They're operating Harbor Defence on VFD using a BC-474.

Radio teams lined up for field radio excercise at military vehicle rally at Weare, NH on July 27.

Radio display at military vehicle rally. Left to right: Bud, WA2AUI; Chris, AJ1G and Pete, WB2JWU. Some of the equipment shown includes: BC-474, GRC-9 and BC-1306.

and associated equipment were displayed for the attending public. In the afternoon two radio teams were transported to preassigned locations by a convoy of Jeeps. Each team had two Jeeps at their disposal. One for equipment and one for radio personnel. Scaled orders were given to each radio team and drivers as the activity commenced. The orders gave directions to an intelligence target with a request for specific intelligence information. Driving directions continued to guide the teams to sites for communications system set up. One of our teams, Bud (WA2AUI) and Pete (WB2JWU) were assigned to measure the muzzle bore of the weapon on the lawn of the local Historical Society. The other team, Chris (AJ1G) and Brown (W1NZR) were assigned to find out the owner and operator of a nearby dam. After collecting the intelligence a message had to be formatted including names of drivers, operators, radio type, and the collected intel. The message was split into five letter groups and the radio team was instructed to set up their radio and monitor a frequency until called on CW. Then the traffic was to be passed back to Headquarters at the rally site. Bud and Pete were using a BC-1306, and Chris and Brown were using a GRC-9. Chris came upon frequency very quickly. Their radio location was about two miles from the rally site. We heard nothing from Bud and Pete for what seemed like an abnormally long time, and then they came on. Bud had forgotten a pencil and had to stop at a nearby general store. Traffic was passed to Headquarters and everyone switched to phone to wrap up the event. The Jeeps delivered the teams back to the rally in short order. Later in the day phone contacts were made on 75 meters on the GRC-9 using a hand crank generator.

Another field radio exercise is planned for September 6 at the MRCA meet at the



Brown, W1NZR, on VFD with a MRC-108/GRC-153 vehicle mounted HF, VHF, UHF radio communications set.

Brown, W1NZR operating a PRD-1 radio direction finding set on VFD.

West End Fairgrounds, Gilbert, Pennsylvania. As a result of the experience of the prior two events a lot of planning and discussion is underway. For one thing, if you can't use a vehicle-mounted antenna, a lightweight ground mounted whip/vertical that can be erected quickly is a must. Also lightweight power sources are essential. Boxes and bags that can easily be packed and handled are important. At least one team wished they had erected everything the night before to check out antenna tuning. Bud learned that a pencil is a good idea if you plan to receive CW. We are also thinking about interjecting more competition into these field events, so there is discussion about different ways a team could be scored.

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QCWA Chapter 207, NOS-AM

by Mike Cowart, WA5CMI
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In October 2001 a new QCWA chapter was formed: Chapter 207 called NOS-AM. This chapter is unique in that it is the only one dedicated to the advancement of amplitude modulation. Oddly enough, AM—so long forgotten by many old-timers—is becoming a very popular mode once again. Over the past several years many amateurs are rediscovering its high fidelity sound, its gentlemanly roundtable form of operation (no VOX please!), and its appeal to those with interest and experience in radio technology. Many discussions on the AM frequencies are technical in nature: older technology such as vacuum tube audio and radio frequency amplifiers and their related circuits; and new technology such as synchronous detection, pulse-code modulation, high-level-modulated Class-E amplifiers, etc.

NOS means New Old Stock: an electrical or mechanical part that may be several decades old but has never been used. It is indeed new stock but it is also old stock. This description fits the membership profile of our chapter. We have members who have always enjoyed AM throughout their long ham radio experience; we have members who have rediscovered it; and we have members who have discovered it for the first time after being hams for over 25 years! There are non-QCWA members who join us in the fun: younger hams who really appreciate all the AM mode has to offer.

The chapter meets throughout the year at some of the hamfests in Texas: twice a year at the Temple Amateur Radio Club HamExpo in Belton, Texas. We have two elected officers. They are President: Mike Cowart, WA5CMI and Secretary/Treasurer, Bob Peters, K1JNN/5. We stay in contact inbetween meetings with on-the-air roundtables and on the Internet. We have a 'group' (not restricted to QCWA members) within Yahoo.com where we can post messages, pictures, and files (the URL is http://groups.yahoo.com/groups/newoldstock). The yahoo group membership is up to over 50 and we have many members outside of Texas.

Last April, we discussed the possibility of operating a special event station at HamCom 2002 in Arlington, Texas. Having a station at a major hamfest is probably not that unusual, having a vintage AM station is. With a station on the air, we wanted to demonstrate to the amateur community how much fun there is in operating the fine old gear in the fine old mode and style. Along with the station, we wanted to display some of the equipment used by our membership. Of course, AM operation is not limited to vintage gear. Many of the modern transceivers do a great job on AM.

Bob Peters, K1JNN took the responsibility of project lead and did an outstanding job of organizing the effort. From the April meeting in Belton, we determined several things had to be done to ensure success: gathering an abundance of volunteers; acquiring a station; planning the antenna and station installation; establishing an oper-

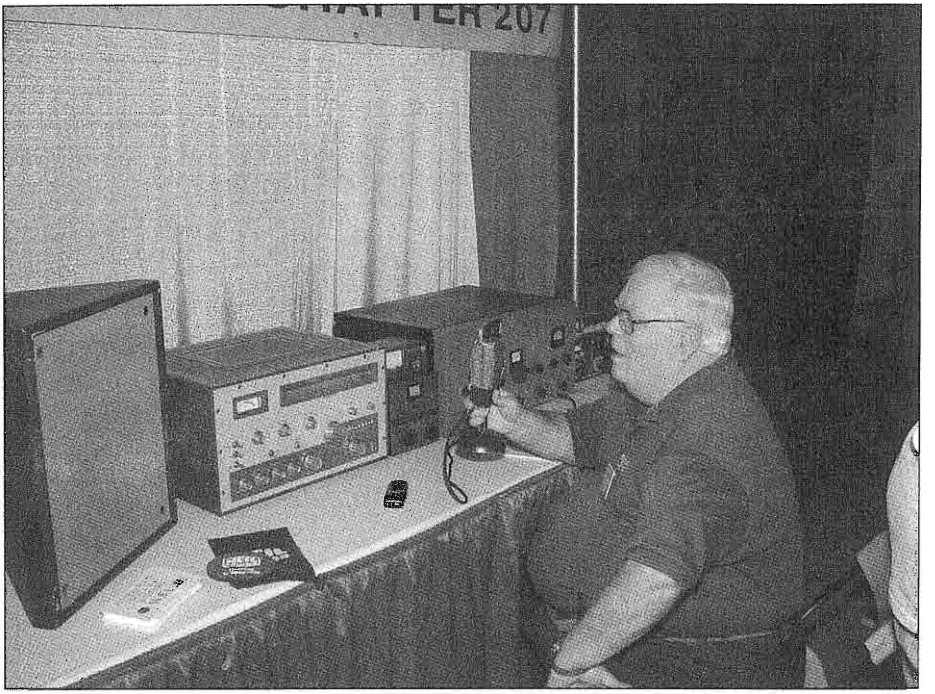

Figure1. Bob Peters operating W5A with others looking on. *Photo by Grant Youngman, NQ5T.*

ating schedule; organizing the booth to present our chapter and AM in the best light and printing QSL cards.

From the meeting many volunteers stepped forward. Not only did we have QCWA members volunteer but also younger non-QCWA members wanted to help out. This was a good thing as Texas June weather can be brutal. Added to the heat generated from the steel convention center roof, some of us old timers could have encountered problems. We organized the volunteers to provide the greatest efficiency by grouping them according to skills and availability: antenna raising, booth planning, equipment acquisition, QSL development, etc.

Bob obtained the special event call sign from the W5YI group: W5A.

We acquired a station (not really a hard thing to do), which consisted of a Heathkit Mohawk receiver and a homebrew 100-watt transmitter running a pair of 6146s in the final. This transmitter is very unique, in that it was built from scratch by a now Silent Key and was made to look like the E.F. Johnson Viking II. It was slightly larger than the Viking II. The single requirement for the equipment was that it be reliable. In addition to the station itself, we gathered some other vintage equipment for display—a WRL Globe Champion 350A, a Hallicrafters SX-140 with matching HT-40 transmitter, a BC-348 WW II liaison receiver, and a Barker and Williamson 5100B (with the SSB adaptor attached). We also had a collage of pictures of members and their stations done by Bob Peters' XYL.

On the Thursday before HamCom, a few hearty souls met just before noon to put up the antenna on the roof of the

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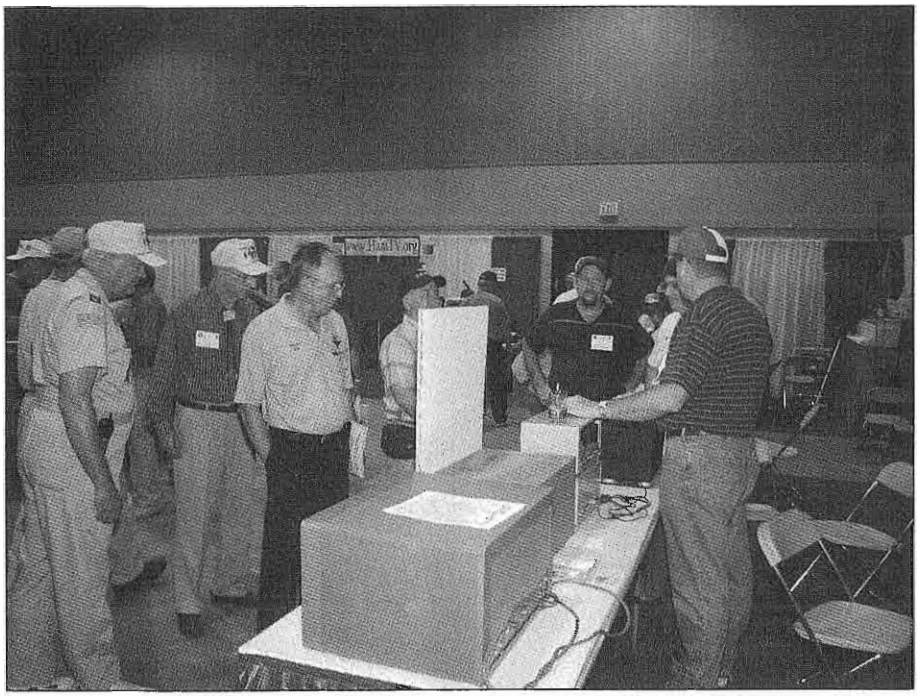

Figure2. Onlookers at the booth. *Photo by Grant Youngman, NQ5T.*

three-story building—an Alpha Delta shortened dipole for 40 and 80 meters (82 feet long). This was the lion's share of effort from our volunteers. Using non-penetrating bases weighted with concrete blocks for the three supports, we mounted it 20 feet at the center and roughly 5 feet at the ends above the roof. The roof was approximately 50 feet above the ground. The RG-8X coax from the antenna to the station was over 150 feet run up through an office window that overlooked the show floor, up a flight of stairs into a maintenance room and out a roof access hatch. The dedicated group of volunteers that raised the antenna consisted of Joe, N3JI; Tim, N5DWV; Carl, N6GJR and Grant, NT5Q.

Of all the tasks, we paid the least amount of attention to maintaining an operating schedule. This we need to correct for any further operations. We established and published over various reflectors the following frequencies: 3880 kHz from 6 until the band closes, then 7290 kHz for the remainder of the day. We did log, however, over 80 contacts, some of them were participating in Vintage Field Day that weekend.

For the booth, we had made an eight-foot by two-foot banner reading 'NOS-AM, QCWA Chapter 207.' Because all booths HamCom are uniform, no construction work had to be done. Each booth had two tables—one next to the aisle and the other next to the wall or partition. Our station occupied the back table, and we used the front table to display our vintage gear, literature for QCWA and AM in general, and the collage of pictures of many AM'ers and their stations. Jane Peters, Bob's XYL, made the very nice collage.

No special event station would be complete without QSL cards to confirm

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Collins 75A-4 Receiver Modification Notes

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1.0 Overview

The stock Collins 75A-4 is an excellent communications receiver, however, it makes sense to look back at this 1954 design, using the components available at that time, to see if better performance is available today. Many articles have been written to improve virtually every aspect of this receiver, owing to its remarkable popularity. The best and most useful modifications have to do with improved selectivity, detected audio quality and signal handling capability.

Probably the best modifications for one to implement are those described by Ray Osterwald, NØDMS and William Beatty, K7CMS. An additional modification to be considered involves the replacement of the second IF amplifier tank circuit (L27-C80) with a mechanical filter.

[Editors' note: Readers should note that the K5EF modification article is for greatly improving SSB performance. AM bandwidths will no longer be available with these changes.

The K7CMS is an important AGC change that is documented in ER for May 1990, page 27. The second IF modification is per November 1975 *Ham Radio Magazine*, pages 70 and 71 as written by Jim Fisk, W1DTY.]

This note considers the effect of these changes and how they were implemented by K5EF on two late model 75A-4s.

2.0 RF/IF Modifications

The RF Amplifier, First/Second Mixers were rewired per NØDMS's recommendations. It was necessary to trim resistor values to achieve the plate/screen voltages contained in Ray's notes.

continued next page

For example, the 100K resistors feeding the screen of the 6EA8 (pin 3) was changed to 27K to obtain the desired 123 volts. Likewise, it was necessary to trim the 3.3K resistor feeding the 6ES8 cathode follower (pin 6) to net the desired 151 volts.

[Editors Note: There is a typographical error in the original NØDMS article and the ER modification compendium. The plate load for pin 6 of V3, the 6ES8 should be a 3.3K 1 watt resistor in parallel with 2.2K 1 watt. Also the 100K screen-dropping resistor at pin 3 of V5, the 6EA8, should be 22K 1 watt. Metal film resistors are preferred for stability reasons.]

Installation of the cascaded mechanical filter opened new "opportunities". First, the insertion loss of the J-type mechanical filters is very high. My filters looked to have as much as 22 dB insertion loss. In the Collins design, the original filter's insertion loss is compensated by the first 6BA6 IF amplifier. Adding a second filter tanked the receiver's IF gain distribution and resulted in very poor sensitivity and improper AGC operation... in fact, I thought that the set was near dead.

In order to make cascaded filters a viable possibility, there are only two choices: better filters having a more reasonable insertion loss or the addition of a fourth stage of IF amplification. More amplification is not desirable, as that would involve the addition of either another 6BA6 tube or FET device.

I had considered adding the FET alternative and obtaining its required "plate voltage" by modifying the 6AQ5 audio amplifier stage. That modification would have involved removing the tube's fixed grid bias, inserting a zener diode into the 6AQ5 cathode circuit and using the voltage developed across the zener to provide both cathode-developed bias for the 6AQ5 and a low voltage source for my FET amplifier. Fortunately, the new Collins torsional-mode mechanical filters have exceedingly good specifications and insertion losses well below 5 dB. And better still, Dave Curry markets a line of torsional-mode filters that have the same appearance as the original J-type devices and plug into a standard 9-pin tube socket.

