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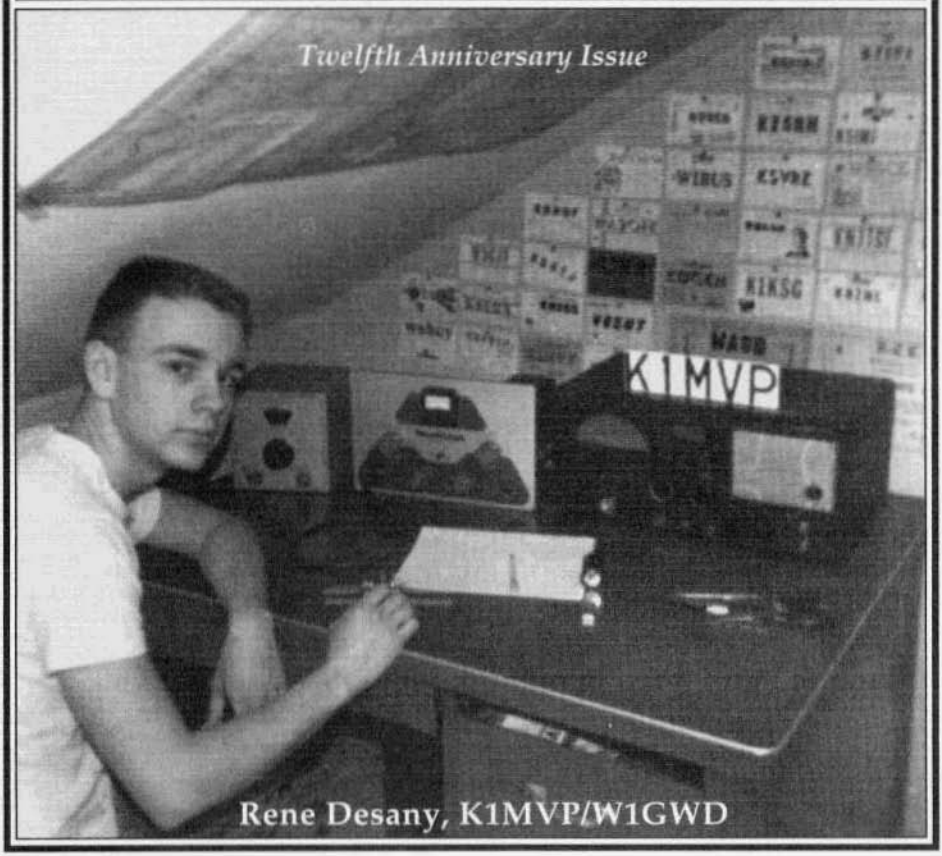
ELECTRIC RADIO

celebrating a bygone era

Number 143 April 2001

Twelfth Anniversary Issue



Rene Desany, K1MVP/W1GWD

ELECTRIC RADIO

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

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

Regular contributors include:

Bill Breshears, WC3K; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Bob Grinder, K7AK; Jim Hanlon, W8KGI; Brian Harris, WA5UEK; Tom Marcellino, W3BYM; Ray Osterwald, NØDMS; Chuck Teeters, W4MEW; Bruce Vaughan, NR5Q.

Editor's Comments

Dayton Book Sale

In years past when we attended the Dayton Hamvention we always reduced the price of our books and other stuff. The idea was that low prices would attract buyers and we could make our money on volume. It occurred to me that we should try this gimmick even though we're not going to Dayton this year. I've reduced the prices on all of the books we sell (not other products) by 20%. This sale will be in effect until at least May 30. I think our prices will now be lower than even Amazon.com. See page 56.

ER Back Issues

There's also a deal to be had on ER back issues. Until May 30 you can order the entire 12 years for $295 delivered. After May 30 the price will be increased to $325.

Vintage Field Day, June 16 & 17

Last year the turnout for VFD was so low that I thought that I'd just give up on it but I've had a change of heart. I think about how nice it is out above Monument Valley in June and I just can't resist giving VFD another chance. I've been going out to Utah for the last 3 or 4 years now and it's become something I look forward to. And I've been hearing from some of the AM'ers who have encouraged me to keep the event going on. As usual, I'm looking for any ideas that could make the event better and attract more participants. I'll be talking more about VFD in the May and June issues.

"How to Repair a Receiver"

Jim Hanlon, W8KGI's 'how to' article on repairing receivers has elicited more comment than any article we have ever run. All of it positive. When I suggested the idea of an article like this to Jim, we both thought that it would appeal mostly to the newcomer to vintage radio. That doesn't appear to be the case. Everyone seems to be getting something from the article series and we've received a lot of input that is worthy of being printed—we'll get to that when the series winds up. And after receivers Jim will be taking on transmitters; good news for all of us. N6CSW

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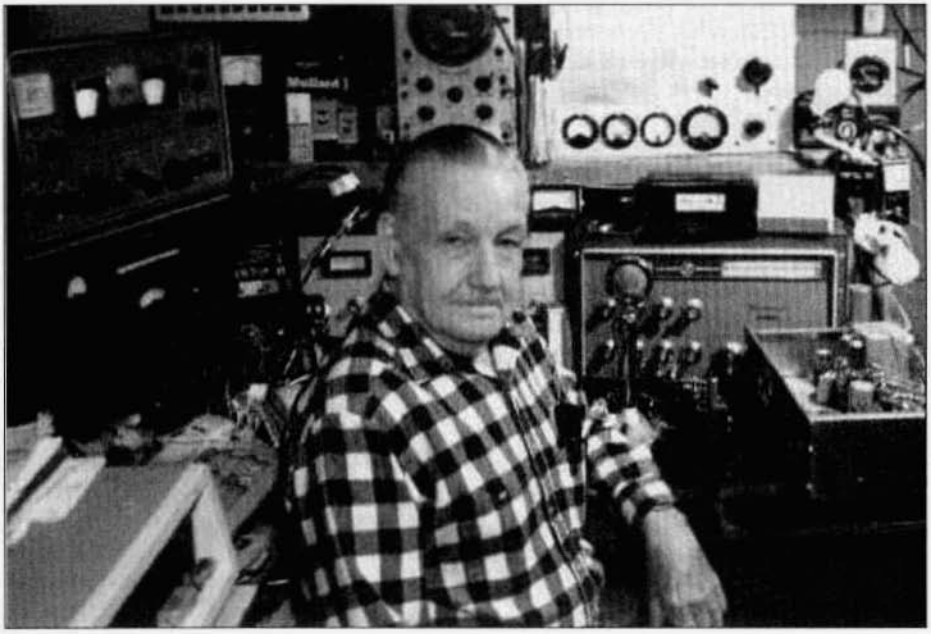
Gene Tincher, K5NYT, Silent Key

by Jim LeMarr, W5NBC
PO Box 337
Coahoma, TX 79511



I don't recall the exact day I first heard him. But, I remember it was some time around the fall/winter AM season of 1993/1994 when I became aware of regular AM activity on 75 meters and started listening in the evening to AM QSOs. There was Gene, on the air almost every night, and often in QSO with his friend Cecil, W5NWX. Most nights, Gene would be on using his venerable Heath Apache, other nights piercing the ether with his trusty Johnson Ranger. These guys seemed knowledgeable but friendly; they didn't intimidate or otherwise harass AM neophytes that checked in with them for a word of advice or just to pass a late winter night. I thought how neat these folks were; how different from other interactions I had experienced on 75M SSB! I purposed to get on with them soon.

After moving to West Texas in late 1994, I got a Johnson Ranger of my own on the air and had the pleasure to get to know Gene well over the years in literally hundreds of AM QSOs. Those who knew Gene will never forget his distinctive voice; at times it was a bit hoarse because of health problems, but always unique and identifiable in any roundtable. Gene loved to make power checks where he adjusted his carrier output from 150 watts to 10 watts or so, and was always pleased to demonstrate that big power was not necessary to life! Gene was knowledgeable yet often careful about sharing his opinions on the air; he was more opinionated in person or via Email. Gene was cautious

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AM International Update April 2001

by Dale Gagnon, KW1I, President

ARRL 160 Meter Band Plan Committee Selected

It was announced this March that the President of the ARRL selected five amateurs to serve on a 160 meter band plan committee. Announcement of this committee has caused much discussion on the AM e-mail reflector I monitor. Some suggest that this is the time to recommend a specific AM allocation. I think this would be a mistake. We shouldn't limit ourselves to one portion of the phone band. We should have freedom to QSO on any open frequency within the phone allocation. I prefer the comment that suggested the inclusion of two AM calling frequencies, 1885 and 1945 kHz in the band plan. This implies that AM can be operated anywhere any other phone mode is authorized, but a couple of frequencies are important places to look for other AM'ers. Other parts of the country outside the Northeast may have other AM calling frequencies that are equally important. If we suggest too many different calling frequencies in our comments we may get no mention. If you do send comments and you like the idea of an AM calling frequency, please mention 1885 kHz. Comments can be sent to 160-BANDPLAN@arrl.org <mailto:160-BANDPLAN@arrl.org>.

Dayton Hamvention 2001

AM will be featured prominently again this year at the Dayton Hamvention. We have been assigned the same outdoor tent location that we had last year, but the number of the space has been changed from 817 to 813. I sure couldn't complain about receiving that number! The plan is for the AM Festival Station to be up and running on Friday morning, May 18. We will be on the air near 3885 kHz for several hours before moving to 7290 kHz. We should be on the air during Hamvention hours until mid-Sunday morning. If you are planning on attending and would like to take a stint at the microphone, please drop me a line. If you're not coming to the Hamvention, how about spending some extra time in your shack that weekend talking to us? We have a tremendous location with lots of traffic. So there will be lots of AM demo opportunities. I want to express my gratitude to Barry Wiseman and Electric Radio for providing sponsorship funding to defray a major part of the cost of the outdoor exhibit space used for the AM Festival Station.

The AM Forum is in Meeting Room #3 at 3:30 PM on Friday , May 18. The program will feature Steve, WB3HUZ, in a talk on receiving AM using synchronous detection. This will be a very practical session to help AM operators understand this detection technique. Steve will review some work going on in the AM community to design a relatively inexpensive synchronous detector that can be used with common AM receivers. Steve plans to include audio segments highlighting actual results using a synchronous detector .

Also on the forum program will be an audio taped segment and digital image set being prepared by Paul, WA3VJB. Paul has been tracking down broadcast transmitters in use in amateur service. He has selected a number of installations and will narrate a sequence of images and have some actual on air audio to accompany them.

Saturday evening, May 19 we will meet again for dinner and AM discussion at Marion's Pizza at Exit 57 (Wagoner Ford Road) off I75 at 7:30 PM. Make sure to bring pictures of your shack! ER

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

Moving a Broadcast Transmitter to the Ham Bands

by Mike Dorrough, KO6NM
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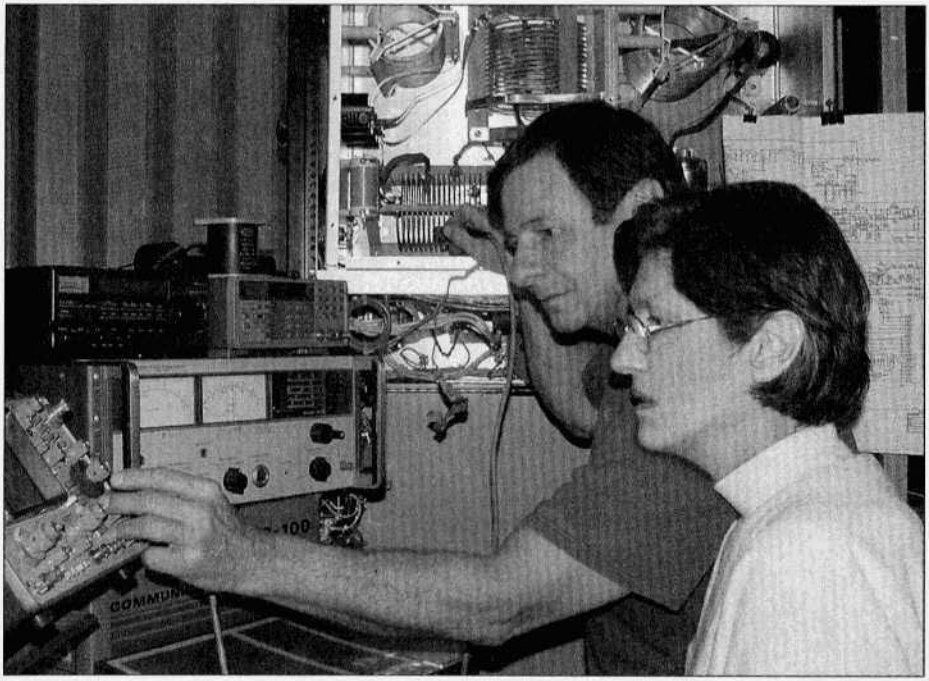
Last installment I got to show off the Ham shack/broadcast facility in Wisconsin. It was a bittersweet experience seeing that setup given the Playboy-centerfold treatment in prestigious ER. By the time the story had been immortalized in print, I would have to leave it all behind. The old-boy-network in Wisconsin has finally succeeded in driving the last nail into the coffin of radio for and by visually impaired people across the USA. I won't go into details here, but suffice it to say that the dream is in mothballs along with our new home. Barring a miracle or major media attention (a network has recently expressed some interest, KEEP YOUR FINGERS CROSSED!) "Project Beacon" is effectively dead. I turned the key, activated the security system and walked away, or should I say flew back to the West Coast. Aside from sympathetic family and three beautiful new grandchildren, other compensation awaited. I was able to confirm that another Collins 820D-2 was in need of adoptive parents in California. Having one of these boxes at the Los Angeles-area QTH for Ham radio operation would soften the blow of not being able to move the family to the new broadcast facility and recording archive. Decommissioning, transporting and converting the very same broadcast transmitter model would be the occasion to answer specific technical questions inspired by Part I. By the way, thanks very much to the great ER readership for the warm response. This latest conversion would also afford the perfect opportunity to fill in some nuts and bolts details.

If you're lucky, the broadcast transmitter of your dreams lives in a "nice house" and is well-maintained. A remote shack, where the transmitter is located at a distant tower-site, is often a formula for disaster. OUT OF SIGHT, OUT OF MIND! I've seen some remote transmitter sites that were cramped, poorly ventilated and even leaky against the wetter elements. These conditions combined with inadequate remote telemetry (or lax monitoring) can cause some spectacular meltdowns. In the "golden age", transmitters lived at the studio and were often part of any station tour. That's why they were endowed with all the sex appeal industrial designers could impart.

The large picture windows displaying glowing and musically pulsating tubes were every bit as much for the benefit of clients as for the station engineers. As more and more operations moved the transmitters to remote antenna sites, the manufacturers started building more Spartan, appliance-like boxes. This initiated a depressing cycle. The less soulful the box, the less tender, loving care might be forthcoming. Everybody loves to pamper and polish an old Rolls Royce, but a similarly aged Chevy Biscayne will usually rust-away, unloved and unlamented. Many station-owners/managers feel no more emotional attachment to an obsolete and inefficient transmitter than you would toward an old, leaky boiler or hot-water heater. Add to this a shrinking number of old school, radio-loving technical people and it's not hard to understand why there are fewer and fewer



Kay Dorrough gives Mike an assist in handling the HP 4815-A RF Vector Analyzer as the latest Collins 820D is converted to operation in the HF spectrum.

surviving classic broadcast transmitters. Business is business and the dumpster is always waiting to gobble up another man's treasure.

Fortunately, this latest Collins 820D-2 was in superb condition, lovingly maintained in a 1st-class remote site thanks to Rick Fulkerson. The 70's vintage 820D-series are exceptions to the rule concerning utilitarian modern designs. While its lack of curved sheet metal is modern and refrigerator-like, the heavy gauge and superb fit and finish of materials are impressive. The advantages of a more modern transmitter based on 1970's technology are also a factor. The efficiency and purity of signal are generally superior to older designs. The lower level input stages are able to run at lower power levels. The final amplifier configuration requires very little drive for full output. Consequently, the lower level RF stages are all solid state.

Collins 820D-2 RF Driver Section

Well, there must be some downside to all of this; otherwise these transmitters wouldn't be replaced. The sad fact is that the cost of replacement tubes has become prohibitive, in the order of almost $1,000 per tube. Collins used the 5-500 Pentode for this series of transmitters on an exclusive basis. Two 5-500's connected as Tetrodes running "Class C", are modulated by two Pentode-connected 5-500's running "Class AB-1". Add to this negative equation for Amateur use, the stress on the tubes created by trial and error band conversion techniques and destructive push-to-talk heat/cool cycles, more about that later. This may be a compelling reason for economy-minded Hams to seek out an older model broadcast transmitter, preferably a popular unit in production for a number of years using more generic tubes.

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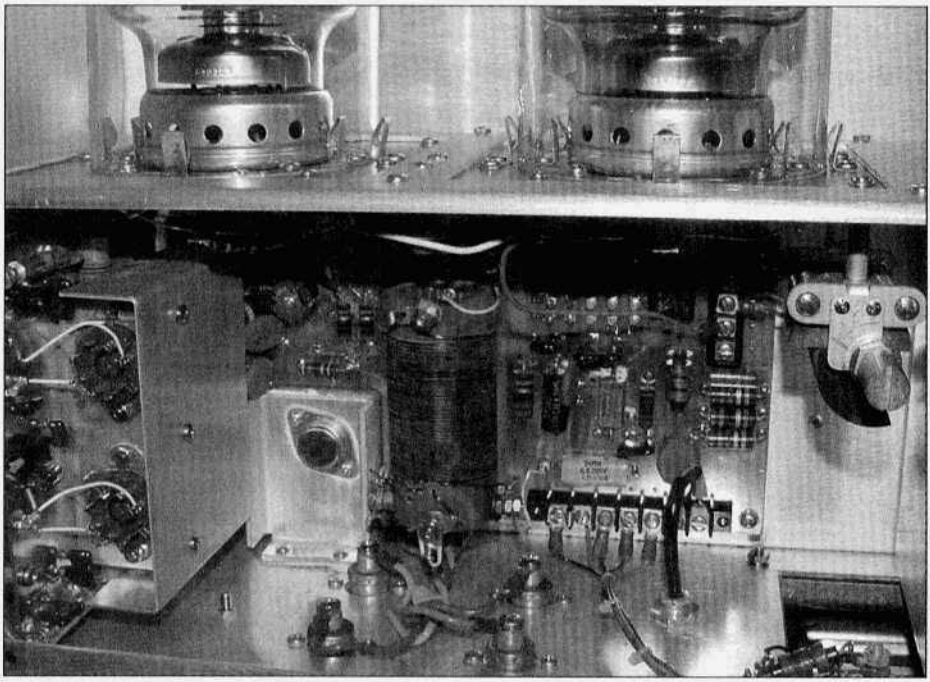


Collins 820D-2 RF Driver Section

The more popular and longer the production run, the more probable that its power-tubes were manufactured in large quantities, by a variety of manufacturers. There are Collins transmitters that are sexier and a bit easier to retube and band-shift.

