ELECTRIC RADIO

celebrating a bygone era

Number 9 January 1990

ELECTRIC RADIO
EDITOR/PUBLISHER Barry Wiseman N6CSW/Ø
Published Monthly by Barry R.Wiseman
at
145 County Road 123
Hesperus, Co. 81326
subscription price : $18 per year
Second Class Postage Pending at Hesperus, CO
Postmaster Send Address Changes to:
Electric Radio, 145 C.R. 123, Hesperus,CO 81326

The Purpose of Electric Radio

Electric Radio is published for amateur radio operators and others who appreciate vintage radio equipment. It is hoped that the magazine will stimulate the collecting of, and interest in, this type of equipment.The magazine will provide information regarding the modification,repair and building of equipment. We will also work towards a greater understanding of amplitude modulation and the problems this mode faces.

Electric Radio Solicits Material

We are constantly searching for good material for the magazine. We want articles on almost anything that pertains to the older amateur equipment or AM operation. From time to time we will also have articles and stories relevant to the CW operator and the SWL. Good photos of ham shacks, home-brew equipment and AM operators (preferably in front of their equipment) are always needed. We also welcome suggestions for stories or information on unusual equipment. For additional information please write us or give us a call.

EDITOR'S COMMENTS

Barry Wiseman N6CSW/Ø

This month I don't have very much to say nor do I have very much room to say it in. I was tempted to stick a Beasley cartoon in this space this month. I think it would be more enjoyed than anything I have to say.

One thing I did want to mention is that I am making a concerted attempt to move the publication date of the magazine back towards the first of the month. This will take some months but we'll get there. The December issue was mailed on the 15th. This issue should be a couple of days earlier than that.

This issue will also be printed by a new printer; the fourth printer we've used in nine issues. The last printer unfortunately went bankrupt. We're hoping that this new printer does a good job for us and we can have a long and happy relationship.

A very encouraging development is the increase in display advertising. This is what will keep ER financially sound. If you order from these businesses please say you saw their ad here. It will help. On to number 10.

TABLE OF CONTENTS

Cover: From a QSL card dated 9-12-58. The station is that of Harry Steffan, W8RHZ, Hudson, Ohio. Does anyone have any information on W8RHZ? I checked the callbook and his call is not listed. Many thanks to Rudy Lazazzaro, W2ZIA for sending along the card.

Reflections Down the Feedline

by Fred Huntley, W6RNC
POB 478
Nevada City, CA 95959

The National SW-3, "Thrill Box", was a great little 3 tube regenerative receiver of the 1930's - now avidly sought after by collectors and connoisseurs of classic radio equipment. This set used two 58 pentode tubes (TRF and regenerative detector) and on 27 triode as an audio amplifier for headphone operation. The 2.5 volt heater tubes could be replaced by 78s and a 76 for 6.3 volt operation since the power supply was a separate unit.

The outstanding quality of the SW-3 was that it was extremely quiet - enabling copying of very weak CW signals that sometimes could not be heard on larger superhets. Also, the SW-3 was very stable in operation due to the National Co.'s very painstaking design. Although the 3 tube regenerative receiver is a pretty simple circuit, stability is not easy to come by. Many a ham who built this type of set experienced an amazing array of squawks, squeals and howls resulting from stray coupling and unwanted feedback. The placement of parts and the shielding are very critical in this type of receiver.

Some of the SW-3's were used commercially; for instance Pan American Airways ground stations used them. They were also taken on various expeditions where reliable and simple equipment was needed.

The SW-3, however, does have it's limitations. The plate voltage must be stable-otherwise the frequency will change. Also, the receiver is subject to blocking from strong adjacent signals. With heavy usage of the two plug-in coils, the coil socket connections would lose their tension or become worn, causing imperfect contact which resulted in intermittent or erratic operation.

About 12 years ago, I built a receiver using the SW-3 circuit. I got around the coil problem by soldering in the coils and switching the tuning capacity to change bands. The HRO tuning capacitor that was used, allowed 3 ranges by using a single section, seriesing or paralleling single sections. This method allowed a total coverage of 3 to 16 Mcs on one set of coils.

Operation of the regenerative detector was also improved against blockage by strong adjacent signals, by using a circuit produced by W6HDM and printed in the May 1953, issue of Radio &Television News. W6HDM used two tubes in the regenerative detector. The grid coil circuit was operated by a cathode follower tube that fed another triode that controlled the feedback winding. With this arrangement the regenerative control became much less critical in adjustment. While it didn't entirely eliminate blocking, it did make a very substantial improvement.

Along with these two changes, I utilized an external voltage regulated power supply, so my receiver was very stable mechanically and electrically. In it's own way, it stacks up quite well against a lot of the less expensive superhets.

I bought my National SW-3 from Sun Radio on Greenwich St. in New York City in 1936, and used it along with a breadboard transmitter consisting of a pair of 210s in M.O.P.A.

continued on page 27

HALLICRAFTERS:

THE MAN AND THE COMPANY

A historical overview

by Chuck Dachis, "The Hallicrafter Collector"
4500 Russell Dr.,
Austin, TX 78745

Hallicrafters began in Boston, Massachusetts, during the spring of 1899 with the birth of it's founder, Wiliam J. Halligan, although it would be another thirty two years before he or anyone else knew it! As a youngster, Bill had a fascination with the new technology of radio telegraphy, anxiously gleaning any information on the subject from the latest scientific journals and the few books that were available. At 16 his first real job was that of wireless operator on an excursion boat in the Boston area. Bill would spend the next several years as wireless operator on a number of ships, seeing sea duty on a mine layer off the coast of Scotland during World War I.

After the war, Bill attended the electrical engineering schools at Tufts College, and then West Point, leaving West Point in 1922 to marry Kate Fletcher. He took a job as a reporter on a Boston newspaper, and also wrote articles for the 'new' American Radio Relay League. In 1924, he became sales manager for Toby Deutschmann (an old friend) who was distributing imported radio parts to American radio manufacturers. By 1928, Toby's business was booming and Bill decided to start his own as a manufacturer's representative, selling parts directly to the radio manufacturers. It was in 1928 that Chicago first appeared in Bill's life. Most of the radio makers were in the Chicago area. It would be the logical place to set up shop, and he did. For three years the business did well, then in 1931, the effects of the depression hit hard on his clients who were going bankrupt faster than the wind was blowing off the lake!

Continuously active in building and operating his own Ham radio station, and not able to sell enough parts to pay the bills, Bill got the idea to build hand crafted Ham radio receivers that up until then had not existed in any commercial inventory. Just a few at a time using the highest quality parts, no mass production. He would call this new business "The Hallicrafters".

The name "Hallicrafters" was chosen from two words. You guessed it, Halligan and handcrafted. A creed of "Handcraft Makes Perfect" was adopted and used in the first logo of the new enterprise in late 1932 .

continued on page 24

ELECTRIC RADIO IN UNIFORM

by Walt Hutchens, KJ4KV
3123 N. Military Rd.
Arlington, VA 22207

The AN/ARC-58

In previous columns we have talked mainly about military sets of the 1940's; sets which are simple enough that they might reasonably be used for hamming. This time, we will look at a more recent and much more complicated set.

Origin of the ARC-58

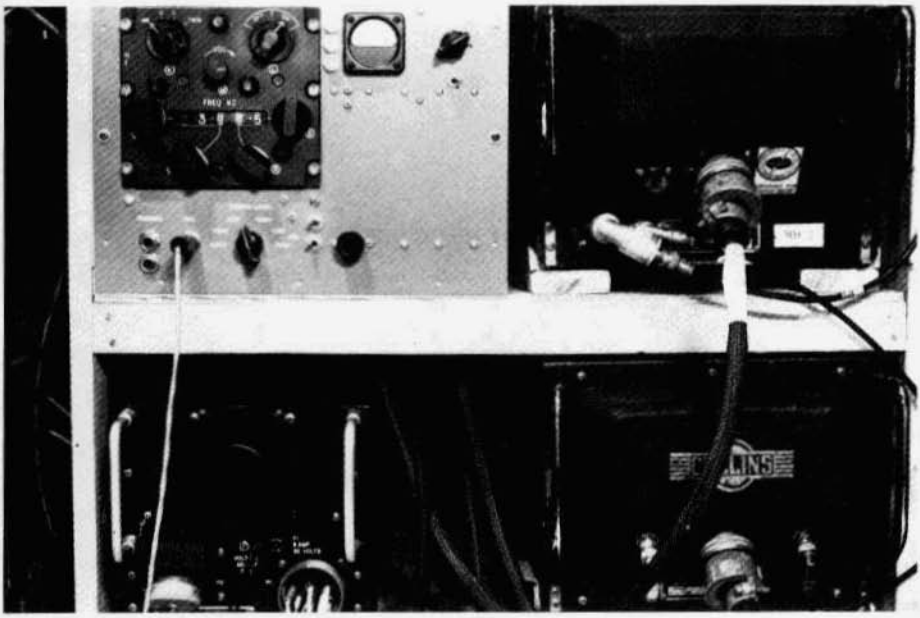
Consider the problem of controlling our strategic bombers. Missions are measured in thousands of miles and if communication fails before a certain point, the mission will be aborted and the plane effectively lost. If you were asked to write specs for the bomber's long range radio set (called a 'liaison' set) you'd probably decide quickly on an SSB transceiver of both great flexibility and unusually high power. Since the intelligibility of SSB voice signals falls rapidly if either end of the link is off frequency you'd also want superior stability. What would you pay? Well -- considering the value of the bomber and its mission, you would probably agree to "whatever it takes".

The bomber was the B-52. From about 1960 through sometime after 1978 (I do not know the end date) the radio was the Collins AN/ARC-58, one of which has, over the last couple of years, struggled to life in Radio Central at KJ4KV. It's impossible to do justice to any milestone radio in an article this size, but the problem is worse for the '58 because of its complexity. We will, therefore, not attempt 'justice', but merely a look at a few of the most interesting features.

Overview

The ARC-58 can send and receive USB, LSB, AM and 'TWIN' -- more often called double sideband suppressed carrier. Though the control boxes supplied do not allow it, the radio is also capable of 'independent sideband' -- two sidebands containing different intelligence -- and CW, as well.

SSB power output is 400 or 1000 watts PEP; for AM a 100 or 250 watt carrier is added. Receiver bandwidth is 6 kcs on AM, 2.6 kcs on sideband. The set covers 2.000 to 29.999 Mcs in 1 kc steps with no provision for finer tuning of either transmitter or receiver. QSY of one kilocycle usually takes three seconds; wide changes of frequency take up to twenty seconds plus time required by the antenna tuner. Rated stability is a fantastic one cycle per ten megacycles per hour and one cycle per megacycle per month!



The ARC-58 system at KJ4KV. Clockwise from upper left: The control box (black panel), the transmitter, the receiver, and the PP-2352 inverter. The gray panel at upper left contains audio input and output and interconnect wiring, metering, and other external circuits.

The radio consists of two main units: receiver R-761/ARC-58 which is actually a receiver and exciter, and transmitter T-605/ARC-58 which is actually a linear power amplifier. Slightly modified versions of these units were procured as R-1149 and T-730/TRC-75 by the Marine Corps; this equipment was mounted in a shelter on a jeep. (We will use 'ARC-58', R-761, etc., to refer to both versions.)

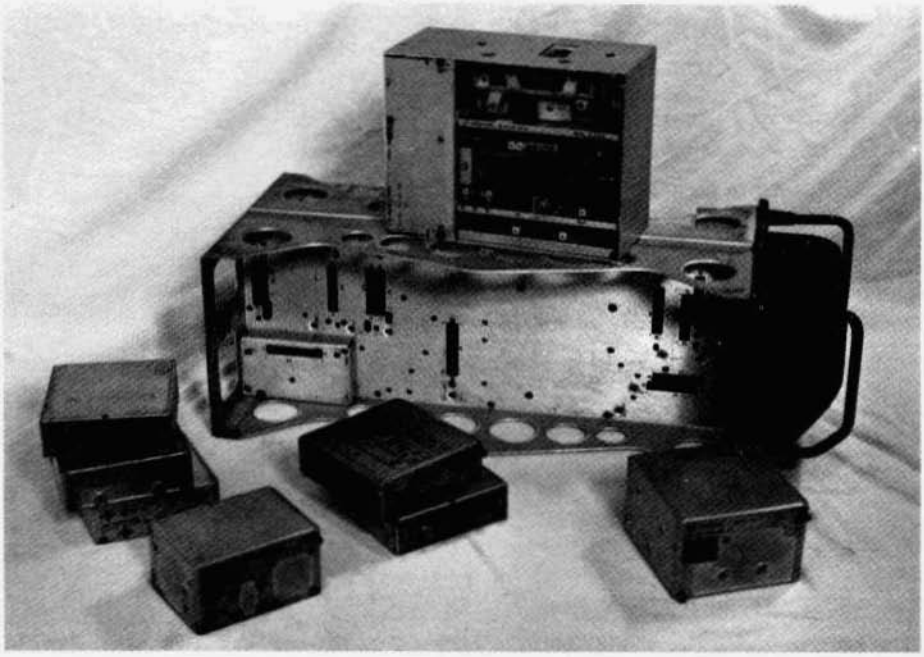
The receiver and transmitter are in 'ATR' packages, 8" x 10"x 20" (HxWxD). There are several other pieces of equipment in the set, namely; a cooling unit, an automatic antenna tuner, and control boxes for the radio and the antenna tuner.

The set uses a mixture of transistors, subminiature tubes, and miniature tubes. The final amplifier is three 4X250B's in parallel. Primary power requirements are 115 volts 400 cps single phase for the receiver and three phase for the transmitter. The receiver consumes 380 watts; the transmitter 1200 to 2000 watts, depending on the mode.

Physical Design

Rarely is the mechanics of a radio more than 'interesting', but in solving the problems of maintainability and heat removal at the level of circuit density (over 100 tubes and transistors) the ARC-58 receiver is a milestone.

continued next page



R-761/ARC-58 with left side modules removed.

The set is built on a closed vertical chassis running from front to rear. Nearly all circuitry is in modules which plug into this chassis from the sides. The chassis contains interconnecting wiring and serves as a duct to carry cooling air to the plug-in units. At the rear of the set an opening connects to a source of forced air; calibrated holes under each module supply it with the right share of flow. Module tops are open or have exhaust holes and the sides of the case are perforated.

Nearly all tubes are visible through holes in the tops of their modules so you can see if they are lit. Module connectors are protected -- if you drop a module on the bench from a height of an inch or two, no harm will be done. There are no mechanical couplings (shafts, gears, etc.) to any module.

Enough test points are provided along the left and right sides of the set to allow identifying a bad module. Troubleshooting in a module can be done with a card extender or cable. Most modules have one or two printed circuit boards; by removing the side covers (one screw each!) you can get to the board(s) for detailed troubleshooting and repair.

Many features above may seem 'obvious' but most of them occur for the first time in this radio. When we look at radios which came between the ART-13 and ARC-58, we'll see some of the ways these things can be gotten wrong!

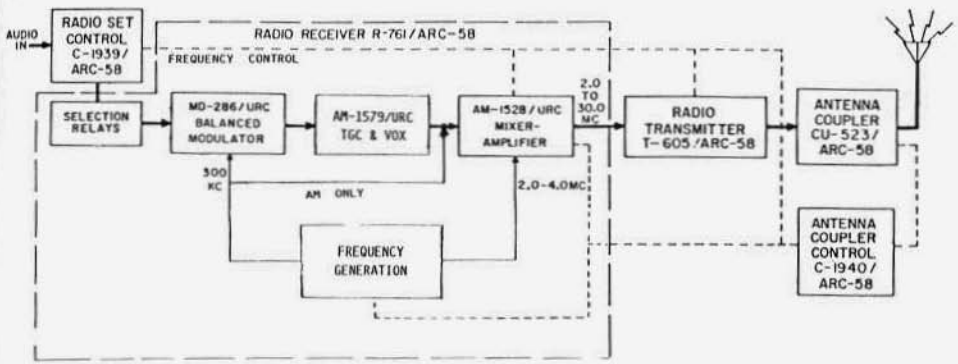
Frequency Setting and Tune Up

Choosing the scheme for setting an operating frequency is difficult for any aircraft communication set because the requirements conflict. The method should be simple because many users are not trained operators; it should be flexible because you may need to work with stations on many different frequencies and sometimes 'by surprise'; it should allow for use by more than one crew member; and it should be as simple and reliable as possible.

We saw one solution in the ART-13, described in November 1989. A trained operator at the transmitter tunes it up on as many as eleven channels which can then be selected by a switch at a remote control box. The frequency must be set from a calibration book and the remote user has only the operator's word that channel 3 is really 3105 kcs. If a new frequency is required, it takes at least a minute or two to set it up and the transmitter must be radiating during much of that time. There must be an associated receiver; in some installations it was a BC-348 which isn't remotely controllable so the remote user couldn't change frequencies without telling the radio op to tune the receiver.

The ARC-58 comes about three generations after the ART-13 and as you'd expect there's a lot of progress. The set is a transceiver, so the receiver is always on the same frequency as the transmitter. All tune-up functions are automatic. Neither transmitter nor receiver has any controls so there is no 'local' operation; these relatively large items can thus be mounted in an unmanned space. You can have as many control boxes as necessary. When the set is turn 'ON' at a control box, that station gets control; if someone else already had it on, his switch goes 'OFF' with a loud 'clack' and he loses control.

For the first time in an HF military aircraft radio, the frequency is set digitally (with switches) in kilocycles -- there is no calibration book and no way to be 'a little' off frequency. There are only four controls: ON/OFF, VOLUME, AM/USB/LSB/TWIN, and FREQ, so any crew member can operate the set.



Simplified block diagram of the ARC-58 when transmitting.

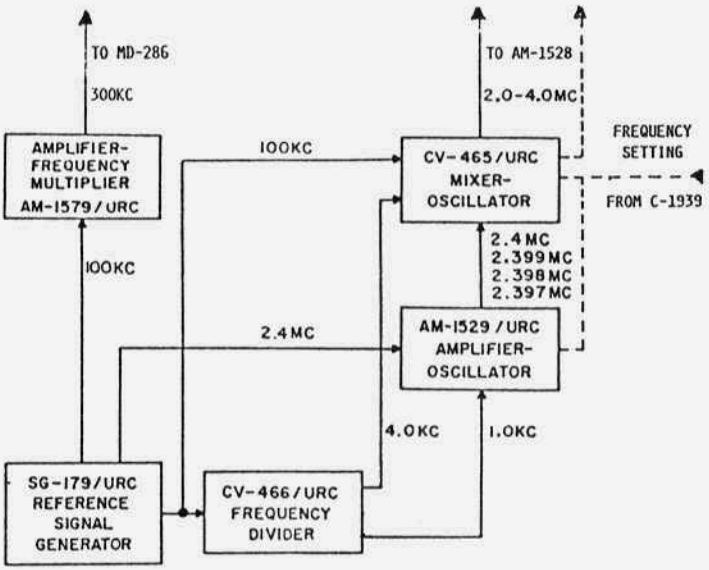
continued next page

Frequency Generation and Control

One of the remarkable features of the ARC-58 is it's combination of simple set-up, flexibility, and stability. This performance isn't free: the frequency generation function takes about 1/3 of the volume of the receiver.

A BC-221 frequency meter is 'stable' and it uses only a one tube oscillator. How can the frequency generation circuits in the R-761 be so much larger and more complex? The difference is in the meaning of 'stable'. At 3885 kcs, my BC-221 drifts over 100 cps in the first hour after a five minute warmup; the ARC-58, less than one cps. Such remarkable stability is achieved by controlling the 'VFO' (which is also the receiver local oscillator) from a precision crystal oscillator.

The crystal is in a temperature controlled oven at 176 degrees F. in the Reference Signal Generator (SG-179) module. Older sets (the R-390 and ARC-38A, for example) use thermostats to control oven temperatures but the ARC-58 uses a much more precise system. The voltage across a temperature sensitive resistor in the oven is compared with that across a stable resisitor; the difference is proportional to the amount the actual temperature is below the desired temperature. This difference signal is amplified and used to heat the oven. If the oven is at the right temperature, the difference is zero and no heat is supplied; up to a limit, the greater the error the more heat. The performance of this system is amazing: the SG-179 oven reaches operating temperature in about ten minutes from room temperature and the error is specified as less the 0.2 degrees.



Simplified block diagram of the R-761 frequency generation system.

The SG-179 ouput frequencies are 2.4 Mcs and 100 kcs; they are generated by dividing the 3 Mcs crystal oscillator signal using a clever circuit called a 'regenerative frequency divider'. This circuit appears for the first time in a military radio in the CFI (crystal frequency indicator) unit of the ART-13 and we will discuss it in a future column.

We want 28,000 stable frequencies in 1 kc steps. This could be done by combining crystal frequencies -- a method called 'synthesis'. One big problem with direct synthesis is that unwanted combinations can sneak through and cause 'spurs' in the transmitter output and unwanted responses or 'birdies' in the receiver. Modern radios, instead, use synthesis to get a signal to control a tunable oscillator. The tunable oscillator is designed for very pure output; although the process of controlling it causes some impurity ('phase noise') the unwanted frequencies are very close to the wanted one and in well designed circuits they are extremely weak.

As in almost all Collins sets after the ART-13, the tunable oscillator is a compact 'PTO' or 'permeability tuned oscillator'. (We will talk more about this device in a future column.) The PTO is located in the Mixer-Oscillator (CV-465) module. The CV-465 gets electrical signals from the remote control box and uses them to position the PTO within 2.5 kcs of the right frequency and also to select (using several slug tuned coils) the proper function of the crystal determined input frequencies.

To get the exact frequency, the PTO frequency function is compared to the crystal frequency function in a frequency and phase detector. A current from the detector changes the inductance of the PTO tank coil slightly to correct the frequency, then the phase signal takes over to lock the oscillator.

Today you can get most of the circuitry for a phase locked loop on a single chip but in 1957 it was not so simple: the CV-465 has ten tubes and 16 transistors. But the result is an oscillator tunable from 2.0 to 4.0 Mcs in steps of 125 cps which is controlled by (and as stable as) a crystal in a precision oven. This signal is mixed and multiplied in the Amplifier-Mixer (AM-1528) module to give both the transmitter output and receiver local oscillator frequencies.

The stability of frequency generation in the ARC-58 is so much better than the KJ4KV frequency counter that the usual 40 minute drift test wasn't tried. My set always seems to be within one cps of WWV at ten Mcs, so it does meet the specs.

Other Receiver/Exciter Circuits

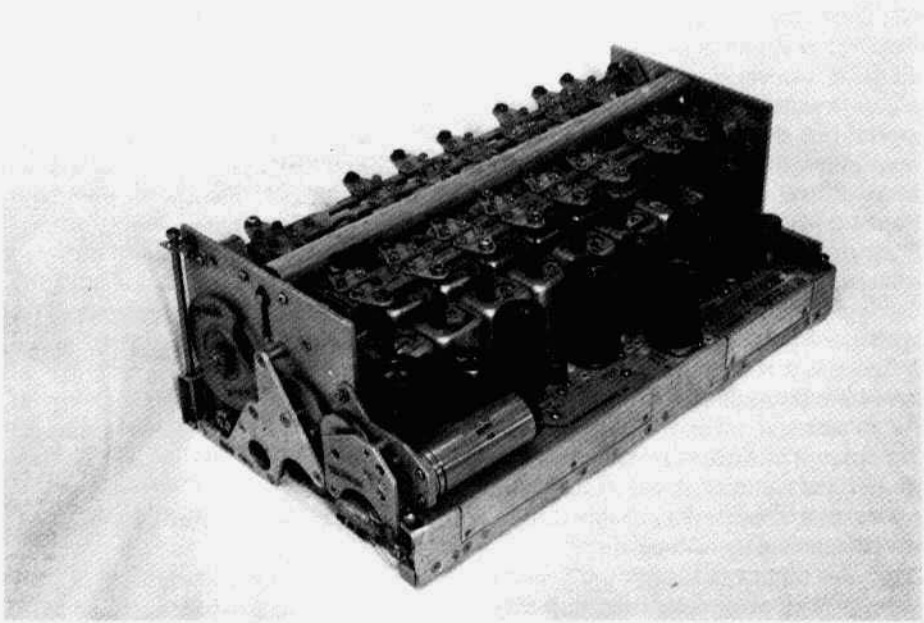
The R-761 contains all the other circuits needed to produce a 1/5 watt RF signal (SSB or AM, as selected) for input to the T-605. It also has all the receiver circuits, from RF amplifier to audio output.

One interesting module is the AM-1528. On receive, this includes everything from the antenna coil to the first IF transformer; on transmit it operates 'in reverse', taking an SSB signal at IF frequency and mixing and amplifying it to 1/5 watt output at the transmit frequency.

One set of coils (30 of them, all slug tuned at once!) is used for both transmit and receive. This is done by running one chain of tubes one way through the tuned circuits and another chain in the reverse direction. On receive you apply plate and screen voltages to one set of tubes; on transmit, the voltage is applied to the other set.

Another area of cleverness is in adjusting the drive for the linear amplifier. Enough excitation must be supplied to operate the PA at the proper output both on low and high power -- without driving it into non-linearity. If operating AM,

continued next page



Amplifier -Mixer AM-1528. The gears on the near end turn drums holding steel tapes connected to two 'bridges' which move the slugs in the coils. The servo motor (near corner) get tuning info from the CV-465.

the right carrier level must be supplied for the level of the SSB signal -- as anyone who has operated a 'Japanese transceiver' for AM knows,this can be tricky. On CW, the PA can be driven into nonlinearity for better efficiency. This sounds like several adjustments but actually there are none -- it is all done automatically, through feedback loops from the T-605 to the R-761.

The Gold Plated Radio

Is anything wrong with this ficticious invoice?

Item	Unit price
Seat, toilet	$600.00
Shaft, bandswitch	10.00
Frame, module	5.00

Answer -- all of the prices are much greater than necessary for an item meeting the functional requirement.

'Gold Plating' in military hardware means design features or contruction methods which add to the cost of a unit out of proportion to what they do to help it perform its mission -- you may recognize the '$600 toilet seat' as a famous example. The other two items are in the ARC-58; I have guessed at the prices.

The AM-1528 bandswitch shaft is about ten inches long and 3/16 of an inch in diameter. In many of the sets, this shaft is a machined ceramic rod -- beautiful, fragile, and very expensive. Later sets use a fiberglass epoxy shaft which is not only much cheaper but less fragile.

Both transmitter and receiver use chassis and module frames of aluminum -- but not plain flat plates. To save weight, the plates are 'chemically milled' (etched) to remove extra material from areas of low stress. The result is -- again -- beautiful, but very expensive. How much weight is saved? My guess -- five pounds

on a transmitter and receiver weighing 100 pounds. This feature wasn't copied in the Marine Corps sets.

Overpriced toilet seats make hot news items, but looking at the ARC-58, I think the waste of tax dollars from 'gold plating' was small. It is hard to get anything new to work at all and a radio which advances the state of radio practice along such a broad front as the ARC-58 costs a lot to develop and necessarily uses some expensive components. A couple of hundred dollars of excess cost in a radio which may have cost around $10,000 a copy isn't much -- and (as in this case) subsequent procurements may eliminate the 'gold'.

On The Air With The ARC-58?

Because of the great complexity of this radio, I will only sketch the issues in putting it on the air.

Unless you get the complete 'accessory' package (a B-52 bomber or a jeep and TSC-15 shelter) you must fill in many missing pieces. The set has no mic or phone jacks and no AF gain control ('VOLUME' on the control box is an RF gain control); it is normally used with an intercom which handles those jobs. An antenna tuner is needed to match the 50 ohm output to your antenna. I improvised this, as I am still looking for the C-1940 control box required to use the ARC-58 tuner. Both receiver and transmitter require some forced air cooling.

The PP-2352 solid state inverter (from the TRC-75) will furnish the 115 volt 400 cycle 3 phase power; the inverter needs about 100 amps at 27.5 volts DC. I have not been able to find a diagram, manual, or connector for this unit but fortunately mine has had only simple problems.

Interconnect wiring requires a few hundred soldered connections. Connectors for this set can't be improvised easily because the pin spacing is too small.

I got two complete radios and some extra modules from different sources at different times. All of the units except one of the transmitters seem to have been 'hangar queens' -- parts or modules had been swapped to keep other sets operational, so I got (mostly) sick modules. Troubleshooting took perhaps 100 hours.

After about two years of occassional work, I am 'mostly' ready to use this set on the air.

Some Conclusions

How does one evaluate a military radio set? It seems to me that one considers six things:

1. Does the design fit the mission? A small unit infantry radio will get banged around, wet and muddy; a tank radio will be used in the presence of extreme noise levels, and must not require fine hand operations while the vehicle is moving; an aircraft radio encounters an extreme range of temperatures and (for carrier aircraft) very high 'g' loads -- were these things considered?

2. Does the radio use the most effective technology available when it was designed?

3. How usable is it? Is the panel well arranged, readable, and adequately lighted for the mission? Is the set simple to use and free of 'tricks'?

4. How maintainable is it? Can batteries be changed easily? Can problem isolation be done quickly without a complex set-up? Are parts which fail often located where they're easy to change?

5. How reliable is the set?

6. How much does it cost?

To some extent these considerations conflict -- a reliable radio, for example, often can be built more easily with older technology, but it may be larger than one using the latest technology. The designer's job is to choose the right set of compromises.

What about the ARC-58? Certainly it gets 'A+' marks in many areas.

continued on page 28

BROADCAST QUALTY AUDIO...
and the Johnson Ranger II

THE PHILOSOPHY OF BROADCAST QUALITY AUDIO

by John Barcroft, WA6ZJC
4286 Farley Ct.,
San Diego, CA 92122

Somewhere in our distant past, it was ruled that the human voice existed totally within the band of frequencies from 300 to 3000 Hz. Since then, virtually all voice communications equipment has restricted its capability to this bandwidth. Even the space shuttle astronauts with their digital technology are cut off below 300 and above 3000 Hz.

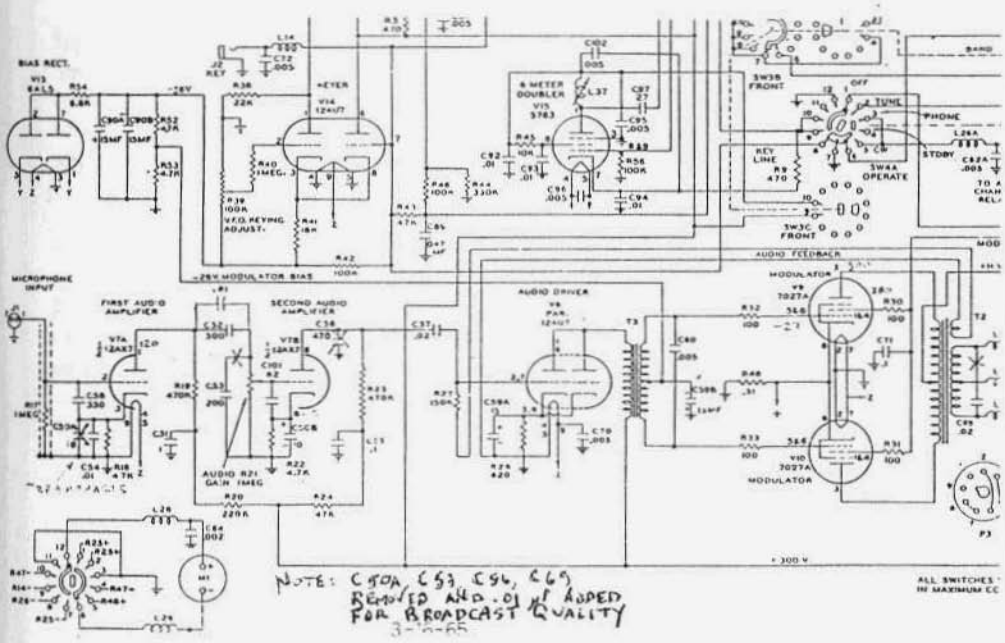
This widespread practice has a very good basis in fact. Obviously, it is spectrum efficient. You can cram SSB operators every three khz with no QRM. Also, as any DX'er will tell you, by concentrating all the power in this narrow voice range, particularly the upper or 'presence' frequencies, you can really cut through QRM and QRN under the most adverse conditions. The idea of spectrum efficiency and the ability to copy through the garbage is the principle reason that most of ham radio has gone to SSB.

But YOU and I are AM operators. Why do we sacrifice the tremendous advantages of SSB for an obsolete, inefficient mode like AM? It seems to me that spectrum efficiency and cutting through QRM are no longer the primary objective of the AM operator. We sacrifice all the communications efficiency of SSB because AM JUST SOUNDS BETTER.

I have taken this idea one step further. If you can sound good, why not sound as good as possible? Why not sound like a broadcast station? For me, it is the ultimate AM experience. But how can we do this in a world dominated by SSB stations? For one thing, we tend to stick to ourselves on our own frequencies in the lesser used portions of the bands. On the lowers bands, we are all concentrated on one or two frequencies, making up for the fact that our signals are wider. While such techniques as 'super modulation' are sometimes used on AM, many of us prefer to cut through the QRM and QRN with carrier power and antennas rather than sacrifice quality. On ten meters, in particular, there is plenty of room for everyone to spread out, and even the lower powered stations do fine when the band is open.

Broadcast quality audio is characterized by low distortion and good frequency response. Distortion shows up in many ways in ham equipment. Typically an SSB transmitter operating in the AM mode has either too much carrier or too much audio. Another common cause is flat final or modulator tubes in a plate modulated transmitter. Most transmitters were designed to operate with low distortion and will do so when properly maintained and adjusted. That leaves the frequency response. When audio quality is the main objective, there is no longer a need to restrict audio to the traditional 300 to 3000 Hz voice frequencies on AM. By making some minor modifications to most rigs the bandwidth can be extended to 100 to 5000 Hz. On ham radio this bandwidth is indistinguishable from the long standing broadcast standard of 50 to 7500 Hz. (Note: this standard has recently been removed from the AM rules under deregulation to allow for premphasis). If you then go a bit further and add a touch of boost in the presence range between 1500 and 4000 Hz to make up for the rolloff at the received end, your signal will sound like the VOA.

continued on page 14



Ranger 11 audio section

John Barcroft, WA6ZJC

A few rigs with big modulation transformers or low level modulation can be coaxed down even lower than 100 Hz. However, going much above 5000 Hz is pushing the rules a bit and really doesn't sound better since few receivers can copy more than 10 khz wide signals.

MODIFYING THE RANGER II FOR BROADCAST QUALITY AUDIO

The following procedures are applicable in general to any tube type AM rig. The example of the Ranger II will give you the general approach to take on your rig.

Referring to the schematic, any capacitor shunted across the main audio path or in series with a negative feedback path cuts off high frequencies. There are no series capacitors in the feedback path. The shunting capacitors are C58, C53, C101, C56, C60. C66, C67, and C83. Each of these capacitors in combination with the equivalent series resistance associated with it forms a low pass filter. Each RC circuit causes the high frequencies to roll off at 6 db per octave above its cutoff or "corner" frequency. The frequency itself is given by the formula $f = \frac{1}{2\pi RC}$

Note: several of the handbooks have a very nice R,L,C,f chart for easily determining the value of R,C, or f when the others are known.

The effect of each of these filters is cumulative. If four 3 khz RC circuits were placed in cascade, the overall response would be down 4 x 3 = 12 db at 3000 Hz. Therefore, each RC circuit must be examined individually to determine its contribution to the overall frequency response. If the equivalent series resistance is obvious by inspection, simply plug the values into the formula. Unfortunately, the true resistance value is not always easy to determine from the schematic. For example, C56 forms an RC circuit with the parallel combination of R23, R27, and the plate resistance of V7B. But R27 has negative feedback voltage applied to it, making it appear to be smaller than it is. A much easier method to determine the corner frequency is to inject a signal generator into the input of each stage and measure the response of that stage alone. As the input frequency is swept upwards, the output level will gradually drop off, reaching - 3db (70.7%) at the corner frequency.

Each stage is measured in turn and the high frequency rolloff at the desired upper frequency limit of 5 khz is measured. Some of the capacitors form filters well above 5 khz. These are usually RF bypass capacitors and should be left alone. The ones which signifigantly affect the desired response should be reduced in value or removed. Remove only enough capacitance to extend the high frequency to 5 khz. The remaining rolloff above 5 khz will reduce unnecessary splatter to neighboring stations. In the Ranger II, I ended up simply removing C53, C56, and C59.

Low frequency rolloff is caused by RC circuits formed by series coupling capacitors C52 and C57 and their associated shunt resistances. The low frequency response was measured a state at a time, and C52 was found to be the primary cause of the rolloff. It was simply bridged with a .01 uf to extend the response well below 100 Hz.

The cathode bypass capacitors for RC circuits with the cathode bias resistors. Since they form a negative feedback network, the overall stage response rolls off below the corner frequency where the feedback is bypassed. In the Ranger, C50A, C50B, and C59A had minimal effect on the 100 Hz response. However, by removing C50A, I created an equalizing network formed by R18 and C54 which gave me a nice 3 db presence boost at about 3 khz. The response of this stage continues to rise until the feedback is completely bypassed. The overall response starts rolling off rapidly above 5 khz due to the responses of the other stages.

continued on page 28

Improved Heater Regulator For The R-390 Receiver

by Bill Kleronomos, KDØHG
POB 1456,
Lyons, CO 80540

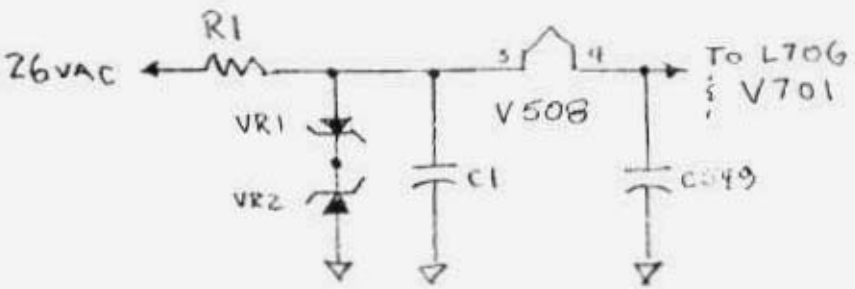
On of the 'joys' of owning and maintaining older receivers is the lack of availability of certain key parts when you need one for repair. One most common case in point is the often failure-prone and hard to find 3TF7 ballast tube used to regulate heater voltage in the R-390. While I do believe that Amperite still manufactures this item, the new price a few years ago was on the order of $40. While I am not a big fan of using silicon in hollow state radio equipment, sometimes it's the prudent thing to do.

Essentially, this circuit utilizes two back-to-back zener diodes to provide a regulated 11.6 VAC to the series heater string of V508 and V701 in the R-390. The original regulator tube provided a nominal 11.3 VAC, so the performance of this circuit should be identical or better than the original, as far as your receiver is concerned.

The theory of operation is quite simple. R1 provides current limiting for the circuit, providing 75 MA through the zeners and the 300 MA through the heater string. On the positive half cycle, D1 conducts with a voltage drop of about .6 volt, and D2 regulates in the reverse biased direction at 11 volts so that the total maximum voltage is 11.6. The same scenario happens on the negative half cycle where D1, being reverse biased, regulates at 11 volts, and D2, being forward biased, conducts with an approximate drop of .6 volt. The output of this circuit approximates a square wave, but this matters little in operating a tube's heater. C1 eliminates any possibility of RF noise generation.

This little circuit can be built on a little piece of perfboard or on a terminal strip. The only thing to watch for is the proper mounting of the zeners. They dissipate some power, and this heat is removed from the device via the leads. Therefore, keep the leads a minimum of some 3/4" long. I like to leave the leads full length and wind them up in a pigtail around a 1/4" diameter drill or other form prior to soldering the free ends into the circuit.

Parts List
C1 .1 uF 100 volt mylar or ceramic
VR1, VR2 1N5348 11 volt 5 watt zener diode
R1 40 ohm 10 watt wirewound



Comments on Norm Scott's (WB6TRQ, President of SPAM) First Draft of a Petition For Rule Making.... Regarding AM Power Reduction. (ER, Nov. 89)

by Dale Gagnon, KW1I
9 Dean Ave.,
Bow, NH 03304

Subject: Proposed AM Power Measurement Rule Making

I am in agreement the purposes behind the purposed rule, but I have issues with the strategy and specific points of argument.

I. Rule Making Strategy

The AM community's most advantageous strategy for this rule is to propose that the present power level be conserved and to convince the FCC that doing this will have no impact on interference levels, FCC field operations or the rest of the amateur community.

a. The most pursuasive argument is not taking privileges away from amateurs that they have had for decades. This strikes a sympathetic note with most amateurs, non-AM'ers included.

b. Continuing the present power levels was supported by the ARRL in 1983 when their comments to the FCC requested a permanent "grandfather" clause. It is unclear what support the ARRL will provide this time around, but it is unlikely they will get behind a power increase.

c. The FCC rule making process is affected by comments. They are influenced by the quality of the comments and the number of comments sent in supporting and those sent in opposed. Unfortunately, supporting comments for a "correct and fair" rule for the AM community can be completely overwhelmed by a landslide of emotional and biased opposing comments. AM'ers must not awaken general anti-AM sentiment by purposing a power increase.

2. Interference Potential of High Power AM.

This is an important issue with the FCC, but not in relation to adjacent channel interference. The FCC is concerned about the interference potential of an amateur station on electrical and electronic equipment in the vicinity of the amateur station. I learned this in discussion with Jeff Anderson, Engineer, FCC Field Operations Bureau, Washington. He worked on the technical issues of the original 1983 rule making. This is one of the reasons that the FCC chose PEP because it is the RF wave peaks that cause interference with other devices and services. By specifying a peak limit the Commission would have a way of regulating potential interference from amateur transmitters.

During a visit to William Cross of the FCC's Personal Radio Branch, I got the impression from him that the FCC was concerned about increased interference if the Part 97.313 rule were amended to continue to allow AM KW's.

Our rule making should point out that the potential for increased interference from high power AM stations is negligible. The number of high power AM stations has probably peaked over the last few years with the resurgence of interest in AM. It is unlikely that many more AM KW's will appear for the following reasons:

a. The incentive for running a KW of AM has not changed for over 50 years.

b. Most commercial units have been found.

c. There is no commercial incentive for new manufacture.

d. Homebrew components are scarce and expensive.

e. Amateurs who homebrew are scarce.

f. Amateur linear amplifiers designed for 1500 watt PEP CW or SSB service are not capable of a kilowatt of AM.

3. Adverse Impact

This is a key argument. I'm not sure if $1,420,000 will mean much to a government agency, but it is important to point out that these amateurs will be penalized with no off-setting gains for the FCC, the rest of amateur radio or the general public.

4. Minimum Power

The argument here can be framed in simpler terms.

Our rule making should state that the requirement for minimum power applies to all modes equally well and has no special application to AM. In addition there is no regulation that all amateurs use the most power or spectrum efficient communication mode or we would all have to operate on CW or a digial mode.

5. PEP Power Meter Error

This is a counter-productive argument. The FCC opposed the ARRL's suggestion of a permanent'grandfather' clause in 1983 with the following, "..we still cannot justify a permanent and continuous expense in terms of equipment and training that would be necessary for us to be prepared to make a special power measurement for this class of operations...".

Many FCC Field Offices have PEP power meters as their only method of measuring transmitter power. Casting doubt on PEP power meters ability to measure AM may not be helpful.

Whether the PEP power meters give appropriate readings on a modulated signal or not, they will give accurate readings on a unmodulated carrier.

Our rule making should specify transmitter power for AM as unmodulated carrier power measured in watts PEP. Today CW, which is nothing more than an unmodulated carrier when the key is down, fails under the PEP power measurement.

6. Using Two Standards to Achieve a Common Power Limit

This argument may look good to us in the AM community, but it is a thinly veiled argument for doubling AM power which has been dealt with above. If we propose keeping present AM power levels then we can agree with the FCC on a common standard, PEP.

Our rule making should take care to point out that we are in agreement with FCC standards. Futhermore, AM carrier power can be measured by FCC field staff with equipment on hand and with no additional training.

7. Amendment

I suggest the following as a replacement for Part 97.313 (b):

97.313 (b) No station may transmit with a transmitter power exceeding 1.5 KW PEP with the exception of AM DSB which may transmit with unmodulated carrier power not exceeding .75 KW .

This suggested rule is the equivalent of today's AM KW input, assuming 75% efficiency of a Class C amplifier stage.

Summary:

I believe that the AM community's best chance at influencing the FCC is based on arguments for keeping the present AM power levels, but measuring them under the Commission's amateur power standard, PEP. This approach is more likely to win ARRL support and it is less likely to awaken significant opposition from other mode operators.

A leading concern of the FCC, increased interference to neighboring electrical and electronic devices can be adequately dealt with using the rationale of a flat high power AM rig population.

Using the above approach technical arguments are neither necessary or desirable to convince the FCC.

William Cross made the point to me that the AM community had to show a compelling reason for the FCC to reconsider this rule.We need to convince the FCC that AM is not facing extinction, but has rebounded from the reaction to the inception of SSB and has an important continuing role to play in amateur radio. The planned reduction in power penalizes amateurs with no offsetting advantage to anyone. Adopting a PEP power rule to maintain the present power level, on the other hand will incur no additional costs to the FCC and will disadvantage no one. After all, it's just continuing what has been in place for over half a century!

Editor's note: Dale is one of the most energetic, articulate and knowledgable advocates the AM fraternity has. We all appreciate his efforts.

RESTORATION / REPAIR TIPS

To remove grease, label gum, ink stains etc. from metal, glass, plastic etc. use Ronsonal cigarette lighter fluid. Apply with a soft rag or Q-tip. **K6VHP**

There's an easy way to locate shorted rotor to stator plates in receiver tuning capacitors. Slip a piece of heavy paper between the plates. An ohmeter connected across the capacitor will serve nicely as an indicator to show when the shorted plates are separated. **K6VHP**

Collins 32S owners need not be off the air if your 516F2 power supply quits. The Heathkit HB-23 series power supplies will serve admirably as a substitute. Low voltage taps should be set for 300 volts. A note of caution: The HB-23 series will not operate a KWM2. The low voltage and filament current requirements exceeds the capability of the power supply. **K6VHP**

To clean up those old QST binders wipe them down with a solution of water and vinegar. The vinegar takes care of the mold. Let dry and wipe down with armoral. They'll look as good as new. **WB2FOU/5**

RF hardware which is silver or silver plated is often badly tarnished in old equipment. Clean it with 'silver dip'; these products are intended to clean silver tableware and are sold with the polishes and other silver cleaning products at supermarkets and variety stores. One trade name is "Tarn-X". Brush the cleaner on with a toothbrush; keep brushing and applying fresh liquid every ten seconds or so until you are satisfied. Do this only with good ventilation as the process generates hydrogen sulfide which stinks (odor of rotten eggs) and is mildly poisonous. Don't get the the liquid on porous insulating materials (such as wiring, bakelite, and unglazed ceramics) as it is slightly conductive and any residue will hold moisture and cause corrosion. For the same reason, rinse away all traces when cleaning is complete. KJ4KV

When you need to check the voltage (inject or take off a signal, etc.) at a hard-to-reach point such as a pin on a shielded tube with no access to the bottom of the socket, try a piece of wire-wrap wire. This material is used in computer wiring and is available at Radio Shack. It has easily stripped insulation on a tinned solid wire which is perfect for wrapping around the pin of a tube. The most common size is #30 which is easily passed up through a tube shield or under a cover plate. The insulation is thin, but seems to be okay for the voltages found in receiving - type circuits. **KJ4KV**

For many of our favorite '30s and '40s radios, crystal control is the only way to stay on frequency. But most manufacturers no longer make crystals in 'real holders' -- such as the FT-243, DC-20 and FT-171.

"C-W Crystals" is the exception. They've made crystals continuously since 1933 and in the last few years have focused on 'vintage' units such as those listed above. Their crystals are finished by etching which is the best method for long-term stability. Because the old holders are no longer made, they use refurbished holders which are marked with a good-looking adhesive label.

They have limited supplies of many older holders you won't get anywhere else; even better, they are happy to put a

continued on page 27

AM FREQUENCIES

2 Meters: the national calling frequency is 144.4. There is local activity in all major cities across the country.

---

6 Meters: the national calling frequency is 50.4. There are some local nets but most activity occurs during sporadic E openings. This is a band where AM activity is definitely on the increase.

---

10 Meters: the AM window here is 29.0 to 29.2. The calling frequency is 29.0. We should remember to move off the calling frequency once contact is made with another station. There is also activity at the bottom of the band between 28.304 and 28.325.

---

12 Meters: the calling frequency here is 24.985. This is a band with great potential. All we need is more people operating here.

---

15 Meters: a number of operators are attempting to revive AM activity on this band. The calling frequency is 21.385. I think we should all attempt to use this band more as an alternative to 10 and 20 meters.

---

17 Meters: the calling frequency is 18.150. This band is gaining in popularity amongst AM'ers. Check it out.

---

20 Meters: almost all the activity here occurs on 14.286. The SPAM 20 meter net starts about 5:30 westcoast time every evening and carries on until about 8 or 9 usually. The net welcomes check-ins. The group has grown so large that another frequency has been activated; now 14.296 is another 20 meter SPAM frequency.

---

40 Meters: the 40 meter westcoast SPAM net happens every Sunday afternoon starting at about 4:00 pm westcoast time. Late night activity around the country usually occurs on 7160, 7195 or 7290. On the eastcoast -mostly on week-ends- the activity is on 7285, 7290, and 7295. Westcoast Sat. nite BASH--7193

---

80 Meters: nationwide the activity is concentrated between 3870 and 3890, mostly in the late evening. The westcoast SPAM group meets on 3870 every Wednesday night at 9:00 PM CA time. The northeast SPAM group meets on 3885 at 7:30 local, Thurday evenings. There is a very interesting net in the Northeast: called appropriately; the Northeast Swap Net. This swap net is every Thursday nite at 7:30 PM EST. It handles vintage equipment and parts only. **Another frequency now used for AM operation is 3835. Some operators have moved down here to escape the congestion on the usual AM frequencies.**

---

160 Meters: 1885, 1895, 1990, 1950, 1995. Nightly activity on these frequencies and others across the country.

"ASTABULA BILL" W8VYZ

by Tom, N8IYV and Jeff, N8CCP, both of Ashtabula County, Ohio

On the afternoon of November 16, 1989, Tom, N8IYV and Jeff, N8CCP, both of Ashtabula County, Ohio, visited "Ashabula Bills" QTH. The following is a brief, candid summary of what we learned from Bill about his long involvement with Amateur radio.

Bill is 64 years old, has been licenced since 1941 at age 16, with the original call of W8VYZ. His "Elmer" was Chuck, W8SRW who is still living in the Youngstown area. He spent three years in the military and was a co-pilot in a B-24 Liberator. As for a profession, Bill worked most of his life as an electrician and assisted in the building of the Perry Nuclear plant here in northeast Ohio. Bill is now retired and when not fishing on Lake Erie, spends most of his waking hours on and with his radio equipment.

Walking into Bill's ham shack (basement) is like stepping back in time, about 35 or 40 years. It was impossible for us to conceive of the vast assortment of radios and radio parts that occupy every square inch of space. Bill puts real meaning into the phrase,"Real Radios Glow in the Dark".

Particularly in the winter months, Bill is on the air almost continuously. The transmitter he uses mostly is a homebrew KW that utilizes a pair of 4-250's modulated by a pair of 833's. He has 800 watts of carrier modulated by 1600 watts of audio. He says this is "Ultra Modulation". He learned about it from an article in CQ magazine in 1956. He says he "temporarily wired up" this rig about 15 or 20 years ago and is still operating it, "temporarily wired up".

continued on page 27

Bill at his operating position

photo by Paul Gordon, N6LL

Bernard "Bern" Doermann, WA6HDY
452 Oxford Dr.,
Arcadia, CA 91006

" I really have been having a ball on 10 meter AM radio telephoney! I've been talking to a lot of fellows I have seen in ER and that makes things even more interesting and lends a personal touch to QSO's.

"I was first licenced as WV6HDY in 1960. I used a Globe Scout 680A and Hallicrafters S-20R receiver. When I passed the General Class in 1962 I upgraded to a Viking Ranger I and HQ-110A with the Courier linear.

"In June of 1989 I put a little HR-2510 in my car for 10M and what do ya know AM activity up there at 29. +! Well that was it. I couldn't sleep at night until I could put a real boat anchor on the air.

" I am proud to announce a complete station now. Ain't she gorgeous! The B&W 5100B apparently sounds great. The HQ-140X was a 'freebee', and not shown in the photo is a Viking II-CD as 'back-up'."

Viking II Transmitter Improvements

by Sheldon Rubin, KT2L
117 N. Ridge St.,
Rye Brook, NY 10573

The E.F. Johnson Viking I and II transmitters are basically well-designed units that are still readily available at the local Ham flea markets at suprisingly low cost. Often they are overlooked while searching for higher-power, more expensive gear. Keep in mind that the power output of the "II" can in fact be increased by substituting 6146Bs for the stock P.A. finals. However, before considering any such modifications, the modulation quality should first be improved.

The stock Viking II uses a 6AU6 speech amplifier followed by another 6AU6 which is triode-connected as a driver for the push-pull 807 modulators. I found it impossible to fully modulate the transmitter without severe distortion. Distortion was also present at less than full-modulation as evidenced by the shape of the RF envelope under sinewave excitation. QST published (Hints and Kinks, Vol. IV, 1959, page 51) the following audio modification which seems to have found it's way into many Vikings: Both amplifier and driver stages were replaced with 12AX7 and 12BH7 dual-triodes to provide additional gain. The triode sections in the driver tube were connected in parallel to present a lower source impedance to the 807 modulators. My previous Viking had that modification along with regulated screen voltage on the modulators and worked well. The proposed change works even better and does not require changing the tube sockets to 9-pin units; although the driver transformer will have to be replaced.

Referring to figure 1, the 6AU6 driver is replaced and rewired for a 6AQ5A beam power stage which in conjunction with the new driver transformer is able to easily drive the modulators to 100%. Plate-to-plate feedback from driver to speech amplifier stage is used to reduce distortion even at maximum modulation. The screen voltage at the 807s should be regulated by a pair of series-connected OA2s at 300 volts to take-full advantage of this modification. Values of certain audio coupling and bypass capacitors were also increased to provide improved audio bandwidth.

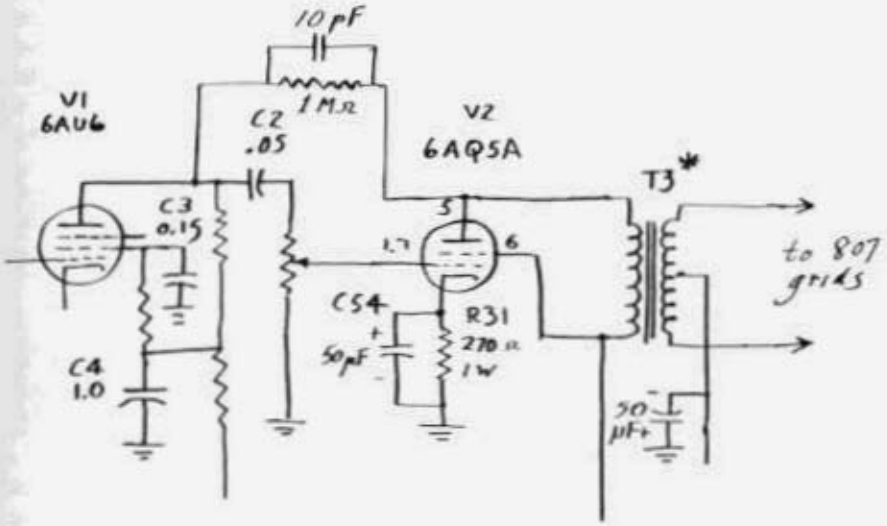
I suggest that anyone wanting to make these mods had better locate an appropriate audio driver transformer first. Audio transformers are becoming more difficult to obtain. There is also some confusion as to the ratios for inter-stage versus driver transformers. An interstage transformer is a step-up transformer even though it is often specified as a 2:1 or 3:1 ratio instead of 1:2 or 1:3 ratio. In any case the step-up is from primary to secondary. A driver transformer may either be step-down or step-up depending on the application. For example, class B driver transformers are generally step-down ratios whereas Class AB drivers may be step-up with ratios in some cases close to unity.

The stock driver transformer has a turns ratio of 1.2:1 primary to one-half secondary of 1.2:2 primary to secondary. It will not handle the 45 MA plate current of the new 6AQ5A stage without burning out. I substituted a larger transformer (Kenyon KR53M) which has a step-up ratio of 1:1.4 primary to one-half secondary or 1:2.8 primary to secondary. Any interstage transformer with a step-up ratio from 1:2 to 1:3 should work providing the primary can handle the current. The secondary must of course be center-tapped.

While on the subject of turns ratios; it might be of interest to know that the Viking II modulation transformer has a pri:sec ratio of 1.6:1.

Regulated screen voltage is obtained as shown in Figure 2 by installing two OA2 VR tubes on a small aluminum bracket mounted under-chassis. The slider on the wirewound resistor (TAP "A") should be readjusted such that the VR tubes remain lit during maximum modulation peaks so long as the current during no modulation does not exceed 30 MA. The clamper tube pot R30 should also be readjusted.

continued on page 26



* See text. 1:2 to 1:3 Step-up. 5K Ω primary @ 40 mA DC.

FIGURE 1. VIKING II MODIFICATIONS TO SPEECH AMPLIFIER / DRIVER.

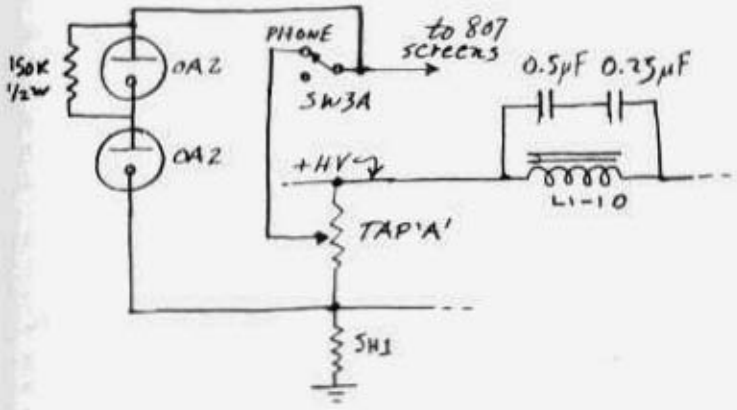


FIGURE 2. ADD'L MODIFICATIONS TO REGULATE MODULATOR SCREENS & REDUCE RIPPLE.

Hallicrafters from page 3

Immediately the young Hallicrafters company was beset with problems. A few sets were built, the S-1 through S-3, at an old manufacturing plant at 417 North State Street. RCA came down hard on them for patent infringements and said," You can't build anymore until you get a license from us, and we aren't going to give you one!" As if this wasn't enough, most of the "Hams" these new radios were designed for hadn't yet recovered from the depression and didn't have the money to buy them. Bill didn't give up. Procuring as many orders for the radios as possible, he would have them built by a licensed manufacturer on small production runs of 50 or 100 sets, using the orders themselves for collateral. An arrangement that at best was very limiting.

What he needed was a license to build under RCA patents. In 1933, Silver-Marshall Incorporated, was in bankruptcy and Bill saw an opportunity to get his coveted license. A deal was engineered, Bill and "The Hallicrafters" took over Silver-Marshall Inc., renaming it Silver-Marshall Manufacturing Company and operating it from the State Street address. This relationship was also plagued with financial problems and ended in late 1934 when Bill was released from his obligations to Silver-Marshall Mfg. with the help of Ray Durst. Ray was a customer credit manager for the Echophone Radio Company, which was also in financial trouble and for all practical purposes was out of business.

Echophone had a 50,000 square foot plant at 2611 Indiana Avenue, and a good license. Another deal was struck with the owner of Echophone and the two companies merged, with Hallicrafters being the dominant partner. Ray Durst became Vice President of Hallicrafters. During the first few months the company was doing 'contract' work for other radio manufacturers and large mail-order houses in order to build it's cash reserves and in late 1935, they started producing the line of communication receivers we are all familiar with. The SX-9 "Super Skyrider" was the first model to be produced in significant quantities, and the company logo was changed.

Hallicrafters' policy was to build a quality product with all the state of the art advances and features at a price that was affordable. With this policy, and good management, they literally pulled themselves up by their boot straps and by 1938, were the most popular manufacturer of communication receivers in the U.S., and were doing business in 89 other countries. It was also Bill's policy to bring out new models as new features and technical advances were made, rather than upgrading the same basic model. This explains the profusion of different models produced, which in the three year period from 1936 to 1938 had reached 23.

Until 1938, the production was devoted entirely to receivers and associated accessories. It was now time to produce transmitters. The job of designing the new product line was to be done by the newly hired Bob Samuelson, who was responsible for the design of the HT-1 through the HT-14 and would shortly become the company's chief engineer.

The onslaught of World War II took the U.S. by surprise, there was a shortage of military radio equipment and a tremendous demand by the government for electronic equipment of all types.

Many of the existingHallicrafter products and designs were pressed into military service. The company geared up for war time production and was responsible for many new designs and innovations. Probably the most well known of these was the HT-4 (BC-610) and related equipment used in the SCR-299. Production of Ham radio gear and related items was all but suspended until 1945.

By 1946, the war was over, so was the wartime production and most of the government contracts. It was time to again produce ham radio equipment and a new line of consumer electronics to satisfy the public hunger for the products they had gone without for over five years.

The old plant at 2611 Indiana Avenue had served them well during the war years but a modern image was needed in the facility and product line. A new plant was designed and built at 4401 West 5th Avenue (5th & Kostner) that would be the company's home for the next 20 years. A "modern" look to the products was incorporated with the help of Raymond Loewey, a well known industrial designer of the time. One of the first post war sets produced in the new facility was the S-38. The logo was again changed to the familiar "circle h".

Production also began on the new line of consumer electronics, including radio phonograph units of all shapes and sizes, am-fm receivers, clock radios in brightly colored Bakelite cases, and television receivers (the first being the T-54). Many of the consumer products bore the name of Echophone, which by now was all but forgotten. Competition was stiff in the consumer field, and although this product line would continue until the late 50's, it never really took hold. Even so, the company was doing better than ever and by 1952, was employing 2,500 people.

The 50's were very successful for the company, Bill's son, Bill Jr., and possibly other family members were involved in the operation. The theme of the fifties was civil defense, and many of the products bore names like "Civic Patrol" and "Defender". Some of the Ham radio products became 'classics', like the HT-32 and SX-101 (1957). Much of this equipment is still in use today and is sought after by nostalgia buffs and collecters.

By 1958, Bill Sr. wanted to retire, and the company was sold. I don't know much about this transaction except that it apparently failed and the Halligans regained control a short time later. In 1963, Hallicrafters purchased Radio Industries Inc. of Kansas City and ran it as a subsidiary, producing many of the Ham radio acessories and some of the major equipment like the HT-45 "Loudenboomer". The Halligans would continue operations until about 1966 when the company was sold to the Northrop Corporation. This ended forever the Halligans' involvement in Hallicrafters.

Northrop would move the company to a new plant at 600 Hicks Road, Rolling Meadows, Illinois, and the logo was again modified.

continued next page

While a subsidiary of Northrop, Hallicrafters would continue to produce Ham radio products for a few more years, but the main purpose was to produce para-military equipment in Northrop's defense systems division. For all practical purposes, the last Ham radio item produced was the FPM-300 in 1972, and a few accessories until 1974. There were also some CB units and portable 'jam box' type am-fm-sw sets of Japanese origin released under the Hallicrafters name. At this point, Northrop turned responsibility for Hallicrafters over to it's partner, Wilcox.

For whatever reasons, the annual sales of Hallicrafters had fallen off sharply since 1970, and by 1977, Wilcox sold the company to the Braker Corporation of Dallas, Texas. It was relocated to Grand Prairie, Texas, where a few more CB's and various portable radios of Japanese and Taiwanese origin were released. About 1980, Braker ceased doing business and along with it, Hallicrafters. Clarence Long (one of the principals of Braker) went to Miami, Florida, and tried to resurrect Hallicrafters, calling it "Hallicrafters International", but this too ended in failure a short time later.

Sometime between 1981 and 1984, the Hallicrafter name was purchased by Tom Lott of California. Tom worked for Bell Laboratories for many years and was responsible for research and development of some of the first transistors in the early 50's. In 1985, he produced some sophisticated business and office telephone systems and marketed them under the name of Hallicrafters. He had also planned to produce a line of FM repeaters and related items for Ham and business use but I have not seen any activity in that area. As of 1985, the address of Hallicrafters was 969-A Industrial Road, San Carlos, California, 94070.

Bill Halligan Sr. is alive, living in Florida, and although his health is deteriorating, is doing well for a man of 91. Sadly, his son Bill Jr. recently passed on. Regardless of the official status of the company, to me the 'old' Hallicrafter company will always be alive and a large part of my life.

Viking II improvements from page 22

Other worthwhile improvements include (1) the addition of a 50 uF capacitor across the grid bias supply for the 807s; (2) resonating the filter choke in the HV supply to eliminate ripple by connecting a series combination of 0.5 uF and 0.25 uF across the choke. The caps should have at least a 600 VDC rating; and (3) raising the screen voltage on the 6146 finals by shunting R28 with a 40K wirewound resistor.

It will be found that after making these mods the audio gain will have to be run at maximum when using a high output microphone such as a crystal or ceramic. If more gain is desired the 1M feedback resistor may be increased to 2M. Removal of this resistor will further increase gain at the expense of increased audio distortion; but in any case, the audio quality and modulation percentage will be improved over the original design. Since I am using an outboard speech processor the reduction in audio gain posed no problem.

I believe that these audio modifications should also permit the Viking II to be fully modulated at power inputs of 170 watts which could be obtained by using 6146Bs as finals provided the power supply can handle the added load.

Reflections from page 2

This 40 meter CW rig was fed into a doublet antenna by a quarter wave length of EO-1 twisted pair RF cable. The link coupling was absolutely cold, RF wise, so I ran the antenna lead from the SW-3 directly to the transmitter antenna pick-up link coil. Upon pressing the sending key, the SW-3 broke into a pleasant sounding 500 cycle audio tone which followed the keying crisply. It was the best kind of CW monitor a guy ever had.

In 1940, I got a job as a shipboard operator and took the SW-3 along with me. I stuck a 117Z6 rectifier tube inside the cabinet and made it into an AC-DC receiver. The ships had 110 volt DC at the convience outlets. One night, while steaming northward in the gulfstream off the Florida coast, I became exasperated with the receiver jumping frequency whenever some motor on the ship was turned on or off, changing the the line voltage. So I picked up the SW-3, went over to the rail, and tossed it overboard. Someday, if an oceanbottom explorer finds a National SW-3 off the coast of Miami, thats how it got there.

Ashtabula Bill from page 20

Other equipment that he uses regularly is a Heathkit DX-100, a Johnson Viking II, two BC-348 Q's with homebrew converters for 10 and 15 meters, and a Hammarlund HQ-170. He has two towers; one carries a beam for 20 meters and another (120') he uses to support his wire antennas for 160, 80 and 40 meters. At various times he has had other big antennas like rhombics which he says are his favorite antennas.

Bill has never operated SSB. He says, " I just don't like the sound of it". Before the resurgence of activity in AM that has occured over the last couple of years Bill says it was pretty 'lonely' operating AM. There were just a few operators that were interested in AM. Today Bill is really an inspiration of sorts to operators just discovering AM. He is a 'library' of information about rigs, tubes, circuits etc. and is always available and encouraging to a newcomer. He has also been very generous with parts from his basement.

When Bill is on ten meters he can be found at 28.304. He doesn't like the high end of the band (29.0 to 29.2 the AM "window") and he wants the novices to know that there is another mode besides "SSB". He feels that the novices should have been given AM privileges under the enhancement program instead of just SSB. Bill works a great many of the novices 'cross mode'. We think that Bill enjoys talking to the novices that are new to ham radio as much as he does talking to his old 'cronies' that he's know for 30 years. The reason there are so many AM operators in Ohio and in particular, Ashtibula County, is the inspiration Bill has provided. Bill is one of the true 'oldtimers' and AM operation would not be the same without him.

Tips from page 18

new crystal in your vintage holder. They also have a (very) few sockets for the older holders.

They operate on a mail order-only basis. The address is: C-W Crystals, 570 N. Buffalo St., Marshfield, MO 65706.

Orders for 160 meter FT-243 crystals will be filled with DC-20 units (pins are the same but body is slightly larger) unless you specify otherwise, because this gives a more active crystal at these lower frequencies.

Crystals from C-W are surely one of the last remaining bargains – at this writing single FT-243S are $2.95 each for 80 and 40 meters, $4.95 for 160 meters, plus postage of $0.50 for a single unit or $0.35 per crystal if ordering more than one. Prices are lower when ordering several and they have many other stock and custom items. A complete price list (plus a bunch of transistor and crystal circuits) is $1.00. Personal checks are accepted. KJ4KV

In Uniform from page 11

You can't beat the simple controls or the fact that the frequency is set directly in kcs. The performance is outstanding, not only in stability but in many other areas as well -- the best AVC I have used, for one. Mechanical filters in the IF's give the set an excellent combination of intelligibility and adjacent channel rejection. I can't think of another conbination of 1960's gear which comes close to the performance of this set in so little space.

For having so many parts in so little space, maintainability is oustanding. The manual is excellent, though marred by typos and a poor transmitter troubleshooting chart.

One weakness of all 'self tuning' radios I know of, from about 1950 until at least 1980 or so, is that every time you change frequency you must radiate a signal for ten seconds or more before you can talk, greatly increasing the chance of intercept. On ART-13 (on the other hand) and a couple of following sets, all controls are Autotuned; when you change channels they return to the previous setting.

The one big question about the ARC-58 is reliability. Just on the 'parts count' you would expect problems: an ART-13 and BC-348 receiver (as used in the B-29 bomber) have a total of 20 tubes; the ARC-58 has 127 tubes and transistors, plus quite a few diodes which I did not count. I can't think of a radio which pushes the technology as hard as this one does -- transistors, for example, were only invented in 1948.

Counting only failures in modules I repaired, I found about twenty problems in my set. About half of these were the 'wear out' problems you expect in an old radio and the others were assorted manufacturing defects and rare problems of the sort you see only when you have a lot of parts.

The ARC-58 looks to me like a racehorse -- unbeatable when in good form, but not your first choice for plowing 40 acres, year after year. I have, however, no real data. If any reader can provide more information on what it was like to serve with the ARC-58 (or TRC-75) I'd like to hear from him.

Next month we'll turn from phase locked loops to modulated oscillators and from 127 tubes and transistors to seven tubes. One more clue -- the using service is one for which we haven't yet discussed any radio. See you then!

Broadcast Audio from page 14

The frequency response of transformers is a function of their design and the impedances across their inputs and outputs. Generally speaking the lower the source and load impedances, the better the low frequency response. I found that the 'iron' in the Ranger II was adequate for my desired response. The modulation transformer distorted a 100 Hz signal at 100% modulation. But in actual practice the 100 Hz component of a voice rarely gets to 100%.

Extending the high frequency response of a particular stage too far may allow it to oscillate. If this occurs, you have removed too much capacitance. Extending the low frequency gain of a stage could cause it to 'motorboat'. This can usually be cured by increasing the decoupling capacitors on the B+ line.

The modifications on the Ranger were done by lifting and insulating one end of each component so the rig could be restored to 'factory' at any time. Reports on the air have been excellent even when used with my (properly tuned) Kenwood TL 922 linear running 350 watts output. So here's the bottom line: Remove C50A, C53, C56, C69, and add a .01 uf across C52 to get some real nice audio from your Ranger II.

John Barcroft, WA6ZJC, is the Chief Engineer for KGB-FM and KPOP AM in San Diego.

CLASSIFIEDS

Free Classified Ads

For Subscribers: 30 words

Non subscribers and additional ads for subscribers

$3., per 30 word ad - 10 cents each additional word

VINTAGE EQUIPMENT ONLY

E.R.
Box 139
Durango, CO. 81302

303-247-4935

DEADLINE FOR THE FEB. ISSUE: FEB.7

FOR SALE: Hammarlund HQ-100, general coverage receiver, mint - $125; HQ-145 receiver - $125. **WANTED:** Hammarlund HQ-200 or HQX-300. Charlie, KD4AJ, (404) 396-0276

FOR SALE: Electron tubes, all types - microwave, transmitting, receiving, obsolete, military – Large inventory. Daily Electronics Corp., POB 5029, Compton, CA 90224. (213) 774-1255; (800) 346-6667

FOR SALE: Clean Mohawk, with manual - $100. M. Heiman, K7BDY, Box 744, Showlow, AZ 85901. (602) 537-2450 or (602) 742-2875

FOR SALE: Brandes headphones, 'Navy Type', 'Tone Matched'. **WANTED:** RME DB-23 or DB-22A preselector, 833A tube, GPR-92 receiver. Fred, W6RNC, POB 478, Nevada City, CA 95959.

WANTED: Collins parts: complete units, junkers, interconnect cables, speakers for A and S series, anything. Bob W1CNY, Box 834, Simsbury, CT 06070

WANTED: Delco 5300; RS-6; BC-611; and manuals for 310B, SBE-2 and PRC-108. Gary Cain, 1775 Grand #302, St. Paul, MN 55105

WANTED: Espionage equipment. Historian purchases spy radios, code and cipher machines and any equipment, devises or manuals pertaining to the world's intelligence organizations. Keith Melton, Box 5755, Bossier City, LA 71171. (318) 747-9616

WANTED: Old National and Hammarlund communications receivers and accessories. Cash or SASE for trade list for above sets. Robert Enemark, W1EC, Box 1607, Duxbury, MA 02331. (617) 934-5043

WANTED: Pilot and German Pre-WW-II military and civilian radios. Also WW-II military. Bill Moore, 1005 Fieldstone Ct., Huntsville, AL 35803. (205) 880-1207

WANTED: 800 cycle CW filter F455B-08 and 8R1 - 100 kc xtal calibrator, & FM adaptor for Collins 75A-3. WA7IHN, 11004 James Way, Aumsville, OR 97325. (503) 749-1149

CLASSIFIEDS

FOR SALE: Early books and magazines on radio, television, telegraphy, and electricity. To get on our mailing list, please let me know what your specific wants are. New Wireless Pioneers, James Kreuzer, N2GHD, Box 398, Elma, NY 14059. (716) 681-3186

FOR SALE: SB-10 - $45; S53A - $45; HQ-100, w/manual - $85; HW-16, w/manual - $59; HG-10 w/manual - $39; Gonset G43 w/manual - $59. **WANTED:** Heath GC-1 or GC-1A. Hank, W3NCX, 1005 Wyoming, Allentown, PA 18103. (215) 435-3276

FOR SALE: Viking II. **WANTED:** 6 kc AM filter for the Collins 75A-4; 4D32 tube; 75A-4 Collins speaker or any 75A series speaker, purchase or trade a Collins S/line speaker. Gary Elliott, K7OX, 6229 E. Joan de Arc, Scottsdale, AZ 85254.

WANTED: German, Japanese, Italian radio equipment of WW-II era, any condition. My interest is in collecting, studying, and restoring to on-air operation, the less common WW-II equipment - not just a museum display. Also interested in U.S.A. mobile and pack sets; especially CW-capable. **FOR TRADE, OR?:** RS-6, Navy ATD, GP-4, RCAF AR-6, AT-12. Thanks! Hugh Miller, KA7LXY, 6400 Maltby, Woodinville, WA 98072-8375.

FOR SALE: WATTMETERS, URM-120, 2 to 1000 Mhz, RF 10 to 1000W, using three plug in couplers (like Sierra 164). Used, removed from service with TS-1285 meter, couplers, metal case and book, 20 lbs - $140 plus shipping. Tartan Electronics Inc., POB 36841, Tucson, AZ 85740. (602) 577-1022

WANTED: Tube testing chart-pages (heavy cardboard or copies) for military tube-tester No. TV-7/U, pages 1 thru 28, missing up to 12BR7 tube. F. Yonker, 7 Old Farms Rd., Saddle River, NJ 07458

1990 WINTERFEST ™: Virginia (Vienna) – Febuary 25. Sponsor: Vienna Wireless Society 1990 Winterfest ™. Time: Tailgate/Seller setup begins 6:00 AM, General Public 7:30 AM. Place: Vienna Community Center, 120 Cherry St., Vienna, Virginia (off route 123 and Interstate 66). Features: Large indoor exhibition area. Breakfast and lunch available. Talk-in: K4HTA/R 146.085/146.685 or W4LBL/R 146.190/146.790. Admission: $5.00 door, $10.00 tailgate, $15.00 (non commercial) and $20.00 (commercial) for indoor tables (no advance door and/or tailgate sales). For information contact: Harry Kaklikian, W4ACN, 4941 Andrea Ave., Annandale, VA 22003. (703) 978-4402

FOR SALE OR TRADE: SX-117; HRO-7 - $125; NCX-3 - $95; Drake 2B - $60; **WANTED:** Elmac AF-68 and Johnson Ranger transmitter. Jerry Boles, N5KYE, (405) 373-2228

FOR SALE: 68 years collection: 10,000+ items: antiques, radios, televisions, phonos, sound, military, ham, catalogs, flyers, books, brochures. 48 page list - $1 refundable. F. Yonkers, W2IBH, 7 Old Farms Rd., Saddle River, NJ 07458.

WANTED: Globe King, Viking 500 or other 500+ watt, AM transmitter. Also want to buy Johnson KW Matchbox. John Morehead, N9HRS, 535 Brown Circle, Elk Grove, IL 60007. (708) 593-2111 days

---

FOR SALE: Beautiful photo copy of Grebe CR-18 operating and information manual - $10 plus $2 First Class mail. P. Weingarten, 67-61 Alderton St., Rego Park, NY 11374.

WANTED: Johnson Navigator. Evan, NØGMR, (402) 435-4083

CLASSIFIEDS

"REAL RADIO GLOWS IN THE DARK" BUMPER STICKER-$1 each with a #10 SASE. We service American made amateur radio equipment, circa 1940, 50, 60 & 70's. Collins, Drake, Swan, Hallicrafters, Hammarlunds, National, B & W, Johnson, Gonset, WRL, Millen, Technical Materials Corp, Harvey Wells and so forth. QRP to QRO. Call or write for a quote on your servicing. **CLASSIC RADIO,** PO Box 3486, Eureka, CA 95502. 24 hr phone (707) 444-3911.

WANTED: 4H4C voltage regulator tube for NC-300. Also a copy of the schematic. J.N. Meade, 12711 Pinebrook, Hudson, FL 34667.

WANTED: Military transmitters and transceivers, 30's - 60's, particularly GP, ATB, PRC-7, ARC-21, ARC-65, and TBW. Walt Hutchens, KJ4KV, 3123 N. Military Rd., Arlington, VA 22207.

FOR SALE: Parting out the following: SX-101A, 75A-3, 32V-3, Ranger, Viking II; Valiant, as is, or part out - $85; FPM-300, as is - $100; NC-300 crystal calibrator - $23. Viking 122 vfo - $25; Valiant - $145; Drake 2-C - $115. Joe Sloss, K7MKS, 4732 119th st., Bellevue, WA 98006. (206) 747-5349

FOR SALE: Hammarlund HQ-170A; National 270; RME 45 with matching speaker. **WANTED:** Johnson transmitters and accessories; Johnson Thunderbolt. Basket cases ok. Bob Sloan, KK4GO, 2340 S. Puckett Mill Rd., Dacula, GA 30211. (404) 945-8642

WANTED: Heath 1 1/4" metal knobs, like those used on the Apache, National NFM-83-50 NBFM adaptor, Viking Mobile VFO. KU1R, George Maier, 64 Shadow Oak Dr., Sudbury, MA 01776. (508) 443-0960

WANTED: .0002 mf mica cap., 6 amp or better. Gary Kabrick, WA7WOQ, Box 34, Amado, AZ 85645. (602) 740-2968

FOR SALE: Vibroplex Collector's Guide. Contains history of every key, identification guide, complete patents, more. Only $14.95 plus $2 S&H. (foreign, $5 S&H) Mass. res. add $.75 tax. Artifax Books, Box 88-E, Maynard, MA 01754

WANTED: Very old or unusual Hallicrafters equipment, entire 1934 "H" & "Z" line of Silver Marshal, parts, memorabilia and manuals. Chuck Dachis, "The Hallicrafter Collector", WD5EOG, 4500 Russell Dr., Austin, TX 78745.

WANTED: Viking Ranger II, in good physical and electrical condition, w/manual; E and F coils for HRO-50T1 or HRO-60. John, K4HRY, 1324 Trotwood, Columbia, TN 38401. (615) 388-6500

WANTED: Ideas on how to adapt a Johnson Ranger for 12 meters in the 11 meter bandswitch position. Steven Putman, N8ZR, 113 Glenrary Rd., Lima, OH 45805

FOR SALE: FT-237 radio mounts, good to fair condition, NATO - $125; complete SCR-610 radio - $350. Steve Bartkowski, 4923 W. 28th St., Cicero, IL 60650. (708) 863-3090

FOR SALE: Rare Hammarlund receiver HQ-215 in very good condition with manual - $195. **WANTED:** Hammarlund HQX-300 transceiver. Charlie, KD4AJ, (404) 396-0276

WANTED: Hammarlund Comet Pro or Super Pro 100/200; factory wired Viking Navigator; Globe Scout; 160 or 80 meter novice crystals; early QSTs. Brian Roberts, 3068 Evergreen, Pittsburgh, PA 15237. (412) 931-4646

FOR SALE: 15 QSL cards from 1930-(used) - $4 postpaid; tubes, 304TL - $15; 1625 - 807 - $5 each plus UPS. Krantz, 100 Osage Ave., Somerdale, NJ 08083.

WANTED: 750TL tubes. Bill Diggins, WA8LXJ, 2699 Shamrock Rd., Morrow, OH 45152. (513) 899-2876

CLASSIFIEDS

FAIR RADIO SALES

1016 EAST EUREKA STREET,
POB 1105, LIMA, OHIO 45002 **419/227-6573**

R-388/Collins 51J3 HF receivers, 0.5 - 30.5 Mhz, AM - CW in thirty bands on wide 6" linear scale; 500 khz IF. Rack-mount-style without top cover; 55 lbs sh wt.Used-checked, $350.00; manual, partial repro, $10.00
Hammarlund SP-600JX receiver*, 0.54 to 54 Mhz in six bands with crystal control feature; 455 khz IF. Rackmount; 73 lbs sh wt. Used-checked, $345.00; manual, partial repro, $10.00
SP-600JX-21A*, rare and last of the series features USB & LSB operation; includes original cabinet and manual. Used-checked, $650.00
SP-600VLF*, like JX- series except 0.1 to 54 Mhz. Hammarlund-made, but with Dero Mfg. tag; rackmount. Used-checked, $395.00

* Note: SP-600's must be shipped via motor freight or bus!
All prices F.O.B. Lima, Ohio. Cash, VISA or Mastercard payment required.

FOR SALE: MC Jones Electronics Co. Micro-Match standing wave meter coupling unit - $35 ppd; Knight Kit VFO with manual - $25 ppd; new 866A and 807 tubes and some old oil filled caps. James Fred, R1, Cutler, IN 46920.

FOR SALE: TMC GPR-90 receiver, excellent condition, no speaker - best offer. Bob Witt, WA2IQX, (716) 648-4274

FOR SALE: January 1990 catalog of Radio/Wireless and Broadcasting books now available. Send SASE to Rainy Day Books, POB 775, Fitzwilliam, NH 03447. (603) 585-3448

WANTED: Manual for Drake 2B receiver or copies of schematic and alignment instructions. Ronald Reu, WBØLXV, RR#1, Box 334, Winfield, MO 63389.

WANTED: B&W 40TVH and 80JCL plug in coils. James Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (404) 748-5968

FOR SALE: "Zenith Trans-Oceanic, The Radio Powered to Tune the World". New booklet (8 1/2 x 11) contains history, model identification, pictures and olds ads - $7. Bob's Books, Box 27232, Lakewood, Colorado 80227.

FOR SALE: 211 tubes - $15 or trade for 813s; RBM HF receiver, will trade for RAX receiver (1.5 to 9 mhz). **WANTED:** SB-10 adaptor; U-7/U plug; manuals (copies or originals) for TBW, BC-348K and RAO. Surplus Steve, KD2NX, (718) 265-2390

WANTED: Hallicrafters owners manuals for models T54, 505, 506, 7" TV's. Originals only. Fred Emerson, 627 Illinois Ave., Elgin, IL 60120. (708) 741-6728

FOR SALE: Heath Apache TX-1 and SB-10 exciter - $135, pickup only; Knight T-60, Sonar SRT-120, Knight Star Roamer - $35 each. John, W6MQK, 1049 N. Holliston Ave., Pasadena, CA 91104. (818) 798-9345

CLASSIFIEDS

FOR SALE: UTC transformers, brand new in factory cartons, 100 different types: transmitting, filament, chokes and modulation transformers. Also audio interstage and outputs etc. Commercial, military and amateur grades. Send #10 SASE for catalog and inventory to: Len Crispino, POB 702, Hudson Falls, NY 12839. (518) 638-8199

TRADE: My FB-7. WANTED: SW-3 coils, pre WW-II National transmitters, Radio Handbooks. Niel Wiegand, WA5VLZ, 911 North Bend, Austin, TX 78758. (512) 837-2492

FOR SALE: Good pull-outs: 833A - $80/pair; 4C22, 814, 815, 6844, 902, 3BP1, 3RP1 - $10 each. Gary Cain, 1775 Grand Ave., #302, St. Paul, MN 55105.

FOR SALE: Grundig Majestic 1060 and Grundig 2066. **WANT:** Drake/Collins/Hammarlund/National general coverage receivers. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

FOR SALE: Viking Valiant II with SSB adapter - $175; Viking Ranger - $100; Adventurer with 250-40 modulator - $50; Heathkit VF-1 VFO - $25. All very nice, work great. Don, KC9PO, 809 Spear, Normal, IL 61761. (309) 452-5618

WANTED: Naval, vehicular, portable radios, power supplies, connectors, cables, dynamotors, manuals, spark parts, sets and films of military nature. Charles Di Cecca, 501 Mystic Valley Parkway, Medford, MA 02155. (617) 396-9354

WANTED: 12 K/ 50 watt resistor with sliding taps. J.J. DeSousa, Jr., W1OFK, 29 Whiting St., Plymouth, MA 02360. (508) 746-6533

WANTED: Manuals for Heathkit Apache; Gonset G-28, G-50, G-76; Johnson 6N2 xmiter, 122 vfo, 6N2 vfo. J. M. Roseman, W9UD, 2716 W. 3rd St., Coal Valley, IL 61240.

WANTED

TRANSMITTING TUBES
FOR MUSEUM

Do you have any old amateur or commercial transmitting tubes worthy of saving for posterity? If yes, help us do same. Contact:

Al Jones K6DIA

Ye Olde Transmitting Tube Museum

P.O. Box 97, Crescent City, CA 95531

FOR SALE: Johnson Ranger 1- $95; 20 amp/115 volt variacs - $50; 1 KW isolation transformer, 115 volt - $50; Bird wattmeter, model 6350 - only $60; Millen rack monitorscope - $35; Design Co. modulation monitor - $35; 813 tubes - $20 each; 100TH - $15 each; 6B4G - $4 each. Inquire on others. Levy, W5QJT, 7600 Blanco Rd., San Antonio, TX 78216. (512) 341-8549

FOR SALE: Transmitting/receiving tubes, new and used, mostly old surplus. Exa: OC3, 3B28, 4D32, 4-125A, 808, 809, 810, 811, 813, 815, 816, 829, 832, 836, 860, 1625, 5894, 6130, 6146, T55, 9003 plus others. SASE for list. I also collect old and unique tubes of any type. Maybe you have something to trade? John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: Modulation transformer, rating plate says; 1.14 KVA, pri. and sec. are 5500 ohm, sec. current .198 amp, made by RCA; also TMC antenna tuner. Bruce, W9OTN, (708) 474-8910 evenings.

FOR SALE: Drake 1A, with manual, very clean - $175 plus shipping. Lance Harmon, AA6QQ, 1103 Oakridge Dr., Roseville, CA 95661. (916) 784-6385

FOR SALE: Books: early radio, electrical, electronics, physics, chemistry, etc. Large SASE. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

CLASSIFIEDS

WANTED: By individual, Collins 75A through 75A4 receivers and Collins general coverage receivers. Also, other high quality general coverage receivers. John Orahood, 5819 Miller Valley, Houston, TX 77066. (713) 440-5598

FOR SALE: 1966 ed. RCA receiving tube manual - $5; pair of good, used, Eimac 4X150As in Eimac boxes - $20 pr.; 3.3 Uf/4KV oil filled caps with brackets - $12 ea.; Heath IT-17 tube tester - $30; Bird 4521 rack mount wattmeter, convertable to a model 43 or peak reader - $75; guts from Bird 43 wattmeter, meter has crack on rear but works fine - $35; sockets for 4X150-250 with screen bypass ring and ceramic chimneys - $15 ea. Bill Kleronomos, KDØHG, POB 1456, Lyons, CO 80540. (303) 823-6438

FOR SALE: Gibson Girl Kites, M-357A, with two baloon inflation tubes and case, used - $30,kite only - $25; RC-292 Antenna Sets for extending operating range of FM radio sets. Covers 20 to 70 Mhz by preadjusted vertical and ground plane elements elevated to 30 ft. by 12 AB-35 mast sections. Portable set includes elements, ropes, stakes, 68 ft of RG-213, roll bag, instructions, etc, 55 lbs, used - $95 plus shipping. Tartan Electronics, Inc., Box 36841, Tucson, AZ 85740. (602) 577-1022

WANTED: Heath AT-1; Knight T-50; Globe UM-1 modulator; meter for Heath AT-1. Still looking for early National receivers: NC-40, 46, 80 etc. Steve Sauer, WA9ASZ, 1274 Londonerry Ln., Greenwood, IN 46142. (317) 882-4598 eves. after 8:00 EST

TRADE: QST, CQ, 73, Ham Radio, Short Wave Craft, Radio Craft, Radio News, Radio, Radio- Electronics, Popular Electronics, Electronics World, Electronics Illustrated. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Heath AG-10 vfo for Heath DX-60 transmitter. Michael H. Wilke, WB4AQL, 215 Dale St., Rossville, GA 30741. (404) 861-3070

FOR SALE: PRC-74C, good working condition, with battery box, antenna, hand set - $700. Several more PRC-74s for repair, call. Michael Murphy, 11621 Valle Vista Rd., Lakeside, CA 92040. (619) 561-2726

WANTED: HRO-50T and T1 coil sets: G, H, J, AA and AB; 3XP2 CRT; earphone (headset) receive AN-B-H-I for my -10db weak one. Rudy Lazzazero, W2ZIA, 3911 Home Rd., Alden, NY 14004. (716) 937-9279

FOR SALE: Hallicrafters SX-42 receiver - $120; Nye Viking 1 kw low pass filter - $17.50; partially assembled National SW-3 receiver - $55; B&W dummy load, model 384, 1500 watts - $60. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

FOR SALE: Signal Corps,U.S. Army, 5 tube radio receiver BC-227A, designed at Signal Corps Laboratories, Fort Monmouth, New Jersey. Serial No. 1, order No. 115, Date 5-17-28, made by the Allan D. Cardwell Mfg. Corp., Brooklyn, New York. Price - $500. Condition mint and working. Phil Weingarten, 67-61 Alderton St., Rego Park, New York 11374. (718) 896-3545

FOR SALE: SCHEMATICS: radio, ham, Canadian, test equipment, surplus, electronic organs - $3.50 plus postage. SASE for manual quotes. Alton H. Bowman, Rd 2, (Chapin Vlg.) Canandaigua, NY 14424.

WANTED: metal shield for underside of band selector area for Viking Valiant. **FOR SALE:** DX-40 w/matching vfo. Merle Crowley, W1GZS, POB 51, West Kennebunk, ME, 04094. (207) 985-3086 evenings

---

TRADE: SX-25, S38A, S53. **WANTED:** National NC-100 or National HRO's with CAA tags. Aircraft radios. Will buy same. James Treherene, 11909 Chapel Rd., Clifton, VA 22024. (703) 830-6272

Back issues of Electric Radio are available for $2.50 each, delivered 1st class.

CLASSIFIEDS

FOR SALE: BC-654 - $65; nearly complete SCR-543-D w/operating shelters, cables, spare parts kit, spare BC-669 & PE-110, less PE-108 & RM-21- $250 OBO; some Command set parts & connectors; TCS connectors. Tech manuals for AN/PRC-25 & 47, AN/GRC-19 (T-195 & R-392), BC-348 E,M &P, some other TM 11's, TM repros for ARC-5 LF/MF/HF &VHF, SCR-274N, RAT, ATA/ARA, ART-13, TM 11-487 of 02 Oct. 44. LSASE for list. Robert Downs, WA5CAB, 2027 Mapleton, Houston, TX 77043. (713) 467-5614

WANTED: BC-611, BC-344/BC-314, SCR-506 (BC-652,BC-653 etc.), AVT-**, AVR-**, MP-37 base & MP-50 antenna mounts, dynamotors DM-41&43, JB-70, cables and other parts for SCR-499 (BC-610-E, etc.), cables / connectors for GRC-19 (R-392, T-195, etc.), junction box, control head,and connectors for ARC-3. Also need Cannon FK-10 or RFK-10 connectors with any backshell. On any of the above will take parts or complete units. Misc. parts especially hard to find. If you think you have something, call or write. Robert Downs, WA5CAB, 2027 Mapleton, Houston, TX 77043. (713) 467-5614

WANTED: Help! I need one low voltage transformer for my Johnson 500. Trans. number is P30316-46 SN. I will pay top dollar for good transformer. Mike, AA4TW, 1102 Virginia St., SW Lenoir, NC 28645. (704) 0758-4170

FOR SALE: Antique radios, parts, tubes, books, vibrators, knobs, amateur, testers, transmitter crystals, etc. Eleven lists. LSASE plus $2 cash (no checks). Richard & Rose's Radio Mart, POB 691443, Tulsa, OK 74169

FOR SALE: Receiving tubes, power tubes, crt's older models plus late numbers UL and CSE recognized. Donna O'Connor, 824 Main St., Belleville, NJ 07109. (201) 751-2591

WANTED: RCA, model 816K. Chuck Dachis, 4500 Russell Dr., Austin, TX 78745

COMMUNICATIONS RECEIVERS

THE VACUUM TUBE ERA:
50 GLORIOUS YEARS
1932-1981

NEW! SECOND PRINTING - REVISED
PRINTED ON COATED PAPER, IMPROVED
PHOTO REPRODUCTION, NEW PHOTOS,
CORRECTIONS, PERFECT BOUND, GLOSSY
COVER, SAME OLD PRICE

- Book covers industry history
- Specs on 700 receivers
- 51 company histories
- 112 photos
- For collectors, connoisseurs and admirers of receivers

$14.95 plus $2 P/S, SASE for details.

RSM Communications
Box 218-E, Norwood, MA 02062

SPAM

THE SOCIETY FOR THE PRESERVATION OF AMPLITUDE MODULATION

TO JOIN

SEND $1. TO: SPAM
BOX 27
POTRERO, CA 92063

PLUS: The names and callsigns of 3 Spam members you have worked on a.m. The names and calls will be checked against the SPAM roster and then the membership certificate will be issued.

WANTED: Million Radio and Television Laboratories products; test equipment and sound systems manufactured in 1930's. Sloan Million, 102 Ithiaca, Colorado Springs, CO 80911. (719) 392-5605

SUBSCRIPTION INFORMATION

$18. per year for 12 issues

First Class- $27.
By Air : Canada--$28. Mexico--$28. All others--$55 (U.S. Funds)

Guaranteed Refund at any time for issues remaining on subscription

$1.50 per month
Brings you the largest classified section published dealing exclusively with vintage amateur radio gear.

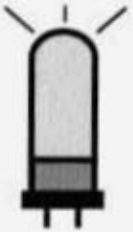
$1.50 per month
Brings you stories on vintage gear,the golden years-the people, the companies-AM operation, homebrew projects and more.

$1.50 per month
Entitles you to a free, 30 word ad each issue.

SUBSCRIBE NOW:

Send a check or money order with your name,call, and address or phone us **(303) 247-4935** 9am- 9pm and we'll bill you

E.R., Box 139, Durango,Co. 81302



SECOND
CLASS

ELECTRIC RADIO
P.O.BOX 139
DURANGO,CO. 81302

TO: