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ELECTRIC RADIO

celebrating a bygone era

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ELECTRIC RADIO

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

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

Regular contributors include:
Chuck Teeters (W4MEW), Jim Hanlon (W8KGI), Tom Marcellino (W3BYM), Bruce Vaughan (NR5Q), Bob Grinder (K7AK), Bill Feldman (N6PY), Dave Gordon-Smith (G3UUR), Dale Gagnon (KW1I), David Kuraner (K2DK), Larry Will (W3LW), Brian Harris (WA5UEK), John Hruza (KBØOKU), Hal Guretzky (K6DPZ)

Editor's Comments

A BPL Update

I had originally planned on an extensive update on Broadband Powerline (BPL) issues, but due to the limited space again this month I will only highlight of some of the more important news items.

There is a BPL system in Manassas, VA that has been a continuing problem and a source of controversy. In a news release from the Utilities Telecommunications Council (UTC), March 16, 2006, titled "Ham Radio Operators Zap Manassas BPL," it is clear that complaints to FCC are not being ignored, and BPL operators can be required to meet the guidelines. The text of the news release is as follows: "Ham radio Web sites this week spread the news that the Federal Communications Commission (FCC) has directed the City of Manassas, VA, and it's Broadband over Power Line (BPL) system operator Communications Technologies (COMTek) to conduct measurements of its BPL deployment. Results are due to the Commission within 30 days and will be used to ensure that the City's system complies with FCC Part 15 rules and to resolve any BPL interference issues. The directive was prompted by a complaint filed January 19, 2006 by an ARRL member, who stated that he could not hear over the interference caused by BPL operations on 40 meters (7.2 MHz) while driving through the city. COMTek operates the Manassas BPL system using Main.net equipment on frequencies between 4 MHz and 30 MHz. Responding to the January complaint, ComTek voluntarily adjusted nearly 600 BPL devices; the company concluded that there is no 'documented basis for further ham radio operator concerns' about the firm's system in the city." [Continued on page 6]

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Cover: Doug Stivison (NR1A) made a box to hold QSL cards. The inside has compartments to hold both overseas cards and normal US-size postcards. The box has been decoupaged with all kinds of images – mostly old QSL cards and radio images, but also old postcards, old postage stamps, and a host of other things to be nostalgic and visually interesting. The original treasures were not sacrificed to make the box, everything was done with reproductions from magazines and catalogs. It is another interesting nostalgic shack project that can be made with simple tools and requires no test equipment!

The Stancor 20P

By Jim Hanlon, W8KGI
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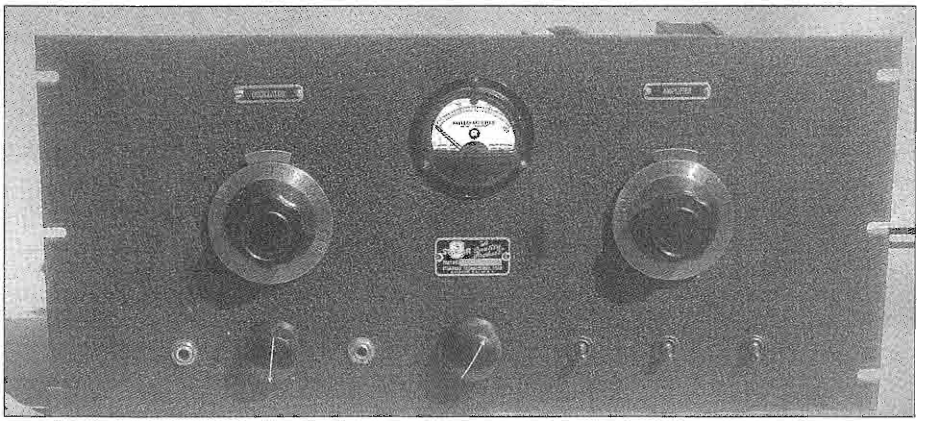
Thanks to the generosity of several good friends, I have recently been able to become acquainted with four late 1930s commercial transmitters and they provide a very interesting insight into the state of amateur and low-power commercial transmitter design of that era. My first encounter was with a Hallicrafters HT-6, written up in ER #196, September 2005. This article will describe the Stancor 20P. Two more articles to come will take up the Collins 32RA and the National NTX-30 and its companion NSM modulator.

Stancor, the Standard Transformer Corporation of Chicago, Illinois, was primarily a manufacturer of "heavy iron" components–transformers and chokes. In the later '30s up through the early '50s, they offered a line of transmitter kits that, of course, used their components. My friend Doc's 20P is one of the first generation of those transmitters, available from 1938 through 1940. Selling for $36.26, it was the second from the bottom in a family of four rigs that started with the 10P at $19.95 and also included the 60P for $44.80 and the 100 whose price I have not been able to find.

As described in its manual, "The Stancor 20P Transmitter comes in kit form and when assembled results in a complete phone and C.W. transmitter, including its AC power supply contained in a cabinet measuring 19" x 13" x 8-3/4" overall. The rated input is 20 watts at all frequencies although this can be increased to 30 watts if desired. The modulator delivers 10 watts of audio-frequency power which is sufficient to modulate the radio-frequency output of the transmitter 100 percent. The transmitter is capable of operation on any frequency from 1.6 to 60 Megacycles and is crystal controlled. Practically any type of antenna may be used.

"Frequency change can be accomplished in 30 seconds or less by means of two plug-in coils, and a plug-in crystal.

"During actual tests, the 20P performed very creditably on all the amateur fre-



The Stancor 20P front panel. On this transmitter, the left knob tunes the oscillator, and the right knob tunes the final amplifier.

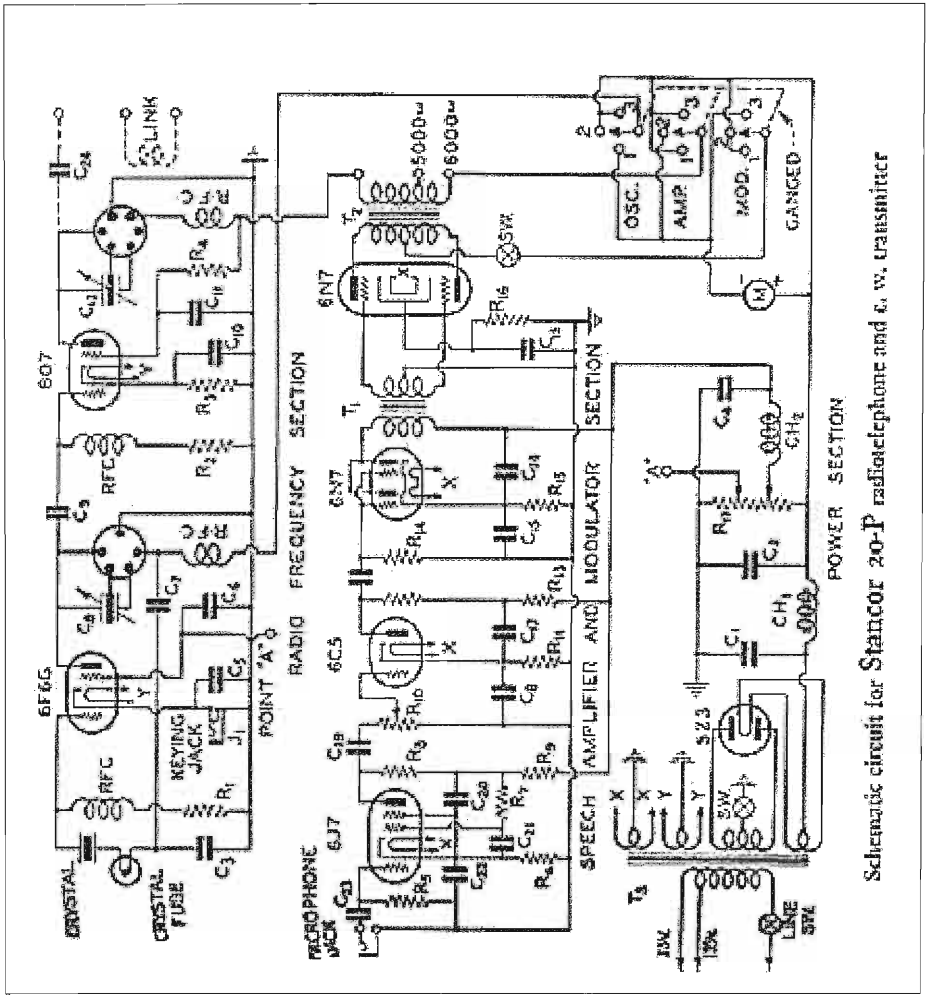


Figure 1: The Stancor 20P schematic diagram.

quencies from 1.75 to 60 Mc. Telegraph signals were clean and without 'chirps.' Phone modulation was excellent. Checking the frequency stability showed it to be practically perfect. When used as a phone transmitter, no frequency modulation was apparent."

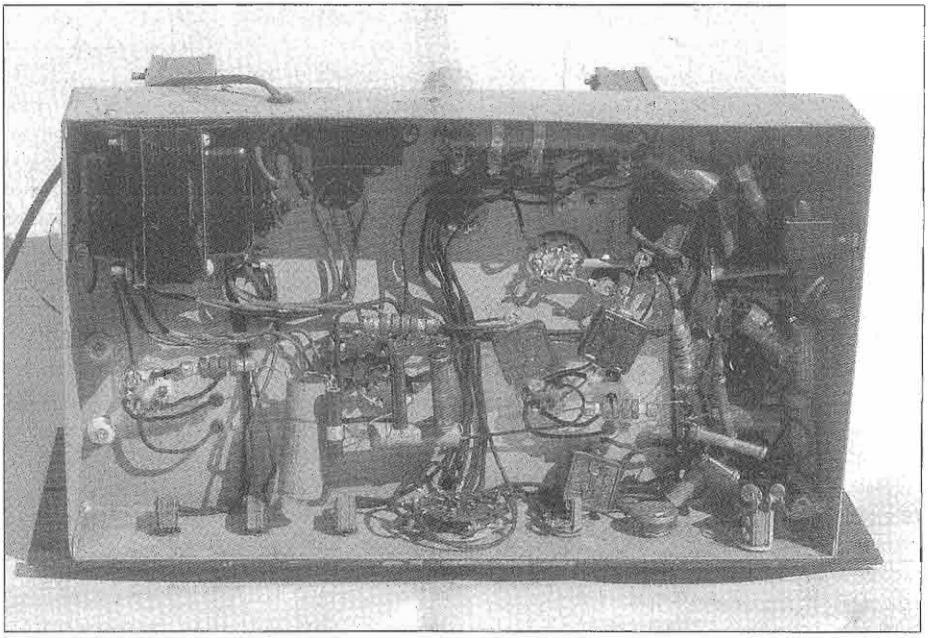
Figure 1 shows the 20P schematic. The RF section consists of a 6F6 crystal oscillator driving an 807 amplifier. The 6F6 oscillator uses a circuit, also shown in my 1940 Radio Handbook, which is supposed to generate output on the second and fourth harmonics of the crystal as well as on the fundamental. This particular oscillator, however, acted like a standard tetrode oscillator and would run only when its plate was tuned to the crystal frequency. The crystal would not oscillate at all when the tank was tuned to a crystal harmonic. I could perhaps have fussed with the feedback capacitors C7 and C3 in an attempt to get it running, but Doc only wants to use the rig on 80 and 40 and he has crystals for both bands, so I did not carry the matter further.

Here is a rear view of the Stancor 20P. The modulator is on the far right, the 6F6 oscillator and 807 amplifier go from right to left next to the panel, and the power supply is on the rear of the chassis.

The 807 amplifier is standard practice for its day. The 807 grid is capacity coupled to the oscillator plate tank. The 807 plate tank is a parallel-tuned circuit, link coupled to its load. A 1250-ohm cathode resistor provides enough protective bias for the 807 so that it doesn't draw excessive plate or screen current when the oscillator drive is keyed off. Under this condition, however, the 807 does tend either to put out some broadband hash or to oscillate on its own, depending on its tuning and loading. It is, however, well behaved and stable under drive. So, I recommended to Doc that he move the ground side of the 807 cathode resistor over to the key jack and key the final along with the oscillator. That's a perfectly satisfactory way of dealing with the 807's tendency to instability and much easier than trying to tame it with shielding or neutralization.

Doc's rig had become separated from its complement of plug-in coils somewhere along the way, but he was fortunate to be able to acquire a number of 5 and 6-pin coil forms from another mutual friend, Bill. The 20P manual has winding information, so I was able to make coils for 80 and 40 meters without even having to resort to my usual charts, Q-meter and grid dip meter resources.

The 20P speech amplifier and modulator are again pretty straightforward, although they use twice the number of stages and tubes as the RF section to develop 10 watts of audio output. A 6J7 crystal mike preamp is RC coupled to a 6C6 voltage amplifier which in turn is RC coupled to a parallel 6N7 Class-A driver. The 6N7 is Stancor transformer coupled to the push-pull 6N7 Class-B modulator stage. This all does a fine job of 100% modulating the 807 at about 20 watts of RF input with gain and power to spare when driven by my D-104 crystal micro-



Under chassis view of the 20P shows its simple, point-to-point wiring. Note the "body-end-dot" resistors typical of the later 1930s.

phone.

A single 400-volt supply provides power to all of the stages in the transmitter. The full output voltage is used on the 6F6 and 807 plates and on the 6N7 modulator. A resistive divider provides lower voltages for the 6F6 screen and for the speech amplifier. Of course, two good Stancor chokes are part of the power supply filter section.

The 20P has a 200-mA meter in the middle of its panel which is switched to read the oscillator, amplifier, or modulator plate currents. The rotary meter switch is located in the middle of the panel beneath the meter. To its left are the microphone jack, audio gain control, and key jack. To its right are toggle switches for the modulator plate voltage, all filaments, and for the B+ plate supply. The B+ plate supply switch is used as a "transmit-standby" switch for both CW and phone. When the 20P is run on CW, the modulator plate switch is turned off so that there is no danger of inadvertently modulating the rig with stray noise in the mike when the key is down or from arcing in the modulation transformer when the key is up. (That is not the case with the Hallicrafters HT-6 that I had previously checked out for Doc.)

The 20P was supplied in kit form, but the assembly instructions were a far cry from those that Heath was to supply with its kits some fifteen years later. "Assembling" and "Wiring" are the subjects of a two-page narrative description in the manual. Apparently, builders of the late '30s were well accustomed to assembling their own rigs and did not require the more detailed approach that the guys of my generation grew up with. Assembly admonitions include "mount all the sockets so that the shortest leads can be made to adjoining circuits." Wiring instructions direct that "All of the radio-frequency

leads should be No. 14 BS gauge wire and should be raised about 3/4 inch away from the chassis in order to avoid the losses due to capacitive effects between the wiring and the chassis." Fortunately, the manual includes pictures of both the wired underside and the top side of the assembled chassis, so the builder had some adequate clues for this work.

On the air, the 20P behaves pretty much as advertised. 20 watts input on 80 and 40 delivers about 10 watts out on both CW and AM phone. Keying is clean, no chirps or clicks. Changing bands involves plugging in a new set of coils of course, but even changing frequency within a band is a chore since one must lift the cabinet lid to get at the crystal and its socket on the chassis inside. At least the tuning controls are on the front panel and keep the operator out of harm's way, in contrast to the Hallicrafters HT-6 where the oscillator tuning takes place inside in close proximity to hot tubes and to unprotected B+ and RF voltages. Fast and easy QSY must not have been a very high priority for the 1930s operators.

Playing with a basic late 1930s rig like the 20P gave me an appreciation for the real progress made in Ham transmitters in the later, more affluent '40s and '50s. Comparable rigs from that era, like the Harvey Wells TBS-50 Bandmaster family or the Heathkit AT-1 and DX-20 through DX-60 series, feature band switching, panel-adjustable loading, a crystal socket on the front panel, and provision for easy installation of a good, inexpensive and readily available VFO. The on-the-air signals from those later rigs were not much different from that of the 20P, but they were a lot more user-friendly and the kit instructions were spelled out in much better detail. It was a lot of fun to be a ham in the '30s, but I think we got more bang-for-the-buck and operating convenience with the transmitters of the '50s.

ER

[Comments, from page 1]

Economics of BPL Systems

It may turn out that BPL systems, while they technically do work, may not see extensive deployment because of high cost and competition from lower cost systems that are already installed. There are several economic analysis papers that have been published in recent years. One such paper is Can broadband over power line carrier (PLC) compete? A Techno-Economic Analysis that was written by Rahul Tongia of the School of Computer Science (ISRI)/Dept of Engineering & Public Policy, at the Carnegie Mellon University. The paper was published during May 2004, and is a long, well researched, professional telecommunications policy analysis. I feel that Mr. Tongia's concluding remarks are well worth quoting in Electric Radio, and they do provide provide a glimpse into the economic realities facts behind large-scale BPL deployments:

"...The ubiquity of power into American homes and businesses lead some to believe it can offer greater coverage than alternatives, especially for underserved areas. However, it is quite likely that the *alternatives have already targeted the more viable (urban) areas*, and the theoretical penetration from DSL [digital speed link] and cable is quite high. DSL is considered a weak competitor in the US because of its distance limitations. However, DSL technology is improving and in the future deployments could choose either extended distances or higher speeds. In particular, rural areas might be technically feasible for PLC systems, but economically unviable (the same argument would hold for many alternatives). This is because of the need for repeater technology, as the signal attenuates rapidly over long distances. Rural power networks suffer from not only longer distances but

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Putting the Amplitude Back Into AM

By Mike Dorrough, KO6NM
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The West Coast AMI (AM International) group and countless other unaffiliated AMers gather together on what we think of as the primary operating frequency of the Western 75-meter 'AM Window,' 3.870 MHz. Amplitude Modulation can be heard on most HF, and even VHF bands, but with 40-meters lost at night to broadcast and 160-meters lost to static in the summer, 75 meters is the most reliable year-round, coast-to-coast North American venue. Scheduled nets and informal roundtables on any given night are a joy to all who participate, and genuine 'edutainment' for those who listen. Good quality AM is the best imaginable recruiting tool to attract new Hams. SWLs can listen with just about any short wave receiver, from antiques to the most basic Radio Shack models. Similar AM groups operate across the nation between 3.880 and 3.900 MHz as the 'easy listening' mode enjoys a renaissance. AM survived a 'near death experience'* to become a robust, prestigious niche within the Amateur community.

SSB VS. AM, or SSB & AM

It is undeniable that a small faction of the much larger single sideband community isn't particularly enamored of AM's resurgence. While some SSB'ers consider this renewed interest in Amplitude Modulation an incentive to try out their rig's 'AM button,' a few feel needlessly threatened. Barring an EMP attack, it's a practical reality that Amplitude Modulation will never again rule the HF amateur airwaves. The talk-power, convenience of modern SSB rigs and the greater difficulty of operating and maintaining a reasonably potent AM station, virtually guarantee a stable demographic in favor of SSB. The war for dominance on the HF bands was won decades ago, but the minority AM community is a vital asset, entitled to exist with dignity, on a level playing field.

Some would assert that SSB advocates engaged in a bit of self-serving manipulation by wrongly equating the Peak Envelope Power (PEP) of AM and SSB. This imposed an unfair power disadvantage on the AM community, namely new regulations that cut the traditional AM kilowatt down to 375 watts of carrier. Adding to the problem of the AM power deficit, some SSB operators apparently aren't aware that there are regional 'AM Windows' by longstanding gentlemen's agreement. Rather than use their rice box's superior frequency agility to move a few kc away, they take advantage of the digital receiver's advanced notching and noise mitigation capabilities to simply 'tune-out' their weaker AM brothers. If approved for general deployment, noisy BPL (broadband over power lines) might

*It should be noted for the record that if not for the efforts of a few, dedicated AMers the mode might have effectively disappeared during the 1980s and early '90s. These sentinels continued to proudly maintain, build, and operate their AM gear even as the AM option disappeared from a number of mass-produced rigs! More recently, we owe a debt of gratitude to Hams like Paul Courson (WA3VJB), Gary Burrows (W2INR, www.amfone.net), and Don Chester (K4KYV). These dedicated AMers, and others, worked diligently to organize comments to the FCC in favor of preserving AM bandwidth. And, special thanks to 'Electric Radio'. This superb publication kept the flame alive in dark times by reminding the Amateur community of its own proud heritage crafting timeless radios of all modes.

again push weaker AM to the brink.

100% 'Amplitude Equality'!

As stated in the past, the AM carrier is like a canvas onto which we paint our voices with infinite subtlety, while SSB is like spraying paint into thin air. If you don't talk, there's no signal. Many characteristics of normal speech, such as volume and intonation are not as well conveyed in the world of SSB.

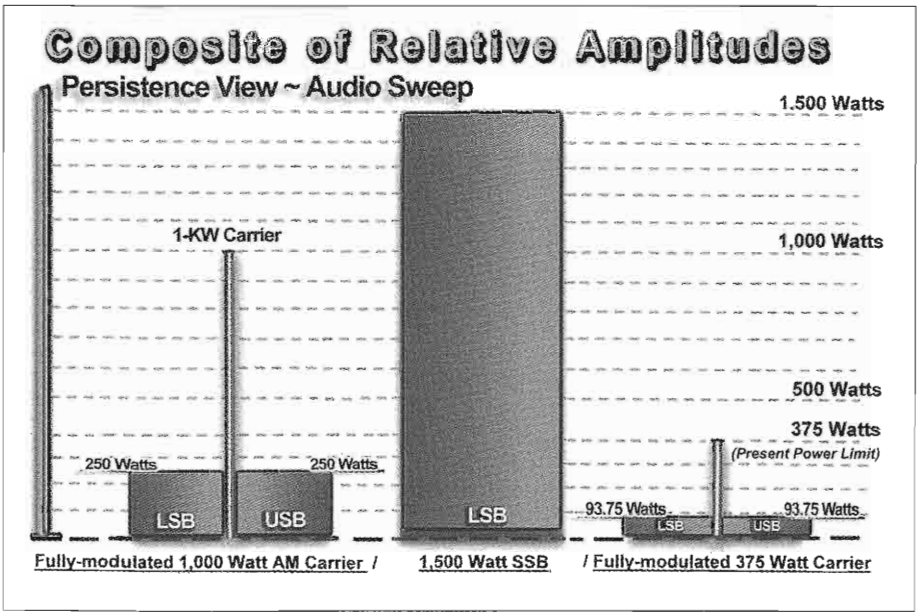
Two points about the way we compare AM and SSB must be considered at the outset. AMPLITUDE should not be confused with PEAK ENVELOPE POWER, and (aside from assessing cost of operation) there is no practical value in directly comparing the *input power* of SSB and AM.

In a sense, receivers are wireless amplitude meters with built-in modulation decoders. It is asserted that if we compare AM and SSB transmitters with identical input power, the SSB rig already enjoys an effective gain advantage of 9 dB compared to AM. If we accept this ratio, the AM rig power input would have to be increased roughly eight-fold to achieve similar sideband amplitude at the receiving end! That's 1,000 watts SSB P.E.P., versus 8,000 watts AM P.E.P. for equal loudness! ***Consider how crippled we are now at a total 1,500 watts P.E.P. vs. 375 watts carrier power!***

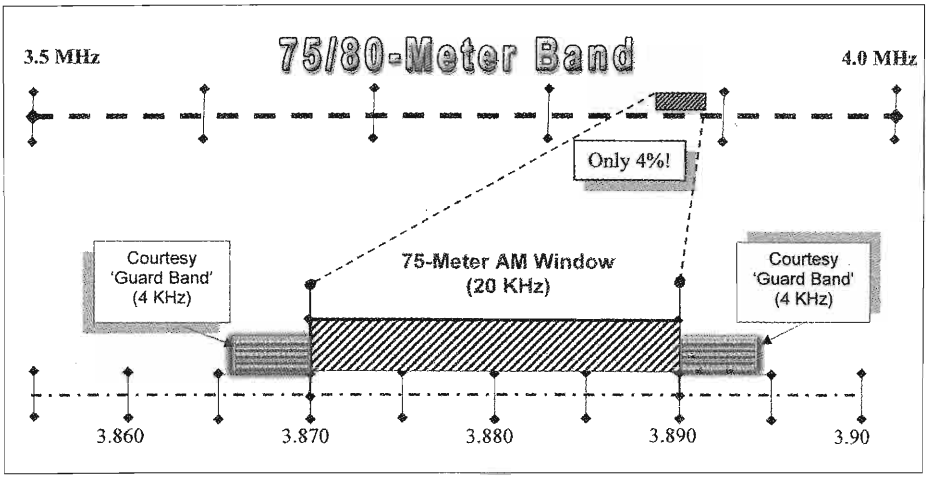
Given equal antenna systems and truly equivalent AM and SSB transmitters, the S-meter at the receiving end is deflected a similar amount. The AM operator's electric meter just spins faster. The amount of AM input power required to achieve an equal amplitude impact at the receiver should be strictly between you and your utility company.

Weakness Is No Virtue!

The relative weakness of AM compared to SSB literally invites interference. Since these are shared frequencies, in a mutual interference situation, the SSB stations may hear AM stations weakly on one sideband not realizing that on the other end, the AM QSO is being decimated!



In challenging interference conditions we could tighten the bandwidth on the receiver and listen to our fellow AM'ers on the opposite sideband, but then why bother running AM? AM critics would be disingenuous to claim that audio quality



has no bearing on the Ham radio experience, considering that the hottest segment of the SSB market are audio bandwidth-adjustable, digital 'Hi-Fi' rigs, outfitted with studio mics, mixing boards and equalizers. Without consciously realizing it, some SSB operators who vehemently express hostility toward Amplitude Modulation, are in reality spending thousands of dollars and almost as many hours adjusting menu settings attempting to emulate the AM experience!

The '4% Solution'!

There is no denying that most AMers are operating older tube gear with stand-alone transmitters and receivers, analog VFOs, with some even 'rockbound' (crystal-controlled). That's the challenge and fun of it. For the AM experience to be satisfying, the AM receiver should be capable of hearing the full bandwidth of the high quality AM transmitter. But, there in lies the rub. The interference problems between AM and SSB operators are much more a function of receivers than of transmitters. SSB operators are listening to a decoded sideband product, while AMers are literally 'listening to bandwidth!'

These are powerful reasons to formalize a universally recognized 75-meter AM Window and a motive to better educate all Hams about real-world bandwidth. To an AM receiver, single sideband is not really all that 'bandwidth efficient'. To demonstrate this, find a typical SSBer and slowly tune an AM receiver across their center frequency. Do the same with a properly modulated AM signal of comparable strength and you will find that artifacts of both are detectable over a similar range of adjacent frequencies. SSB operators simply need to give a wider berth or courtesy 'guard-bands' to accommodate AM receivers!

Good Fences Make Good Neighbors!

To solve the SSB vs. AM problem, many correctly believe that we need to formalize and connect the East and West Coast AM Windows from 3.870 - 3.890 MHz. After all, 20-kHz is only about 4% of the total 75/80-meter band! With our recent less-predictable propagation conditions, the confusion resulting from different regional windows is resulting in ruffled feathers in the 'middle regions.' For example, would an SSBer in Texas or Oklahoma give deference to the East Coast, or West Coast AM Window? ***A national, contiguous, 75-meter AM window*** would end the confusion.

In the past, it would have been enough for us to generally agree to this 'AM Window' and enforce it with fraternal social pressure. As can be heard on any busy 75-meter night, the power of courtesy and social pressure is weakening in

our modern society, so Part 97 Rulemaking may be the only course. Even with an official rule change, it is hoped that when we operate in the SSB mode we'll all be more sensitive to our surroundings when operating at the edges of the 3870 to 3890-kc band portion.

It should make all Hams proud that a noble legacy of design, homebrewing, restoration, preservation and recruitment by example, is alive and well in eclectic AM groups across the land. In these troubling times, AMers represent an inestimable pool of specialized RF expertise that could one day be of value to all Americans. In return, it is hoped that the long-suffering Amateur AM community will soon be rewarded with 4% attitude and 100% amplitude!

ER

[Comments, from page 6]

also lower densities of users sharing physical equipment (like the LV [low voltage] transformer). Data from Ascom (2001), the European PLC [power line carrier] equipment provider, indicate that the drop-off with distance is very pronounced for the higher frequencies, many tens of times dB higher than for lower frequencies... There are limits to increasing the signal strength based on emission regulations. However, even with the poorer economics, PLC providers may choose to target rural or underserved areas precisely because they would be the only game in town, and thus free to charge the (required) higher rates. However, if one looks into the near future, the one to three years timeframe, it is feasible that broadband wireless [RF-based systems] (based on IEEE 802.16 technology, also known as WiMax) will prove cost-effective for rural and other underserved areas, especially considered its efficient sharing of infrastructure. When considering the penetration of PLC, on a total household basis, PLC is unlikely to gain a market share greater than a few percent in the next few years because of the head start that cable and DSL systems have and also the modest penetration of broadband into US homes. There are over 20 million broadband subscribers in the US (Q2 2003) of which almost two-thirds are cable modem subscribers (Cable Datacom News, 2003). At a recent workshop on PLC technologies, the author asked industry representatives how long it would take for PLC systems to gain traction, or one million users. Their response, 3 years, was regarded as optimistic, given estimates of 1 year just to begin full-fledged commercial deployment. In addition, since the technology is less standardized and power systems vary across utilities (mandating extensive field-testing), there is great variance between utilities in their ability to deploy PLC systems—both technologically and in a business sense. Even if PLC reaches 1 million users in 3 years, during the same time [2007 time frame], cable and DSL might have improved significantly, growing by perhaps 30–50% over their existing base."

Photos

Many readers mention how they like to see the photo section in Electric Radio. Please remember to keep sending in your shack photos, equipment photos, and photos from Ham events so that I can run the photo column more frequently. Any questions about photo formats will be gladly answered by phone, letter, or email.

Corrections

In Part 2 of the SX-101A receiver series (ER #197), I was wrong when I mentioned that the reverse-painted dial glass is unavailable. It turns out that quality reproduction dial glass for this receiver is available from Radio Daze. See the ad inside the rear cover for their contact information. Also, I mentioned using strong ammonia for cleaning aluminium surfaces. Larry Will (W3LW) reports that on some types of aluminum alloys, ammonia will discolor the metal. So, it's a good idea to test anything used to clean

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How to Rescue a Transmitter

By Paul Courson, WA3VJB
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(Glen Burnie, Md.) — Radio hobbyists looking for a really "big rig" to put on 160, 75 and maybe 40 will do well to research the older, established community radio stations in their region, calling the switchboard and learning the name of the station's engineer to inquire about possible "treasure." A group of Pennsylvania Hams in early September completed the rescue of a broadcast transmitter, and this is a story about that mission and how it came about.

Commercial "standard broadcast" stations have been clearing out their old vacuum-tube AM transmitters in recent years with the development of solid state replacements that have proved reliable, are smaller in size, and offer far less power consumption. These factors are especially important to smaller AM stations licensed at the 1,000 watt and under category, which happens to be the power range that overlaps the Amateur service.

There has also been a dramatic consolidation in the radio industry such that group owners hold the licenses to many stations, including many of the small-town AM stations what were once family-owned and run as a local business in the pre-television boom years of radio broadcasting. The large, corporate owners of today have little interest in keeping old transmitters around, and when these older stations change hands it is often a race against the scrapyard to try to "save" a tossed-out transmitter.

Such was the case at WFBR-1590 kc, in the little town of Glen Burnie near Baltimore. A new owner had bought the station in the summer of 2005, and was remodeling the studio, office, and technical rooms, and did not want to keep the old RCA transmitter around anymore.

Yet, what a transmitter it is !The model BTA-1M dates to the late 1940s, and showcases a quad of 833A triodes arrayed left to right behind a "shutter door" style of observation window. This door opens to the left with small louvers like a rolltop desk, and features panes of viewing glass where tube filaments and plate color can be monitored while in operation.

Have Transmitter, will Travel

Stepping up to provide a good home for this orphaned transmitter, Mark Bell (K3MSB), who cleared the acquisition with his wife, said "I'll be in touch very, very soon," when word reached the author of its availability.

Mark assembled a strong work crew to accompany him southbound. The self-appointed "grunt" was Chuck Hepfer (KB3JXY), a beefy guy not intimidated by large bulky objects like a 300 lb. modulation transformer. "I usually just do stuff that's heavy," he said when asked to describe his credentials. Then, as he stood there sizing up the transformer, he added "I've moved some pretty heavy things, but this is taking the cake."

Mark, Mike Stackpoole (N3VQH), and Chuck are members of the Hilltopper Transmitting Association at Felton, Pennsylvania. Mike was the tape measure guy. He called upon analytical skills to determine whether the transmitter would clear a narrow space in the station's technical room. He said "the size of the thing is really surprising, to be honest. We think it's the biggest transmitter in the club."

KCØRIJ, Scott Worley, is a co-worker with Mark, who had introduced him by saying "I'm trying to corrupt him into

hollow state." Scott's father Leo is W7KY, a retired broadcast engineer. Scott, leaning against the liftgate of a rented truck as the others inside the station pushed and tugged the RCA toward the door, said "I did a lot of moves like this when I was a little guy, and I learned to stay out of the way!"

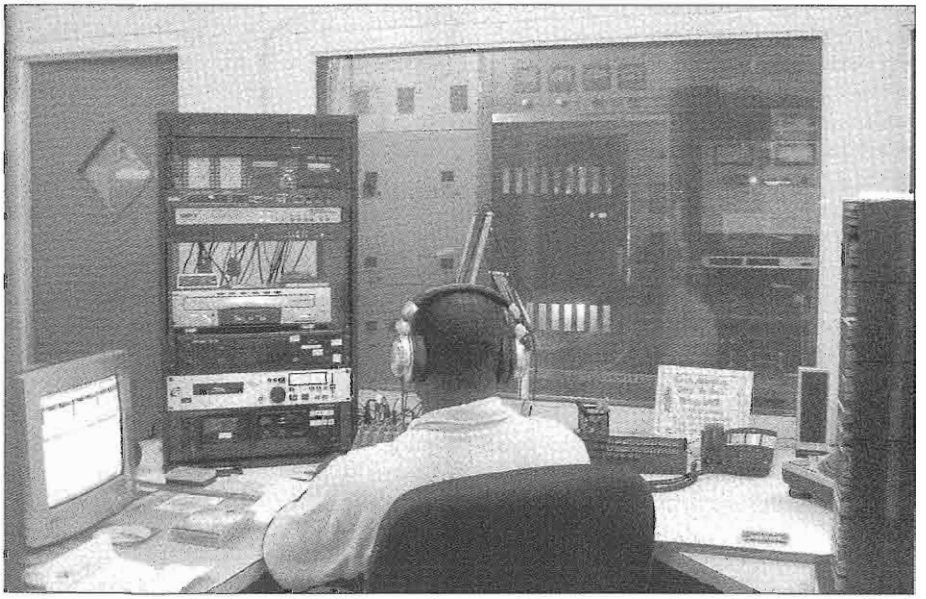
Scott was providing blankets and moral support along with the occasional strong shoulder to shove the big iron onto the truck. When he told his dad about the upcoming trip, Scott said his father "was excited, he was asking me all sorts of details about it, he was pretty sure of the model, the year, and how heavy it would be." Scott's 4WD pickup truck would later come into play when the rented truck got stuck in the sandy soil behind the station.

The Big Move

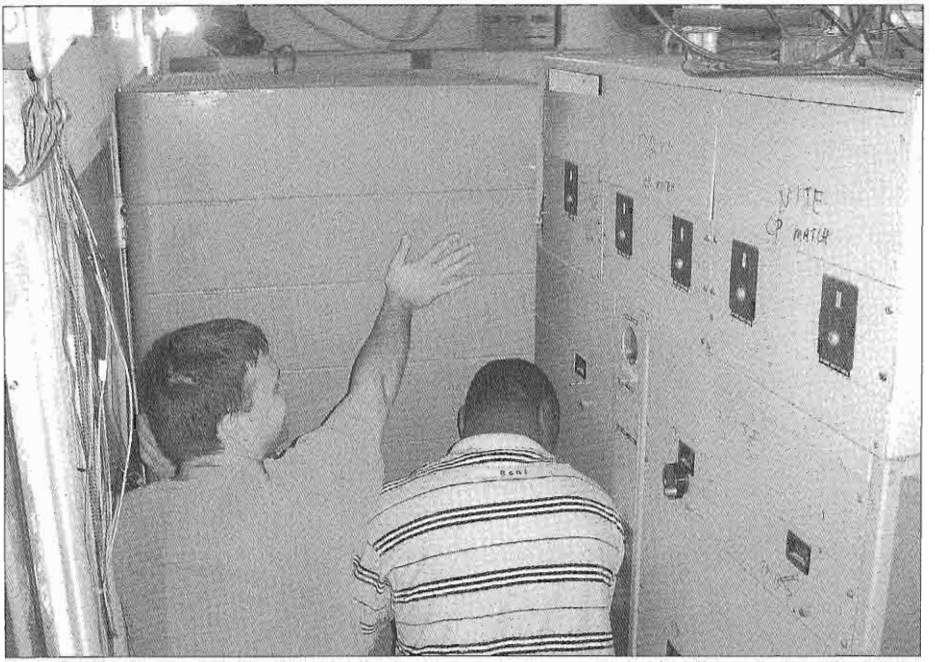
Over a period of years the technical room of a radio station typically sees layers and layers of wiring and equipment placed in sometimes random order, without much thought given to how someday one of the "modules" may have to be taken out. We estimate that the RCA had less than a half-inch of clearance at its most narrow point. All obstructions to choose from could not be moved because it would knock the station off the air. So, either engineering legacy at the station carefully calculated proximity, or we were very lucky.