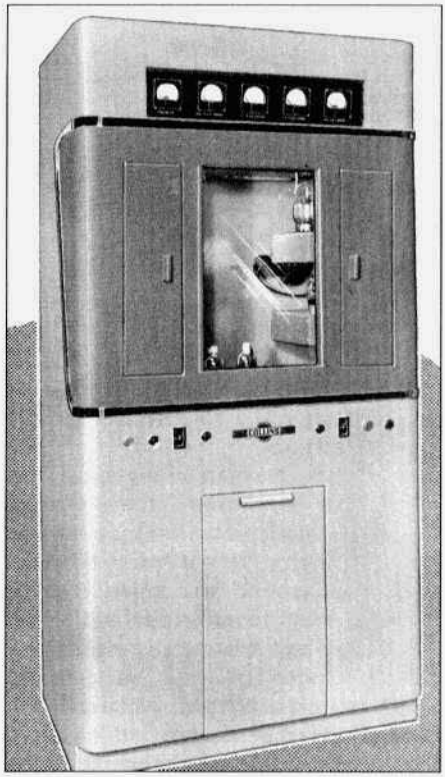
And The Winner The... Collins 20V/550A-1 Series

The Tetrode-based Collins 20V and 550A are not only gorgeous, they utilize power and modulation tubes that are much easier on the bank account, 4-400A's and 4-250A's respectively. These rigs were manufactured over a long period of time and should be more readily available than examples of the 820D-series. Adding weight to the 20V/550A side of the scales are their straightforward RF driver and tank circuitry. These can be moved to any popular HF AM-window in an afternoon without expensive test gear. One of the various MFJ model resonance meters will make the job go even faster.

The Collins 20V just happens to be one of those transcendent machines that are almost living things, right up there with Wurlitzer bubble juke boxes, Nikon F's and Chevy Nomads. There is just as much pleasure in gazing at one of these transmitters as in using them. This might just be the one Ham rig the YL or XYL would tolerate sitting in the living room. (I can dream can't I?)

These Tips Apply to Any Number of Small to Medium-Sized Broadcast Rigs:

CAUTION: Before putting hands on, or in the transmitter, be sure that the power to the unit is turned off and disconnected. The power supply to the average commercial transmitter is way overqualified to run a bank of electric chairs. I've learned not to take anything for granted. That goes for the large capacitors if you are picking up a unit that has recently been in service. A shorting stick (metal bar on a long nonconductive handle) is recommended shorted



The 1 KW Collins 20V-series and its half power siblings, the 550A-series are the Wurlitzers of broadcast transmitters. The large tube picture windows, illuminated meters and sumptuous styling are all that any Ham could want. As with all Collins products, engineering and construction are first-rate.

across all terminals, just to make sure that everything is dead and dark. Also take note of the potential hazards from any companion or replacement transmitters that might still be in operation. It should be mentioned at this point that "three-phase" units are not practical for residential installations. It might sound "cool" to take on a 10 or 20-KW blowtorch and run it at low power but the power supply issues are too convoluted for even experienced technicians. Virtually ANY single-phase, tube-based rig can be adapted for Ham use for at least the 160-meter band. NOTE: Early solid-state broadcast transmitters are very efficient but present daunting conversion challenges in adjusting resonance in multiple banks of transistor modules.

A standard tool kit is suggested to undo any hardwired utilities or wall bracketed devices. A hand-truck is also a must if you are solo. Don't forget to look around for remote control panels, spare parts, etc. If there is room, light and a safe environment in its location, it is most often desirable to remove the modulation and plate transformers to lighten the load. The removal of these heavy components also reduces the possibility of damage in transit. These weighty objects are meant to sit in the box when it is in the vertical position. Unless you are hauling the transmitter in an open bed, it will have to turned on its side resulting in potentially damaging force being exerted against thin sheet metal. ***ALWAYS LIFT WITH YOUR LEGS!***

Roller Coaster:

Most broadcast transmitters in the 1,000 Watt or less category are transportable in a mini-van such as my beloved GMC, AKA "KO6NM". I've managed to wrestle most of these rigs into the back of the vehicle single-handedly minus the heavy mod and power iron. Beg, borrow or steal some thick cardboard to protect the paint on the van and transmitter as you tilt and slide the rig into the van or onto the pickup bed. Once back at the QTH, the first thing I do is get out the electric drill, tap and screws to install a set of four heavy-duty casters on the bottom of the rig. Make sure that you are drilling into metal thick enough to carry the full weight of the transmitter. As aftermarket automobile accessory installers will tell you, be careful not to drill through any plumbing or wiring harnesses on the other side.

With the rollers installed it becomes

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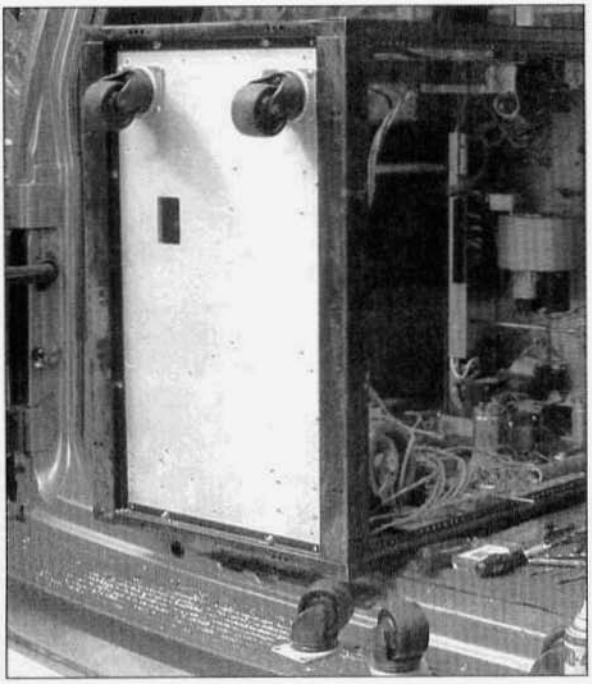


A good time to install the heavy-duty casters is just before you unload the transmitter.

very easy to maneuver the transmitter during the cleaning and modification stages. Again, be careful when pushing some top-heavy, narrow cabinet units. They can tip over if the wheels catch on an obstruction. Later, the casters facilitate service and cleaning, as well as affording some protection for finished floors.

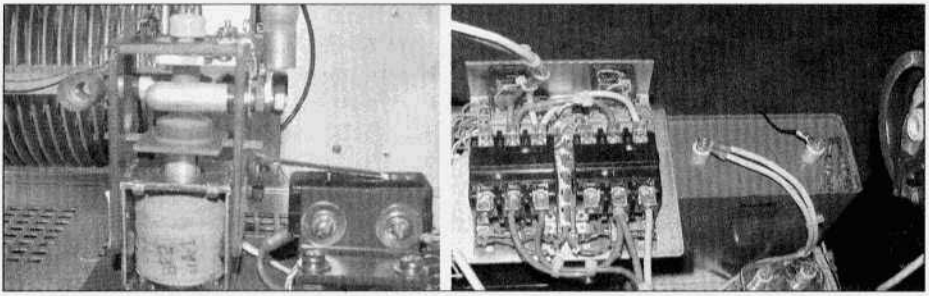
Soap & Water:

This may be the most controversial aspect of my electronic equipment restoration procedure. Thorough cleaning is necessary because mold spores and bacteria like to eat insulation and also like to get a foothold in your home. Thanks to years of forced-air and heat, the average broadcast transmitter is literally an incubator for germs, not to mention a favorite toilet for rodents and bugs. Who wants all that alien DNA in the shack? The only answer is to sterilize with water and an antibacterial cleaner. It should be remembered that caution must be exercised in applying water to any electronic component, what I really mean is use common sense. Before washing down the transmitter, the meters must be removed and any fragile paper labels covered with plastic and tape. ***NEVER SUBMERGE COMPONENTS, ESPECIALLY TRANSFORMERS!***

Any remaining transformers/chokes that are not hermetically sealed can be plugged with putty (Funtak) around lead holes. Wet the entire transmitter with a fast and sharp spray from a garden hose.

Saturate the unit inside and out with a Formula 409-type cleaner. Let it soak in for several minutes out of direct sunlight. Work the cleaner into stubborn greasy areas with a stiff paintbrush; an old toothbrush is excellent for detailing small areas. Work the cleaner into pots, waferswitches and make sure that you turn multi-position switches so that the cleaner is worked across all contact surfaces.

After the cleaner has had a few minutes to lift the grime rinse the unit again with the sharp, fast spray. Turn switches and pots during the rinse cycle as well. Once all of the dirt and cleaner are flushed away, towel-dry as thoroughly as possible. Again be careful not to let direct sunlight bake the beads of water and cleaner into paint surfaces. As car buffs know each water bead is a little magnifying lens, perfectly capable of etching its outline into painted surfaces. As quickly as possible play the biggest, meanest fans you can find on the interior and any sub chassis you may have washed by the same method. Let the



Antenna TR relay with failsafe micro-switch and newly installed PTT relays. The micro switch prevents plate voltage from being applied in the event of TR failure.

fans run for at least 24 hours. This drying process is MOST IMPORTANT! Once the chassis and sub chassis are dry, use a silicon spray and buffing towel to bring life back to wiring harnesses and other surfaces. You'd be amazed at how great a really ragged piece of gear can look after this process. There is also the security of knowing that when you turn on the blowers for the first time you won't smell any mold or mildew pouring out of the vents! The tropical fresh breeze emanating from the sterilized big rig will make you ever so much more popular with the YL than a blast of mildew and insect parts!

Dummy-Up:

After cleaning and reassembling the rig, the first order of business is to bring her up on a dummy load. If you think that an old Cantenna or 100-watt light bulb will do the trick, you're in the wrong department. Beg, borrow or steal a 1,000~2,000-watt continuous duty-cycle load. These commercial loads look like radiators. That is exactly what they are, oil-filled radiators. The dummy load will not only get you through the tasks of bringing the rig up on its original broadcast frequency without breaking the law, it will be invaluable during the process of modifying the tank circuit looking into a stable frequency-indifferent 50-ohm load. The beefy dummy load also provides a means of legally conducting audio tests using a wide variety of tones, voice and even music.

I often let the rig play into the dummy and listen on radios inside the house to recapture memories of full-bodied, creamy AM before the advent of squeezed and chopped NRSC! The 1% distortion of the 820D-2 is mono-music to the ears.

The broadcast rig's tank and other circuits should not be modified until the transmitter is fired up on its original broadcast frequency just to verify that its basic components are working properly. If you modify before doing this you'll find it difficult to determine if problems are a result of your tinkering or something more basic. An internal crystal oscillator usually determines the original fixed operating frequency somewhere between 530 and 1600 KHz. I have rarely found a broadcast rig lacking these components. In the event that the crystal is missing or defective a function generator can be employed in place of the oscillator. Remember that some circuits multiply the fundamental generated by the crystal oscillator or substitute VFO. Conduct all tests at the lowest power setting available.

Now that the rig is running properly in original configuration, at its design frequency, the first order of business is to install the relay circuits necessary to operate the rig in the civilized push-to-talk mode. Relays should have large enough contacts to handle lots of current. It's best not to power the relay system from one of the on-board low-voltage transformers. This might pull

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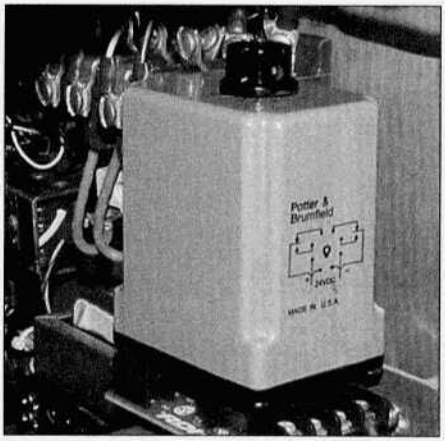


Potter & Brumfield "variable delay" relay allows staggered keying reducing surge-related problems. This unit has a range from a few milliseconds to 15 seconds. A total of five new relays were installed. It is false economy to multitask relays in such a high-power application.

down bias somewhere else in the circuit.

Select your relays and install an appropriate, dedicated transformer to power them. The relays will control receiver muting, antenna switching, oscillator/driver stages and plate voltage in that order. The plate comes up last thanks to an adjustable delay relay. The order is important in terms of protecting your receiver and having the oscillator stable before the plate voltage is applied. The delay relay doesn't directly handle the massive plate voltage. It merely controls a larger plate voltage relay. The staggered key-up also dramatically decreases the likelihood of blowing a fuse or circuit breaker and protects the expensive final tubes.

Here is the antenna TR relay with failsafe micro-switch and newly installed PTT relays. The micro switch prevent plate voltage from being applied in the event of TR failure.

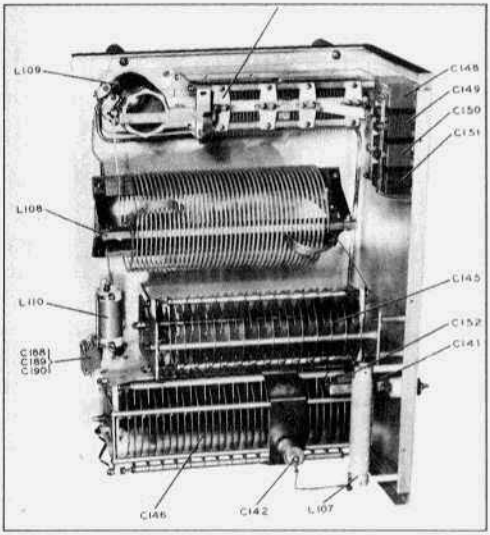
The Final Challenge!

YOU HAVE ARRIVED, ALMOST ! Assuming that the big PTT-equipped transmitter is up and running and that you feel confident that the household wiring is safely up to the task, the next step is to move the operating frequency up into the HF bands. Most of the Collins AM broadcast rigs can easily handle 160, 75, 40-meter operation and maybe beyond. This flexibility may be due to Collins' international and military markets demanding modular construction practices featuring superior inter-stage shielding. Some other brands present difficulties beyond the 160-meter band. The shielding, tank-circuit design, reactors and chokes all play a part. Providing detailed instructions is next to impossible because of the wide variations in design and even variations between different production runs of the same model. I've done the deed with various Collins 20V-Series, Gates and others by guesstimating the coil-turns left un-shorted from a ratio roughly calculated from the relationship between the original and target frequencies. "Tune" and "Load" padding-capacitor values are then plugged in to achieve the desired plate and grid-current values. Naturally it is a good idea to target these values so that the variable tune/load caps are not at their lower or upper limit.

A grid-dip meter is useful, but some sophisticated resonant circuit designs such as the extra-clean "triple-node" approach employed by Collins in the 820D-Series, require dynamic measurement techniques.

Attempting to shift the resonant frequencies of this rig's sophisticated tank-circuits, by looking at isolated "L/C" components, is like trying to scoop up quicksilver with a fork. With final tubes costing $1,000 each, it seemed that punishing trial and error retuning could only lead to heartbreak and wallet-bust!

The Hewlett Packard (HP 4815-A) RF



550A/20V final tank circuit section. The straightforward design lends itself to easy band shifting.

Vector Analyzer makes the task of dynamic resonance measuring a snap. For Ham applications such a device is prohibitively expensive and unfortunately this specific HP model is no longer manufactured. I understand that these, and later models, can be found as rentals. A quick scan of the Internet turned up a number of rental companies offering such services. Before laying out a big rental fee it might be a good idea to view some of the other resources on the net describing the procedures for using such an esoteric piece of test gear.

In Conclusion

The use of broadcast-iron on the Ham bands is a satisfying experience for the user and listener. Unfortunately these 1KW gems can't legally be operated at full power. The FCC and ARRL are great organizations but they are dead wrong in their calculations comparing SSB and AM output power. They're confusing GROSS INPUT and NET OUTPUT power. They should be looking at power where the "rubber meets the road", or where the RF meets the receiver. The analogy to automobiles is very apropos. If you choose to drive a Cadillac or Lincoln down the highway at 65 MPH, it's taking up no more lanes than a Toyota traveling at the same speed. It is our right to choose to pay extra for fuel to drive a bigger, more elegant machine. The FCC's strangling rules on AM input power are akin to an irrational law that would limit the speed of bigger cars so that the gross energy expended per hour would be the same as for a Toyota traveling at 65 MPH. A well maintained and properly modulated AM transmitter running at 1,000 watts takes up no more real spectrum resources than the typical 1,000-watt SSB signals heard up and down the bands these days. The only indicator that detects the difference is the AM operator's faster spinning electric utility meter.

Let's stop apologizing for running Amplitude Modulation. We know that the intentional power hobbling instituted by the Amateur "establishment" to put AM at a disadvantage has accomplished its intended purpose. 95% of licensed Hams don't run AM, and never will. Now that AM is no longer a threat to the dominance of SSB, it's time to restore balance. The reasons are many, including fairness and the special role AM plays historically, for home-brewing and as the ultimate recruitment medium. Product detectors are still lacking in all but the most costly shortwave radios! Had AM not existed, most ER readers might never have heard the magic QSO that sparked interest in becoming a Ham. While we're lobbying to up the "speed-limit" for AM, we can make the most of our few hundred watts by maximizing modulation. Therein lies another tale... **ER**

Next month Part III - How to set up and use mixing boards, equalizers and processors!

Crystal Marker for Receiver Calibration

by Tom Marcellino, W3BYM
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This neat little project was the result of not having a stable signal generator or frequency counter. Perhaps you have a similar solution. Well this may be your answer. With a few crystals from the "value box" i.e. junk box and some resistors and capacitors you can build this very handy tester. I had some additional parts which made the project less expensive, and easier to construct. Namely the 10 position crystal sockets and rotary switch. These two items came directly from a Johnson Viking II parts rig. CAUTION this project uses a modern device some call a transistor. If you are a purist vacuum tube individual, you may want to modify the circuit for vacuum tube operation. But, if you consider the extra power supply components compared to the nine volt battery, well maybe you might want to try this solid state stuff just once. If you don't have a supply, parts are available from Radio Shack or like supplier.

To make things even easier, there is no magic in the circuit, see figure 1. Versions can be found in many of the ARRL Handbooks or QRP data books. Even the parts are not that crucial, this tester can mark nineteen frequencies. The choice of base crystal frequency and resulting harmonics is up to the builder. I used what crystals I had on hand and found others in the fleamarkets. Some yielded band edge marker and others fell somewhere within the band. This tester was made to calibrate receivers with ham band coverage only.

The project was constructed using a 4" x 7.5" x 2.25", see photos figure 2 and 3, Radio Shack plastic box with a metal lid. The main circuit components were mounted to a mini circuit board from the same supplier. No fancy board masking and etching used here. Being a tube sort of guy, I never learned that new technology. Just plain point to point wiring using #22 insulated hookup wire. The whip antenna is the fold down variety and extends about 20".

There is no calibration in the pure sense - nothing to adjust. What you have as the crystal frequency is what you get. Of course you can lap in a crystal and move it up to 10 kHz or so if you wish. Crystals will start to lose activity when moved too far. What you need to do is perform a verification of the crystal frequency by your best possible means. I used my Kenwood digital receiver. The Viking II crystal selector switch has ten positions and a little chart was made showing the corresponding frequencies. This was attached to the lid for ready reference. The crystals are identified by first value in the chart per position and their useful harmonics shown next.

Position 1, 1.8 MHz
Position 2, 2.0, 10.0 (WWV) MHz
Position 3, 3.5, 7.0, 14.0, 21.0, 28.0 MHz
Position 4, 7.025, 14.05 MHz
Position 5, 7.15, 14.3, 21.45 MHz
Position 6, 7.175, 14.35 MHz
Position 7, 7.295, 29.18 MHz
Position 8, 7.425(non-ham), 29.70 MHz
Position 9, Empty
Position 10, Empty

Note: Some frequencies are shown only with one place accuracy. Multiple place accuracy will vary with the indi-

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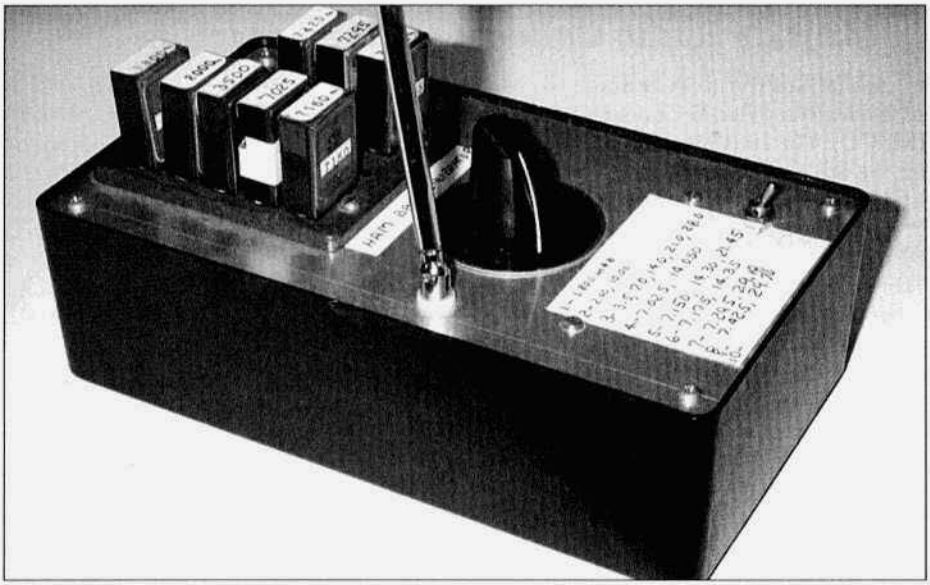
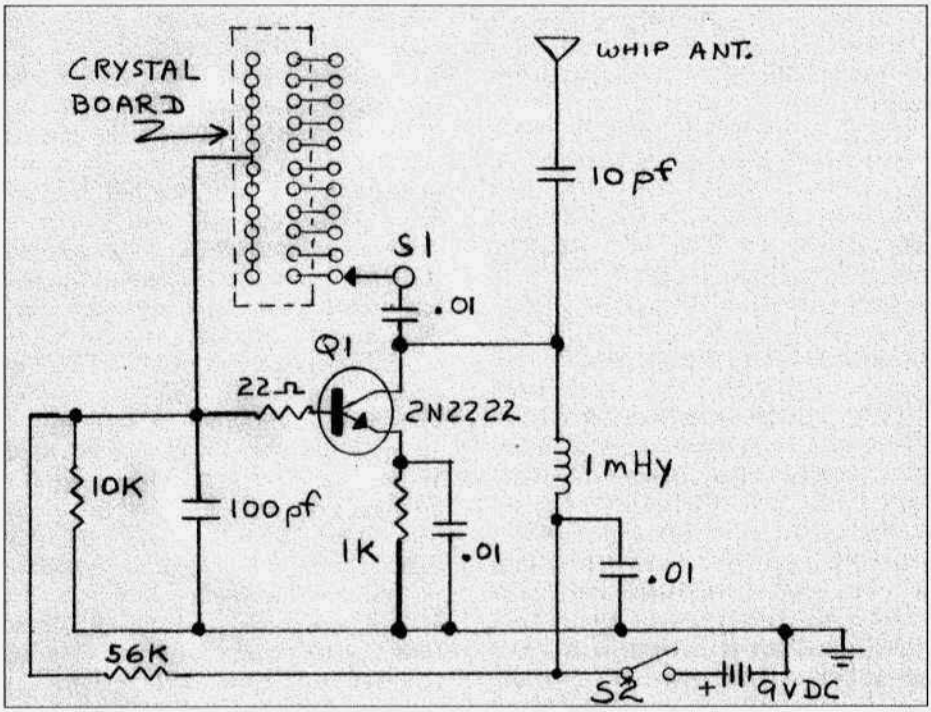



CRYSTAL BOARD
WHIP ANT.
10pf
S1
.01
Q1
22Ω
2N2222
1mHy
10K
100pf
1K
.01
.01
56K
S2
+
9VDC

Military Radio Collectors Group Meeting 2001

Last call for the sixth annual meeting of the Military Radio Collectors Group (MRCG). The 2001 meeting will be held on the 4th and 5th of May at Camp San Luis Obispo, CA. Early birds start gathering the day before in the RV park, BTW.

Friday will be devoted to equipment setup, operating events and informal get-togethers at the NCO Club and the adjacent RV area. Those wishing to set up and operate may do so under their own calls. The swap meet starts Saturday (6 May) at sunup in the parking area adjacent to the Club, and the formal program will follow at 0900. A full program of speakers and demonstrations will be presented.

Pizza will be available Friday evening and a BBQ lunch is planned for Saturday.

Numerous examples of both vintage and modern equipment will be in operation and on display throughout the meet.

For more information contact Dennis DuVall, W7QHO (w7qho@aol.com); Trish Gibbons, WA6UBE (wa6ube@tactical-link.com); or Hank Brown, W6DIX (htbrown@earthlink.net).

Dennis DuVall, W7QHO

Military RTTY at MRCG 2001

One additional note re this year's MRCG - Al Tipsword, W6GER & Dave Ross, N7EPI will have several military 850 shift RTTY stations on the air at the MRCG meet. They invite your participation and support, either in person at the MRCG event or on the air with a RTTY contact. This old mechanical gear is a lot more enjoyable and puts on a much better show when there is a live operator at the other end of a radio link.

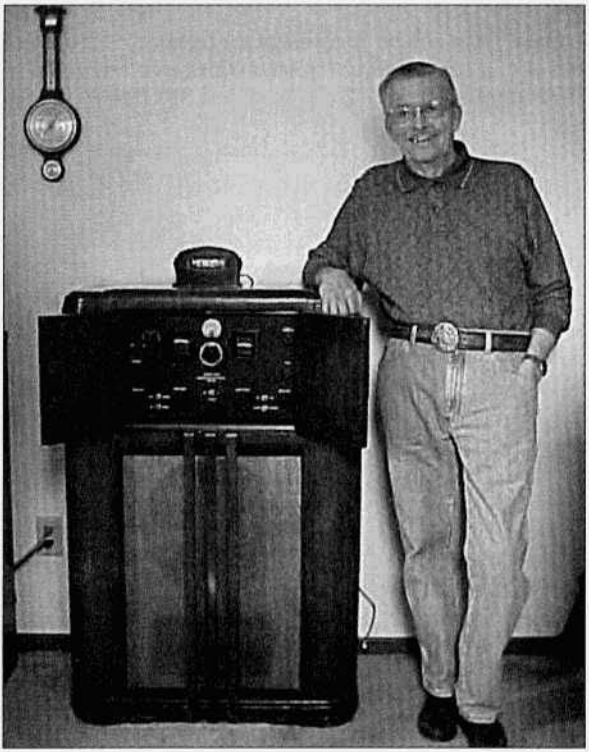
Primarily, activity will be on 10137 USB, using 850 shift MARK LOW tones (MARK = 1575 CPS & SPACE = 2425 CPS) at 60 WPM, but there may also be similar ops on 14087 or thereabouts. Plans are to be on the air on Friday the 4th, and again on the afternoon of Saturday the 5th. RTTY stations at MRCG 2001 will include a GRC-46, a 1KW TRC-75, a PRC-47, and possibly a GRC-106.

Since "It's the Clatter That Matters!", mechanical Baudot teleprinters will be used exclusively at MRCG 2001. Currently, machinery includes a Kleinschmidt TT-4A & a MITE TGC-14 & a MITE TGC-29, but some Teletype Corp. machine may show up too. (If time permits & interest demands, some oldtime RTTY art may also make an appearance, in the form of broadcast printouts of the lovely and gracious Rytta & her sister Baudette...)

Most military RTTY gear is usable with the tone & speed setup mentioned above, with two of the more common compatible sets being the GRC-106 & MD-522 combo & the PRC-47 & CV-2455 pair. Additionally, most commercial & amateur RTTY setups can be adjusted to work with this old military 850 shift gear as well.

Before & after MRCG 2001, you can hear this same equipment on the hambands on a regular basis. "Clatternet" is a RTTY roundtable which meets around 0930 or 1000 Pacific time on Saturday mornings. Frequency is again 10137 USB, with the same 850 shift MARK LOW tones & 60 WPM teleprinters. Clatternet isn't a structured net, it's an informal roundtable discussion where teletype enthusiasts get together to yak. One and all are welcome to join in.

For more info on either RTTY at MRCG 2001 or on Clatternet, you can contact Al Tipsword, W6GER at atipsword@gotnet.net or Dave Ross, N7EPI at ross@hypertools.com



The Story of My Hammarlund SP10X

by Gil Parsons, W8OGL
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Ross, OH 45061
psscopes@concentric.net

This tale begins with one of the many QSO's I have had over the years with Gene KB4YST. He mentioned that he had a Hammerlund Super Pro in a large console cabinet. Having had an SP in the past, I thought I would like to have another one. I told Gene if he ever wanted to sell it, I would be interested. He replied that he didn't want to sell it, but he would trade it for a Johnson Ranger! This was fine with me because I had three of them on the shelf plus a parts Ranger. A few weeks later my XYL, Genie, and I made a trip to Louisville, KY to make the trade. Upon seeing this receiver, I realized Gene got the worst end of this deal (have been trying to even it up ever since)! This thing took up the entire back of the Nissan Pathfinder; it is the size of a BC-610. The cabinet measures 44 _" H., 29 _" W and 18" deep. The weight is HEAVY! The front panel is 99% and the cabinet is 95%. Once home, I set about recapping the entire receiver and power supply. It now works great – lots of room-filling audio.

Now that it worked well, I wanted to know more about the receiver and its history. Following is what I have pieced together with Gene's help:

The receiver and power supply were purchased by Lamont Wilson KC4JK (SK) on June 4, 1937 for the sum of $208.51 (name of original owner and call furnished by Gene; the rest of the info is on paperwork with receiver). The serial number of the receiver is 850, the power supply is 916. According to Gene, Mr. Wilson, being newly married at the time, bought his new bride the receiver for a wedding present. She thought it was too ugly to put in the living room, so Mr. Wilson bought the console cabinet with the 15" Jensen speaker to blend in with the living room décor. The 1937 ARRL Handbook's advertising section shows the SR150 console.

Mr. Wilson used it for a number of years before retiring it to the basement in favor of newer gear. Eventually, he asked Gene if he wanted it. Gene had it for about 10 years before yours truly entered the picture. According to Raymond Moore's book, *Communications Receivers* , (this is a great book by the way) the SP10 prototype was made

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From Harold Knight, W1SKS

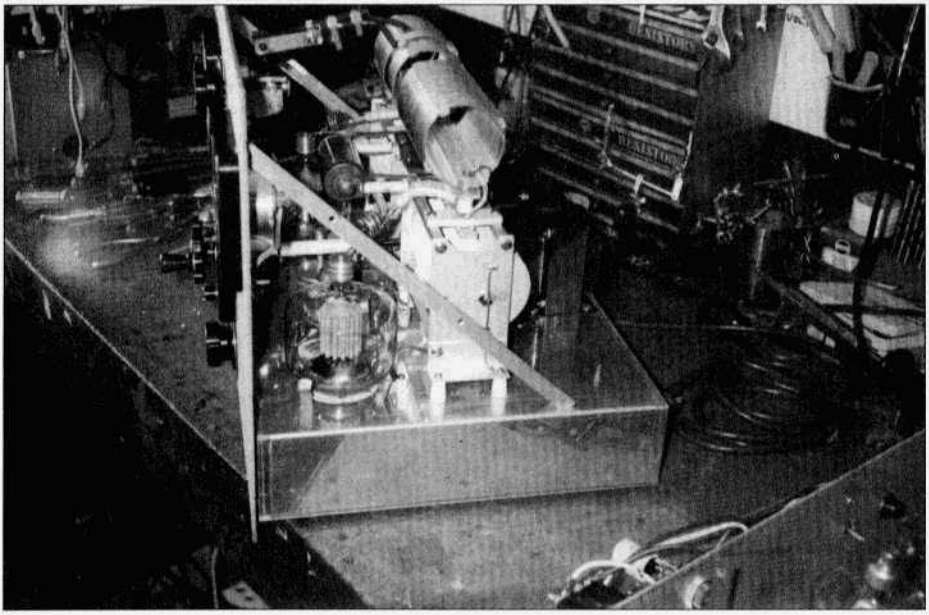
Enclosed is a picture of my present ham shack, located in an upstair bedroom of an 1870s farm house. Needless to say, it takes many trips upstairs to manage all of the boatanchors, however once in place... if the ceiling supports hold... the equipment is there for good!

As you will notice, all the junk is good old USA or home brew. The exception is the Kenwood Twins and a Model TS830S both old enough to have attained 'citizen' status.

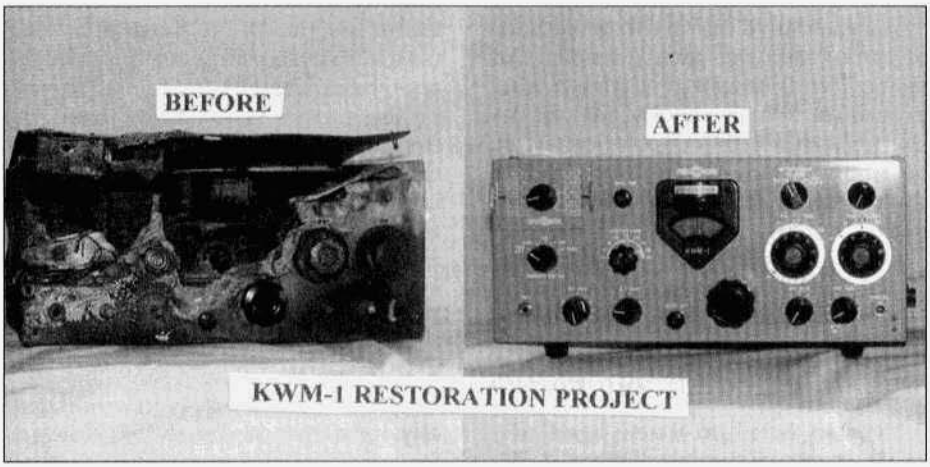
I have enjoyed many QSOs at this QTH and have been domiciled here for 45 years. First licensed at Calais, Maine (Washington County) in the late 1940's as W1SKS - with the help of Bob Blaney, W1LIP now W9FRU and Arnold E. Fountain, W1QWW. After a few years away from the ham community to serve as Communications Supervisor for the State of Maine, Inland Fisheries and Wildlife Dept, I again, with urging from Arnold Chick, W1TT, got back into Ham Radio as KA1NKR. End of story! - until W1SKS again became available as a vanity license. From the photo you can see that I work mostly AM... 75 meters in daytime with regular 3875 kc group: W1UAX, George; W1JZ, Mr. Mike; W1QWW, Arnold; WA1HLR, Tim; the list goes on!

The 1945 kc Gray Hair net on 160 meters on Tuesday nights is special! The rig is PP 100THs Class C and mod is 4-125s Class B, home brew with about 400 watts RF. The receivers are classics— R-390A with a National HRO-5AT1... which I purchased new from Radio Shack at 167 Washington St., Boston, MA in 1946!

Must say I enjoy your ER magazine and look forward to it each month... most especially the building articles. I still home brew and enclose picture of the new rig almost ready to smoke test . This is PP class C, 3-400's, with 4-125 Class B mod. The exciter is a Viking II, a complete rebuild, with all K6AD ER mods. In addition to the K6AD mods, I have added a Collins PTO (internal) with digital read-out. I am looking forward to seeing it 'Glow in the Dark'. W1SKS



New rig under construction at W1SKS; 3-400s modulated by 4-125s.



Derik, VY2DA transformed the burned-out hulk on the left into the almost mint unit on the right over the course of a single weekend. He's told me that he used materials he found around his garage and parts salvaged from old broadcast sets. I think this demonstrates the superior abilities of our neighbors to the north. April Fools

Product Review

The TM-1 Tuning Meter

by Thomas J. Bonomo, K6AD
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San Mateo, CA 94402
tom@cpic.net

The TM-1 simplifies tuning, saves finals, and allows you to tune up right on top of a QSO with only milliwatts of RF going to the antenna.

This is one of those "It's so damn simple and elegant, why haven't we always done it this way?" kind of articles.

We each have our favorite methods of tuning our rigs and antennas. For years, I've followed the same tuning procedure, which usually goes something like this: 1. Switch antenna switch to dummy load. 2. Tune up rig into dummy load. 3. Switch antenna switch back to antenna position. 4. Switch rig switch to MFJ 259 antenna analyzer. 5. Dial in band and frequency (keeping an eye on the drift!). 6. Adjust antenna tuner for minimum SWR on the MFJ analyzer. 7. Switch antenna back to rig and operate.

Need to switch to a new band? Repeat all seven of the steps above. In lieu of the MFJ antenna analyzer, you can, of course, use your rig and an SWR meter, but your finals won't appreciate it and neither will your fellow hams: you will be radiating your tune-up signal, creating unwanted QRM.

I am happy to report there's a surprisingly easier and better way, and it only costs $49.95: the TM-1 Electric Radio Tuning Meter. This unit is appropriate for anyone who uses a multiband antenna and a tuner (regardless of the type of rig you own or the mode you operate). Not only does it simplify the procedure and make it a heck of a lot faster, but you will have done your finals a big favor by not loading them into mismatched impedances, and you will have done your fellow hams a big favor by not generating a lot of unnecessary QRM while you fiddle with the antenna tuner.

Let's look at the procedure with this handy little box: 1. Switch from Operate to Tune on the TM-1. 2. Tune your rig for maximum reading on the unit's meter. 3. Tune the antenna tuner for a null reading. 4. Switch back to Operate. You're done! (It even sounds faster!)

How is this possible, you ask? The TM-1 is built upon the principle of the Wheatstone bridge. In the Operate position, the box is bypassed and does nothing. In the Tune position, the transmitter is connected to the dummy load (so it always sees 50 Ω, regardless of the antenna mismatch) and a small sample of the power is extracted from the dummy load to drive the bridge and the tuner and antenna. The antenna tuner is adjusted to bring the internal bridge into balance, as seen by the null on the meter. When 100W is used to drive the system, the antenna radiates only 25mW!

The TM-1 is not rated for any specific power level, but should safely handle a couple hundred watts (you would usually tune up with much less, I hope). Exercise common sense when running more than 100 watts through the TM-1. When in the Tune mode, higher power levels may overdrive the meter. When in the Operate mode, just exercise the usual caution, remembering that as with any antenna/tuner system, accidentally

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VINTAGE NETS

Arizona 40M AM Group: Meets on 7293 kHz at 10:00 AM MST (1700 UTC) on Sat. and Sun.
West Coast AM Net meets Wednesdays 9PM Pacific on or about 3870kc. Net control alternates between John, W6MIT and Ken, K6CJA.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3860 +/-
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net controls are Andy, WA4KCY and Sam, KF4TXQ. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours.
Arizona AM Net: Sundays at 3 PM MT on 3855. On 6 meters (50.4) 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 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0500 ET on 3885 + or - QRM.
Westcoast Military Radio Collectors Net: Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. http://www.crompton.com/grayhair
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet on Tuesday nights on 3805 at 2100 Eastern and on Thursday nights on 3875. West Coast 75M net that takes place on 3895 at 2000 Pacific Time.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Collins Collector Association Monthly AM Night: The first Wed. of each month on 3885 kHz starting at 2000 CST (0200 UTC).
Drake Users Net: This group gets together on 3865 Tuesday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, W8NS; Rob, KE3EE and Huey, KD3UI.
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.
K1JCI. 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 Calif. Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. NC is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745.
Midwest Classic Radio Net: Sat. mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.
Boatanchors CW Group: 3546.5, 7050, 7147, 10120, 14050. 80 on winter nights, 40 on summer nights, 30 and 20 meters daytime. Nightly "net" usually around 0200-0400 GMT. Listen for stations calling CQ BA, CQ GB.
Wireless Set No. 19 Net: Meets the second Sunday of every month on 7.175 +/- 25 kHz at 1900Z (3760 +/- 25 kHz alternate). Net control is Dave, VA3ORP.
Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22:00 UTC on 7220. Net control is Dennis, VE7DH.

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

The Story of Two Radios

The end of one and the beginning of another...

by Bruce Vaughan, NR5Q
504 Maple Drive
Springdale, AR 72764

Of all things made by the genius and hand of humans, the regenerative receiver must be one of the most remarkable. Elegant in its simplicity and nervous in temperament, it responds to the hand of the builder and operator more like a fine violin than a piece of engineering.
Barry Kirkwood, PhD, ZL1DD

Part 1

I arrived at the hamfest parking lot, already alive with action, about 5:30 AM. That gave me an hour to set up my tables, and 30 minutes to take a look around the hall before the convention center doors opened at 7:00 AM. I was only half finished with my set-up when I happened to glance across the room and spotted a stranger carrying what appeared to be a National NC-100A. Within seconds I was by the young man's side waiting for him to place the heavy receiver on his reserved table.

He explained to me that the receiver was some sort of Navy receiver that he was unfamiliar with, and that it was built by National. He told me the set was a 'parts only' set as it had been so badly 'butchered' it was beyond repair. His asking price was $75.00. That seemed a little 'steep' to me for a 'junker' so I passed it up and returned to my table.

Sales were good that day. I sold all of my major items. My few remaining parts fit easily into a corner of the trunk of my old sedan with room to spare. I was lowering the deck lid when the fellow with the National came out the door 'huffing and puffing' under the weight of the big, heavy, receiver. He glanced my way, "Give me 25 bucks and I'll set this in your trunk instead of mine."

"Sold," I replied, as I quickly raised my deck lid as high as it would go. I had no idea what I would do with my purchase, but I was sure there were a lot of good parts in the receiver.

I did not bother to put the old boat anchor in my shack; I placed it on a shelf in the garage. I'd take a look inside when I had more time; that time did not come soon. Months later I gave the set a more thorough inspection. I was shocked to see what neglect and inept repairmen can do to a fine piece of radio equipment. I made a decision to run it for sale in a popular Radio Magazine. My ad brought one response-that from a ham in Springfield, Missouri, only 100 miles from my QTH. I sold the rig over the phone with the understanding that the buyer pick up the receiver the following weekend. Now, some 12 years later, I have not heard from that buyer.

Several years ago I decided that I would strip the set for parts. I hated to do that to a piece of history, but apparently no one wanted it, and I had neither the time nor ability to do a complete restoration on the receiver. I feel my cannibalism was justified. Then, as I inspected further, I made a decision to leave the power supply, audio output stage, and the controls intact.

Before removing all the parts I ran a test of the power supply and audio output stage. Both were found to be working normally. Why not, I reasoned, build a simple regenerative receiver inside this roomy enclosure? I installed a 75

Completed receiver with coil holder and coils. Note coil identification stripe on left aluminum panel.

regenerative detector stage, and two stages of audio pre-amplification. I used one section of the ganged capacitor, with most of the plates extracted, to tune the detector. I was pleasantly surprised-the radio worked. Not great by any means, but for several nights I listened to UA, G, PY, and much more DX on the 20 meter CW band. I installed a speaker in the side of the cabinet-an unwise move in a regenerative receiver. I got away with it-provided I kept the audio adjusted at a normal level or below. At higher levels of audio the sound found its way back to the detector tube and caused all sorts of microphonics.

I 'tweaked' voltages, tried a new set of tubes, checked capacitors, even rewired the detector circuit. After playing with the set a few days I realized it fell into the mediocre category, not a 'keeper,' and as such was relegated to a life on the shelf once again. I blamed the less than thrilling operation on the general layout of parts. Many leads were excessively long. I placed it on the end of my wife's sewing table-a location I realized was highly temporary. When she next used her sewing machine I was kindly requested to remove 'that God-awful' piece of junk immediately. Once again the old receiver was returned to the garage-a sad fate for a battle scarred veteran radio. Five more years would pass before it was once again returned to the warmth, if not security, of my workshop. This time it was there for total destruction. I removed every thing worthwhile, tossing most of the 60-year-old capacitors and resistors, plus many feet of wire, into a waiting trash barrel. There was no way I could toss out the cabinet, chassis, and National dials even though I was puzzled as to their future use. Though I would not admit it, I was already planning another receiver using many of the same parts from my previous disappointing project.

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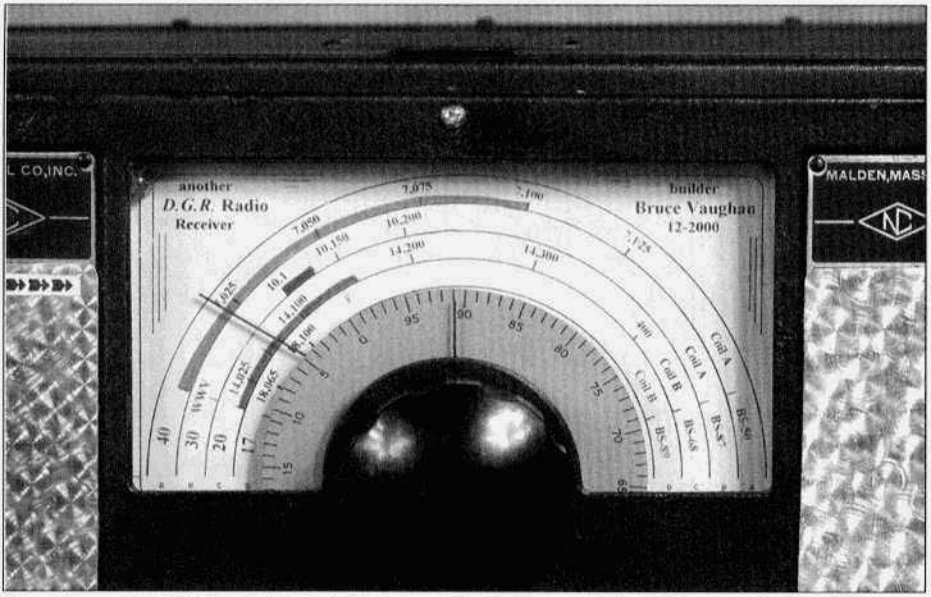


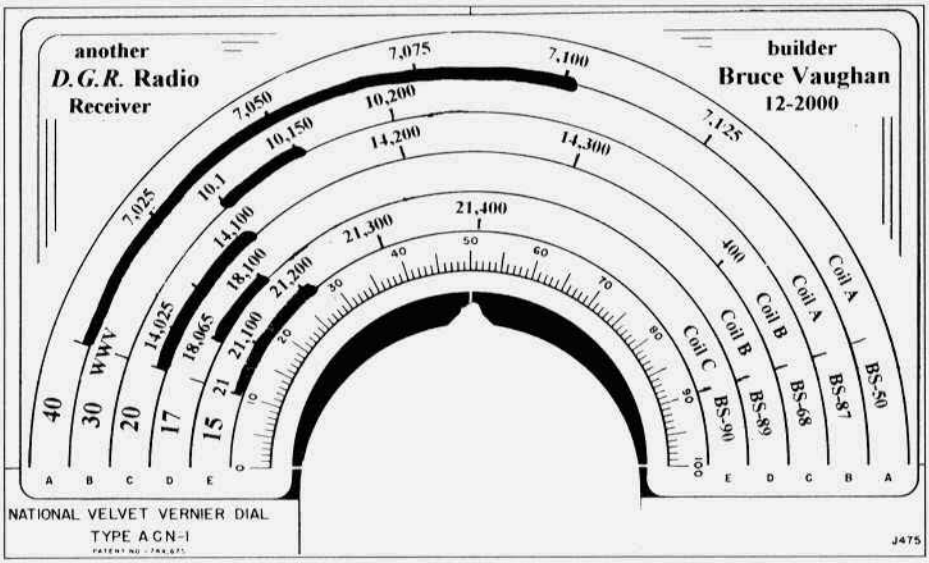
Receiver with dial installed. What does D.G.R. stand for? "Damned Good Regenerative" of course.

For those of you who are unfamiliar with my philosophy of radio construction I will review it here. Please, bear with me as I explain; I promise to be brief.

My building ideas are due in part to my admiration of some of radio's great manufacturers-especially the National Company. Pay attention to detail, build gear like a battleship, and keep in mind that simple circuits often work exceedingly well when properly constructed. Remember the old HRO was with us for over 30 years. Oh yes, it was changed often, but basically the radio stayed with standard circuitry and avoided gimmicks of any kind. It served with dependability and excellence during WW 2 in every branch of our armed forces, and was copied by both the Japan and Germany. Imitation, like plagiarism, is the sincerest form of flattery. Remember that both Japan and Germany had in their possession radio circuits equal to, and quite possibly superior to, the HRO. Did those receivers work like the HRO? No way.

With this in mind I looked at the inline tuning mechanism again. With reluctance, I decided to adapt it for use in one of my simple receivers. Built as it was, use of a hacksaw was needed to remove the big capacitor shaft from the gearbox. Once the deed was done, I realized the shaft would have to be reduced to a standard 1/4" size before I could use it. I have no machine tools so it would have to be done the hard way-with a file. I carefully marked the end of the shaft with a cross filed with a three cornered file. As closely as I could measure, the cross marks were in the center of the shaft. Then I started filing away the metal trying to keep the cross in the center. I filed away carefully until my 1/4" shaft coupler slipped onto the almost round shaft. I tried it attached to a variable capacitor and found it to be very close to the desired roundness. The inside of the gearbox and gears were cleaned, re-lubricated, and the outside cleaned and polished-then set aside.

I turned my attention to the chassis.



Completed, calibrated dial ready for installation in receiver.

Badly corroded, the chassis was simply beyond cleaning. I tried my little palm sized, electric sander. I could see it was going to take a long, long, time to dig deep enough to remove all the rust and corrosion. What about paint? I tried some aluminum spray paint. The spots where corrosion had etched deeply into the metal could still be seen. As a last resort I reached for a small can of Aluminum 'Hammartone' paint. I found the paint difficult to brush on. It dried so quickly that I could not get a smooth job. I assumed that if a heavy coat were applied, it would never dry to a hard finish. I was very wrong. With nothing to lose, I brushed on a liberal coating of the paint to the battle scarred chassis, I was surprised to find it dried to a finish that was extra durable. Better still, it looked good.

What about the old filter capacitors? Amazingly, they tested good. I decided to go with them-being careful to fuse both the primary and secondary of the transformer. I polished the cans with steel wool before laying aside.

Oh yes, the transformer. I connected 120 VAC to it, hooked up my AC voltmeter to the HV winding, and plugged the thing in. No smoke! The HV stayed a little above 400 Volts. While that seemed on the low side, 200 volts each side of the CT, I assumed that was the way it was designed. I plugged it again the following morning and left it on all day.

The power transformer and choke were sanded and sprayed with a good quality black satin paint. There were two dividers under the chassis. One ran from near the front panel to the back side of the chassis, while the other was mounted at 90 degrees, connecting the longitudal divider to the left side of the chassis. I decided to leave them in-they should offer shielding between the detector circuit and the power supply.

I would keep improving the breed-a simple detector, plenty of audio, a marker generator, and a few ideas I wanted to try out. I had plenty of room-that was apparent. Knowing RF losses cannot be tolerated in a simple receiver; I dug out brand new tube sockets with good insulation. In an attempt to use the old tube socket holes I ended up with long leads again. Well, perhaps this time I could get away with it.

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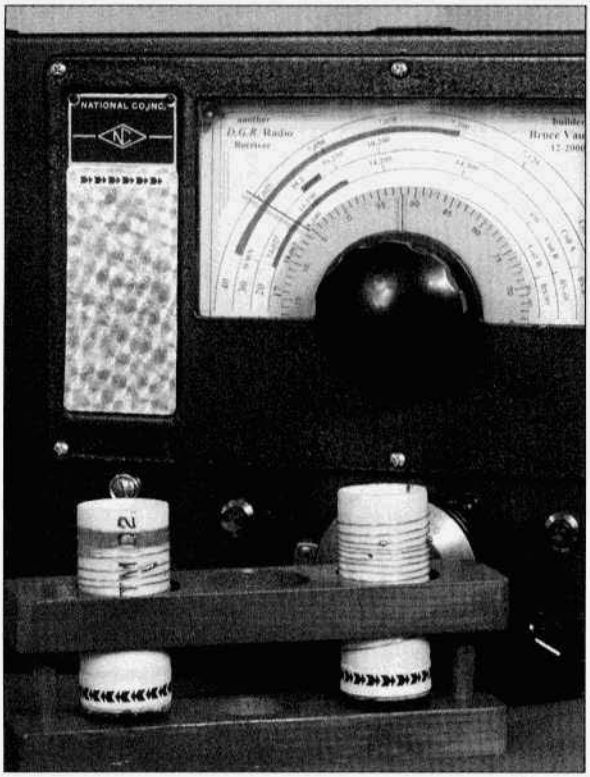

Unique method of matching coils to receiver. Try this method, described in text, you will like it.

At last the day came for an on-the-air tryout. Now, if my theory holds, a receiver exhibiting the most bugs and poorest operation when first powered up, ultimately ends up being one of your better receivers, then I had a sure fire winner here. I won't say the set had a few bugs-it was a complete disaster. Hum, low audio gain, backlash in the tuning, rough regeneration, some weird sounds that must have been generated in the chassis-I ended up changing everything else and still had 'em. The set had one virtue-it did not smoke.

Trouble shooting a simple receiver normally takes me a day or so. I spent a week on this one and it was still terrible. Oh well, back to the drawing board.

I bought three rolls of solder wick, and used two of them taking out parts and stripping out my previous wiring. Next, out came the dividers. I found them either blocking my wiring routes or forcing me to mount parts in areas of the chassis where they did not belong. Now, the set began to look better. Several problems remained. The National receiver had a metal dial slightly smaller than (4X 6), with the frequencies silk-screened on its yellowed surface. I wanted to calibrate my receiver with the low end of each HF band marked on the lower left end of the scale. I could set this frequency accurately using my built in crystal marker. Then I would calibrate each band using my Kenwood 930, which is accurate enough for my purpose. But how could I end up with a professional looking dial? I remembered I had a used National ACN-1 vernier dial in its original box. I knew there was at least one brand new blank paper dial with it that had never been calibrated. More about this later on-the set is not even built.

As I progressed with the parts layout, another problem reared its ugly head. The Navy receiver had holes and markings for two controls on each side of the dial. I tried to use them in my first effort and feel that was part of my problem. I needed to do something to do away with these holes and still keep the set looking presentable. I cut thin sheet aluminum to fit over the holes and lettering. I could either paint it black like the remainder of the dial or I could do some engine turning. I chose the engine turning. Once finished, the aluminum covers were cemented in place using plain old radio service cement.

I realized the top and back would need some modification. I did not want a back cover on the radio. The back must be open for convenient coil changing and adjustment of the antenna coil. As this was a simple mechanical problem I put it aside for the present time.

Now, it appeared, I was getting close to a layout suitable for my receiver. I still had too many tube socket holes in the chassis. I moved the detector socket nearer the detector coil and mounted an extra octal socket adjacent to it. The socket is for possible future use and at the present time is unused. At any time in the future it will be in a perfect place to add a stage of RF.

As I progressed down the audio line, I realized I had one socket too many. I added a second socket by my 6V6 output. At some future date if I so desire I can change the circuit to a PP output with very little trouble.

Two of the sockets would be used for the marker crystal and the crystal oscillator tube. This pretty well organized the chassis into a workable layout.

My former attempt had used a 0-100 direct reading dial for the band-set capacitor. A vernier tuning dial makes resetting much easier. I found a nice one, but it was just a wee bit too large to fit below the main tuning (band-spread) dial. I solved this problem by rotating the dial to a horizontal position.

Before we get to the actual construction, here is a problem that has plagued me for years. With so many homebuilt receivers and transmitters in the shack, each requiring a number of plug in coils, you very soon find yourself up to your butt in plug in coils. How in the world is it possible to keep the coils with the unit to which they belong?

I first tried magic markers. I put a wide red mark by a coil socket, and then painted a red stripe around the top of the coil. That's all well and good, but there are only so many colors. The second thing wrong with this system is keeping a set of several magic markers out of the hands of my grandchildren. Very soon I was into trying two red stripes to match a socket with two red marks. Believe me, it just never worked out the way I intended. I then tried numbering and really got in a mess. My next step was to build a coil holder for each receiver. A stamped metal plate was attached to the coil holder and an identical plate placed on the receiver. This was pretty good as long as you kept the coils in the proper holders. When trying out radios, perhaps listening to two or three each evening, the coils often ended up in a jumble on my desk. When 'pickup time' arrived, I had no idea what coils belonged in what holders.

Then one evening last month the solution came to me as I was using the computer. If you are using MS 'Word,' click on the font button and pick 'Press Writers Symbols.' Each letter on your keyboard prints out a different symbol. Run off a row of symbols for each coil set used in a receiver. Using any good glue attach a ring of these symbols around the coil near its base. When dry, coat with a sealant. Cut a 1-inch string of the same symbol and attach to the chassis near the coil, and another on the front panel. Now you have a very easy way of keeping track of coils. So simple and yet so foolproof. It is easy to spot a coil with a row of large black triangles, squares, round spots, for example, and match them to a receiver with the same symbol. Try it... **ER**

Next month Part 2.

A complete index of the entire 12 years of ER is available for viewing or downloading at the following website: http://www.qsl.net/n9oo

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

How to Repair a Receiver
Part 2

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Ok, so the receiver is not making smoke, but it's not working either. What do you do then?

First off, if there is a very loud hum in the speaker or headphones, the power supply filter capacitors are probably not doing their job and you need to replace them. You have several choices at this point. The least expensive thing to do will be to buy new "Axial Lead Electrolytics." Typical single section filter capacitors of this sort will cost a dollar or two each. You can also find new or new-old-stock can-type electrolytics, which may match the style of the capacitors in your receiver, but they will generally cost twenty dollars or more for a two-section capacitor. Some people who are very concerned about the appearance of their boatanchor will even empty their old capacitor can or shell and put new, axial lead capacitors inside. Whichever way you decide to go, it is advisable to make the new "input capacitor," the one attached to the rectifier filament or cathode and C-47B in the NC-57, no bigger in capacitance than the original one being replaced. A larger capacitor will increase the surge current drawn from the rectifier and may shorten its life. If you can't find one at the correct value, you might try two smaller units in parallel or you could simply just use the next smaller available size. The only problem that might create would be a little more hum, which you could correct with more capacitance at the "output" side of the filter, and a little lower B+ voltage in the receiver. The "output" capacitor, the one separated from the rectifier by a filter choke or a resistor (C-47A), should be at least as large as the original. A bigger capacitor at this point will not harm the rectifier, and it should decrease the overall hum level more than the original capacitor did. Be sure to observe the polarity markings on electrolytic capacitors. The + side goes to the more positive voltage (e.g. B+) and the - side to the more negative voltage (e.g. ground). All capacitors should have a working voltage rating at least as high as the originals they are replacing.

Now that you have the hum cured, and presuming the receiver still doesn't work, the next things to check are the audio stages. Start by using your VOM/VTVM to measure the voltages associated with the audio output and driver stages listed in your manual. If the voltages are in the ballpark, see if the audio output stage is working by touching the control grid, G1 (marked H1), with a screwdriver blade. Please use one with an insulated handle in case you happen to touch the wrong thing! You could also attach a clip lead to it. If the amplifier is OK, you should hear some hum. Audio output stages generally have a resistor from cathode to ground for "cathode bias," and that resistor is usually bypassed by an electrolytic capacitor (R-33 and C-61). If that capacitor has deformed and lost its microfarads the stage will still work but the amplification will be low. Make a mental note to come back after you have the radio playing and test that capacitor by shunting

another capacitor across it using clip leads. Once again, the + side should be connected to the tube cathode and the - side to ground. If the volume increases you will need to replace that capacitor as well.

If you don't hear hum when you do the above test there may be something wrong with the audio output transformer or the speaker. I use high impedance (2000 ohm or more) headphones with a fairly large DC blocking capacitor in series, a 0.1 microfarad at 400 volts or more will do, to troubleshoot audio stages with no apparent output. Ground one side of the phones and probe the far end of the capacitor onto points where you expect to hear audio, like the control grid and the plate of the audio output tube and the secondary of the output transformer. Keep the phones off your ears while you are touching the capacitor lead to a B+ point because you are going to hear a loud click as the capacitor charges to the B+ level. And don't forget to discharge the capacitor by touching its lead to ground when you are through using it. If the speaker seems to be the problem, measure the resistance of its voice coil with your VOM/VTVM. A good speaker should measure just a few ohms.

If the audio output stage responds to your screwdriver test, try the same thing on the control grid of the first audio amplifier (marked H2). If it hums properly go back to the top, nongrounded side of the audio volume control and touch it. You should hear hum there too, and it should be adjustable by the volume control.

Once the audio stages are working properly, it's time to check out the Intermediate Frequency (IF) amplifier and detector. Measure the voltages associated with those stages listed in your manual. Once they are OK, connect the output of your signal generator through a 0.01 microfarad, 400 volt capacitor to the signal grid of the mixer. That's the grid fed from the tuned circuit between the mixer and the RF amplifier or the antenna input if you don't have an RF stage, marked "IF" on the NC-57 diagram. That will be grid 3, pin 8 on a 6SA7, pin 7 on a 6BE6, and the cap on a 6K8 just to mention several common mixer tubes that you might run across. Attach the ground or shield of the signal generator lead to chassis ground. Tune the receiver to the bottom of the broadcast band if possible, and set the signal generator to the receiver's nominal IF frequency with its modulation on and its output at a moderate level. In most single conversion superhets, the IF frequency will be between 455 and 465 kc. If the IF stages are working properly you will hear the signal generator modulation in the speaker or phones. If it doesn't come through try tuning the signal generator above and below the nominal IF frequency a bit to see if it comes in somewhere else. The well-intentioned former owner of my Echophone EC-1 "tightened all the screws" on the IF transformers before he shipped it to me, and the result was no response at 455 kc but several responses between 420 and 430 kc. If you don't get any response at all, try injecting the signal generator into the control grid, G1, of the individual IF amplifier tubes in order going back toward the detector. If you get no response out of any of the IF stages, try pulling out the last IF amplifier and injecting the signal generator into that stage's plate connection. You will have to do that through a capacitor, something around a 0.01 microfarad, 400 or more volt unit will do, to block the B+ voltage at the plate from the signal generator output. If that doesn't work, try injecting the signal generator directly into the detector, usually a diode and pin 5 on the 6H6 dual diode in the NC-57. At some point you should hear the signal generator modulation, and that will give you a clue as to what is and is not working in

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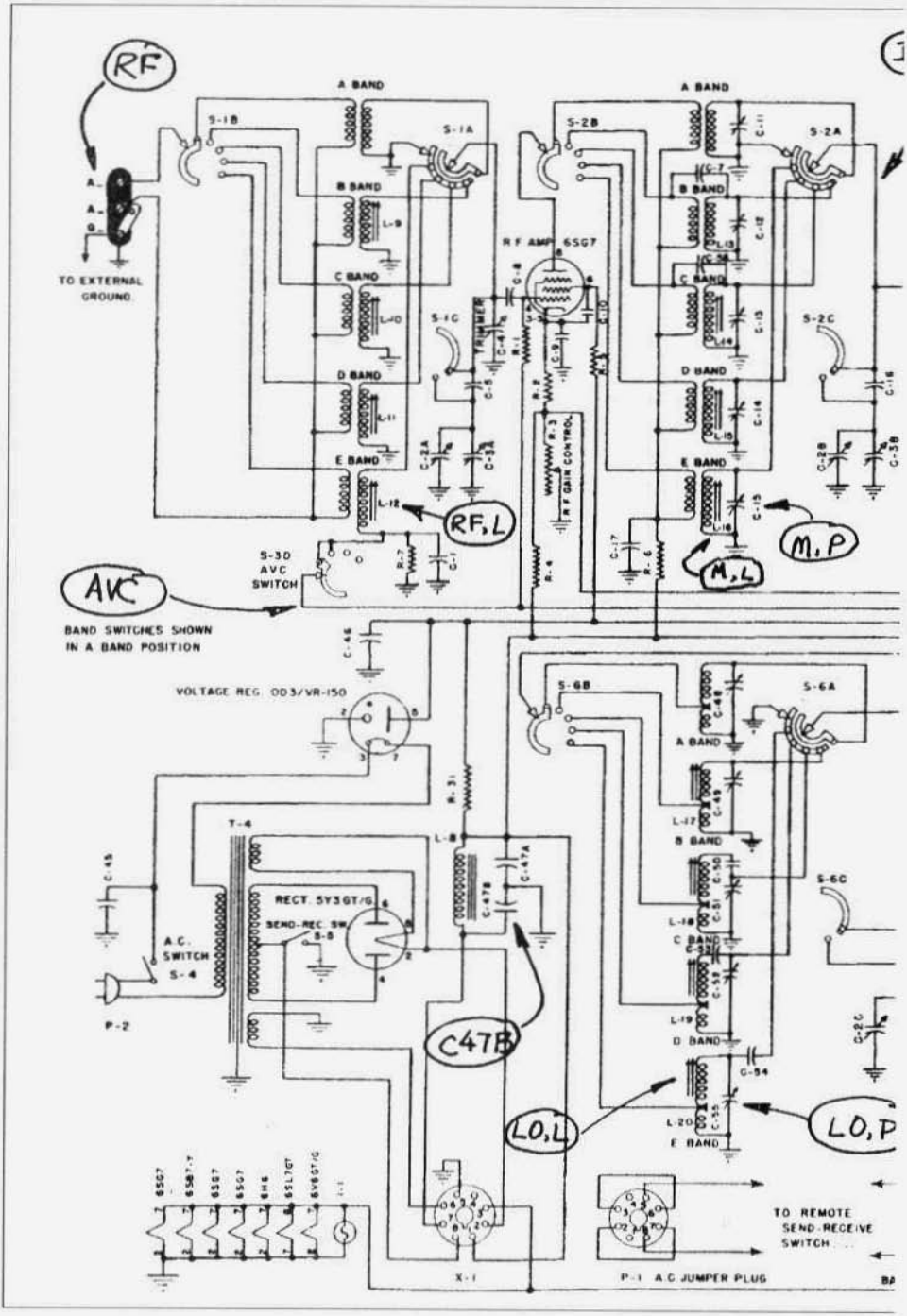
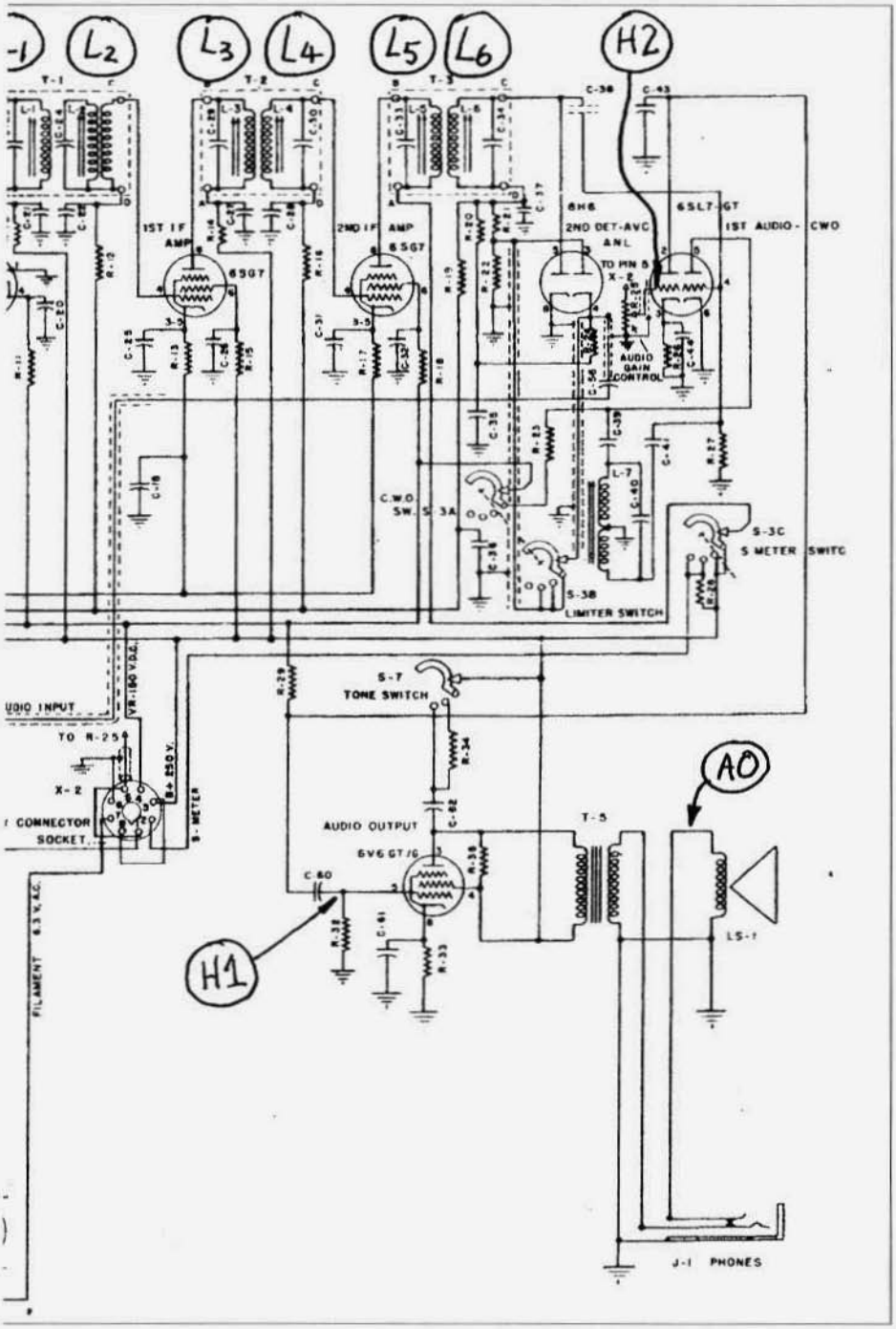


NC-57 Schematic


L2
L3
L4
L5
L6
H2
H1
A0
T-1
T-2
T-3
1ST IF AMP
6SG7
2ND IF AMP
6SG7
6H6
2ND DET-AVC ANL
6SL7-GT
1ST AUDIO - CWO
TO PIN 5 X-6
AUDIO GAIN CONTROL
C.W.O. SW. S-3A
S-3C
S METER SWITC
S-3B
LIMITER SWITCH
S-7
TONE SWITCH
AUDIO INPUT
TO R-25
X-2
CONNECTOR SOCKET
B+ 250 V.
S-METER
AUDIO OUTPUT
6V6 GT/G
T-5
LS-1
J-1 PHONES
FILAMENT 6.3 V. A.C.

the mixer, IF amplifier, detector string.

If you are particularly unlucky you may find that there is voltage on the B+ side of an IF transformer but not on the tube side. If that's the case, several things might have happened. Some receivers, the Hammarlund SP-600 Super Pro being one that I have run across, have a "decoupling" resistor and a bypass capacitor inside the IF transformer can. I have seen that capacitor short to ground and the resulting current burn out the resistor. Measuring from the outside, I found the correct voltage at the B+ side of the transformer but zero volts on the IF tube plate. Once I opened the can and replaced the capacitor and resistor the stage operated properly. The other possibility is that the IF transformer winding has opened up. You can check that out by shutting off the power and making a resistance reading across the winding. If the winding is open, do not immediately despair. Take the transformer apart and look carefully, and you just might find a broken or burned lead or a failed solder joint. If they burn out due to excessive current, coil windings usually open up at the point where they get the hottest, and that is where the wire is out in the open and does not have the advantage of the "heat sink" provided by the winding and the coil form. If you find a break in the wire you may be able to solder another wire to it after very carefully scraping the enamel insulation off the existing wire, or you may decide to unwind a turn or two from the transformer winding to get enough length to reattach the original connection. Don't worry about unwinding a turn, there should be plenty of adjustment range left in the transformer once you get to doing an alignment. If all else fails you should be able to find some kind of replacement for the transformer. Our editor, Barry Wiseman, may be able to direct you to a person who has a junker receiver like yours that could serve as a donor. Or one of the sources for help and for parts at the end of this article might turn up, if not an exact replacement, certainly a transformer that would allow you to get your receiver working again.

Once you can hear the signal injected into the signal grid of the mixer, the next thing to check is the receiver's local oscillator. It may be a separate tube, or it may be part of the mixer especially if the mixer is a pentagrid type like the 6SA7, 6BE6 or 6SB7Y in the NC-57 or a triode-hexode like the 6K8. In any event, as you will know from reading your ARRL Handbook, the local oscillator will be above or below the incoming signal frequency by an amount equal to the IF frequency. Usually, especially on lower frequency bands, it will be above the signal frequency. So for example if the receiver is tuned to 1000 kc and it has a 455 kc IF, the local oscillator should be running at 1455 kc. Perhaps the easiest way to check it is to listen for your local oscillator on another receiver. You can also use an oscilloscope if you have one. Couple your scope probe first to the point in the mixer where the local oscillator is "injected," grid 1, pin 5 on a 6SA7 or pin 1 on a 6BE6, or grid 1 of the hexode, pin 5 on a 6K8. If you can't see the local oscillator signal there, look at the control grid, G1, on the oscillator itself (pin 5 on the NC-57's 6SB7Y marked "LO"). And of course measure the voltages listed in your manual even if you determine that the local oscillator is working. I had an experience with an RME-70 where the local oscillator would run on the lower frequency bands but not on the higher ones. It turned out to be a shorted paper bypass capacitor on the screen grid, G2, of the oscillator tube that cut the screen voltage back to something under 10 volts. Replacing the capacitor and the screen-dropping resistor put me back in business on all bands.

Once you know the local oscillator is working, try injecting a modulated sig-

nal from your signal generator into the mixer's "signal grid" (point IF) as you did above when you were testing the IF string. This time tune the signal generator not to the IF frequency but to the incoming frequency that the receiver is tuned to. If all is well you will hear the signal generator modulation. And did I say measure the voltages listed in your manual on the mixer tube?

When the mixer is good, go on to try the RF stage or stages. Start by measuring the listed voltages for the RF stages. If all is well, connect your signal generator tuned to the incoming frequency to the antenna terminals (marked RF). If you get no or very limited response there, try attaching it directly to the control grid, G1, of the RF amplifier tube, for example pin 4 on a 6SK7 or pin 1 on a 6BA6. If you get little response at the antenna terminals and better response at the tube grid, check the DC resistance of the antenna link coil for that band and the section of the bandswitch that connects the input links. I have run across several cases where the antenna link coil has been burned open on one or more bands, perhaps by a current surge due to a nearby lightening strike. Usually, like the IF transformer case above, the coil wire is melted somewhere in the open span between the bandswitch and the coil itself, since that is where it is not well heat-sinked. If you are careful you can solder a fine wire to the melted end near the coil and reattach that to the bandswitch. If the entire coil is fried, as all of them were on a Howard 435A that I repaired a long time ago for my friend Mac, you can simply rewind the entire antenna coil. Try to estimate the number of turns from the burned marks, and if you can't tell just guess. Use a couple of turns on the highest frequency band, and more on the lower bands. Whatever you do will work, and you can experiment with a different number of turns later on or ask another owner of the same receiver for advice.

The last thing to check is the Beat Frequency Oscillator (BFO). This is the oscillator that beats against incoming CW and SSB signals to create an audio signal in the detector output. The BFO should be centered at the IF frequency and adjustable by a panel control on better sets for several kc above and below. If you can't hear a whistle on an incoming signal when you turn the BFO on, it may not be working or it may be tuned to the wrong frequency. There is usually another slug or capacitor adjustment on the bfo coil or elsewhere on the chassis that is used to set the frequency to the IF frequency. (Remember, my friend who tightened all the screws may have worked on your set too.) You can listen for the second harmonic of a 455 kc BFO at 910 kc on the broadcast band. You can also look at the BFO signal with your oscilloscope at the control grid, G1, or the plate of the BFO tube. Of course, check the manual voltages on the BFO stage. If you still don't get satisfactory BFO action, check the capacitor that couples the BFO to the detector or last IF stages. In many cases it is just two pieces of wire twisted together, sometimes called a "gimmick" capacitor in the parts list (C-38, a "dotted" capacitor in the NC-57). Many older receivers, in particular those of the Howard and RME persuasion, used a rather low level of BFO signal injection. That was fine when most of the signals on the band were fairly weak. But if you notice that the loud signals tend to "block" the receiver and sound distorted and turning down the RF gain control doesn't help much, or worse yet you have a Howard that doesn't have an RF gain control, you might want to increase the BFO coupling level. In a receiver with a twisted wire coupling capacitor, that can be accomplished by just putting a few more twists into the wires.

Yet another last circuit that you

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should check on your receiver is the Automatic Volume Control (AVC). The AVC circuit provides a negative voltage proportional to the strength of the incoming signal, which is used to bias the RF and IF amplifier stages. These stages use "remote cutoff" amplifier tubes whose gain varies with bias. As the incoming signal gets stronger, the AVC bias voltage gets larger and the gain of those stages decreases. If you have a signal strength meter (S-meter), it responds to the AVC voltage. The S-meter should deflect almost all the way on a very strong signal, for example a nearby broadcast station. There are usually one or more capacitors, typically totaling 0.1 mFd, connected between the AVC line and ground. If this capacitor is shorted, the AVC circuit will not work. If your receiver does not have an S-meter, you can check the bias variation on the AVC line (point AVC) or at the "bottom" side of one of the IF transformers windings that attaches to the grid on the "top." There should be a variable, negative voltage that goes to zero when the AVC switch is set to "off" or to "MVC," (manual volume control).

By this time you should have a working receiver. The next thing to do is to give it a thorough alignment. Before I get to that point, however, I need to talk for a moment about AC/DC receivers.

Caution, Dangerous, AC/DC receivers!

AC/DC receivers have no power transformer and their chassis is usually connected directly to one side of the AC power line. Typical receivers of this type include the Hallicrafters S-38 family and the S-41 and S-120, all of the Echophone amateur receivers EC, EC1, EC2 and EC3, and the National SW-54. Any receiver that has a series filament string with a rectifier like a 35W4 or a 35Z5 and an output tube like a 50C5, 50L6 or 35L6 is certainly an AC/DC receiver. Because one side of the line is directly connected to the chassis these receivers are potentially lethal, especially to the service person. When one is properly boxed up inside its cabinet it is reasonably safe. The chassis in my Echophone EC1 is electrically insulated from its cabinet, and the steel cabinet is connected to the chassis through a 0.25 mFd capacitor. I strongly recommend several things if you are working on an AC/DC receiver.

First, make sure that you are using at least a two wire line cord with a polarized plug (one lug wider than the other) or a three wire line cord. Make sure that the "ground" side of the AC line, the side that measures zero volts to the round pin on a three pin plug and usually the side served by a white wire, is the side connected to the chassis. AC sockets are usually "polarized" so that the wide lug on a two-wire polarized plug will fit only into the ground side. So if you use a two wire line cord, test the circuit first to be sure but in general attach the wire connected to the wide lug to the chassis.

Second, you may well want to consider using an "outboard" dpst (double pole, single throw) switch installed in both sides of the power cord to turn the receiver on and off rather than relying on the spst switch on the volume control. When the volume control switch is off, the hot side of the AC line is attached to the chassis through the low resistance of the unheated tube filament string and is again a hazard. With this arrangement there is a 50/50 chance that there is a 0.25 mFd capacitor, perhaps old and leaky but at least a 100K ohm impedance at 60 cycles, between you and 120 volts. An external dpst switch installed in series with both sides of the line cord that breaks both sides of the power line completely removes the power and is the least dangerous thing you can do. Also, wire across the volume control switch so you cannot inadvertently turn the external switch on with that switch off and thus make the

chassis hot. And replace that cabinet bypass capacitor with a new one rated for at least 400 volts DC.

Third, be very very careful when you are servicing a bare AC/DC chassis. By far the best thing to do is to use an "isolation transformer" to power an AC/DC chassis when you are working on it. An isolation transformer is a 1:1 transformer that gives you 120 volts out for 120 volts in but with the secondary winding floating, that is not connected to either side of the input line. I have a monster isolation transformer that I picked up for a few bucks at a local surplus shop. If you can't find one for a reasonable price, you can make one. Just connect two low voltage transformers back-to back, with the low voltage windings connected to each other. The 120 volt winding of the output transformer will then be electrically isolated from that of the input transformer. If the volt ampere product of the transformer secondaries, for example 24 volts times 2 amperes equals 48 watts, equals or exceeds the power consumption rating of your receiver, for example 35 watts for my six-tube Echophone EC1, your homemade isolation transformer will safely power your receiver. If you don't use an isolation transformer, at least check the voltage between the chassis and the power line ground, the round hole in a modern three-wire socket, each time you plug the radio in and before you touch anything on the chassis.

One other tip regarding the AC/DC sets, check to see if yours has a panel lamp. The lamp is typically wired across a portion of the rectifier filament and it is also part of the current path to the rectifier plate, so it is wise to have a good, working bulb in the circuit. It is usually a number 40 or a number 47 bulb.

Now you are ready to align your receiver.

Alignment

An alignment for a receiver is something like a tune up and a new set of plugs for a car. It will determine that all of the adjustable circuits in the IF and RF amplifiers are peaked for their maximum gain and selectivity, and it will assure that the calibration is correct. Strictly speaking it may not be necessary to perform an alignment on your receiver. If the calibration is "on the nose," and if you can peak signals and background noise with the "antenna trimmer," the RF stage and local oscillator are probably OK. If you have not changed any of the IF amplifier tubes, the IF alignment may be "good enough" as well. I like to at least check out the alignment on any new receiver that I run across my bench so that I know it's working at its best when I'm through with it. So in case your receiver is in need of an alignment or you just want to put it into peak condition, here is how you would go about it.

Again, I will presume that you have a single conversion superhet with one or more RF and IF amplifier stages and I will walk you through a generic alignment procedure. You would be better off to follow the specific procedure in your instruction manual, but it should be close to what I'm about to lay out. If you have a substantially different receiver, you will need to follow its manual instructions. If you have one of the Hammarlund HQ-120 series (HQ-120, HQ-129X, HQ-140X, HQ-150, HQ-160 or HQ-180), pay close attention to the manual for the IF alignment which will be somewhat different from what I suggest here.

One of the first things you will need are the proper tools to adjust the IF transformers and the RF trimmer and padder capacitors. These may be simple, screwdriver adjustments if they are capacitors, or they may be slugs in the coils for some IF transformers. Radio Shack has some plastic alignment tools that will fit the holes in your alignment slugs. They also have plastic

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The Eldico SSB-1000F

(The Last of an Elegant Breed)

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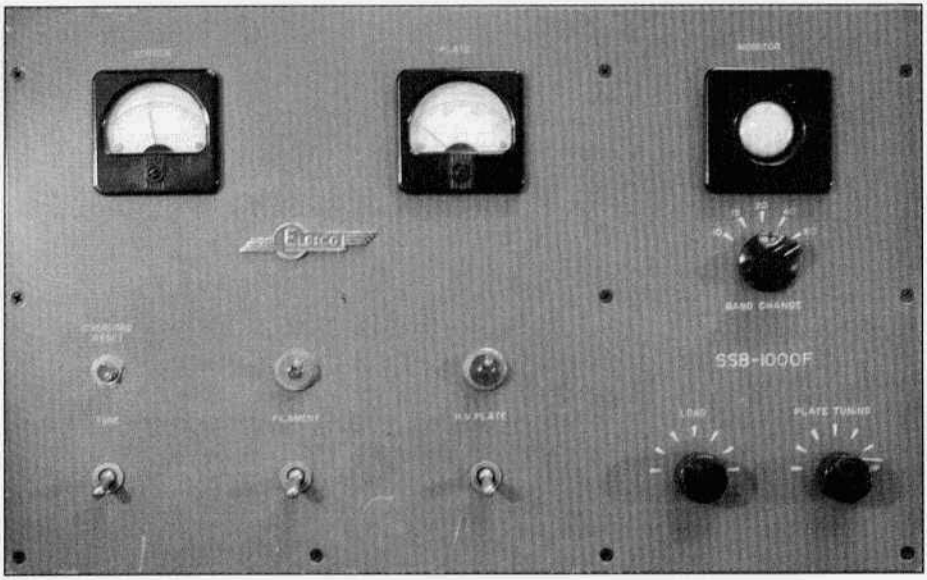
Introduction

In the early years of hotrodding a popular saying was, "If it don't go, bore it". This referred to enlarging an engine's cylinder diameter, which raises horsepower because of the increased displacement and compression ratio. Yes, there were other ways to wring additional power from your engine and pass it to the wheels but, dollar for dollar, none were as effective as boring. Similarly, if we want our stations to be heard better we have several options. We can build a directive antenna system, but then our signal will be stronger in some directions than others. We can add speech processing, but what about CW? We can change modes or operating times, but doing so is not always possible. As with engine boring, increasing the power applied to our antennas appears to be the most effective method of dramatically improving our station's overall readability.

With this in mind, upon acquiring my first Eldico SSB-100F transmitter (ER #142), I immediately set out to find a matching amplifier. Briefly mentioned first in QST (Feb '58) and in greater detail in the April issue, the SSB-1000F was the last in a line of three amplifiers developed, produced and sold by Eldico Electronics for amateur radio purposes. The first was the SSB-500, a '56 vintage, 500W PEP input model with a single 4CX250. A year later, the SSB-1000 (non-F) appeared with a pair of the same tubes and sporting 1000W PEP input. Appending the 'F' to the basic model number was a deliberate attempt to associate this new amplifier with the SSB-100F that had been introduced just over a year earlier.

Before delving too deeply into the 'F', it should be known that Eldico produced several variations of the 'non-F'. Early QST ads show them painted black wrinkle while in later ads they are glossy grey. Oddly enough, an SSB-1000 manual dated April 22, 1960 states it is painted black wrinkle, yet the manual pictures depict only units in grey. In addition, there were early versions whose meters were somewhat centered and close to one another. Later versions had their meters and scope symmetrically placed between the front panel edges.

Concurrent with the purchase of Eldico by Radio Engineering Laboratories, Eldico stopped advertising to the amateur market in mid-1959, roughly a year after the SSB-1000F's introduction. Because these amplifiers were on the market just over a year, with a formidable price tag ($745) to boot, sales were apparently quite limited. Although I will probably never confirm this, I suspect the serial number sequence began with #1001. This is because the example photographed for the manual is #1010 and because the only other serial numbers I have ascertained are #1019, #1031, #1034 and #1067. In addition to the five in this tightly numbered series, one owner reported having a '1000F' marked variation with a different front panel layout (perhaps like some of the non-F models). It appears this unit was a prototype or early production version as it is merely ink stamped with a '69' on the chassis instead of the typical kilo-series



Front panel of the SSB-1000F

numbers that are die stamped on an adhesive backed metallic label. In light of the reported serial numbers and short time the amplifiers were available for sale, I expect less than 100 of these amplifiers were produced and sold.

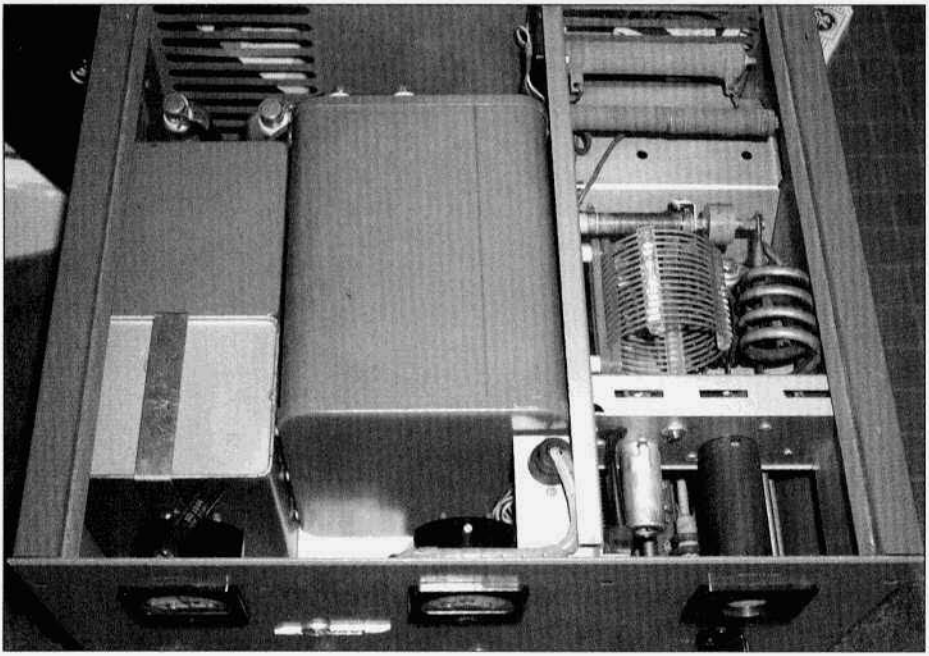
Although the SSB-1000F resembles the glossy grey versions of its 'non-F' predecessor, the two amplifiers are indeed different. The 'F' has a pair of Eimac 4CX300A finals and, depending on whether you are reading the QST ads or the power supply description or the voltage chart in the manual, a 2500 or 2750 Volt supply. On the other hand, keeping in line with 4CX250 limitations, the non-F has but a 2KV supply. The additional 100 Watts of plate dissipation and increased high voltage allow the 'F' to boast of its 1250W PEP input. In addition to the SSB rating, the amplifier is capable of 1000 Watts input on FM, FSK and CW and 750 Watts on AM. As with the SSB-100F transmitter, its matching amplifier covers 80 through 11/10 meters, but in five bands rather than eight.

Mechanical Description

Housed in a cabinet measuring 17 inches wide, 15 inches deep and 10-3/4 inches high, the SSB-1000F weighs a hefty 98 pounds, although it feels much heavier due to its compactness. If there were handles or if the rubber feet provided more than a meager 1/4 inch clearance above the resting surface it would be much easier to maneuver. The interlock-equipped lid allows quick access to all of the tubes, including the finals, as they are not in an RF tight compartment. The rear panel contains the bias adjustment, two fuse holders, a grounding stud, the AC cord and two SO-239 connectors to get the RF in and out.

As with most linear amplifiers, the SSB-1000F's front panel is sparse. At the top left corner is a meter for monitoring screen current. As should be in any amplifier that utilizes tetrodes with oxide coated cathodes, like those in the 4CX300A, the screen current meter should measure both positive and negative screen current. In this case, the scale reads +30 to -20 mA. In the middle

continued next page



Top view

of the panel is the 600 mA plate current meter. A 1 inch oscilloscope occupies the top right corner. Along the bottom are the Tune/Operate, Filament and Plate toggle switches and the Plate Loading and Tuning controls. The bandswitch is above these tuning controls and directly below the scope. A push button switch to reset the plate overload relay resides to the left of the orange (Filament) and red (Plate) panel lamps.

Electrical Description

The amplifier is of grounded cathode design. The final tubes are parallel connected and operated in Class AB1. The untuned (resistive) input has 50 ohm, 50 Watt, noninductive resistor stack to ground. This differs from the non-F model which has a bandswitched input circuit and variable capacitor tuned via the front panel.

The pi-design output matching network consists of three coils, a 250 pF tuning and two parallel-connected 520 pF loading capacitors. Extra loading capacitance is included in the 80 meter position. The 10 meter tank coil is made from 1/4 inch silver plated tubing while the 15/20 meter and 40/80 meter coils are perhaps #10 and #14 gauge wire, respectively. Neutralization is not required due to the 4CX300A design and the resistive input circuit.

A minor complaint with the amplifier's design is that its self-contained power supply will not operate from 220 Volts. However, the 500 mA high voltage transformer (an ET-348) is massive for an amplifier designed with SSB in mind. Its center-tapped secondary feeds a pair of 866AX full wave rectifiers that are followed by a 4-20H swinging choke input filter that utilizes a 10uF oil-filled capacitor. In lieu of the originally specified mercury vapor rectifiers, 3B28s were installed in my amplifier.

Two windings of a second transformer (an ET-314B) provide 6.3V and 2.5V for the filaments. Eldico engineers were either unaware or they merely

ignored the fact that the 4CX300A specifies a filament supply of 6.0V, not 6.3V. A third winding and its associated selenium rectifier and RC filter create -155 Volts that feeds the top of a 5K ohm, 25 Watt bias setting potentiometer. This transformer in my amplifier has been sloppily replaced by three transformers; one of top of the chassis and two on the bottom, and a quartet of 1N1084 diodes sit in place of the selenium rectifier.

Screen voltage for the finals and plate voltage for the oscilloscope are derived from a series of wirewound dropping resistors fed by the HV. Two OA2 and one OB2 gas regulator tubes stabilize the screen voltage at 300 (tune) and 405 (operate). The oscilloscope also uses some of the regulated 300V.

Horizontal deflection for the ICP1 oscilloscope comes from a 6AU6 whose input is driven by one side of a 6AL5 that rectifies a portion of the input energy. The other side of the dual diode creates a DC signal for intensity modulation of the scope. Vertical deflection comes from a gimmick capacitor connected to the final tank coil.

A 117VAC bias relay that is energized via the rear panel terminal strip applies either operating bias (-55V) or cutoff bias (-155V) to the finals. A DC relay in the plate current return path can be energized by an adjustable level of plate current (actually it is cathode current). When this happens, 117VAC is applied to a second relay that is wired to latch itself on until the overload switch is opened or the plate switch is deactivated.

Restoration

Other than cleaning, lubricating and refastening the dangling plate voltage relay whose mounting bolts had backed out during transit, the only obviously needed repair was to separate and burnish a set of contacts that were partially welded together on the once loose relay. Why the contacts were in this state became obvious when I applied power and activated the HV. The relay started 'oscillating'. Assuming the problem was of electrical nature, I reviewed the schematic and determined, after discovering a drawing error, that the oscillation was due to contact adjustment. The heavy duty DPST contacts were closing before the relay clapper was close enough to the pole to allow it to complete its travel when the AC voltage to the coil dropped momentarily due to the surge current involved in establishing a field in the plate transformer and / or charging the 10 uF filter capacitor. By merely spreading the gap between the contacts slightly the oscillation ceased.

Modifications

In spite of the well known fact that most tetrodes with oxide coated cathodes can exhibit negative screen current, Eldico elected to ignore Eimac's recommended inclusion of a screen current bleeder resistor. This resistor prevents the screen voltage from soaring should negative screen current exceed the regulation ability of the screen voltage source. In accordance with the 4CX300A data sheet and Bill Orr's Amateur Service Newsletter, AS-13, I planned to add a 20K wirewound however, as I was troubleshooting the plate relay problem, I discovered a previous owner had already done so. While the current through this resistor reduces the current through the VR tubes proportionally, thus prolonging their lives, it also passes through the screen current meter, causing it to read artificially high by 20 mA during operation.

Uncomfortable with the arcing between the series connected DPST contacts of the plate relay, I chose to rewire to them in parallel and add an 11 Amp varistor (Mouser C11) in series with the plate transformer primary. These modifications reduced the arcing to a reasonable level.

Two factory punched holes in an aluminum panel directly above the blower

continued on next page

The author's vintage SSB station

allow access to the bearing lubrication points. In order to reach these holes, a second panel covering the large wirewound resistor array must be removed. Through the years multiple removals and reinstallations of this panel scraped away the anodizing on an adjacent vertical panel. No doubt tired of this process, a previous owner drilled two additional matching holes in this upper panel which allow lubrication of the motor bearings with a long, thin tube. Perhaps the ease of lubrication afforded by these extra holes is why the blower in my amplifier is still relatively quiet to this day.

Operation

With a dummy load connected and the bias set to allow 200 mA of idle current, I connected an SSB-100F and attempted the recommended amplifier tune-up procedure on 80 meters. After resonating the plate tank in the tune position, the procedures calls for increasing the drive until the screen current is between 15 and 20 mA. With the added 20 mA through the screen bleeder resistor this implies a screen meter current of 35 to 40 mA, which is off the scale. After establishing a feel for how exciter plate current changes affected the amplifier screen current, I merely brought the drive to the point that the screen current meter was at full scale and then increased the drive by an amount I thought would establish approximately correct screen current. Then I went through the multistep process of increasing the loading until the screen current dropped to about 15 mA (-10 to 0 mA plus 20 mA) and re-resonating the plate. When the plate current reached the manual specified 500 mA the screen current was about 25 mA, which is in the range specified in the manual (0 to +10 plus the fixed 20 mA of bleeder current).

Using this method, my Waters Dummy Load/Wattmeter registered an even 600 watts. If we assume the HV was 2500 Volts (I didn't bother to measure it), the amplifier's efficiency is about 48%. My less-than-scientific method of establishing drive level and loading appeared to work for, when I added modulation, the oscilloscope revealed a perfect trapezoid. Additionally, when I moved the Waters to the output of the SSB-100F, the meter revealed exactly 30 Watts, which is the maximum drive level specified in the manual.

Subsequent tune-up on the higher frequency bands, including 10 meters, produced similar results, which is a testimony to the 4CX300A finals and the robust tank circuit. Unlike many amplifiers, tune-up on the higher frequencies is smooth and easy due to the 5:1 reduction drives on the plate tuning and loading controls.

With two Dow coax relays that came

with my SSB-1000F and the switched 117 VAC sources available from the amplifier and the exciter, amplifier bypassing and quiet T/R switching was easily implemented.

Conclusion

Considering the stylish SSB-1000F is a dream to work on, a breeze to use, comfortably quiet and provides reasonable power output with readily available tubes, I highly recommend it. Indeed, finding one might prove difficult but, for me, the chase is half the fun. As I would like to better understand the production volume, I would appreciate serial number feedback from any owners. While I cringe at the thought of one of these uncommon amplifiers being a parts unit, I would very much like to find an original T2 (ET-314B) and/or at least identify the transformer's manufacturer. Last, I would like to thank those SSB-1000F owners (you know who you are) who provided information in support of this article. **ER**

Crystal Marker from page 12

vidual crystal. There will be "accumulating error" which the builder may want to consider to increase the accuracy of the tester. For instance a 3.500 fundamental may actually read 3.501. In this case its useful harmonies will be 7.002, 14.004, 21.006, and 28.008.

The completed unit is useful when calibrating a receiver. Granted it isn't the final answer with its limited marker points but will get the receiver calibrated. It has other uses around the shack like a quick in-band frequency check. Having battery power makes for less hassle especially if used in a mobile application. With the whip fully extended a good S9 signal should be available with the unit sitting next to the receiver. **ER**

Product Review from page 18

operating high power into highly mismatched impedances may generate dangerous RF voltages on the line, creating high voltage arc-over, as we so often see in antenna tuners.

The TM-1 is constructed by Ron Hankins, KK4PK. As you have probably seen in my other reviews of Ron's products, I am a big fan of his rugged build quality. This unit is no exception. There are three SO-239 connectors on the rear of the unit: Tuner, Dummy Load, and Transmitter. No power is required.

So why haven't we always tuned up this way? I can't tell you. But maybe by the time I discover why California doesn't build power plants I'll have the answer to this question. I can tell you tuning will always be done this way in my shack in the future!

For more details about how this device works, see The Antenna Null Meter, Electric Radio Magazine, April 1994 (ER#60, page 30-33). The TM-1 is available through the Electric Radio Store for $49.95 plus $4.50 S&H.

TUBE COLLECTORS GROUP FORMED: The new tube collectors association is now in operation. This is a non-profit, non-commercial organization of collectors & history enthusiasts focusing on all phases & vintages of tube design. The founding president of the group is Al Jones, W1ITX, who is known for his award winning tube collection. For more details & complimentary copy of the association's bulletin contact Al Jones, CA, (707) 464-6470, Ludwell Sibley, OR, (541) 855-5207, or mail request to POB 1181, Medford, OR 97501.

Gene Tincher, K5NYT, Silent Key from page 2

with religion or politics on the air; he was predictably reticent about transgressing our traditions that safeguard the airwaves from arguments about matters of faith or political belief. Gene could carry on a fine QSO on the merits of using low level AM exciters and linear amplifiers vs. high level modulated transmitters and then move immediately into regaling me with the current goings-on in Tulsa (his home and my hometown). Gene was willing to hang in there with me and others who he figured out were trying their best to learn about radios that glow in the dark; he was a faithful friend that helped me pass many late night hours on the road in HF QSOs while I was mobile traveling from place to place on business trips.

Gene was like many of the Greatest Generation that survived the Depression and won WW II as he rarely spoke of his military years. Yet, Gene was in the Army and served in Europe near the end of WW II; only after his passing did I learn that Gene was a radio instructor and even participated in operating the public address facilities for the Nuremburg War Crimes Trials. Gene moved to Tulsa in the late 50's and set up his own radio/TV repair business, and then entered the broadcasting business in 1969 as a studio engineer for KTUL-TV. After a tour with KTUL-TV, Gene worked for a couple years for the OETA (PBS) station KOED-TV in Tulsa, and then returned to KTUL in 1981 where he worked until his retirement in 1993. Gene was well respected by his colleagues, and they established a web page in his honor on a Tulsa broadcasting history website (http://tulsatv.tripod.com/tincher.html) after they learned of his passing.

Gene loved amateur radio and AM in particular to the end. We maintained regular schedules, and I had my last QSO with him on December 23rd. It was pleasant as always, and we anticipated visiting again before the new year. However, Gene fell ill in the intervening days and became a Silent Key on January 3rd. It still seems strange that weekend nights on 3890 don't include hearing that distinctive friendly voice from Tulsa, but in many ways he yet will be with his AM friends as the years go by.

Thank you, Gene for your friendship and help. Good night from the Radio Ranch... Kilo Five November Yankee Tango from W5NBC and the group...73 **ER**

Super Pro SP10X from page 15

1 year -1935. The SP10 and the SP10X were made 1 year -1936. These were the two years that the P/P42's were used in the output. Starting in 1937 they used 6F6's in the output. In one of the QSTs from 1937, there is an ad for the SP. It mentions that a "SuperPro" bulletin is available as well as a "SuperPro" Console bulletin. If anyone out there happens to have one of these bulletins, particularly the Console bulletin, I would be interested in getting a copy of it.

In conclusion, this is a fine receiver and a unique product from a great company. Had it not been for the kindness and generosity of KB4YST, I would not be its proud owner. **ER**

How to Repair a Receiver from page 33

screwdrivers that may be useful especially if there happens to be B+ on any of the capacitor screws that you will be adjusting. My experience with the plastic screwdrivers is that they are too flimsy to adjust most capacitors, so I just wrap the shank of a metal screwdriver near the tip with plastic electrical tape so that it won't short the capacitor to a transformer shell ground. **ER**

Ed. Part 3 next month and when the series is completed the author will respond to the comments we've received.

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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, others. Also some military, test equipment, VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

FOR SALE: 30 yr accumulation of radios & parts (xcvrs, rcvrs, amps, pwr splys). Call w/wants. Donald Baird, WB7VNC, AZ, (602) 953-0279.

FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covell, WA8SAJ, (440)951-6406 AFTER 4 PM, wa8saj@ncweb.com

FOR SALE: Hallicrafters HA-2 & HA-6 w/pwr sply, cables, manuals, exc - $475. **WANTED:** Yaesu FI-2100B & FV-101B. Robert Braza, W1RMB, MA, (508) 222-5553.

FOR SALE: New Collins winged lapel pin, still have meatball version, either type - $5.95 + 75¢ s/h. Will be available in Dayton, space 2952. W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029. (760) 747-8710

FOR SALE: Several 23 & 40 channel mobile CB radios not checked - $5/ea. Noonan, SC, (843) 726-5762.

MESSAGE: Radio Yard Sale. Seventh Annual Spring Blowout. Vintage Radio & communication gear, old test equip, tubes, parts, literature (including Ryders & Sams) and a whole lot more. May 19 & 20, 9AM to 5PM. Rain date May 26 & 27. Jim Koehler, 242 Guy Lombardo Ave., Freeport, NY 11520. (516) 623-0035

FOR SALE: Connectors, meters, relays, tubes, crystals, hardware, misc parts, etc., list - $1. Joe Orgnero, VE7LBI, 1349 Leask Rd., Nanaimo, BC V9X 1P8 Canada joseph@pacificcoast.net

FOR SALE: Solid state amplifier, Avantek, 10 to 400 MHz, need 12 VDC, milled aluminum case. L. Gardner, 458 Two Mile Creek Rd., Tanawanda, NY 14150. radiolen@aol.com

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

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

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FOR SALE: Remote VFO 820 for a Kenwood TS-820 - $79 + shpg. Henry Mohr, W3NCX, 1005 W. Wyoming St., Allentown, PA 18103

FOR SALE: Tubes, NIB or tested good, priced low. SASE for list. WA7HDL, 167 Hwy 93S, Salmon, ID 83467

WANTED: Noise silencer (immunizer) and crystals holder/switch for Hammarlund HQ-170/180X receivers. Ed, N5BEW, (817) 222-5355, ecuevas@juno.com

WANTED: Working crystal filter unit for 75A1. Will also accept an entire 75A1 parts unit with or without cabinet. Steve Aug, W3DEF, 8005 Ellingson Dr., Chevy Chase., Md. 20815, (301) 588-2262, mccrk@aol.com

WANTED: Book, "Index to Surplus" by Roy Pafenberg W4WKM, 1945 to 1961. Chris Bisaillion VE3CBK, 1324 Old Carp Road, Kanata, Ontario, Canada, K2K 1X7, whiskey1@sympatico.ca

WANTED: Info on tuning units TU-55 (18 to 24 Mc) and TU-56 (24 to 30 Mc) for HT-4H/BC-610G xmtr. Steve Davis, KD2NX, 11 Vineyard Ave., Middletown, NJ 07748. (732) 495-3241, kd2nx@worldnet.att.net

WANTED: HR0 power supply 697, any condition. Ivan, WA6SWA, POB 248, Reno, NV 89504. (775) 329-7738, idh@cs.unr.edu

WANTED: Globe King 500/A/B/C xmtr. Will pick up anywhere near Chicago. Jim Jorgensen, K9RL, 1709 Oxnard, Downers Grove, IL 60516. (630) 852-4704. JandRJor@interaccess.com

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WANTED: SCR-522 channel selector, controler and cable with connector. Yokohama WW-2 Japanese Military Radio Museum, Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama 246 Japan. Fax 011-8145-301-8069, takado@carrot.ocn.ne.jp

WANTED: Old Callbooks, especially those covering the years before 1930. Alan, W3BV, PA, (215) 295-0943 or W3BV@arrl.net

WANTED: Swan equipment: sevrs, meters, etc. Buy or have trade items. Working or not. Butch, WA8X, (517) 275-3420 PM's EST, jpeitsch@voyager.net

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FOR TRADE: Two good RCA 833A's for one Taylor 833A; also looking for Taylor 204A, 813, 866B. John H. Walker Jr., 13406 W. 128th Terr., Overland Park, KS 66213. (913) 782-6455, johnh.walker@honeywell.com

FOR SALE: Rare Hallicrafters FPM-200 xcvr - BO; Collins 30K-4 xmtr - BO. PU SW Ohio. Bill, WA8LXJ, OH, (937) 544-2812

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FOR SALE: 75A-4, S/N 1632, 4:1, 1 filter - $700; HRO 60R, 9 coils - $450. Both good condx & + shpg. Bob Zimmer, 205 Brigham Hill Rd., Milton, VT 05468. (802) 879-7235, zimmerb@biotek.com

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FOR SALE: 2001 COLLINS CALENDAR now shipping, 15-months, all color! $14.95 postpaid USA and Canada. Trinity Graphics, 5402 1/2 Morningside, Dallas, TX 75206. www.kk5im.com

FOR SALE/TRADE: Misc. parts, tubes, for tube gear. Sandy Blaize W5TVW, 40460 Edgar Traylor Rd., Hammond, LA 70403. ebp66-55.com

FOR SALE: General Radio, output pwr meter mod 583-A #69 - $50. Bernie Samek, 113 Old Palmer Rd., Brimfield, MA 01010. (413) 245-7174, Fx 245-0441

FOR SALE: Thordarson KW chokes, NOS, orig wooden boxes; 6404 swinger, 10.4hy, 380 ma, 93 ohms; 6407 smoother, 20.0hy, 380 ma, 160 ohms - reasonable offer on both. G. Stevens, POB 704, Longmont, CO 80502. (303) 776-9036, vintage1@prodigy.net

FOR SALE: Hickok 610A FM TV alignment signal generator; Hickok 690 TV RF Marker xtal controlled, both mint; wood cabinet for RCA 128 cathedral. + UPS. Call for details. Onerio Sabetto, N8PIU, 1717 Burgess Rd., Cleveland, OH 44112. (216) 481-1036

FOR SALE: (2) Rhode & Schwarz HF xcvrs 150W 1990 vintage, 19" rack mount mod XK854C-1. Tom Berry, W5LTR, 1617 W. Highland, Chicago, IL 60660. (773) 262-5360 or 262-0016

FOR SALE: Orban 9100A AM - Off Timed audio processor, like new, perfect condx in every way. This processor enables you to achive the highest level of audio quality on AM. If you are serious about AM you need a Off Timed - $2800. I will consider a comparable trade. Tom, W2KBW, NY, (716) 741-9574, 10 AM to 10 PM.

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

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

FOR SALE: Books, all electronics related; 300 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. wotok@email.msn.com

FOR SALE: Build your own "Midget" bug replication by K4YQX, ca 1918, featured by K4TWJ in CQ Magazine, May, '98. 10 detailed blueprints. FAX (507) 345-8626 or e-mail <bugs@mnic.net>

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

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

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

FOR SALE: AIWA model AR141 portable rxcr, FM, AM, SW bands, high sensitive 14 transistor circuit - $30 + $10 shpg. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405. (541) 345-2169

FOR SALE: Viking II w/122 VFO & ant tuner; Drake TR4 & AC4; SB200 & xtra tubes; HW101; HW100. W7RBF, AZ, (602) 864-9987.

FOR SALE: Interference Measuring Set NM-20B by Stoddart Electro Systems, w/90780-2 AC pwr sply & pwr cables, no antennas or manual, exc condx - $120 + shpg; similar set by Singer as made for Air Force, w/manual, pwr cord & extra tuning unit but without antennas - $130 + shpg. US Navy RBM rcvr, covers HF from 1.5 to 20 MC exc unmodified condx, as seen in ER # 127, pg 29 - $95 + shpg. Bob Simpson, NØNTC, 9570 Haney Dr., Houston, MO 65483. n0ntc@ttrain.missouri.org

FOR SALE/TRADE: QST's; ER's, & Scope OS-8C / U. Les Mathews, WB2UQU, 2405 Thistledown Ct., Sewell, NJ 08080. (856) 218-8838

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, 133 Carlbody Rd., Carlton, GA 30116. andy@wa4kcy.com

WANTED: SW3 #33A and #35 coils. I will trade my extra coils SW3 coils. Hank Bredehorst, 2440 Adrian St., Newbury Park, CA 91320. (805) 498-8907

WANTED: Parts for a TMC GPT-750 xmtr. I need the AM modulator deck and other parts to restore this unit. John, KF2JQ (716) 873-0524 jpruss@acsu.buffalo.edu

WANTED: Long wire ants AT101, AT102, GRC-9, DY88/105, PP327/GRC9; counterpoise CP12 & 13 GRC9; BC348 pwr conn PLQ102/103. KA1ZQR, 348 N. Main St., Stonington, CT 06378.

WANTED: Globe King 500 B/C; Viking Valiant I/II; Viking 500; Heathkit Mohawk. Frank, (916) 635-4994, frankdellechaie@sprintmail.com

WANTED: National SW-3 model I, version 3. Uses 32-32 30 tubes. Dean Showalter, W5PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: Hallicrafters SX73, Scott special communications rcvr. EA4JL, phone Kurt Keller, CT, (203) 431-6850, k2112@earthlink.net

WANTED: Collins 32V & Collins 75A series; Globe Scout, National SW54. KB0W, CA, (916) 635-4994. frankdellechaie@sprintmail.com

WANTED: Millen 90800 exciter/xmtr w/or without coils. Ted Bracco, W0WNZW, IL, (217) 857-6404 x306. braccot@hotmail.com

WANTED: Amplifier AM3007 for T-827/FR 1059B AN/WRC-1 set. Don, WA2ELD, KY, (859) 254-1886 or Ldrooke@infi.net

WANTED: Viking Valiant, working or not; plate relay coil for B&W 5100B. Sam, k4ndy@alltel.net

WANTED: Volumax audio limiter, 4000 series by CBS laboratories in operating condx. Jon Gray, W5NXS, 3004 LaSalle Dr., Dothen, AL 36303. (334) 792-6527

WANTED: Hookup data for Para Dynamis frequency counter model PDC 256. Hoyt Ray, 2388 Hwy 36E., Milner, GA 30257.

WANTED: Rhode and Schwarz model EK07 rcvr. Harry Weber, 4845 W. 107th St., Oak Lawn, IL 60453.

WANTED: Radio News, Electron 1940 to '50. Alan Mark, POB 372, Pembroke, MA 02359

WANTED: Sonar Fourbander SSB schematic (similar 1963 Singlebanders). Jim Novak, WA9FIH, 2335 S 2nd Ave., N Riverside, IL 60546.

WANTED: Spkr for RAS/HRO-1-5, table top or rack type, RAO spkr, ARC-5 controls- C-26, C-29, C-48, C-38, C-30, C-24, J-22; new/used tubes: 807, 2E22, 7360; coils: B&W touret output, GF-11 TX coils; GRC-9 radio & all acces"; manuals: SCR-274N, TCS, RAO. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. msg" (707) 523-9122, wb6fzh@arrl.net

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

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

WANTED: I wish to correspond with owners of National FB7/FBXA/ACS coil sets. Jim, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511. j.c.clifford@juno.com

WANTED: British, Commonwealth W.S. 62, W.S. 22, W.S. 18, W.S. 48, W.S. 46. George Rancourt, K1ANX, MA, (413) 527-4304

WANTED: PreWW-II Iowa QSL cards; materials of 1920s Iowa Radio Relay League. Will trade or purchase. Bill Smith, W5USM, w5usm@aol.com

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

WANTED: Any info on the Eldico company and the Eldico SSB Twins for future article. Joel Thurtell, finder@radiofinder.com

WANTED: 1930s Army Navy control boxes, pwr splies, dynamotors – any wierd types. William Donzelli, 15 MacArthur Dr., Carmel, NY, 10512. (845) 225-2547, aw2886@osfn.org

WANTED: Back issues of QRP or RADIO AGE magazines. Gary Fender, W5UUO, 450 Cunningham Rd., Celina, TN, 38551. (931) 243-5323, gdfender@multipro.com

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

WANTED: Crystals w/80 meter CW band fundamental, pin spacing of 1/2" & pin diameter of 1/8"; also sockets. Douglas Reeves, WB6RKY, POB 278135, Sacramento, CA 95827. wb6rky@hotmail.com

WANTED: Looking for the plug in AM modulator for the E.F Johnson Adventurer. John, N4JZEU, johne@tds.net

WANTED: Plate xfmr for Eldico SSB-1000F. Robynn K7DFW, (503) 728-4157, k7dfw@clatskanie.com

WANTED: WW II Military Television

Looking for the following for a restoration project: round & square cameras, #AXT, CRV, ATH; transmitters, #AXT-6, 7, ART-26, 28; dynamotor CRV-21; test set, I-232, 231, 206, TS-93, CRV-60058.

Maurice Schechter, 590 Willis Ave., Willis Park, NY 11596
516-294-4416, mauricsch@cs.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: Military radio TM's, origs & reprints. New list. Send $1 & address label to Robert Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043-2410. (713) 467-5614.

FOR SALE: I repair all tube type amplifiers. Licensed in 1955. Steve Gross, N4PZ-W9OJL IL, (815) 734-4255.

FOR SALE: 51J-4 filter replacements, direct plugin—6.0 kc Collins mech. filter, 500 cycle xtal lattice - $215 each; R-390A 16 kHz flat phase filter, for Hi-Fi AM - $245. Chuck Felton, KD0ZS, WY, (307) 322-5858, feltoned@colley.com

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

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

FOR SALE: Over 40 electronics magazines, mostly 1960's & '80's - 99¢ ea + shpg; also available: electronics books, parts, etc. List for stamp. Bob Eckert, 133 E. 7th St., Clifton, NJ 07011.

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

NOTICE: A website dedicated to traditional ham radio & classical radio resources. Visit Ham Radio USA, http://www.hamradiousa.com

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

FOR SALE: 75A3 for parts, SX-115 for parts, CE-100V - $300 each. No Ship. Harry, WA6IUR, (626) 355-6280, henmark@aol.com

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

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FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KD0ZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. (307) 322-5858, feltoned@colley.com

FOR SALE: I am making aluminum plate and grid connectors for T series tubes. If interested contact Alan Price at fixr75268@cs.com

FOR SALE: Drake, Collins, Heath, ham equipment & testers. Garage full, call your needs. Van Sias, K7VS, Medford, OR, (541) 779-4723.

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

Announcement: Six Meter Club of Chicago, Sunday June 10, DuPage Fairgrounds, 2015 Manchester, Wheaton IL; indoor/outdoor Flea market also featuring vintage/antique radio gear. Overnight RV parking available. Info, (708) 442-4961, 24 hours or http://cyberconnect.com/orion/hamfest.htm

FOR SALE/TRADE: National xcvr manuals NCX-3, NCX-5, "200", NCX-500, NC-1000. Bernard, N4AQ, POB 690098, Orlando, FL 32869. (407) 351-5536.

FOR SALE: Thordarson KW chokes, NOS, orig wooden boxes: 6404 swinger, 10.4hy, 380ma, 93ohms; 6407 smoother, 20.0hy, 380ma, 160ohms. Reasonable offer on both. G. Stevens, POB 704, Longmont, CO 80502. (303)776-9036, vintage1@prodigy.net

FOR SALE: Ten-Tec 2kw Tuner Model 8238 in exc condx - $300 plus shpg. Lee, K7LTB, (775) 575-6705, ltb@birdhouse.fernley.nv.nv

WANTED: Stancor/Chicago PCC200, PCO/PS0150, RC8150; Triad A-9-J, A-10-J, A-11-J, A-12-J **FOR SALE:** Books, send SASE. Richard Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

WANTED: Small 1" panel meters, especially DC ammeters. Send price info. Chris Cross, POB 94, McConnell, IL 61050

WANTED: RBB/RBC rcvrs, pwr splys, cables & RAK/RAL equip. Andy Miller, KD6TKX, CA, (831) 484-2389, amillertkx@aol.com

WANTED: Mics: Astatic JT 30/40; UT-48; Shure CR90/81/41; 707A; Turner VT-73; CD/BD; parts for same. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. tomsmics@flexcomp.com

WANTED: Desperate for museum display: lge AC cooled or water cooled xmtg tubes. Certain types including; RCA, 898, 862, 893A or R & 5831s; other manufacturers such as Federal Telephone & Radio F-124R. Name your price. Tommy Bolack, 3901 Bloomfield Hwy, Farmington, NM 87401. (505) 325-4275

WANTED: R-390A rcvrs, parts rigs or restorable, will restore yours at reasonable prices. Walter Wilson, KK4DF, (706) 733-8323, wewilson@knology.net, www.knology.net/~wewilson

WANTED: Front end coil assembly for BC-455, 6-9.1 mc command rcvr. Norbert C. Wokash, WA0KJE, 3312 W. Bijou, Colorado Springs, CO 80904. (719) 633-5661

WANTED: Hallicrafters S-29 Sky Traveler rcvr without modifications, magazine reviews & orig manual. Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 pm

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

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. daniele4116@aol.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: RCA 140, 141, AVR5A. GE K80, K80X, K85. Any condx. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. treherne@erols.com

WANTED: Seeking unbuilt Heathkits, Knightkits. Gene Peroni, POB 7164, St. Davids, PA 19087. (610) 293-2421

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: Drake 1A rcvr, 399C1 Collins VFO; JRC 505 twins. K5YY, AR, (501) 756-5010. k5yy@arrl.net

WANTED: Collins 310B3, basket case OK - welcomed; & Chicago 500W CMS-2, high-level modulation xfmr; Taylor T21. Jerry, W8EGD, CO, (303) 979-2323.

WANTED: Clean Mackay 3010C & Kenwood R599D w/all filters & manual. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Electronics, radio (cables for TCS), nav, SO radar for WW II PT boat. Roger, PA, (610) 998-0380

WANTED: Collins 70K-2 PTOs working or not; IN82A diodes; Bretting 14/14AX manual. Clark, W9IIT, KS, (785) 286-2132

WANTED: National NTE. I love National. Sylvia, N1VI, 33 Lawton Foster Rd., Hopkinton, RI 02833. (401) 377-4912

WANTED: Collins 30K1 xmtr; also need orig manuals & literature for 75A1, 32V1, 30K1. Paul Kluwe, W8ZO, POB 84, Manchester, MI 48158. (734) 428-2000

WANTED: Dual potentiometer, 10 meg & 5 meg w/concentric shafts (Hallicrafters 025-201807). Hiltz Liles, W5AQ, 1833 Elaine St., Jackson, MS 39204.

WANTED: HP400 meter; Heath IM-11 factory wired version or HP410B; must have 230 VAC. Wies, Curiesraat 49, NL 7555 NA Hengelo, Holland. Fax: +31.74.250 5523

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RCA HB-3 Tube Handbook - $ 75.
RCA Radiotron Handbook, 4th Edition - $ 62
Radio Boys on CD-ROM - $ 39.
80 years of QST - $ 39.95 per set (generally 5 or 10 year set).
All 11 volumes - special package price - $ 373.
Collins Radios Technical CD-ROM series. Vol. 1 - Collins Receivers; Vol. 2 - Collins Transmitters & Amplifiers; Vol. 3 - Collins Transceivers; Vol. 4 - Accessories, Power Supplies, VFO's, etc. Each CD - $ 79, Complete Set - $ 279

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970-564-9185, er@frontier.net

WANTED: National HRO black wrinkle spkrs, oak coil boxes, coils; Western Electric horns, spkrs, amps, mics. Barry Nadel, POB 29303, San Francisco, CA 94129. bnadel@ccnet.com

WANTED: Searching for RME CT-100 or 389 xmtrs and info about them. David Edsall, WITDD, 156 Sunset Ave., Amherst, MA 01002. (413) 549-0349, dedsall@crocker.com

WANTED: Mohican; SB-200; SB-220; SB-100; SB-101; SB-102; Knightkit Band Spanner II; Heath GW-12A; GW22A; GW42. Debbie, AR, (870) 857-3366.

WANTED: New or used unmodified BC459A, BC696, TB/ARC/5, TP9/ARC/5, CBY52232. Louis Lytch, K2DET, 117-33 230th St., Cambria Heights, Jamaica, NY 11411-1806. (718) 528-5065

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

WANTED: Collecting military electronics including radio, radar, RDF and test, manuals & literature. William Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6031

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: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, (631) 360-9011, george2@aol.com

WANTED: 500W Polypedence Mod xtmr, Stancor 3098 or 3099 or similar. Ronnie, W5SUM, 1855 Shady Ln., Shreveport, LA 71118. (318) 688-1389

WANTED: B & W 3026 Air-Dux coil stock (2" dia. 8 t.p.i., 14 gage wire); Collins. WA0AKG (402) 464-8682 email: <pocoty@radiks.net>

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

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: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1; 51S-1; 75S-3A, C 32S-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: 80 & 40 meter xtals in FT243 holders. Howard Weinstein, K3HW, 4041 Ridge Ave. Apt 4-405, Philadelphia, PA 19129. (215) 843-1180. k3hw@arrl.net

WANTED: Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CFX, 23800 Via Irana, Valencia, CA 91355. (661) 259-2011. FAX (661) 259-3830

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

WANTED: WW II military remote control rcvrs #ARW/CRW, xmtrs, dynamotors PE186-PE126, joy sticks, Gyroscopes for the GB, Azon glide bombs. Maurice Schechter, NY, (516) 294-4416 or mauricesch@cs.com

WANTED: Manuals or copies for Heath freq counters model SM-104 & IB-1101. John T. Myers, WA8MQM, POB 485, Jenison, MI 49429

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 399C-1; 62S-1; KWM-1; 302C-3; 51S-1; 75S-3C; 32S-3A. I buy any Collins equip. Leo, KJ6HI, CA. Ph/Fx (310) 670-6969. radioleo@earthlink.net

WANTED: QSL cards from old/pre WW II Ham DX countries; old regen kits. Hajime Suzuki, Nishikuniyoshi 1644-24, Ichihara-Shi, Chiba-Ken, 290-0231 Japan

FOR SALE: RIT for KWM-2 and 5-Line. No modifications for KWM-2. $59.95 tested/42.95 for kit. SASE for details and order info. John Webb, W1ETC, Box 747, Amherst, NH 03031

FOR SALE: Military Radios, etc. E-mail N1UDI@ATT.NET for a List or SASE. Ronnie Parker, 1357 Bridgeport, CT 06601

FOR SALE/TRADE: Military: radio xcvrs R19C/RCI, RBLA; BC306 antenna tuning unit, 5 tuning units; Collins 51S1 fixup or parts; telegraph apparatus company key; new/used xmt'g tubes - $50 all; German mic, headphones. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402. (319) 393-8075

FOR SALE: Crystal calibrator, model 111B by Measurements Corp - $25; frequeter VHF, BC906D - $25; Heath capaci-tester model CT-1 - $10; Realistic, tube type FM only, high fidelity tuner - $10; antenna relay unit BC442A w/50 pF vacuum cap - $25. All + shpg. J. Mucsak, 1549 Showcraft Rd., Penfield, NY 14526. jasdpm136@juno.com

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

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

FOR SALE: Homebrew AM/CW xmtr, 6146 final, w/pwr sply, 1950s design. New parts, precision machined case, photos available - $125. Van R. Field, W2OQI, 17 Inwood Rd., Center Moriches, NY 11934. (631) 878-1591, W2OQI@ARRL.NET

FOR SALE: —General Radio Oscillators—1021P2 with 1021P1 power supply—(3) 1218A's—1209B—1214A Modulator—1211B with 1201A power supply—(2) 1201B pwr splies—1216A IF amp—1217B pulse generator—1750A mechanical sweep drive—line stretchers, slotted line, trombone line, pads, mounts, and many other 874 components. Request list from pegrus@juno.com. Earl Russell, WR1Y, Groton MA 01450 (978) 448-5822

The Collins Video Library

The Collins KWM-2 Video 4 hours - $89.95. Highly detailed video on operation, rebuilding, alignment, troubleshooting and neutralizing of this classic! A must for anyone who owns and operates a KWM-2/2A. Printed documentation included.

The Collins 75S-3/32S-3 Video 3.5 hours - $74.95. An in depth examination of the most popular version of the S-Line. Operation, modification, alignment, neutralizing and more! Much of this information applies to all versions of the S-Line!

The Collins 30L-1 Video 1 hour - $39.95. A complete guide to the 30L-1 amplifier. Operation and safety, updates and a discussin of the 811A triode. Learn the secrets to greater performance.

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The Collins Amateur Radio Equipment Video Spotter's Guide 1 hour, 40 minutes - $24.95. Close to 90 individual pieces of Collins Radio equipment are shown in the video. Examples of some of the gear covered are: KW-1, KWS-1, 30K-1, 20V-3, 75A-4, KWM-2, S-Line, KWM-1, 30S-1, 30L-1, KWM-380 and much more!

The Collins KWS-1 Video 2 hours - $39.95. This video is the perfect companion to the 75A-4 video for owners of the "Gold Dust Twins"! Butch Schartau, KØBS, shows you how to operate, maintain and repair your KWS-1. Watch as Butch goes through the entire alignment and neutralization process, as well as showing you how to properly operate this famous transmitter.

The Collins 75A-4 Video 4 hours - $89.95. This video is four hours of information on how to repair, maintain and restore this classic receiver. Butch Schartau, KØBS, guides you through all aspects of keeping your own 75A-4 running like a top.

R-390A Video 7 hours - $109.95. Here it is! Long awaited by serious "boatanchor" enthusiasts! The ultimate receiver now has the ultimate video to go along with it. R-390A expert Chuck Rippel, WA4HHG, covers an absolutely incredible array of information in this "heavy duty" video. This video looks at operation, its modules, circuit description, front and rear panel details, complete mechanical and electrical alignment, PTOs, performance evaluation, modifications, troubleshooting and restoration. There is nothing like this video available today, at any price!

R-390A Addendum Video - $49.95. Another 3 hours and 40 minutes of R-390A information from Chuck Rippel, WA4HHG.

SP-600-JX Video 4 hours - $89.95. Chuck Rippel,WA4HHG, takes us through all aspects of the SP-600-JX—repairs, restoration and modifications. This video is a must for any newcomer attempting to work on the SP-600.

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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: RCA tube manuals, RC-15, RC-20, RC-25; ARRL Handbooks, 1965, 1968, 1972 & 1978. LSASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660, brett37298@aol.com

FOR SALE: Collins drum overlays: 75A-2, 3, 51J#. For 75A-4 & KWS-1, specify new/old - $8.50 ea. 2/$15 ppd. Correct colors. Charlie Talbott, K3ICH, 13192 Pinnacle Ln., Leesburg, VA 20176-6146. (540) 822-5643.

FOR SALE: Repro Nameplates, R-390A generic - $9; 51J-3 and 51J-4 exact replicas - $12. Tom Marcotte, N5OFF, 242 Chestnut Oak Dr., Mandeville, LA 70448. marcotte@iamerica.net

FOR SALE: Heath Nostalgia, 124 pg book contains history, pictures, many stories by longtime Heath employees. (See BOOKS inside back cover.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028.

FOR SALE: 2 Hallicrafters S-20R rcvrs. Both in great condx (cosmetically and electrically) - $50 ea. + shpg. Gerry, K4LVZ, K4LVZ@juno.com or (386) 673-0197.

FOR SALE: No charge manual copies, Viking 500, Globe Chief, Ten-tec 540, Tektronix Type Q and 115 spectrum analyzer plug ins. Fenton Wood, 4716 Stonebriar, College Station, TX 77845. milordwood@aol.com

FOR SALE: Collins 51J-4 in good (not collector "mint") condx, all filters, good dials - $625. EBen Deoviet, W6FDU, 933 Robin Ln., Campbell, CA 95008. (408) 374-9519, w6fdu@aol.com

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FOR SALE: QST binders: small $5 + $2 shpg; large $6 + $2 shpg. R.J. Eastwick, W2RJE, 400 N. Haddon Ave. Unit 109, Haddonfield, NJ 08033. (856)429-2477.

MESSAGE: Hallicrafter restorers note: Rub on decals are available from the DATAK Corp. Kam Mejadhon, manager will help you. 3660 Publishers Dr., Rockford, IL 61109. (800) 645-2262.

FOR SALE: T-Shirts 4 Color 807 Tube - $18.07 ppd. Priority Mail (CA-$19.43). S, M, L, XL (XXL-+$3). See ER #128 pg. 52. http://members.aol.com/tcsopr / mousepads, buttons, hats, etc. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. msg# (707) 523-9122. wb6fzh@arrl.net

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) 851-4585.

ELECTRIC RADIO STORE

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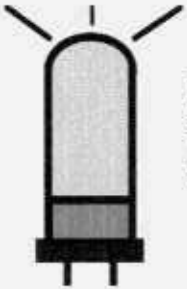

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