Therefore, my receivers have two of Curry's 2.5 kHz filters installed in cascade, with the new filter effectively replacing L27-C80 per the techniques describe by Jim Fisk in *Ham Radio Magazine*. Note that V8 must be series fed with a new LC network tuned to 455 kHz. In Jim's original article this network consisted of a 2 mH choke paralleled by a 63 pF capacitor. I used what was in the "parts stock" and made sure that this network was tuned on the nose for 455 kHz.

Other small changes were made to assure a bit of excess IF gain (to allow compensation for tube aging) remained in the design. Those changes included the removal of C-139 and the well-documented change of R50 to 68K.

[Editors note: This change is covered in the ER modification compendium.]

3.0 AF Modifications

To effectively eliminate the usual noises and pops from my elderly radios, I replaced all of those pesky mica-coupling capacitors. I found several leaking 0.1 tubular capacitors in my first set and made the decision to simply replace them all.

[Editors note: Audio quality is improved because the receiver no longer has leaky coupling or bypass capacitors that change amplifier bias voltages.]

Next, I installed the K7CMS modifications. In testing, one set needed to have C87 reduced to 5 pF, as indicated by K7CMS, while the other did not.

4.0 Results

The modified 75A-4 performs unbelievably well. The audio quality is 1000% improved over a stock 75A-4. The cascaded filters work well and provide what is as near to brick-wall selectivity

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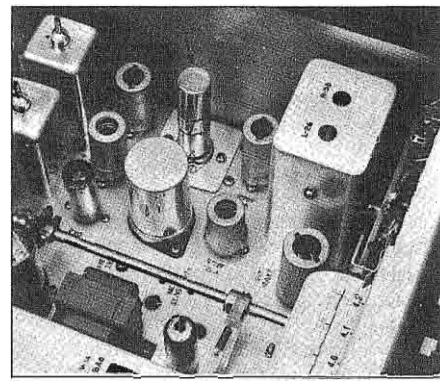
Increased Selectivity For The Collins 75A-4

by Jim Fisk, W1DTY

The ultimate skirt response of the 75A-4 selectivity curve can be improved considerably by replacing the second 455 kHz IF amplifier tank circuit (L27-C80) with a 3.1 kHz Collins mechanical filter (F455J31) as shown in fig. 1 (modification suggested by W4ZKI). Since most amateurs who use the 75A-4 for SSB operation have replaced the original 3.1 kHz filter with a 2.1 kHz filter, the 3.1 kHz unit is seldom used. If a 3.1 kHz filter is not available, a 4.0 kHz filter (F455J40) will still provide a noticeable improvement in skirt response. The L27-C80 tuned circuit is in the IF can next to the filter capacitor, C94.

Remove the bottom panel of the receiver, disconnect all the leads which go to the L27 IF can, and remove the two retaining nuts (don't discard the IF can—you may want to restore the receiver in the future). Cut out a small piece of thin aluminum, 1-3/4 inch (4.4cm) square, and punch a 3/4-inch (2cm) hole in the center for a 9-pin tube socket. Drill the two chassis-mounting holes and position the tube socket so pins 1-2 and 6-7 are aligned with them. Install the socket on the plate and fabricate a small brass shield about 5/8 inch (1.6cm) high. This shield is placed across the tube socket between pins 3-4 and 8-9 and soldered in place (see mechanical filter sockets A, B and C for reference). Ground all unused socket pins.



Filter installation in the Collins 75A-4

Wiring the new filter into the circuit is straightforward and requires only four mica capacitors and one inductor. (C201-C204 and L201 in fig. 1). Install the two 100 pF filter resonator capacitors at the input and output socket pins (the filter is symmetrical so either set of pins may be used as the input). Install a small terminal strip next to V8 for the junction of R45, R47, C70, C210 and L201. Delete C69 and R46 as they are not used in the new mechanical filter circuit.

An improvement in IF gain can be obtained by removing resistor R29 from the plate circuit of V6. This resistor swamps out the Q of L24 and increases the bandwidth for AM reception; it is not required for SSB or CW operation.

Reprinted from November 1975 *Ham Radio Magazine.*

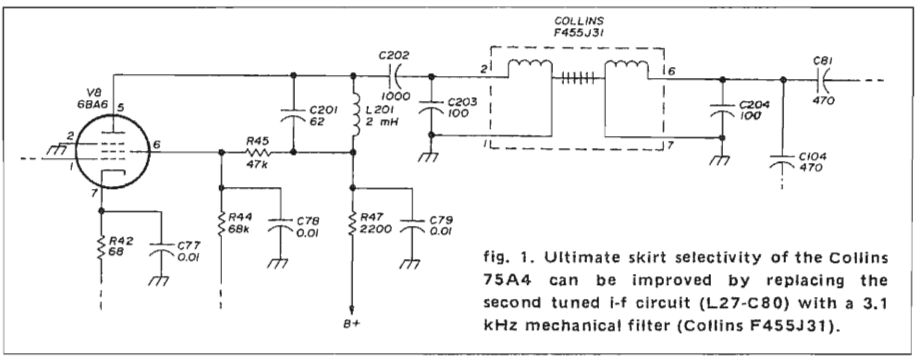


fig. 1. Ultimate skirt selectivity of the Collins 75A4 can be improved by replacing the second tuned i-f circuit (L27-C80) with a 3.1 kHz mechanical filter (Collins F455J31).

as I had ever hoped for. Frankly, in years past I never operated my 75A-4s for long periods... an hour or two at most... simply because the audio was so lousy. Now, it can stay on day and night! It is amazing just how dead quiet the set is without an antenna connected (actually, I spent a bit of time trying to figure out what was wrong... it was almost too quiet!) and how signals seem to just pop out where before they were awash in internally-generated noise.

5.0 Troubleshooting

The following voltage measurements may prove helpful to someone trying to troubleshoot his set once the modifications have been made. All were made using a digital voltmeter with the radio in the SSB mode, AGC selected for "Slow", RF Gain set for maximum level and the band switch set to 20 Meters. Initially, I found that the first RF Amplifier's plate voltage was much lower than expected. The cause was an out of spec 2200-ohm resistor and another leaky 0.01 ceramic bypass capacitor. While minor variations in voltage measurements should be expected, any voltages found outside of a 10% tolerance should be investigated. ER

V-2 6GM6 RF Amplifier
Plate (pin 5) 169v
Screen (pin 6) 110v
Grid (pin 1) -1.15v
Cath (pin 2) GND

V-3 6ES8 1st Mixer
Plate 2 (pin 1) 59v
Grid 2 (pin 2) 6.1v
Cathodes (pins 1&8) 6.29v
Grid 1 (pin 7) 0.0v
Plate 1 (pin 6) 150v

V-4 6EA8 2nd Mixer (Pentode Section)
Plate (pin 6) 191v
Screen (pin 3) 121v
Grid (pin 2) 0.0v
Cath (pin 7) 2.85v

V-5 12AT7 HF Oscillator
Plate 1 (pin 1) 160v
Grid 1 (pin 2) 0.0v
Cath 1 (pin 3) 1.55v
Plate 2 (pin 6) 157v
Grid 2 (pin 7) 0.0v
Cath 2 (pin 8) 1.81v

V-6 6BA6 1st IF Amplifier
Plate (pin 5) 166v
Screen (pin 6) 60v
Grid (pin 1) -1.07v
Cath (pin 7) 0.1v

V7 12AX7 Q-Multiplier
Plate 1 (pin 1) 168v
Grid 1 (pin 2) 0.0v
Cath 1 (pin 3) 1.61v
Plate 2 (pin 6) 172v
Grid 2 (pin 7) 0.0v
Cath 2 (pin 8) 1.61v

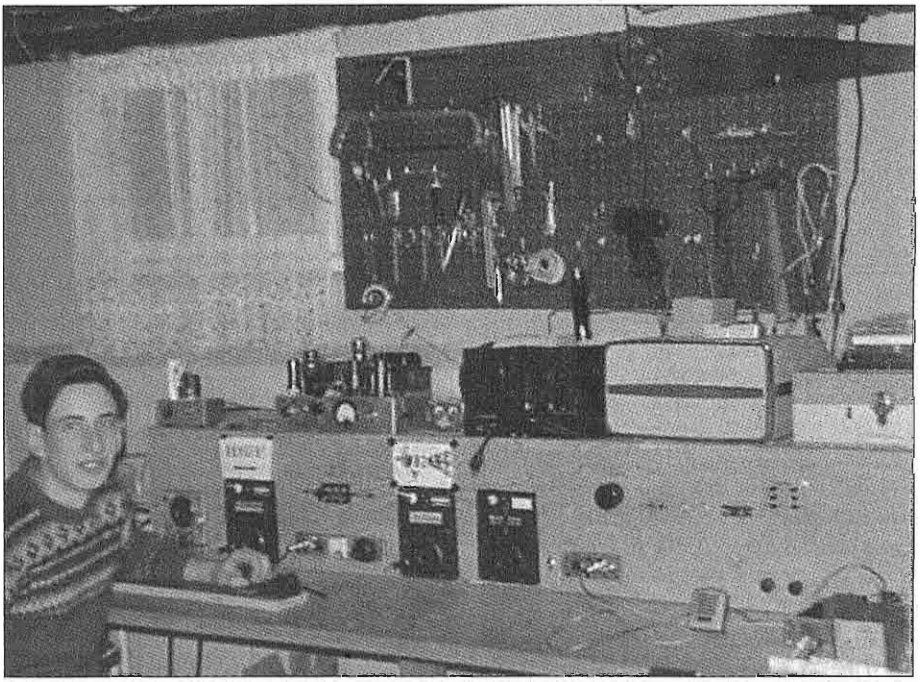
V-8 6BA6 2nd IF Amplifier
Plate (pin 5) 169v
Screen (pin 6) 64v
Grid (pin 1) -1.26v
Cath (pin 7) 0.62v

V-9 6BA6 3rd IF Amplifier
Plate (pin 5) 161v
Screen (pin 6) 67v
Grid (pin 1) -0.16v
Cath (pin 7) 1.07v

V-11 12AU7A Product Detector
Plate 1 (pin 1) 110v
Grid 1 (pin 2) 0.0v
Cath 1 (pin 3) 3.75v
Plate 2 (pin 6) 56v
Grid 2 (pin 7) 0.0v
Cath 2 (pin 8) 3.69v

V-21 6BA6 AVC Amplifier
Plate (pin 5) 162v
Screen (pin 6) 69v
Grid (pin 1) 0.0v
Cath (pin 7) 1.04v

Jeff Covelli, WA8SAJ, at one of his operating positions. He is well-known for his repair and restoration work on vintage gear.



David Fein, WB2KRS, in his first hamshack back in the '50's. Note the Command sets built into the plywood console. Those were 'the' days!

The FU-40 Exciter

by Howard Hood, WA7QQI
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I like to spend part of my Sunday afternoons browsing through my collection of old ham radio magazines. One weekend as I was going through my stack of old *CQ* magazines from the 1940s, I ran across a advertisement that stopped me (see fig 1). It was from the Burstein-Applebee company in a *CQ* magazine from 1948 and it advertised a 10 to 80 meter transmitter kit rated at 25 to 40 watts. I paused at this point because I remembered something, minus the meter and plug-in, that sure looked like the B&A kit. I located the chassis in a box of junk and contacted the former owner. Yes, he remembered it and after a lot of searching I had the original instruction sheets in my hand. A strip of tape across the bottom of the first sheet gave the company name—Burstein Applebee.

Information gathered from various sources indicated that parts kits for the exciter were available from several suppliers, including Radio Surplus Corp and McElroy Mfg Corp, in the 1946 to 1947 time frame. B&A does not show up until 1948 according to my small collection of *CQ* magazines. On the front page of the instruction sheets there was a block of writing covered by that B&A label tape. Using a bright light behind the sheet I was just able to make out Radio Surplus Corp toward the top of the block. Evidently B&A acquired the parts stock for the transmitter from Radio Surplus Corp and sold kits under their own name. The Radio Surplus Corp data refers to their kit as the FU-40 as does B&A in the 1948 advertisement.

As you can see from the advisement the FU-40 was offered by B&A in several partial kits. You had a choice of the foundation package which included the rack panels, sockets, spacers and four tuning units for $9.95. For another $9.31 you could get a kit of all the remaining parts except for the power supply and tubes. Another three bucks, from other advertisers in the same issue, got you all the tubes.

The FU-40 is a low power transmitter for the 10 through 80 meter bands that makes use of the Series Coil Units (Tuning Units) of the BC-610 (see fig 2). The exciter is constructed on a series of panels and spacers using open frame construction and was intended to be rack mounted. The front panel is 5.25 inches by 19 inches and contains the 0-200 mA meter and meter switch. The tuning units slide through the front panel to a 2.5 by 10 inch coil mounting panel located on spacers 4.5 inches behind the front panel. The 4 by 17 inch rear panel is also supported by spacers and is 7.25 inches behind the front panel. All panels are constructed of aluminum. The rear panel contains the antenna jacks, keying jacks, power jack and tube sockets. The 807 amplifier tube is located on a mounting bracket parallel to the rear panel and in a horizontal position (see fig 3).

The transmitter consists of only three stages, a 6AG6 xtal or ECO oscillator (switch selectable), and a 6L6 Buffer/Doubler stage followed by an 807 amplifier (see fig 5). Band switching is accomplished by installing the appropriate BC-610 tuning unit and xtal. As mentioned above the oscillator can be crystal controlled or run as an electron coupled oscillator with strong

Figure 1. Burstein-Applebee advertisement from September 1948.

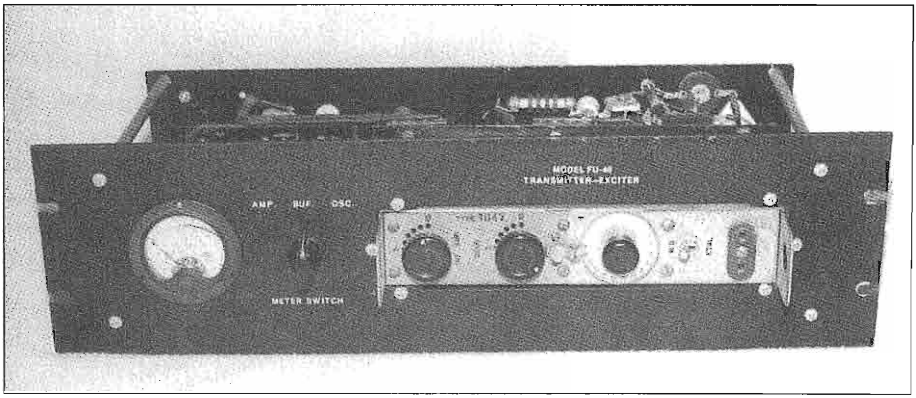

Figure 2. FU-40 Exciter front view with BC-610 tuning unit installed.