The station has a religious format, and the studio was separated from the technical room by only a large window with two panes of glass. "The guy in there was doing his prayers, he was deep in prayers," Mike noted, "and here we are on the other side of the window, moving a 1000 lb. transmitter." The cleric did not reveal any distraction as the object scraped past and the grunting men moved by.

The Federal Communications Commission in the past required someone to constantly monitor the transmitter's operation. As a cost-saving measure, stations often placed their transmitters in



Last known photo of the BTA-1M at WFBR, 1590kc, behind the glass that's in front of the operator. Stations could save labor costs in complying with required FCC transmitter readings by assigning the studio operator instead of an engineer.

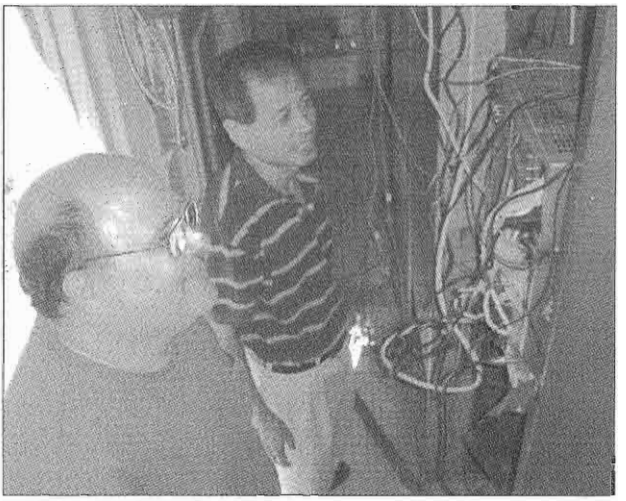


In removing the transmitter, the clearance was so tight we thought we heard the dust scraping off the paint!

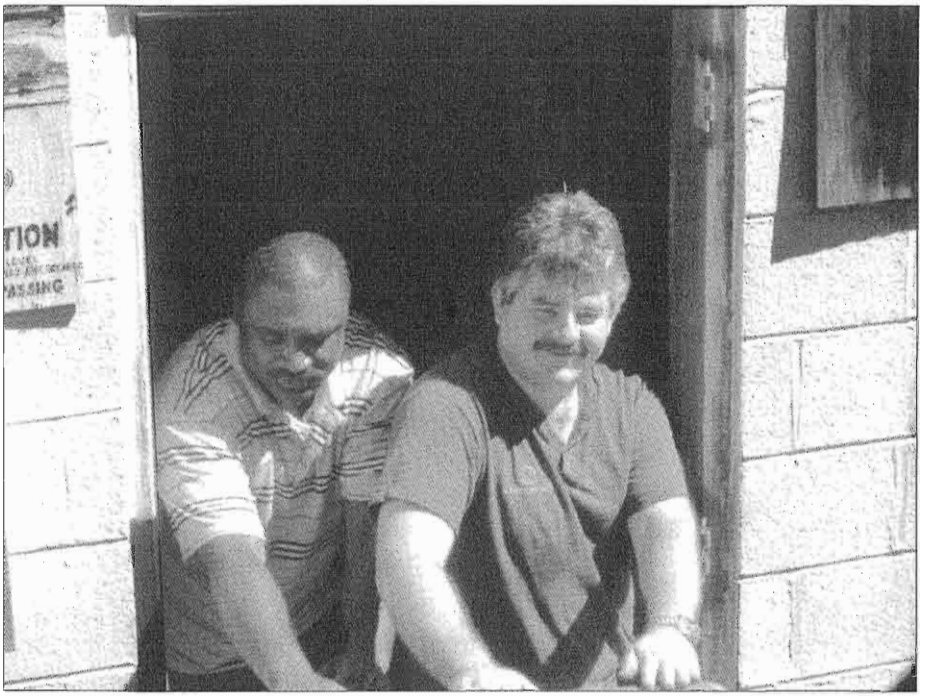
view of the on-air personnel so they could watch the indicators. Eventually, remote-control was permitted and newer stations had no need to configure their floor plan for line-of-sight.

Once around the bend and headed for the back door, there was more room to handle the transmitter. Chuck and Mark got on the door side of the rig, with Mike, and two station employees tipping the cabinet toward them so it could be lowered horizontally to a hand truck as "wheels" to then push it out the back door. The crew put blankets in place to protect the finish, straps around the cabinet to protect the cargo, and a chain on the grip of the hand truck to pull it out the door and up a small rise to the station's back yard.

Despite having removed the heaviest transformers, the cabinet itself repre-



Right: Mark (K3MSB) learns how some of these wires are still important.



The religious host helps Scott (KCØRIJ) push the old transmitter out the back door of the station.

sented a challenge to safely handle into the truck.

Truck Talk

Renting a cargo truck is a good idea for transmitter rescues. The hydraulic lift gate is very helpful not only in elevating huge transformers, but also as a way to get a transmitter up from the ground and in position to ride a dolly the rest of the way into the truck. Such moves can be done without the lift gate, but be prepared to fight gravity.

Most trucks rented for weekend consumer use do not have commercial knobby tires or winch accessories to help with loading and transport. We could have used both for this move. The weight of the transmitter, once loaded, helped us discover that the empty truck had been parked on sandy soil. We got stuck as we pulled away from the door.

Scott's 4WD truck initially promised to extricate truck and transmitter. But we snapped a tow strap, and a chain (the same chain used on the 300 lb. transformer, earlier) worked so well that we had all four wheels on the truck spinning with nary a move by the rental truck.

A few phone calls later, we found out most Triple-A membership towing agencies don't want to touch a rental truck with cargo aboard. We eventually found an independent who came out within a half hour, cabled up the rental truck, and winched it free as we shook our heads and observed the hole that the spinning tires had left behind.

Three hours to load the transmitter, three hours to get out of the sand trap, and the members of the Pennsylvania group were on the way home with some stories to tell. Later, an update on Mark's progress bringing the RCA to 75 meters.

ER

Milestones In The History of Amateur Radio

The Transatlantic Sending Tests, 1921-1924

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Amateurs struggled valiantly during the first few years following WWI to extend the range of their contacts. They dreamed endlessly of a day when their transmissions would range worldwide. Wavelengths below 200 meter were largely forbidden pastures and, anyway, the characteristics of short wavelengths seemed to grow more mysterious the shorter they became. The default focus was thus on 200 meters, and on even longer wavelengths for a few specially selected stations. Equipment limitations and spectrum ambiguities required that steps toward the goal be incremental. Transcontinental communications were first to occur, and as confidence burgeoned, goals expanded to include the possibility of transequatorial and transoceanic communication. Since an enormous concentration of amateurs was located on the East Coast, and a lively cohort of amateurs was active in Europe, the challenge of making two-way transatlantic contacts drew preponderantly more attention.

It was generally agreed that the first step to transatlantic communication was to determine whether powerful American amateur stations could be copied across the Atlantic Ocean. M. B. Sleeper, radio editor of "Everyday Engineering Magazine" proposed in 1919 a concrete plan for "transatlantic sending tests." Sleeper was an insightful radio engineer whose ideas commanded respect. In the 1920s he established the Sleeper Radio Corporation of New York, authored several books and journal articles, and became editor of "Radio and Model Engineering," a magazine published for experimenters who built their own equipment. Unfortunately, however, "Everyday Engineering" collapsed into bankruptcy in late 1920, and Sleeper, temporarily out of work, asked the ARRL to assume management of the tests.

Sleeper's plan called for American amateurs to transmit on the nights of February 1, 3, and 5, 1921. Hardly a month was available for arrangements when Sleeper approached the ARRL. Nonetheless, some two-dozen amateurs with outstanding spark stations lined up to transmit their signals to perhaps 250 British listeners. Transmissions were on 200 meters. The results were a dismal failure—no signal bridged the Atlantic. Significantly, in artful frankness, A QST editorial, written shortly before the tests, predicted the results: "While we are very hopeful that at least one of the entrants will be heard overseas, the British amateurs have not had the practical experience in short wave reception that we have benefited by over the past ten years, and so they are working under more or less of a handicap" ("Transatlantic Tests," 1921, p. 20).

Specifically, the failure was attributed adroitly to the ineptitude of British amateurs, e.g, they either jammed each other on two-hundred meters with regenerative, self-radiating receivers, could not even find the 200 meter wavelength on their receivers, or encountered interference from commercial station harmonics and local electrical noises (DeSoto, 1936, p. 72).

Given the ambiguities associated with the first tests, plans for a second period of tests crystallized at the first National ARRL Convention in Chicago, August 31-September, 3, 1921. None doubted that the investment in time and energy

was worthwhile. As (Warner, 1922, p.7) stated, the subject of transatlantic tests "intrigues the amateur—his greatest desire in life is to get 'distance' with his equipment."

The ARRL Board decided that Paul F. Godley, 2ZE-2XE, would go to England, on behalf of the ARRL, in order "to supplement the efforts of the British amateurs" (Warner, 1922, pp. 7-8). Godley was chosen because in the "unanimous opinion" of the ARRL Board "he was America's most expert operator in the practical reception of short wave signals." Godley was on the Advisory Technical Committee of the ARRL, and a member of both the Institute of Radio Engineers and the Radio Club of America (DeSoto (1936, p. 73).

Paul F. Godley, 2ZE-2XE, "A.R.R.L.'s Successful Overseas Listener," from QST, February 1922.

The ARRL Board advanced disingenuous reasons for sending Godley to England: to have a double chance of success, to make comparisons of the relative sensitivity of American and British amateur receiving apparatus, and importantly, to make the tests truly democratic, that is, by having "an ARRL man there, one used to twirling a mean variometer all night long, the tests could be made a great popular event with free-for-all periods in which the whole country participate [sic]. Warner (1922, pp. 8-9) assured QST readers that Godley's trip to England was intended to be only 'an auxiliary to the British efforts.' It was 'in order that the tests might be expanded into a big popular event without asking the British amateurs to stay up all night every night.' The board wanted, Warner declared, 'it clearly understood that an American representative was not sent merely because we feared the English amateurs weren't seasoned operators or weren't able to get us with their equipment."

A French radio magazine, on the other hand, insisted that Godley made the trip because the ARRL Board feared that "the British weren't sufficiently hard-boiled owls" (Warner, 1922. p. 8). DeSoto (1936, p. 72), who was privy to the minutes of the 1921 ARRL Board meeting, observed that "Traffic Manager Fred H. Schnell presented a plan [to the Board] to ensure that any possible deficiencies in British receiving technique would not imperil

the possibility of amateur signals being heard across the Atlantic on these tests." Schnell said that he did not doubt the ability of the British amateurs, but after all, "they had not succeeded before."

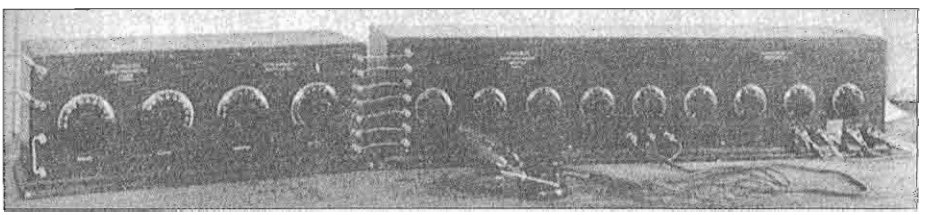
Godley sailed for England on November 15, 1921. The ARRL had obtained official permission from British authorities for him to set up his receiving apparatus. After examining different locations, Godley chose an open field near Ardrossan, a ship building port on the West coast of Scotland. Since there were no buildings on the site, he camped, exposed partially to the elements, in a 12x18 foot tent, which sheltered a lantern, tiny oil stove, table, chairs, and his receiving equipment. The latter consisted of both an Adams-Morgan "Paragon" RA-10, a regenerative shortwave pre-tuner linked to a "Paragon" DA-2 detector/amplifier, and a ten tube, homemade superheterodyne receiver. Godley erected a Beverage antenna on the edge of the sea, that is, a single wire 1300 feet long, supported 12 feet above ground on ten poles.

For six successive nights, December 7-16, amid gale winds, chilling squalls, driving rain, fog and mist, Godley listened for transmissions from the United States and Canada.

The free-for-all time, during which amateurs in each of the nine Inspection Districts called "Test" three times and signed three times, was scheduled to occur between 7pm and 9:30pm EST. To provide all amateurs with equal opportunity, the free-for-all period was divided into ten parts of 15 minutes each, the starting time for the turn of each part was rotated every night so that amateurs in different districts transmitted sometimes early, sometimes late, etc.

The time from 9:30pm until 1:00am EST was reserved for twenty-six stations that qualified for participation by proving that they had worked other stations overland at distances greater than 1,000 miles (Warner, 1922, p. 10). The ARRL staff selected each of these elite stations. They transmitted on wavelengths of 200, 210, 230, 260, 360, and 375 meters. The three and a half hours set aside for individual schedules were divided into periods of 15 minutes each, and a time was assigned to each station. They transmitted, two at a time, on relatively clear channels, following a complex schedule that the ARRL had pre-arranged.

Eight British amateurs copied successfully the signals of American amateurs. However, the British did not hear a single spark station. Godley heard thirty different signals, nine high-power spark stations and twenty-one relatively low-power vacuum-tube stations. The ARRL Board claimed that the late 1921 transatlantic tests showed that it was possible to cross the Atlantic on 200 meters with a power of fifty watts or less with vacuum tube transmitters and aerials that are "as grasshoppers" compared to those of commercial stations. Warner (1922, p. 13) believed that the stature of amateur radio



A panel view of the tuner and homebrew superheterodyne receiver used by Paul Godley at Ardrossan. A separate rheostat controlled the filament voltage of each tube. From Radio Broadcast, February 1923.

got "a big boost up the ladder from these tests." They clearly demonstrated the superiority of vacuum-tube transmitters over those of venerable spark, and they led Godley (1922, p. 40) to assert that "it now lies within our power to communicate frequently with our British cousins, provided we show the will to do so."

When Godley returned to the United States on December 28, 1921, as a "conquering hero" and to a rousing welcome (Warner, 1922. p. 13), it represented a defining moment in the history of amateur radio in that finally amateurs had shed their national insularity and had attained "cosmopolitan international characteristics" (DeSoto, 1936, p. 81).

Consequently, a third set of tests, planned jointly by the ARRL and the Radio Society of Great Britain, was scheduled with high expectations for December 12-31, 1922. The tests covered a period of 20 days; transmissions were scheduled from 8:00pm until 1:00am EST. During the first ten nights, American and Canadian amateurs transmitted while European amateurs listened. The first two and one-half hours of each evening was given over to "free-for-all transmissions within each Radio District in 15 minute intervals, with assigned turns rotating each night. The remaining three and one-half hours of each night were assigned to 324 American stations, which had qualified by proving that they could transmit distances of at least 1,200 miles. These privileged stations transmitted in 15-minute periods in groups of 22 to 25 stations. During the final ten days of the tests, European amateurs transmitted while American amateurs listened. The British and French amateurs divided the ten, six-hour periods into two equal sections, which they used in alternation, that is, on one night the British transmitted first and on the next the French transmitted first.

The results of the third transatlantic tests revealed that signals of 315 different U.S. and Canadian amateurs were copied in Europe. Spark proponents were dismayed to learn that not one spark station was heard across the Atlantic. Whereas before the tests, only two or three American stations had ever been heard in France, on the occasion of the tests, 239 were heard in France and Switzerland. Moreover, at least 20 American amateurs copied regularly the signals of French 8AB, British 5WS, the London station of the Radio Society of Great Britain, and British 2FZ, the station of the Wireless Society of Manchester (Warner, 1923a).

Warner (1923a, p. 13) reported exuberantly that "the success of the European reception of Americans was many times our fondest anticipations." The reception of Europeans by Americans, however, he found disappointing, since the number of European stations heard was very low. Why? Warner suggested that poor weather and poor transmitters may have been responsible to some degree. But the real problem he admitted reluctantly was "poor cooperation on the part of the American amateur" (Warner, 1923a, p. 14). The QRM he lamented was at times "merciless." The first night of European transmissions, for example, was "hopeless" because of hundreds of American amateurs transmitted "Test" in the mistaken belief that it was still one of their transmitting nights. On any given night, 100 to 150 American stations could be logged on 200 meters during the time that Europeans were transmitting.

Who were these miscreants who cluttered up 200 meters while experienced, sophisticated operators strained to copy the Europeans signals through the QRM? "It was the punks and lids who were at it, the halting fists that could hardly be read, the poor sets which had never been heard out of their back-yards before, and blessed if they weren't getting out all over the country during this quiet spell, and enjoying it hugely" (Warner, 1923a, p.17).

The mixed results of the third transatlantic tests during December, 1922,

prompted Fred Schnell, ARRL Traffic Manager, to arrange a two-way contact between 1CKP, South Manchester, Connecticut, who had been heard in England, France, and Holland, and French 8AB, who possessed the strongest European signal copied in the United States. The special two-way effort occurred between January 26, 1923, and February 3, 1923. Via cablegrams, periods for listening and transmitting were set from 5:00pm to 7:00pm EST and from 10:00pm to 12:00pm EST on wavelengths between 195 and 200 meters.

Each of the amateur stations, throughout the test period, faintly heard at times unreadable signals from the other through very heavy interference, local noise, and fading. Two-way communication could not be established. However, French 8AB was heartened by the near misses, and he promised to try to contact stations in the United States on Sunday, Tuesday, and Thursday, from midnight to 12:30am EST until March 15, 1923. "Who will be the first U.S. ham actually to work 8AB," asked Warner (1923b, p. 15)? He thereupon promised "a genuine Brown Derby" to the first American to establish two-way communication with Europe. No amateur in the United States, however, succeeded in working French 8AB during the latter's intensive effort to accomplish the Herculean feat.

Schnell (1923a, pp 9-10) announced plans for a fourth set of transatlantic tests to be held toward the end of 1923. On this occasion, the American side would listen for foreign signals. European stations must be convinced, he said, that they can be copied here. "We defeated ourselves last year by causing so much QRM that those listening hadn't a ghost of a chance to hear a weak signal." This time, to prevent misunderstanding, "we will do no transmitting." The ARRL conducted the transatlantic tests in cooperation with British and French amateur societies, December 22, 1923, until January 10, 1924. Schnell exuded confidence when he stated prophetically that "we expect to establish two-way communication and these may be the last Transatlantic Tests" (Schnell, 1923b, p. 29).

Schnell (1923c, pp. 9-11) felt intuitively that conditions were propitious for hearing European amateurs in the United States and Canada. First, amateurs in the U. S. were restricted officially from transmitting during the quiet hours from 8:00 to 10:30 pm, second, the wavelengths should be relatively quiet anyway, because there were no scheduled transmissions by American or Canadian amateurs; third, to make it worth while to keep one's transmitter silent and to concentrate on receiving European signals, many manufacturers, jobbers, and dealers had donated prizes worth $3,500 to be awarded for best reception records. "Any amateur using his transmitter during any period of the scheduled hours of the tests," Schnell declared, "will be disqualified for prize competition."

The European stations transmitted from 8:00pm to 1:00am EST on wavelengths between 180 and 220 meters, with 200 meters promoted as the primary wavelength. The period from 8:00pm to 10:00pm was designated as a free-for-all time when both French and British amateurs transmitted. The French and British stations transmitted on alternate days from 10:00pm to 1:00am EST. Amateurs on both sides of the Atlantic were urged to attempt to make a two-way transatlantic contact after January 11, 1924, when according to Schnell (1923a, pp. 9-10), "the lid will come off and everybody is invited to take 'pot luck' at trying two-way communication with any European he can hear."

Roland B. Bourne, 1ANA, a Massachusetts amateur won the grand prize of a Grebe transmitter. Grebe, 2ZV-2XE evolved an experimental prototype of the transmitter in his laboratory. The 50-watt, vacuum-tube transmitter, however, never made it out of its experimental stages, and Grebe chose never to market it. Per-

haps he anticipated a boost in favorable publicity for his manufacturing company when he offered a production model as a grand prize for the fourth transatlantic tests, which may be why he made the offer impetuously before he had the transmitter on one of his assembly lines. Whether he ever produced a transmitter for delivery to Bourne is not known.

Bourne won the prize because the sum of the mileages from his location to stations that he copied was the largest total submitted. Lesser prizes were awarded for (a) reception of a European amateur over the greatest distance; (b) greatest total station miles of French amateur signals on any one date; (c) greatest total station miles of British amateur signals on any one date; (d) reception of the greatest grand total of station miles of French amateur signals during the entire contest; (e) reception of greatest grand total of station miles of British amateur signals during the entire contest (Schnell, 1923c, p. 11).

Schnell's prediction that the "free-for-all period," to start January 11, 1924, would produce two-way communications across the Atlantic was fulfilled. But it did not produce the "first" as he had predicted. The first two stations to bridge the here-to-fore impossible barrier turned out to be Fred Schnell, 1MO, himself and Leon Deloy, French 8AB. The two amateurs made the first two-way contact across the Atlantic on 110 meters on November 27, 1923, about one month before the start of the fourth transatlantic tests. Schnell had obtained special permission from the Radio Inspector to operate around 100 meters. More meaningful to amateur radio than the historic contact itself was the fact that Schnell and Deloy had demonstrated that transatlantic amateur communication was relatively easy at 100 meters as compared to 200 meters.

Indeed, by the end of January 1924, thirteen European stations had worked seventeen amateurs in the United States and Canada (DeSoto, 1936, p. 90). Only amateur license restrictions impeded a mass exodus of American operators from 200 meters to around 150 meters. However, a migration of amateurs legally to shorter wavelengths was only months away. Transatlantic sending tests, like those of late 1923 and early 1924 had become obsolete. A phase of amateur radio—one that had elevated hopes annually only to have them disintegrate into perennial disappointments—was over.

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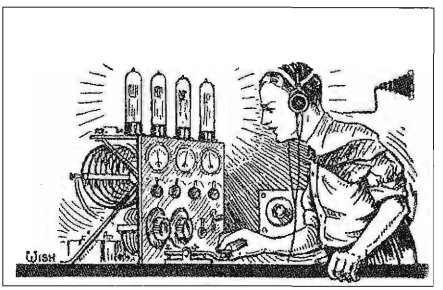

The American VHF-AM Equipment Gallery

Part 2, The Poly-Comm 2 Transceiver

By Jim Riff, K7SC
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When the well-known and common Gonsets came on the market in the 1950s, it established the standard for compact VHF transceivers. The combination of receiver, transmitter, and power supply in one package was a new and exciting concept. Many companies offered 2-meter components, but Fossett Gonset combined them into one system, and made mobile and base operation possible with one compact package. These Gonset Communicators have been written about extensively, so we will focus on the other companies who challenged this technology with their own designs.

In a continuing series of articles I will cover 4 more of the next-generation, 2-meter AM tube transceivers that competed for market share in the then-fast growing 2-meter market. Today, with the growing interest in 2-meter AM activity in the US, these old tubed "boatanchors" have become increasingly popular. Operation, maintenance, repairs, and just collecting of these boatanchors has become easy and fun.

Polytronics Lab Inc. of Clifton, NJ, designed and sold numerous 6-meter, 2-meter, and CB transceivers in the early 1960s Their operations closed in April 1965. Noted for their compact and stylish designs, such as shown in **Figure 1** by Chief Engineer Bill Hargreaves (W2SXB, SK), these base or mobile transceivers were limited in their popularity by their very high selling price. They were compact, reliable, and performed quite well.

Figure 1: The Polytronics Poly-Comm 2 transceiver shown above was designed by Bill Hargreaves, W2SXB.

Although the compact package featured 19 tubes located both above and below the chassis, the Poly-Comm 2 was simple and easy to work on.

The 15 front-panel controls are nicely arranged and are easy to operate. The built-in VFO adds increased flexibility and convenience to the one front-panel crystal selection. Sold by Allied Radio, Lafayette, Henry, and others through their catalogs, **Figure 2**, above, they were soon dropped when these catalog houses introduced their own similar house brands at much lower costs. Although these competitors sold their 2-meter radios at up to half of the Poly-Comm's cost, they did not incorporate onboard VFOs and had inferior specifications in order to keep the cost down.

Pros: They had great modulation provided by parallel 6BQ5s, a very sensitive 5-nuvistor receiver front end, compact size, variable-ratio receiver and VFO tuning, stable all ceramic bypass and coupling capacitors, all in a compact, modern looking design.

Cons: The 19-tube design runs very hot, and uses an uncommon 7551 RF PA tube. The set requires a 20-minute warm up to minimize VFO drift, and they are still expensive today on the used equipment market.

Specifications: The Poly-Comm 2 featured 117V and 12V operation, full PPT, a push-pull, 7-watt RF output, a nice triple-conversion receiver with high sensitivity of .1μv with 5-kc selectivity. They were 23 lbs, and came in a package size of 11 inches X 12 inches X 5 inches. In 1964, it would cost you $349.50 to buy one.

Conclusion: The Poly-Comm 2 was one of the best performing transceivers of the time, but is increasingly difficult to find, and should not to be confused with the inferior "Poly-Comm 62," a dual-band model that had many compromises. Only minor capacitor changes in the audio chain could be added to increase transmit audio fidelity. Perfect for utilizing the increasingly popular 2M AM nets on 144.450 MHz.

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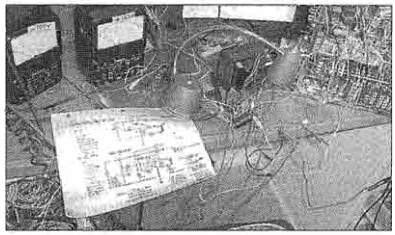
The Restoration Corner



A Design note: Using RF Chokes in Colpitts VFOs

By Bob MacDonald, N2NIR
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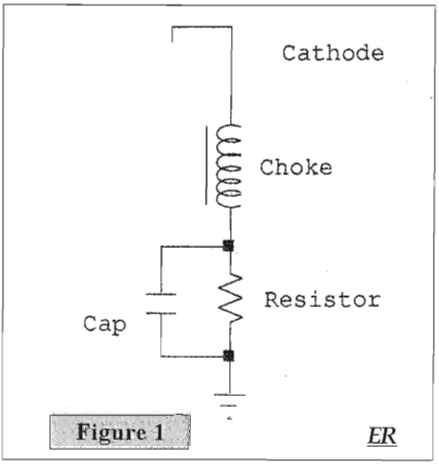
Recently, while working on a Colpitts VFO for a new project, I had a problem! The peak of the sine-wave at the oscillator grid was distorted. The distortion is caused when the grid attempts to go positive, and distortion causes all kinds of unwanted output frequencies from the VFO. In a receiver, this can mean unwanted noise. After some trial and error efforts, I noticed that the cathode voltage was quite low, about 1.0 volt. The only component between the cathode and ground is a 500-µHy choke. The choke is a single pie design, type 70F, from JW Miller. The series resistance is approximately 100 ohms. I looked at some other chokes of the 1.0 - 2.5 mHy type that I have in my transmitters. I found that they were generally in the 400-ohm to 500-ohm resistance range. I tried a 2.5-mHy, 400-ohm type and the distortion went away. The net of this is that I needed more resistance in the cathode circuit to keep the tube running in Class A, if I plan to use the smaller choke. My experience with using chokes for VFOs included only the larger higher resistance type, so I tripped over this problem unexpectedly.

Happily, the solution is rather simple; add a resistor in series with the choke. Bypass the resistor with an appropriate capacitor and that's it. See **Figure 1**. The resistor will be typically between 220 to 470 ohms. Remember, the total resistance is the new resistor plus the resistance of the choke.

A test circuit can be setup using a 1000-ohm pot as the resistor and reduce the resistance until the oscillator starts reliably. Measure the resistance value of the pot and replace it with a fixed resistor.

The bypass capacitor impedance should at least 1/10 the value of the resistor. For a 220-ohm resistor, the cap impedance should be about 22 ohms at the lowest operating frequency. This solution also works for solid-state VFOs as well, and can eliminate the clamping diode in the gate circuit. The suggested change is noted in the application notes available from "Fox Crystals" on the Internet [www.foxonline.com].

Happy oscillating; Bob, 'N2NIR'



High-Performance Audio for R-390 AM Reception

Part 2

By Bill Feldmann, N6PY
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The worst problem I've found with my R-390's AM performance is audio quality. For communications use, using headphones on the local audio output, it was acceptable, about as good as a stock 75A-4, but not nearly as good as my SX-28 or even my 75A-1 and non-mechanical filtered 75A-2. The audio got worse when using a Hammond 600-to 8-ohm transformer with an 8-ohm speaker.

After reading many articles on R-390 and R-390A audio, but considering the difficulty of modifying an R-390's crowded audio module, I decided to try replacing the local audio's 600-ohm output transformer with an 8-ohm Hammond 125-ASE transformer. By mounting the transformer on its side, as shown in **Figure 1**, I was able to mount it on this crowded module. I removed the positive feedback between the output and driver stages by shorting R609 and increased the audio output by adding a 100-µf cap across the output tube's cathode resistor, R608. In my manual, this is recommended as service modification #2. The line audio positive feedback resistor, R633, was shorted out, but the cathode resistor was left unbypassed to further reduce the line output audio distortion.

These modifications to the R-390 local audio resulted in much better audio coming from a Jensen C10Q speaker mounted in a Collins 270G enclosure that is used

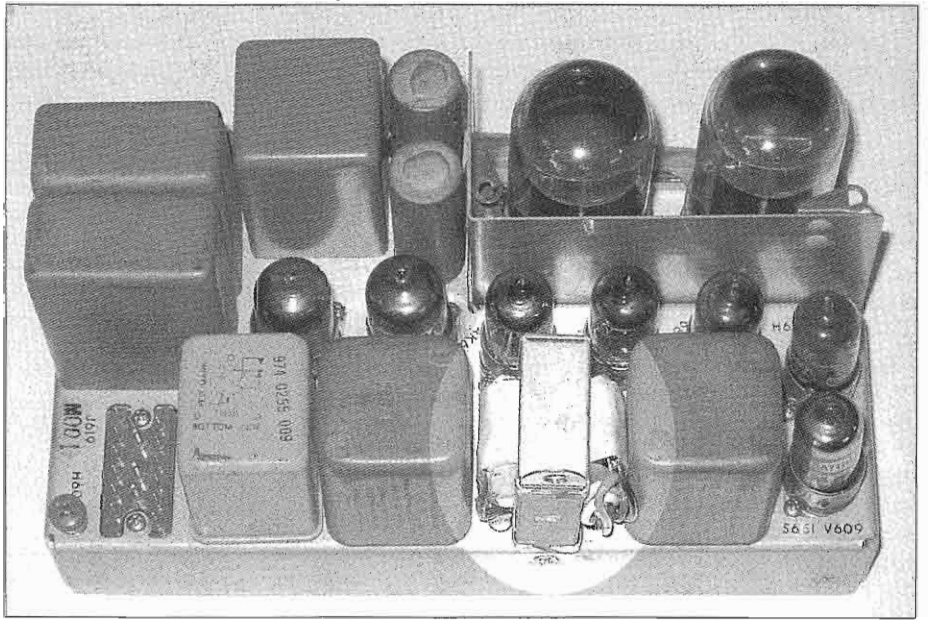


Figure 1 above shows the very crowded R-390 (non-A) audio module with my Hammond 8-ohm output transformer mounted in the highlighted area of the picture above.

Figure 2: The outboard 15-inch speaker system has my amplifier mounted above the base reflex port as shown in this view.

for my Collins receivers. The audio was nearly as good as from my A-line receivers with the local audio gain control set for quiet room listening. But, at higher levels, I could still hear some distortion. Listening to broadcast music, even in 16-kc selectivity, my SX-28's audio was much better than the modified R-390 audio. I wasn't satisfied, since I enjoy listening to broadcast music on my general coverage receivers. Further study indicated the best solution might be to use an external audio system that could supply adequate audio power.

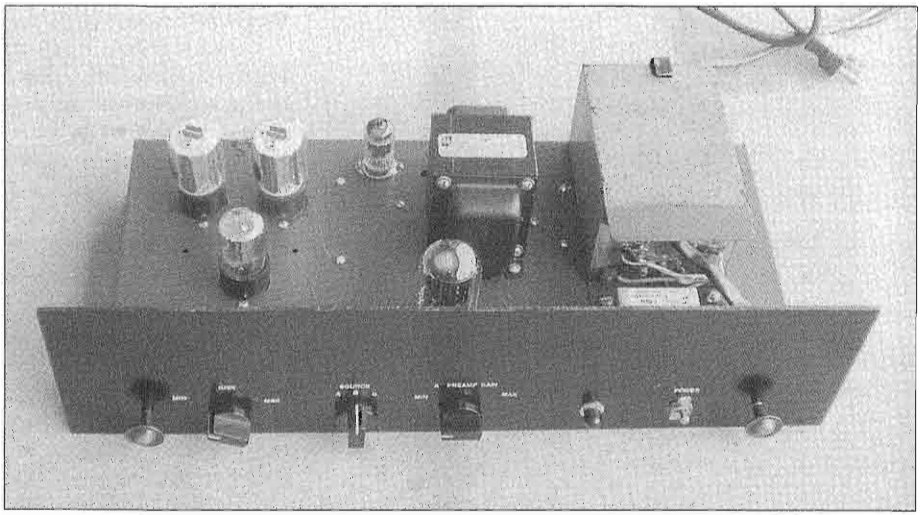
Last October, the opportunity for an audio system was presented when Brian Thompson (NI6Q) mentioned he had a spare prototype 15-inch speaker and enclosure he had developed for Joe Walsh (WB6ACU). It was capable of 70 watts of audio and had very good mid and high range audio response.

This system, shown in **Figure 2**, also had a place for an audio amplifier just above its bass reflex port; the amplifier described below is also shown installed.

This system came without an amplifier and the speaker had an odd input impedance of 150 ohms. I tested this system on music from half of my R-390's line output transformer winding, giving a 250-ohm match, and driving the speaker to a comfortable level in a quiet room. Comparing the audio from a broadcast station playing swing music, the R-390 sounded better than the same station tuned in on my SX-28. My XYL, who has a good ear for music, also felt the audio from this speaker system was better.

It now looked like I had a solution to the R-390's audio problem if I could only build an amplifier to drive the outboard speaker system. The line audio seemed to have a clean output if its output was kept below .1 watt. The speaker system was designed for a high output, so it would be great to have an amplifier with sufficient power, at least 25 watts, to drive the speaker for outdoor use on our patio. The problem was to find an output transformer to match this speaker's unusual 150-ohm impedance.

Consulting the Hammond web page, I found their push-pull transformers had the normal 8 and 16-ohm outputs and a few even had 500 ohms, but nothing near 150 ohms. But their 30-watt model, 1645, had a 70-volt output. After a simple calculation of what output impedance would be required to match 30 watts of audio at 70 volts of audio, I determined this winding must be close to 166 ohms,



Above is Figure 3, showing the completed amplifier with the power transformer on the right side, the audio transformer in the center, the 6SN7 and 6L6 output tubes on the left, the 12AU7 preamp tube in the center rear and the 5V4 rectifier in the center just behind the front panel.

perfect for my requirement. An email to Hammond confirmed my reasoning, so I ordered a 1645 Hammond transformer from Antique Electronic Supply. This transformer has the added feature of being of an ultra-linear design. It has a primary winding with a screen tap for tetrodes, making it capable of very low audio distortion.

A British inventor, Alan Blumlein, invented the ultra-linear amplifier prior to WW2; visit http://www.doramusic.com/Who%20Was%20Blumlein.htm for more about Alan Blumlein. Joe Widunas (N6DVD) sent me, in Adobe format, a very interesting paper by David Hafler on this system. If you are interested in this paper, send me an email and I'll send a copy by return email.

The amplifier I built, shown in **Figure 3**, has front panel gain controls, an input channel-select switch, a power switch, and a power-indicator lamp. On the back of its chassis are terminal strips for the audio inputs and a fused power receptacle.

Knowing nothing of audio amplifier design, I decided to take a crack at designing my amp by copying other designs.

I tested the amp using my scope and an HP205 audio signal generator. I have no way of measuring audio distortion so I just looked for clipping of the output's sine waves and listened to broadcast music. I determine frequency response by looking at output amplitude using my scope while sweeping the frequency of my HP-205 audio oscillator that feeds the amplifier's input.

I also confirmed the impedance of my 150-ohm speaker using a method described in a Jensen paper on 70-volt audio systems that was sent to me by John Svoboda (W6MIT). The method uses a signal generator and a variable resistor in series with the speaker to test speaker impedance vs. frequency. This speaker has an impedance of 150 ohms near 100 cycles and 450 ohms at 7 kc. This increase with frequency is normal for moving coil speakers. They are usually rated for the lowest impedance in their usable frequency range.

