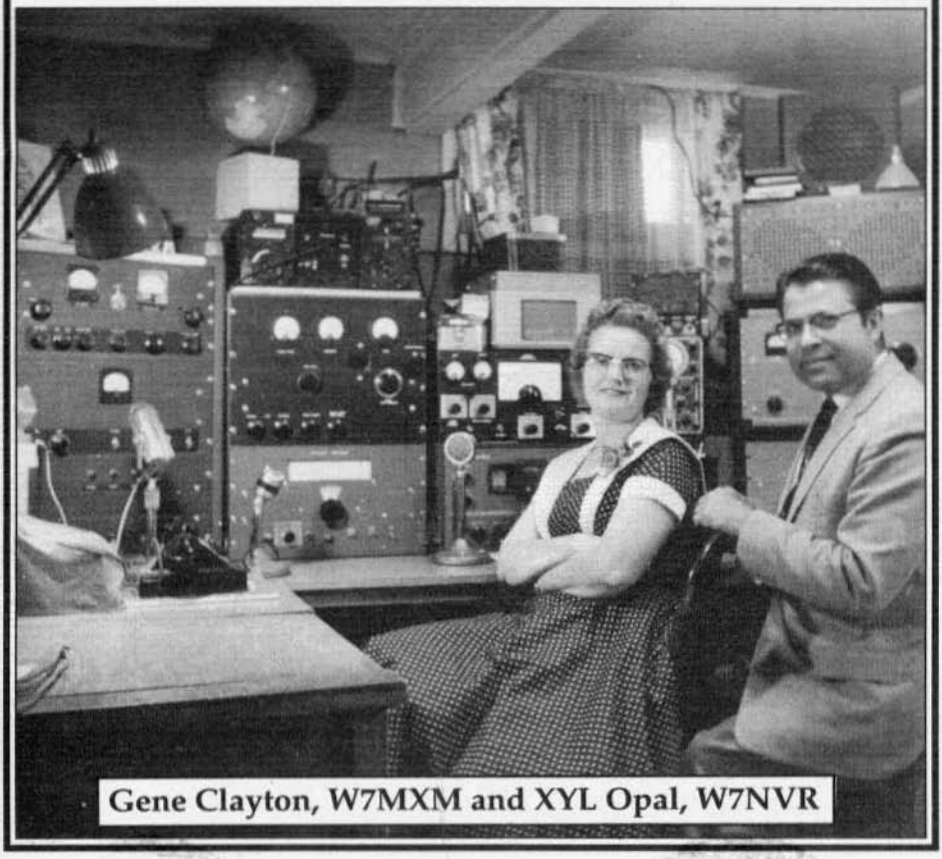
$2.50

ELECTRIC RADIO

celebrating a bygone era

Number 109 May 1998



Gene Clayton, W7MXM and XYL Opal, W7NVR

ELECTRIC RADIO

published monthly by Electric Radio Press, Inc.
14643 County Road G, Cortez, CO 81321-9575
Second Class postage paid at Cortez, CO and additional offices
Authorization no. 004611
ISSN 1048-3020

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

copyright 1997 by Electric Radio Press, Inc.

Editor - Barry R. Wiseman, N6CSW
Office Manager - Shirley A. Wiseman

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK and others.

Editor's Comments

Vintage Field Day

Thanks to a mention in the May QST I've received many, many requests for information on VFD. It may be that we will have some (hopefully many) participants in VFD who are new to vintage radio. So far it looks like there will be a better level of activity this year than last. And let's hope the propagation is better too. I'm planning to operate from somewhere in southeastern Utah. This weekend we'll be checking out a couple of sites.

I plan to concentrate my efforts on AM. On Saturday when the event starts at 7 PM I'll be on 14.286. I've been operating there regularly the last while with Bill, W8VYZ, Doug, VE4BX and others. Generally the propagation has been good during the early evening hours. After 20 meters fades out I'll move to 75, probably somewhere in the AM window, between 3870 and 3890. I'll hang in on this band for as long as I can stay awake. Sunday morning I'll start out by checking 15 meters. I think a good frequency there would be 21.425. If 15 is open I'll stay there as long as I can. I think that on 40 meters a good frequency would be 7290 and of course 20 meters should be great all day.

For those of you who can't get out into the field for VFD, please consider getting on the air to make some contacts with the VFD stations. It should all be a lot of fun.

Shortwave Receivers Past and Present, Third Edition, by Fred Osterman

Back in ER #94, February 1997, I reviewed the Second Edition of this book. I "wholeheartedly" recommended it. For those of you who may not be familiar with the book I'll quote the author to let you know what it's all about, "This book is designed to provide the radio hobbyist or receiver collector with concise information on the value, features, specifications and performance of current and former

continued on page 39

TABLE OF CONTENTS

Cover: Gene Clayton, W7MXM, with his first wife Opal, W7NVR, who is a Silent Key. This photo was taken in 1949. On page 3 see Gene's story "Long Live Ham Radio" and a photo of him and his present wife, Pat, WA7VRH.

Looking Back

by Lew McCoy, W1ICP
1500 Idaho St.
Silver City, NM 88061
mccoy@zianet.com

I was asked recently via the internet, if I would talk more about Ross Hull, who worked at the League in the 1930s. I may have left the impression that I knew Ross Hull personally—I wish I had but he was killed many years before I came to work at the League. By Goodman, W1DX, was a friend of Ross and I called him the other day and while Byron and Ross both lived on Selden Hill for a time, and I guess they were close friends, Byron couldn't help me much with information about Ross.

I have mentioned Selden Hill a couple of times in looking back. I think I might go over that one more time, from my knowledge, for the record. West Hartford, Conn. was the headquarters for ARRL in the days when I came there. There had been another "initial" location-I believe it was on Park Ave. but the League grew rather rapidly and they bought a building at 38 La Salle Rd., West Hartford. W1AW was located about seven miles away in the town of Newington. The building in West Hartford became too crowded and the new headquarters were built on the seven acres that was the home of W1AW.

Many of the people that came to work at the League lived at Selden Hill. If there ever was an ideal radio location it was Selden Hill. The property was owned by the Selden family who had been early settlers in the area dating clear back to the revolution. Rilla Selden had inherited the big house and I guess because times were tough, she took in boarders—No-correct that—she insisted on calling them "lodgers"; she DID NOT run a boarding house.

One of her early lodgers was Ross Hull, who had come over to the States from Australia. I don't know if Ross was a ham in Australia or not. Byron tells me that he thinks that Ross's brother was an amateur, but not sure about Ross. However, Ross being an Australian could not get an amateur license in this country. I am guessing now, but my guess is that either Hiram Percy Maxim or Kenneth Warner hired Ross. Get one point clear here: Ross was a brilliant thinker. His early experiments with the Hartley oscillator proved that.

Probably more important, Ross Hull was associate editor of QST in 1924 and in the August issue of that year caused physicists to delve more deeply into their theoretical studies by showing that, if the radiated energy was concentrated in a beam with a directive antenna system it was possible to maintain relatively reliable communications over distances of several optical horizons. His studies contributed much to the knowledge of radio propagation.

Ross also was engaged in early television research, in fact it was his undoing. He had moved from Selden Hill and had his own place. At a gathering at his house one evening, he was demonstrating the high voltage supply that ran the TV setup and got across the wrong wire and was electrocuted.

The important point is that Ross had a marvelous mind and made many contributions in the field of communications. If I learn more about it I will be happy to recount what I hear.

Byron Goodman is the only one I know that was actually a friend and buddy of Ross. The problem is, By is older than I am, and I am 82, and we both have simple problems; about the only thing we can remember clearly is when it is time to have a martini.

Please send any comments via e-mail. I am happy to respond—it gets lonely sitting here on the continental divide. W1ICP

Long Live Ham Radio

by Eugene L. Clayton, W7MXM
508 S. Ammon Rd.
Idaho Falls, ID 83406

During my youth, I seemed drawn to electronics and electricity. I enjoyed toying with anything that was associated with electricity; light sockets, plugs, wires, etc. I learned the Morse code at an early age and since I had a brother in the Signal Corps in the army, I would send messages back and forth to him when he was on furlough, with a code oscillator I had made from an electric door buzzer.

When I was a Freshman in high school, I enrolled in an electronics course from the National School Of Electronics in Minneapolis, Minnesota. This course also provided me with parts and instructions to build many simple kits. The most enjoyable kit was a one-tube, shortwave radio, using the famous 30 tube. I procured a six-volt automobile battery, a B battery and a C battery and enjoyed listening to CW on the shortwave bands.

During my high school years I enticed a friend to learn the code. He had an uncle that was a railroad telegrapher, and the uncle gave my friend an old clapper that was used by the railroad so he could send and receive code. We ran a wire from my home to his home and spent many happy hours playing checkers, chess and a game called Battleship. We got quite profi-

continued on page 36

The author in his present-day hamshack with his second wife Pat, WA7VRH.

ELECTRIC RADIO IN UNIFORM

by Dennis DuVall, W7QHO
8011 Frontier Drive
Severn, MD 21144
wa3yxn@aol.com

Adventures With the ART-13 and BC-375
East Coast Military Radio Net Rundown

I've recently been fortunate enough to add the ART-13 and BC-375 transmitters to my military collection. This has been my first operating experience with these sets and the purpose of this article is to add my bit to the lore surrounding these two fine classics. A rundown on the activities of the East Coast Military Radio Net is also included.

The ART-13

I'm late in becoming an owner of one of these. I remember turning down one for free back in the 60s, but hadn't been in the right place at the right time since the rebirth of my interest in military gear about ten years ago.

I owned a real basket-case for about 20 minutes at a local hamfest a few years ago but got talked out of it before I could leave the flea market. It was a real wreck and I always wondered why the guy was willing to give me almost $100 for it. Then about a year ago I made a 100-mile goose chase out to the QTH of an old geezer who said he had a nice one in his garage. But when I got there, you guessed it, no rig! ("I sure don't know what could have happened to it,... supposed to be right here,...guess I must have sold it to someone else...etc., etc.")

The unit I've finally acquired came from the estate of a local SK and is the Navy ATC version. The transmitter had been stored for several years in less than ideal conditions. A lot of paint had flaked off the case and many of the exposed metal parts were corroded. Under the grime, however, the set was electrically and mechanically complete and unmodified. None of the tubes, knobs or meters were broken and the cabinet was in quite good condition except for the flaking paint.

I really didn't have much trouble getting my unit on the air. I started with a the usual chassis cleanup, lubrication, contact cleaning, etc. The low frequency changeover relay was badly corroded and I removed and discarded this at the start.

The first problem encountered was a seized autotune head on the PTO. I had to remove this from the set and tear it down completely to get to the problem area. This overhaul turned out to be relatively easy, but I spent some time getting the synchronizing correct when I reinstalled the unit.

The only other problem I encountered was with a mica coupling capacitor between the first and second multiplier tubes (C-112). This checked out OK with the ohmmeter initially but showed evidence of leakage on power up. When the power was removed this cap. then acted like a battery with al-

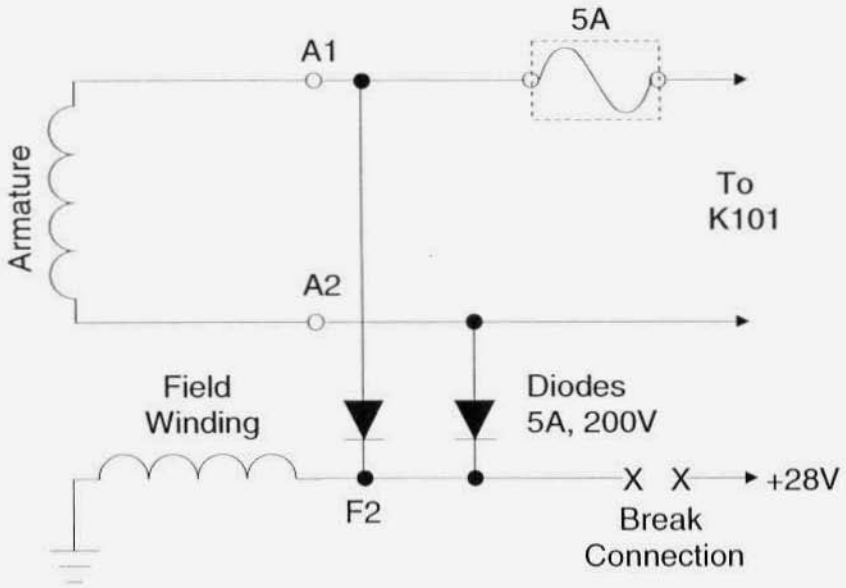


Fig. 1. ART-13/ATC autotune motor circuit mods. (Circuit diagrams courtesy of WB3HUZ)

most a volt output as measured by a high impedance meter! The immediate result was low grid drive to the 813 PA on the bands above 6 MHz.

This capacitor is completely buried down inside the buffer chassis, but I was able to salvage the original component by applying 200 volts directly across it for a couple of hours. This fix was at the suggestion of my friend Norm Chipps, N3RZU, who had run into this phenomenon before with certain mica units. Norm reports the "voltage treatment" usually works with HV micas exhibiting these characteristics and may take up to a couple of days in stubborn cases. (Don't try this with those black plastic jobs!)

I also made a couple of improvements I would like to pass along. The first of these concerns the autotune drive motor which has 28 vdc applied to the field winding at all times. This makes the motor case too hot to touch. Out of consideration for 50-year-old components I came up with the modification shown in Fig. 1 which provides excitation to the field only during the autotune cycle. The fuse is included because (a) if either of the diodes shorts out, the 28 vdc supply will also see a short circuit, and (b) an open diode will result in no excitation to the motor field and destructively high armature current will be drawn. The diodes can be mounted directly on the motor terminal block.

The other modification involves the input circuit to the speech amplifier. As with other military transmitters, the ART-13 seemed to be designed to limit modulation to about 50%. The simple changes shown in Fig. 2 allow full modulation with my T-17 and Motorola mics. Note that the dynamic microphone circuit is unaffected.

Walt Hutchens, KJ4KV, did an excellent article on the ART-13 in 1989 (ER #7) and others have addressed this equipment as well (see ER #28, 29, 30, 32 and 62). I found the Kleronomos articles to be particularly useful.

continued next page

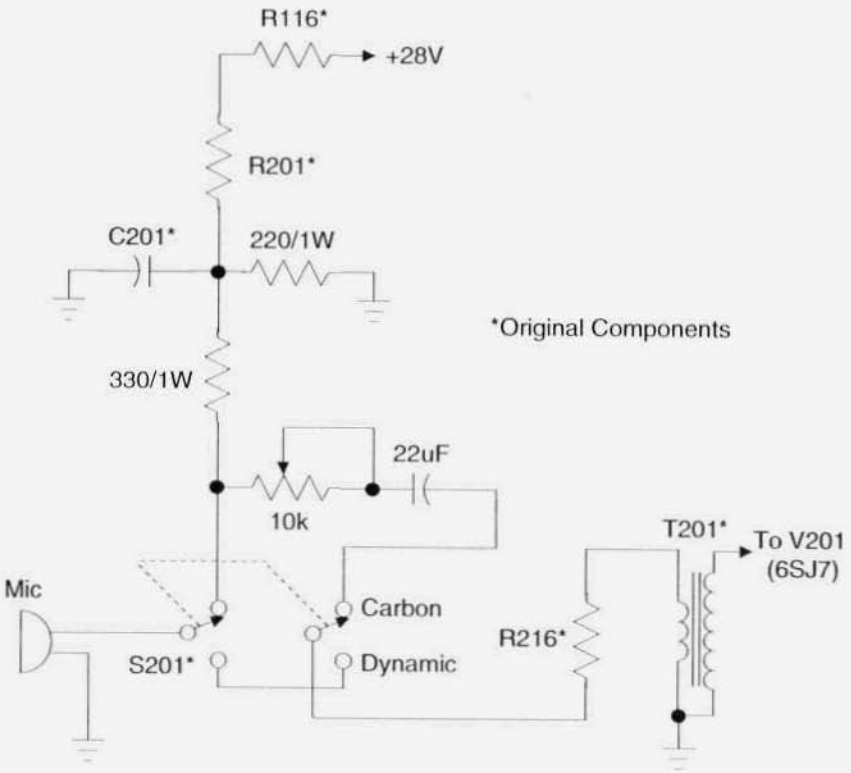


Fig. 2. ART-13/ATC audio mods

Taming The BC-375

This transmitter came to me courtesy of my friend Ted Young, W3PWW. Ted has been campaigning with a BC-191 here on the East Coast for some time and now has a BC-375 companion unit to my rig up and running FB as well.

These transmitters can sound bloody awful on phone when adjusted and operated according to the original instructions which call for loading of 200-220 ma combined PA and oscillator current. This gives about 75 watts into a 50 ohm load. At this carrier level, 100% downward modulation can be achieved by shouting into the microphone but the transmitter flat-tops at only about 40% in the positive direction. A significant FM component is present as well and the resultant signal is fully intelligible only through a receiver with a wide IF passband such as the BC-348s originally paired with these sets.

Examination of the original design revealed several possible reasons for all this distortion. There is no buffer between the oscillator and the PA and so the variations in PA grid impedance that occur during modulation are seen as a varying load by the oscillator. The specifications on the 211 PA tube call for 14 watts of drive for AM operation at a 100 watt power level, but the actual input to the PA in the 375 is only about 4 watts (KJ4KV, ER #13). The bias for the class B modulator tubes (also 211s) is derived from the PA grid leak circuit and so audio voice peaks can be reflected back to the PA grid circuit. Also, the audio power available from the single type 10 speech amplifier/driver stage is insufficient to support true class

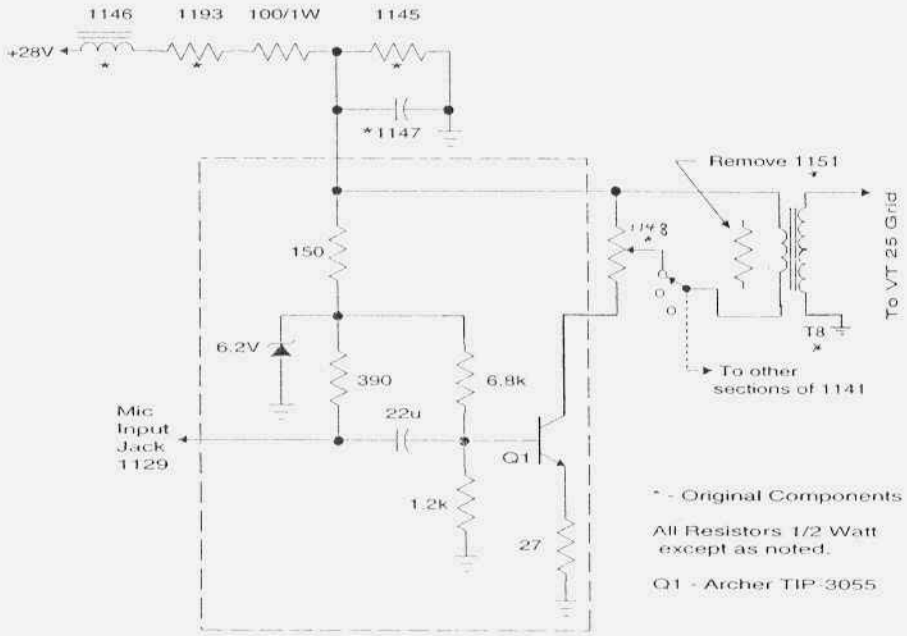


Fig. 3. BC-375 audio mods

B operation in the modulator and, finally, the RF and audio stages are fed from a common, unregulated high voltage supply.

The lack of upward modulation was addressed first. With my 1100-volt home-brew supply the set appeared to be capable of providing a peak RF power level of about 200 watts. This would correspond, properly, to a 50-watt carrier and reducing the PA loading to this level improved the symmetry of the modulated waveform considerably. There was still somewhat more downward than upward modulation, however, and tracking this back through the audio chain revealed significant distortion in the carbon mic input circuit.

The problem here seemed to be a combination of a low microphone load impedance (50 - 100 ohms depending on the gain control setting) coupled with a low bias level (approx. +6 vdc). I did some tinkering with the input circuit constants which improved the linearity somewhat, but there was still insufficient audio gain to comfortably modulate the transmitter with T-17 and similar mics. This problem was eliminated by the installation of one of the transistorized mic. amplifiers I use in many of my military rigs (Fig. 3). At this point the output waveform finally looked like "normal" AM and on-the-air reports since have been excellent. ("I can't believe it's a 375." - WA1HLR)

A final note here on BC-375 flat-topping. As noted before, both the PA and the modulators are underdriven. Under the "linear" operating conditions described above, it was noted that the modulators were drawing very little grid current. A higher carrier level might be accommodated if audio drive could somehow be increased but I did not pursue this.

The FM'ing problem was addressed next. This is almost nonexistent with

continued on page 38

A Versatile Relay Switchbox

by James C. Garland, W8ZR
310 E. High St.
Oxford, OH 45056

Last week I noticed my Central Electronics 100V transmitter sitting on the basement shelf next to its matching 600L amplifier and thought, "I really ought to put that rig on the air. Wouldn't it be fun to pair it up for the evening with, say, an SX-115 receiver?"

In truth, I have similar thoughts about many of my vintage rigs. How about getting on 80-meter CW some weekend with my Valiant and SX-101? Or maybe six-meter AM with my Ranger II and NC-303?

I've spent countless hours at my workbench with all these rigs—chasing down parasitic oscillations, dead mixer stages, broken switch wafers. I've sanded and scraped and primed their cabinets and panels, and strained my back hauling them out to the backyard with an air compressor and paint sprayer.