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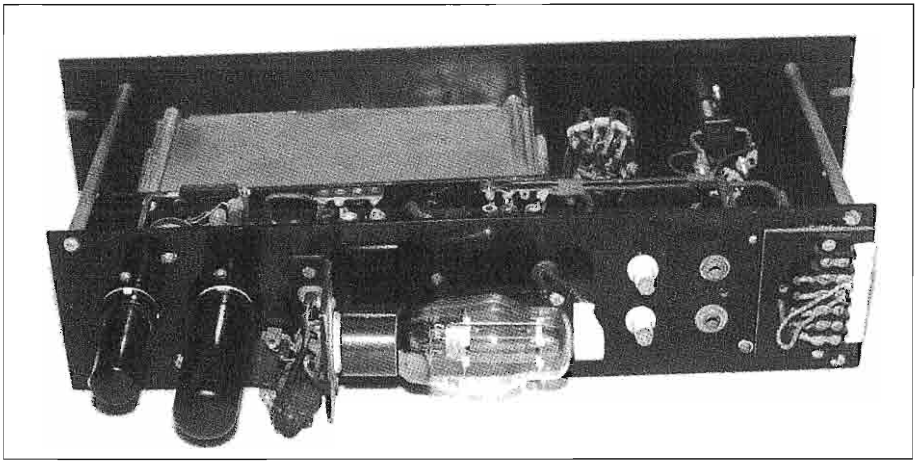

Figure 3. Rear view of the FU-40 showing tube installation.

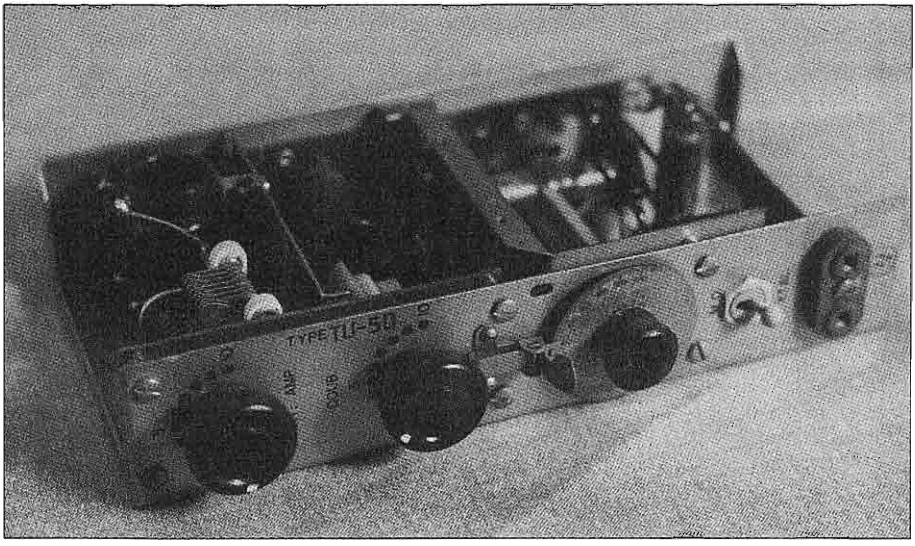

Figure 4. TU-50 (20M for the FU-40) tuning unit from BC-610.

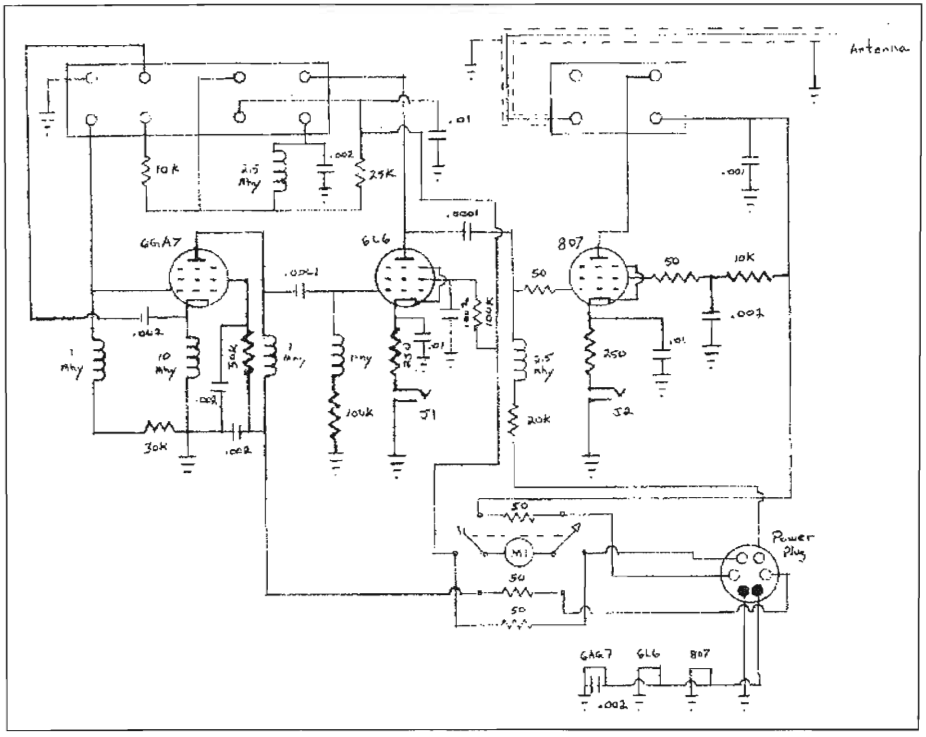

Figure 5. Schematic for the FU-40 exciter.

harmonic output. The plate and screen currents of all stages are switch selectable and can be read on the front panel mA meter.

Power out of the FU-40 varies from 25 to 40 watts depending on the band selected. The output is link coupled from the 807 amplifier. No neutralization is required.

The 6AG6 tube is used in the FU-40 xtal/ECO stage rather than the 6V6 of the BC-610. This allows the suppressor grid to be connected to ground, maintaining the shielding effect of the screen grid and obtaining better oscillator stability.

The BC-610 Tuning Units or series coil units (see fig 4) are the unique part of the transmitter. Since they contain complete tuned circuits they allow for fast band changing and all adjustments can remain as last used.

The frequency ranges specified for the unmodified units will not be correct when used with the FU-40. The original BC-610 amplifier stage used two 807 tubes in parallel and capacity coupling. When a single 807 and link coupling are used the unmodified tuning units will be higher in frequency.

Since the BC-610 used 2.0 to 3.4 mc xtals, more modification of the tuning units is necessary to allow use of 80 or 40 meter amateur xtals. This is done by removing turns from the oscillator cathode coil. In order to maintain better frequency stability of the electron coupled oscillator it is operated at half the frequency of the doubler. However, xtals of the same frequency as the buffer/doubler can be used for straight through operation. Care must be taken during tuning to prevent spurious or odd harmonic output. Keying of the FU-40 may be done at either the amplifier or the buffer sections.

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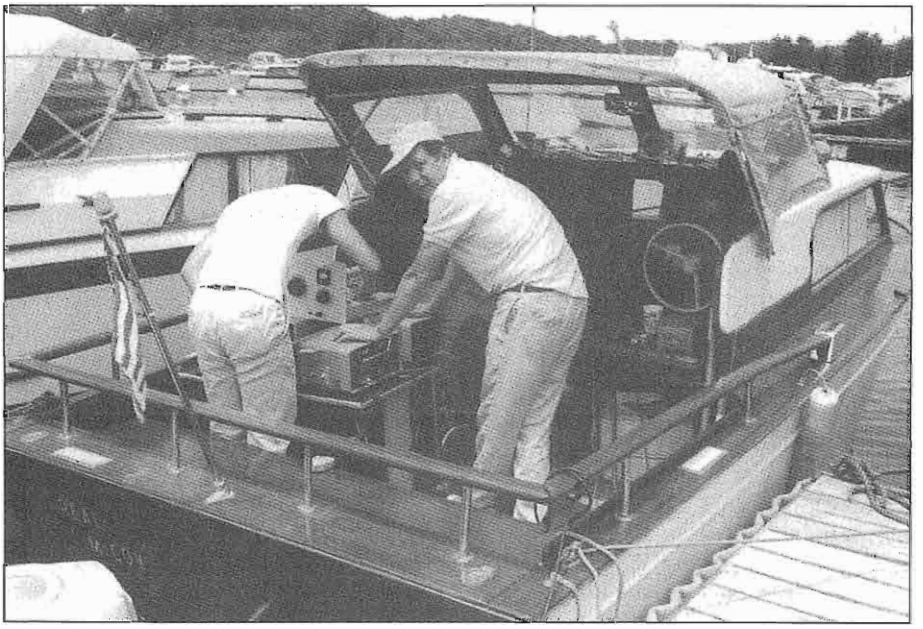

While clearing up my desk recently I found a letter from old friend, Silent Key, Lew McCoy, W1ICP, with these photos. I don't think I've used them before. The top photo was taken at ARRL Headquarters in 1950. The bottom photo was dated July, 1965. The other man in the photo is Robert DeBragga, W1RT.

VINTAGE NETS

Arizona AM Nets: Sat & Sun, 160M 1885 kHz at sunrise,75M 3855 kHz at 6 AM MST, 40M 7293 kHz 10 AM MST; 6M 50.4 MHz on Sat. at 8 PM MST; 2M 144.45 MHz, on Tue. at 7:30 PM MST.
West Coast AM Net meets Wednesdays 9PM Pacific on or about 3870kc. Net control alternates between John, W6MIT and Ken, K6CJA.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3860 +/-
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net controls are Andy, WA4KCY and Sam, KF4TXQ. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours.
Colorado Morning Net: An informal group of AM'ers get together on 3875 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0500 ET on 3885 + or - QRM.
Westcoast Military Radio Collectors Net: Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. www.hamelectronics.com/ghn
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet on Tues nights on 3805 at 2100 Eastern and on Thur nights on 3875. West Coast 75M net that takes place on 3895 at 2000 Pacific
Collins Collector Association Monthly AM Night: The first Wed. of each month on 3880 kHz starting at 2000 CST (0200 UTC). All AM stations are welcome.
Drake Users Net: This group gets together on 3865 Tuesday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, W8NS; Rob, KE3EE and Huey, KD3UI.
Drake Technical Net: Sunday's on 7238 at 4PM Eastern time hosted by John, KB9AT; Gary, KG4D; Jeff, WA8SAJ and Evan, K8SQG.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. NC is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745.
Midwest Classic Radio Net: Sat. mornings on 3885 at 7:30AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.
Boatanchors CW Group: 3546.5, 7050, 7147, 10120, 14050. 80 on winter nights, 40 on summer nights, 30 and 20 meters daytime. Nightly "net" usually around 0200-0400 GMT. Listen for stations calling CQ BA, CQ GB.
Wireless Set No. 19 Net: Meets the second Sunday of every month on 7.270 +/- 25 kHz at 1800Z (3760 +/- 25 kHz alternate). Net control is Dave, VA3ORP.
Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22.00 UTC on 7220. Net control is Dennis, VE7DH
Mighty Multi-Elmac 75 meter AM net: Every Tues eve at 8 PM EST. NCS is Mike, N8ECR
Nets that are underlined are new or have changed times or frequency since the last issue.

Home-Made Plug-in Coil Forms

by Bob Dennison, W2HBE
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When I was in sixth grade, I built my first regenerative receiver.(1) It covered the broadcast band and the 160M ham band. Only one coil was used and it was wound on a cardboard form that previously had held bathroom tissue. It would be a few years before I discovered plug-in coils and shortwave radio. At that time, several manufacturers offered complete sets of pre-wound coils. Usually there would be four coils to cover the popular shortwave bands. These were usually meant to be used with a 140 pF tuning capacitor. They also offered two additional coils that provided coverage of the AM broadcast band. If you are curious about plug-in coils, I suggest you read the excellent article by N6DM published in ER(2), it covered all aspects of coil winding.

Recently, I felt the urge to build another regenerative receiver so I began to wonder about which plug-in coils to use. I felt that they should be cheap and readily available. I solved the problem by fabricating my own plug-in coil forms. They are low in cost and easy to make using readily available material. See Fig.1. The coil form cylinder is made from a plastic pill bottle. The terminal end of the coil is taken from the base of a 6SN7 octal tube. These should be easy to find since 'jillions' of them were used in TV sets.

Start with the pill bottle. You must first remove the paper label that was put there by the druggist. Some of these labels may defy removal. If you have a friendly druggist, explain to him (or her) that you are a radio set builder and would he (she) please sell you three or four clean bottles. Your druggist will very likely give you the bottles free of charge.

Prepare the tube bases as follows. Wrap the tube in a paper towel and break the glass by striking it with a hammer. Using diagonal cutters, clip the wires that support the tubes elements. Using an Exacto knife, clean out the remaining glass and cement inside the base. Be careful—don't cut yourself. Unsolder the wires in the tube pins and clear away any solder remaining inside the pins. A small drill bit is helpful—I used a No. 59. Set the base aside—it will need more work later.

The main body of the coil form will be cut from the pill bottle. Both the top and bottom of the bottle must be cut off and discarded. Here's how I did it. Clamp a round rod of wood or pipe in a horizontal position in a vise. Slide the pill bottle onto this rod or pipe. Using a hacksaw, cut off both ends of the pill bottle. Using sandpaper, smooth off the cut edges. You now have the plastic cylinder which will constitute the main body of your coil form.

You are now ready to attach the coil form cylinder to the tube base. In my work, I ran into two different situations. In the first case, the plastic cylinder had an inside diameter slightly smaller than the outside diameter of the tube base. I scraped and sanded the top outside edge of the tube base. Then I sanded the inside bottom end of the coil cylinder. Eventually, I was able to force the pill bottle cylinder about one-eighth inch onto the tube base. Now all that remains to be done is to apply epoxy and wait for it to harden.

On the third coil form, the pill bottle had the same diameter as the tube base. Here, I merely epoxied them together. I don't know how long this bond will hold but so far it seems to do the job.

Incidentally, the Q of these coils is higher than that of the coils used in a couple of my previous sets—ranging from 16 to 50 % better. This I attribute to lower losses in the coil form body-translucent plastic—either polystyrene or polyethylene versus opaque bakelite

Fig.1. Low cost plug-in coil forms can be made from pill bottles and tube bases.

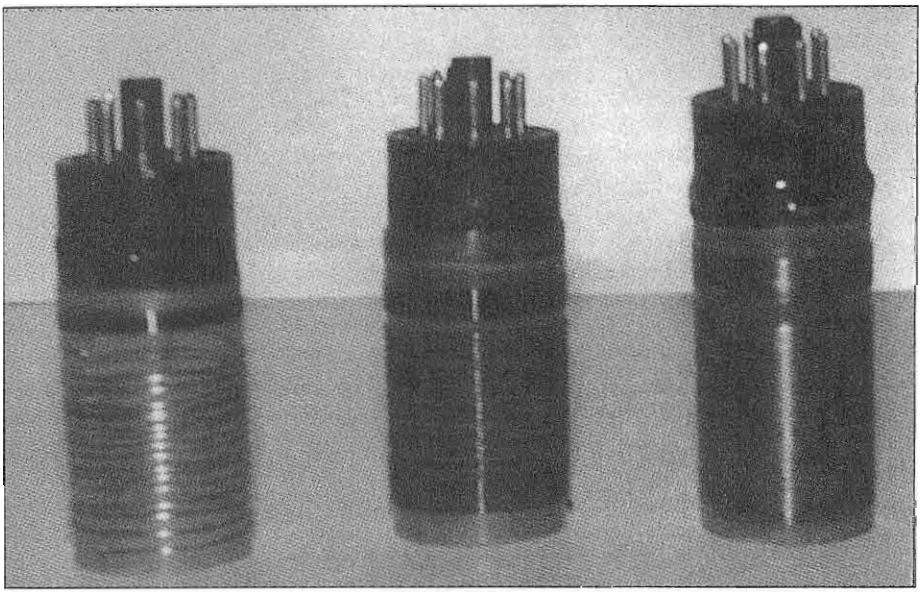

Fig.2. A set of home-made coils. Ticklers have extra turns which will be adjusted later.

derivative. Higher Q means better selectivity which is particularly advantageous in a simple regenerative receiver.(3)

It may sound like a lot of work but it beats paying five or six dollars plus postage for each coil form you need. And, there is the satisfaction and feeling of pride in a job well done. ER

Footnotes

1. "The Schoolboy's 1934 All-Electric Radio", Bob Dennison, ER, No. 5, Sept. 1989.
2. "Some Random Thoughts on Plug-In Coil Forms", Donald Meadows, N6DM, ER, No. 67, Nov. 1994.
3. "Regenerative Detectors", H.A.Robinson, W3LW, QST, Feb. 1933.