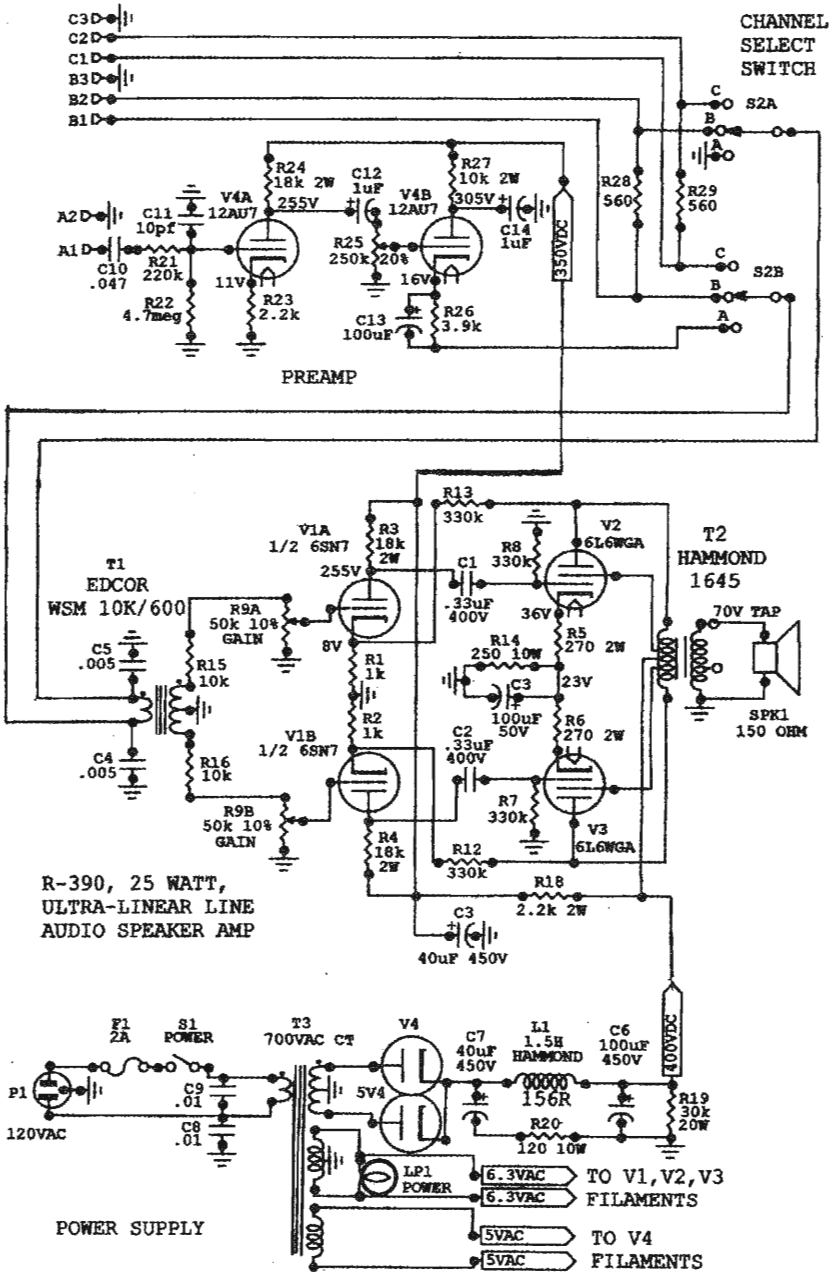


Figure 4: The schematic of the complete amplifier with the preamp and inputs on top, the driver and output stages in the center, and the power supply drawn on the bottom.

After prototyping and testing, I came up with the design in the schematic of **Figure 4**. It's output stage uses a pair of 6L6s in class AB1. It's capable of delivering 25 watts of audio into 150 ohms with no sign of clipping or visual distortion of the sine waves on my scope. I used 150 and 450-ohm, 5-watt carbon resistors for testing. But, at full power, the tests had to be very short to not smoke the resistors. The amplifier uses a 6SN7 dual triode tube R-C coupled to the 6L6 grids. Initially, I used the R-390's line output to directly drive the 6SN7 grids through a 560-ohm swamping resistor. But, upon further thought about other uses for this audio system, I added an Edcor input transformer for more versatility.

To drive the amplifier from other sources, I added switch S2 to select from 500 to 600 ohms sources on channels B and C, or a very high impedance source on channel A.

The amplifier's overall gain is controlled by the dual potentiometer R9 on the 6SN7 grids.

The high impedance channel A preamp gain is set by potentiometer R25, allowing the overall gain to be equal when switching between channel A and the other input channels.

Channels B and C have 560-ohm matching resistors, R28 and R29, to present proper loads to 500 or 600-ohm sources. When the amplifier is being driven by a low-impedance source, I shunt the input at the terminal strip with a resistor equal to the output impedance of the source.

I found the amplifier response to be flat within 1 dB between 10 cycles and 20 kc. It takes less than 1/16 watt of input into channels B or C to drive the amp to 25 watts of output. This excellent frequency response is from large value interstage coupling caps and negative current and voltage feedback.

Unbypassed resistors R5 and R6 provide current feedback for the 6L6 output stage, and R1 and R2 are current feedback for the 6SN7 driver stage. These resistors were selected for proper cathode current in the 6SN7 driver.

Voltage feedback is provided through R12 and R13 from the 6L6 plates to the 6SN7 cathodes. I don't have the ability or knowledge to calculate resistor values for proper voltage feedback. But, by testing and trying resistor values to obtain a flat frequency response, I determined the values of these resistors.

The preamp, V4, has current feedback because R23 is unbypassed. I found that driving the primary winding of the input transformer, T15, from the preamp through C13 resulted in the best match and better frequency response than driving it in parallel.

R26 establishes the DC current through V4B and the transformer's primary. The preamp's input impedance is very high because of the unbypassed 2.2k cathode resistor for V4A and its 4.7-Meg grid resistor. This amp can be driven to full power by a non-amplified D-104 mike feeding the preamp.

The power supply uses a 5V4 rectifier tube and a PI filter to supply 400 VDC at 120 VAC of input voltage. For best audio performance from 6L6s, their plate voltage should be near 400 volts, according to my RCA tube manual. I found it best to use a 5V4 rectifier tube that has indirectly heated cathodes. This will warm up slower than the amplifier's other tube filaments so as to not exceed the voltage rating of the filter caps.

I used a surplus military transformer for T3. It has a 700 VAC center-tapped winding and both 6.3 VAC and 5 VAC filament windings. But, the 6.3 VAC filament winding was center tapped, so I had to keep both filament wires above ground. I discovered this when I initially wired the filaments to chassis ground and almost burned up the transformer. There was low filament voltage and it started blowing fuses.

After building the amp and installing it into the speaker enclosure, I connected

channel A across the diode load of my R-390 and the line output to channel B. For reception of strong voice AM signals, using 8-kc of IF selectivity, I found very little difference in audio quality between the R-390 line and diode outputs. With power line noise and other QRM during AM voice reception, I usually use the line output so I can use the noise limiter and the 3.5-kc audio filter along with controlling the audio gain from the R-390's front panel. For broadcast music on very strong stations when using 16-kcs of IF selectivity, I use the diode load output. There are more lows and highs giving excellent music fidelity. Figure 96 in my R-390 manual shows how the audio output drops off below 200 cycles and above 6 kc with its internal audio amplifier system.

I also find I'm able to copy poor or weak amateur AM signals nearly as well using this audio system as with headphones connected to the local audio.

To determine why this system seems to work so well, I ran a simple frequency response experiment. Since I didn't have a chamber for audio testing to reduce sound reflections, I set up my speaker system in my back yard, over the lawn, pointing out toward an open field behind my property. I placed a high-quality, flat-response condenser microphone 10 feet in front of the speaker, and in line with the speaker's cone. The mike was connected to the preamp of my Symetrics 528 audio system to amplify the mike's output so I could observe it on an oscilloscope. I used my HP205 audio oscillator to drive the audio system's amp and adjusted the input frequency.

I swept the amplifier input with a constant signal amplitude between 50 cycles and 9 kc while recording the system's audio output on my scope by noting the displayed sine wave amplitude at each test frequency. I next converted this data from scope amplitude voltage to decibels by using the output observed at 50 cycles as "0dB." This resulted in a very revealing plot of the system's frequency response.

The curve showed a rapid raise from 0 dB at 50 cycles to 12 dB at 150 cycles and then a flat area up to around 800 cycles. This was followed by a sharp dip to 8 dB at around 1.1 kc, followed by a steady raise to 18 dB at 3kc; then a fairly flat area to 5 kc, followed by a drop to around 0 dB at 8 kc.

Since the amplifier has a completely flat response over the range of frequencies tested, this response is the result of the speaker and enclosure design.

The frequency response is very similar to the response I've found best for setting my Symetrics 528 EQ system for use with my AM transmitters. I use a low frequency peak for warm sounding audio, but a higher upper mid-range peak for good communications quality, with a dip at 900 cycles. This response experiment indicates why this audio system sounds so good for listening to music and AM amateur radio audio.

This audio system has made my R-390 a much better receiving system. Music, using the diode load output, is outstanding, better than from any other receiver I've used. Unfortunately, if you want to build this system, the speaker and enclosure I used are not available, being only a custom built prototype. I know of no source for them at this time, but maybe something could be built by using multiple speakers and crossover networks. Most 15-inch speakers don't have good high frequency response unless you can find a special one like I did. A good 10 or 12-inch, wide-frequency response speaker in a bass-reflex enclosure could work well using an amplifier like mine.

Hopefully, this article will give you some ideas and some guidance for using an R-390 for AM reception, and a design for an audio system without having to modify your receiver. I would like to thank everyone mentioned above for the equipment and valuable information they supplied for this project.

ER

Ham Radio's Twins

The Morrow MB-560 Transmitter and Falcon Receiver

By Harold Smith, W4PWQ
1435 Bush St.
Pensacola, FL 32534

The Morrow Twins that I have in my collection are the Morrow MB-560 transmitter and the Morrow Falcon BCT receiver. They were produced in 1956 and 1959.

They were designed primarily for mobile use, both measuring 11 3/4 x 4 x 7 inches. Those of us that were present in 1955 and 1956 will remember that automobiles in that period had plenty of radio space under the dash. The Morrows fit under the dash very well and performed quite well also.

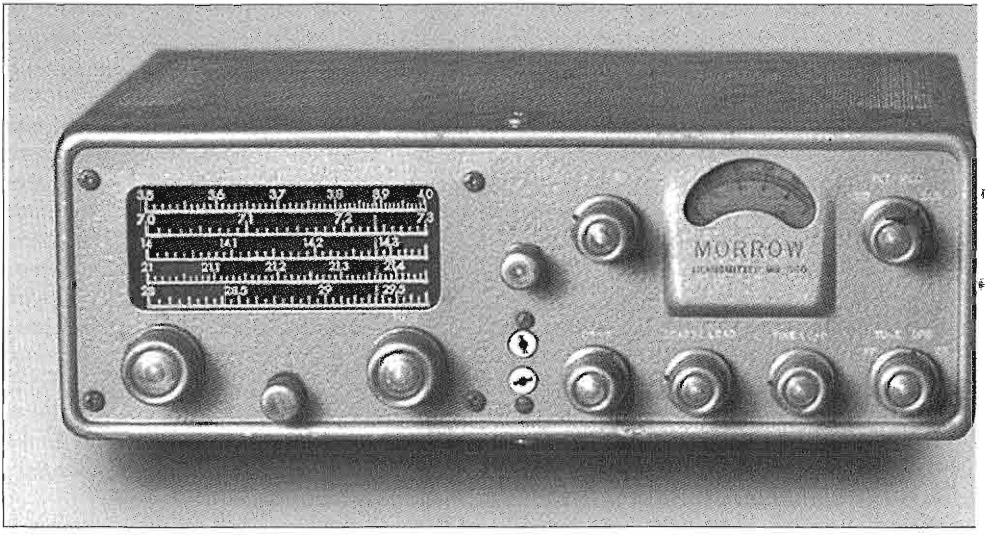
Remember that in 1956 very few, if any, cars had air conditioners. A few years later they started hanging air conditioners under the dash. This made installing a ham radio a new challenge.

Morrow Twins have slide rule dials, polished aluminum knobs, and engraved lettering with the usual white highlight.

The best way to describe their appearance is "they are beautiful."

My first experience with Morrow was about 1954. I had been using a home-built converter feeding into my car radio. It was not really good but was barely usable. I saw an advertisement for the Morrow 3BR three band converter from Salem, Oregon. I had to have one. I think I paid about $75.00 for it. It was a lot of money to spend but it was terrific. I was the first Ham in town to own one and, needless to say, it got lots of attention.

I believe that the period of 1955 was about the time that manufacturers were striving to see who could build the smallest, most compact mobile radios. Companies like Morrow, Gonset, Heath, Subraco, Elmac, Harvey Wells, Johnson, Lysco, Palco and others were mostly turning out mobile transmitters. Some were also building receivers. This part of Ham radio was short lived. By about 1962, most of these companies were gone. They were either out of business or had moved



The Morrow MB-560 transmitter is on the left. (Photography by Joe

on to more profitable markets.

Morrow MB-560 Transmitter

The specifications for the Morrow MB-560 transmitter are:

- Bands - 80-40-20-15 and 10 meters
- Modes - AM and CW
- Output power - 50 watts
- Input power requirements - 6 or 12 V, 250 VDC, and 300 to 600 VDC, and 67V (minus) for the modulator.
- Modulator limiting
- Modulator band pass filtering

MB-560 uses the following tubes:

- RF section, 12AT7 VFO crystal/ xtal osc., 6AN8 cathode follower/driver, 5763 amp/driver, 6146 pa.
- Modulator section - 12AX7 speech amp, 6AL5 clipper, 12AT7 audio driver, a pair 6AV5s in the modulator, and two 0B2 regulators.

There was plenty of good AB2 modulation with excellent quality, even with the carbon microphone that is required. If Morrow built a power supply I have never seen one. In the AM mobile days of the 1950s, we used 6 or 12-VDC dynamotors. This was about the time that automobiles were switching from 6-volt systems to 12 volts. Presently for fixed station use, I use a 120-VAC power supply.

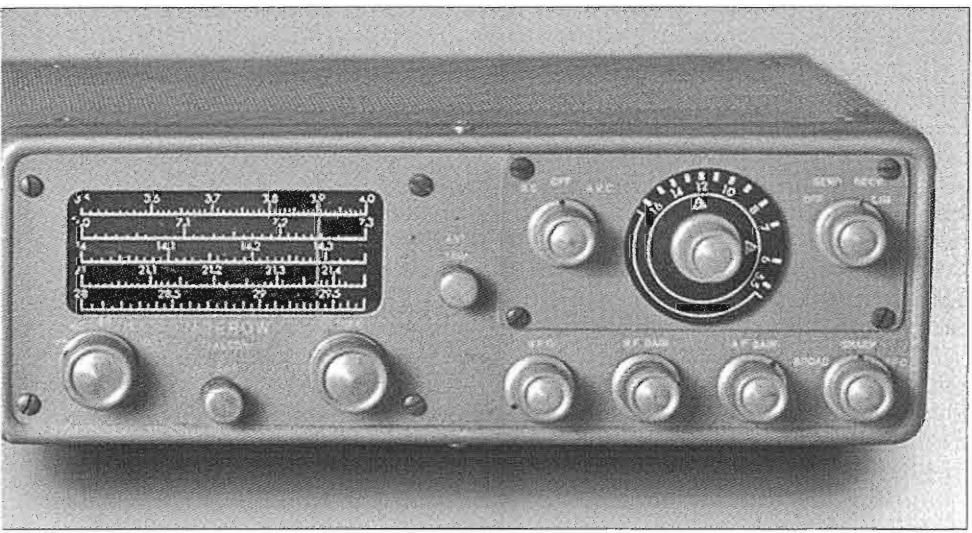
Morrow Falcon Receiver

The Falcon version appears to be the same as their model MBR-5 less the "S" meter and calibrator. My receiver is actually the Falcon BCT. It has a built-in broadcast receiver to be used as a Conelrad monitor.

FCC required all Hams to monitor the Conelrad emergency frequencies in the broadcast band. That requirement was short-lived, thank goodness.

The receiver uses 13 tubes and is a double-conversion design. The IF frequencies are 1525 and 200 kHz. It covers 80 through 10 meters, AM and CW modes. It has all of the features that make up a good quality receiver. The tube lineup is 6BZ6 RF amp, 12AT7 1st mix and local osc, 6BJ6 1st IF amp, 6BE6 2nd mix and xtal osc, 6JB6 2nd-IF, 6T8 det/avc and bfo, 12AT7 noise amp. 6AL5 noise squelch, 6AL5 noise limiter, 12AX7 1st audio/squelch, 6C4 2nd-AF, and finally a 6AQ5 audio amp output.

I hear the "old timers" on the air talking about how they could work on and fix the old tube equipment but they cannot do anything with solid state gear. Don't believe the part about tube equipment being easy to work on and fix. They have



ras, K9OCO) **The matching Morrow Falcon Receiver is on the right.**

obviously never had to dig into a 13-tube compact receiver, unstack layers of components and try to reach and replace a broken bandswitch.

The Morrow Twins were designed to be used as mobile units and were great performers.

Speaking of mobile units, I am reminded of a happening back in the late '50s. At the time, we were having 10 meter transmitter hunts (foxhunts) on Sunday afternoons. It was my day to hide. I had a 1955 Dodge 4 door with my Morrow transmitter and receiver. We met at a shopping center. When everyone arrived and signed in, I took off to places unknown. Actually, I drove around the complex and parked out of sight, not a block away. I removed my antenna, placed it I my trunk. I installed a 100-watt lamp as a dummy load, placed an advertisement banner on the back of my car for disguise, put on sunglasses and a hat with coat and tie. I placed my microphone inside a newspaper to hide it. I called in and gave the ready signal. Here they go in all directions with their loop antennas out the window, trying to zero-in on the fox.

I was required to transmit every two minutes. They would drive out of range and come back. Take off in another direction, out of range, come back. Normally someone would find the fox within 30 minutes. This went on for over an hour. Finally some dude came around the corner on foot. When he got close by he heard my dynamotor running. He dragged me from my car and threatened to cripple me. The hunt was over. They never allowed me to play "Foxhunt" with them again. I never could figure out why! (TRUE STORY!)

To sum up the Morrow twins, I can honestly say, "They are beautiful and I love them." I believe ER #43, November 1992, has the history of Morrow and the founder Mr. Ray Morrow (W7AWE).

[Comments from page 10]
metal parts on an area that can't be seen before doing the entire part.

The photo on page 13 of ER #199, December 2005, needs updating. Mike Monnier (W8BAC) reports that the transmitter chassis pictured is actually part of the homebrew transmitter cabinet on the left side of the table in the upper photo on page 15. This was discoverd after more research into the W8GLW archive.

Finally, In ER #200, January 2006, page 23, "Murphy" got his hands on the circuit diagram for the WARC-band converter. The grid-return resistor in the crystal oscillator portion of V-1 is missing. This was commonly about 100k-ohms in many applications.

AMI Update - April 2006
By Dale Gagnon, KW1I
AMI President

Dayton Hamvention 2006 - AM activities are again planned for the Dayton Hamvention May 19-21. The AM Forum is scheduled for 4:00 pm on Friday, May 19. Check the Hamvention program for the correct meeting room.

The feature presentation of the AM Forum will be a program by Rick Ferranti, W6NIR: "Calling All Rangers! - A Technical History of Radio Development in the US Forest Service" - Though not widely known, the US Forest Service's Radio Laboratory was a key innovator of portable HF and VHF AM radio equipment in the 1930s and '40s. A handful of radio engineers — all of them Hams — not only designed and fielded the gear; they also discovered and exploited a whole new HF radio propagation mode - NVIS. This heavily illustrated talk will include the radio amateurs, antennas, and equipment that made an enormous difference in the safety and effectiveness of the foresters on the fireline.

On Saturday evening at 7:00 pm AMers will gather at Marion's Pizza Restaurant in Dayton to enjoy eyeball QSOs and to swap stories and pictures.

The AM Broadcast Transmitter Log

Part 9, The Martians Meet Frankenstein

By David Kuraner, K2DK
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Haymarket, VA 20169
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This month we will be discussing several uniquely different transmitters. Each has its unique attributes and can serve as examples of how to convert similarly designed transmitters. The "Frankenstein" modulation scheme and a higher power level are all quite interesting and deserve to be highlighted. One of the BC transmitters I considered converting is a McMartin BA-1K, a 1-kW box. Both this model and its big brother, a 2.5-kW box has been converted and documented. Next is a one-of-a-kind transmitter which started life as a Continental 1-kW box. In previous months, several control systems were described. Further detailed elaboration for each transmitter would be redundant and become repetitive. Only a brief discussion of control requirements will be given.

The McMartian (sic) Boys

The BA-IK, "Marty," is a mid 1970's design weighing in at 800 pounds. The low-power audio and RF stages are solid state. The exciter is a separate RF box embedded within the bigger box. The output of the exciter is variable up to 40 watts to drive the final stage of parallel 4-500As. Most of the BA-1K rigs were converted to 4-400As when these boxes were still in regular service because the "4 by 5s" were already getting extremely expensive. Not many transmitters were using them and this was just as the solid state 1-kW BC AM boxes were starting to appear. (It would be tempting to try to obtain one of these early solid state transmitters for conversion, but they are not suitable. They use multiple power modules and combiners which would make retuning extremely difficult.)

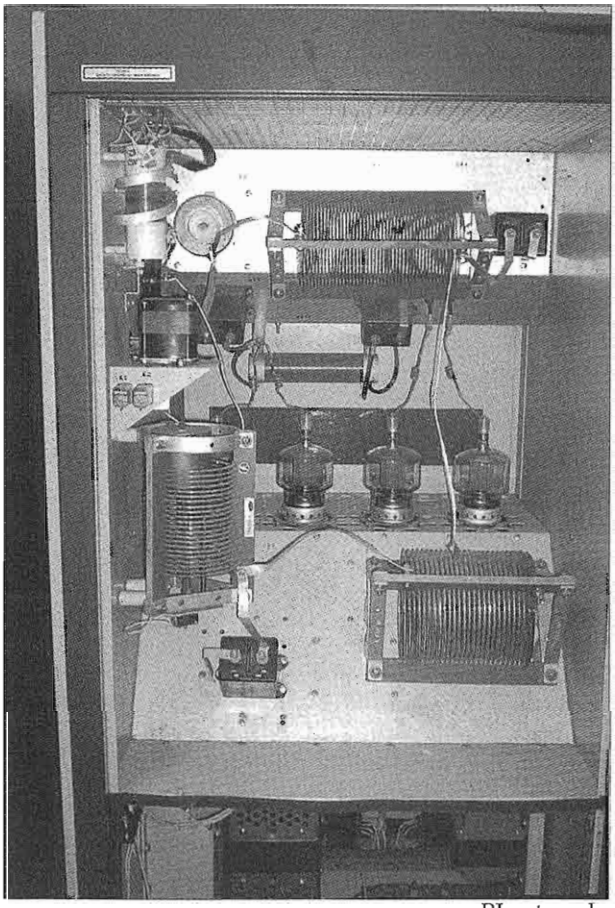
The tube conversion from "4 by 5s" would be to simply place the "4 by 4" tubes in the same socket and change the filament voltage from 10 volts to 5 volts. Sometimes a new filament transformer was used. Others would change the primary voltage on the existing transformers from 240 to 120 volts so the secondary output voltage was cut in half.

The exciter used a crystal at twice the output frequency. It was digitally divided to the proper frequency. This was supposed to result in better frequency stability. It was probably unnecessary and it becomes problematic for us because, to use the existing exciter, you must order a special crystal. All who have this transmitter converted to amateur use eventually disabled the internal exciter for an external one.

A modern transceiver is often used with an antenna tuner for matching into the grids of the final. A vintage transmitter could be employed as well. The PI tank circuit of the vintage transmitter would most likely facilitate a better match to the grids, negating the need for a tuner.

The BA-1K uses a motorized system to tune the final vacuum tuning capacitor and the variable loading coil. The vacuum variable is restricted from 500 µf to 1000 µf by limit switches. Similar limit switches are used with the variable loading coil. When transformers are removed for shipping, the transmitter box is top heavy because of these motor assemblies.

My preference would be to try to preserve the motorized tuning in some fashion; however the box which was converted was placed on all three bands, 160, 80 and 40 meters. In order to do this, the existing output network was reworked totally by removing the motors and directly tuning the vacuum variable from the front of the transmitter. The network was converted to the PI network configu-



Above: The rear view of an unmodified McMartin. The drive motor for the loading coil is seen on the left. The two small relays are associated with the limit switches. The tuning vacuum variable is just above the motor. The three band conversion removed everything for just a simple PI network. The external exciter goes directly into the final grid circuit.

ration and a variable output vacuum cap was added.

The transmitter is reported to be very stable on all three bands and is being driven by a modern transceiver acting as an exciter.

The remote control connections appear on TB7 and TB8. The filament start is a contact closure. The HV plate control is momentary on and off. The transmitter is normally supplied as a 1-kW/250-watt rig. The power change is accomplished by different taps on the HV transformer, so two relays are required for the power selection function as previously described for the Gates BC-1G[1]. TB6 provides connections for the remote control of the tuning motors and remote metering functions.

The major electrical difference between the 1-kW and the 2.5-kW are the tubes used. The "Big Mac" as its owner, Bob Raide (W2ZM), calls it, employs parallel 4-1000s in the RF stage and two 4-1000s for the modulators. Bob has referred to the McMartin as vending machines because of the wood grain contact paper these boxes have on the front. Bob made some modifications including converting to the PI network with a Q of 12 for the output circuit. There are no rewards for efficiency, as the filament power alone for the four bottles is 600 watts.

The "Big Mac" is excited with a Viking II for both RF and audio. The 4-1000s in the modulator have been rewired for triode operation to eliminate the screen and control-grid bias supplies. There is plenty of audio from the push-pull 807s in the Viking 2 to drive those big bottles. The input circuit is inductive coupled and neutralization was added. Band switching simply requires a shorting clip on the coil to change inductance as needed for resonance.

Bob has designed a very simple step-start circuit for the HV, shown in **Figure 1**. Two activators are used. The first is

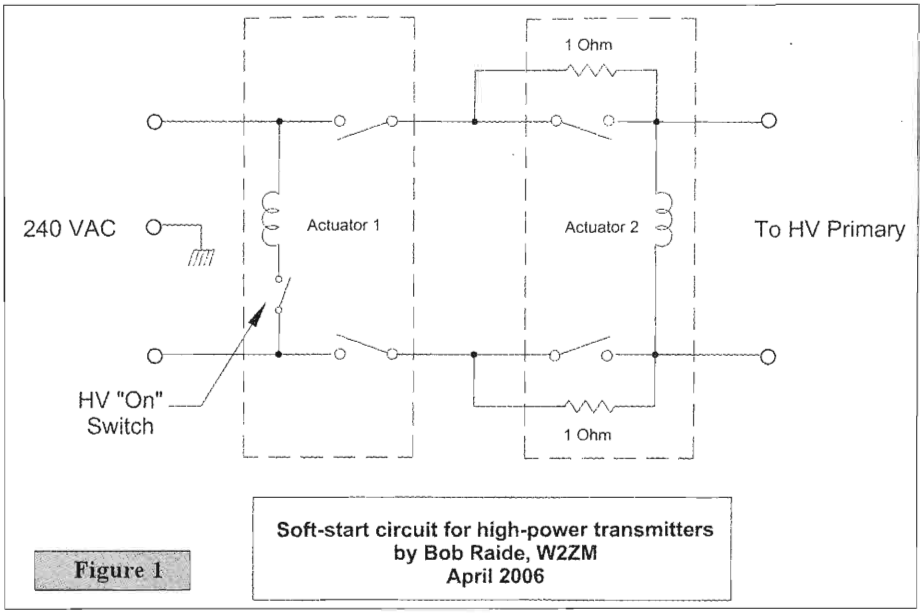


Figure 1

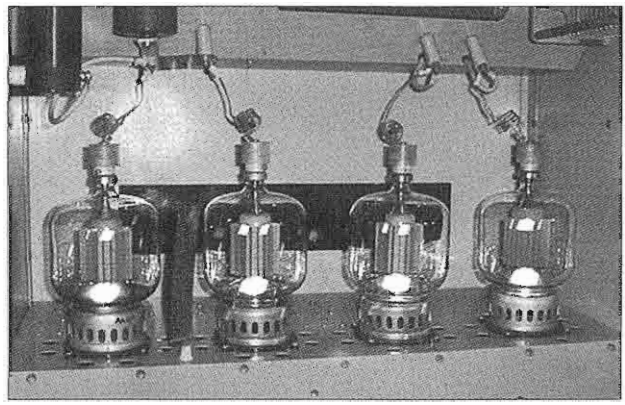
Soft-start circuit for high-power transmitters
by Bob Raide, W2ZM
April 2006

triggered by the Viking II's RF changeover relay. One-ohm resistors are in each leg of the primary HV winding and the second activator's coil. As the initial surge draws down the line voltage, the second activator does not come in until the line voltage recovers sufficiently for it to do so. Once number 2 triggers, the one-ohm resistors are removed from the HV primary and the rig is now up and running at full power. The sequence is very rapid with no perceptible delay or double clicks. Bob uses 100-watt resistors, but believes that the ones sold by Radio Shack at 10 watts should be OK for the few moments they are active[2]. This scheme could be applied to almost any rig needing a soft start.

The Bruiser, AKA Frankenstein

This transmitter started life as a 1-kW Continental AM transmitter. The unique thing about it, placing it aside from most of the 1-kW rigs we have been talking about, is the fact that it uses four parallel 4-400As in the RF stage and was screen-grid modulated.

Somewhere in its afterlife, it came to the attention of Timothy Smith (WA1HLR) and Bob Raide (W2ZM). These two "mad scientists" came up with a crazy scheme to rejuvenate the monster. It was Bob who turned it into the Frankenstein with parts from different rigs and designs to make a living



4-1000s from the rear of the 2.5 kW McMartin.

breathing "Whatever!"

It seems that the original design had the plates of the finals glowing red and was extremely inefficient because of the grid modulation design. The box was extremely big, and it was realized that two additional bottles with the appropriate mod iron could be incorporated with ease. So, Bob, not needing a giant and equally inefficient electric heater, transplanted the entire final modulator section of a defunct RCA rig. Like the monster Bauer, he drove the final RF and modulator stages from the same Viking II. The modulator tubes were 833As running Class B.

It's quite a sight to see two 833As and four 4-400As looking back at you thru the viewing window. The RF final is now fully running Class C, resulting in much greater efficiency. Mods for the input circuit and neutralization, both similar to the monster Bauer, were included. And like all of Bob's rigs, it sounds great!

So, here you have some additional conversion possibilities for the different designs you may encounter.

The Transcontinental Bauer-to-Bauer QSO

There have been many BC-to-BC rig QSOs of the same manufacture. Mainly, they are Gates and Collins because of their proliferation on the Ham bands. This past October, the first known Bauer-to-Bauer QSO took place between me on the east coast and Paul Wende (VE7MHZ) in British Columbia on 80 meters. Also this past October, a McMartin-to-McMartin exchange was reported as our editor Ray Osterwald was reading the mail in Colorado.

It appears that many of these less recognized names are finding there way into amateur service. If you have experience with any BC rig not already mentioned in this series, please pass it along. Let's encourage our fellow Hams and not force them to continually reinvent the wheel.

[1]David Kuraner, K2DK, The AM Broadcast Transitter Log, Part 5, The Gates/Harris BC-1 Series, ER #198, November 2005

[2]A limited number of 10-ohm, 50-watt resistors are available. Please contact K2DK for further information.

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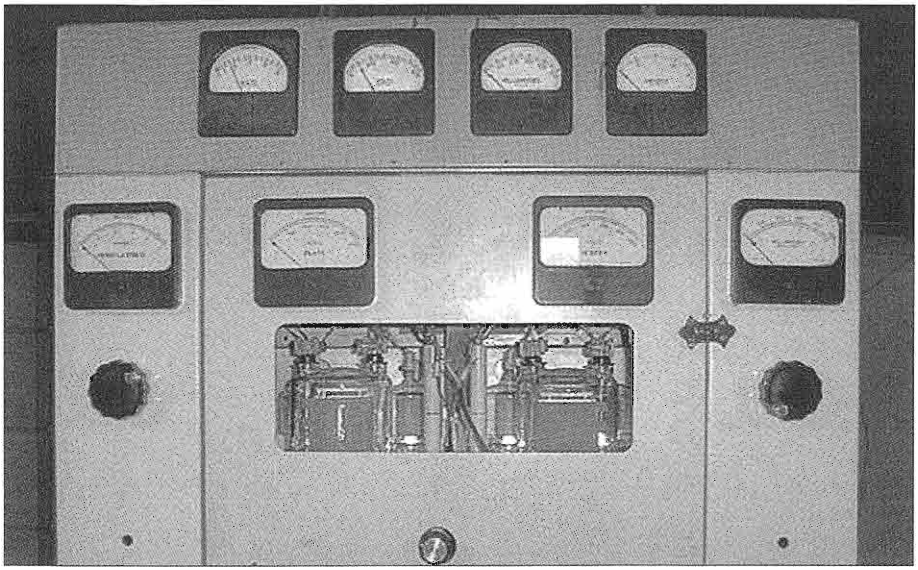

"Frankenstein!" Look closely and quad 4-400s can clearly be seen behind the 833As.

Further Applications of Classic Transmitters

By Towers, J.H. and Duncan, J.M.

Our article "Classic Transmitter Controlled Computer" in the April 2005 ER was apparently seminal and has produced an outpouring of creative applications of classic transmitters. This demonstrates clearly that we BA enthusiasts are definitely not Luddites in a digital world.

From Atlanta, where you normally don't think of cold weather, there is a report in a CX Newsletter that a Viking 500 was an effective heater for the shack and also served as a low table. Our research built on his finding and we were able to improve on it. There has been a trend to replace venerable old rectifiers such as the 866, 5R4 and 5U4 with solid-state devices. We discovered that replacing these nondescript solid state devices with the original tubes not only increased the heating capability of the classic transmitter but also restored much of its former beauty - double payoff!

Tailgating is a significant highway safety hazard and can be effectively controlled with an appropriate mobile classic transmitter. It is well known by any Ham who has attempted to put a significant HF rig into a modern car that the engine computer control and other computer controlled systems do not play well with HF radios. Drawing upon the extensive RFI research we did as part of our CTCC work, we again reverse engineered the RFI situation. Our analysis and research indicates that a mobile classic transmitter at 500 watts input on 14 Mc, and a rear bumper mounted whip, would slow down a modern car's tailgating. It is a simple but effective self-limiting process: disrupting the following car's engine computer until it is a safe distance behind. (Remember that this is a one over R squared phenomenon when designing your system.) But, you ask, what about my car, won't the classic transmitter affect it too? Only if you have left the fine tradition of BA enthusiasts and are no longer driving your '57 Buick Roadmaster or '49 Plymouth. As an adjunct to the 500-watt transmitter, one might also employ a full length, quarter-wave whip on 20 with a lead weight (capacitive load) on the tip. At highway speeds it will assume an appropriate position well to the rear of your car and will appropriately threaten the windshield of a close-in tailgater.

A West coast BA collector reported several years ago in a CX Newsletter that he had demonstrated an effective method of controlling his children's electronic game playing by running his Johnson Desk kW at full power. Our research

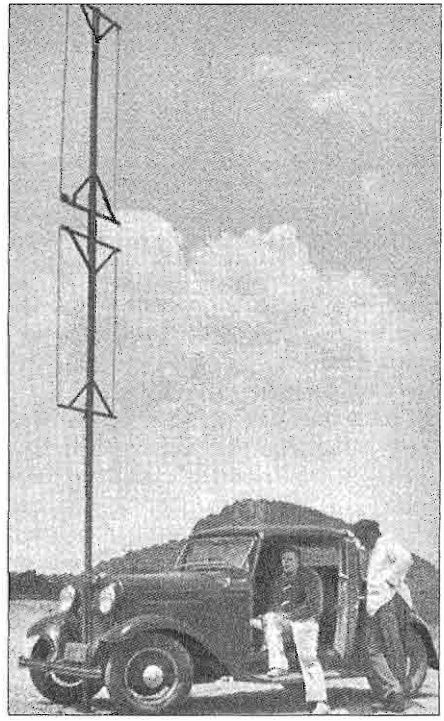

Figure 1: The Towers and Duncan mobile radio lab.

attempted to build on that but using techniques other than brute RF power. Our approach was to draw upon the current "V-Chip" thinking by using a Johnson Valiant or Viking I for the same purposes. While the classic "V" transmitters, in particular the Viking I, are well suited to blotting out the games' pictures on a television set, they unfortunately do not reliably disrupt the games themselves so we are now advocating Rocco's original "D-kW" approach.

A New Mexico enthusiast found that when his electric fence charger went on the Fritz, several of his boatanchor transmitters served very well as replacements. Augmented by a transmatch to load up the fence, his Globe King convinced not only his dogs to stay in his yard but also a wandering bear to stay out of it. After the initial application, a Meissner Signal Shifter was all that was needed to keep the canines in check.

Not all of the applications for classic transmitters have such a high tech airs about them. One Ham, who asks to not be named, shared with us that he had an ongoing problem of voids and empty spaces throughout his basement, garage and closets. The inspiration came to him one day that the optimum way to solve this emptiness was with classic transmitters – which he has done with some success. An unexpected benefit is the size and weight of the gear precludes frequent cleaning and makes painting the area almost out of the question.

That same OM also noted that the rigs in the garage provided a convenient storage area for resident mice to keep their excess purloined dog food. This is being kept very quiet though, least the animal welfare community demands that classic transmitters be modified to provide for the safety of the mice. The difficulty of protecting them from dangerous high voltages and RF exposure risks would be significant.

Along similar non-high tech applications is one submitted by another anonymous ham. In this case, a BC-375 tuning unit case, the CS-48, was being used as a seat while pulling weeds and tending the garden. The extremely durable finish and rugged construction will allow this application to be enjoyed for many years.

We recognize that there are advantages accrued through the application of digital technology. With that in mind, we undertook to apply digital tuning to classic transmitters and receivers. After significant analysis it was apparent that the traditional electronic design approaches were much too limiting so we opened our thinking and went out of the box. A mechanical approach to digital tuning finally appeared on the white board, which we found could be easily implemented and significantly improved tuning speed and ease. This is the opposite of the spinner knob found on many Collins rigs. A small concave indentation carved into the knob can be used for turning it with just one digit – or finger. Another triumph; simple is best!

There are reports of practices in the past involving classic transmitters in unusual applications that have, thank goodness, fallen out of favor. A most grievous of these was observed at the Dayton Hamvention many years ago. A Ham, who is now a silent key and so will not be named least his legacy be tainted, initiated a contest to see who could toss a Globe Scout transmitter the farthest. One speculates that he had made an ill-advised purchase and recognized that it could not be sold, so he developed this disrespectful contest to recoup his losses.

As you can see from this sampling, there are innumerable uses for classic transmitters and associated integrated modern digital techniques. We encourage you to try some of these ideas yourself and share your results. Also, we are still actively researching the field and would appreciate knowing of your accomplishments. The progress made in this exciting field will be reported in the April 1, 2007 issue of ER. ☺

The KDØZS Equipment Notebook

The New Viking Valiant, Part 1

By Chuck Felton, KDØZS
1115 S. Greeley Hwy
Cheyenne, WY 82007

My basic approach in setting up the modulator on a communications transmitter produces maximum talk power. At the receiving end, this produces maximum signal to noise ratio.

Military funded research produced several conclusions about "talk power" that are easily demonstrable. These include the following items:

1. Extremes of treble and bass energy are noise that reduce intelligibility and should be filtered out.

2. A modest amount of automatic level control, up to 10 db or so, makes the voice more consistent. This allows keeping the modulation level high without over-driving the modulator.

3. The voice wave form has a high peak-to-average ratio. Most of the tonal and intelligence information is contained in the bottom 30% of the wave form. The top 70% consists of spikes–actually packets–of energy, the "scream energy" used to convey primitive information over long distances, well before radio. These spikes can be clipped or compressed to increase the percentage of the remaining wave form containing speech information. Depending on the voice characteristics, 6 to 10 db of clipping gives greatly improved intelligibility when considering compression of useful dynamic range at both transmitter and receiver.

This basic processing can all be done with simple means within the transmitter. Clipping can be set just short of 100% modulation for maximum use of available modulator power. Some negative feedback around the entire modulator-driver, and cathode degeneration, control transformer ring, reduce distortion and suppress splatter. This new Valiant design is meant to be used at 100% modulation, compressed and clipped. It's loud with minimal distortion, and without splatter.

Limitations

A tube-type audio power amplifier (modulator) is limited by it's output (modulation) transformer:

- The low end is limited by the overall loaded inductance.
- Power is limited by the size and quality of core material.
- The high end is limited by distributed and shunt capacitance of the windings.

When these areas of limitation are invaded, saturation of either core or amplifying devices results. The result is saturation which results in splatter, and intermodulation which generates new frequencies which degrade intelligibility. The bottom line is don't give the transformer anything it can't handle. Negative feed back reduces distortion at lower levels only.

The stock Valiant driver transformer bass rolloff point is one thousand cycles. It's a high pass filter. It is the worst possible thing you could have after a clipper; it's trash.

On the other hand, the modulation transformer -3db point is about 100 cycles. A gradual rolloff from here down allows natural sounding voice.

Modifications

The speech amplifier and driver modifications are shown in **Figures 1 and 2**.

To eliminate the driver transformer and effect true Class AB2 or B operation requires a driver capable of supplying current in the positive direction. The cathode follower does this well. Look at "Radiotron Designer's Handbook," 4th edition, and Bill Orr's "Radio Handbook," 15th edition, for discussions of this.

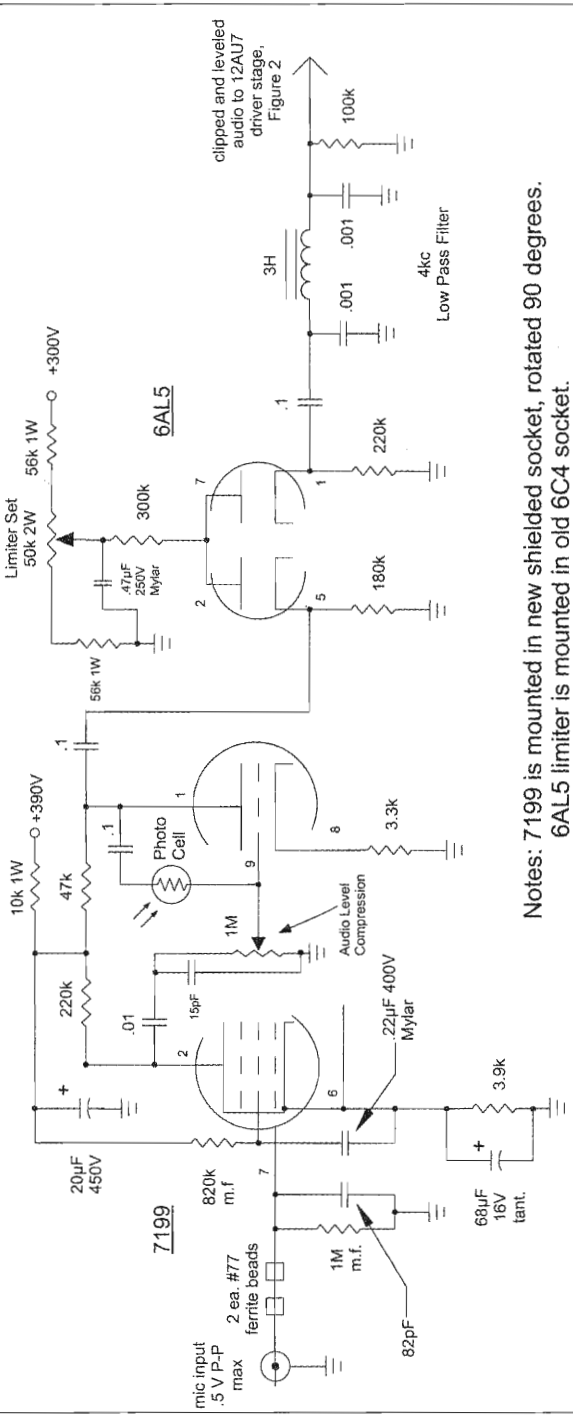
mic input .5 V P-P max
2 ea. #77 ferrite beads
7199
20µF 450V
10k 1W
+390V
47k
220k
.01
.1
Photo Cell
15pF
1M
Audio Level Compression
.22µF 400V Mylar
820k m.f
1M m.f.
82pF
68µF 16V tant.
3.9k
3.3k
56k 1W
Limiter Set 50k 2W
+300V
56k 1W
300k
.47µF 250V Mylar
6AL5
.1
220k
180k
3H
.001
.001
4kc Low Pass Filter
100k
clipped and leveled audio to 12AU7 driver stage, Figure 2
Notes: 7199 is mounted in new shielded socket, rotated 90 degrees.
6AL5 limiter is mounted in old 6C4 socket.

Figure 1

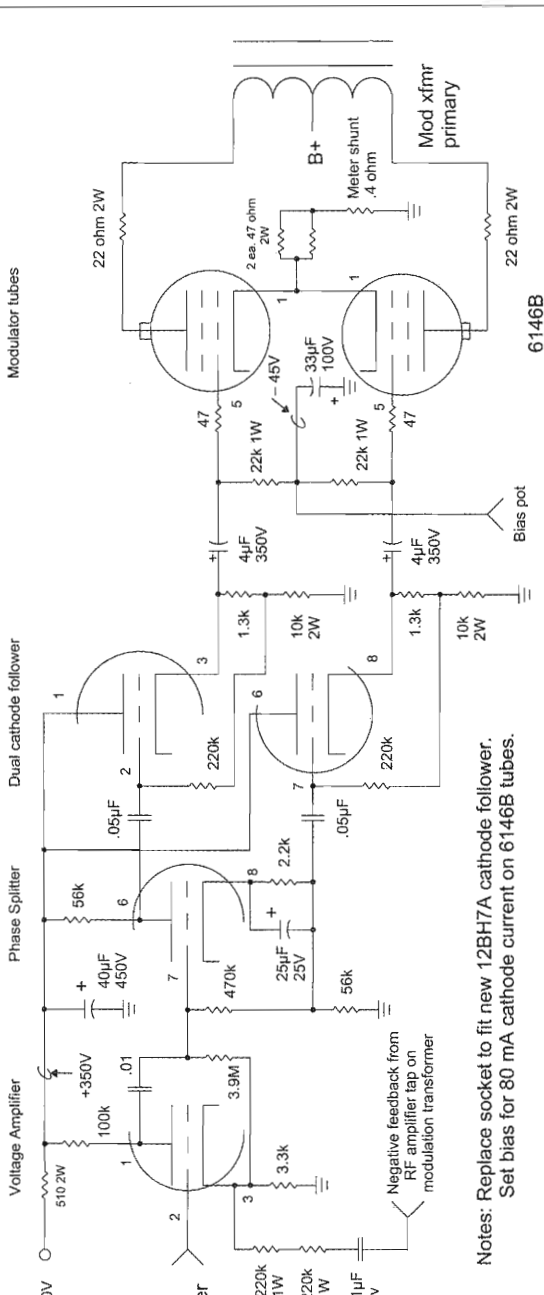
12AU7
Voltage Amplifier
12BH7A
Phase Splitter
Dual cathode follower
6146B
Modulator tubes
+390V
+350V
510 2W
100k
.01
3.9M
3.3k
220k 1W
220k 1W
.01µF 3kv
Audio input from L.P. filter
Negative feedback from RF amplifier tap on modulation transformer
40µF 450V
56k
470k
25µF 25V
56k
2.2k
.05µF
.05µF
220k
220k
1.3k
1.3k
10k 2W
10k 2W
4µF 350V
4µF 350V
22k 1W
22k 1W
47
47
22 ohm 2W
22 ohm 2W
2 ea. 47 ohm 2W
33µF 100V
45V
B+
Meter shunt .4 ohm
Mod xfmr primary
Bias pot
6146B
Notes: Replace socket to fit new 12BH7A cathode follower.
Set bias for 80 mA cathode current on 6146B tubes.

Figure 2

The -3db response point from the clipper to the modulator Class-AB2 grids is 8 cycles with this new driver. This prevents clipped energy from reappearing as noise spikes.

The 4-kc low pass filter removes any high frequency noise or distortion.

A real-time peak modulation monitor, which also provides some negative peak loading, is the yellow pilot light on the front panel. This turns on at about 90% modulation and is meant to flicker steadily with the voice. If it doesn't flicker, you're nowhere near 100% modulation. If the indicator is on continuously for the whole word, very little flicker, you're hitting it too hard with resultant degraded intelligibility. The received carrier necessarily controls receiver gain for AM reception. If you're not near 100% modulation at the transmitter, the received signal-to-noise ratio suffers.

Be Quick and Use a Fan

The relationship between modulator grid drive level and clipper output level is fixed. This is an adjustment that only needs to be made once in a while. First, short the AGC sender LED with a clip lead. Then, tune up into a dummy load with a 400-cycle audio source and Clipping Threshold (right side panel) full clockwise (no clipping). Look at RF output on a scope. Increase the audio level until you see obvious saturation on the wave form. Rotate the Clipping Threshold control gradually until the clipped wave form just squares up and slightly diminishes in amplitude. That setting should be around 5 or 6 and left there. The result is that any distortion now occurs in the clipper, which does not saturate or generate IMD, not in the modulator. The clipping also occurs right at full modulator output for best efficiency. Remove the clip lead.

The front panel Clipper Level control now sets automatic volume control threshold in relationship to 100% modulation which is clipping level. As the Clipper Level control (actually AVC threshold) is advanced, the leveled audio sounds louder as the "speech sounds" (lower 30%) become a larger and larger percentage of 100% modulation. At maximum clockwise, the voice may become muddied and less intelligible. Your ears will define where to leave it. Straight up works for me.

When correctly set up, the limiter and AGC thresholds will not allow over modulation. What's left for the audio gain pot is to set the amount of compression. This control compensates for varying mike output and mike technique. While talking into the mike normally, advance Audio Gain until the peak modulation monitor just flickers steadily. Advancing beyond this point gives compression. Some compression provides consistency, too much causes room noises and hum picked up by microphone to intrude.

LED Compressor Circuit

What allows the simple, no-distortion audio AGC is the optoisolator as a negative feedback element in an amplifier stage. This was used in studio mixing boards years ago, with the light-variable resistor (a photo cell) illuminated with an incandescent bulb. These worked well but were not reliable because the bulb burned out. Enter the LED flashlight! About 25% of these LEDs emit useful light at very small current (~50μA). This allows their use at tube impedances to control cadmium sulfide photocells, which have just reappeared in the parts catalogs. When they are mounted face-to-face and surrounded by shrink wrap tubing, you have a high impedance opto-isolator. This AGC circuit can be applied to any tube transmitter.

[Editor's note: Part 2, coming up in next month's issue, will show the details of Chuck's revolutionary opto-isolated compressor, power supply and bias circuitry, and additional Valiant improvements.]

ER

VINTAGE NETS

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

BFO CW Net: Tuesdays, 7PM local ET, 3693 kc. QSX WY3D in Southern NJ. Vintage gear welcome!

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

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

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

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

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

Collins Collectors Association (CCA) Nets: Tech./swap sessions every Sun. on 14.263 Mc @ 2000Z. Informal ragchew nets meet Tue. evening on 3805 kc @ 2100 Eastern time, and Thu. on 3875 kc. West Coast 75M net is on 3895 kc 2000 Pacific time. 10M AM net starts 1800Z on 29.05 Mc Sundays, QSX op 1700Z. CCA Monthly AM Night: First Wed. of each month, 3880 kc starting @ 2000 CST, or 0200 UTC. All AM stations are welcome.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Brian (NI6Q), Skip (K6LGL), Don (W6BCN), Bill (N6PY) & Vic (KF6RIP)

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

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

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

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

FOR SALE: Hammarlund SP600 $150. Pickup only. Lou, K4LOU, 540-347-2196

FOR SALE: Cushcraft R7 ant, coverall all 7 bands $100, vy gd cond, I ship. John Snow, W9MHS, 1910 Remington Ct., Andover, KS 67002, 316-733-1856

FOR SALE: RCA Radiotron Designer's Handbook, 4th Edition, 1482 pgs, $39 + shpg. Henry Mohr, 1005 W. Wyoming, Allentown, PA 18103-3131

FOR SALE: Heathkit HA-10 warrior amp, in 9 out of 10 condition for $300. Bob, W1RMB, 508-222-5553.

FOR SALE or SWAP: Swan Cygnet Xcvr $185. Icom AT150 automatic tuner $150. Bill, K5WJB, 281-540-9866

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FOR SALE: National 3-bar speaker, $75 +shipping. Edward Sauer, KC9SP, 787 N. Peterman Rd. Greenwood, IN 46142. 317-881-1483.

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

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

FOR SALE: Ford spark coil $15. Heath HW-16, no cabinet $35. BC348R with S-meter $65. Hallicrafters S77A $50. National multiband tank coil (MB-40) assembly, new, $50. Richard Cohen, 813-962-2460

FOR SALE: Leesona coil winder. Shop floor variety & heavy. Pictures available. $200 OBO. Bill, N5ACA, 713-721-2242, mingqi53@sbcglobal.net

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FOR SALE: Tecraft 10 meter AM transmitter, exc, $95. Johnson 6N2 VFO, exc, $85. Richard Prester, 131 Ridge Road, West Milford, NJ 07480. 973-728-2454. rprester@warwick.net

FOR SALE: Scott Model 800-B, beautiful all chrome with Sams Photofact schematic, $500 firm plus shipping. John Snow, W9MHS, 1910 Remington Ct., Andover, KS 67002, 316-733-1856

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FOR SALE OR TRADE: Complete QST 1915 to now, $6000, price and shipping negotiable. K8CCV, 330-427-2303

FOR SALE: Bogen Model MA 20 amp exc cond to as new, $35 plus shipping. John Snow W9MHS 1910 Remington Ct., Andover, KS 67002 316-733-1856

FOR SALE: Senior VoltOhmyst Model WV-98C exc cond $35 plus shipping. John Snow W9MHS 1910 Remington Ct., Andover, KS 67002 316-733-1856

FOR SALE: Precision tube and battery tester Series 10-12 with B-16 socket adapter for later tubes and all manuals. Exc cond $125 plus shipping. John Snow W9MHS 1910 Remington Ct., Andover, KS 67002 316-733-1856

FOR SALE: Precision tube and battery tester Model 612 plus new B-16 socket adapter for later tubes with manual exc cond $100 plus shipping. John Snow W9MHS 1910 Remington Ct., Andover, KS 67002 316-733-1856

FOR SALE: Precision Series 10-12 tube and battery tester with manual but no lid very good cond $45 plus shipping. John Snow W9MHS 1910 Remington Ct., Andover, KS 67002 316-733-1856

FOR SALE: New 12v batteries Model PSH-12180 NB (80 watts/cell) Power PSSonic rechargeable battery high-rate series $50 each plus shipping. John Snow W9MHS 1910 Remington Ct. Andover, KS 67002 316-733-1856

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

FOR SALE: Millitary radio cover olive drab cover-radio set CW-329/G US, no stains or damage.Been stored, $5. Halli S40B,all orig. $90. Midland CB M-77-888 40 ch. w/mic $35.Hammurlund 200 series, Xmitter, w/ pwr supp. (to ship about 75lbs ea) they weigh about 55 lbs.$100. Bernie Samek, 113 Old Palmer RD. Brimfield, MA. 01010, 413-245-7174, bernies@samnet.net

Vintage Radio Auction

Saturday, April 22, 2006 at 10 AM EDT

The Collection of Dexter T. Deeley

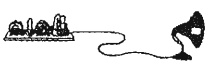
at the Expo Auction Center

8157 Garman Rd., Burbank Ohio (Exit 204 off I-71)

then south on SR #83 to the Duke & Duchess Gas Station, turn left onto Garman Rd. and follow to the auction site.

Estes Auctions is pleased to be selected to offer the vast collection of Dexter T. Deeley of Lake Lure, North Carolina. As a collector Dexter spent 50 years in the hobby. His first radio and the one that led to collecting all those years, was a Crosley Pup with the original box which he still had and it will be sold in this auction. Dexter was a very active member of the AWA while residing in New York. He joined the AWA in 1963 and became treasurer in 1968. He served 30 years at that position. He was the type of radio collector that would take time to help anyone who was just getting started in this great hobby. With his retirement and moving to North Carolina Dexter felt it was time to let others enjoy his collection. Among the offerings are a Grebe CR-3, CR-5, CR-6, CR-8, CR-9, CR-12, CR-13, CR-14, Grebe Clarifier, Grebe RORN, Grebe CR-18 with coils, Grebe RORD, Grebe RORH, Grebe RKAB, Grebe RORK, Grebe RORJ, Grebe Synchrophase 7, Zenith 3R, Zenith 4R, Zenith 2M, Magnavox AC-2 amp, Amrad 2634-3475, Western Electric 4D, 2B tuning unit and 7A amplifier, Western Electric loop antenna, Kennedy Type 311 portable, Kennedy 220, Kennedy 525 amp, Kennedy Model 15, Kennedy Model 5, Kennedy Model 20 Type 440, Kennedy 35 Type 445, Kennedy 281, Kennedy 521 amp, Kennedy T-3, Kennedy 110, Federal 61, Federal 58, Federal Jr. crystal set, Federal 57, Federal 110, Federal 102, Federal Pleiophone, Tuska 225, Tuska 228, Tuskadyne, Tuska Superdyne Jr., Clapp-Eastham HR, Type HZ amp, GE ER-753 crystal set, GE ER-753A, Radiola Special, Radiola 6, Radiola VII, Radiola VIIB, Radiola Super VIII, Radiola Regenoflex, Radiola V, Radiola VI, Radiola 28, Radiola Grand, Radiola X, Radiola IV, Radiola III, IIIA, Radiola 24, Radiola Sr., Radiola Type RS, DeForest interpanel set, DeForest D-10 w/loop, Adams Morgan RA-10, Adams Morgan DA-2 amp, Radiola II, crystal sets DeForest DT600, AW Gamage, Radiola Bijou, Gecophone, Meago MR-101, RDO R-100A, Kilbourne & Clark, Giblin, Marvel, A.C. Gilbert and others. Crosley Type 50, 50A, 51, Type 5, 6, 52, 52SD, 51SD, Type XJ, Trirdyn 3R3, 51 portable, Super Trirdyn, Wireless Specialty 501, many horn speakers, loop antennas and AMATEUR RADIO RECEIVERS Breting 12, Hammarlund HQ-120, National NC-183D, National NC-300, converter & speaker for NC-300, National HRO-60 w/coils, National SW-3, RME-69, Hallicrafters HT-33 amp, HT-32 xmtr, SX-100 receiver, Hammarlund Comet Pro, Central Electronics - 100V, National HRO-500 new w/box, Heathkit DX-60, 10B, HR-10, HG-10 VFO, Knight P-55 receiver, Lafayette KT-200, Globe King 500. Also many other radios, early meters and tube testers. We will update the sale as time passes so watch *Antique Radio Classified.* Preview April 21 from 4 pm til 8 pm and from 8 am til sale time on April 22.

Richard Estes, K8LRY - Auctioneer



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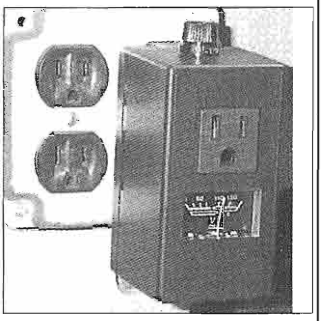
ZIM ELECTRONICS INRUSH CURRENT LIMITERS

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

Model AB-1M (With Voltmeter) $34.95
***NEW! Model AB-300M* 300 watts (2.5 amps x 120 VAC) with meter $39.95**
Model AB-1 (With Pilot Light) $29.95
Shipping, each limiter $5.45
(4 or more limiters are shipped free for US orders. Overseas customers please ask for shipping quotes.)

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



Model AB1-M

Electric Radio Store
720-924-0171

FOR SALE: RCA ribbon mic, 50 yrs old, P.A. $150. Two Astatic D-104 mics, candle holder type, $50 ea. Hank, 570-654-2347

FOR SALE: Kenwood TS 520 in excellent physical and electrical condition. $250 postpaid. Carl, W3BRX, 717-852-3223, W3BRX@AOL.COM.

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

FOR SALE: DRAKE TR-7/TR-7A/R-7/R-7A Service kit. Includes 13 Extender Boards and Digital Jumper Card. $63.85 includes postage. See http://pweb.amerion.com/~w7avk, Bob, W7AVK, 807 Westshore J28, Moses Lake, WA 98837, w7avk@arrl.net, 509-766-7277.

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

http://tomsradiorepair.bizland.com

FOR SALE/TRADE: Heathkit manuals: DX20, DX35, DX40, DX60B, DX100, HR10B, HW12, HW29A, HW30, RX1, SB104. NI4Q, POB 690098, Orlando FL 32869, 407-351-5536, ni4q@juno.com

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

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

HALLICRAFTERS SERVICE MANUALS: Ham, SWL, CB, Consumer, Military. Need your model number. Write or email. Ardco Electronics, PO Box 24, Palos Park IL, 60464, WA9GOB@aol.com, 708-361-9012 www.Ardcoelectronics.com UPDATE COMING

DRAKE INFO FOR SALE: Drake C-Line Service Information. Hi-Res Color photos of boards and chassis with parts identified. CD also includes Hi-Res scans of R-4C and T-4XC manuals, various version schematics and more. Garey Barrell, K4OAH@mindspring.com, 4126 Howell Ferry Rd, Duluth, GA 30096. 404-641-2717

HALLICRAFTERS PARTS: Hallicrafters SX101/101A reproduction main tuning knob. Includes silver inlay and set screws. $35.00 Mike Langston KL7CD, 1933 Diamond Ridge Drive, Carrollton, Texas 75010, mlangston@hcpriceco.com 972-392-5336

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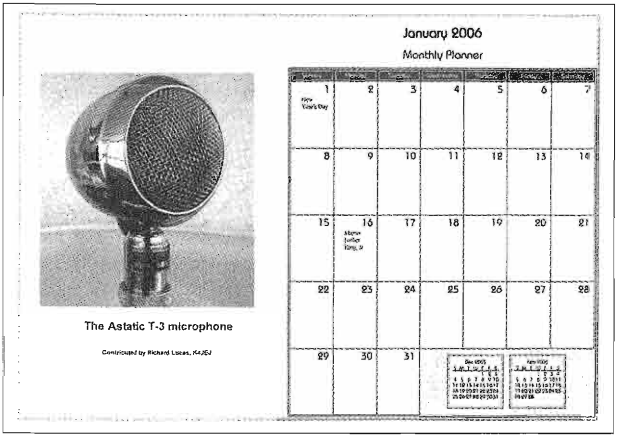
JOHNSON PARTS: EFJ replacement parts: Valiant tie bolts-4 for $18.50. Ranger tie bolts-3 for $17. 80-2CM mic connector (also for Heath/Collins/others) $10 All ppd. Contact Cal Eustaquio, N6KYR/8, 823 W. Shiawasee St, Lansing, MI 48915, catman351@yahoo.com

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

FOR SALE: QRP transmitter kits. Step-by-step instructions. Wood model, up to 5 watts 40/80M $15. "Tunatin" one watt 40M $10. You furnish crystal and power. Robert Larson, 1325 Ridgeway, Medford, OR 97504 W7LNG@arrl.net

SERVICE FOR SALE: Repair, upgrade, performance modification of tube comm. & test equip. Accepting most military, all Collins & Drake, & better efforts from others. Laboratory performance documentation on request. Work



The 2006 Electric Radio wall calendar is now available from the ER Bookstore. 12 full color photos of vintage equipment and shacks! $11.95 postpaid! See p. 63 for order information.

guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, 1115 S. Greeley Hwy, Cheyenne, WY 82007. 307-634-5858 feltondesign@yahoo.com

FOR SALE: Obsolete Triplett parts. Send part number and description for possible quote. USA only. Also several tons of transformers, switches, other material that's Triplett surplus. Bigelow Electronics, POB 125, Bluffton, OH 45817-0125

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

TUBES FOR SALE: Tested good globe 201A and 226 $14, 227 $10 and others. Slightly weak 226, 227, 245, 280 guaranteed to work in early radios ½ regular price. Write or e-mail: tubes@qwest.net for a new price list or see www.fathauer.com. George H. Fathauer & Assoc., 123 N. Centennial Way, Ste. 105, Mesa, AZ 85201. 480-968-7686 or toll free 877-307-1414

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

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

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

PARTS FOR SALE: Complete hardware set to connect Collins PM2 to KWM2 - $19.95 ppd. Warren Hall, KØZQD, POB 282, Ash Grove, MO 65604-0282.

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

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

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

BOOK FOR SALE: Heath Nostalgia, 124 page book contains history, pictures, many stories by longtime Heath employees. (See ER Bookstore) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028

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

FOR SALE: Check my eBay store: RadioWorld-OnLine and my website www.radioworld-online.com. Carl Blomstran, PO. Box 890473, Houston, TX 77289 281-660-4571

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

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

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

PARTS FOR SALE: Parts, tubes, books, ECT. Send two stamp SASE or email letourneau@wiktel.com for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761

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

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

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

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

WANTED: Altec Lansing horns: 811B, 511B. Drivers 808-8A, 806-8A. Ron, 262-673-9211, karenson87@yahoo.com

WANTED: Ops manual Hickok 539C tube checker. Will share: Hickok 539C obsolete tubes data; 752 & 752A tube checkers general, obsolete & foreign test data. Bob Wheaton, W5XW, 16015 White Fawn, San Antonio, TX 78255, 210-695-8430.

WANTED: Circuit diagram w/component values for Precise model 909 VTVM. Rudy, W2ZIA, 716-937-9279, 3411 Home Rd, Alden, NY 14004.

WANTED: Western Electric tube tester. **FOR SALE:** Swan 350 - $100. Carter, WD4AYS, 434-979-7383, celliott14@earthlink.net.

WANTED: ZM-3A/U capacitor analyzer, please contact Mike at mike46@shaw.ca

WANTED: Looking for a Hallicrafters HT33B, working or not, must be clean and have all the knobs. Also need an SX101A MK III. James Ryan, W2RXR, POB 126, London, OH 43140

WANTED: Heathkit Apache TX1 and Mohawk Receiver Dead or Alive. Jeff, KEØMT, ke0mt@aol.com 720 855 7347

WANTED: 4-1 knob for 75A-4. Do not need gears. George Spears, WA8WMS, 734-981-3899, wa8mws@wwnet.net

WANTED: To buy five working tubes 99/199/299 types. Raymond Fisher, POB 488, Charleroi, PA 15022

WANTED: Power transformer for HQ-110A receiver. 115V Primary, 230V, 0V, 230V 110mA, 5, and 6V filament secondary windings. Horizontal mount. Doug @ 507-835-1175, dougsterr@juno.com

WANTED: Sylvania 6ESB pilot lamp, Swan 700 schematic, 8950, NCX 1000 any cond. Ed, W9NXR, 637 Emerald Ave, Mundelein, IL 60060

WANTED: RCA CR-91A cabinet, meter. Like AR-88 cabinet. Also wanted an original manual for the CR-91A. Bob,AB3L,AB3L1@aol.com 412-760-6098

WANTED: Anything by DAVID GRIMES: radios, especially model 3XP, and advertising, ephemera, literature, references, parts; please contact: Mike Grimes, K5MLG; 5306 Creekside Ct.; Plano, Texas, 75094, 972-384-1133, grimesm@flash.net

WANTED: Parts to fix up Trans-Oceanic radios. I need a plastic front panel for a H500. A cabinet would be great if you have one. Need a plastic wavemagnet cover for a 600 series. Need mounting parts for the main carrying handle for the 600. The G500, H500, and all 600 series handles will interchange. Kevin Rutsky, R.D. #1, Box 155, Pittsfield, PA 16340. 814-489-3193

WANTED: Globe model UM-1 plate modulator and/or Globe model SM-1 screen modulator in good working condition. Alan W. Fremmer, KB2HEI, 550-H Grand Street, New York, NY 10002, 212-777-3630, awfremmer@aol.com

WANTED: Service for my Hallicrafters transmitters. Will deliver/pickup within 4 hours drive of Savannah, GA. Bob, W4WTO, 912-663-4311. armco1@bellsouth.net

WANTED: Radio magazine, November 1939 and all after March 1942. Bill, w6fa@caltech.edu or 626-836-2065.

WANTED: Clean Gonset G76 with power supply/speaker and working R390A. Frank, KB0W/6, fdellechaie@sbcglobal.net, 916-635-4442.

WANTED: National NC-183DTS speaker, NFM-83-50 adaptor and SOJ-3 Selectojet. Contact Ric at C6ANI@arrl.net

WANTED: Holtzer-Cabot AN/PSM-2-A Megger in good condition, Mike, VE7MMH, at mike46@shaw.ca

WANTED: Parts to fix up Trans-Oceanic radios. I need a plastic front panel for a H500. A cabinet would be great if you have one. Need a plastic wavemagnet cover for a 600 series. Need mounting parts for the main carrying handle for the 600. The G500, H500, and all 600 series handles will interchange. Kevin Rutsky, R.D. #1, Box 155, Pittsfield, PA 16340. 814-489-3193

WANTED: SX115, HT32B, HT33B and SP600JX21A. Also cabinet for 51J4 and SX73. Ward Rehkopf, 16173 Indian Valley St., Schoolcraft, MI 49087 269-679-3435. radiohound2@yahoo.com

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

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

WANTED: Navy WW2 shipboard receivers and transmitters. Need equipment, manuals and general operating information. Receivers of the type RAK, RAL, RBA, RBB, RBC, RLS etc, Transmitters of the type TBA, TBK & TBM (with modulators), TDE TBS etc. Equipment is for the restoration of Radio facilities aboard the **USS Alabama (BB-60)**, now part of the Battleship Memorial Park, Mobile, Alabama. I was a Radio Technician aboard the Alabama in WW2 and would like to hear from other WW2 RTs and Radio Operators concerning radio operating and maintenance procedures aboard other Navy WW2 ships. Please call Stan Bryn, AC5TW, at 1-800-984-9814 week days between 0800-1100 MST. Or email intor@zianet.com.

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

WANTED: Collins 310B-3, basket case OK, 70E-8A PTO per 1948. Chicago CMS-2, pair of Taylor T-21. Jerry, W8GED, CO, 303-979-2323.

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

WANTED: Tektronix **Type 570** curve tracer, any condition. Ron, AA2QQ, 718-824-6922

WANTED: INTECH COM 6000 Service Manuals: COM3648, COM1000, COM1005 HF SSB Marine radio. Wes, K5APL, 870-773-7424 k5apl@cableone.net

WANTED: Harvey Radio Labs Tri-Tet Exciter or FT-30 Transmitter. $1000 reward! Robert Enemark, W1EC, PO Box 1607, Duxbury, MA 02331, 781-585-6233

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

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

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

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

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

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

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

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

WANTED: Schematic and related info on Halowatt TR5 broadcast rcvr made mid-1920s in Portland, OR. Fern Rivard, VE7GZ , PO Box 457, Cranbrook, BC V1C4H9 Canada crc@cyberlink.bc.ca

WANTED: Collins 312A1 speaker, National SW5, Eldico R104 and T102, QSL cards from 1920's, 9CXX or W9CXX. Scott Freeberg, WA9WFA, 327 Wildwood Avenue, Saint Paul MN 55110. 651-653-2054 wa9wfa@qsl.net

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

WANTED: Commercial or kit-built 1930s and 40s transmitters. Doc, K7SO, 505-920-5528 or doc@cybermesa.com

The Caps Are Back!

By popular request, we are offering another run of the popular Electric Radio baseball caps. These new caps are a nice 5-panel all-cotton style with an adjustable rear headband and a 3-inch front brim. The background color is light tan, and the ER logo is embroidered in 3 colors, not printed. These hats will hold up for a long time.

$19.95, including priority shipping.

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Bailey, CO 80421
720-924-0171
Or on-line: www.ermag.com

WANTED: Hallicrafters SX115, SX88, Collins 75A-1, AM broadcast transmitter in New England area, Heath DX100B. Will pay good price for good equipment. w1txjohn@aol.com, 802-775-7632 Eves.

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

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

WANTED: TCS & TBY Navy radios. Ken Kolthoff, K8AXH, PO Box 215, Craig, MO 64437. Work #913-577-8422.

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

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

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

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

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

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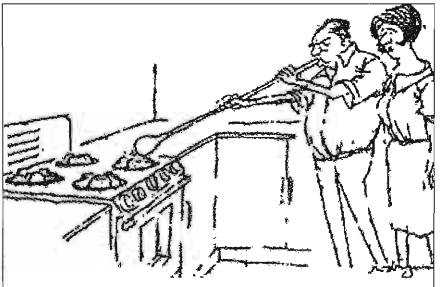

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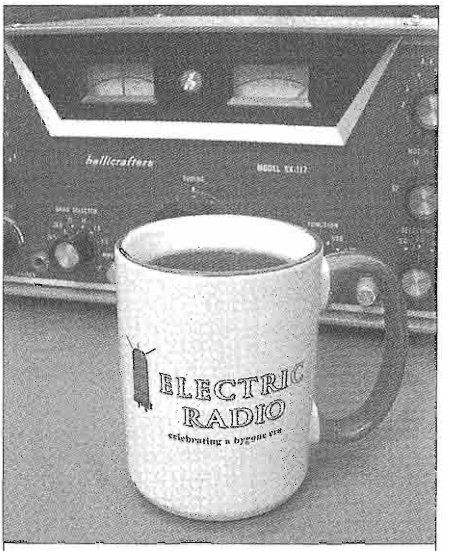

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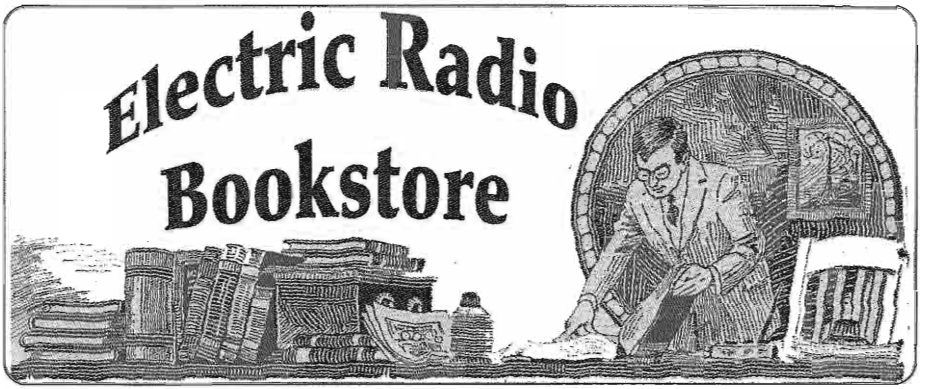

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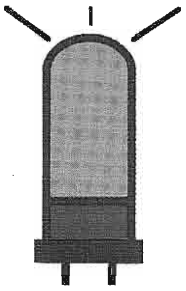

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