But all too often, after I've checked the RF output into a dummy load or measured sensitivity with a signal generator, these classic radios just sit unused on a shelf, instilling vague feelings of guilt whenever I look at them from across the room. "Please operate me," they seem to call out.

Here's my problem. I hate hooking up T/R relays, muting, and control circuits. I've got several vintage rigs "permanently" on-line, and for these I've soldered and laced and neatly routed all the interconnecting cables and relays. But, frankly, I find it a pain to wire up antenna relays and cables if I just want to play with a rig for a day or two.

What I've needed is a versatile relay switchbox that will let me quickly interconnect receivers, transmitters, and amplifiers for just an evening or weekend's use. That is what this project is all about. Before I go into details, however, I need to explain something. Picture the following.

It is six o'clock on a clear June morning, and the long path has just opened into Africa. You glance out the window and see dew glistening on the six-inch ladder line as it makes its quarter-mile journey out to the west rhombic. The 872Bs have warmed up, and the light from the 4-1000A and the 810s cast slight shadows in the early dawn.

You're tuned up at 14,290 kHz and, it's time to call your first CQ of the day. You reach for your D-104 and look briefly at the oak-framed ON THE AIR sign on the wall. You make a final check of the row of meters lining the top of your six-foot transmitter cabinet. The plate voltage meter reads 4500. All seems normal. With the confidence that only a mighty 4-1000A can bestow, you sit back in your leather chair and firmly squeeze the push-to-talk bar on your mic stand. As the powerful transmitter awakens and a violet hue from the rectifiers suffuses over the room, your ears are rewarded with the soft click of antenna relays closing.

Now I know what you're thinking. *Click? What is this click nonsense? What happened to "KA-CHUNG?"* Well, sorry folks, but this isn't a ka-chung kind of project, and if that's what you're after then read no further. All you'll hear from these relays is a barely audible click.

However, don't let the auditory modesty of the little relay box described here deceive you. This rascal can handle the full output of your Johnson Desk Kilowatt as easily as it can the ten watts from your Hartley oscillator. Furthermore, you can interconnect two receivers to a transmitter and amplifier and

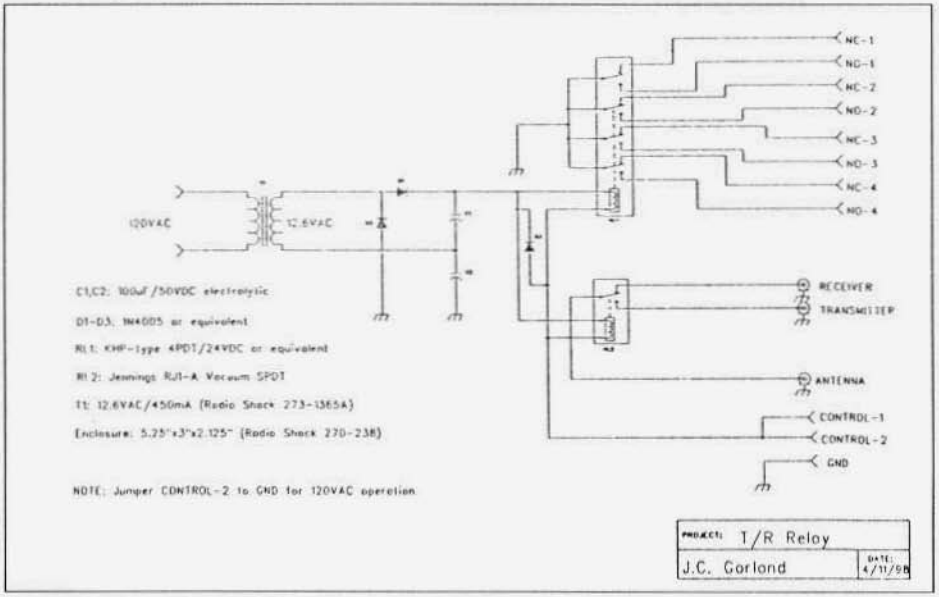


Figure 1. The circuit is the picture of simplicity.

each can have its independent control and mute line. There are a total of four normally open and four normally closed contacts, in addition to the RF transfer contacts, all fitting easily inside a 5.25 x 3 x 2.125 inch minibox. Best of all, the relays can be activated two ways—either by 120 VAC, or by grounding a low voltage DC line. This little box is truly versatile.

Now I'll be the first to admit that it doesn't take a rocket scientist to design a relay box, and Figure 1 confirms this fact. The circuit is the picture of simplicity. The 120 VAC control voltage is applied to the primary of a small 12.6 VAC, 450 mA Radio Shack transformer, and the secondary is rectified and filtered by a voltage doubler consisting of D1, D2, C1 and C2. The coils of relays RL1 and RL2 comprise a 225-ohm load for the voltage doubler, with diode D3 suppressing the inductive kick when the relays open.

When 120 VAC control is desired, either the CONTROL-1 or CONTROL-2 terminal is jumpered to ground. The values of C1 and C2 are chosen so that the relays don't hum and also close quickly.

When DC control is desired, one connects 120 VAC to the indicated terminals and activates the relays by grounding either the CONTROL-1 or CONTROL-2 terminals. Two control terminals are provided for flexibility. The open-circuit voltage at the control terminals is 36V (dropping to 24V across the relays with either terminal grounded). Using the relays specified, the closed-circuit DC current through the relay coils is about 110 mA.

The secret to the power handling capacity of the relay box is the little Jennings RJ1-A vacuum relay, visible in Figure 2 on its L-shaped aluminum bracket. This thumb-sized, one ounce powerhouse will switch 14 Amperes at 2.5 MHz, corresponding to 10 kilowatts of RF into a 50-ohm antenna! Although the RJ1-A's current capacity drops to 7 amperes at 32 MHz, that is still 2,500 watts. So go ahead and load up your Collins KW-1 on ten meters, crank up the mic gain, and yell "Hellooooo Radio" to your heart's content; you won't frizzle a thing except the traps in your tribander. Furthermore, the RJ1-A closes in only 2 milliseconds, so you'll never

continued next page

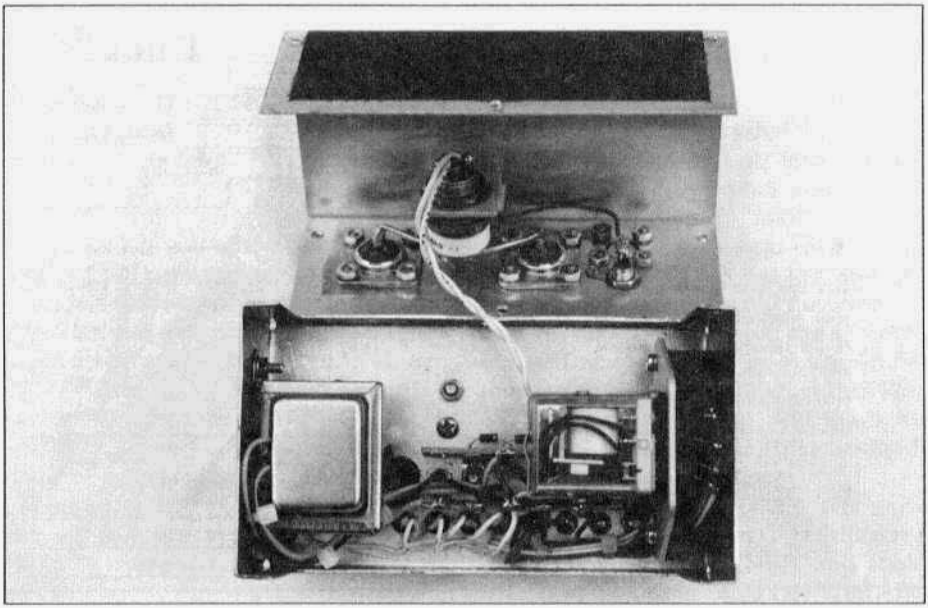


Figure 2. The secret to the power handling capacity of the relay box is the little Jennings RJ1-A vacuum relay.

have to worry about hot-switching the contacts. The RJ1-A is to the venerable Dow Key relay as a turbocharged Corvette is to a Chevy van. But, alas, there's no "ka-chung."

Short lengths of No.12 wire bridge the gap from the RJ1-A terminals to the adjacent antenna and transmitter coax jacks. A longer length of Teflon-insulated hookup wire connects to the receiver ports.

The other relay visible in the figure is a Potter and Brumfield KHP-type 4PDT relay, with 24 VDC coil. The four independent sets of contacts are rated at 3 amperes at either 120 VAC or 24 VDC. I like the KHP series because the gold-plated contacts assure that one can virtually forget about intermittent contacts. KHP relays are commonly available at hamfests or surplus outlets for about two bucks. As can be seen in the photo, the relay plugs horizontally into a socket, mounted on a homemade aluminum bracket. A retaining clip secures the relay snugly in its socket.

Figure 3 shows a photo of the completed project. Ordinary SO-239 coax connectors are used for the transmitter and antenna coax inputs, while a BNC and RCA "phono" jack are used for the twin receiver ports. A two-terminal barrier strip is used for the 120 VAC connections, with the exposed terminals covered by a protective shield fabricated of 1/32 inch fiberglass. An eight-terminal barrier strip provides access to three pairs of normally open and normally closed contacts, with the remaining two terminals dedicated to ground and the DC control line. A second DC control line is made available at an RCA jack, visible at the back left of the enclosure. The other two RCA jacks on the right side of the enclosure are for the fourth pair of normally open and normally closed contacts. The combination of RCA and barrier strip connections provides increased flexibility in cabling.

The relays and power supply are mounted in a standard Radio Shack aluminum minibox. I prepared the box for painting by first wet sanding it with

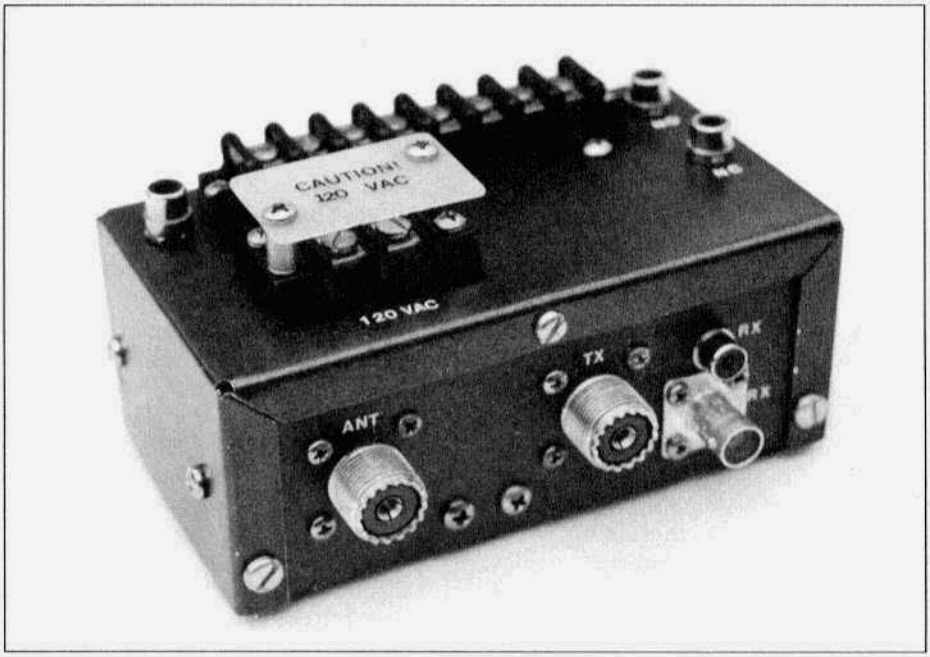


Figure 3. The completed project.

No. 600 sandpaper and then spraying it with self-etching gray primer, available from R&R Designs (1-800-372-4287). After the primer dried, I overcoated it with charcoal color automotive lacquer, available in small spray cans from my local NAPA dealer. I used press-on lettering to label the terminals and sealed the lettering with a coat of matte-finish clear Krylon spray. Small adhesive-backed rubber feet completed the project.

All the parts for the relay box are readily available, although you may have to scrounge a bit to find the RJ1-A relay. These are available new from distributors (the TenTec Titan II amplifier uses one as its antenna transfer relay), but you'll save money if you buy one removed from surplus military, industrial, or medical equipment. I see RJ1-As advertised frequently in the Ham Trader Yellow Sheets and in the classified ads in ham magazines. The Kilovac HC-1 is an exact replacement of equal quality. You should be able to buy either one for about $35.

Of course, you can substitute other types of vacuum relays, depending on availability. I happen to like the Jennings RFl-D, which is even tinier than the RJ1-A but can easily switch 2000 watts. A nice but somewhat larger relay is the Jennings RF3-A. With it, you'll only have to limit your power output to 30 kilowatts! Of course, some of the characters one hears in the evening on 75 meters might find that too restrictive—jespecially the guy who keeps whispering "Rodd-neeey" on the 3.898 kHz swap net.

So now I'm all set to put some of my vintage rigs on the air. I just can't decide what to hook up for this weekend. How about a Ranger and an RME-6900? Or maybe a Challenger and HRO-50? Or a Valiant II and SX-101? How will I ever make up my mind? This is all so confusing. Jeez, I didn't realize ham radio had gotten so stressful! ER

THE FIRST *TUR-KEY* - An Electronic Bug

by Chuck Teeters, W4MEW
841 Wimbledon Drive
Augusta, Georgia 30909

The article in ER #98 on the TO electronic bug brought to mind that mine is 48 years old. It has worked flawlessly since it was given to me in 1951 by W2IMU, with the comment that it might help my sending a bit. I don't know if I should have been insulted or not.

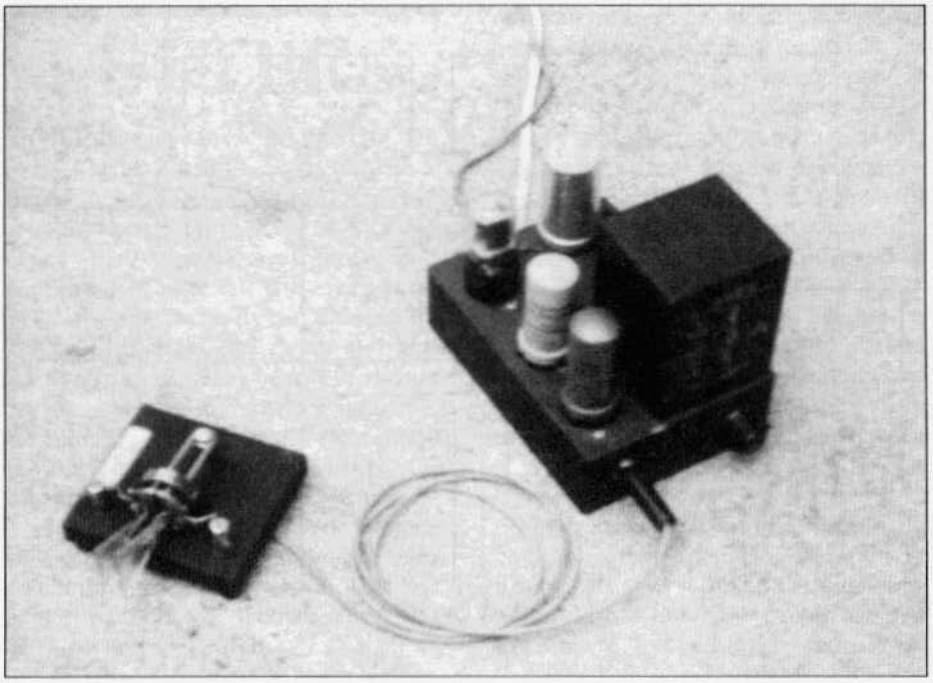
Dick Turrin, W2IMU, was one of the most fun loving and intelligent hams that graced the halls of Fort Monmouth, N.J. He was at Monmouth from 1949 to 1952 so he could use the G.I. Bill to pay for college after his military service. Because of his ham license and CW speed, he was assigned to K2USA/A2MON, which is where I met him. He was a 40 wpm op with an intuitive ability to make anything electronic work better, and a personality that you had to love.

The 80 and 40-meter CW transmitters at K2USA were WECo 33As with two 813s in the final. They were in the back room and remotely keyed from the operating positions in the front of the station. The receivers were BC-1004 Super Pros. If a new ham was having trouble making a contact, Dick would go to the back room, and use the oscillator test key on the 33A to provide a contact. I wonder how many that operated at K2USA knew that when their first solid QSO was with W2IMU he was using the same transmitter they were. Dick's sending was like a tape even when he was keying a Federal lever switch.

The Massachusetts National Guard was sent to Germany to replace a unit sent to Korea in 1950. This generated a lot of traffic with Mass. and Germany. The 20-meter rig, a Collins 20K didn't quite have enough power so Dick whipped up a California KW with 833s. He didn't have a cabinet for the amp so he put it in a closet and kept the door locked so no one would fry. He was the only one that knew it was there and how to switch it on. I can't tell you the number of times he would suggest to a 20-meter operator that perhaps he could help. You can guess the rest. He would tell them everything from how they were not holding the key right to that the BFO was on the wrong side of zero beat when he got a 589 after they got a 449.

Electronic keys go back to the thirties, but to the best of my memory only one, the Mon-key, was commercially produced prior to 1950. The idea of automatic dashes to accompany the automatic dots of the Vibroplex was appealing, and various articles appeared through the years, some all relay and some with vacuum tubes. All provided correct timing for the dots and dashes but were difficult to master because they would not self-complete the last dot or dash of a character, and did not provide a time equal to a dot when switching between dots or dashes. Advertisements for the Mon-key recommended a few weeks practice before using it on the air.

QST had two articles on electronic keys in 1948 which Dick tried. He had built a paddle with nice action, but was not happy with the electronics and decided he could do better, but needed two fast plate relays. I had just reviewed a Teletype Corp. 400 wpm teletype multiplex set, the AN/FGC-5, that used WECo 275B mercury relays keying teletype loops from 12AU7s. I gave Dick two relays on the condition that he didn't tell where they came from. His



W2IMU's "Tur-Key" connected to a Bencher paddle.

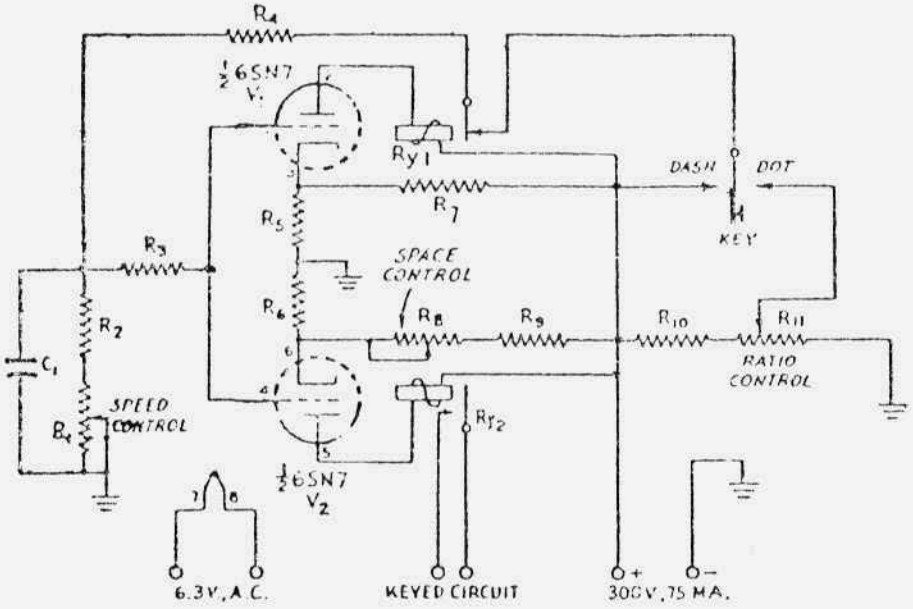
keyer worked great and everyone at Fort Monmouth that tried it said he should write it up for others to copy.

"Debugging the Electronic Bug" by W2IMU appeared in the January 1950 QST. It was well received and was on the kit market from two different companies before the summer of 1950. Dick's electronic key was self-completing so you couldn't cut the last dot or dash short, and the spacing within the character was the same for dots, dashes, or dot-dash combinations. As a result, it was easy to use. He introduced a keying space or weight adjustment, the dot-space ratio, independent of the dot-dash ratio adjustment. And he did it with one 6SN7, my two relays, and a handful of parts. True to his word he did not mention my WECo relays, nor did he put a picture with the article.

The next W2IMU electronic bug was the "Tur-Key" described in the September 1954 QST. This time Dick used digital circuits for timing, which others copied and improved upon. The W9TO keyer was about the fourth in a series of improved Tur-Keys. However, based on my experience with the 1949 model, I don't think you can get more for your money than with his original key. Eleven resistors, one cap, one tube, two relays, and a power supply make up the whole works. It works as well as any electronic bug that doesn't have buffers, and is the height of simplicity. With dry relay contact output you can key anything with no worries about polarity, voltage, or current. I have used the key to cathode key H.B. 6146s, Johnson Vikings, DX-100s, various Kenwoods and Icoms, and even a 71A Hartley for the AWA contests.

The only unusual parts required are the relays. WECo 275Bs are around, and others work. Check ER 90. I have used non merc surplus Clare SK5028s. Fair Radio has P&B KR-4175 plate relays that work, and only cost $2. Any 3K to 5K SPDT 3 to 7 mA relay will work if

continued next page



Schematic of the "Tur-Key" above, parts list below.