Thermal AM

by Ray Osterwald, NØDMS
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Everybody knows that a lot of strange, unexplained things happen on the bands. Periodic fades at exactly the same time of night, extreme long-range propagation of very low power stations, long-delayed echoes, and sudden complete fades of very high power stations are not unusual. Longtime listeners to the standard broadcast band are probably familiar with the program interference occasionally noticed between stations having no apparent harmonic relationship of their carriers. It was also noticed on the 160-meter band back when there were only AM carriers on the air. This effect is usually blamed on some kind of receiver defect, when in fact what is causing it is a little-understood mechanism where signals actually cross-modulate in the atmosphere. It has been referred to as the Luxembourg Effect, although I have not found a reference that explains where the name came from.

Cross-modulation is the transfer of modulation from a strong unwanted carrier to a weaker, desired signal. In a receiver, it is caused when a strong adjacent signal drives an amplifier into distortion and the amplifier becomes a part-time mixer. In the atmosphere, it happens in the ionosphere and is called ionospheric cross modulation. There is little recent research in the subject due to lack of funding and interest. The effect is easier to notice on the broadcast band because of standard carrier spacing and known power levels. I've always wondered what causes it, so when I recently came across the results of an experiment that was done in June 1950 by a broadcast engineer by the name of George Mather, my questions were finally answered.

The Experiment

KYW in Philadelphia and WRVA in Richmond are two longtime high-powered AM stations. KYW is a real old-timer and was the seventh station in the United States to begin a regular broadcast schedule when it went on-the-air at Chicago, Armistice Day 1921. It moved to Philadelphia in 1934. Probably by coincidence, the reporter who broadcast the Hindenburg disaster on June 6, 1937 worked at KYW.

In an experiment that would have made Nikola Tesla proud, George Mather obtained a temporary permit from the FCC to experiment with the ionosphere using the carriers of KYW at 1060 kc and WRVA at 1140 kc. Unchanged in over 50 years, both stations have 50 KW of carrier with unlimited hours of operation and directional antennas. The directional characteristics turned out to be ideal for Mather. By positioning a test receiver in Ottawa, he was able for KYW, to bisect the radio path from Richmond to Ottawa directly in the middle over Scranton, Pennsylvania. The gain of KYWs' antenna system provided some 113 KW of disturbing power at the center point. The map in figure one shows the path, and figure two is the path geometry of the test conditions.

Mather ran his tests in the small hours of the morning, 2:00 AM, Tuesday June 6th to Sunday June 10th, 1950. KYW and WRVA cut their programming exactly at 1:59 AM. KYW operated with a 100-cycle tone at 98 percent modulation, four minutes on and one minute off until 2:15 AM. WRVA ran carrier

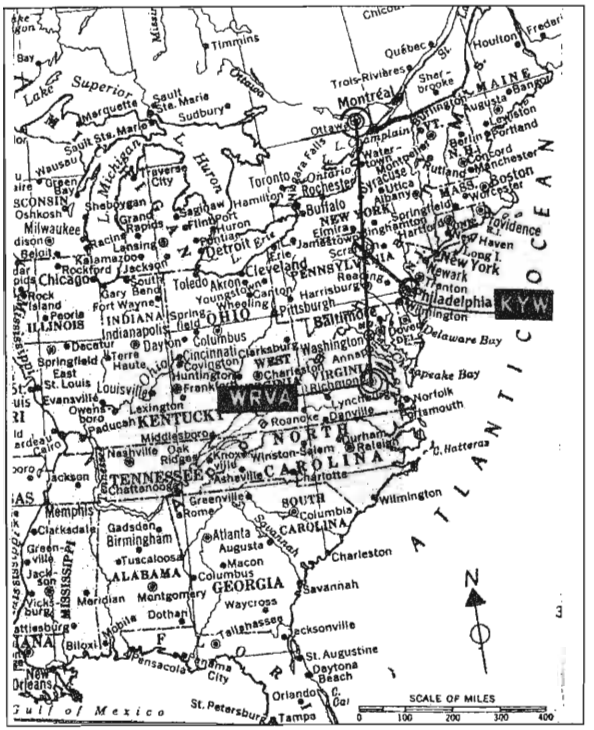

Figure 1. Map of eastcoast showing locations of KYW and WRVA radio stations.

only on June 6 and 7, and ran a 440-cycle tone at 30 percent on the 8th, 9th, and 10th. In Ottawa, Mather set up a wave analyzer tuned to WRVA at 1140 kc. A wave analyzer is an instrument used to determine the frequency components of an audio waveform. It is basically a very selective tunable filter attached to a voltmeter. Its purpose was to measure the amplitude of the 440-cycle tone and the amount of transferred 100-cycle tone from KYW. He also had a second receiver set up to measure the WRVA field strength in Ottawa. This test was only possible at night. During nighttime, the severe daytime absorption of broadcast band signals nearly disappears and the ground wave field is greatly reduced. Propagation via the ionosphere then becomes possible.

The experiment pretty much proved the existence of ionospheric cross modulation. The 100-cycle tone at KYW was detected on the WRVA carrier all five nights, and was strong enough to be heard in a speaker and detected with the analyzer. Mather determined that WRVA was cross-modulated between .6 and .75 percent by the tone at KYW. The transferred modulation was affected by normal fading, and the transferred tone disappeared at the same time that KYW cut modulation. Stations adjacent to WRVA were examined with the wave analyzer and found to be free of 100-cycle modulation. In addition, the instrument found no other modulation on WRVA other than 100 cycles.

How it works

When molecules in the atmosphere are bombarded during daylight hours by high-energy radiation from the Sun, positive and negatively charged particles are released from their orbits around the nuclei of gas molecules. This is how the gas in the atmosphere is "ionized" into layers and becomes conductive. Radio waves reaching the densely ionized layers are reflected like light across a mirror. If the layers were thermally cool and perfectly reflective, there would be very little absorption of the radio wave energy. This is rarely what happens because the ions are colliding with each other at a frequency that depends on their thermal energy. The level of their thermal energy depends on what is going on 93 million miles away on the Sun. Essentially, when the thermal energy of the ions is high there are a lot of collisions and a lot of radio wave absorption.

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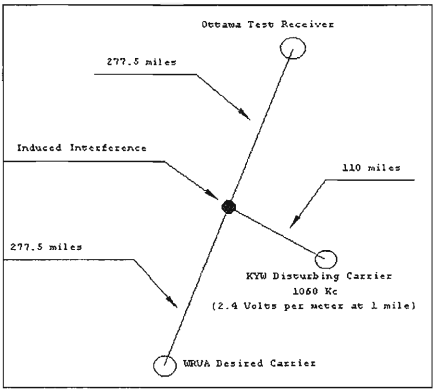

Figure 2. Diagram of Test Conditions.

When a radio wave intersects with the ionosphere there is an exchange of energy. Some of the electromagnetic energy in the wave is transferred to free electrons. As this happens, the total amount of thermal energy of the ion is increased. The ion collision frequency goes up and so does absorption of the radio signal. The passage of the radio wave sets up a disturbed region in the ionosphere.

If a second radio wave enters the disturbed region it transfers even more energy to the mix of ions. Absorption goes up further because of increasing thermal energy. However, if the interfering wave is suddenly removed, absorption of the first wave will go down. If this process is deliberately repeated you end up with ionospheric cross modulation. Figure 3 is a diagram of the interference conditions.

In the case of WRVA being interfered with by KYW, the process was slightly different because KYW was not pulse modulated. The 100-cycle audio modulation of the KYW carrier produced a voltage variation on the carrier at the 100-cycle rate. The voltage variation induced heating and cooling cycles to the ions at the 100 cycle audio rate. This is translated into periodic absorption of the desired WRVA carrier at 100 cycles, periodic amplitude variations, and hence thermal AM!

This is one of the reasons why operating low-band is so interesting. Many other phenomena exist down there that remain unexplained. See you on 160 this winter! ER

Some References:

The Proceedings of the IRE, September 1949

Proceedings of the Royal Society, #200, 1950

Electronics Magazine, September 1950

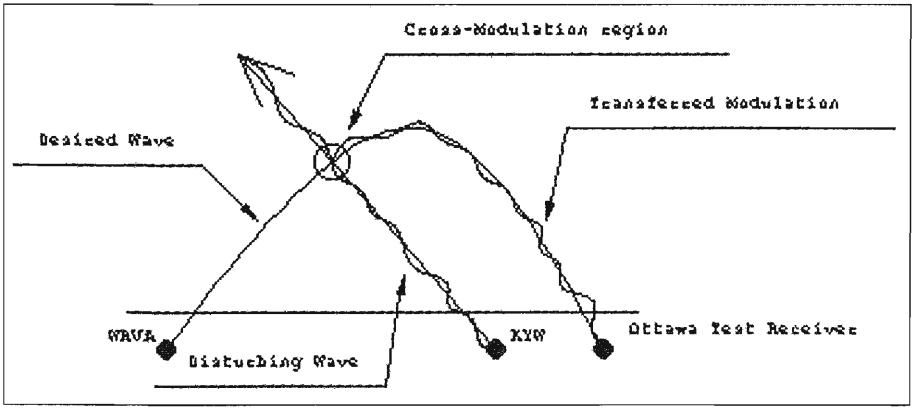

Figure 3. Diagram of Interference Conditions.

Radio Service in the Golden Age
1930's through the 50's

by Bruce Vaughan, NR5Q
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Episode 15

'White Lightning', 'Shine', and 'Madison County Penicillin'

One hundred percent, genuine, 'Honest to God' Ozark 'Hillbillies' are not as plentiful in our area as a stranger might assume. In the mid 1950's a radio repairman holding down my number one bench was about as close as they come. He was independent, quick to anger, honest, and fiercely loyal. Those qualities made up for whatever shortcomings he might have as a repairman. Dennis could be trusted to never do anything stupid to a TV. Sometimes he was a bit slow in finding the problem, but once the TV was diagnosed, his repairs were clean and efficient. This is more than I can say for many TV 'bench men' working in area shops at the time.

Dennis was a tall, slender, young man somewhere in his thirties—it was difficult to pinpoint his age because many of his miles had been traveled on a very rough road. He always had a lock of blond hair hanging in the middle of his forehead, and a hand rolled cigarette dangling from tobacco stained lips. When he spoke one immediately noticed the absence of at least half his teeth. Dennis was so slender he had trouble keeping his shirt tucked in his baggy pants. His appearance suggested that he had recently encountered a wild cat and come out on the losing end. I wanted all of my repairmen to keep a tool pouch and belt on while working, but Dennis was so skinny that the belt kept dropping to his knees. He finally gave up wearing it. I knew better than to make an issue of it.

I remember the day well-Christmas Eve, late 1950's. Let me explain the business climate at the time. Wal-Mart had not yet reared its ugly head. Sam Walton, the Wal-Mart founder, was still running his Variety store on the Bentonville Square. He was beginning to have dreams of branching out. Several variety stores in our area were about to become the forerunners of the giant discount chain.

I, with help of my wife and family, operated a TV sales and service store, three coin operated laundries, a camera store, and a Magnavox Home Entertainment Center. The TV shop, camera store, and Magnavox center occupied a 4500 square foot building on Springdale's south side. One laundry adjoined the TV store, another was located on the North end of Springdale, and the third laundry was near the center of our trade area.

Springdale was already starting to grow into a larger town than many older residents preferred. Almost 100% of area retail sales were made by small independent merchants before the giant discount stores arrived. You can well imagine the madhouse that existed in our store during the Christmas holidays. Everyone wanted pictures and movies of their Christmas holiday. At this time my camera store was the primary source of all photo supplies sold in our area.

continued next page

The Magnavox store was full of shoppers looking for TV and stereo sets. The laundries always did a good business, however when the weather turned bad it was unbelievable. The noisy, humid laundry rooms quickly turned into a mad house of tired, irritated women trying to get everything clean and dry for Christmas day.

The laundries were supposed to be trouble free—coin operated you know. However, you could be sure that at least a dozen ladies would overload washers or dryers and yell for help, five or six machines would fail half way through a washing cycle, change machines would shortchange customers, a soap machine would go crazy, and some six year old child, un-watched by his mother, would (a) get shocked when he stuck a hairpin in a 120 volt outlet, (b) fall off the top of the coke machine, (c) try to hitch a ride in the dryer drum, or (d) break a bottle of bleach, starch, or soft drink on the floor spreading broken glass everywhere. You could make book it would happen.

Cash sales of electronics and cameras were not the norm during the fifties. Filling out contracts and answering the phone kept my wife Mary busy. I had one maintenance man for janitorial work and laundry maintenance. In the shop four repairmen, and one delivery man had more than they could do. I, along with three other employees tried to keep up with sales.

We always had a large number of items in Christmas layaway, and many sales during November and December were Christmas presents scheduled for Christmas Eve delivery. It is easy to see how this was the most dreaded day of the year. KP in the Air Force was an easy, relaxing day compared to Christmas Eve. Our problems were compounded by the fact that TV was still relatively new, and customers felt that their TV and radio must be in their home and working on Christmas Day.

We opened our store for business promptly at 7:00 AM. The hours from 7:00 until 9:00 while busy were more or less organized. By 10:30 we began to lose control, and by noon the store was complete bedlam. Christmas Eve afternoons were a 'management by crises' operation. Pickup trucks filled our shop parking lot. Customers afraid they might miss a Christmas program loaded their TV in their trucks and brought them to the shop and stood in the way of everyone until their TV was repaired. OK, so I was not a good businessman. A smart merchant would have never allowed customers in the repair area. However, many things we accept today would have lost a customer back then. For example, to refuse a credit sale was thought to be a direct insult to the customer. You were in fact telling him that you did not trust him. That is one good thing the discount stores brought to the area—the idea of cash sales.

This pretty well describes the business climate, but before you can appreciate the stories about Dennis I must also acquaint you with the geographical, and historical aspects of NW Arkansas. Springdale is located in Washington County about 25 miles east of the Oklahoma line, and approximately 30 miles south of the Missouri line. Twenty miles east of Springdale you enter Madison County, referred to by many people of both counties as 'Booger County.' This is not considered a derogatory term, indeed a good many Madison County residents are proud of the name. As one travels east from NW Arkansas the country becomes more mountainous, and in many ways more primitive. Only a few years ago there was not a single stop light in some Arkansas counties. I do not know whether this is still true. The people of Madison County are noted for being slow to make friends, loyal once they become friends,

unafraid of a fight, and 100% American. You don't mess around with the people there. A relative of mine who still lives in Hindsville, the area settled by my ancestors, put it rather well when he said, "In Booger County you better be polite or ride a very fast horse."

Dennis and I both shared Madison County experiences. On the Christmas Eve in question, about mid-afternoon I made a fast visit to the shop to see how things were running. There must have been at least six men standing around whom I did not know. Dennis was working on a console TV for one of the waiting customers. He really looked under pressure. His hair hung down over one eye, the other eye was half closed because smoke from his ever-present cigarette was getting in his eyes. On the bench was a full cup of coffee, now cold, because he had not had time to drink it.

"How are things going Dennis?" I asked.

Dennis muttered a word I can't repeat and slammed his 1/4 inch nutdriver down on the table.

"Dennis," I said, "What you need is a water glass full of good ol' Madison County 'white lightning.'

"Boy, I'd shore love to have one 'long 'bout now," answered my repairman.

"So would I Dennis, so would I," I replied. "I haven't had a good drink since I left 'Booger County' and moved to Springdale. If I had a quart I'd get up in the morning and spend the day just "a sittin' and a sippin'."

With that verbal exchange I returned to the sales floor. Dennis knew I was just joking him. In truth, I have never tasted 'white lightning.' I always believed those tales about some moon shiners using old auto radiators for condensers in their stills—thus turning out 'shine with a large lead content.

Two incidents that day were enough to drive any man to 'white lightning' even though it might be laced with lead. I had received my first Magnavox color TV with a full remote control. The control was inoperative—not the TV but the remote unit. About 1:30 PM one of the towns more prominent businessmen came in and asked to look at color TV sets. I showed him my stock, about 20 different models. Of course he liked the one with the inoperative remote. I explained to him that the remote unit was inoperative and that the company had one on the way to me, but it could very well be a few days in coming due to the Christmas rush. He wanted to know if the missing control would affect operation of the set if he used it manually. I explained that it would not. He bought the set provided I could deliver it immediately. Now, I never enjoyed a time when I was in business when I was rich enough to turn down a sale.

"I will not only see that the set is delivered, I'll grab one of my men off the bench and deliver this set personally to your home within 30 minutes."

I rang up a nice sized check, over $650.00 as I remember, and immediately called to Dennis to give me a hand in the delivery. While driving to the newer home in one of our better housing areas Dennis and I discussed the 'white lightning' joking I was doing with him.

"Bruce, did you know a couple of those 'old boys' standing around in the shop were from Madison County. You might have hurt their feelings. You better be a little more careful when joking about 'Booger County.'

"No, Dennis, I didn't know," I replied. "You are 100% right. I was sending when I should have been receiving. I guess I'll learn to keep my mouth shut someday."

We arrived at the upscale home, the gentleman let us in, and showed us where he wanted to place the TV set.

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After putting it in a prominent corner of the living room, I checked out all of our channels, and explained the operation of all the front panel controls. All the while the wife of the customer sat on the sofa with a highball in her hand. Her eyes had a glazed appearance. We made a fast exit and returned to work.

I had just entered the shop when I was called to the 'phone. It was the customer's wife. I never realized it while I was in her home, but she was 'past all pain.' To be totally frank the old gal was 'drunk as a skunk,' you know, 'Crocked to the Gills' and now she was crying. "You forgot to bring the remote control with this TV," she said. "It's my Christmas present, and it is not working."

I explained that the set had arrived with a defective control and that one was on order, as a matter of fact I explained it in great detail—all to no avail.

For the balance of the afternoon she called every 20 minutes crying and wailing about her Christmas present that did not work. There is little more trying on ones nerves than a 'crying drunk.' I offered to pick up the set, and refund the purchase price in full, I offered to exchange for any other set in the house, I offered to loan her a TV, and let her choose any model after Christmas; I offered every thing I could think of. All my offers were answered by loud wails about her Christmas set that did not work.

The second disaster of the day occurred about 3:30 PM. I sent my delivery men to a town 25 miles from Springdale to deliver an 'almost new' trade-in—a beautiful monochrome console TV. Priced at $150.00 the monochrome sold almost immediately. It was scheduled for Christmas Eve delivery.

The hours passed, and deliveries were stacking up higher and higher. My delivery truck was almost 45 minutes late in returning. I knew I had a problem. Soon the two men came through the door looking far too solemn for this happy holiday. "What happened," I asked. "Well, we know you are going to be mad, but we had an accident," said the driver.

"What sort of accident?" I asked.

"Well it was this way—we set the TV in the back of the truck. We were so rushed and all I did not take time to tie it down. Just as we entered the town of Prairie Grove a dog ran in front of us. I hit the brakes and the set crashed into the cab of the truck. The picture tube imploded-and well, the set is a mess. The customer is on the way up here to talk to you. I think they will be happy with a full refund, and an apology, but I am not sure."

All this proves is that all idiots are not in institutions.

This day, like all days, finally came to an end. I was far too exhausted to play Santa that night, as was our family custom. The children were allowed to open gifts, throw paper all over, and play until far past their bedtime. Mary and I literally fell into bed; far to tired to even watch the evening news on TV.

It seemed I had just fallen asleep when the doorbell rang. I looked at my watch—5 AM. The doorbell rang again. By this time, Mary was wideawake. "Bruce, Bruce, wake up! Someone is ringing our doorbell. One of our neighbors must be in trouble, or maybe a death in the family. Get up! Get up!"

I crawled out of bed, and pulled on a pair of pants over my pajamas. As it was not yet daylight, I turned on the porch light to see who was there. I recognized the rugged looking fellow as one who was in the shop yesterday while I was 'kidding around' with my repairman. I opened the door. Before I could speak he handed me a paper grocery sack and said, "You owe me $10.00. You said you would like to have a drink so I brought you one. I was not about to put up any sort of argument with the gentleman. I handed him and ten-dollar bill

and thanked him profusely. He turned and made a fast exit and left in an older model pickup truck.

I closed and locked the front door, and opened the sack. Inside were two, one-quart fruit jars—each contained a perfectly clear liquid. I removed one of the jar lids and lifted the jar to my nose. The odor was a cross between rubbing alcohol, and 100-octane aviation fuel. I was not about to taste it. I went to the kitchen and stored my 'white lightning' in the top of our kitchen cabinet, as near the ceiling as possible. I wanted to make sure my youngest child could not get into it. I never gave my bootleg whiskey another thought.

Years later my wife decided to have a professional painter help her with some redecorating. She hired the painter to repaint the kitchen, including the inside of all kitchen cabinets. He was also to do all the walls and woodwork in the house. We had used the painter before, and knew he did a good job. Remember, this was many years ago. His price for the entire job was $200.00 labor—he would charge all the paint and material to my account at the local paint store.

The paint job turned sour from the beginning. The color of our kitchen cabinets was not what Mary expected. Typical of most men I could not see enough difference between the paint chip Mary had picked, and the finished cabinets. However, I was curious as to why two electrical outlet plates had been painted over filling the receptacle holes with paint. Also the wood trim paint in one room was not semigloss, but simple water based latex wall paint. Finally, after five days, the job was finished.

When I went to settle up with the painter I handed him a check for $200.00 as we had agreed on. He handed the check back to me and said, "Bruce make the check out for $180.00. I have a confession to make. I found your 'white lightning' supply, and drank it all while I was on the job. I figure I owe you at least $20.00 for the half gallon of moonshine."

One day a gentleman came into my shop with a very nice 21 inch GE console TV set that needed some minor repairs. He told me that he had driven over from Huntsville, a distance of thirty miles, to get his set repaired. He came to me because I was his nearest GE dealer. In such cases I always made an effort to do the repairs immediately, thus eliminating the need for my customer to make a return trip.

While I was servicing the GE, the customer and I got to 'swapping' stories about Madison County. You see, I could do this without fear of offending anyone because my name alone linked me to 'Vaughan Valley' one of the earliest communities in western Madison County. It is OK to tell funny stories about the area if you are a native.

I found out my customer was the Madison County, County Agent, a much respected office in our area. He told me that his wife was a nurse at the recently completed Madison County hospital. "There is not much goes on in the County that we don't know about," he said.

"Here's a good story, and every word of it is true," he said, as he began his next story.

Last Spring our rural mail carrier was making his rounds one Monday morning when he stopped at a roadside mail box out east of Huntsville. It was late spring and though the days were pleasant enough the nights had been rather chilly, sometimes near freezing. Just beyond the mailbox was a small creek, and beyond that the farm of a nice old gentleman who lived alone and farmed the little 80 acre farm. The nearest neighbor was almost a mile away.

It was such a pretty scene the mail carrier decided to turn off the ignition of his car, and step from the vehicle for

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a moment. He was reminded of his years on the farm when he was growing up. As he stood listening to the sounds of nature,the stream rippling over the shoals, birds in every tree, and a sound he could not identify. It was like the lonesome howl of an animal or perhaps a wounded animal. He decided to investigate. Working his way toward the sound he found it necessary to wade across the shallow creek and into the dense underbrush on the other side.

He soon found the source, and a horrifying scene it was. The elderly farmer had apparently been 'brush hogging' last Saturday when his tractor overturned on the creek bank. He fell under the whirling blade and it mangled his leg so badly that it had to be amputated. He had been trapped under the brush hog, badly injured, since last Saturday, a period of over 40 hours. Ever since Saturday afternoon he had been without food, without water, and spent two nights in near freezing weather. It was a miracle that he was still alive.

The mail carrier realized he could do nothing by himself, and hurried to the nearest telephone to summons help. The old gentleman was rushed to Huntsville's, Madison County Hospital where they amputated one leg, started IV's, gave him some blood, sewed up numerous cuts, and filled him with antibiotics. It appeared for a few days that the old fellow would survive, then his condition seemed to start a downhill slide. He developed a low-grade temperature that indicated some sort of infection was gradually taking the old man's life. All the newest miracle drugs did nothing to improve his condition.

Saturday night, two weeks after his accident, four old friends from his area decided to pay him a visit, and perhaps cheer up their buddy. They showed up at the little hospital with their fiddle, guitar, and some home cooked food. At first the Nurse on duty refused them entrance to the injured man's room. They plead with her, told her that it might be their last visit to the old fellow, and at last she consented. The rooms adjoining the old man's room were vacant, never the less, she reminded the quartet in a firm voice that whatever music they played for the patient must be soft and low. She also warned them that no matter what, their visit must be a short one, the patient needed his rest.

The visit began quietly enough. Soft strains of fiddle music drifted from the room. Occasionally off-key singing by one or more of the group could be heard at the nurses station. Gradually the singing became louder and the tunes faster. It was plain to see that the nurse must ask the visitors to leave. When the middle-aged nurse entered the room she found the group passing around a Mason fruit jar. All of the group were stomping their feet and clapping hands as the fiddler sawed off 'Red Wing' on his fiddle. It was easy to see the entire group was well on their way to feeling no pain. Her patient was sitting up in bed smiling broadly, and keeping time to the music by banging an empty glass against the bedside table top. He was, quiet obviously, 'drunker than a skunk.'

As a safety precaution she placed a call to the hospitals lone security officer, but the move was unnecessary. The four men were overly polite and left quietly. Each old fellow thanked the nurse for allowing them to visit and 'cheer up' their neighbor.

Soon after the group took their leave, the patient went into a sound sleep. When the nurse checked on him two hours later she found he was literally wet with sweat. His temperature had 'broken,' and when morning arrived his temperature was normal. By Sunday noon all the nurses were talking of the patient's miraculous recovery how-

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Radio Physics: A Beginner's Experience

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Our sixth-grade class was doing a unit on electricity. The teacher spent considerable time on Thomas A. Edison, the inventor of new electrical devices which changed the world. She encouraged her pupils to study more about him outside of class. At that time, just prior, to WW II, Edison symbolized one great result of unfettered American individualism when one's genius could prevail in science without government subsidy or university support. It was a time when Edison's achievements inspired emulation among young people who might still hope to create great things in their garage laboratories or in their back yards with nothing holding them back except probably a lack of funds. Thomas A. Edison had become a role model for young Americans.

Hollywood quickly caught on. Moviegoers could watch young Mickey Rooney do his Tom Edison role in a film showing a passionately inspired teenaged inventor. The movie, I think, was called "Young Tom Edison." Without question it was successful because some months thereafter Hollywood produced a sequel called "Edison the Man." Now Mickey Rooney had become Spencer Tracy who played a mature Edison.

With Edison as a model, our sixth-grade teacher had no trouble arousing her students' curiosity about that magic, man-directed force called electricity. Although Edison was the god head of her unit, she also had the wisdom to include in her educational image two other figures. There was Samuel F.B. Morse, credited with the telegraph's invention. There was also Alexander Graham Bell who invented the telephone. All three of these men had something in common which our sixth-grade teacher continually stressed, though in a gentle manner befitting the attention span of her young pupils. She pointed out that these men had imagination and intellectual curiosity, that they were motivated by an idealistic vision of a new technology's power to serve mankind. Moreover, all three were Americans.

All three of these inventors had something else in common. Their inventions used electricity conducted by wires. This made classroom explanations easy, except for Bell's telephone principle. This was hard to grasp because it involved voice modulation of an electric current. The teacher thus glossed over it. However, the principles of Edison and Morse were ideally suited to a blackboard diagram in the sixth-grade classroom. The teacher drew a picture of a battery with two wires coming from it. Next, she drew the picture of a light bulb and attached the two wires to it. Then she explained how the battery's electricity passed through the light bulb and then returned to the battery. The next day, she showed how Edison's use of electricity was tied to his invention of the incandescent light. As a classroom demonstration, a dry cell was hooked across a flashlight bulb. When the wires touched the bulb, it instantly glowed with life. For sixth-graders it

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was a dramatic example of electricity's mysterious power.

One student, a day or so later, brought to class a wooden breadboard, probably the end of an apple crate. On this he had mounted a D-cell flashlight battery held in place by nails which contacted the battery's positive and negative ends. A wire wrapped around each nail led to a flashlight bulb. One wire led directly to the bulb mounted in a porcelain fixture on the breadboard. The other lead's route to the fixture was interrupted by a switch. It was a strip of sheet metal. When pressed, it would contact the head of a nail driven into the board. Wire wrapped around this nail led directly to the bulb fixtures other terminal. Pressing the switch would close the circuit and make the bulb glow.

The teacher seemed flattered that her skill had evoked such enthusiasm in at least one of her pupils. She lavished praise and made this breadboard project the focal point of class discussion, pointing out that switching electricity on and off was the principle of Morse's telegraph. Her own enthusiasm in turn affected the other pupils. They crowded around the breadboard eagerly watching the bulb flash whenever someone pressed the switch. In order to give everyone a chance, the teacher rationed switch pressings to about five per pupil. Thus everyone got a chance to press the switch and make the bulb glow. The pupil who had produced the breadboard mentioned to the class that his father had helped a bit with advice and also had given him the porcelain fixture for the bulb. His dad had also said that with the switch you could send dots and dashes of Morse code, just like operators did on telegraphs and radios. The pupil thus became a classroom celebrity. His fellow pupils respected the new world of electricity that his breadboard had demonstrated. The teacher saw in him a powerful resource for developing her unit on electricity.

The teacher had been a bit hesitant about connecting the topic of electricity with the concept of radio, probably because neither she nor her sixth-grade pupils knew much about radio. Besides, Marconi was not an American inventor. She said that radio was a special use of electricity that scientists were still working on. She gently passed the buck by asking the pupil with the breadboard if he could find out more about electricity and radio.

The pupil's father was glad to address the class and, being a ham, was eager to share his enthusiasm for his hobby with his young sons peer group. In front of the class, he thanked the teacher for inviting him and proceeded to remove things from the cardboard carton that he had brought along. First there appeared a breadboard, quite different from the previous one with the battery and flashlight bulb. This one had completely different objects attached to it. From the carton next appeared some rolls of wire and finally a single headphone. The pupil's father first attached one wire to the iron radiator housing of the classroom's steam heater. Next, he walked over to a window and threw the other wire out of it. Then he clipped both wires onto the board. The class watched in awed silence while his fingers manipulated things attached to the breadboard. Finally he broke the spell, beckoning the teacher to approach. He pressed the headphone against her ear; and she exclaimed, "I can hear voices!"

The flashlight-bulb episode had generated enthusiasm, but now this new device, a crystal set with a tuned circuit coupled to the antenna, evoked near chaos. The sixth-graders bunched up

around the demonstration table. A few got to hear voices. The teacher was trying to organize the throng so that every pupil got a chance to listen—when the bell rang. History records few instances where sixth-graders have reluctantly left the classroom, but today was one of these instances. The teacher had to move quickly to offset her pupils' disappointment. Her voice was loud enough to command the attention of her chattering sixth-graders, yet its sound was soft though authoritative, like a loving mother instructing her children. She promised that the man would return another day to continue his demonstration. How could the man refuse without betraying the trust both of his son's peer group and of this friendly teacher?

In class discussion the following day, the pupil's father became known as the Radio Man, and the pupil himself became the object of admiration for having such a father. It was arranged that the Radio Man would return the next Friday. The pupils eagerly anticipated this coming Friday almost like Christmas Eve when happy surprises provided by elders capture young minds and emotions. The Radio Man reappeared in the classroom shortly after lunch time, again with his mysterious cardboard carton. At first the same breadboard appeared; the two coils of wire were hooked up as before. After some juggling with the cat's whisker, all was ready. The crystal set again produced voices in the single earphone. The teacher saw to it that each of her pupils previously cheated by the bell from hearing radio voices now got a chance to hear them. Soon all the pupils had experienced the breadboard crystal set's magic. Suddenly everyone assumed the act was over when the Radio Man disconnected the antenna and ground wires from the breadboard. He put it back into the cardboard carton, as if preparing to pack up and depart. What a glorious surprise it was when the Radio Man instead withdrew a different breadboard from the cardboard carton.

This other breadboard had more things attached to it. Two cylindrical vertical objects stood out. One was dark brown with wire coiled around it. The other object was made of glass, something like a light bulb, but of different shape. Its clear glass let one see inside where some wires supported a sheet-metal structure. The Radio Man next took from the carton two new objects. One of them looked like a cylindrical flashlight battery, but was much larger. The other object resembled a brick encased in cardboard. The Radio Man attached wires from these objects to the breadboard. He next attached the familiar wires coming from the steam heater and the window. The class again watched in awed silence while his fingers manipulated things on the breadboard; all the while he held the single earphone to his ear. Now and then a squeal was heard that varied in pitch. Finally, he once again beckoned to the teacher. She came forward and listened to the earphone. While the Radio Man slowly moved a control on the breadboard, she smiled and said both to him and to her class that now there were many more voices than before and even some music. This time the bell did not curtail the act; each pupil got a chance to listen and to move the control that selected the voices and magic. One pupil observed that this thing sounded just like the big radio at home.

After each pupil had gotten a chance to listen, the Radio Man, like a magician preparing for the next event, confidently pulled the brown cylindrical object from the breadboard and replaced it with

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another similar object which seemed to have less wire wrapped around it. Again, squeals of varying pitch, interspersed now and then with voices escaped from the earphone while the Radio Man made adjustments. Again, he beckoned to the teacher who listened for some minutes not with a smile this time but with the semblance of a frown. The Radio Man probably assumed that she had never before heard radio signals like these short and long beeps—that she could not possibly understand their meaning, much less explain them to her pupils, because one needed special training and practice in order to decipher their message. The Radio Man, perhaps in order not to embarrass the teacher, soon shut down the breadboard. But these short and long beeps had aroused the pupils' curiosity. He explained to the class that the breadboard had been picking up "shortwave" signals which one probably couldn't hear on the big radio at home. One pupil commented that the stuff on his folks' big radio at home never squealed like the breadboard. The Radio Man explained that these beeping "shortwave" signals were dots and dashes, just like the very first of all radio signals that man transmitted through space.

This aroused the sixth-graders' curiosity in two fronts. They wanted to know more about how signals send themselves through space and about how dots and dashes can send messages. The teacher was probably ecstatic, as this tied in beautifully with her prior attempt to explain Samuel Morse's invention. The Radio Man's next classroom visit a week or so later saw heavy use of the blackboard. He first drew the alphabet in a vertical column. Parallel to it in another vertical column he sketched the dot-dash equivalent for each letter. He explained how the dot sounded like a "dit" and how the dash resembled a "dah," just like the broken squeals the pupils and teacher had heard from the breadboard. Rather than trying to explain wireless propagation to sixth-graders, he passed the buck to higher authorities. He suggested to the teacher that she recommend outside reading to her pupils; on the blackboard he chalked a few references. He made clear that some of these would require parents' assistance, such as the *Encyclopedia Britannica*. His praise focused on one reference in particular: The *Radio Amateur's Handbook* published by the American Radio Relay League. Someone, perhaps the teacher, asked the Radio Man what a "radio amateur" was. He explained in some detail how a fraternity of American radio experimenters had eventually won recognition by their government as a group because of their contributions to radio science and public welfare. He than explained that joining this group required a license from the government. And he pointed out that to obtain this license an examination was required, but that radio amateurs (he avoided the term "ham") had fun building radios and communicating with other amateurs all over the world. He developed this latter point in some detail in order to offset the sixth-graders' possible disillusionment in having to pass a test before getting on the air. Also, he suggested that the teacher mimeograph his blackboard references and give each student a copy to take home for parents to read—he realized that sixth-graders were a long way from doing independent research.

The Radio Man told some stories about his radio friends thousands of miles away, about how they talked to each other with the code that he had sketched on the classroom blackboard. He showed the pupils some cards sent

to him by his radio friends. Each card had some letters and numbers boldly printed. He said the largest print was the stations call sign and that the smaller lettering gave the name and location of the operator and described briefly the operator's station. One card was from a country in Europe. The Radio Man then gave each pupil one of his own blank cards as a souvenir. His call was a W6 in front of three big letters and was printed in blue ink.

Inspired by the achievements of Edison, Morse, Bell and Marconi, my sixth-grade imagination only really caught fire when touched by the Radio Man whose devices had brought the miracle of electricity and radio directly into my sixth-grade classroom. My father, fortunately, understood my sudden enthusiasm for radio, as he at an age slightly older than I then was, had once built a spark station based on his 1912 Boy Scout handbook.

According to the Radio Man, one now needed a license to transmit on the air. The license requirements were passing a test in code and radio theory. In return, the government would issue a license and call sign. My father had been briefly active on the air just months prior to the Radio Act of 1912. He needed no license to build or operate a transmitter. He used his initials DCM as a call sign and knew nothing about the amateur-band frequency segments for which a transmitting license was now required. Such definite spectrum allocations intrigued my father because in his day spark operation didn't care too much about precise wavelengths.

After I described to him what the Radio Man had done in my sixth-grade class, my father helped me build a crystal set very much like the one he had once used. Precise adjustment of the cat's whisker of the crystal detector produced in the headphones no longer the screech of a rotary spark gap or the weak rasp of a Ford spark coil, but a mild hiss modulated by human voices and music. My father was almost as impressed as I was. Moving the brass sliding contact across turns wound on the cardboard cylinder would separate strong stations on the high and low ends of the broadcast band.

But the Radio Man had also shown us sixth-graders a wonderful radio with a small glass cylinder that sometimes squealed and received strange signals from far away—many signals that seemed very close together.

Such a device lay far beyond my father's brief radio experience which had never progressed into the realm of vacuum tubes. But his open mind readily supported my young enthusiasm. He brought home library books about radio, which included the *ARRL Handbook*. Unfortunately, he couldn't interpret this material for me because his background in radio was almost as limited as mine. Being a high-school teacher, he contacted a colleague in the science department and found out where local radio experimenters went to buy parts and compare notes. It was a learning experience for both of us.

One day my father and I had something to do in downtown Long Beach, California. Maybe the mission was to get me a haircut or a new pair of shoes. I forget. I remember only the surprise stopover at Scott's Radio Supply on Fifth Street. The shop's display window showed many radios and parts neatly arranged, but the greatest impact came from the many cards affixed to the background panels of the window's display. These cards, similar to those of the Radio Man, were printed confirmations of radio contacts with very exotic regions of the world. Each card bore in large

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type a callsign and in smaller print listed the name of a country. Each card also bore some handwriting too small to read through the display window.

Behind the counter inside was a friendly lady, perhaps in her forties, a bit corpulent with hair somewhere between brown and blond. Her manner impressed me as a patient mother who considered all radio aficionados as her children. She listened closely to my father. After the expert's calculated pause preceding an important decision, she suggested that a kit receiver might be his son's best introduction to the vacuum tube.

The kit was by Meissner, a regenerative receiver with one tube, a 1E4G. I clearly recall this tube—it was the very first vacuum tube that I ever held in my hand and plugged into a socket. The frosted characters inscribed on its glass case looked like "IE4G." only later did I learn that the "I" character was really a "one" and indicated the filament voltage. Research disclosed much, much later that this tube, a medium-mu triode, was not a product of RCA; I found its description only in a GE tube manual. This kit included a coil for the broadcast band.

As my father proceeded to consummate the purchase, the lady mentioned the need for batteries. She said that ordinary flashlight cells would power the tube's filament but that a source of higher voltage was also necessary. Seconds later there appeared on the counter a Burgess B-battery, 45 volts, about the size of two bricks stacked one atop the other. The lady said this battery should last as long as the tube—hundreds of hours. She was right. The 1E4G draws a maximum of four milliamperes of plate current.

Somehow the Meissner kit got put together. I don't recall how much my father helped out. I think I did most of the soldering, because first impressions are lasting, like the first whiff of resin-core solder smoke generated by a 100-watt iron whose copper pyramid tip far out-sized the socket pin it touched. The receiver worked well. Sometimes I'd fall asleep in bed with the headphones still on, having reveled in my new power to select different broadcast stations, a choice denied by the former crystal set.

My radio enthusiasm grew like a bean stalk until suddenly cropped by what happened on December 7, 1941. At eleven years of age, my hopes of hearing shortwave hams were dashed as was the possibility of becoming one. I had begun to think about buying extra coils for the Meissner receiver, financed by my magazine route, but now why bother? The war clouds darkening the world rained depression on the eleven-year old's vision of radio. But ether waves still awaited receivers to capture them. The Meissner Company, probably now involved in the war effort, no longer provided receiver kits, much less the coils to enhance these kits.

Young radio people, just starting out, needed some kind of written guidance. The ARRL Handbooks provided guidance, but most beginners avoided them because the text tended to assume a technical understanding that ignored beginners just entering the ballroom. These handbooks, year after year, were written in the correct, impersonal style of a research paper, a style that almost condescended to the uninformed reader and probably sterilized the germinating enthusiasm of many young beginners who simply didn't know what many of the words meant. Also, these young radio people could not hope to become active hams at that time because of the war. So they turned elsewhere.

Young radio people during the bleak war years found at least one effective

instrument tuned to their frequency. It was *Popular Mechanics Magazine.* This publication devoted three or four pages each month to a project that radio aficionados, even those with close to zero background, could grab onto. It was always a project that one could build at minimum expense, usually with resources available despite the war effort, a project requiring almost zero theoretical understanding. It was usually some kind of an audio gimmick or a radio receiver. The monthly project required parts usually available through salvage of junked broadcast receivers and perhaps from commercial stocks predating the war effort. But one project from this magazine remains unforgotten.

In my young experience, there had been the crystal set, then the Meissner kit. My third radio construction project came right out of *Popular Mechanics Magazine.* In one issue during the war, probably in 1943 or 1944, the magazine's radio column described a construction project that seemed most interesting. It was a TRF broadcast receiver built on a breadboard, powered by household AC current. It required four tubes—RF stage, detector, audio stage and rectifier. I wish I could remember the exact tube types; I know the RF tubes were either a 6J7G or a 6K7G. They were octals with the grid cap on top. The rectifier was, I think, a type 1-V, a diode with a 6-volt filament. The audio output tube may have been a type 41 or 42. A light bulb was the series dropping resistor for the filaments. I remember only that all four tubes had a glass envelope of the same shape. Perhaps a reader of ER with a Popular Mechanic's file covering the war years can fill in this memory gap—I'll gladly pay copying and postage expenses. The RF coils were hand-wound on paper cylinders, the cases of expired D-cell flashlight batteries, as the article recommended. I remember the chore of winding many turns of fine wire onto these forms. I had no access to junked radios as a parts source. Therefore, I had to turn elsewhere.

I needed capacitors, resistors, tubes with sockets, coil wire, a potentiometer, and a dynamic loudspeaker. My parts list, tediously drawn up, seemed to impress the lady at Scott's Radio Supply. Just months before war broke out in 1941 she and her husband had moved the business to larger quarters on Alamitos Avenue in Long Beach, California. She seemed eager to help the young radio buff to the extent permitted by wartime parts shortages. Perhaps she sensed that youngsters once touched by the radio mania would keep coming back as they grew older, when their knowledge, enthusiasm and pocketbooks would outgrow wartime restrictions. Anyway, she studied my parts list with serious attention. Fortunately, she could provide, from her prewar stock, the tubes the article called for and the three-gang tuning capacitor. Most resistors and bypass capacitors posed no problem, but when it came to the power supply filter capacitors called for in the article, she seemed depressed. She said sorry; she didn't have just the ones on my list. Perhaps she sensed my disappointment, a youngster's dream being shot down in flames. She said she could provide, however, capacitors that would work just as well (they were of higher capacity and a somewhat greater working voltage). Taking her at her word, I shelled out the proceeds of my magazine route plus a bit extra from my parents.

The three-gang tuning capacitor, the dynamic loudspeaker with audio matching transformer and most of the

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resistors, bypass, and blocking capacitors agreed closely with my parts list. When only differing values were in stock, the lady said they would work just as well. I trusted her and it turned out she was right. This project required more than one visit to her store. When I paid, she always had me sign the receipt form whose bottom half bore the imprint of a rubber stamp. Right below this imprint was a line on which she had me sign my name. The in-print said that the buyer hereby certified that these parts would be used only for repair or maintenance of existing radio equipment. These were war years, when America's consumer resources were limited or rationed in many categories. This radio had already long existed in my imagination, so there was no conscience conflict on my part.

Soldering connections on this *Popular Mechanics* project was a training session for the future. The resin-core solder smell from the earlier Meissner kit was quite different from the fumes of soldering fluid I used for this new project. The smell seemed much like the water of our town's public swimming pool which was heavily chlorinated. The solder I purchased from the local Sears store was solid lead with no flux core, but the salesman said that was no matter if I used Sears' soldering fluid with it. Resin-core solder was then in short supply. This receiver was built on a wooden breadboard, according to the article. The Sears fluid, probably diluted hydrochloric acid, worked fine and made for easy soldering.