C1 - 0.02-µfd. 400-volt paper.
R1 - 4-megohm potentiometer.
R2 - 1 megohm, 1 watt.
R3 - 2 megohms, 1/2 watt.
R4 - 510 ohms, 1/2 watt.
R5, R6 - 2400 ohms, 1 watt.
R7 - 25,000 ohms, 5 watts.
R8 - 3000-ohm wire-wound variable.
R9 - 20,000 ohms, 5 watts.
R10 - 10,000 ohms, 5 watts.
R11 - 3000-ohm wire-wound potentiometer.
Ry1, Ry2 - See text.
V1, V2 - Section of 6SN7.

you are not a 40 wpm speed merchant. Whatever you use, the two relays should be identical.

Circuitwise, the plate current of each section of the 6SN7 operates the two relays. Both sections of the tube are biased into cutoff. To make the key self-completing, Ryl disconnects the paddle until after the keying relay, Ry2, releases. A higher cathode voltage on V2 puts it into cutoff before V1. The time is set by R8 cathode bias adjustment for V2. To start a dot or dash the paddle applies different voltages to charge C1, which discharges through the speed control, R1. The voltage is applied to the grids of V1 and V2, making them conduct for a time depending upon the voltage and the setting of R1. Don't put anything larger in for C1, as it will not have time to charge before Rl disconnects the charging voltage. R11 adjusts the dot dash ratio. Observation of the keying, with the speed control set for the slowest speed makes it easy to adjust the key. Adjust R11 for a 3 dot dash time and set R8 to get a dot space be-

continued on page 37

LETTERS

In defence of David Sarnoff

Bill Reike's passing reference to David Sarnoff and his rank in the U.S. Army, and how he got there [Letters, ER #108, April 1998] piqued my interest, so I thought I would tell the story more fully, to show he really did deserve the rank of Brigadier General, one star, U.S. Army. The rank had been his reward for his assistance to General Eisenhower and the Supreme Headquarters of the Allied Expeditionary Forces (SHAEF) and the D-Day invasion of Europe.

When America entered World War I, Sarnoff applied for a Navy commission as lieutenant j.g. in communications, which was turned down, Sarnoff felt, because he was Jewish.

Later, in 1924, with the help of a General Harbord, he applied for and received a commission in the U.S. Army Signal Corps Reserve as Lieutenant Colonel. This entailed a peacetime "tour of duty" at Fort Monmouth, NJ two weeks out of each year, and in 1930 he was promoted to full Colonel status, in the Signal Corps reserve. During the intervening years he fulfilled his reserve obligations faithfully and took technical courses and seminars which he felt would speed him up the brass ladder.

His big break came when a professional acquaintance, Major General Henry C. Ingles, recommended Sarnoff to General Dwight D. Eisenhower as the perfect communications expert to coordinate communications for the impending D-Day Allied invasion of France. Sarnoff jumped at the chance, despite his worries about RCA which he felt would suffer from his absence. His duties were threefold: 1). To install a broadcast station powerful enough to reach all military personnel in the Mediterranean and Europe theaters, 2). Inspect and improve D-Day and post D-Day communications capability in France and Germany, and 3). Ensure adequate print and radio press coverage. Since he accomplished all three, he was awarded the rank of Brigadier General, one star, U.S. Army, approved by President Roosevelt, on December 7, 1944. However, Sarnoff was destined to rise no higher despite his political efforts and prior and subsequent RCA intelligence assistances to the Army, made at his insistence. This didn't stop him from requiring all to refer to him as "General Sarnoff."

His major contributions were in the civilian sector, including commercial broadcasting of radio and television. If he could see how low broadcast programming has sunk, he would be ashamed. His principal character strength, as far as I am concerned, was his insistence that programming would improve the culture of the masses, despite his eighth-grade education. To this end, he rescued the great Italian conductor Arturo Toscaninni from the Italian fascists and had him brought to America.

Sarnoff organized the NBC Symphony Orchestra with Toscaninni as its principle conductor. Toscaninni had the right to hire and fire each and every musician, and when he died, the orchestra was disbanded. In my opinion, the NBC Symphony Orchestra was Sarnoff's biggest contribution, and far outweighs his well-documented character flaws.

He loved America in a patriotic way and was very proud of his army rank. After all, he rose from a Russian-Jewish emigrant kid to Brigadier General in his adopted country, an accomplishment even he could not duplicate today.

John P. Devon, KI6DQ/KH6

Product Review

The CP5TR Transceiver Kit from Vintage Radio Kit Company, 427 North Main St., Sharon, MA 02067. 781-784-0847. Reviewed by ER Editor, N6CSW

The QRP CP5TR transceiver kit follows the company's earlier kits, the CPCW-5 transmitter and the Cakepanion general coverage regen. Like the earlier kits the transceiver kit uses a cakepan for a chassis (13 x 9 x 2 inches). All of the components are high quality and the workmanship on the assembled unit that I've been using is top-notch.

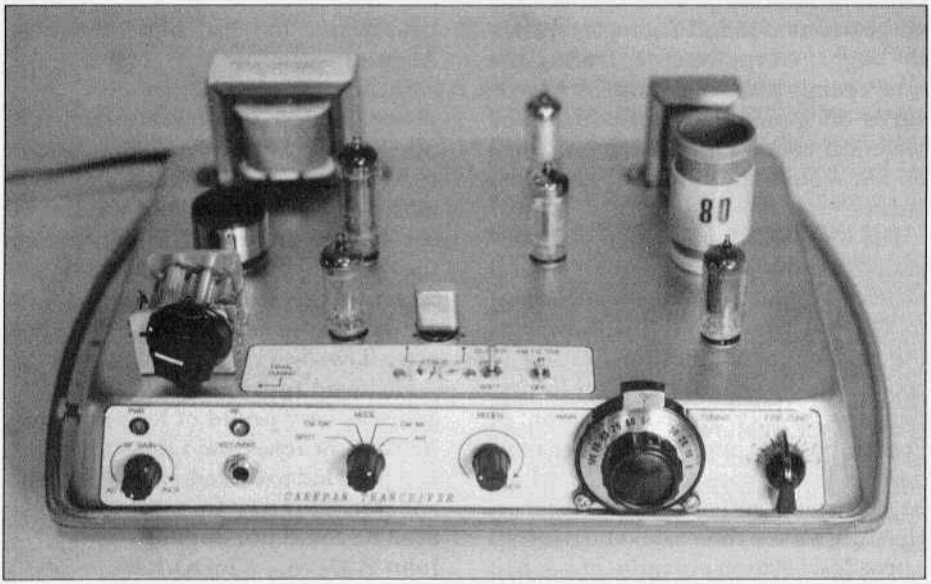
The transceiver has 5 tubes and operates on 160, 80, 40 and 30 meters with plug-in coils.

Pete Whelpley, W1VZR, the principal designer of the CP5TR, tells me that the circuits for both the transmitter and receiver sections have been around for a long, long time and that designing the transceiver was just a matter of putting the two together with some modern innovations like the QSK circuit and LC filter.

What impresses me most about the CP5TR is the regen receiver. The best adjective to use is 'unbelievable'. I compared it my Knightkit Space Spanner (I built this unit in 1955) and there is just no contest. This receiver is much, much more sensitive (with 2-stage switchable hard and soft clipping) and the LC type CW filter works absolutely great. It also has fine tuning RIT—3 kc plus or minus the center frequency.

The xtal controlled transmitter provides 5 or 1 watt output on CW, with sidetone monitor and electronically switched QSK. The quality of the CW signal is excellent. On AM (push to talk!!) the audio is broadcast quality. I made only one local contact on AM but I did some tests in our house putting Shirley on the mic. My assessment is that I wish all my AM transmitters sounded this good.

So our kudos to Carl Gelormini, WB1EYE (the owner of Vintage Radio Kit) and Pete Whelpley, W1VZR for designing the CP5TR. I think it's great that there is still ONE company selling tube-type kits. The price of the kit is $299.95 and fully assembled it is $389.95. N6CSW



This picture was taken at the home of Dan Harlan, N8ETQ. Pictured left to right: Dan Harlan, N8ETQ; Bill Reike, K8DBN; Ron Mayer, W8KYD; Jim Malone, W8PEV and Bob Reardon, W8EPQ. Dan's dog Cinder is also in the picture.

Kenneth Ball, WA6BQX, with a very early HRO he recently acquired. Ken (who is 81 years old) was first licensed in 1947 as W3NNU.

continued on page 37

W5GST in 1940

by Niel Wiegand, WA5VLZ, 2646 60th St., NW, Rochester, MN, 55901

In 1940 Vance Gildersleeve, then W5GST, now K5CF, was working as a broadcast engineer at KTEM, his first job. This picture was taken in his room where he was rooming with a family in Temple, Texas.

The RF section at the top of the rack was built around the Gross CW25 chassis. It was the 40-20-10 meter RF section. It consisted of a 6V6G tritet crystal oscillator, an 807 buffer/doubler driving a Taylor T40. It ran 100 watts on CW and about 75 watts on phone. The top meter on the panel was to read the different currents of that deck.

Behind the panel, below this unit was another RF unit. A 6L6G crystal oscillator driving a 203A on 160 and 80 meters.

continued on page 39

VINTAGE NETS

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
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. URL: http://www.crompton.com/wa3dsp/grayhair.html
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating.
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the first Sunday of every month on 14.165 at 1900Z and 3760 at 2000Z. Net control is Dave, VA3ORP.
Beer Town Traders Net: On 3885, 5:30 Central Daylight Time on Saturdays.

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

Tribute to a Classic[1]

Lew McCoy's Modern Design of a High-Power Final

by Robert E. Grinder, K7AK
7735 N. Ironwood Dr.
Paradise Valley, AZ 85253
atreg@asu.edu

Congress first imposed regulations upon amateur radio in 1912. One aspect of the Radio Act limited amateur transmitters to a maximum input of one kilowatt (KW). Successive regulatory agencies--Department of Commerce, Federal Radio Commission (FRC), and Federal Communications Commission (FCC)--endorsed the restriction until June, 1990. The FCC elected then to abandon the input measure for one based on power output. A kilowatt, radio frequency (r.f.) amplifier designed for [plate] amplitude modulation (AM) was affected particularly, since to meet the new power output requirement, its input power had to be reduced.

The one KW input limit upon all transmitters--a constant in amateur radio for 78 years--was at first an annoyance. For example, amateur radio was dominated from 1912-1921 by high-power, spark transmitters. Operators in their reach for distances often ran inputs of two or three kilowatts of raw alternating current. The spark era waned early in the 1920s with the ascendancy of post-WWI tube technology and continuous wave (c.w.) transmissions, which covered long distances with low power, cut through static, occupied less bandwidth, and reduced local interference. Eventually, in 1928, the FRC outlawed spark transmissions on amateur bands.

Once attention centered on tube technology, the kilowatt phone transmitter presented a long-range goal toward which many amateurs worked diligently. Progress evolved slowly. Although advances accelerated rapidly during the 1920s, radio theory, technical expertise, and component development did not endow amateurs until the early 1930s with sufficient knowledge to produce KW final amplifiers that would suit their purposes.

High-power, c.w. transmitters came first. Finally, in 1938, multi-band, kilowatt transmitters, capable of plate modulation, appeared (Jennings, 1938; Millen, 1938; Thordarson, 1938).

The first AM, kilowatt final amplifiers were relatively primitive. However, incremental refinements, augmented by WWII research and development, cumulated until June, 1956. The date marks the QST issue in which Lew McCoy (1956) unveiled his "modern design" of a KW, plate modulated, final amplifier. It depicted a thorough integration of postwar accomplishments in theory, technical aspects of construction, and components.

Further, because McCoy introduced the amplifier when single-sideband (SSB) activity was becoming popular, he designed it to be suitable for AM, SSB, and c.w. operation. No wonder, then, that the QST article was reproduced in several editions of the Handbook of the American Radio Relay League (ARRL) starting with the 1957 edition. And given the subsequent enthusiasm within the ARRL for SSB, it is no wonder either that McCoy's amplifier represents the last in ARRL publi-

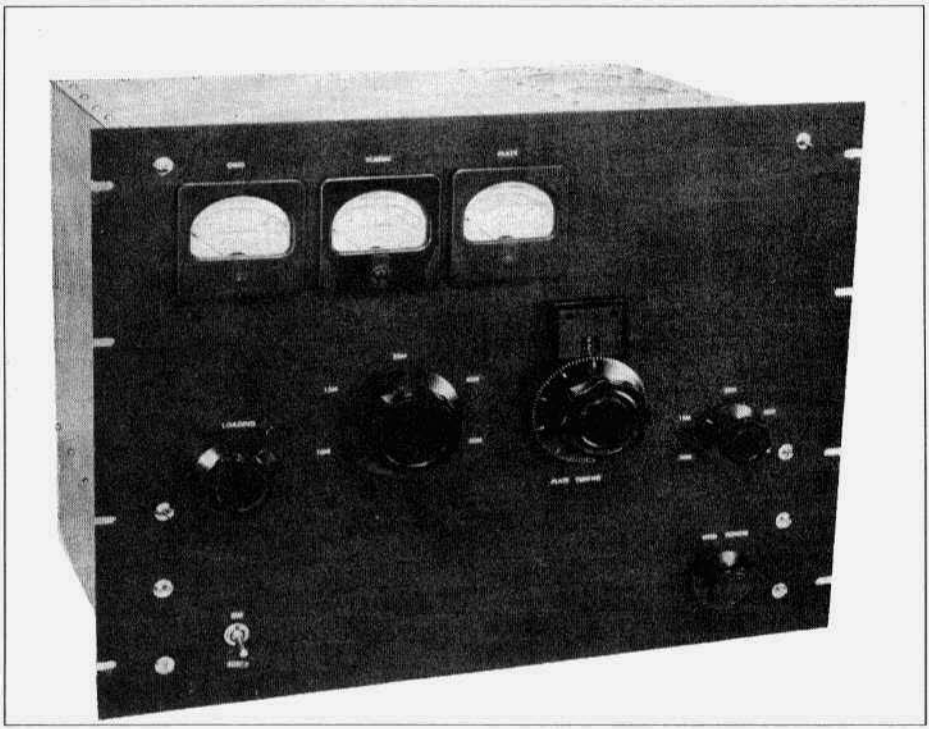


Figure 1. McCoy's 1-KW final using a pair of 4-250As in parallel.

cations of a distinguished series of high-power r.f. amplifiers centered on AM operation.

The purpose of this article is twofold. First, I document the historical antecedents of McCoy's extraordinary final amplifier by tracing from about 1938 to 1956 the evolution of AM, KW, r.f. amplifiers. Part I, "Pre-WWII kilowatt amplifiers," includes three sections, "Push-pull triodes," "Series-feed," and "Tank circuits;" Part II, "Post-WWII kilowatt amplifiers and TVI," includes one section, "Advent of the modern final." The time span indicates an all too brief period of less than twenty years when KW, plate modulated, r. f. amplifiers predominated in amateur radio.

Second, Part III, "The McCoy final," reviews briefly the basic features of McCoy's r.f. amplifier. McCoy (ER, 1998, #105, p.3) mentioned recently that he had "designed a high-power amplifier for By Goodman for the [ARRL] Handbook." He stated also that he knew "many of the readers [of Electric Radio] built that amplifier." I am one of the readers to whom McCoy made reference. I started gathering parts in 1963, and I finished building the amplifier two years later. It has been the pivotal rig in my amateur station ever since. A "Postscript" indicates the extent to which I replicated McCoy's design--99.9%--see Figures 1 and 2 below; see also Figures 3 and 4 in Part III. My account serves, I hope, as firsthand testimony to the enduring qualities of his remarkable accomplishment.

Part I: Pre-WWII Kilowatt Amplifiers

When the FRC in 1928 prohibited amateur spark transmitters, it also decreed that amateur vacuum tube transmitters must use "adequately filtered

continued next page

direct current (d.c.) power for buffer and driver stages." Final amplifiers, nonetheless, could be powered by alternating current. The FRC intended thereby to enhance the stability of frequency determining stages (ARRL Handbook, 1930, p.22). Five years later, in 1933, to further narrow the bandwidth of signals, the FRC laid the groundwork for future amateur activity when it ruled that all stages of a transmitter must be derived from filtered, direct current (American Radio Relay League, 1965, p. 66).

Shortly before the FRC declaration, Barton (1931) described how a Class-C, r.f. amplifier could be modulated with a Class-B audio amplifier. Barton stated that the system "is perhaps the cheapest and simplest transmitter to build for a given r.f. power output with 100 percent modulation" (p.13). Thus fortified with Barton's insights and their compatibility with filtered d.c. input power, amateurs were ready to begin thinking seriously about constructing high-power AM transmitters.

Radio engineers had differentiated three basic classes of amplifier, A, B, and C, some years earlier. The B and C classes were useful for r.f. amplifiers; however, until the SSB era, the Class-C, r.f. amplifier was overwhelmingly the amplifier of choice (Dawley, 1947, p. 96-97). Class-B amplifiers were fine as modulators in that a linear relationship holds between excitation voltage and output voltage, and they can be operated with a small amount of excitation. But as r.f. amplifiers, tubes in Class B yield moderate outputs of approximately 30 percent to 35 percent.

On the other hand, the ratio of output to input for a Class-C, r.f. amplifier may be as high as 85 percent. Whereas a hefty amount of excitation is required, this disadvantage was outweighed in the 1930s by the fact that the characteristics of a Class-C r.f. amplifier cause its signal output to be linear with respect to changes in plate voltage. Indeed, the linearity of a class-C amplifier may be extended from zero plate voltage to twice its normal value in conjunction with Barton's (1931) audio system of Class-B modulation.

The Class-C, r.f. amplifier, plate modulated by a Class-B audio system, furnished amateurs with a quintessential framework for creating a kilowatt phone transmitter of relatively outstanding efficiency. A transmitter was usually built during the 1930s on a breadboard or on chassis stacked in an unshielded relay rack. Operators preferred open construction, which enabled them to keep an eye on glow emanating from their amplifier tubes. Openness also facilitated making frequency adjustments and changing coils for different bands. Shielding was implemented mainly to keep people away from lethal voltages.

The nucleus of the final was comprised of push-pull triodes, series-feed, and an air-dielectric variable with plug-in coils for the tank circuit, with link coupling to open-wire feeders. The circumstances that led to this state-of-the-art layout are reviewed below:

Push-pull triodes. R.f. power amplifier tubes were the most expensive single item in the final of a KW transmitter. Popular triodes, like the Amperex HF-300 ($35) Eimac 150T ($24.50), 300T ($60.00), Taylor T-200 ($21.50), RCA 810 ($13.50) etc., were relatively modest in cost, and thus, are representative of the medium-power triodes operated in push-pull to attain a KW input. A few high-power triodes, such as the RCA 851 ($350) were available for single-ended use, but they were prohibitively expensive. Medium-power tetrodes were given virtually no consideration due to unavailability (the 813 [1938] in push-pull could handle only about 500 watts; the Eimac 4-250A, which became the mainstay of post-WWII finals, did not appear until 1945).

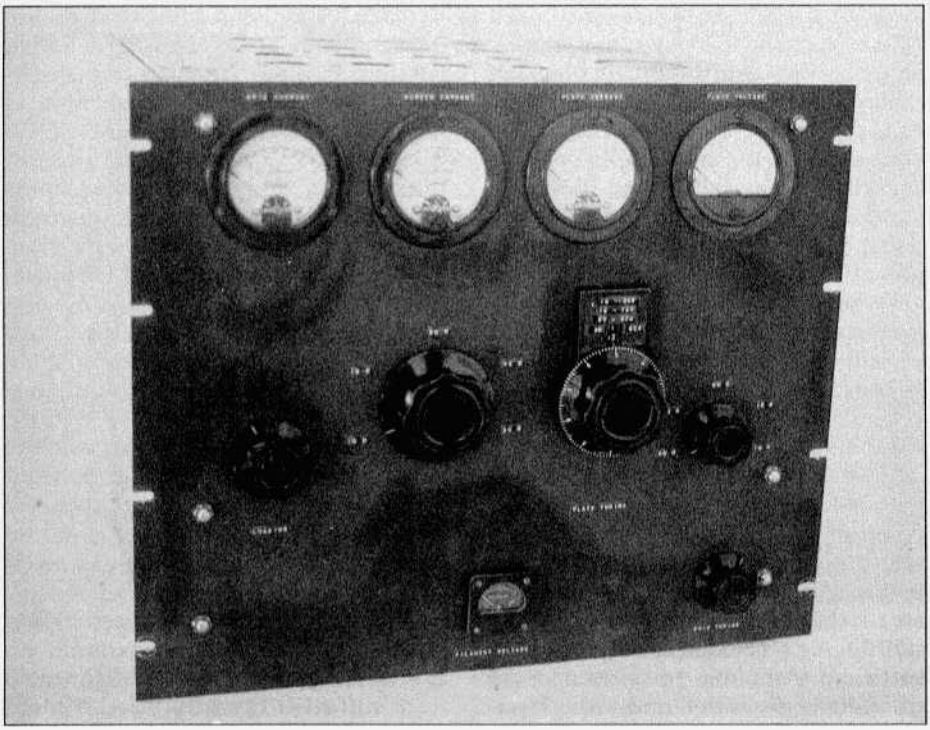


Figure 2. The author's replica of McCoy's 1-KW final.

Triodes were used in push-pull rather than in parallel, because, in the instance of the latter configuration, too many parasitics resulted from stray inductances, connecting leads, and tube capacities. Further, push-pull operation gained legitimacy among amateurs in the 1930s when they learned that it was more effective than other designs in balancing out even harmonics. An r.f. amplifier often emitted in its output harmonics of both even and odd multiples of its operating frequency. The harmonics might fall on either a higher amateur band or a frequency not assigned to amateurs. Standards for controlling harmonics were adequate for the era--a twenty meter harmonic on ten meters was acceptable if heard across town but not if copied across the country. So amateurs, knowing that the potentially strong second was greatly weakened, were satisfied that the push-pull design successfully mitigated the problem of harmonic radiation.

Series-feed. Since the d.c. power that is fed to the plate circuit of a high-power r.f. amplifier generates substantial r.f. voltage, the latter must be kept from getting to ground through the d.c. power supply. Series-feed applies d.c. voltage to the plate through the tank circuit at a point practically at r.f. ground potential. A by-pass capacitor to ground at the feed point dissipates any residue of r.f. voltage.

Series-feed requires usually that the tank circuit be insulated from ground. The plate-tank capacitor and plug-in coil are at high d.c. potential, and, therefore, present a dangerous temptation to unwary operators who, in their haste to change coils, may fail inadvertently to remove power from the circuit.

Amateurs in the 1930s might have preferred to adopt parallel- or shunt-

continued on next page

feed for their high-power amplifiers, whereby d.c. voltage is connected directly to the plate circuit. A blocking capacitor between plate and tank circuits prevents a short-circuit of the d.c. voltage, since the shaft of the variable capacitor is now at ground potential. Parallel feed places the incoming d.c. voltage in the plate circuit at high r.f. potential; consequently, a r.f. choke of very high impedance at the operating frequency must be inserted in the d.c. voltage line to prevent leakage of r.f. voltage back into the power supply.

Unfortunately, amateurs in the 1930s were deterred from employing parallel-feed for two reasons: (a) capacitors with voltage ratings satisfactory for passing r.f. and blocking d.c. at thousands of volts were not yet in the amateur marketplace; and (b) an appropriate r.f. choke was beyond technical feasibility. A r.f. choke was required with sufficient insulation to withstand the r.f. voltage generated and of high impedance at all output frequencies, including harmonics, for if the choke resonated at any transmitter frequency, it would draw current, overheat, and maybe fry.

Tank circuits: Amateurs in the 1930s aspired to construct high-power tank circuits that would facilitate rapid band change, ideally, from 1.75 MHz to 56 MHz. This particular goal, more than any other, set transmitters in the amateur community apart from those in broadcast and other commercial services. However, as noted by Jennings (1938, p. 28), who built one of the first amateur AM, kilowatt transmitters, the "flexibility of the transmitter goes down in some ratio to the increase in power and efficiency." The first impediment to flexibility was the number of buffer/doubler stages that must be added between the crystal oscillator/exciter and final to attain multi-band operation. Each stage required at least one tank circuit, and the driver and final usually required a grid and plate tank circuit, respectively. Buffer stages operating straight through at higher frequencies usually had to be neutralized; the final tubes definitely required neutralization, since for efficiency their input and output circuits were always tuned to the same frequency. The tube complement of Thordarson's (1938) kilowatt transmitter, which was designed for operation from 160 to 10 meters is illustrative: 6L6G crystal oscillator, 6L6G buffer/doubler, RK39 buffer/doubler, T-125 driver, and T-200 push-pull final amplifier.

A second impediment to flexibility arose from the fact that tank circuit efficiency--which is reflected in an optimal ratio or "Q" between capacity and inductance--was very difficult to maintain from one band to another.

For example, a variable capacitor of appropriate minimum-maximum capacity range for 14 and 28 MHz would lack sufficient capacity for 1.75 MHz; conversely, a variable capacitor optimally suited for 1.75 MHz would not work well on 28 MHz. The need for an air gap of from .3 to .5 inches between the plates of a variable capacitor, to prevent flash-over at 100% modulation, exacerbated the problem. A variable capacitor with such a sizeable air gap might have been a few inches or more in both height and width and 10 to 15 inches in length.

The dilemma prompted Millen (1938) to recommend that amateurs operate their high-power transmitters on only two bands instead of five or six. Why not, he reasoned, if one is a phone operator, choose the 20- and 75-meter bands; if one prefers c.w., pick either the 20- and 40-meter bands or the 40- and 80-meter bands. Amateurs would be relieved thereby of laborious tasks associated with handling a box full of plug-in coils and retuning a huge array of variable capacitors.

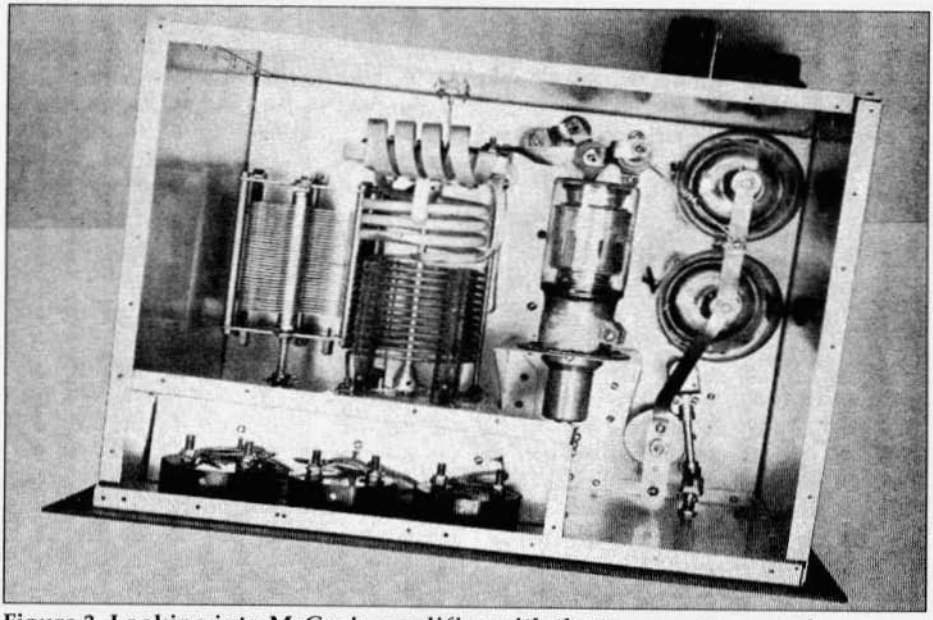


Figure 3. Looking into McCoy's amplifier with the top cover removed.

Part II: Post-WWII Kilowatt amplifiers and TVI

When amateurs resumed activity following WWII, they found that coaxial cable, which had been used for military radio, radar, and sonar since August, 1943, was immediately available on the surplus market. Heretofore, amateurs had used ordinary rubber covered wire, twisted in various lengths with coupling loops at each end, to link stages inductively. They also routed parallel wires, separated 4 to 6 inches by ceramic spacers, around nearby objects to couple r.f. inductively from a tank circuit to an antenna. The invention of coaxial cable, whereby an inner conductor is isolated from a vinyl covered, copper shield by translucent polyethylene, thus revolutionized amateur techniques of interconnecting stages of a transmitter and feeding r.f. to antennas.

Otherwise, the kilowatt r.f. amplifiers of amateurs shortly after the war were clones of those that they had operated before the war. Hardly a decade later, however, McCoy's "modern design" represented a wholly distinct approach. Parallel tetrodes had replaced push-pull triodes, parallel-feed had supplanted series-feed, and, a vacuum variable capacitor and a band-switching inductor in a pi-network tank circuit, which was impedance matched to coax, had displaced the earlier air-dielectric variable capacitor/plug-in coil configuration. Importantly, McCoy's final also incorporated complete r.f. shielding whereas those of the previous era ignored generally this aspect of transmitter design.

The striking differences that arose in the decade between the end of WWII and 1956 in high-power, r.f. amplifier design were precipitated by an FCC decision in late 1945. It allocated 100 channels for FM broadcasting between 88 MHz and 108 MHz, and assigned television channels 2-6 between 54 MHz and 88 MHz, and channels 7-13 between 174 MHz and 216 MHz.

The aftermath of these actions, entailing an explosion in the production of

continued next page

consumer television sets, posed a mortal threat to amateur radio. Amateurs soon discovered that FM and television were incompatible with the high-power transmitters that they had evolved painstakingly during the 1930s and late 1940s. Front-end overload, harmonics, and spurious emissions, such as key-clicks, sideband splatter, and parasitics, destroyed their neighbors' TV reception. Amateurs in droves shut down their r.f. amplifiers, observed "quiet hours," or ceased operating entirely.

An undaunted segment of the amateur community, however, sought to preserve its operating privileges by enhancing transmitter efficiency through such efforts as meticulous neutralization, elimination of parasitics, shorter r.f. returns to ground, additional bypass capacitors, harmonic traps in grid and plate leads, filtered power leads, low-pass filters, total shielding of r.f. units, etc. Amateur publications disseminated information for coping with TVI, and the ARRL dispatched Lew McCoy in the early 1950s to meet with audiences in over 50 cities to demonstrate convincingly that TVI could be eradicated and to inspire beleaguered amateurs to fight the problem.

Advent of the modern final. The disarray stemming from the onslaught of TVI abated considerably as amateurs turned from the push-pull to the pi-network tank circuit (Bruene, 1945). The latter both functions as a low-pass filter and permits the use of a single adjustable inductance instead of plug-in coils to cover multiband operation. It makes workable a compact, completely shielded layout (Grammer, 1952b, pp. 13-14). Indeed, at the height of the TVI trauma, engineers at Collins Radio Company made the then heroic announcement that they would market soon the KW-1, a multi-band, AM kilowatt transmitter, featuring a pi-network design that would dramatically decrease TVI (Roberts & Roberts, 1950).

Simultaneously, the technical staff at the ARRL, in contrast to Collins' market aspirations, struggled to show home constructors how to utilize the pi-network layout in building high-power r.f. amplifiers. A dearth of procurable components initially thwarted its efforts. However, manufacturers eventually developed those necessary for McCoy, in 1956, to put theory into practice--to design a final amplifier that could be replicated easily by home constructors.

During the early 1950s, Collins also was plagued by the void in high-power components. The company, therefore, put its substantial design and manufacturing resources to task of constructing parts for the final of the KW-1. Collins engineers soon found, however, that the challenge of creating components from scratch to meet exacting standards involved not only systematic research but also serendipity and trial and error.

Unaware of the snares that lie ahead, Collins declared precipitously in October, 1950, that deliveries of the KW-1 would begin in March, 1951. However, in April, 1951, production was postponed indefinitely, because of operational shakedowns, minor changes in engineering design, and delays in the delivery of materials. Finally, Collins stated in October, 1951, that shipments of the KW-1, at $3,850, had begun ("Advertisement," 1950a; "Advertisement," 1950b; "Advertisement," 1951a; "Advertisement," 1951b).

An amateur who ordered a KW-1 in 1951 obtained a kilowatt, AM transmitter, 160 through 10 meters, that virtually eliminated undesirable output frequencies. Never before in amateur radio had a new product, via either commercial or home engineering, represented over its progenitors an advance of such magnitude. Operation of the transmitter is facilitated by a single, gear-driven bandswitch; thus, among its many attributes, Collins emphasized that the KW-1 "provides the ultimate in

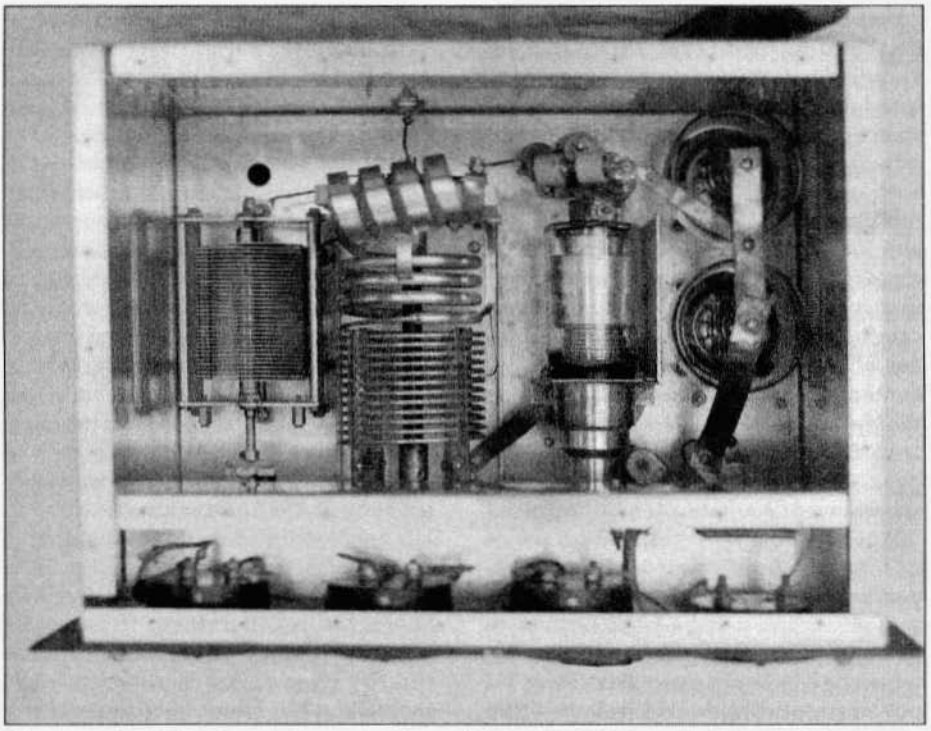


Figure 4. Looking into the author's replica of McCoy's amplifier with the top cover removed.

operating simplicity" ("Advertisement," 1950b). Nonetheless, the appearance of the sui generis components mounted on the chassis of the KW-1 final looks as if it had been arranged during a nightmare ("Advertisement," 1951c; Roberts & Roberts, 1950, p. 33).

One observes, for example, at the front of the chassis, two 4-250A tetrodes. Nearly buried behind them, an Eimac vacuum variable capacitor, 18-200 mmf. [first available April, 1948], is set vertically to save space. Four fixed mica capacitors are in parallel with the vacuum variable for tuning 160 and 80 meters. A pi-network, which consists of innumerable coils, distributed helter-skelter, matches optimally the plate impedance of the tetrodes to a value of about 300 ohms at the input of a L matching section. The L section, in turn, transforms the 300 ohm impedance to 50 ohms. The pi- output capacitor consists of two split-stator capacitors, one above and one below the chassis. Each section covers from 30-465 mmf.; the two capacitors are ganged together for tuning.

Grammer (1952a), a scant few months after the first KW-1 rolled off the assembly line, published a widely read conceptual rationale for utilizing a pi-network tank circuit in TVI harmonic reduction. He urged matching the pi-network of a thoroughly shielded r.f. amplifier to low-impedance coaxial output, which would attenuate harmonics by partially shunting them to ground; those that escaped, he said, could be further impeded by low-pass filters and antenna tuners.

Subsequently, Grammer (1952b) responded somewhat pessimistically to skeptics who pondered how they might

continued next page

adapt the pi-network layout in building high-power r.f. amplifiers. He acknowledged that components constituted the "chief" obstacles to home construction. The dilemma forced him to qualify his advice and accompany it with caveats: (1) He would use the 15 mh. Barker & Williamson 375E, a variable inductance coil, which was marginally useful at 500 watts; he insisted that coax from the antenna be matched carefully to the load to minimize danger of arcing the inductor at its roller contact. (2) He chose as tank capacitor the National TMA-150A, 22.5-150 mmf., with 0.171 spacing. It carried a 6,000 peak-voltage rating, and it was only seven inches long, but it compromised "Q" at both 10 and 80 meters because of its limited minimum and maximum capacities.

(3) He urged using a 10,000 volt mica for the parallel-feed blocking capacitor, which had been recently created for TV power supplies, although he knew little about it. (4) He recommended the National 175 as the high-power r.f. choke; however it had been introduced in the mid-1940s, before the 21 MHz band was opened in December, 1951, so he showed how it could be rewound. (5) He noted that to match coax to the load of a tetrode, such as the 4-250A, the pi-network output capacitor would need to be about 100 mmf. at 28 MHz and 800 mmf. at 3.5 MHz. To attain the enormous span in capacity that was required, he band-switched parallel combinations of fixed mica capacitors, yet he worried whether available capacitors could withstand r.f. current demands.

Part III: The McCoy KW final

The early 1950s were trying times at ARRL. Amateurs could purchase for $3,850 the KW-1, which mitigated the horrors of harmonics, but few could afford it. Home constructors thus looked to the ARRL for guidance in building inexpensive, high-power amplifiers that were both compact and shielded. Unfortunately, definitive suggestions were on hold. On the one hand, two essential components were not yet procurable in the amateur marketplace: a r.f. choke expressly designed for multi-band, shunt-fed transmitters and an efficient, compact, band-switching pi-network inductor. On the other hand, two essential components were procurable, a compact tuning capacitor and a compact output/loading variable capacitor; however, the significance of these items was apparently overlooked until the choke and pi-network inductor were developed.

The National Company produced in 1953 the R-175A, an upgrade of the R-175, with a high-impedance winding in the 15 meter band. Then, in July, 1955, Barker & Williamson marketed its trim Model 850, an 80 through 10 meter, pi-network inductor. It features a high-current, r.f. switch with silver-graphite contacts, a ten meter winding made of heavy silver plated strap, a 15 meter winding of heavy tubing, and stepped sectional coil windings.

The R-175A and the Model 850 pi-inductor led the ARRL staff to identify compatible variable capacitors. For example, for the pi- tuning capacitor, the vacuum variable capacitor came into focus. The Jennings Radio Company had announced in December, 1945, that after several years of research, it had successfully manufactured the first vacuum variable capacitor. In June, 1947, the Company placed nine of them on the market, and, in March, 1954, it produced a vacuum variable capacitor priced under $50.00 for the amateur field ("Advertisement," 1945; "Advertisement," 1954). As noted earlier, Eimac introduced its first vacuum variable capacitors in April, 1948, and Collins had utilized one of them in the KW-1; however, amateurs preferred the Jennings capacitors, once they became readily available, because of their

greater ranges in capacity relative to their small size.

For the pi- output variable capacitor, the Cardwell 8013, 50-1500 mmf., with 0.030" inch spacing between plates, and only 5 inches long, was discovered buried in industrial catalogues. The 8013 had been obtainable since 1945, and thus could have obviated problems associated with stacking fixed capacitors in parallel with a low-capacity variable, but it languished unnoticed during the formative years of pi-network amplifiers.

McCoy's "modern design" of a KW, AM, final r.f. amplifier became viable--in terms of the ARRL priority of providing designs that could be easily replicated by home constructors--after the National R-175A, B & W Model 850, Jennings UCS 300 mmf. vacuum variable capacitor, and Cardwell 8013, 1500 mmf. variable capacitor, were readily available to home constructors.

As Figure 1 shows, the three meters on the front panel of McCoy's final measure from left to right, respectively, grid, screen, and plate current. The controls, from left to right, are for the 8013 output-loading capacitor, the Model 850 pi-network bandswitch, and the UCS 300 vacuum variable capacitor. The control at the far right is for the grid-circuit bandswitch; the control at the far lower right is for the grid-input tuning capacitor. The components are mounted on a 17 X 13 x 4 inch aluminum chassis, which is attached to a 19-inch relay rack panel, 15 3/4-inches high. The above-chassis section is enclosed in a 11 1/2-inch high shield made from 1/16-inch sheet aluminum. An aluminum bottom plate completes the below chassis shielding.

Figure 3 reveals the layout of the components with the top cover removed. The three meters are in a separate enclosure that measures 11 X 3 X 3 inches. The tubes at the right are 4-250As in parallel. A neutralizing capacitor is in front of the tetrodes, as is a right-angle drive to the panel control for the switch shaft of the grid turret, which is mounted vertically under the chassis. Next, a Jennings UCS-300 vacuum variable is supported by an aluminum bracket 6 inches high and 4 inches wide. Immediately to the rear of the tank capacitor stand a National R-175A r.f. choke and a TV high-voltage blocking capacitor. A Model 850 inductor unit is mounted between the vacuum variable and a Cardwell 8013 pi-output capacitor.

Postscript. A comparable, top-down view of my replica of McCoy's final is shown in Figure 4. The main difference between Figures 3 and 4 is an extended meter enclosure in the latter for a plate voltmeter (see panel view, Figure 2). Also, I substituted a pair of 4-400s for the 4-250s. Note that Figure 2 shows an additional small meter, bottom center, for monitoring filament voltage at the sockets of the tetrodes.

The amplifier has worked for me exactly as McCoy assured his readers that it would. I have neutralized it only once--in 1965--and I have used it regularly since then, from 80 to 10 meters, as either a plate modulated Class C amplifier or a Class AB1 linear amplifier. I drive it in Class C with an Elmac AF-67; I excite it as a linear in Class AB1 with a National NCX-5. I plate modulate it with push-pull HF-200s in Class B. I use separate high-voltage power supplies, controlled by Variacs, for the r.f. amplifier and the modulator. I switch both screen and bias voltages, appropriate for a given mode of operation, with a single rotary switch. These voltages are obtained from separate power supplies whose outputs are regulated with different combinations of VR-tubes.

How is it that I elected to build McCoy's final? I was a teenager growing up in Southern California during WWII, and I obtained my general license shortly before hostilities ceased.

continued on page 40

The Compulsive Builder

The Early Years

by Bruce Vaughan, NR5Q
504 Maple Dr.
Springdale, AR 72764

In retrospect it seems I have always been more interested in building radios than in operating them once they are completed. During the depression years building was done from necessity. If you wanted a short wave radio you built it. Few commercial receivers were available—and those few were out of financial reach of a kid in his early teens.

What was the catalyst that first ignited the ham radio fire that has burned within me for over sixty years? I often wonder. Perhaps it was that night in 1931 when my family visited my dad's cousin. We lived in the country and such visits were common at the time. There was no other inexpensive form of entertainment available.

Cousin Albert, an inquisitive young man, was taking a 'radio course' from NRI. On top of their battery radio was a breadboard on which he had mounted a large coil of wire, and other gadgets with big black knobs attached. Albert kept twiddling with the knobs and moving the coils of wire, and the radio signals actually became more easily understood, and much louder. He explained he was matching the 'Aerial' to the radio. It made quite an impression on my 9 year old mind.

Two years later I came into possession of a dozen or so copies of a magazine called "Short Wave Craft." I was so impressed I could hardly lay them down. I took a copy to school and hid it in my notebook so I could read it while the teacher thought I was studying. I got a friend interested in radio and we worked out a way to send obscene messages across the room—from his desk to mine. My first DX. We used our pencils. Holding a pencil vertical, we touched the desk with the eraser for a dash—inverted the pencil and touched the desk with the point for a dot.

By age fourteen, we had fashioned home-built keys from hacksaw blades and buzzers from everything imaginable. Old radio speakers gave out a loud raspy note when 2.5 volts AC was applied from old transformers. Now, at age 76, I am amazed when I read all the ads in QST offering 'methods' of making the code easy. Learning code for me was as easy as learning to ride a bike or skate—and much more fun.

My first regenerative receiver was built in 1933. I was 11 years old. I would like to say it worked perfectly but it didn't. The set looked good on its varnished pine breadboard, but I only had some old 201A's and could not afford a battery. I tried AC on the filaments—the hum was terrible. I attempted to rectify my filament supply, and burned out my supply of '01A's.

I was lucky at finding 'Elmers.' Out in the country near my grandfather's place, lived a young man who it seemed could build anything electrical or mechanical. I remember him working on a radio that appeared in one of the mechanical magazines, probably 'Modern Mechanics'. This set used two of the new metal tubes. It was called 'The Hurricane Radio.' As it used only six volts on the plate it could be operated from a six-volt automobile battery, thus making it an ideal emergency receiver.

The author in his 1938-'39 hamshack. His call then was W5HTX.

The set worked. At night we could tune in WLW, XERA, KTHS, KVOO, and sometimes KOA in Denver. He agreed to help me build one. I saved up money for tubes and parts and built the radio. He let me use his to look at while doing the wiring. My set worked good. I used four flashlight batteries for power, and as you might imagine they had a very short life. I could not afford to buy batteries for it, so the set was soon junked.

I wanted so badly to become a radio amateur but did not have any idea how to do so. I had friends to help me build, and talk about radio, but none were hams. They told me it was very difficult to pass the amateur radio exam—and I believed them.

Then a wonderful thing happened. My dad, without a job, and in an effort to keep food on our table, decided to move to Springdale, a big city of almost 2000. We made the move in 1937. I was fifteen years old. As luck would have it, Springdale had ham radio operators. W5FKT, the local theater manager, W5BQI, an auto mechanic and my number one 'Elmer,' W5AG, a Class A operator who clerked in a dime store, and Wade Luckett, W5GWA, a fourteen year old boy who lived just one block from our apartment.

Wade explained to me that since we lived more than 125 miles from a regular examining point, that it was possible for Alan, W5AG, to administer my exam for a class 'C' license. My privileges would be the same as those of a Class B operator.

In the fall of 1938, I started listening to the code and theory lessons broadcast on 160-meter AM by W9BSP of Olathe, Kansas. I had no difficulty at all. I told Alan to send for my exam.

One cold winter afternoon, Alan called and said he had all the papers and was ready. He said he would come by the house within the hour. He arrived promptly and while we sat by our

continued next page

The author (now NR5Q) at one of his several operating positions in his present-day hamshack. The gear shown includes some of his homebrewed projects.

old wood heating stove he explained the rules to me. First I would have to copy 13 WPM. If I passed the code test, he would give me the envelope containing the ten problems, and essay type questions.

"Go over there and tune in some CW on forty meters," said Alan.

I sat down in front of my Sky Buddy and tuned across the band. Soon I had a good loud signal. I picked up a pencil and started writing—Alan was standing behind me. After a short time he tapped me on the shoulder, "You passed. Now turn off the radio and see what you can do with these questions."

I still remember one question almost exactly as it appeared. "What is said to exist when a capacitor, in parallel with an inductance, is adjusted so that the resistance offered to the flow of an alternating current is at a minimum?"

Beside the Sky Buddy was my first transmitter—all built, tuned up, and ready to operate. I liked to consider it one I had built but, without the help of W5BQI, I might well have been in trouble. The transmitter was constructed on a hardboard chassis, and sported coils wound from solid aluminum ground wire. The rig's capacitors came from old BC radios, and the neutralizing capacitors were home made. The power supply was built of old radio parts as well. The transmitter used a 47 crystal oscillator, link coupled to a pair of P.P. 45's in the final. I liked to call it a 50-watt rig. In reality, I suspect the output was somewhere between 15 and 20 watts.

Now we all know what a temptation it is to turn on a transmitter before you get a license. I resisted for three weeks or so. Then, one afternoon after school I could wait no longer. I tuned up the transmitter and sent a CQ. I used my buddies call, W5GWA--with his permission. He had been urging me to do so for days. I had little faith; I did not expect an answer. I tuned slowly across

the 40-meter band—W5GWA, W5GWA, W5GWA, W5GWA, de W5HHR, W5HHR, W5HHR. I almost went into cardiac arrest. When W5HHR finished his long call I threw the plate switch, the antenna switch, and turned back the volume on the receiver. I was shaking so badly I barely got back a reply. Then when I stood by, there he was again ... I tried to complete the QSO but I was simply too nervous. I could not do it. I pulled the switch.

I still have the card from W5HHR. He was using a 45 self-excited oscillator and a single 30 regenerative detector and Zepp antenna. The card says, "So wat wuz th matter u had to QRT."

My ham license, with the call W5HTX, arrived a day or so past Christmas in 1938.

I was in my senior year in high school and needed some spending money. The owner of the only radio repair shop in town was completely 'snowed under' with work. I hit him up for a job. He looked me straight in the eye. "Can you fix any of these radios?" he asked, waving his hand toward fifty or more radios awaiting repair.

"I'll sure give it a shot, if you'll let me," I replied. Clarence had let me, on rare occasions, use his ancient test equipment, and even taught me some of the basics of trouble shooting. With perhaps three hours total bench time I was ready to call myself a radio repairman. Such is the optimism of youth.

He reached for a little five-tube AC-DC set. "I've checked the tubes in this one—even switched 'em out, and the darn thing is still dead. See what you can do with it."

I removed the set from the cabinet—turned it on—and touched the center tap of the volume control with my finger. I got a nice loud hum. The audio, power supply, and speaker seemed to be OK. Clarence had taught me a little about using a signal generator. He said that most sets used 456 kc IF's. I adjusted Mr. Cantrell's generator to 456 and through an .01 capacitor (condenser back then) fed a signal into the IF stage. Nothing. I grabbed the VOM and set the scale to 250 volts DC. Oh, Oh, voltage on only one of the four wires going into the first IF.

"I need a new IF transformer, Mr. Cantrell," I said, "I'm pretty sure this one is shot."

"I don't stock stuff like that," replied the owner. "I would have to tie up a fortune to stock everything. I carry a good stock of tubes and a few paper condensers and some carbon resistors, and that's about it. I order everything special I need from Pittsburgh Radio. I can have a transformer here in a few days. Put it back together and grab another one."

I began to see why he was so far behind, "Is it OK if I spend a few more minutes on this one?" I asked.

I drew a crude picture of the area below the chassis and clipped the transformer wires as close to their connecting points as possible. I noted the color of the transformer wires on my pencil sketch. Then I took a quarter inch nut driver and removed the two nuts holding the transformer.

Carefully I slipped the transformer from its can. Boy, how lucky can you get. I spotted the break in the hairlike wire near its solder lug. Gently I scraped the wire clean, applied a tiny bit of flux, and tinned the wire. Then, I checked the resistance of the winding. Bingo, I now had continuity through the minding. I re-installed the IF in its can, and re-wired the transformer in the circuit. I turned the radio on and music came spilling forth loud and clear.

Mr. Cantrell turned, looked my way with amazement. He was sure at that time that I was a boy genius. Little did he know how darned lucky I was.

I repaired two more sets that afternoon. About five O'clock, Mr. Cantrell came over and stood by me while I

continued on page 39

Secret Radios of WW II

by James Riff, K7SC
9411 E. Happy Valley Rd.
Scottsdale, AZ 85255
rtjv20@email.sps.mot.com

As the war in Europe continued to expand, more and more American troops and airmen were captured and sent to German prison camps. The US government hurriedly set up a secret group to assist these interned GI's in their required escape attempts. One of the most needed items was the ability to communicate, and to this challenge American industry played a key role in the design of miniature transmitters and receivers that could be hidden in Red Cross shipments.

The Geneva Convention allowed for the shipment of needed comfort and food items to all prisoners of war, and the Germans followed this to some extent. The US did likewise to their prisoners held in the states. While the incoming packages were initially visually inspected at the prisons the later, 1945, parcels were x-ray inspected and this reduced the flow of hidden materials into the German camps. American electronics companies including Motorola, Zenith, and Magnavox were chartered to design and supply components for a wide range of miniature radios. Their proven ability and understanding of communications, and their classification as Signal Corp. top secret suppliers made them easy choices for the needed products.

The BBC was the proven European communication link providing secret coded messages to many organizations throughout the continent. Their powerful 6Mc, 9Mc, and 13Mc signals could be easily heard from the Baltic to Africa, making this the beacon of choice for all clandestine operations during the war. A secret US department known as Military Intelligence Service, approached the heads of these radio companies and requested (directed) them to develop miniature receivers that could receive the BBC, and transmitters that could send short range CW signals in the 3.8Mc band. Motorola cooperated, and their engineering department on Augusta Blvd. in Chicago produced a receiver design that could be hidden in a game board only 5/8 of an inch thick. This set was a multi-tap basket weave coil, a 1N22 microwave diode (the best available detector) and flat mica capacitors. The taps were selected with metal tipped pegs through position holes in the game board (Fig. 1 x-ray view). These sets were assembled in a secret military location, and shipped by the hundreds in individual Red Cross packages mailed from the USA. Most every prison camp in the German system was equipped with these receivers. Earphones, antenna wire, and instructions were hidden in various other shipments of clothes and food. Each was assembled by the selected Signal Corps and ham radio prisoners in the respected barracks.

The next stage was to design and conceal miniature transmitters, along with the battery packs needed to power them. With the advent of the new subminiature tubes being designed into the bomb and artillery proximity fuses produced by Motorola, the design was rapidly completed. These radios would transmit a 100mw CW signal in the 75M band and be paramount in the linkage with underground and invading forces. Battery cells and transmitter components were concealed in the center of softballs sent as recreational items. Each was carefully assembled by the barracks electronics team and used in accordance with the instructions sent over the BBC. So successful were these designs that after years of use the transmitters were still functioning perfectly

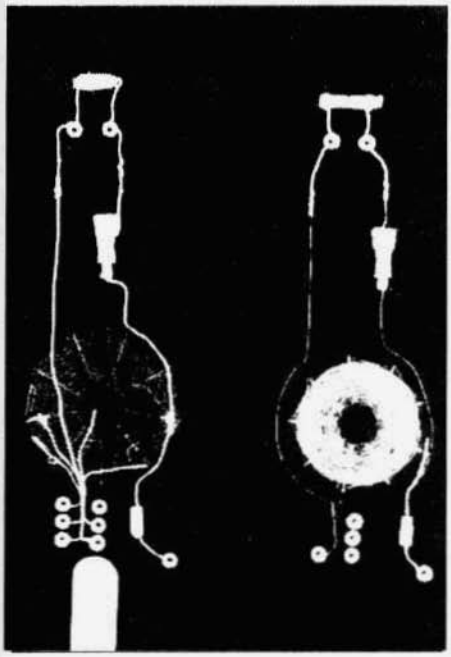


Figure 1. X-ray view of a game board showing the radio hidden within it.

when liberating forces opened the camps.

On the other side of the world our troops held in Japanese camps were almost totally denied Red Cross packages, and very few radios were ever smuggled into these camps. German prisoners held in US camps were allowed to receive mail and packages from the homeland. The Germans also enclosed radio receivers in their shipments, many copied from the captured American shipments. One such camp located in the Phoenix Arizona National Guard armory housed German naval prisoners, and their receiver shipments were knowingly passed through by Army inspectors; as the real news of the war effort from American sources counteracted the written propaganda that they read in their mail. It was noted that many of the German miniature radios were in fact the captured American sets retuned to different frequencies. It was thus determined that the enemy technology and material resources were seriously inadequate. As a footnote some of the escaped prisoners from this Arizona camp were recaptured at a local cafe and indicated that they preferred to stay in the area and not return to Germany—and many did just that. ER

Addendum to the SX-62 Air Force 1 story

Some additional information regarding the DC-7B aircraft described in my recent story: this actual Air Force 1 plane is now on display at the Pima Air Museum in Tucson, Arizona.(It is on loan from the Air Force) A recent restoration has the static (non-flying) display in excellent condition, and interior tours are available most any time. Although the main aircraft communications equipment is tube-era Collins, the BC-348 was still available as back up and can be used for DF headings if needed. One of the main reasons that Kennedy liked to tune his own receiver was his personal need for up to the minute public feelings and comments on his policies, and radio Havana was one of his regular programs. Although the DC-7B was the backup aircraft, it became Air Force 1 whenever the president was on board. JFK used this plane when flying to smaller air fields that could not accommodate the larger C-137B (Boeing 707). It was usually always shuttled to his destinations even though he was on the C-137B, and was on standby when the C-137B had problems. The Air Force had many additional communications links tied to JFK's desk, including voice scramblers and telephone interconnects. Due to the high security regarding these systems and their function, they have been removed from the aircraft, and only colored lamps and connectors remain today.

Jim Riff, K7SC

Long Live Ham Radio from page 3

cient with code. I soon got interested in getting my license for Ham Radio.

I started college in 1940 and got married in 1944. By the time I was ready to take my license test, the war broke out and I had to wait till it was over. In 1946 I did travel to Salt Lake City, Utah, and passed the test and got a B class license. The following year I traveled there again and got my class A license and at the same time took all the elements for the First Class Radio Telephone license, which I passed. How happy I was!

The first rig I had was built from war surplus, which was plentiful and very reasonably priced. The rig was a mobile using an 829B and a PE103 dynamotor. I built a converter for the car radio which permitted me to listen to 10 meters and I was very pleased that I could make contacts so easily. Even today, 10 meter AM is ham radio to me. My station grew and my wife, Opal, got interested in my hobby and got her license, W7NVR. Together we built up our station to be what the picture [on the cover] shows it to be.

I had a job working for the City of Idaho Falls, Idaho as power plant operator. This job allowed me spare time and so I started building kits; Heath kits and Johnson Viking kits. I believe I built every transmitter and receiver kit Heath offered. I have the last one of the kits that I built, of thirteen transmitters, a Heath TX1, which can be seen in the picture of my present station. I built the kits and other hams would buy them and I would take the money and buy more kits. Soon I had paid for my radio station at the power plant where I worked.

My call there was W7VEK. I thought it was an appropriate call: W7, Volts Electrons and Kilowatts. I had fun cleaning up the noise generated by the power plant and sub-station. I finally built a noise blocker that eliminated the unwanted frequencies of the unwanted noise and I had very good reception.

In 1948 I read an article in Radio News And Television that described an interesting type of modulation called "The Taylor Principle Of Supermodulation". I was interested and started procuring parts so I could build this rig. I had difficulty in finding all of the suitable parts and had to modify a transformer for the modulation transformer and the other hard component was the high voltage capacitor. I tried many capacitors and with the scope in the circuit I finally found one capacitor that was better than most others I had tried and this one made the upward modulation pattern to be what I was looking for. So far as I know this was the only supermodulation transmitter in my area at that time. It worked very well and I received many good reports on the good, powerful audio. I spent many happy hours using this station. Another transmitter in the picture is a single-sideband transmitter using an 807 final. This rig drove a 4-1000A linear that I built. When I built this rig there was only one other SSB station on the air that I could hear in Stibnite, Idaho. He was using a 10A exciter.

Soon, I built a summer home and installed a ham station at that location also. The call there was W7CBF. I was forced to get extra calls because I was signing W7MXM, W7MXM mobile, W7 portable in two different locations and the FCC field engineer advised me to apply for two more calls, which I did. Later the rules were changed and I had to decide which of the calls I wanted to keep. I opted to keep W7MXM.

My wife and I enjoyed this hobby very much. We had an automobile wreck in 1963, which took my wife and hospitalized me for two weeks. I was devastated and couldn't enjoy our hobby. I finally gave away or sold all of the radio gear. It was really tough to do.

In 1967 I met a young girl that wanted to be my wife. I love and appreciate her for coming into my life when I needed

help so badly. Soon we were married. When we were moving some of our things and hauling things into our new home, or to the dump, Pat saw an unfinished piece of gear, a Hot Water 12, that was in a box. It was placed on a cedar desk that I had made. She asked me what it was and I said it is just junk and we can throw it away. She said it looks new, what is it. Well I said it is a long story and I related to her what it was and that I used to talk all over the world and so on. She said that I shouldn't throw it away, so we kept it and hauled other things to the junk yard. Since it was time for me to go to work, I left and when I arrived back home from work, Pat had the rig sitting on the desk that she had moved into our bedroom. She said lets hook it up and talk. I explained to her that I had to finish assembling it first, which I started to do. The short version of the story is, after the shortcomings of the Hot Water 12, we ordered a Heath Kit SB102, and a SB220 linear which I built. I put up an 80-foot tower, assembled a Hornet 10, 15, and 20-meter beam and raised it to the top of the tower and we started talking all over the world again.

Pat and our children were so interested in the distance we could talk that they kept me up till the wee hours in the morning. Soon I said I must get my rest. I said if you want to stay up and talk all night you are going to have to get your own licenses, which they did. Pat's call is WA7VRH. We count 11 licensed in our family. We have eight children and 34 grandchildren and 13 great grandchildren. We keep in touch with our family via ham radio. Our oldest son, WA7OIM, is a commercial pilot and since I have my pilot's license, we often fly together and use the radio to communicate with our families from the airplane. Pat and I have built up a very nice, effective radio station. I have searched around and found many pieces of the old station that I gave away. I have restored these pieces and they are in the photo of my present station.

I so much appreciate my wonderful, beautiful wife for getting me back into my very enjoyable hobby. It is because of her and her interest in helping me that I have the enjoyment of our hobby. She has encouraged me, helped me, even bought me two 60-foot poles as a birthday present so that I could erect another 80-meter antenna. When I want a new piece of gear, she says buy it! She truly has made my life happy again. I pay tribute to her, Patricia A. Clayton, WA7VRH, who has brought joy and happiness back into my life. Long live Ham Radio! ER

THE FIRST TUR-KEY from page 14
tween dots or dashes.

I replaced the original paddle in 1991 with a Bencher. For fun, I put the original paddle in a box, marked it defective-warrantee return, and mailed it to Dick. I hadn't seen Dick in 35 years, but I got an immediate response. After inquiring as to any improvement in my CW, he ask if "that thing" I sent him was really the one he put together in 1949. I assured him it was, and we got down to renewing our friendship. But it was not for long as Dick became a Silent Key three years ago.

Dick's abilities after the Army and E E degree were used by Bell Telephone Labs for over 30 years. He spent much of his ham time developing 1240 MHz moon bounce. He had many articles published on moon bounce in QST. He wrote the ARRL microwave manual for the League. But I will remember his electronic keys, and sense of humor at K2USA. If you like CW, vacuum tubes, and simple things, try W2IMU's key. I think you will like it as well as I do. ER

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

ER in Uniform from page 7
the TU-5 on 160 meters but can be significant on 75 and above. The effect can be readily demonstrated with a TS-50 or other modern rig with FM capability. The audio quality of the FM component is actually quite good.

I originally thought that interaction between the PA and modulator grid circuits could be the culprit here, but regulating the modulator bias voltage had no apparent effect. Improved regulation of the common high voltage supply did not help either.

The FM'ing was finally "cured" by PA neutralization adjustments, a technique I had heard discussed in one of the San Luis Obispo videos. The neutralization settings in my 160, 75 and 40 meter tuning units had been originally established in the normal way, i.e., minimum oscillator feed-through with B+ to the PA disconnected. It was found that a slight INCREASE in the neutralizing capacity from these initial settings eliminated the FM'ing almost completely on 75 (TU-6) and 40 meters (TU-8). The result was quite dramatic - the demodulated FM heard loud and clear on my TS-50S virtually disappeared with only a slight RH adjustment of the neutralizing control (located under the calibration chart on the front panel). Only a slight residual carrier wobble remains under heavy modulation.

I also found that my 375 liked a bit of voltage. At 1100 volts I was able to run 50 watts of carrier with 100%, undistorted modulation as mentioned above, and at 1200 volts this increased to 60 watts. At 1000 volts, however, only 30 watts of carrier could be fully modulated and at 900 volts this decreased to 20 watts.