This breadboard receiver with loudspeaker worked great while I owned it—I later traded it for a BB gun. The TRF circuit provided good selectivity on the broadcast band and also much better fidelity than I had experienced through the crystal set's headphones, and it didn't require frequent touch-ups of a regeneration control. This radio sat on a table beside my bed during the last war year. At night, I would turn the audio gain way down so as not to bother my parents. I can still hear the voice of Chet Huntley reporting the nightly news; his segment at 10 pm was introduced by a passage from Beethoven's Fifth Symphony, not by the three-dits-and-dah motif, but instead by the massive triumphant climax toward the end of this "victory symphony's" final movement. The power of this musical passage seemed to guarantee to all listeners, intuitively, that good and justice would prevail in the world and would overcome humanity's blunders.

This homebrew TRF broadcast receiver's speaker also announced to me the A-bomb drops in early August, 1945. Over this speaker came word of Japan's surrender and the end of World War II. It was also the end of my limited world of radio physics which had involved only receivers.

Now I made a vow to get licensed to transmit, sooner or later, a vow finally fulfilled in April, 1947 when the small white envelope from the FCC finally appeared in our Long Beach, California mailbox. That April day was sunny and clear, typical for Southern California. The small, white FCC envelope, smaller than the usual QSL card, the only piece of mail delivered to us that day, contained my first operator's license and station license bearing the call sign W6ZGM. I had calculated that my new call would probably lie in the W6 Y-suffix group. Although proven wrong, I didn't complain. ER

D-104 Boom Mic

by Mark Gilger, WBØIQK
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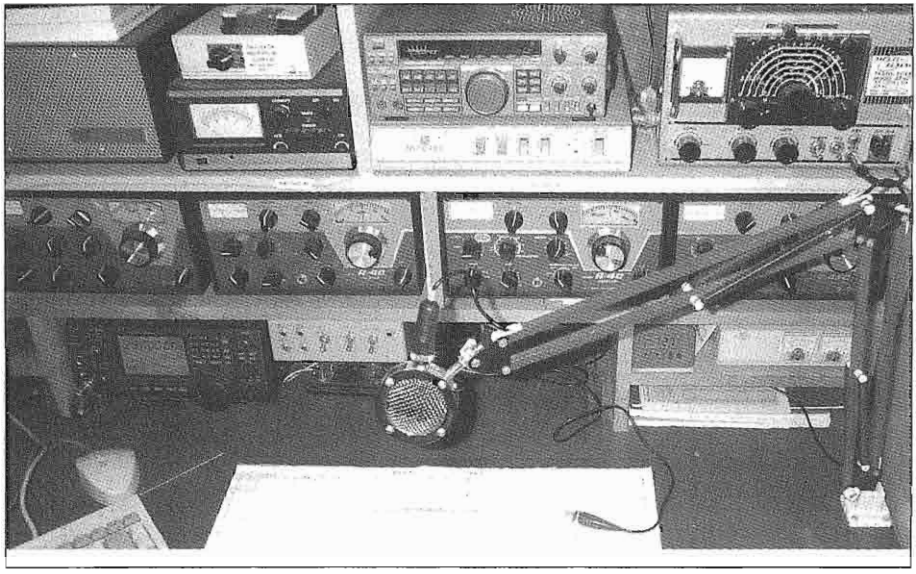
Doylestown, OH 44230
mgilger@brightdsl.net

I recently realized that I was starting to have neck pains from bending over my D-104. Even though my standard D-104 has a nice tall stand, it was still not tall enough to not have to bend over to talk in it. In the process of cleaning the garage, I came across and old desk lamp (Picture #2) which was headed for the trash due to a damaged light socket. Well a light went off, and I realized that this would make a perfect boom mic stand for the D-104 head (Picture #1). If you can locate a lamp with the type of hardware as seen in Picture #3, it will bolt right up to the side of the mic and it has the same curvature of the D-104.

Equipment & Parts needed:
1) Soldering gun
2) Solder
3) Drill & drill bit
4) Heat gun
5) Small & Large piece of heat shrink
6) Coax PL-265 rubber boot
7) Lamp assembly
8) D-104
9) Screwdriver
10) Two metal screws
11) Microphone plug
12) PTT push button latching switch or foot switch.

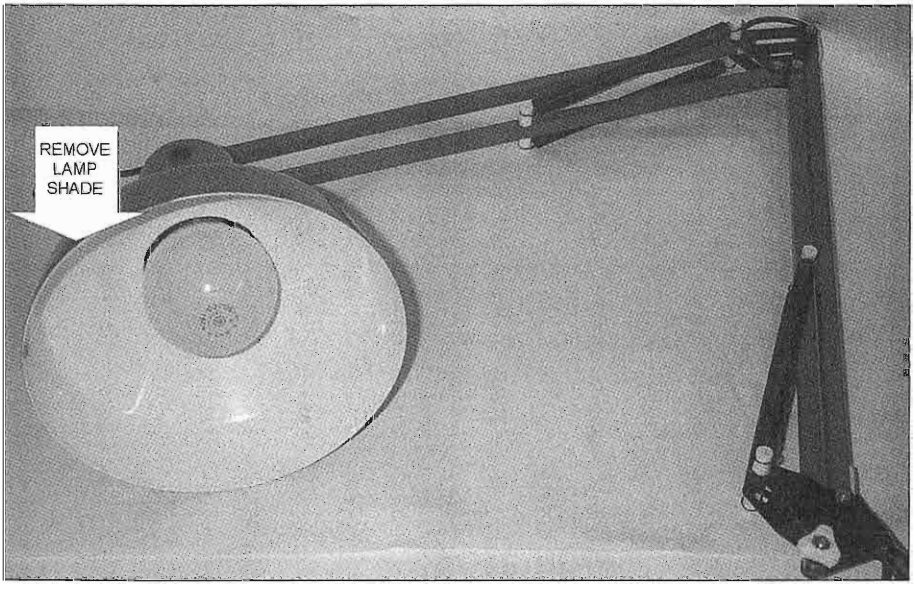
Steps to conversion:
1) Remove lamp and shade assembly from the arm assembly. On my particu-

continued next page

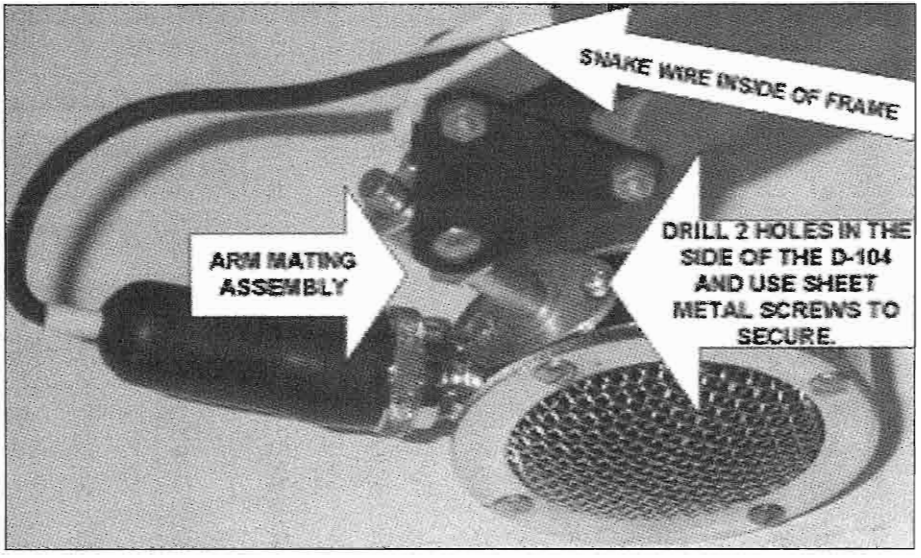


Picture 1.

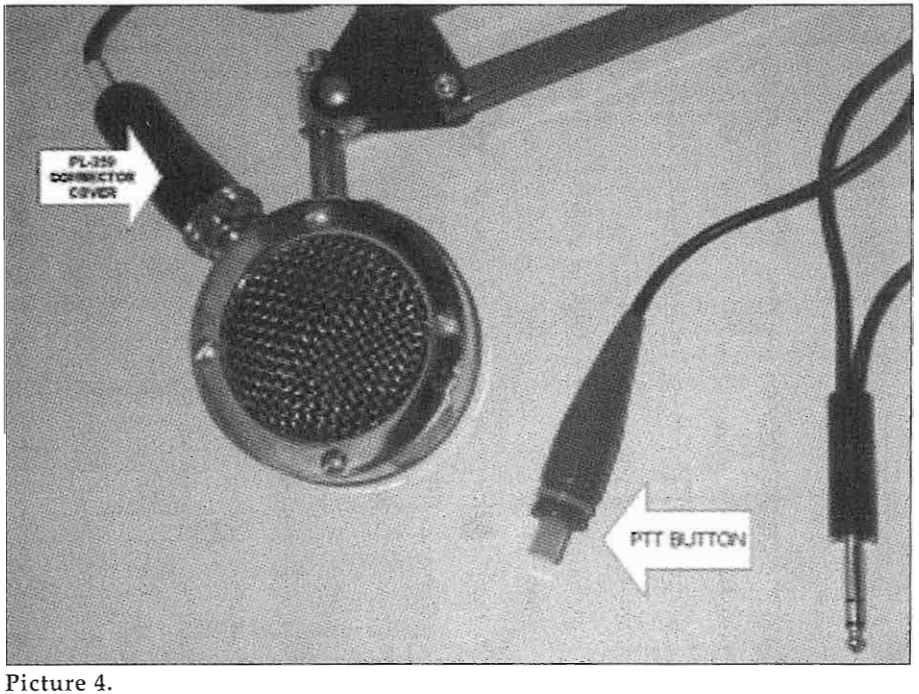
lar model, I had to drill out two rivets, which held the arm mechanism to the shade assembly.
2) Pull the AC wiring out of the arm assembly.
3) Remove the back of the mic head and pull the element away from the unit to prevent accidentally drilling into it in the following step.
4) Drill two holes, of the proper diameter to match up to the arm mating assembly that the lamp assembly was just removed from (Picture #3).
5) Fasten the head to the arm mating assembly (Picture #3).
6) Remove D-104 from its stand.
7) Put a small 1/4 - 1/2 inch piece of heat shrink on the wires that will be hooked up in the following step.
8) Solder shielded audio cable to the D-104 head. The shield should be connected to pin #1&2, the hot to #3. Pull up the heat shrink mentioned in step #7 and shrink with heat gun.
9) Locate a plastic boot for a PL-259 plug, and pull it up onto the wire and slide it over the mic plug. As an alternative to the boot, a larger piece of heat shrink can be used.
10) Snake new mic cable through arm assembly.
11) Install mic plug and solder cable to the appropriate pins.
12) Locate the new PTT button, or foot switch and solder it to the appropriate length of two conductor, shielded wire, or audio cable to reach the switch (Picture #4).
13) Pull the heat shrink up over the PTT wire and solder the remaining end to the mic plug.
14) Pull the heat shrink up over the PTT relay body and with a heat gun, heat up the heat shrink over the switch assembly. ER



Picture 2. Here what it the lamp looked like before the conversion. The conversion took several hours to perform, but it was well worth it.



Picture 3.



Picture 4.

The FU-40 Exciter from page 17

Power requirements for the exciter are 6.3 volts at 3 amps for the filament and 300 to 750 volts at 200 to 250 mA for the plate and screen voltages. It is recommended that the plate and screen voltages of the oscillator be very well regulated.

The tuning units recommended for the FU-40 are as follows: The TU-47 for 80 meters; TU-48 for 40 meter; TU-50 for 20 meters; and the TU-51 for 10 meters.

Typical conversion of the tuning units involves changing the frequency range by removing some or all turns of wire from the buffer/doubler plate tank coil and amplifier plate tank coil. The coils are then rewound as required and a two turn link installed. This is of course a very simplified description of the conversion process. Due to the scarcity of the BC-610 parts these days this process is a little disturbing.

As I cleaned and checked out the FU-40 I found a few things that were a little unusual. Most of the components used were post WW II except for the resistors. Almost all of these were the old dog bone type and had drifted in value. Size of the fixed capacitors varied greatly with some being quite large and with very long leads. The original builder must have had a good sized junk box! Construction, layout and soldering were very neatly done.

Probably my biggest surprise was the wire harness. It was constructed of number 12 insulated solid copper wire. It was laid out very neatly with laced runs and all bends were a sharp 90 degrees. A ground bus of number 10 bare copper wire ran the complete length of the rear panel.

Deteriorated wiring and components were replaced and a little touch-up painting done. The missing tubes and meter were replaced to complete the FU-40. Now came the problem of finding the BC-610 tuning units. Surprisingly, it only took a little looking locally and I was the owner of half a dozen tuning units. After all these years they are still around.

The FU-40 was a rather unique project. It was from the era of WW II surplus and yet it used a little 1930's wiring style and a mixture of old and new components. This little exciter will make a nice conversation piece in my collection of old ham gear.

For those interested in this type of exciter, the eleventh edition of the *Radio Handbook by Editors and Engineers* has a slightly different version of this RF unit. Included in the article is information on using a PE-110B for the power supply and a schematic for a modulator. ER

Military Radio Collectors Association Meet

The Military Radio Collectors Association will hold it's third annual meet at the West End Fairgrounds, Gilbert,PA,September 6th,7th and 8th 2002. The event will again beheld in conjunction with the Red Ball Military transport Annual Rally. The "offical" hours are 08:00 to 17:00. This is a golden opportunity for anyone interested in vintage military electronics. Activities include equipment displays, on the air operation, formal presentations and a swap meet.

See the MRCA webpage for complete information: http// www.milradio.org or contact:

Pete Hamersma, WB2JWU
PO Box 467
Holderness, NH 03245
Email pehamers@worldpath.net

Clatternet: 850 shift RTTY roundtable, on 10137 kcs USB Saturday, starts 0930-1000 Pacific time.

Radio Service from page 30
ever one problem existed they did not have before. The old fellow was still high as a kite. They knew he was getting some 'white lightning' from somewhere-but where. They searched his room high and low. They posted a guard to keep watch to see that no one slipped him any moonshine.

Monday morning arrived. While his physical condition was much improved and all vital signs normal, they had an inebriated patient. Finally the source of 'shine' was located. Before leaving, his friends had filled the plastic water pitcher with the 100 proof clear liquid. The aides were simply adding a little more ice and water to the pitcher rather than emptying it and refilling it.

By the following week the patient was discharged. He returned home and his recovery was better than expected.

From that moment onward 'white lightning' received a new name in the small town. It is now known throughout the area as Madison County Penicillin. ER

Summer Radio Fun from page 5
I can remember poking fun at radio ops running military radios with short verticals. Similarly powered stations running long wires and dipoles almost always overpowered them. I used to think low power military field radios and these antennas were a waste of time. I now have a new appreciation for these field radios when they are applied correctly. We've had a lot of fun with this so far this summer, and we're planning to have more radio fun before its over. ER

P.S.
Plan to operate AM International Discovery Weekend, September 27-29, 2002. Details in September ER.

QCWA Chapter 207 from page 8
each contact. Dutch, WB7DYW designed our QSL card using his computer. We had 200 printed up so that everyone that made a QSO with W5A will have one.

Many passersby at HamCom stopped at out booth and were intrigued with the old gear and the station. Many old timers began to reminisce about earlier days in their lives when they operated these fine old AM rigs. They enjoyed hearing AM again from the large 15-inch speaker placed next to the Mohawk. Newer hams that have never operated this mode stated how nice it sounded and asked many questions: Where can you operate AM? What do I need to get on? Are there any web pages about AM? And so on. The booth certainly raised the interest for AM, and we hope will lead to many newer as well as older hams joining in the fun. Having so many volunteers allowed us to always have two people man the booth and one to operate the station. No one with a question was turned away because of someone not being there.

AM operation is not everyone's cup of tea. But no one can deny that AM operation is growing. Locally here in the Texas area, the local frequencies are occupied quite a bit, and new call signs are heard almost everyday. Our special event station was one way to promote both the QCWA and AM. It is considered by the membership to be a success. We look forward to next year's HamCom. Look for us. ER

A complete index of the entire 13+ years of ER is available for viewing or downloading at the following website: http://www.qsl.net/n9oo

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Deadline for the September Issue: September 1

FOR SALE: Repair and restoration on all vintage equipment; 45 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

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

FOR SALE: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig. - $17.50 ppd. Bruce Kryder, W9LWW, 336 Sliders Knob Ave., Franklin, TN 37067

FOR SALE: Military Radio manuals, origs & reprints. List for address label & $1. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, rwdowns_wa5cab@compuserve.com

FOR SALE: Jennings vacuum capacitor - $95; new filament xfrmr 7.5v @ 21.5 amps - $45. Joel, W4SLH, 337 Compass Point Dr, Oriental, NC 28571. (252) 249-2344

FOR SALE: Super Pro 210SX in rare field HDQS portable rack, (2) 8" Pola spkrs & pwr sply, nice - $475. Ron, MI, (517) 374-1107

FREE: PU only, WW II junk: panel, racks & lots of parts, Central Indianna. Dave, K9HDQ, (765) 354-2884

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

FOR SALE: New Collins winged lapel pin, still have meatball version, either type - $5.95 + 75¢ s/h. W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029. (760) 747-8710

FOR SALE: Send SASE for large list of excess parts. publications, ham & test gear. K4AFW, 104 Glenwood Dr., Williamsburg, VA 23185

FOR SALE: Mohawk/Apache drum dial reproductions. email for details. Ron, AB5WG, ab5wg@mylinuxisp.com; (281) 491-7823

FOR SALE: Vintage Radio Service. We repair radios, record changers, radios home, auto, tube & transistors. 1930-1980. Ken Hubbard, KA9WRN, POB 792, Beloit, WI 53512. (608) 362-1896

FOR SALE: (2) National NC-173 rcvr, both will need little repair - $200 ea. Hoover, SC, (843) 726-5762

FOR SALE: Knight Kit T150 & R100 w/s meter & calibrator, both - $275. J. Kelly, POB 25, Long Lane, MO 65590

FOR SALE: DX-100 w/PTT, antenna relay, & SS rectifier; NC300 w/xtal calibrator, both - $450. J. Kelly, POB 25, Long Lane, MO 65590

WANTED: Any info relating to ASB-8 Airborn Radar set. Pete Deierlein, KD2LN, 6257 Perryville Rd., Chittenango, NY 13037. (315) 687-5456, p.deierlein@worldnet.att.net

WANTED: National NTE CW xmtr in working condx. I love National. Sylvia Thompson, 33 Lawton Foster Rd., Hopkinton, RI 02833. (401) 377-4912. n1vj@arrl.net

WANTED: National Co. emblems, escutcheons, logos from equipment, also National AN/WRR2 in working order. Don Barsema, 1458 Byron SE, Grand Rapids, MI 46606. (616) 451-9874. dbarsema@prodigy.net

WANTED: Wkg xtal controlled CB radio mobile or base, connot contain ICs or tubes. Rex Badger, KB9JAU, POB 4518, Jeffersonville, IN 47131. (812) 282-4824

WANTED: Tektronix T-192 storage oscilloscope volts/division knob #366-1646-00 or parts unit. Thanks! Robert, (303)988-2089, rgbdenver@att.net

WANTED: Still looking for manual, schematics, trouble-shooting, RCAF Rx by TMC R-5007A/FRR502. David Boardman, VA2DVD, (418) 877-1316, radioman@dbtubes.com or

WANTED: Heath SB series parts source; B&W 160,80,40 JEL coils; McElroy bug. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688, k9vky@arrl.net

WANTED: Dynamotors from WW II & Korean wars, looking for real small sizes, clean & unused. Bob Ryan, 1000 S. Gilbert St. Apt. 132, Hemet, CA 92543

WANTED: RCA AR88D, CR-88 or SC-88 rcvr w/cabinet & w/out mods. W8JKS, 1344 McDonald Hill Rd., Frankfort, OH 45628. (740) 998-4518

WANTED: TS-9 handsets for EE-8 field phones. **FOR SALE:** OS/8A oscilloscope, schematic, case, works - $50. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612

WANTED: Knight Star Roamer pwr sply for Multi-Elmac A-54 sply #PSA-500. George Elliott, #AP-5528, 10745 Rte 18, Albion, PA 16475.

WANTED: BC-348 ( ) rcvr w/following suffix, B, C, H, J, K, M, N, P,S, for collection. Ken Kolthoff, K8AXH, POB 215, Craig , MO 64437. (660) 683-5353

WANTED: ARRL CallBook, this year's or last year's or year before. How much? Bob Ryan, 1000 S. Gilbert St. Apt 132, Hemet, CA 92543.

WANTED: Basing diagram for 400 cycle Fork oscillator model 2003 by American Time Products. R. Ahmann, W7SC, 3932 S. Mesaview Ln., Boise, ID 83706

WANTED: Speed-X straight telegraph key, model with chromed oval base. Mike, VE7MMH, hardiem@intergate.ca

WANTED: Radios Master catalogs, pre vol #12th ed, all before 1947. R.V. Matson, W1CSO, POB 956, Lake Panasoffkee, FL 33538. (352) 568-1629

WANTED: SCR-522, other WWII radio for flying aircraft restorations. NIB or exc condx. Ian Abbott, KC6UPT, (209) 747-3639, ian@wildblueaviation.com

WANTED: TBX radio and/or accessories required by military radio collector. Ray, VK2ILV, ROBINSON@SHLRC.MQ.EDU.AU

WANTED: VLF coil sets H&J in good condx for HRO-50. Jack, W8JNH, OH, (937) 548-4110

WANTED: Older rigs & accessories. Brian Carling, AF4K, 117 Sterling Pine St., Sanford, FL 32773. http://come.to/AF4K/

WANTED: Looking for a Knight T-150A that I modified in the '60s. I added a one-tube reactance modulator behind the VFO. It was enclosed in PC board material which was soldered together. Does anyone have this T-150A? Ed Santavicca, AA8TV, OH, (216) 521-6093. aa8tv@aol.com

WANTED: High torque navy syncro, 90-115 VAC 60 cycle, 1/4" shaft. John, KS, (785) 436-2346.

WANTED: Manuals for HP411A RF voltmeter and 532B universal counter. Frank Hill, WA6SYI, 1313 Milton Ave, Walnut Creek, CA 94596. fdhill@attglobal.net

WANTED: Johnson KW matchbox in good condx. Dave, WD4PLI, CA, (818) 846-0617.

WANTED: Browning xmtr T2700 or S-9, working or not. Robert Martin, 111 Bancroft, Rochester, NY 14616. (716) 663-4182

WANTED: National radio pwr sply's for HRO, HRO-5 or SW-3. Bill Cabeen, KM6P, CA, (310) 829-7678, cabeen@ucla.edu

WANTED: The following 73 Magazine issues: Aug '62, Sept '62 & Jan '66. Walt Tukkanen, POB 254, Koza, Okinawa, Japan, 904-0021. billtukkanen@yahoo.com

WANTED: Copy of SSR-5A rcvr schematic from manual or inside rcvr top cover. Mike Bittner, 27215 Sunnyridge Rd., Palos Verdes, CA 90274. (310) 377-4797

WANTED: Fully functional w/manuals: Johnson AN/FRT505 xmtr, Swan F51 and FC76. Contact Ric at C6ANI@ARRL.NET

WANTED: Hallicrafter S16,17, or 18. Will pay top price for unit in good physical shape with all parts. CONNEEKLEIN@aol.com

WANTED: SB 104 main tuning knob. Ed Cuevas, (817) 222-5355 (Fort Worth), ecuevas@juno.com

WANTED: Globe Chief 90, DX-40 or similar. Pse state price and cdx. Thanks! Carl, KN6AL, 3290 6th Ave., 1E, San Diego, CA 92103. (619) 997-6146 kn6al@earthlink.net

FOR SALE: OEM Heath belts - $2.50 each shpd; or 10+ for $2 each shpd. Send check or money order. Roberta Hummel, 202 Midvale Dr., Marshall, WI 53559

FOR SALE: Manuals for old ham gear of the '30s to the '70s. Check WEB Catalog www.hi-manuals.com

FOR SALE/TRADE: Misc. parts, tubes, for tube gear. Sandy Blaize W5TVW, 40460 Edgar Traylor Rd., Hammond, LA 70403. ebjr@i-55.com

FOR SALE: Vintage equipment at the K8CX Ham Gallery Classified Ads section. Visit the largest Antique QSL Card Gallery http://hamgallery.com

NOTICE: T-368 Registry. For info w2zr@aol.com. Subscribe to the T-368 & BC-610 reflector at: http://groups.yahoo.com/group/T-368_BC-610

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

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

FOR SALE: Please visit www.radioworld-online.com. We have ham gear, tubes, parts and so much more!. Carl A. Blomstran, POB 890473, Houston, Tx 77289

FOR SALE: Aluminum knob inlays, Collins, Drake, National, Hallicrafters, Heath; Collins Dial Drum Overlays. Charlie Talbott, 13192 Pinnacle Ln, Leesburg, VA 20176. (540) 822-5643, k3ich@arrl.net

FOR SALE: Dentron 160-10AT kw transmatch w/ balun, coax, single or twin output, exc - $59 +shpg. H. Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103

FOR SALE: Older type electronic parts & hardware; free vintage flyer. Mail order since 1954. Bigelow Electronics, POB 125, Bluffton, OH 45817

FOR SALE: VM parts, new boxed electron tubes, new Heathkit parts, new panel meters. Norm, 1440 Milton St., Benton Harbor, MI 49022

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 e-mail<bugs@mnic.net>

FOR SALE: Parts, tubes, books, ect. Send two stamp SASE or email for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761. wb0cte@arrl.net

FOR SALE: Tubes. We specialize in early receiving & collector tubes & tube related books. Send for free catalog or see www. fathauer.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281. (480) 968-7686, tubes@qwest.net

FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W90JI / N4PZ, IL, (815) 734-4255 or N4PZ@aol.com

FOR SALE: Collins S-line and A-line repair. FCC licensed, many years of experience. lal@metrocast.net, (207) 457-9257

FOR TRADE: 1 KW HB 1930s vintage AM xmtr w/o tubes. Trade for good boat anchor equip - BO. PU only. W8JKS, OH (740) 998-4518

FOR SALE: Globe King 500B; National NC183D rcvr; both exc. Virgil, W4OL, 847 Old Sweetwater Rd., Sweetwater, TN 37874. (423) 337-6484

FOR SALE: TMC mode selector, ps & manual, ultra modulation model UM4-B - BO + shpg. George, AZ, (480) 986-5797.

FOR SALE: 51J-4 filter replacements, direct plugin—6.0 kc Collins mech. filter, 3.3 xtal lattice, 2.3 kc xtal latice ,500 cycle xtal latice - $215 each; R-390A 16 kHz flat phase filter, for Hi-Fi AM - $245. Chuck Felton, KDØZS, WY, (307) 322-5858, feltoned@coffey.com, www.feltondesign.com

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FOR SALE: Military and commercial communications items: http://www.maxpages.com/murphyjunk. Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. (619) 444-7717

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

FOR SALE: Panel refinishing: Johnson Ranger sets - $250; Valiant sets - $300; Johnson 500 sets - $300; Collins R390(A), front side - $125, both sides - $225; Hammarlund HQ-180 series panel & bezel - $200, cab add $100. http://w4pnt.8k.com. Dee Almquist, 534 W. Main St., Waynesboro, VA 22980. (540) 249-3161 Cell: (540)480-7179

FOR SALE: Orig manuals NC183D - $20; SX96 - $10; 75A-4 - $25; 1950s National Co. log book - $15; Johnson Ranger, complete, front panel rough - $125 + UPS. Richard Cohen, FL, (813) 962-2460

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (248) 391-6660, hires@rust.net

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FOR SALE: Complete hardware set to connect Collins PM2 to KWM2 - $19.95 ppd. Warren Hall, KØZQD, POB 282, Ash Grove, MO 65604.

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. (307) 322-5858, feltoned@coffey.com, www.feltondesign.com

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FOR SALE: Ur old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, CRBCS1@prodigy.net

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FOR SALE: New Release. For details send 2-stamp LSASE to: Olde Tyme Radio Co, 2445 Lyttonsville Rd. Ste 317, Silver Spring, MD 20910

FOR SALE: WACO-5NWX telephone filters. Just plug in. 1/$13.95, 2/$25, 3/$34. Money back. Cecil Palmer, 4500 Timbercrest Ln., Waco, TX 76705. (254) 799-5931, w5nwx@hotmail.com

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 1572 Newman Ave., Lakewood, OH 44107.

WANTED: Antique tubes. Paying $40 ea for good used type 201 tubes (not A). Buy list & new 2000-2001 catalog of collector tubes available. See www.fathauer.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281. (480) 968-7686, tubes@qwest.net

WANTED: Old military radar displays, scopes, antennae, receivers, manuals, etc. Even half ton items! William Donzelli, 15 MacArthur Dr., Carmel, NY 10512. (847)225-2547, aw288@osfn.org

WANTED: Bendix radio rcvr RA-1B; Belguim set RST-101. George Rancourt, K1ANX, MA, (413) 527-4304 or k1anx@mindspring.com

WANTED: Collins 70K-2 PTOs working or not; IN82A diodes; Bretting 14/14AX manual. Clark, WØBT, KS, (785) 286-2132

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WANTED: Electric Radio; Antique Radio Classifieds; Old Timers Bulletin. Alan Mark, POB 372, Pembroke, MA 02359

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WANTED: 1950's Popular Electronics; 1961-65 Heathkit catalogs & Radio-TV Experimenter. John Curtis, WØCAR, 3146 S. Franklin St., Englewood, CO 80110. (303) 781-8027, wøcar@arrl.net

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

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WANTED: Collins 32V & Collins 75A series; Globe Scout; National SW54. KBØW, CA, (916) 635-4994. frankdellechaie@sprintmail.com

WANTED: Hallicrafters SX88 or SX115. Larry Redmond, 413 Bedfort Dr., Duluth, GA 30096. (770) 495-7196

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WANTED: Schematic for Craftronics CT120 transmitter. Tom Grove, k6lqi@aol.com

WANTED: Info & references on PRC-6 walkie/talkie. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 PM

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