W3PWW and I ran some drift tests with essentially the same results reported by KJ4KV in his 1990 article (ER #13), i.e., no problem on 160 and 75 meters but intolerable on 40. In a test QSO on 40 meters, my 375 exhibited a frequency shift of almost 2 kHz (downward) over the course of a transmission with most of this change taking place during the first 30 sec. Audio quality was great, however, so if we can just figure out how to get rid of the drift.....

The East Coast Military Radio Net

This continuing Saturday morning activity was launched by Walt Hutchens, KJ4KV, in late 1990. Under the initial format, the net began at 0500 East Coast time and ran for about an hour on 3885 kHz. Walt was net control for the first several years of operation.

Net practices have evolved over the years. The early starting time was originally chosen to provide a relatively QRM free operating period, particularly for the low power sets. Also, early morning propagation on 75 meters was excellent during the early 90s and it was not uncommon for half a dozen GRC-9s to be heard during a session. By the mid-90s, however, propagation conditions had deteriorated and some mornings only those stations running T-368s and BC-610s could hear each other.

During a couple of particularly bad periods when 75 meters was very "long" in the early hours, net operations were moved to 1995 kHz where conditions were found to be much more favorable. Unfortunately, many net regulars do not have 160-meter capabilities and so, when possible, we would shift from 1995 back to 3885 when 75-meter propagation cut in (usually around sunrise). The operating period was also extended and the net now typically runs until 0800.

We are now back on 3885, 0500-0800 East Coast time every Saturday morning. There has been considerable discussion over the years about alternative operating times and frequencies and a couple of trial runs have been made (ex., late Sat. afternoons). However, considering propagation, QRM, participant's work and family schedules, etc., a better time and place have yet to be found. There is also an affili-

ated CW activity which meets most Sunday evenings on 3565 at 2100 East Coast time.

We currently see 15-20 checkins during most Saturdays and know of many listeners as well. Regular participants include W3PWW (Ted), WB3CTC (Mike), WB2JWU (Pete), KJ8L (Steve), AJ1G (Chris), KW1I (Dale), K1KHP (John), W1NZR (Brown) and N3XON (Gary) to name a few. WB8JBT/7 (Brian) also frequently joins in from Tucson, AZ.

AJ1G and WB2JWU have been continuous participants since the very beginning but KJ4KV has long since moved on to other endeavors. I have been net control most of the time for the past several years but will be relocating to the West Coast by the end of the summer. See you next Saturday on 3885. ER

The Compulsive Builder from page 33

prodded the inside of a cathedral RCA. "Let's lock it up and go over to Penrod's and have one of their big dollar steaks," he said. "I'm buying."

I continued to improve my station. Bob Henry, W9ARA (Amateur Radio Apparatus) ran a special $44.50 price on the Breting 9. I had to own one of those. A pair of T-40's in push-pull was added to my transmitter increasing the power to 150 watts soon after my license arrived. I used the old transmitter as a driver and link coupled it to the final.

I could not afford to go to college that fall. I worked for a year and saved enough to enroll at the University of Arkansas in 1940. I continued part time work for Mr. Cantrell until I left for the Air Corps in 1942. ER

NOTICE

Listen for the Antique Radio Club of Illinois vintage operating ham station on 80-10 meter AM fone in August (5th -8th). Certificate QSL for 2 or 1-way report. N9CQX/9

W5GST in 1940 from page 18

No knobs came through the panel. Vance still has the scars to show where he got shocked while neutralizing the 203A with the plate voltage on. The middle panel meter was for this deck.

Below that was the modulator, which consisted of a Turner mike, 57 speech amp, 57, 46 driving PP 46s in class B. The modulator could be switched between the two RF units. The bottom meter was for the modulator.

The panel was made of 1/4" plywood. The rack was made from bedstead angle iron bolted together. The dolly the rack is sitting on was also made from bedstead angle iron, welded together and casters.

The final plate voltage power supply was a 2 1/5 kilowatt pole pig full wave rectified by 866s. The two 110 volt windings were in series so that It got out around 900 volts dc. The low voltage power supplies were conventional 300-400 volt supplies. Vance got the pole pig from W5FBC in Cuero, Texas who worked for Texas Power and Light.

His receiver was a Hallicrafters SX-16. One day, Vance's landlady came in when he was on 10 meters and said she could hear him on her water heater in the kitchen. He had a friend talk on the rig and, sure enough, he could be heard on a corroded/oxidized pipe joint. ER

Editor's Comments from page 1

shortwave communications receivers." The difference between the second edition and the third edition is that this book is bigger (473 pages versus 351 pages) and it's better in that it covers 1942 to 1997 receivers whereas the second edition covered 1945 to 1996.

The book is truly great—good photos, good printing, well organized and very well written. It's available from the ER Bookstore for $24.95 plus $3 S&H. N6CSW

Tribute to a Classic from page 29

Several high-school friends and I hung out at Dow radio in Pasadena, where we became acquainted with pre-war amateurs who were preparing to get back on the air. A few of them possessed stations that defined the term "California AM kilowatt." The majestic sight in these grand transmitters of a vast display of radio components working in perfect harmony--open, breadboard layouts, enormous red-hot triodes, skyscraper tank circuits with towering plug-in coils, reassuring hum emanating from huge transformers, throbbing heat all over the place--was phenomenal. I convinced myself that someday I, too, would build a "California AM kilowatt."

My resolve never wavered, and eventually, in the early 1960s, time and resources enabled me to pursue my goal. I began by searching through the Handbooks for a contemporary design of an AM, KW, r.f. amplifier. McCoy's "modern design of a high-power final" in the 1957 ARRL Handbook caught my eye. I was impressed especially both by its elegant, esthetic appearance and by the fact that I could purchase or order all its critical components at a local parts store.

When I built it, I did not realize that its blending of theory, construction techniques, and newly developed components constituted a crowning accomplishment in the history of AM kilowatt r.f. amplifier design. I am just plain lucky! **ER**

References

Advertisement. (1945, December). Electronics, 18, p. 190.

Advertisement. (1950a, October). CQ, 6, pp. 10-11.

Advertisement. (1950b, October). QST, 34, pp. 78-79.

Advertisement. (1951a, April). QST, 35, p. 2.

Advertisement. (1951b, October). QST, 35, p. 2.

Advertisement. (1951c, November). QST, 35, p. 2.

Advertisement. (1954, March). QST, 38, p. 102.

American Radio Relay League. (1930). The Radio Amateur's Handbook. Hartford, CT: author.

American Radio Relay League. (1965). Fifty years of A.R.R.L. Newington, CT: author.

Barton, L. E. (1931, November). The class-B push-pull modulator. QST, 15, 8-12.

Bruene, W. B. (1945, May). Pi-network calculator. Electronics, 18, 140-146.

Dawley, R. L. (Ed.). (1947). The radio handbook, eleventh edition. Santa Barbara, CA: Editors and engineers, LTD.

Grammer, G. (1952a, January) Practical applications of pi-network tank circuits for TVI reduction. QST, 36, 10-15, 104-106.

Grammer, G. (1952b, October). Pi-network tank circuits for high power. QST, 36, 11-16, 106-114.

Jennings, J. E. (1938, October). A six-band one-kilowatt transmitter. QST, 22, 28-31, 88-90.

McCoy, L. (1956, June). Modern design of a high-power final. QST, 50, 42-46, 158.

McCoy, L. (1998, January). Looking back. Electric Radio, #105, 2-3, 39.

Millen, J. (1938). Notes on amateur radio transmitter design. Malden, MA: author.

Roberts, D. & Roberts, B. W. (1950, November). Inside story of the KW-1. CQ, 6, 30-33, 56.

Thordarson Electric Mfg. Company. (1938). Thordarson transmitter guide, No. 344-C. Chicago, Il: author.

Footnote [1]

Figures 1 and 3 are from QST, June, 1956, pp. 42,44. Reprinted by permission of the American Radio Relay League. I am grateful to Joel Steenis, KB7RYU, and Paul Finell, W7EFQ, for their assistance in photographing and preparing the four figures.

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 20 word- ad per month. **Extra words are .20.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word**. Your name, call, address and telephone number count as **6 words**. Hyphenated words count as **2 words**. **Please count the words in your ad and if you're over 20 words send payment for the extra words.**

Non-subscribers: $3 minimum for each ad (up to 20 words). Each additional word is .25. **Please call or write for display rates.**

VINTAGE EQUIPMENT ONLY

ER
14643 Road G
Cortez, CO 81321-9575

Phone/FAX (970) 564-9185
e-mail: er@frontier.net

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

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

FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hifi, parts. Send 2 stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805. aq253@osfn.org

FOR SALE: Tubes, Penta Labs 811A - $20; 572B - $55; 3-500Z, matched pr - $300; US NOS 811A - $35. Many other US NOS. VISA/MC. Dee, W4PNT VA (800) 755-2365, soundnmind@rica.net

FOR SALE: 6U8A or 6EA8 NOS 5yl. - $3 ea, 10 for $2.75 or 100 $2.25 mix OK. Fred Honnold, W6YM, 17890 Sharon Ct., Pine Grove, CA 95665. (209) 296-5990.

FOR SALE: S-38 (smooth finish), excellent condx, (Bottom & back missing) S/N HA-6 - $75. Don, K1DC, W. Bridgewater,MA, (508) 587-7045, k1dc@hatchassoc.com

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

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

FOR SALE: 7.5 amp Powerstat in metal cabinet w/xfmr, rectifier, filter, meters - $20. Mervyn Ellsworth, 2309N 25th St., Boise, ID 83702. (208) 345-6878

FOR SALE: Heath HR-10B, exc w/ manual cpy - $85 + UPS; Adventurer, good, w/ manual cpy - $85 + UPS. Chuck, NZ5M, (806) 798-1452

FOR SALE: Drake 2NT cw xmtr - $75 plus shpg - homebrew VFO also available. Carl Banfield, W2YH, 24 Fox Hill Dr., Franklin, NJ 07416. (973) 827-7441

FOR SALE: SP-400 parts unit, works but is modified, no case or P/S - $75 + shpg. Keith, KK5FE, 31 Claudia Dr., Covington, LA 70435. (504) 892-4538, kk5fe@communique.net

FOR SALE: Radio Set AN/GRC-10, complete unit w/MT-700 rack and manual, in GC. Marvin, 2957 Gaffney Rd., Richmond,VA 23237. (804) 275-1252, wa4hoj@juno.com

Hamvention 1998

The Manual Man will be at SPACES 1960 and 1961. Bring your excess amateur, audio and radio-related manuals to trade, sell, barter, etc. **manualman@juno.com**

WANTED: 1963 WRL catalog; will trade 1957 WRL or 1963 Allied catalog. NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

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

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

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 105 Sweet Bay Ln, Carrollton, GA 30116. wa4kcy@usa.net

WANTED: E. F. Johnson Co. HAMALOGs, unusual photos and information 1923-70. Bruce Hering, 41120 State Highway 13, Waseca, MN 56093. (507) 835-5619. bhering@efjohnson.com

WANTED: RADIO Handbook, First Edition, published May 1935. Lynn Stolz, N8AJ, OH, (614)885-5428

WANTED: Homebrew xmtrs and rcvrs or parts, working or not. George, N1TNQ, (401) 724-5516

WANTED: National FB7 and ACS coils or parts of coils in any condx. Jim Clifford, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511. (813) 654-7531, j.c.clifford@juno.com

WANTED: Gearshift for Teletype Model 28, or complete machine with one. Ivan, WA6SWA, POB 248, Reno, NV 89504, idh@cs.unr.edu

WANTED: Top dollar paid for Winchester Radios and Winchester related items. Donald Daggett, 122 Hall Rd., Grahamsville, NY 12740. (914) 985-7249, wc2e@webtv.com

WANTED: RF exciter unit for T-368 xmtr, also pair RCA 811A's. John Svoboda, W6MIT, (530) 672-0903, svoboda@directcon.net

WANTED: Schematics, info on a Gross model CB250 (or similar model) to assist in restoration. John Brewer 179 Palmer Dr., Clayton NC 27520. johnmb@mindspring.com

WANTED: O-92B/FLR for R-1230/FLR. Francesco Ledda, TX, (972) 985-0268, fledda@airmail.net

WANTED: Navships 94200.1 "Directory of Communication Equipment" Joseph W. Pinner KC5IJD, 201 Ruthwood Drive, Lafayette, LA 70503 kc5ijd@sprintmail.com

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

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

WANTED: Collins 310A-1 &/or 310A-3, any condx; 30J, 30K-(any); 302C-1, 312A-1. **FOR SALE:** SC-101 lamp hoods & grills. Butch, KØBS, MN, (507) 282-2141

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

WANTED: Noise Blanker PCB for KWM-380/HF-380 (Only PCB not assembled). T. Haruyama, JA1OZZ, t_haruyama@atg.mitsumi.co.jp

WANTED: James Millen 90201 low voltage power supply and 90902 oscilloscope. Doc, W9VVN, (218) 586-2952.

WANTED: TMC GPT-750 xmtr. Top dollar price paid for unit in first class condx. Alan Gray, W3BV, 1361 Sylvan Rd., Perkasie, PA 18944. (215) 705-0943, agray@voicenet.com

WANTED: 50/60's xtal desk mic's that work!; Heath Lunchbox mics. Bob, K6GKU, AZ, (602) 816-0660, CTXP98A@Prodigy.com

WANTED: Radio BC-969A SCR 614A. Weber, 4845 W 107th St., Oak Lawn, IL 60453-5252

WANTED: Transmitter BC129, amplifier BC116, dynamotor BD46; pre 1940 aircraft radios or parts. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272, treherne@erols.com

WANTED: Allied A2516 or Kenwood/Trio JR500S, any condx, or manual for either rcvr. David, WD6AF, maggihouse@aol.com

WANTED: Matching spkrs for National HRO-5 & NC-270; any Harvey-Wells spkrs or VFO's. Kelley, W8CFC, IN, (219) 365-4730.

WANTED: Roller chart info for Precision tube master series 10-12. Bob, KC2CPQ, NY, (914) 877-1413

WANTED: VFO & AC pwr sply for Harvey-Wells TBS-50D; 1957 or 1958 WRL catalog. George Shute, W4BDG, 2910 Virginia St. NE, Albuquerque, NM 87110. (505) 298-7347

WANTED: Main tuning knob Collins KWM2A. Ray, VK4FH, POB 5263, Daisy Hill, Brisbane, Queensland, Australia 4127. Fx 617-32993821

WANTED: QST Nov. 1940, Dec '42, April '43, all 1945. Richard Petersen, 1940 Grand Ave., Marion, IA 52302. (319) 377-9126

FOR SALE: Genuine new surplus: Unused R-390A cabinets #CY-979A/URR w/shock supports and misc hardware package - $305; top and bottom cover sets - $75. Mac McCullough, TX, (214) 324-4849, Fax - 324-4844

NOTICE: Central Wisconsin Radio Amateur Swapfest-Auction Sunday June 7, 1998, Junction City, Wisc. Featuring both big and small dealers. Tailgaters welcome. Contact John, W9JN, (715) 457-2506, jfw9jn@tznet.com

FOR SALE: Hallicrafter's manuals, copies starting at $5, some Johnson, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Vintage radio owners, retire the variac, new solid state SofStart available SASE. Rick Paradise, KE4OCO, 515 Wood Forest Ct. NE, Marietta, GA 30066-3519.

FOR SALE/TRADE: Hammarlund/HQ-145A; RME/4350; Heath/SB-301; NC-300; BC-348Q; TBS-50-II. **WANTED:** Drake/2-NT, 4/line. SASE. Sam Timberlake, KF4TXQ, POB 161, Dadeville, AL 36853. (256) 825-7305, stimber@lakemartin.net

FOR SALE: GR 650 Impedance Bridge - $75; Gates AM Broadcast Modulation Monitor - $ 100. Steve Johnston, WD8DAS, 3350 Oakham Dr., York PA 17402. (717) 755-3920.

FOR SALE: Swan 240, good condx. JeRB, K8WPI, MI, (616) 382-5401, Jerb@lserv.net

FOR SALE: Parting out Hallicrafters HT-37, SX-62A. Write or email your wants. Don, KC7YDB, POB 71467, Reno, NV 89570. GilsonDP@aol.com

FOR SALE: Collins ARC-2A AM/CW xcvr, orig W/dynamotor - $125, PS - $25, RT-70 xcvr w/HS, mic, PS - $75. Mike, WB2UID, 38 N. Reading St. Hooksett, NH 03104. (603) 668-8549

FOR SALE: The K7FF Super List no longer exists. Thanks to you who purchased items from it. Derek, K7FF.

FOR SALE: RU-18 rcvr, 3 coil sets in orig boxes, orig manual, everything exc to like new condx - $135. Patrick Marineau, K9HF, 6300 Kingsway Dr., St. Louis, MO 63123. kampem1@juno.com

FOR SALE: Johnson Challenger, good condx, operational, w/manual (copy) - $60 plus shpg. Carleton Rand, W1PZI, 85 Black Hall Rd., Epsom, NH 03234. (603) 736-9695

FOR SALE: Collins 51S1 - $1650; 302C-3 - $325. Lane, KM3G, (619) 470-6528, km3g@cts.com

FOR SALE: New Hammarlund rcving tubes; S-Meter $25. **WANTED:** Coil set for MILLEN 90651 dipper. Norm, W1CIX, POB 402 West Bridgewater MA 02379. (508) 583-8349

FOR SALE: Collins radio parts. Send SASE for list. Bill Mills, 188 Ellis Mill Rd. NE, Milledgeville, GA 31061-9020.

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. (817) 799-5931, w5nwx@juno.com

FOR SALE: New reproduction HQ129-X panels - $53, ppd. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150, rh84216@usa.net; www.gate.net/~rh8421/radio/html

FOR SALE: SX-115 + R-48A speaker, manual & spare tubes, collector quality - $800, prefer pickup. Don, K1DC, W. Bridgewater, MA, (508) 587-7045, k1dc@hatchassoc.com

FOR SALE: NC-300 + matching spkr, stal calibrator, manual, good condx -$250. Prefer pickup. Don, K1DC, W. Bridgewater, MA, (508) 587-7045, k1dc@hatchassoc.com

FOR SALE/TRADE: Hallicrafters SX28, SP44, orig, no mods, manuals - $1 SASE for pix. **WANTED:** Globe Champ or Viking Valiant. Bob, K6GKU, AZ, (602) 816-0660, CTXP98A@Prodigy.com

FOR SALE: National MB-150 mult-band tank - $40; Johnson 500 manual - $20; SAMSCB Photofact #5 ,#6 ,#79, #91 - $40 set; Triplett 630 APL VOM - $35. **WANTED:** Heath HW32 manual. Dave, W1DWZ, (508) 378-3619, w1dwz@juno.com

FOR SALE: Collector quality Heath Two'er, a 9.5 to 10, w/book, mic, very nice; black S-3 8 rcvr, good condx, works! Fred Clinger, OH, (419) 468-6117, after 6 PM EST

FOR SALE: Rubicon instruments portable precision potentiometer therocoulpe EMF measurement test set in nice wood case, manual - $20. Allan Luire, W9KCB, 605 E. Armstrong Ave, Peoria, IL 61603. (309) 682-1674

FOR SALE: Collins radio orig 50TH year book; The Collins Story by Arlo Goodyear, 1954; 651S-1 manuals, part 1 & part 2; 618-T1, 2, 3 manuals; Colins Airborne manuals. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE/TRADE: BC-312; BC-342; BC-344; Collins TCS-5 xmtr; ARB (complete). **WANTED:** Manual for T-339 & DP-12; R-90I rcvr; junker AN/SRR-13. Tom Brent, Box 1552, Sumas, WA 98295-1552. (604) 826-4051

FOR SALE: Hammarlund HQ 170 - $100 + shpg. Frank, KA0DQV, KS, (316) 856-3220.

FOR SALE: AN/MS, rack-panel connectors, meters, relays, xfmrs, tubes, equip, literature, more, list - $1. Joe Orgnero, VE6RST, Box 32 Site 7 SS1, Calgary, AB T2M 4N3, Canada (403) 239-0489

FOR SALE: Collins 75A4, VGC - $675; Collins 75A4 2 filter, VGC - $1000; Hallicrafters SX-100, VGC - $250. Dan, K8WOZ, 3626 Red Oak Branch Ln., Kingwood, TX 77345. (281) 361-3847

ELECTRON TUBES FREE Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 8311, Essex, VT 05451. (802) 879-1844, FAX (802) 879-7764

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

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

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

FOR SALE: Free info on many topics related to vintage amateur radio equipment & operations at http://www.mnsinc.com/bry/hamlynx.htm Everyone welcome. Brian Carling, G3XLQ/AF4K.

FOR SALE: New Ranger I, Valiant I & Navigator plaster dials, 160-10 freq no's in green, w/all holes like orig - $17.50 ppd. Bruce Kryder, 4003 Laurawood Ln., Franklin, TN 37067. (615) 794-9692.

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

FOR SALE: Coax cable RG-11AU - 20¢ per foot. Francis Waggoner, W2PTI, 268 Barben Ave., Watertown, NY 13601. (315) 788-1621.

FOR SALE: HRO 60 w/spkr & 7 coils, exc condx - $600. Chuck, KØRFQ, 641 N. Oak Grove Ave., Springfield, MO 65802. (417) 863-7415.

FOR SALE: Viking Valiant, works good, w/book - $285; Heath HM-102 SWR/pwr meter - $30; TCS xtals, 5 for - $20; Bliley BC-3 xtals, 3 for - $15; U-ship. WA7HDL, ID, (208) 756-4147 after 2330Z.

FOR SALE: CE 200V - $325; 15 years PE - $75; 15 years RE - $75; NCX-3 - $150. U-shp. Keith Perry, K7PSZ, 384 S. 48th St., Springfield, OR 97478. (541) 726-1512 after 6pm.

FOR SALE: Gorset Communicator III - $45; Drake TR4C, AC4, MS4 - $350. Ron, K1BW, MA, (413) 538-7861.

FOR SALE: 2 National 6+2 VFO's, 1 Heath VF1, all w/books. W.F. Rhodes, 1324 N. Dorset Rd., Troy, OH 45373-4604.

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

FOR SALE: Collins 516F-2 bias mod, parts/instr - $12, ppd/US. Cory,N2AQS, 1000 E 14th/178, Plano, TX 75074-6249. hinec@cogate.dl.nec.com

NEW RELEASE: Flyer 198. For details send 2-stamp LSASE to: Olde Tyme Radio Company, 2445 Lyttonsville Rd. Suite 317, Silver Spring, MD 20910.

FOR SALE: EICO grid dip meter model 710 NIB - $110; new foot SW - $12. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: Yaesu YO-100 monitor scope 455 IF - $100. WB4KVB, TN, (615) 227-8361.

FOR SALE: GPR90 w/cabinet & manual, exc + condx - BO over $500. Bob, KL7HDY, AK, (907) 346-1044.

FOR SALE: Galena xtal radios, super sensitive & selective, in rare wood cases. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447.

FOR SALE: Drake T4XB, R-4A as set; Globe Chief DLX, WRL 755 VFO. Jim, ND, (701) 852-4809 eves.

FOR SALE: SX-100 w/R46B, good condx - $190 + shpg. Vern Snyder, 5 Parkview Dr., Winder, GA 30680. (770) 307-1459.

FOR SALE/TRADE: Command set rcvrs & xmtrs. Ken Kolthoff, K8AXH, 8967 Scott Dr., DeSoto, KS 66018. (913) 585-1196.

FOR SALE: Several RME radios, not working. **WANTED:** Hammarlund HC 10 converter, reasonable. Noonan, SC, (803) 726-5762.

FOR SALE: National Assoc. of Broadcasting Engineering Handbook, 6th edition, like new - $25 + shpg. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405-2375. (541) 345-2169.

FOR SALE: Messiner Signal Shifter - $90. **WANTED:** Johnson Invader 200 & Central Electronics 600L amplifier. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603.

FOR SALE: NIB 4-125A's - $85; RCA 811 - $15; Eimac 7203/4CX250B - $90; 250TL - $75. Frank S. Law, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415.

FOR SALE: Big Collins KWM-380 Service Manual; small 380 operators manual; plus more Collins stuff at Dayton, Space 3353. For more info - Gary, CA, (714) 552-1068.

FOR SALE: T368 exciter complete, needs TLC - $45. **WANTED:** NCX5 parts; T150 & SX101 meters. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531.

FAIR RADIO SALES

1016 East Eureka Street
POB 1105, Lima, OH 45802

419/227-6573
FAX 419/227-1313

Radio-Electronic Surplus Since 1947!

* Military Radio
* Electron Tubes
* Test Equipment
* Transformers
* Variable Capacitors and Coils

We have most R-390A spare parts including:

VFO f/R-390A (not Collins), gov't reconditioned - $45
IF Amp with good filters, but less RT510, used - $100
3TF7/RT510 Ballast tube, unused - $17.50

Shipping charges additional! Ask for our 1997-2 catalog!

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

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

FOR SALE: Yaesu FRDX-400, rcvr, CC , man - $100. **WANTED:** Parts for HQ170-IF xmfr, part K38946-1; NC300 S-meter. CC on wanted items. Burt, KC8FBR, MI, (517) 736-8020.

FOR SALE: Heath HS-24 - $20; Monitoradio MR-10 - $35; Dow Key T/R switch, new - $70; Heath xtal pack - $60; Bud Gimix - $30; Collins 4 hy choke - $55; H&K 24G tube, new - $20. Free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (973) 728-2454

FOR SALE: Heath Chippewa amplifier & sply, not pretty, but restorable - $250; Valiant, VG - $275; Viking I, VG - $175; Johnson 250 matchbox, near mint - $100; SB-610 monitor scope - $95; Hallicrafters R-42 spkr - $100; J-47 knee key, NOS - $45; ARRL handbooks & other stuff. LSASE for list. WA7IHN, POB 442, Aumsville, OR 97325. wa7ihn@aol.com

FOR SALE: Tubes, many specials; NOS under 80¢; used tested under 40¢. Stamp for list. David Boardman, 10 Lemaistre, Sainte-Foy, QB G2G 1B4. Canada, (418) 877-1316.

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

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

FOR SALE: R-390A Repro nameplates - $9 shpd. N5OFF, 111 Destiny, Lafayette, LA 70506. trinit698@dt.net, (318) 989-3430

FOR SALE: Books, all electronics related; 200 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. wwtok@email.msn.com

FOR SALE: English Redifon R408 rcvr, 15 bands, 13 kHz-28 MHz, AM, SSB, CW, beautiful - $250. Stuart T. Carter II, 680 Fernwood Dr., Melbourne, FL 32904-1995. (407) 727-3015

FOR SALE: Heath HW8 QRP scvr w/pwr sply, very nice - $125 shpd UPS. **WANTED:** Aircraft band handheld. Ros, WB0GKL, CO, (970) 259-0785.

FOR SALE: Early HRO/exc - $200; complete AN/GRC9 set, exc w/extras - $350. Harvy Nye, 1480 W. 12th #8, Eugene, OR 97402. (541) 334-1784

FOR SALE: Bakelite panels; straightened lengths of #10, #12, #14 tinned wire; SASE for info. Parker, W1YG, 87 Cove Rd., Lyme, CT 06371.

Battery Not Included

All DFDs feature jumper selectable 10Hz/100Hz resolution and have digital filtering to eliminate flicker due to roundoff.

KIT $49.95
+ $1.50 S/H
Add $10.00 for LED backlit display module

Digital Frequency Displays

Add digital readout to vintage gear.

DFD1

for single conversion and direct conversion radios. IF offset adjustable from +/- 0 to 16 MHz in 1KHz steps VFO inputs to 40 MHz.

DFD1-Hammerlund

for HQ-100, 105, 110, 120, 129, 140, 145, 150, 160, 170, 180, 200, SP-400, SP-600.

DFD2

For Collins, Heathkit SB series, TS-520 and FT-101 Measures HFO (crystal), VFO and BFO then computes and displays RF frequency.

DFD3

Can be used with any radio from 1 to 32 bands. Programs itself for over 100 different radios including all Collins, Heath SB series, Drake, Hallicrafters and many many others. Manually programmable for any radio. Measures only the VFO.

MasterCard VISA

Almost All Digital Electronics
1412 Elm St. S.E., Auburn, WA 98092
Phone 253-351-9316, FAX 253-931-1940, e-mail neil@aade.com
Call 9AM/9PM pacific or Visit our web site http://www.aade.com

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

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

WANTED: Schematic for Hammarlund Super-Pro 110 rcvr; HP 412A DC voltmeter. Don, CA, ph/fx (818) 368-7374.

WANTED: Manuals Hallicrafters SX62A, Globe Chief 90A, Heath GR64, Knight TR106, VFO frequency dial for Hallicrafters HT37/32. Jack, KL7GKV, OR, (541) 839-4423.

WANTED: VFO knobs for Ranger II or Valiant II; modulation xfmr for B&W 5100, need not be orig. Andy, KA0SDT, 201 Moore Dr., LaCrescent, MN 55947. (507) 895-8926.

WANTED: 1997 Callbook, no telephone. Herb, K9GTB, RR2 Box 158C, Gillespie, IL 62033.

WANTED: Mics: EV605, 638, 641; Astatic UT-78; Shure 545S/54PE/54SD; CR80, CR41, 707A. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225, fx 328-4217. tomsmics@flex.comp.com

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

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

WANTED: Valiant II; Swan 600R Custom; Hammarlund SP600-JX21A; TMC GPR-92. Ric, C6ANL POB N4106, Nassau NP, Bahamas.

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. danielc4116@aol.com

WANTED: Hammarlund SP600-JX17, XC-100P xtal calibrator; ARRL Antenna Handbook 2nd-Edition; EFJ Ranger II in VG-excel, cond's; Brian, IL, (888) 851-4202.

WANTED: UTC A-12; copy of MIL-T-27A spec; RCA, Langevin B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763. richmix@erols.com

WANTED: Any military entertainment radio (Morale rcvr), manuals, accessories, or data plates. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. ph/fx (707) 544-5179.

The Original.

An Excellent Choice for Collins 30L-1 Users!

Svetlana 811A

Svetlana is proud to present our new 811A High-Mu Triode, manufactured the *original* RCA way, before cost cutting changes. Especially for 30L-1 owners, this tube was designed by an unparalleled team of engineers for superior performance.

- Externally improved with ceramic base and ceramic insulated plate cap
- Internal structure aligned and supported for 30L-1 horizontal mounting.
- High quality manufacturing.
- Superbly matched.

Svetlana
ELECTRON DEVICES

For free 811A technical data, a list of Svetlana amateur radio tubes with characteristics and a QST article by Bill Orr, W6SAI on the 30L-1 and the Original 811A, contact:

www.svetlana.com

Headquarters: 8200 S. Memorial Parkway•Huntsville, AL 35802
Phone 205/882-1344 • Fax 205/880-8077 • Toll Free 800-239-6900

Marketing & Engineering: 3000 Alpine Road • Portola Valley, CA 94028
Phone 415/233-0429 • Fax 415/233-0439 • Toll Free 800-5-SVETLANA

FOR SALE: Join SPAM, the Society for Promotion of AM. Learn about Advanced Modulation Certificate, Circuits - $1 plus large SASE 3 stamps. W4CJL, 202 Baker Dr., Florence, AL 35630

FOR SALE: Hallicrafter's SX-25, vg, & matching PM-23 spkr - $275; Drake 2AQ - $75; GSB-100 parts unit - $60; Gonset Communicator II, 2m - $49. Shpg included. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881

FOR SALE: Signal Corps BX-4 battery box from SCR178/179 equip, clean, some mod's - BO. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612

FOR SALE: Kenwood antenna tuner AT-200, cosmeticly fair - $125 + shpg. Tom Murray, 3177 Latta Rd. #409, Rochester, NY 14612. (716) 723-1672 ph/fx, tomvidtek@aol.com

FOR SALE: TCS military radio set: TCS13 xmtr on shock mount, TSC rcvr, matching Collins 115/230 volt pwr sply, connectors - $295. PU only or I could deliver it to Dayton. John Peterman, W9VG, 3022 N. 53 ST., Milwaukee, WI 53210. (414) 445-0533

FOR SALE: RME collectors: HF10-20 VFO, exc cond's - $50 + shpg. I can deliver it to Dayton. John Peterman, W9VG, 3022 N. 53 St., Milwaukee, WI 5321. (414) 445-0533

FOR SALE: R-390A RF deck/xtal deck, counter, some tubes missing - $50. George, K1ANX, MA, (413) 527-4304

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

FOR SALE: RME 6900 ham rcvr, looks & works great - $200 + shpg. I can deliver it to Dayton. John Peterman, W9VG, 3022 N. 53 St., Milwaukee, WI 53210. (414) 445-0533

FOR SALE: Heath HO-10 monitor scope - $50; unused RCA 913 1" scope tube - $15. Clarence Filley, W7KE, 1109 S. 2nd St., Hamilton, MT 59840. (406) 363-1946

FOR TRADE: Two good RCA 833A's for one Taylor 833A; also looking for Taylor 803, 813, 875A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR SALE/TRADE: KWM-1 plugs & sockets; brand new DPA-24HV2-33S-2 plug. **WANTED:** 51S-1 T4 600ft part No 667-0522-00; 5 sided skirted Rejection tuning knob; PTO locking lever; 75A-4 small bakelite cylindrical spinner; knob for 4:1 pro knob; KWM-1 main tuning knob; 75S-3C 200 Hz xtal filter. Steve Darventiza, 20 Scott Rd., Herston Brisbane, Australia 4006

FOR SALE: Collins Radio Company 1958 to 1966; Avionics & Ground Communication Service Manuals, specifications, technical data; 651S-1, 618+ manuals. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

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

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

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WA0JAKG, NE, (402) 464-8682.

WANTED: KWM-1 w/516F-1, 312B-1, SM-1, TRX should be working, orig & exc condx. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069. taka-doi@kk.iijtu.or.jp

WANTED: Information-WW2 TCS Radio System: Design, Manufacturing & Operation for article. Any help appreciated. Thanks. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. (707) 523-9122 (message) greg6fzh@aol.com

WANTED: Test equipment & tube audio amplifiers. Mike Nowlen, WB4UKB, 2212 Burgee Ct., Reston, VA 20191. mike@3dnet.com

WANTED: Hammarlund SP600-VLF rcvr. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: McKay Dymek radio literature & info. Gene Peroni, KA6NNR, POB 58003, Philadelphia, PA 19102. (215) 665-6182

WANTED: Small PA system using 6L6; a set of B&W, airduct, etc; coils 80 BCL-40BCL-20BCL or equiv; 2" dia PSE. Joe, K2QPR/4, FL, (561) 220-7362.

WANTED: Knight T-175 6 & 10 meter linear. John K. Smart, 1344 McDonald Hill Rd., Frankfort, OH 45628-9575. (740) 998-4518

WANTED: Hammarlund SP600-VLF rcvr. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.


Licensed at least 25 years ago ?
And licensed now ?
Then you should belong to the
Quarter Century Wireless Association
For information write :
159 E. 16th Ave., Dept ER
Eugene, OR 97401-4017
http://www.teleport.com/~qcwa

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

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

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

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

WANTED: Hallicrafters HT-1, HT-9, HT-31, 5-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attwx.com

WANTED: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: Broadcast gear, compressors, limiters, old mics, consoles, EQ, tube recorders, thanks! Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax

WANTED: Navy xmtrs: MQ, TCA, TCE, TCN, TCX, TDE; rcvrs: RAW, RAX, RBD, RBJ. Steve Finelli, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211. navrad@enter.net

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

WANTED: Your retired Vibroplex Zephyr or Presentation bug; unbuilt xmtr kits; 4CX1000 tube. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688

WANTED: Heath VFO HG-10B or HA-5 Hallicrafters VFO. Bill, W4PBN, TN, (931) 433-7453.

WANTED: HELP! Need manual or copy for rare Hammerlund SP600 JX28, can you help? R. Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083. (609) 783-4175

WANTED: Heath SB-200 parts unit; Heath IT-11 capacitor checker; Hickok 600A tester. William Shibler, 5899 Barnes Ave., Bethel Park, PA 15102. (412) 835-7015

WANTED: Sargent info, have acquired a Sargent model 11 UA. Are there any others out there? Need a manual copy & would like to talk/correspond w/any other owners of this or similar sets. Dean Showalter, W5IJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

The Radio Finder©

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

Find the Radio Finder at Dayton: Table # 4253

MAY SPECIALS

AMATEUR TRANSMITTERS: **COLLINS** KW-1, #70, works FB; KW-1, #31, needs work; 30-K w/ 31A-3 exciter; 32S-1; 30L-1; **DRAKE** T4-X; **JOHNSON** Invader 2000; Ranger; Valiant; Thunderbolt. **GONSET** GSB-100; **HALLICRAFTERS** HT-32; HT-40; **HEATH** DX-100; Apache; HA-10 Warrior amp. **MULTI-ELMAC** AF-67; AF-68; **DENTRON** GLA-1000 amp

AMATEUR RECEIVERS: **COLLINS** 75A-2; 75A-3; 75S-3; 75S-3B; 312B-3 speaker; 312B-4; 516F-2 case only w/speaker; CP-1. **DRAKE** R-4A; **HALLICRAFTERS** SX-88; SX-100; SX-99; SX-71; SX-62A; SX-42; SX-25; SX-17; S-40B; R46/R46B speakers; **HAMMARLUND** SP-600-JX w/prod. det.; SP-600-JX-16; SP-200 (BC-779) w/power supply; HQ-180-AC; HQ-120; **NATIONAL** HRO-5RA1 complete rack set; RAS-5 WW II complete rack HRO-like rx; HRO-60; NC-2-40-D w/spkr; NC-183D; NATIONAL RBL-5 WW II LF receiver; **NATIONAL** speaker; **SCOTT** SLR-F "anti-submarine" receiver

TRANSCEIVERS: **COLLINS** KWM-1; 516F-1 AC; 516E-1 DC; KWM-2 w/blanker, Waters; KWM-2A; prototype 312B-5; CC-2 KWM-2 in suitcase; KWM-2 DC supplies; **DRAKE** TR-4C w/AC-4/MS-4; TR-7; **GONSET** Communicator II, III, IV; **HEATH** SB-102; HW-101; HW-16; Twoer; **KENWOOD** 830-S; **NATIONAL** NCX-1000; **YAESU** FT-101-E; FT-101-E accessories: remote VFO, monitor scope, Landliner phonepatch, digital readout; FTDX-560

MILITARY RECEIVERS: **COLLINS** R-388; R-388 w/spinner knob; **COLLINS/Miltronix** R-390-A; Arvin/Miltronix R-725; good just-serviced, working R-390; R-390-A; CEI 354; **WATKINS-JOHNSON** DMS 105A; BC-348-Q; **MOTOROLA** R-644/URR 20-30 MHz AM/FM receiver

FILTERS: 75A-3 6 KHz, 800 Hz; DRAKE R4C-250 Hz.

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

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

PURCHASE RADIO SUPPLY

Electric Radio enthusiasts. Tired of antiseptic electronics stores? The answer to this sad condition is a heavy dose of Purchase Radio Supply.
Looking for transmitting and receiving tubes, components, hardware, and publications? You name it, we may have it.

Purchase Radio Supply
327 East Hoover Avenue
Ann Arbor, Michigan 48104

TEL (313) 668-8696
FAX (313) 668-8802
e-mail: purchrad@aol.com

NOTICE: Watch Radio Finder web site http://www.radiofinder.com for new listings of old keys and bugs, including a 1920 Vibroplex, an old McElroy and plenty more. Old QSTs, CQs, and Radio magazines now are part of the web catalog plus many old Handbooks and other radio publications.

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

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

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

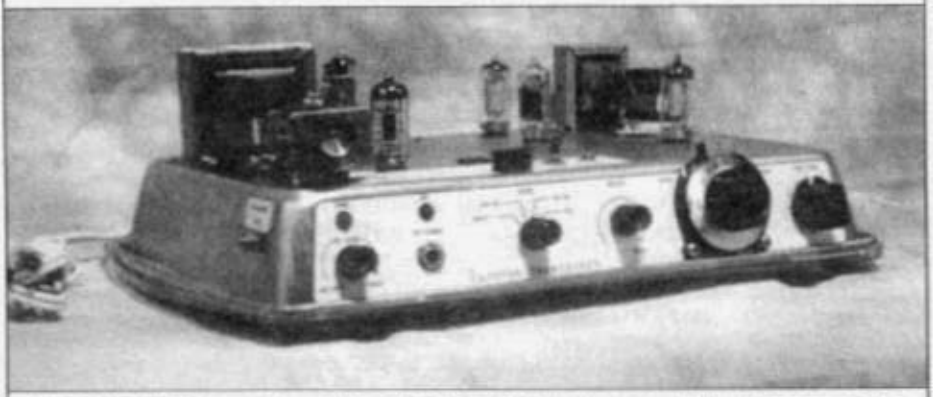
MESSAGE: "Transistor Network." Free sample! Magazine for collectors of regular & novelty transistor radios. Articles & ads. Free 20 word ad monthly. Subscription: $17 (US); $28 (Canada); $36 (Foreign). POB 43, Live Oak, FL 32064-0043

FREE: Encyclopedia of Amateur Radio Equipment. Hundreds of photos & descriptions spanning over 80 yrs. http://www.aade.com/hampedia/hampedia.htm

---

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

NEW FROM VINTAGE RADIO KIT FOR 1998
INTRODUCING THE CPSTR
HF TRANSCEIVER KIT
CW, AM FONE, FULL QSK, SOLID 5 WATTS OUTPUT
160 THRU 40 (30 METERS OPTIONAL)



With a handful of crystals and a headfull of nostalgia, you can still feel the warm glow of old time radio at your finger tips. For more information and a spec sheet on the new CPTR send for the new expanded 1998 catalog showing more kits and fun projects. Please enclose $1.50 or a 9x12 self-addressed envelope with $1 for postage for the new Vintage Radio Kit 1998 catalog. Vintage Radio Kit, 427 North Main St., Sharon, MA 02067. 781-784-0847, cpcw56@aol.com, Website @mnsinc.com/bry/vintage.htm

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

FOR SALE/TRADE: Transmitting/rcvng tubes, new & used. $0.55 LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR SALE: Repair & restoration, tube & transistor vintage radio. FCC licensed. Mike Zuccaro, 8795 Corvus Pl., San Diego, CA 92126. (619) 271-8294

FOR SALE: Collins 32V owners, new Raytheon 4D32 tubes - $19 while they last. Don Gies, W4GIT, FL, (352) 475-1950

A.G. Tannenbaum
Electronic Service Data
P.O. Box 386 Ambler PA. 19002
Phone 215 540 8055 Fax 215 540 8327
ON LINE CATALOG www.voicenet.com/~420n
VINTAGE PARTS & SERVICE DATA 1920s PRESENT
FREE PRICE CATALOG
CREDIT CARDS WELCOME

WANTED: Triplett Modulation Monitor 1696A; Chicago splatter choke SR-500; Chicago modulation transformer CMS-3; UTC bias transformer S-51; Triad splatter chokes C-26X. Mike Ruggiero, W2NVR, Rd 3, Box 3358, Saylorsburg, PA 18353. (610) 381-3211, w2nvr@ptd.net

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

FOR SALE: Boatanchor paints, Heathkit Tech Journal Subscriptions; phone filters - call or write for free catalog. R&R Designs, 202 Midvale, Marshall, WI 53559. (800) 372-4287

MESSAGE: See me again at Dayton, Space 1353. Look for the WWII uniform. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

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@trust.net

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

The Collins Video Library

featuring Dennis Brothers, WAØCBK assisted by Floyd Soo, W8RO

The Collins KWM-2 Video 4 hours - $89.95
The Collins 75S-3/32S-3 Video 3.5 hours - $74.95
The Collins 30L-1 Video 1 hour - $39.95
The Collins 30S-1 Video 1 hour - $39.95
The Collins Amateur Radio Equipment Video Spotter's Guide 1 hour, 40 minutes - $24.95
The Collins KWS-1 Video 2 hours - $39.95
The Collins 75A-4 Video 4 hours - $89.95
R-390A Video 7 hours - $109.95

All videos are now available in PAL version!

Purchase three or more videos and get 10% off the retail price!
Add $4.50 each for the first two videos for shipping & handling within the U.S.A., additional videos are shipped free.
Produced by Floyd Soo, W8RO (ex-KF8AT)

ER Bookstore, 14643 County Road G, Cortez, CO 81321

FOR SALE: CIA Xmtr: CW, pair 4-125s, early '50s, 2 cabinets w/handles, approx 200 lbs. - BRO. Call for info. K1BOX, MA, (508) 624-4340.

FOR SALE: Collins KWS-1 SN#1363, SAC KWS-1 SN#673. George, K1ANX, MA, (413) 527-4304.

FOR SALE: HP 8640B solid state signal gen .5-512 MHz, LED digital display of frequency, calibrated output -1uv-3V AM + FM + pm sc modulation. Can be removed from water tight transmport case & rack mounted. Connect an antenna to the output & set for max output & you can check rcvrs sensitivity with it connected to the antenna, very nice shape, guaranteed - $350 + UPS; TEK 465 scope DC-100 mc, dual trace delayed sweep, portable, 20 lbs, solid state w/handle, tested, guaranteed - $250 + UPS; Collins 225-400 MHz 100 watt antenna coupler has digital input control w/ hook up data w/tunable cavities. Controlled by servos could probably be modified for other freq, untested - $50 ea + UPS; HP 410C multimeter solid state smaller version of famous 410B 20 Hz-700 MHz DC-1500V, AC-300V, 0-10M ohm w/probe - $45 + UPS; IP-804 Panaramic display 21.4 IF input solid state, made by ACL rack mount X3 inches 115 VAC input gout over hauled in sealed box - $250 + UPS; ARC-39 HF aircraft xcvr, appears to be stand alone unit 28V input & 100 watts outpu? uncure of specs gov't overhauled - $95 ea + UPS; web site & email meob.com most things available have not been added to site yet. I'm still working on the complete listing. Tony Snider, 512 Princess Anne Rd, Virginia Beach, VA 23457. (757) 712-7129 res, fx 426-6454, (800) 654-9251, Fridays only.

FOR SALE: Elmac PS2-VAC pwr sply - $20, Tom Berry, K9ZVE, 1617 W. Highland , Chicago, IL 60660. (773) 262-5360

FREE: GE 1950's xmtr rack cabinet, full height, enclosed, adjustable rails w/locking doors. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

FOR SALE: Cushman CE-15 1000MHz spectrum analyzer Manual,digtal frequency readout,audio monitor - $1000. Ed brown, W6GX, 5702 Goldfield Dr., San Jose, CA 95123. (408) 227-9301. edbrown@hotmail.com

FOR SALE: Collins R-388 - $175; Collins 310B-3 for restoration, missing PTO - $150; Collins ART-13 - $135. Wayne, N0TE, 1212 17th Rd. NW, New Strawn, KS 66839. (316) 364-5353

FOR SALE: Large National radio spkr. Doug, KG8JT, OH, (937) 335-1300.

FOR SALE: Collins Navy 1.5-12 Mc TSC-12 units, transmitter, no PS - $150; receiver / 110 VAC PS - $150. Gary, WA9IYF, 3429 Gaddy Ct., Falls Church, VA 22042.

FOR SALE: Collins ashtray - $50; Millen GDO w/ coils & spare - $90; TEK-453A manual - $25, ppd on all. Rudy, W2ZIA, NY (716) 937-9279

FOR SALE: Collins 75A4 (2), spkr, manual, filters (6) - $1750; orig Collins literature. V. Vogt, 330 SW 43rd St. #247, Renton, WA 98055. (206) 382-5571

FOR SALE: Reworked Heath DX-100B - $200. Prefer local pickup near St Louis, MO. Jim, KA9EXM, 618-288-6471

W7FG Vintage Manuals

E-Mail: w7fg@w7fg.com
Home Page: http://www.w7fg.com

3300 Wayside Drive
Bartlesville, OK 74006
(800)-807-6146 (918) 333-3754

*comb binders with protective covers

* New catalog late Jan. SASE w/3 stamps

* 7 days a week

24 hour turn around on orders, with 1st class mailing

"over 3000 manuals in stock"

"most Heath audio in stock"

Collins, Drake, Globe, Hallicrafters, Hammarlund, Heathkit, Johnson, National, Swan, etc., etc.

WANTED: National coils, dog house pwr splys & NIB parts. I love National. Sylvia K. Thompson, N1WVJ, 33 Lawton-Foster Rd., Hopkinton, RI 02833. (401) 377-4912

WANTED: To buy or trade military surveillance & countermeasures rcvrs & jammer or related gear 1960 - present. Tony Snider, VA, (757) 721-7129.

WANTED: Collector/builder seeks lge & small vacuum tubes & vacuum tube collections, sockets, etc. Will pay good prices. Please call Marc, OR, (800) 330-2004.

WANTED: Keys - keys - keys - keys - keys - keys - keys - keys - Jim, KØYLW, KS, (785) 364-3989

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. (501) 318-1844, Fx 623-8783, james.true@ibm.net

WANTED: E.H. Scott Radios only in very good condition. EA4JL, contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: Diagram/info on Fisher Research Labs Marine AM Tx&Rx "Shipmate/Mate"; AM filter for R4C; mercury wetted relays, 5 &12v. K5AJZ, 3009 E. 90 Pl., Tulsa, OK 74137. (918) 299-6363, dlestourgeon@ci.tulsa.ok.us

WANTED: Extended range coil kit (350 thru 1900 kHz) #341-A for Heathkit GDO model GD-1B. Al Kaiser, W3LEQ, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: Dial bezel for NC-80 or junker w/ good bezel; circular/slide rules, old. Robert B. Eneemark, W1EC, POB 1607, Duxbury, MA 02331. (781) 934-5043

WANTED: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1, 515-1; 755-3A, C 325-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: National SW-3 first model, 2 volt version; S-101 xfmrs; NC600 condensors; Browning preselector. Dean Showalter, W5TJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: Xmtg tube sockets, 813s, etc. Send SASE for list 4 tubes & socket extenders. Typetronics, POB 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, fax 583-0777

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

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

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

WANTED: Command sets ART-13's; Collins radios & all accessories top $ paid; also most radios repaired reasonable. FCC licensed. WA1DEJ, MA, (781) 485-1414 eves, hobfact@tiac.net

WANTED: Info on Signal Corps US Army radio xmtr & rcvr, Forest Service type SPF built by Spokane Radio Co., #500A. George, K1ANX, MA, (413) 527-4304

WANTED: HT-37 manual, small gray knob, meter, SX-71 main & bandspread knobs. Jay Lyter, PA, (717) 741-4270, wa3ong@juno.com

WANTED: Kenwood T-599/R599 twins, orig silver face w/connecting cable. Paul, WA4PST, GA, (770) 227-9480.

WANTED: WW2 Japanese military radio of any kind. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069, takadoi@kk.iijtu.or.jp

WANTED: RCA AR-88 (or CR-88, etc.); R390A. Robert Harding, KC5LHR, 1321 Monte Largo Dr., NE, Albuquerque, NM 87112. (505) 291-0950, robert.harding@abq.com

WANTED: Heath HW-12 or HW-12A, 80 meter SSB xmtr. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677

WANTED: Ameco xmtrs: TX-86 & pwr sply; AC-1; Wireless set No. 62 & TBX-8. George Rancourt, K1ANX, MA, (413) 527-4304.

World's First CD-ROM For The R-390A Receiver

Announcing the first CD-ROM Technical Reference for the R-390A Communications Receiver. Includes US Army, US Navy technical manuals on this fine receiver and more! Includes historical, technical information and vendor sources as well. Now shipping! **Only $ 49 +** shipping and surcharge for charge orders. Tune in for details on the R-390A web page at ***http://www.electrosys.com/r390a.htm*** This is the first in a series of Boat-Anchor CD-ROM publications designed for specific manufacturer's radios! Keep tuned for new releases. Call or Email for CD-ROM Catalog!

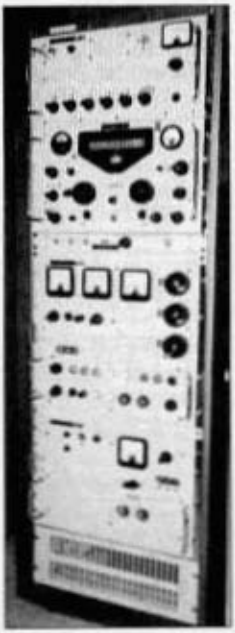
ELECTRONIC SCHEMATIC & MANUAL SERVICE

Need schematics, books, manuals, catalogs about communication and antique radios? We've got thousands on hand in digital form for Email delivery. Drop in to visit at http://www.electrosys.com/rea.htm . Books, history, schematics and more on our CD-ROM publications all now available brought to you by the makers of 80 years of QST on CD-ROM for the ARRL.

Radio Era Archives - 2043 Empire Central - Dallas, Texas 75235 - (214)358-5195 - Fax (214)357-4693 - Email: tsm@electrosys.com

Preserving the Radio Era for all time - - Digitally!

RACAL TRANSMITTER FOR SALE



MODEL TTA371C 1 KW TRANSMITTER IN VERY GOOD CONDITION. COVERS 1.5 TO 30 MHZ CONTINUOUS COVERAGE. SSB, DSB, CW, FSK. ORIGINAL CABINET WITH WIRING HARNESS AND TELESCOPIC SLIDE RAILS. SERVO TUNED. 4CX1000 FINAL AMP. SIXTIES DESIGN. MANY SPARES. SET OF TECHNICAL MANUALS. BELIEVED TO BE THE ONLY EXAMPLE IN NORTH AMERICA—VERY RARE.

ALSO AVAILABLE:
RACAL TA127 1 KW H.F. TRANSMITTER
RACAL TA83 500 W H.F. TRANSMITTER

FOR PRICES AND FURTHER DETAILS CONTACT:
NIGEL BOYD, K4UGD
770-414-0550 (work)
770-922-8546 (home)

CONVERT YOUR WATTMETER TO READ TRUE PEP FOR LESS THAN $20! The PDC-1 will convert your Average Reading wattmeter to Peak Power! Even works on the Bird 43!
$19.99 postpaid in the USA and Canada
HI-RES COMMUNICATIONS, INC.
8232 Woodview, Clarkston, MI 48348
(248) 391-6660 or hires@mist.net

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

Radio Repair & Restoration
Hollow State/Solid State R^3
Specializing in the SBE 33, 34
Chuck Banta, N6FX 909/593/1861

DR. RADIO
***Repair & Restoration of Vintage Equipment**
* **Reasonable Rates & All Work Guaranteed**
Steve Trimble, KSDJH
Box 73, Weston, TX 75097-0073
Call Toll Free: 1-888-73-K5DJH

Mil-Spec Communications
R-390, R-390A, R-388 & other military receivers
Sales - Service - Manuals - Parts
Box 633, Englewood, FL 34295-0633
941-474-6818, Fax - 941-474-7874
"Since 1985"

ELECTRON TUBES: All types - transmitting, receiving, obsolete, military-- Large inventory. **Daily Electronics Corp.**, 10914 NE 39th St., B-6, Vancouver, WA 98682. (800) 346-6667, (360) 896-8856, FAX (360) 896-5476

WANTED
Drake RV-75 VFO
Will pay top dollar.
Dave Hutchison, 765-497-9410
djhutch@concentric.net

Repro 390A Nameplates $9 ea, two for $16, five for $35, w/screws, shipped. Tom Marcotte N5OFF, 111 Destiny, Lafayette, LA 70506

WANTED: Hallicrafters S-2, S-33, S-35; HT-2, -3, -8, -12 (old series); AC p/s for HT-45; BC-669 or parts; complete BC-729. **Chuck Dachis, WD5EOG, "The Hallicrafters Collector"**, 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

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

WANTED: Compressor amplifiers & other pro-audio gear: mics, preamps etc-tube or solidstate. Mark Linett, CA, (818) 244-1909.

WANTED: Tube type shortwave converters, preferably pre-war. David L. Muse, 510 Minturn Ave., Hamlet, NC 28345.

WANTED: Western Electric sound reenforcement equipments - mics, amps, tubes, spkrs, horns. Barry Nadel, POB 29303, S.F., CA 94129. (415) 346-3825

WANTED: SX-100 tuning or bandspread knob & S meter. Kerry, WA4LXK, Box 121, Hope Hull, AL 36043. (334) 281-0970

WANTED: Old (1950'2 or earlier) ARRL Amateur Radio World Map; Pennwood Numechron 24-hour clock. Steve Taylor, N4CE, VA, (703) 299-8569.

WANTED: Hallicrafters HT-18 in very good condx. Mike, 305 N. Keith St., Scammon, KS 66773. (316) 795-4614

WANTED: Hallicrafters SX-62A rcvr, exc to mint condx. James Geer, WB5LXZ, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: Meter for Hammarlund HXL-One linear. Paul Wang, KU6T, 10472 1St., Santa Monica, CA 90403. (310) 825-1564, pkcwang@ee.ucla.edu

WANTED: Historical info on the development of the 12AT7, 12AU7 and 12AX7. Which of these was first, when, production info, etc. Tech info not needed. Kurt Miska, 3488 Wagner Woods Ct., Ann Arbor, MI 48103. (248) 641-0044 (days), Fax (248) 641-1718, khm@tir.com

DFD103
Universal Digital Frequency Display

The Model DFD103 Digital Frequency Display works with any receiver and most transmitters by counting only the VFO signal. All of the VFO and band information for many receivers and transmitters (listed below) is pre-programmed into the display's memory. This allows the operating frequency to be displayed by counting only the VFO signal. There is also a manual program mode that lets you program the display for any receiver or transmitter (up to 32 bands) that is not pre-programmed. You can even use the 32 bands to manually program the unit for multiple receivers or transmitters. For example two 16 band, four 8 band, or any other combination totaling 32 or less can be programmed. Each band can be individually calibrated to allow for crystals that have aged or any other mis-alignment or error, to 10Hz accuracy. The calibration information is also stored in memory, so that any time you return to that band, the display is automatically calibrated. You only calibrate each band one time.

Collins All including R390 • R390A **Heathkit** HW-100 • HW-101 • SB-100 • SB-101 • SB-102 • SB-300 • SB-301 • SB-303 • SB-310 • SB-313 • SB-400 • SB-401 • HR1680 **Drake** R1-A • R2-A • R2-B • R2-C • R-4 • R-4A • R4-B • R-4C • SPR-4 • SW-4A • T-4BX • TR-4 **Yaesu** FT-101 • FT-101B • FT-101E • FRG-7 • FTdx560 • FRdx400 • FLdx400 • FR-101S **Kenwood** TS520 • R-599 • T-599 • TS-511 • TS-900 **ITT MacKay** 3010B • 3010C **Swan** 270-B • 300-B • 400 • 500-CX • 700-CX • 600-R • 600-T **National** NCX-1000 • NCX-500 • HRO-500 • NC-200 **SBE** SB-33 • SB-35 **Hammerlund** HQ-215 **Henry** Tempo-One **Squires-Sanders** SS-1BS • SS-1R **Star** SR-700 • ST-700 **Galaxy** GT-550 • V-MARK3 **Allied** AX190 • A2516 • A2517 **Icom** IC-700R **Lafayette** HA-350 **Hallicrafters** SR-150 • SR-160 • SR-400 • SR-400A • SR-500 • SR-750 • SR-2000 • SX115 • SX-117 • HT-44 • FPM-300

$169.00 + $6.00 Shipping

Ron Hankins KK4PK • 555 Seminole Woods Blvd. • Geneva, FL 32732
Phone: 407-349-9150 • Email: rh8421@usa.net
http://www.gate.net/~rh8421/radio.html

ELECTRIC RADIO STORE

BACK ISSUES

All back issues are available at $34 per year or $3.25 for individual copies. Buy the entire first 9 years (#1-#108) for $240. This price includes delivery in the U.S. Foreign orders please inquire.

COMPENDIUMS

Collins 75A-4 Modification Compendium- all the factory modification bulletins from Collins Radio Co., all the articles printed in CQ, Ham Radio, QST and ER, 85 pages- $20 plus $3 S&H

Service Modification Compendium for the S-Line, KWM-1/2/2A series - 260 pages - $45 plus $4 S&H

Service Modification Compendium for the KWS-1, 32V and 75A series - 42 pages - $15 plus $3 S&H

T-SHIRTS

The front displays the logo from the cover of ER (the tube outline, Electric Radio, and 'celebrating a bygone era'). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio). The T-shirts are U.S. made by Hanes and come in S-M-L-XL-XXL. The color is just a little lighter than the cover of ER - $15 del. ($16 for XXL)

BOOKS

Vintage Anthology - Book 1 by Dave Ishmael, WA6VVL.....$14.95

The First Fifty Years: A History of the Collins Radio Company and the Collins Divisions of Rockwell International $49.95

Fixing Up Nice Old Radios by Ed Romney.....$24.95

Communications Receivers, The Vacuum Tube Era: 1932-1981 by Raymond S. Moore.....4th Edition $19.95

Oscilloscopes, Selecting and Restoring a Classic by Stan Griffiths.....$19.95

McElroy, world's champion radio telegrapher by Tom French $19.95

The Pocket Guide to Collins Amateur Radio Equipment 1946 to 1980 by Jay H. Miller, KK5IM.....$19.95

Heathkit A Guide to the Amateur Radio Products by Chuck Penson, WA7ZZE.....$24.95

Heath Nostalgia by Terry Perdue, K8TP.....$14.95

Radios By Hallicrafters by Chuck Dachis.....$29.95

Transmitters, Exciters & Power Amplifiers by Raymond S. Moore.....$21.95

The Cathode-Ray Tube, Technology, History and Applications by Peter Keller $29.95

Receivers Past and Present, Communications Receivers, 1942-1997, 3rd Edition, by Fred Osterman, ...$24.95

Please add $3 S&H for one book and $1 for each additional book.

Three or more books shipped free!

ER Parts Unit Directory

If you need a part for a vintage restoration send $2 and an LSASE (.32 postage) for a list of parts units. If you have a parts unit, consider putting it on the list.

ER, 14643 County Road G, Cortez, CO 81321-9575

TUBES • PARTS • SUPPLIES

YOUR COMPLETE SOURCE FOR...

TUBES:
Over 3500 receiving, transmitting, audio and industrial types in stock, including many foreign and early types.

TRANSFORMERS:
Hard to find power, filament and output transformers as well as filter chokes for tube equipment. We feature HAMMOND performance transformers as well as many new old stock transformers.

AUTHORIZED DISTRIBUTORS FOR

HAMMOND MANUFACTURING™

Svetlana

PARTS:
Resistors, tube sockets, potentiometers, knobs, dial belt lamps, diodes, speakers, wire, phonograph needles and cartridges and much

CAPACITORS:
High voltage electrolytic and mylar capacitors, multi-section capacitors and more for

LITERATURE:
Extensive selection of literature and books on antique radios, tubes, circuits diagrams, communication gear and hi-fi equipment. Some items not available elsewhere!

SUPPLIES:
Grill cloth, cabinet restoration supplies, batteries, chemicals, tools, test meters, gifts and kits.

CALL OR FAX FOR OUR NEW 40 PAGE CATALOG!

ANTIQUE ELECTRONIC SUPPLY™

LIMITED PARTNERSHIP

6221 S MAPLE AVE. - TEMPE, AZ 85283 - (602) 820-5411 - FAX (602) 820-4643 OR (800) 706-6789

Subscription Information

Rates within the U.S.

$28 per year 2nd class

$38 per year 1st class

Canada by Air (only).....U.S...$42

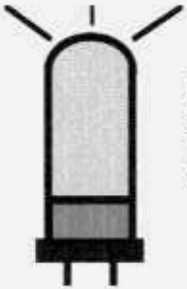
Other Foreign Countries by Air (only).... U.S. $54

Guaranteed Refund at any time for issues remaining on subscription

subscribe by mail or phone

ER
14643 County Road G
Cortez, CO 81321-9575

Phone/FAX (970) 564-9185
e-mail er@frontier.net



ELECTRIC RADIO
14643 County Road G
Cortez, CO 81321-9575

FIRST-CLASS MAIL
U.S. POSTAGE
PAID
MAILED FROM ZIP CODE 81321
PERMIT NO. 23

FIRST CLASS

TO: