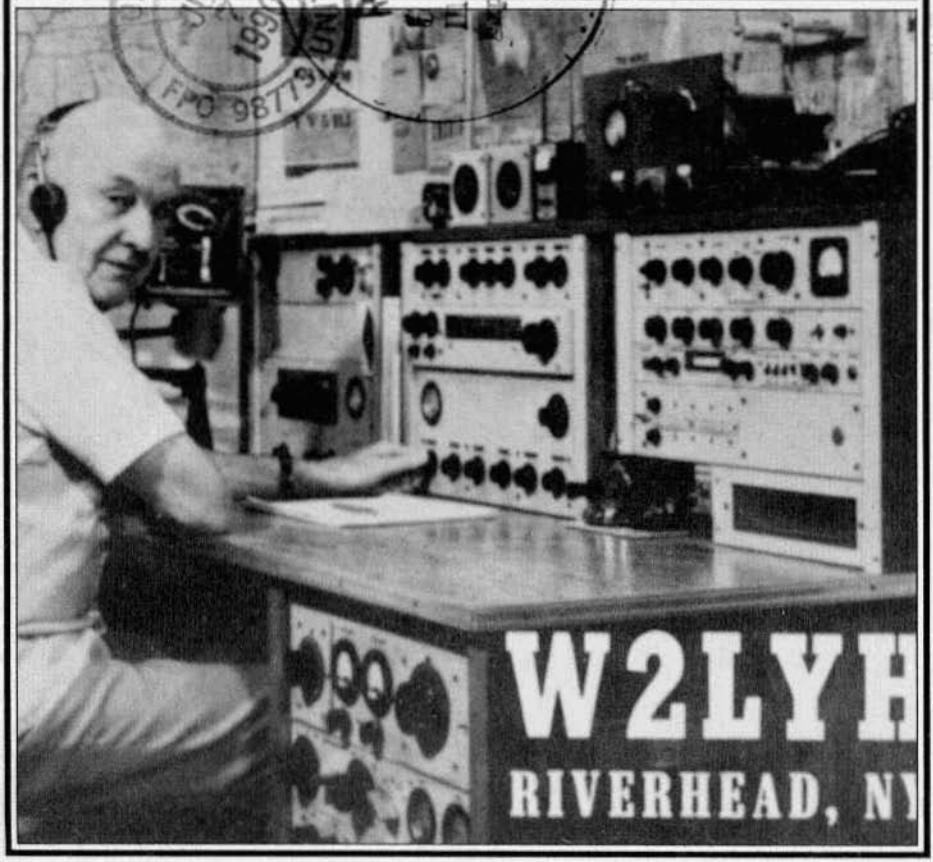
ELECTRIC RADIO

celebrating a bygone era

Number 12 April 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 Paid at Hesperus, CO

authorization no. 004611

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 is issue #12. I had planned to talk about the beginnings of ER - it's an interesting story - and sort of pat myself on the back for making it through a year but I have neither the time nor the space for it this month. Maybe next month.

The ARRL deserves a round of applause from the AM fraternity. They have done an admirable job for us in preparing the Petition For Rule Making (page 3) regarding the AM power question. I'm delighted that we have their support. I also want to congratulate Dale Gagnon, KW1I, for his work on our behalf. Dale has been the real "sparkplug" in the AM fraternity concerning this issue. You will notice when you read the ARRL petition that many of Dales comments (ER #9) have been incorporated into it.

Yesterday I had a call from Bill Knish, WBØKEK, out in Waseka, Minnesota. He told me that E.F. (Edgar) Johnson (9ALD) is in the hospital recovering from a perforated appendix. Bill says (and I agree) that it would be nice if we all sent Edgar a letter or card to let him know that he is still appreciated in the amateur community.

continued on page 29

TABLE OF CONTENTS

2	Reflections DownThe Feed-line	W6RNC
3	ARRL Petition	KW1I
4	Electric Radio In Uniform	KJ4KV
8	Why Five Meters	W3QL
12	Photos - W8PRQ, W3HHC	
13	More On the Modulation Monitor	W2HBE
14	Restoration Techniques	WB5EOG
16	3db Attenuator	K7NWB
17	HO-10 Noise Problems	KD6ZR
18	Repair/Restoration Tips	
19	AM Frequencies, Contest Information	
20	Letters	
22	Solid State Bias For Amps and Modulators	KDØHG
25	Shortwave Corner	Pat Zapalac
33	Classifieds	

Cover: Robert McGraw, W2LYH, with his homebrew station. In a forthcoming issue Bob will describe his transmitter and receiver which he built in the early sixties.

Reflections Down the Feedline

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

Over the years, amateur radio CW and phone operating procedure and jargon have been undergoing a process of gradual evolution. Words, phrases and abbreviations sometime acquire different meanings, or new words come into usage as substitutes.

The lineage of our operating practices starts out after WW-I and proceeds up until WW-II. Commercial and amateur styles were mostly the same, since most commercials started out as hams. During WW-II many hams went into the military communication services. Also, many non-hams in military communications became radio amateurs after the war. So, military operating practices had a great effect on ham radio.

In the 1950's came the introduction of the novice license. This was followed by the emergence of Citizens Band radio. Since the FCC gave novices their sub-bands, novices mostly communicated with other novices and developed some radio jargon of their own. When the FCC gave novices use of only a small part of the amateur frequencies, they sort of broke the continuity between the old timers and the newcomers. When novices graduated into the mainstream through upgrading their licenses, they brought along with them their radio operating practices. Since there were large numbers of novices, as time went by some of their practices became conventional operating procedure.

A similar situation prevailed on the Citizen Band. The CB operators developed their own procedural style and many of them graduated into acquiring a ham license. With considerable numbers of CB operators becoming hams, their operating practices also had a large effect on amateur radio practices.

At any rate, things are always changing, and whether the old was better than the new, or vice versa, can be argued by those so inclined.

In the early days of wireless, "CQD" was the distress signal. After the S/S Titanic disaster, a U.S. Senate committee held an investigation into its causes. Gugliemo Marconi, the wireless inventor, was invited to testify. During the hearing, Marconi explained that the distress call "CQD" meant "clear quickly, danger". From that, I deduce that the general call "CQ" originally meant "clear quickly" - get out of the way and allow a clear frequency channel.

On amateur phone, it used to be that when a station signed off at the close of communications with another station, he said, "signing off" or "closed" or "out". Some operators embellished things by saying "over, off and out".

On CW, "CL" still means closed. On phone, the word "clear" came into usage. I suspect that it might have originated in the 1950's or 1960's among 2 meter FM operators.

"Way back when", the word "break" was unknown on phone. If a station wanted to interrupt, he did so mostly my means of call signs - but interrupting or breaking into a QSO was rarely done before the days of transceivers.

On CW, the situation was similar. It used to be that if you wanted to interrupt another CW station, you merely sat on the key for a while. The use of "BK" was totally unknown.

In the "good old days", amateur phone stations made up their own phonetics. There were military and AT&T phonetics but no hams used them. Many stations coined humorous or picturesque combinations for their call signs - a few hams today still do.

On CW, a standard final-final goodby for young-squirts etc. was the old "shave and a haircut -- shampoo" routine -- dit dit-dit-dit-dit dit-dit. Nowadays this act has been totally revised. All that is left of it is that each station sends a dit-dit. A very few stations use the original.

continued on page11

ARRL FILES AM POWER PETITION

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

The ARRL petition supporting the retention of present AM power levels was submitted to the FCC on April 2, 1990. The League has put together an impressive document that makes a convincing case for continuation of high power AM operating privileges.

The ARRL Executive Board chose to request a permanent continuation of the present "grandfather" clause rather than an output measurement for AM as reported earlier. They decided this to be consistent with their earlier position taken during the original rulemaking process. The League justification for filing this request for retention of AM power levels is the principle that earned privileges should not be reduced. This is a good approach because it is a concept that can be embraced by every amateur, not just AM operators.

The League petition includes a request to postpone the June 1, 1990, termination of the "grandfather" clause. League counsel was highly optimistic that this petition would go through the complete FCC rule making process, including a comment period on the petition, Notice of Rule Making with comment period and Report and Order with the FCC's final position one way or the other. This process can take well over a year to complete.

Informal feedback from the FCC received by ARRL counsel has been cool towards the subject of this petition. It will be very important at the appropriate point in the rule making process to demonstrate the AM community's size and vitality by filing comments and encouraging other mode operators to file as well.

Further reports on this subject will inform the AM community how and where to send comments as the FCC administrative process rolls out.

Before the
Federal Communications Commission
Washington, D.C. 20554

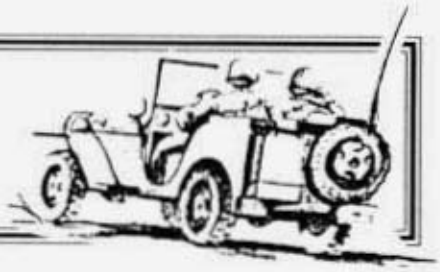
In the Matter of	)	
Amendment of section 97.313 of the	)	RM-
Commission's Rules Governing	)	
Transmitter Power Standards in the	)	
Amateur Radio Service	)	

Petition For Rule Making

The American Radio Relay League, Incorporated, (the League), the national, nonprofit association of Amateur Radio Operators in the United States, by counsel, and pursuant to Section 1.401 of the Rules, hereby respectfully requests that the Commission issue a Notice of Proposed Rule Making at an early date looking toward the amendment of Section 97.313 (b) of the Rules governing the Amateur Radio Service. The proposed rule change would eliminate the "sunset" provision in the present rule governing transmitter power of amateur stations using A3E emissions. In support of its proposal, the League states as follows.

continued on page 30

ELECTRIC RADIO IN UNIFORM



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

'Command' Sets -- Part 2

Will those readers who have used a command set please hold up their hands.... That's what I thought: most of us.

For hams licensed before 1970 or so, a command transmitter converted to crystal control with the help of an 'Elmer' or a command receiver as a communications receiver (or both) was a very common novice rig. And many of the experimentally minded among us used them later....the BC-453 or R-23/ARC-5 LF set as a highly selective IF, the 80 and 40 meter sets as mobile rigs, the transmitters as VFO's, the higher frequency transmitters or receivers to convert to 20, 10 and even higher bands...Can there be any doubt that this is the most converted military set in history?

In June, it will be fifty years since the first large contract for command sets, yet here we are, devoting a whole column to using these remarkable radios as ham and SWL sets. 'Conversion' of the sort practiced in the first 25 years after the war makes little sense today and in fact we will talk more about how to remove old changes than about making new ones. Like anything fifty years old, (me, for example!) command sets have some chronic problems; we will talk about troubleshooting and adjustment. Finally, we will discuss the limitations and what you can do about them.

You can make these radios work with only a schematic. For more complex repairs, however, you need a technical manual for at least one of the sets (ARA/ATA, SCR-274N, or ARC-5) plus schematics for any others you are working on. The best discussion of theory is in the ARA/ATA manual. The ARC-5 manual has wiring diagrams showing interconnection of command sets with liaison and other equipment. Because of space limitations, information given in the technical manuals won't be repeated and we will focus on 'tips', leaving details to be worked out by you, the engineer. Have fun!

Taking Out Old Changes

Unmodified command sets are still 'out there' if you search for them. It is easier (and much less costly!), however, to start with less-than-perfect sets and restore and repair them, using 'field expedient' accessories until you can find the real thing at a reasonable price. That is the approach I took in building the command set station at KJ4KV; the result is one of my favorite rigs, and I had a lot of fun along the way.

When removing old changes, the best way to find out how the wires are supposed to run is to look at an original set. If you don't have a good set, check the 'wiring diagram' in the manual for the set you are restoring.

Here are some common changes to look for, with hints on removing them.

1. Filaments were rewired from 24 to 12 volts by reconnecting pairs of 12 volt tubes from series to parallel. Sometimes this change was made by replacing the original 12 volt tubes with 6 volt equivalents with no wiring change; sometimes both wiring and tube changes were done to allow 6 volt operation.

2. When rewiring transmitter filaments for 12 volts, a 126 ohm wirewound in a clip at the rear of the chassis was discarded; this resistor parallels the filament of the 1629 'eye' tube and must be replaced when changing back to 24 volts. Use at least a 10 watt resistor if you can't find the original (#7010) unit.

3.In order to operate the transmitter filaments on AC, R-70, a 1000 or 1500 ohm resistor between pins 2 and 8 of the 1629 socket was removed and a higher value connected from pin 8 to B+.

4. The rear and dynamotor connectors were removed. You can use epoxy glue to install a replacement taken from a junk set. Rear connectors must be perfectly aligned or the set won't fit the rack.

5. The dynamotor stop studs on the receiver chassis were removed. Replacements can be mounted with machine screws. Take the studs from a junk set; drill and tap them for #3-48 screws. Ditto the studs on top of the receiver and transmitter cases (but #2-56) and the rods holding the wirewound resistors in the receiver (but #4-40).

6. The box at the bottom of the receiver front panel was removed. It can be replaced with one from another set. If the wires to the box were removed, disconnect the leads to the replacement at the other end and bring them along.

7. The tuning range was changed by removing plates from the tuning capacitor (s) and/or turns from the coils. Unless you like the result, the altered parts must be replaced.

Other common changes included installing phone and keying jacks,removing relays from the transmitter, and replacing the antenna terminal with a coax connector. All of these changes can be undone in the obvious fashion; cosmetic damage can be ignored or hidden with a screw, hole plug, or patch.

The Frequency Transplant

If you have a unit with fatal cosmetic damage and another which is good but the wrong frequency range, you can do a 'frequency transplant'. For both transmitters and receivers you must swap the coils, the tuning capacitor (s) if they differ, and a couple of small parts. (Study the manual to determine exactly which parts.) For the transmitters, also make sure the two adjustable air padder capacitors are set to the proper angle as shown on the wiring diagram. The angles are measured so that 45 degrees is 25% meshed, 135 degrees is 75% meshed and so on.

The dials are held by the obvious nut and a small pin. When mounting a new dial on a transmitter, fully mesh the tuning capacitor. On ARC-5 transmitters, mount the dial with the small mark which is about 15/32" counterclockwise from the low frequency end of the dial, aligned with the index. On other transmitters, measure this position. Then drill a new hole (#56 drill), tap in the pin, and secure with a drop of black enamel.

On receivers, there is a mark 1/2" beyond the high frequency end of the dial. Fully open the tuning capacitor and mount the dial so the mark is aligned with the index. Do not install the pin until you are satisfied with the calibration of the set, as you may have to move the dial.

When I did a transplant on a T-22/ARC-5, the errors were small (14 kcs high at 9.1 mcs and 4 kcs high at 7.0 mcs), even before calibration. Talk about interchangeable parts – Eli Whitney would be proud!

continued next page

ER in Uniform from previous page

Troubleshooting

When the set is 'back to original' you are almost ready to fire it up. There are, however, a few checks which will find the most frequent problems much more quickly (and safely) than a smoke test. The following steps apply to both transmitters and receivers, except as noted.

Mesh the tuning capacitor (s) fully and check carefully that the stators are properly positioned. They are supported on three glass balls (later sets have a flange on the ball) which are held in spring loaded mounts. If the radio is dropped (or the plane lands too hard!) the stator sometimes jumps out of its mountings and you have either severe detuning or a short.

If a ball is missing, it is often loose inside the set. If it is, you can remove the capacitor and reinstall the ball; otherwise the capacitor must be replaced.

Turn the radio upside down and remove the screws holding the capacitors along the chassis sides or rear. Push each cap of less than 1 mfd clear of the chassis and use a checker which applies 250 to 300 volts to test between each top pin and the capacitor case. These should read infinity. The capacitors which bypass the receiver and transmitter oscillator high voltage must be perfect or the radio will be unstable. Likewise the one from pin 3 of the transmitter 'eye' tube to ground -- if this is leaky, the 'eye' will be permanently open -- and in ARC-5 receivers, C-7A and C-15A on the AVC line.

Capacitors over 1 mfd are electrolytic (lug is positive) and can be checked with an ohmmeter. They should read over 500k after charging.

You can get replacement caps from a junk set. Another source is the later 'ARC type 12' sets. These capacitors are rated at 400 volts and have a better seal than the original ones. You can also pry open the top of the original cap and replace the 'insides' with disk ceramics -- the method prefered by command set restorer, Pete Hamersma.

It's a good idea to check the resistors with an ohmmeter. Those which are more than 20% above the marked values should be replaced.

If there are no other obvious problems, you are now ready to test. For a receiver, connect a few feet of wire to the antenna terminal and a 600 ohm speaker or phones to the audio output. If the set is in good shape you will be able to hear at least the strongest signals. If there's audio distortion, check the audio capacitors, C-24, C-29, and C-40 which were not checked earlier. For other problems, check the tubes, then make voltage tests and (finally) do signal tracing.

To test the transmitters, hook up a dummy load (use a series capacitor as discussed below), set to 'VOICE', key the set and load it up following the instructions in the manual. Using the dynamotor or a plate supply of around 560 volts, you should get about 75 ma of plate current (measure in series with the center pin of the rear connector) and somewhere between 10 and 20 watts out.

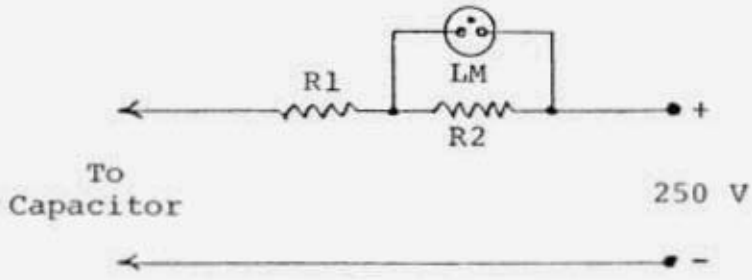
Transmitter problems can be hard to find. The most common symptoms and causes are:

PA plate current zero -- select relay (under chassis) corroded contacts or R-76 open. If R-76 is open on an SCR-274N or ATA unit check C-66 and look for one or more glass ball insulators missing from the PA tuning or padder cap. On ARC-5 sets, check C-72.

PA plate current very low, no output -- antenna relay (above chassis) badly corroded contacts, broken wire, or contact problem on loading coil or variable link in PA tank.

PA current near normal, output very low – glass ball insulator missing from PA tuning or padder capacitor causing PA tank to be badly detuned or (on ARC-5) shorted.

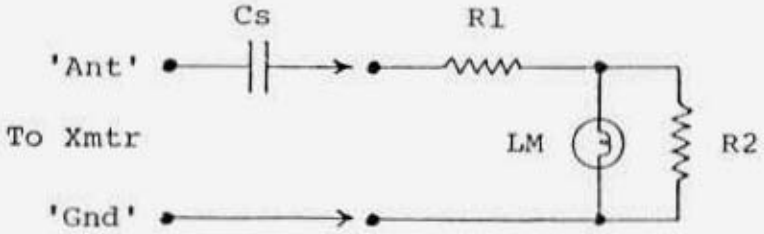
continued on page 26



Parts List: (Numbers in parens are Radio Shack catalog nos.)

LM - #NE-2 neon lamp (272-1101)
R1 - 470k ½W resistor (271-053)
R2 - 1 meg ½W resistor (271-059)

A simple checker for paper and mica capacitors. The neon lamp should light momentarily when you connect the capacitor, then go out. If it stays on, the capacitor is leaky. If you don't have a suitable power supply, a command receiver dynamotor will work.



Parts List: (Numbers in parens are Radio Shack catalog nos.)

Cs - Series capacitor, see text
LM - #1819 pilot lamp (272-1119)
R1, R2 - 8 ohm 20W non-inductive resistor (271-120)

Like most HF aircraft sets, the command transmitters work best with capacitive loads of 20 ohms or less. If you clamp the resistors on a heat sink, this dummy load will take 100 watts for short periods, making it useful for almost any aircraft set. The lamp begins to glow at about 1/2 watt and is near full brilliance at 100 watts.

THE ATLANTIC DIVISION HAM NEWS

MAY~1932 VOL.2-NO.5

Why Five Meters???????

byW3QL, RM Southern N.J.

Reprinted from "The Atlantic Division Ham News", May, 1932

To you hams who have pounded brass, had DX and worked on all the regular orthodox bands of Amateur radio and the thrill begins to wear away; why not try five meters?

When you sit down in the evening and want to talk to some local Ham about the club meeting,baseball game, or some new type tube and you hear him calling CQ on CW or phone, then you get him and what, do you do? Well you "chew the sock" for several hours doncha? That is if your fist holds out. Now figure it up, if you are using a fifty watter with an input of 145 to 150 watts to the plate, 37.5 watts to the filament, and possibly an additional fifty watts to the buffer and oscillator. Over two hundred watts power to talk about ten miles; waste extravagance. Now don't say you never do it, we all do. If you are using a couple of 210's the power you waste in them is even plenty.

You are also violating a government regulation regarding the minimum amount of power to be used in carrying out efficient communication. You are also causing QRM to some local friends and you might be causing plenty of QRM for several thousand miles. Now honestly OM, is it fair to cause QRM when working local stations with full power when a little five meter rig having a total input of ten watts will crack a signal R9 for a radius of at least 12 miles?

There are about fifteen local hams in South Jersey that have five meter rigs and have been carrying on consistent nightly QSO's. We have even started a "Checker Five Meter Club". Whenever we want to have an enjoyable evening we call "CQ CQ checker players".

Then the fun begins by playing checkers over five meters. If you have never done it, you have a thrill coming which will give you a new kick in life.

The little drawing is a diagram of a transmitter and antenna used at W3QL. This station has been on the air on five meters since Febuary, practically every night. The first antenna was two 4 foot copper rods, parallel, about 6 inches apart, with a four inch in diameter coupling coil placed in the field of a single turn tank coil. This antenna system was later replaced by a zepp, with twenty foot feeders, tuned by two midget condensers, and the single turn antenna coupling coil. Direct coupling to the tank coil was tried but resulted in poorer quality, however with better "soup" into the zepp.

Under a meter test this little transmitter put one half an ampere into the feeders and the meter reading did vary when placed in the center of the eight foot vertical aerial. The meter readings were normally one quarter to three eighths of an amp. with fine reports all around.

Different powers were used all the way from 125 volts on the plates to something over six hundred, drawing 100 milliamperes. Signal strength was not any different on reports, from 300 to 600 volts, so 300 to 350 is now being used. This rig is modulated by one '50 type tube. The usual resistor is shunted out of the circuit and the same voltage is applied to both oscillator and the modulator. The modulator has one stage of speech amplification.

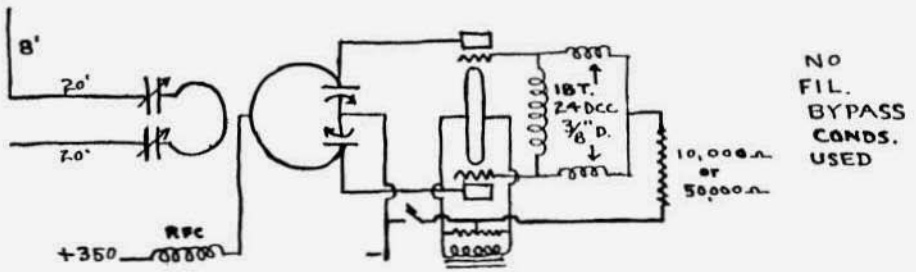
continued next page

Why Five Meters from previous page

Fifty per cent modulation is all that is necessary in the operation of this transmitter. It is always advisable to get as much carrier output as is possible, because this will knock down the super regeneration in the super-regenerative receivers and will make the voice come through clearly. If you have too much modulation, you are liable to have a bit of trouble being heard decently. This theory of course does not apply to receivers other than the Super-regenerative type. If you have too much modulation, you are liable to have a bit of trouble because of the super noise; so beware OM.

As you will note by the diagram, it is simple and easy to construct. The condenser that is used here is a Cardwell, twenty three plate job that has been knocked apart, using two rotors and five stators in each section (too lazy to take out the others). The copper tubing is about four inches in diameter and is hooked directly to the condensor. The positive lead is hooked to the center of this one turn.Choke coils are eighteen turns each, wound on the three eighths inch dowels, double spaced for voltage breakdown etc. The grid coil is five turns on a one half inch down of number 14 aerial wire (this happened to be handy). The tuning of the coil by squeezing the turns together and pulling them apart, is not extremely critical, BUT it does help plenty in getting the "soup" into the tank circuit.

Tubes can be 201A modulated by a pair of 171A's or a 210 modulated by one 250 tube. Or else they can be 171A's modulated by a 247, or any other pentode. All types have been used with fine results, whatever you have handy, try them, they will probably work. But don't over-load your tubes so that the signals creep and the tubes blush from shame. That is punk business, as it means signals hard to read.



W3QL's FIVE METER TRANSMITTER

Now for you birds who hate to talk, your outfit can be keyed, BUT, who in time will read it? For every time your carrier goes on the air, the super is knocked down and the operator at the other end hears nothing but a quiet spell in his receiver. So, you will have to use a mike or modulate it by a buzzer or some other form of modulation.

Grid leaks will range from 10,000 ohms to 50,000 depending on the type of tubes you use in the oscillator. For type 10's use 10,000 ohms, and for 201A's and 112's use 50,000 ohms. If you will look in July 1931, QST you will find plenty of dope.

There is plenty of room for expansion, design, experiment, fun and entertainment and what have you on this band. Why not join in the movement and occupy the band, THEN WE WON'T LOOSE IT FROM NOT BEING USED. Oh yeah! Duplex working is the stuff; our only trouble down here in South Jersey is that our QSO's last from 7 PM to midnight. Hi This band will bring the local boys together as NO OTHER BAND HAS EVER DONE. What say gang, get going.

HOW TO FIND THE FIVE METER BAND by W3QL

Finding the five meter band can be done in several ways; a wavemeter, or by taking off a harmonic from your receiver, for instance, the eighth beat from 7100 kc is 56,800 kc. Take your eighth harmonic beat and you will be in the band. You'll know it, because it will be the strongest one you will hear and your condensor will be approximately fifty per cent out, if like the one described in QST (July issue). However, if you want a transmitter, build it up, get it oscillating and put it on the air. Any of the fellows will be glad to help you find the band. Five meter wave-meters are available from General Radio Co., Cambridge.

Editor's note: I want to thank Don Kahle, W8PRQ, for sending along the old magazines. I think this is only the second time ER has ever re-printed anything. I hope you all agree that this story was well worth it.

Reflections from page 2

Similarly, on CW, "III" has been transformed to "IIEE" by over 50 % of the operators. Then, there is the "R" situation. On phone, it used to be that the word "Roger" was totally unknown. "R" on CW means "received", but today it is used as a substitute for "yes".

When we come to the subject of "Q" signals, there also have been changes in habit. The signal "QSL" was previously unknown on phone, and on CW it meant "your message received" - with application to actual message traffic and not to ordinary conversation.

About 8 or 10 years ago, some amateur CW stations started using "SU" as a final goodby. "SU" was and is used by commercial CW stations since the early days, but hams and some commercials now use it in the sense of the meaning "see you (later)". My understanding is that "SU" is from an old, obsolete "Q" signal: "QSU" - which meant, "I will call you again".

As the old saying goes: "Time marches on". Styles of operating will continue to change. If you have a way of doing things, that you like and think is a good way to go, by all means: innovate. When other operators start following your new technique, it's the start of a trend. That's all there is to it. It's a case of follow the leader, and conformity.

A Correction

In ER #8, page 25,parts list, near the top of the page ," U1-LM 371T" should be "317T.

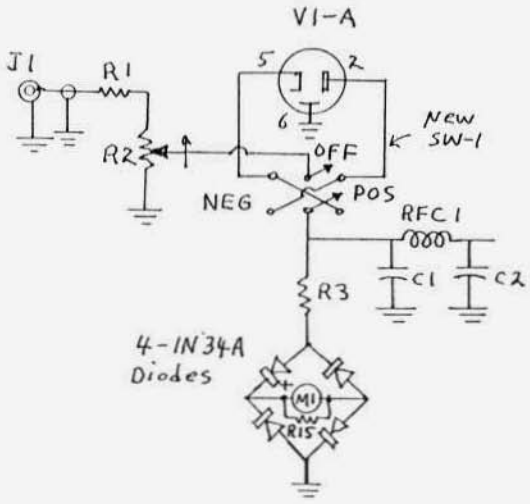
Don Kahle, W8PRQ

Paul Fritsch, W3HHC

More on the Modulation Monitor

by Bob Dennison, W2HBE
82 Virginia Ave.
Westmont, NJ 08108

Modulation monitors used in commercial AM BC stations provide a switch to allow reading either positive or negative modulation. This normally requires a 4PDT switch. Two poles are employed to reverse the connections to the RF diode and the other two poles reverse the connections to the carrier meter. There is a simple way to add this feature to the modulation monitor I described in the Febuary issue of Electric Radio. The ON-OFF switch, SW-1, is replaced with a Radio-Shack 275-620 DPDT/Center-Off switch. This switch is used to reverse the connections to the RF diode, V1-A, and is now labelled NEG-OFF-POS. See diagram.



The Modified Modulation Monitor.

A bridge rectifier is used to automatically provide the correct polarity of current to the carrier meter. The voltage drop in the germanium diodes is quite low and will require only a slight adjustment of the CALIB control, R-6.

Don't be surprised if you modulate your rig with an audio oscillator and you read slightly different percentages in the NEG and POS positions of SW-1. It indicates distortion either in the audio oscillator or (more likely) in your transmitter. If the difference is more than 5% at the 85% modulation level, it would be advisable to get out the scope and see where the trouble is. Typical sources of trouble are listed in the ARRL Handbook.

Since writing the original article, I have found another reference on the subject of voice-wave polarity.* This article is highly recommended if you are tempted to squeeze more power out of your transmitter.

* Lop-sided Speech and Modulation, George Grammer, W1DF, QST, p. 14, Feb. 1940.

Restoration Techniques of a Serious Collector

An Overview by Chuck Dachis, "The Hallicrafter Collector"

4500 Russell Drive
Austin , TX 78745

"This radio has been completely restored". How many times have you heard that statement? What does it mean? The condition of being "restored" means different things to different people. I have seen "restored" radios where the dust was wiped off, a tube or two and a capacitor replaced to get them to work. I have also seen "restored" radios that have been completely disassembled, all metal parts refinished to exact paint or plating formulas, new lettering silk screened on the new finish, all components and wiring replaced with "new" components of the same type and vintage, and new plastic parts molded from old formulas. Would this radio be restored?, or is it new! To me the answer lies somewhere between these two examples. Each of my restorations is done on it's own merits, dictated by the condition of the "raw material".

The process is started with a preliminary physical cleaning and assessment of general condition. Any physical or mechanical problems of modifications that would impede the electrical restoration are handled first. "Extra" non original switches, "magic tuning eyes", or meters will be removed and the resulting holes in the front panel filled. Filling the holes can be tricky. Generally I will use a backing of metal duct tape, then fill the hole with automotive "Bondo". Sometimes several thin coats with a light sanding between each will be necessary. Once dry and sanded smooth, I will "spot" paint the repaired area (s) with matching paint, usually with an "air brush", blending in to the existing finish. Depending on the location of the hole, the panel may have to be removed to effect repairs. If any original controls or switches are broken, bad, or missing, they will be replaced or added at this time.

Proceeding to the electrical restoration, all modifications are removed, sloppy former repairs reworked, and all circuitry returned to the original factory schematic. Next the individual small components are checked; paper and wax by pass capacitors first. To check these capacitors the terminal holding one of the leads will be carefully de-soldered and the lead removed. The capacitors are then checked for "leakage" resistance on the high range of a good analog VOM (the digital units do not work well for this test).

It has been my experience that most of these capacitors are "bad", typically having a leakage resistance of 100 K ohm to 10 megohm, and I will generally replace all of them. The reason "leaky" capacitors are replaced is three fold. First, a circuit will not operate properly when a capacitor is acting more like a resistor. Second, the leakage current through a dozen or so capacitors can create enough additional "load" on the power supply to cause failure of the power transformer and other power supply components. And last, when I restore a set I want it to work for a long time. If I didn't replace all these capacitors, sooner or later (usually sooner), they will fail. The mica and ceramic capacitors are almost always good and will not generally need to be replaced or even checked.

Any resistors connected to the terminals we de-soldered while checking and replacing capacitors will also be checked at this time, and replaced if necessary. Resistors are the next biggest culprit in degrading the performance of the equipment. It is typical for many of them to

"look" perfectly good and be anywhere from 10 to 200 per cent higher in resistance than the marked value. This causes a serious voltage deficiency in a given circuit, not allowing it to function properly. Any resistor that is more than 10% out of tolerance (high or low) will be replaced.

Now I get brave and apply power to see if it works, or smokes! Usually it works, not always well, there is more to do. Check and replace any bad tubes, and any major component that may be bad (transformers, IF cans, and electrolytic capacitors). "Clean" the controls and switches with control cleaner, and finish the physical cleaning of the chassis and major components. Next we do a complete IF (intermediate frequency) and RF (radio frequency) alignment, in that order, following the factory instructions. The set should now work as well or better than it did new!

Paint and lettering on the case and front panel; what do we do about that? Most of the time the paint and lettering can be restored to it's original brilliance by using various cleaners and rubbing compounds available for that purpose. Caution should be exercised with some cleaners on some surfaces. Test it on a small inconspicuous area first. There is nothing more disheartening that to take a dial or lettered panel and "clean" all the numbers or lettering off the surface!. A mild dish washing detergent will usually remove most of the dirt and grime with no damage to paint or lettering. Extreme caution should be used in cleaning the numbered side of glass or plastic dials. Start with plain water and a soft cloth, do not rub hard. Using "Windex" and some other glass cleaners can be disastrous. They contain ammonia which can dissolve the lettering.

After cleaning, any paint scratches can be touched up, and a missing or faint letter here and there can be replaced quickly by using "dry transfer" lettering. Your radio should now work and look almost as it did when it left the factory. Sounds simple doesn't it? Well, it's not!

Lead "dress" on the replaced components is very important from an electrical point, and also from an esthetic sense. Keep the leads as short as possible. The new component should be installed in the same space from which the old one was removed, and all terminals to which the component is connected should be de-soldered and old lead material completely removed prior to installing the new component. Some of these components are in places that seem nearly impossible to reach. It helps if you have training as a brain surgeon, and a lot of patients!

In addition to the 'usual' tools I find surgical and dental tools such as hemostats and tweezers very useful, and of course a magnifier light is essential for those of us with failing eyesight! The only electronic tool really essential for most restorations is a good analog VOM. Oscilloscopes, frequency meters and signal generators can make the job easier but are not necessary. For RF alignment I do recommend using a signal generator, but it can be accomplished without one by using broadcast stations of known frequency on the standard broadcast band and WWV on the short wave bands. IF alignment can be done 'by ear', but again I do recommend a signal generator for accuracy and maximum performance.

In replacing small components I use 'state of the art' mylar capacitors to assure continued long lasting performance, and new resistors of proper type and values. But what about large components such as power, audio and IF transformers? Here my philosophy is to use only original parts. There is no commercial source for these parts so where do you find them? The answer is simple, although somewhat costly. I will sometimes purchase as many as five radios of the same or similar model to get enough parts to restore one.

continued on page 24

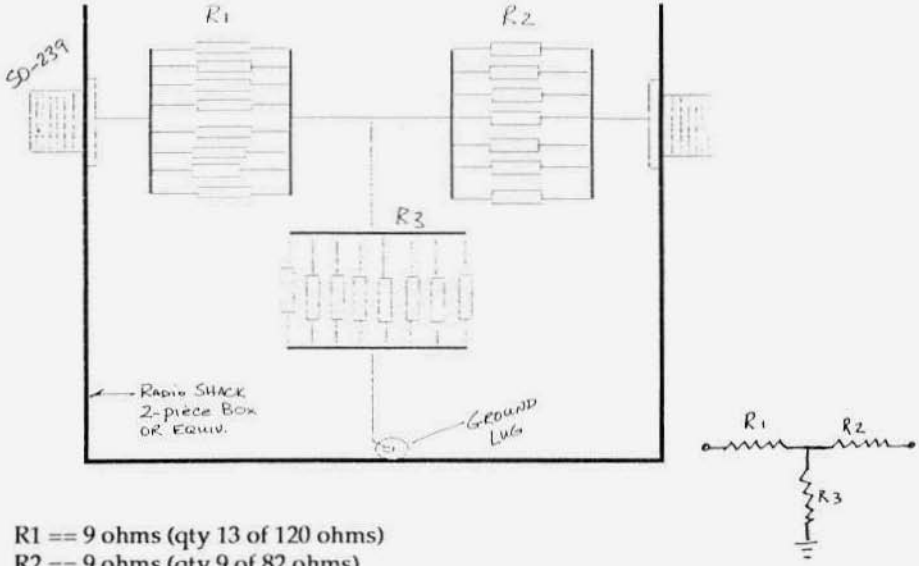
3 db Attenuator

by Bob Norman, K7NWB
708 North Chesnut Circle
Mesa, AZ 85213

I found the circuit in a manual for the Hallicrafters HT-45 linear amplifier. All resistors are 2 watt and are 5% tolerance rated. Of course they are non-inductive, composition, carbon or metal film types. The ones that I used are 3 and 5 watt metal film resistors and 3% tolerance. That's all the store had, so I paid more than I needed to.This 3dB pad improved the overall characteristics of driving my linear amplifier with a Ranger.

The way I've connected the resistors in parallel allows for air circulation and makes a very neat looking finished product. As you can see ,each group of resistors that make up R1, R2 and R3 are arranged between two rings. To determine the size of the rings draw a circle on a paper and stand the resistors on end and arrange them with equal space between them around the circle. Experiment with different sized circles until you find the right size. I used #18 gauge bus wire for the rings.

When you have the three groups of resistors soldered between rings you then solder a wire across the diameter of each ring on either end.From the center of this wire you connect R1 and R2 together and the other ends of each to the center connector of each SO-239. From the center of the wire between R1 and R2 run another wire to R3. Connect the other end of R3 to the ground lug. That's it. You can see that the values here are appriate for a transmitter in the 50 to 100 watt range. For a transmitter with a greater output adjust the values of the resistors accordingly.



R1 == 9 ohms (qty 13 of 120 ohms)
R2 == 9 ohms (qty 9 of 82 ohms)
R3 == 137 ohms (qty 16 of 2200 ohms)

Heath HO-10 Noise Problems

by Rick Lutzinger, KD6ZR
647 Chocktaw Drive
Fremont, CA 94539

John Staple's (W6BM) article last month on using a monitor scope to observe your output signal is excellent advise. I send all my HF signals through one on the way to the antenna. If you would rather not build one, there are plenty of nice old Heath HO-10's and later models available at swap meets at reasonable prices. I have three HO-10's in my shack and prefer them over the new solid state units. These units use a three inch CRT and are perfect for either trapazoidal or conventional sweep modes. They also contain a two-tone audio generator useful for making linearity checks on sideband transmitters, etc.

I have found one minor problem with the Heath unit that apparently enters into play with age. After experiencing a few weeks of annoying interference to the HF gear in the shack, I decided I had to find the source of this noise. I later noticed that upon turning off the Heath HO-10 monitor scope, the noise disappeared.

After probing, staring and contemplating the problem, I concluded that the noise was due to high voltage arcing at the CRT socket. These sockets are constructed by trapping the metal contacts between two layers of phenolic and then riveting the two layers together. The resulting air space, between the two layers, provides a great place for dust accumulation. Over years of use, this dust, along with a little moisture, is all that is necessary to provide a leakage path for the 1000 volts on some of the contacts. Voilla!, a spark gap transmitter. I have three of these compact little scope in the shack and two exhibited the same symptoms, one much worse than the other.

Heath still maintains inventory of these sockets and after ordering and installing them, the problem was completely resolved. This problem may surface on other Heath scopes as well. The replacement socket appears to be an improved version.

A little hint about rewiring the socket; it is not necessary to completely unsolder and unwrap the wires and component leads from the original socket. Using small wire cutters, simply cut the entire terminal away from the body of the socket. Using a small screw driver, carefully pry the remaining socket body off of the CRT pins. Now, position the new socket over the CRT pins aligning the keyway in the socket to the key on the CRT base. Gently tap the socket onto the CRT base with a small hammer and a small round dowel. Move the dowel around the socket base to allow even movement onto the CRT pins.

After you have the new socket in place, trim as much of the old terminal away from the old solder connection and resolder this to the new terminal being careful not to make cold-solder joints. Pre-tinning of the new socket terminal will help in making a good reliable solder connection. I repaired both of my units without having to remove the CRT from its mount.

It is a good idea to make a neat sketch of the socket wiring prior to proceeding with this operation.

Collecting/Repair/Restoration...TIPS

How to Restore Variable Condensers

I discovered this trick by accident, or rather deduced this by inductive reasoning after making a large batch of stewed tomatoes for spaghetti sauce. I noticed that after cooking the tomatoes the aluminum pot was positively shining. The acid in the tomatoes did a fantastic job of reducing the aluminum oxide making it look brand new. I made up a second pot (stainless steel so I would not waste the effect) filled with the skins and the other scrap plus some rather old tired looking variable condensers with aluminum plates. I cooked this pot for about two hours while boiling down the stewed tomatoes. After flushing the skins away and oiling the bearings with silicone spray I now have two very nice N.O.S. variables. They are clean and shiny and the insulation seems none the worse for the ordeal. I tried the same trick using vinegar with much less dramatic results. There is something in the tomatoes that is a superior aluminum cleaner.
Tim Walker, N2GIG

A Meter to Watch Out For

The Radio Shack (Micronta) 22-211 folding multimeter has many nice features, but if it picks up RF (either from radiation to the leads or the voltage under test) the readings become wildly inaccurate with errors of 50% or more of full scale.

A Ground Rod the Easy Way

You can put down a really good station ground rod using only materials from your local hardware store, and rather easily, at that. An 8' length of 1/2" copper pipe will cost you around $10. Get a short section of 1/2"garden hose with a female fitting on one end; attach the other end to the copper pipe with a hose clamp, and hook up your garden hose. Hammer the other end of the pipe mostly shut, so it sprays a powerful fan of water. Now just shove it into the ground. If the going gets tough, grab the pipe (gently to avoid crushing it) with a pair of pliers and turn it from side to side. If you hit a rock you can't get past, pull out the pipe and try again, nearby. Put the pipe in flush with the surface and pour in a cupful or so of chemical fertilizer to increase the ground conductivity; salt is often recommended but it is hard on nearby vegetation. Connect the ground wire with a tight hose clamp, cover it up, and mark the spot (if you wish) with something like a golf tee, pushed flush with the surface.

Cool That Transformer

Power transformers often generate quite a bit of heat. When mounting one of the type which mounts through a hole in the chassis, make the hole about 1/8" larger than necessary along the sides (Be sure to leave enough at the corners to give solid support for the mounting bolts.) Thread an extra nut on each of the mounting bolts so the transformer will have extra clearance. The airflow up around the sides of the unit will help keep it cool and contribute to long life.

AM FREQUENCIES

2 Meters - - - 144.4 - calling frequency Activity in most cities.
6 Meters - - -50.4 - calling frequency
10 Meters - - - 29.0 - 29.2 operating window. Most activity occurs here, although there is some activity around 28.325
12 Meters - - - 24. 985 - calling frequency
15 Meters - - - 21. 385 calling frequency
17 Meters - - - 18.150 calling frequency
20 Meters - - - 14.286 nightly SPAM net starts around 5:00 PM CA time.
40 Meters - - - 7160, 7195, 7290 - main operating frequencies. Westcoast SPAM every Sunday afternoon on 7160. Starts at 4:00 PM CA time.
80 Meters - - - 3825 - 3850, 3870 - 3890 main areas of operation. Westcoast SPAM net , Wednesday evenings, starting at 9:00 PM CA time. The frequency is 3870. The Northeast SPAM group meets Thursday evenings , starting at 7:30 EST. The frequency is 3885.

IT'S STRICTLY A NOSTALGIA THING --- IT'S A KENWOOD TS 940 IN A HARVEY-WELLS BAND-MASTER CABINET

20 Meter "Allnighter" May 5

The first annual "Electric Radio 20 Meter Allnighter Contest" will be Saturday May 5 from 10:00 PM until 6:00 AM, May 6, PDT. That should make it from 1:00 AM till 9:00 AM , May 6 on the East Coast.

This contest will be quite unlike other contests in that the QSO will have to be conducted on AM (2-ways) , and the following information will have to be logged:the location of the other station, the transmitter, and power output, the receiver and the antenna. The contact will also have to be conducted outside of a net or group. In other words you can't join a group and work everyone for points. Score 1 point for stations in the U.S. and 10 points for all others. Add 50 points if you operate the entire time period of the contest. To enter the contest an organized - and legible- log must be submitted no later than May 20. Remember that if you contact a SSB station in order for that contact to count he must switch to AM for the contact.

Since I announced my plans for this contest last issue the response has been tremendous. Everyone thinks it will be a lot of fun and a good promotion for AM. And it's an opportunity for us to work some DX when the band is not crowded. It should be interesting.

There will be a first, second and third prize (high-class certificates suitable for framing) for those stations scoring the most points and also prizes for the most exotic DX station worked,and the most exotic quipment used. These last two categories will be judged by W6RNC, KDØHG and KJ4KV.

Other contests are in the planning stages and will be more complex and have more categories i.e. contests within contests for military equipment, real vintage gear, low power and so on.

CU on 20 for the "Allnighter". Barry

LETTERS

Dear ER

I really enjoyed the Feb. 90 article on the Techrad, TX350. It sounds very similar to the RCA MI-8174 low frequency submarine transmitter that I have most of the parts for.

A local OT donated a big pile of stuff to our local club. I was going through the pile and spotted the 100 lb. RCA plate transformer, and then a modulator deck with transformer. They all appeared to be from one transmitter. Then I found the "rosetta stone"- the manual. It guided me through the rest of the pile so I eventually found the remaining filter chokes, filament transformers and a complete set of RCA tubes-brand new in the boxes! The manual is odd; written in English, but all transmitter control references are in Dutch! (Gloenstroom = filament switch). Apparently the radio was made for the Dutch Navy for submarine use around 1939. For obvious reasons it never was delivered.

I also was able to find the external speech amp - MI-7179A- which appears to be a broadcast studio monitor amp (type 82-C) in a table top rack cabinet. Unfortunately, no transmitter cabinet or chassis could be found. I'm going to build it up for 160, 80 and 40 in an old 6' rack which has 4 nice old round faced Weston meters already on it. Apparently it was a "big rig" before.

If anyone has any info on the MI-8174 and 7179A, I would be interested. Apparently there was a similar HF unit (MI-8173) which shared the speech amp. An AR-77 was used as a companion receiver.

I really enjoy Walt Hutchen's ER in Uniform. Walt and I have had many late night QSO's and he is always running something interesting. I think one time we had a net going with two model 19's, a couple of BC-654's and even a TBX!

Good luck with your awards/contest programs. How about a "contest within a contest"; Field Day competition with contestants using only military surplus equipment. Bonus points for using a PE-94 10KW generator or hand cranked generators.

Chris Bowne, AJ1G
3 Carnot Ct.
Pawcatuck, CT 06379

Dear ER

First off, I want to tell you how much I look forward to receiving each issue of Electric Radio. I only wish it was a more lengthy publication. I hope it is growing even if slowly. I usually sit down and read it cover to cover immediately. Great stuff.

Barry, one of the things I like best about ten meter AM is it's usually a good refuge from the monotonous redundancy of contests and contesters. Needless to say, I am not very excited about your contest plans. Perhaps you can spice it up somehow and make it something different from the old "your 5-9 California" syndrome.

By the way, I really enjoy the historical stories about the manufacturers of old and the trials and tribulations that the engineers went through to get their products to the market place. I can really relate to this as I am, and have been, in electronic product engineering for twenty-seven years.

Rick Lutzinger, KD6ZR
647 Choctaw Drive
Fremont, CA 94539

Dear ER

ER has more features of interest to me than the other publications I read; (Ham Radio, QST, Radcomm etc.). While my employment keeps me current with today's technology, I seem to get a lot more enjoyment fooling around with vacuum tube gear. I served in the U.S. Naval Communications Station in Japan during my Navy hitch and really enjoy reading about the older military gear. 50% of my ham station is homebrewed and I'm working on the other 50% - so I do also like reading about home grown radio projects. What really sets ER apart from the other magazines is the lack of advertising dominance by Yeasu, Kenwood and Icom! I'm glad to be able to flip thru the pages and not be overwhelmed by multi-page ads for imported ham gear!. Please don't change that aspect of ER!

James (Chip) Owens, NWØO
1363 Tipperary
Boulder, CO 80303

Dear ER

Just a short note to let you know what we've been up to here around Ashtabula, Ohio.

We have been operating on 40 meters quite often; 7290 and 7295. The boys have a good foot hold on these two frequencies. There is AM activity on here everyday from early morning up till the commercial broadcast stations run us off about sundown. There's a lot of AM'ers here on the East Coast. All great fellows, too.

On 10 meters, here locally, we have a group of AM'ers that try to hold regular schedules on Tuesdays, Wednesdays and Thursdays at 9:30 PM EST on 28.304.

Also on10 meters, the fine hams on the island of Peurto-Rico have a new repeater on 29.100. They have a 10 meter AM link that is on all the time, tied in with their 2 meter repeater. I've had many fine QSO's with Andy KP4ANG. He told me they had tried 10 meter FM but had too much QRM so they switched over to AM. They're using a solid state Ranger 3500 for the 10 meter link, running about 30 watts to a dipole antenna on top of a mountain. Andy says their club has around 600 members and they have a lot of fun.

Tom Addair, N8IYV
1782 St. Rt. 193
Dorset, OH 44032

Dear ER

Since 1956 I have been a ham and involved with electronics professionally as an engineer in microelectronics since 1970, but my greatest hobby enjoyment is in restoring old equipment to operating condition, particularly military gear. Consequently Walt Hutchen's articles (ER in Uniform) are of considerable interest. The WW-II surplus gear was all most of us could afford in the fifties and a great deal could be learned about radio and electronics by working on that class of equipment. Nowadays my efforts are in restoration of equipment to operating condition rather than conversion (atoning for my past sins!).

Ken Lakin, KD6B
2601 Oakwood Rd.
Ames, IA 50010

Editor's Note: The best part of my day is always that time when I sit down and read the days mail. I always get encouraged and somehow motivated to work harder. Many thanks to everyone who has written.

Something Old And Something New

Solid state bias for amplifiers and modulators ..... without a bias supply

by Bill Kleronomos, KDØHG
POB 1456
Lyons, CO 80540

About the time solid state devices took over the field of electronics, the golden era of AM radiotelephony was coming to an end. As a result, many old designs for RF decks and modulators which could have benefitted by some of the unique uses of semi-conductors were not. Instead, as we all know, references and design data for AM equipment were dropped from the amateur literature and handbooks. While designing a new modulator for an old Elmac I ran across a problem - just where was I going to obtain the operating bias for a pair of 807 modulator tubes operating in class AB2?There was no provision in the Elmac, which was designed as a mobile rig, for any negative voltages. After some thought, I dismissed using two old standbys, the bias battery and the cathode bias resistor. I needed about -30 volts, and a bias battery would have been too big. The cathode resistor means of biasing doesn't work right with amplifiers that operate in class AB2, B, or class C. So, what to do?

It dawned on me over morning coffee one day that I could use the same zener diode cathode biasing that had worked so well for me in the past in class B linears I built for SSB use. [An explanation for those of you unfamiliar with this technique --]

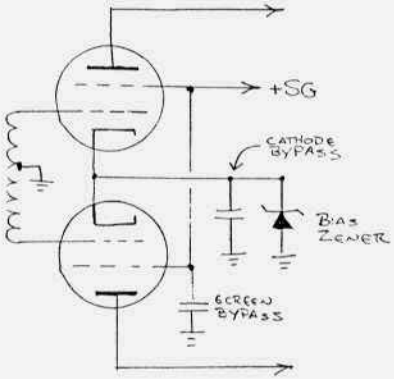
The conventional way to bias a vacuum tube amplifier is to ground the cathode for DC and to apply a negative bias voltage to the grid with relation to the cathode (ground). If instead you grounded the grid for DC, and you put a positive voltage on the cathode, then the grid would still be made negative with respect to the cathode as in the conventional method, right? Right! Great in theory, but the problem is the regulation of the bias voltage. In the conventional method of grid bias, the bias voltage needs to remain constant regardless of the grid current, which is generally several tens of milliamps. A simple regulated grid bias supply will work fine and provide the needed regulation. The problem with cathode bias is that you need to hold the bias voltage constant while the cathode current varies up to hundreds of milliamps, or, even amps. A much tougher problem. This is why cathode resistor bias doesn't work very well in class AB2 or B amplifiers. As the plate (cathode) current varies through the cathode bias resistor, so does the cathode bias voltage. And in these types of amplifiers, the plate current varies tremendously from zero to full signal operation. So, we lived with the situation until the development of the power zener diode in the 1960's, which neatly solves the problem of obtaining a regulated source of cathode bias voltage. But, as I mentioned earlier, new tube and modulator designs were no longer appearing in ham literature after the mid '60's, so the use of zeners for cathode bias in class C amplifiers and class A, AB and B modulators never caught on.

How To Do It

The basic circuit for a vacuum tube using zener diode bias is shown in figure 1. All that is required is a zener diode of the proper voltage and wattage rating, and a cathode bypass capacitor - a few microfarads at audio frequencies, and .01 uF or so in the HF frequency range in the case of RF amplifiers. The zener diode's voltage rating should be the same as the grid bias voltage needed. This voltage value can be determined from the tube's data sheets, or through experiment with an adjustable power supply connected to the grid of the tube while the cathode is temporarily grounded.

The wattage rating needed for the zener can be determined by multiplying the maximum operating plate current of the biased amplifier by the voltage of the zener. Example: if the zener voltage needed is 20 volts, and the maximum plate current is 100 MA (.1 A), then .1x20=2 watts dissipated. A five watt zener would work just fine. Several zeners may be connected in series to obtain a particular voltage. In the case of zeners in series, calculate the dissipation of each diode individually.

Power zener diodes come in a tremendous range of voltages, from 2 or three volts to several hundred volts. Common wattage ratings are 1 and 5 watt, in axial lead packages, and 10 and 50 watt in stud mount diode packages. Carefully observe, tho, that either the cathode or anode of the zener can be connected to the case of the stud mount packages. It saves some trouble to get a zener with the anode connection to the case which allows simply bolting the zener to the equipment's chassis using no insulating hardware.



Push Pull audio /RF stage with zener bias

In the case of using zener bias on a modulator (class A, AB, or B), or audio amplifier make sure that the grid of the tube (s) is returned to ground through a fairly low resistance. This can be as simple as grounding the center tap of the audio driver transformer.

In the case you plan to bias a class C RF amplifier, select a zener voltage roughly equivalent to the cutoff voltage for the tube (s) used, and obtain the additional operating bias required through a simple grid leak. In the case of a linear amplifier just select a zener that makes the tube idle at the proper current.

The main disadvantage of using zener diode cathode bias is that you cannot adjust the bias voltage, once set. You can, however, fine tune the idle current of a tetrode or pentode amplifier by making small adjustments to the screen voltage, as required. Triodes, on the other hand are not very picky as to bias voltage, and once you have selected the proper voltage for a triode amplifier it most likely won't need adjustment when tubes are changed.

Let me wrap this story up by saying that using zener diode cathode bias offers great possibilities in the construction or restoration of our beloved hollow state boat anchors. In our era where bias cells are no longer stocked by the local radio parts store we can make advantageous use of some modern technology to fill the void.

Restoration Techniques from page 15

Many of the Hallicrafter models from a given time period used the same or very similar components. This gives me a choice of models to choose from making acquisition of parts easier. If the radio is rare and needs a power transformer, and the chance of finding another, is slim, I will have the transformer re-wound.

Physical restoration used to give me problems, particularly in matching paint for cabinets and panels. To solve this problem I took clean examples of the dozen or so shades of Hallicrafter gray and black to a local automotive lacquer company and had them special mix a quart of each. If a panel or cabinet is in very bad condition, I will acquire another, (unless rare), rather than do a complete re-paint or re-lettering job.

So now you know where I get my original parts. But how do you find a forty year old radio of a particular model to use as a source of parts, or for the collection? I have been collecting Hallicrafter products since 1974. About eighty per cent of these are acquired through my continuous ads in the national radio magazines, like QST, Antique Radio Classified and Electric Radio. The remainder are acquired by attending radio swap meets. It is my policy to buy any Hallicrafter product whenever it is offered if "the price is right" regardless of how many of the same model I already have. After 16 years I have built quite a stock of "parts radios".

This stock of parts makes restoration much faster than would otherwise be possible. If a front panel, dial, or power transformer is needed, it's off to my "parts department", get one, and continue the restoration without waiting weeks or months to locate and obtain the part. I usually purchase tubes - and sometimes capacitors, resistors, power cords and small items like rubber grommets - at the swap meets. I have bought many hundreds of "new" military surplus tubes; usually in lots of a hundred or more for a few dollars. Admittedly, this is getting harder to do as most people are now selling by the tube for a much higher price.

Purchasing radios and parts in these quantities is probably not a good idea for everyone. There are commercial sources where most tubes, manuals, and some components can be purchased in small quantities. One such source is Antique Electronic Supply, in Tempe, AZ. Ardco Electronics in Berwyn, IL, can usually supply photo copies of Hallicrafter manuals and for other brands I recommend Hi Inc. in Council Bluffs, IA.

In recent years there has been a tremendous resurgence in interest in antique and vintage radios of all types. This has driven the price of most of these items to levels where only the 'well off' can contemplate a collection of considerable size. Most of the radios bought today are by what I call ' mini collectors', those who want from one to a dozen or so sets. For most, the emphasis is on owning these radios and not on restoring them.

The twenty to sixty year age of these vintage radios means they will almost certainly need considerable work to bring them back to their original glory. Once properly restored, they will usually provide many more years of good service and pleasure. For those of you who are not technically inclined but want to own and operate one of these radios - good news! One of the 'spin offs' of the antique radio 'boom' is the reappearance of technicians who know how to work on these sets. Several advertise in the national radio magazines and in any larger city there is likely to be one or more vintage radio repair shops listed in the phone book.

Editor's note: Classic Radio, Eureka, CA, (Shelly, K6VHP) and Barney Wooters, W5KSO, Denver, CO are two repair /restoration shops we can recommend highly. Both have ads in the Classified section.

SHORT WAVE CORNER

by Pat Zapalac
1956 S. Vaughn Way #201
Aurora, CO 80214

I've been involved in short wave listening for several years. I also collect and restore vintage receivers. Although I am not a ham I spend a good part of my listening time "cruising" the ham bands. I find the AM operators to be very interesting and enjoy the discussions on gear and technical subjects.

Barry has asked me to contribute a monthly column on short wave listening. He wants me to provide times and frequencies and additional information on programs that would be of interest primarily to amateurs; particularly amateurs operating AM with vintage gear.

Both he and I would like input from others that are interested in short-wave listening. That input could include information on new programs on the air, changes in times or frequencies, good old receivers to use, antennas that are effective and so on.

We're also assuming that a lot of hams listen to shortwave broadcasts only occasionally. One reason for this might be the lack of a simple directory to let them know what programs are on when and where. For this first column I've compiled a short list of general news programs with time and frequency information to sort of get the new people started. Next month I'll list those programs that relate directly to amateur radio.

All times listed are UTC. The programs can be heard with very little difficulty and with simple receiving equipment. I am able to receive all of the stations listed with nothing more sophisticated that a Zenith Trans-Oceanic.

The programs listed provide a wealth of information. Radio Canada, for instance, has a program on Saturday evenings, which features Glen Hauser. He give up to date information on the "who", "what", "when" and "where" of shortwave broadcasting. His report also includes current and projected propagation conditions which can be useful to the amateur radio operator.

So let's flip those switches and turn those dials. I'm sure you can find that special program that will 'spark' your interest.

Radio Canada International 0:00 - 1:30, 2:00 - 3:00 UTC. Monday thru Fridays on frequencies of 5.960 and 9.755, World at Six and As It Happens. SWL Digest is on the Saturday evening broadcast.

Voice of America 1:00 - 2:00 UTC on 9.815, 3:00 - 5:00 on 9.575. News at the top of the hour. Informative topics follow each news broadcast.

Radio France International 3:15 -4:45 on 9.800. News followed by current news topics.

Radio Netherlands 3:30 - 4:30 on 9.590. News followed by various subjects of discussion. Sunday nights broadcast features "The Happy Station " program with various types of music. Monday nights there is a great science program called, "Research File".

BBC 2000 - 2200 on 5.975 and 15.260. News and current events programs.

ER in Uniform from page 6

PA plate current somewhat high (or 1625 shows color), output low -- gassy 1625 (s).

PA plate current 125 ma, 1625's are okay, no output -- no drive to PA. Select relay (under chassis) corroded contacts or other MO circuit problem causing no oscillation, or no drive coupled to final. Drive can be checked across R-74; this is brought out to the rear connector on ATA/SCR-274N sets.

Loading coil stiff (especially if it gets that way suddenly) -- right hand bearing seized in bracket; remove, clean, lube with silicon grease.

Excessive drift (much above .01% in 40 minutes) -- oscillator bypass cap C-58, or 1626.

Frequency jumps 50 or 100 cps irregularly -- 1626 or 1625 tube, check by tapping tubes.

Note rough or 'eye' opens just a little at a cluster of frequencies near the crystal frequency -- bad 1626 grid leak resistor or capacitor.

Calibration and Alignment

Because these radios are so well made, careful calibration and alignment really pays off. The procedure given in the manuals for the receivers is a simplified one; the method given here will give better accuracy. As with other old radios, allow the set to operate ten hours or more to dry out before starting final adjustment.

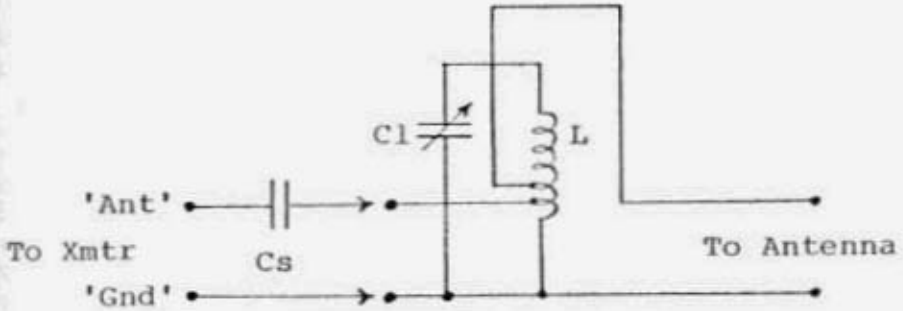
Align the IF's to exactly the specified frequency. Removing the receiver case will expose the padder capacitors and the oscillator series trimmer. Adjust the oscillator trimmer and padder following the instructions in the manual, then check the calibration. A fast way to do this is with harmonics on a crystal oscillator which will give you ten or fifteen checkpoints across the dial -- for example, a 200 kc crystal for the 3 - 6 or 6 - 9.1 Mc receivers.

If calibration is not okay, (index does not touch the dial line at each point), remove the cover over the tuning capacitor and examine the slotted plates on the oscillator gang. If they are only slightly bent and calibration is 'close', you can correct it by carefully bending plates. Otherwise, straighten the plates (also those of the RF and antenna gangs) and readjust the trimmer and padder. (You do not need to replace the capacitor cover to make these adjustments.)

If (after setting the trimmer and padder) calibration is off more than two or three line widths at the low end of the dial, remove the pin, move the dial about 1/16" and readjust; if the problem gets worse shift the dial, the other way. If there's a problem near the center of the dial, remove the coil set, take out the four screws holding the oscillator coil, take out the fiber tab locking the slug, carefully adjust the slug 1/2 turn, and reinsert the tab. Turning the slug clockwise (in) decreases the inductance. Be sure to get the coil back in the can facing the right way! The two screws which secure the coil set must always be installed before testing.

Adjust either dial position or the coil and the oscillator trimmer and padder until you are within one line width across the dial except at the low end where two or three widths error is okay. Finish up by bending the capacitor plates slightly.

When the set is calibrated, track the RF and antenna circuits. Tune in a signal near the high end of the dial (say 5.8 Mcs) and adjust the respective trimmers. Without touching the 'align input' knob, tune in a signal near the low end (say 3.2 Mcs) and readjust each trimmer. If you had to decrease the capacitance then the inductance of the corresponding coil should be decreased. Screw the slug in one turn and repeat the test. On the second try you will likely be close enough that no significant improvement will result from further adjustment.



Parts List:

Cs - Series capacitor, see text
L - 30 turns #20 wound 16 tpi, 1" diameter ("Miniductor" or equal) tapped at 2 turns, 4 turns
C1 - 200 uuf air dielectric variable
Cs - Series capacitor, see text

The command transmitters won't load a 50 ohm resistive antenna, but this simple tuner will do the trick and reduce harmonics at the same time. Cs is the series capacitor discussed in the text.

Transmitter calibration and alignment is simpler. Remove the cover over the oscillator coil and make sure all coil and capacitor mounting screws are tight; replace the cover and tighten its screws firmly. The oscillator is adjusted using the slug in the coil and the padder capacitor, then (if necessary) bending oscillator capacitor plates. Moving the dial is not useful and there is no series trimmer cap. At each checkpoint you must load and tune the antenna circuit because (as on any MO-PA set) these settings affect the transmitter frequency.

The PA tunes quite broadly, so only the padder cap ordinarily needs adjustment.

Every command set I have worked on could be calibrated to less than one-half the width of the lines on the dial across the tuning range.

Mixing Different Types of Sets

While you are waiting for a complete and matching (all ARC-5, ATA/ARA, or SCR-274N) set up to deliver itself to your door, many components can be interchanged among the three groups of sets.

The exception are:

Transmitters: ARC-5 is plate/screen modulated, has unique rear connector. ATA and SCR-274N are screen modulated and connectors are the same.

Receivers: 'Plug compatible'. BC-455 (7-9.1 Mcs) and corresponding ARA receiver have much worse selectivity than R-27/ARC-5. ARC-5 receivers have AVC; others do not.

Modulators: MD-7/ARC-5 is plate/screen modulated; BC-456 and ATA unit are screen only. Two large connectors on MD-7 differ from ATA/SCR units and are harder to find; these can be improvised.

continued next page

ER in Uniform from previous page

Trans. Control Boxes: Can be 'mixed' but connectors and functions differ. BC-451 has convenient mike and key jacks, there is no exact ARC-5 equal.

Receiver Control Boxes: Interchangeable but functions differ.

Racks: ARC-5 and other transmitter racks have different transmitter (rear) and modulator connectors; mixing tx. racks and transmitters requires major work. Receiver racks are interchangeable.

All other accessories can be interchanged freely.

On The Air With Command Sets

There are several other issues which come up when using command sets as a ham station:

1. Receivers can be controlled from the front panel by means of a 'local control adapter' – a small control box with RF gain control and a combination ON/OFF and BFO switch which plus into the front of the set. This devise was called FT-260 by the Army and C-24 by the Navy; it is almost never seen today. You can make a substitute from the 'remote control adapter' (dummy box) which plugs into the same place when the set is remotely controlled or from an aluminum plate with an improvised connector. Use a miniature DPDT center off switch wired to turn the receiver 'ON' when thrown either way and ground the BFO 'OFF' line when thrown to the right. The RF gain control should be 50K, preferably wirewound.

2. Like most early aircraft sets, the transmitters 'like' a capacitive load. To minimize losses (of as much as 50%) in the loading coil, use the largest series capacitor you can resonate. The following values are suggested:

Frequency	Capacitance (uuf)
1885	400 - 700
3885	200 - 300
7285	150 - 175

Receiving type mica capacitors can be used, but use a couple in parallel to handle the current.

3. Since the military normally set command operating frequencies with a test oscillator or frequency meter, there's no way to zero beat another station. To add this, connect the 24 volt DC supply through an SPST toggle switch to an 800 PIV diode to a resistor to the transmitter oscillator plate voltage line. Closing the switch applies a small plate voltage to the MO; you will be able to hear the signal in the receiver. The MO frequency varies slightly with the resistor value. On my T-19, 82k gives the right (same as transmit) frequency, but this will vary from set to set.

4. To make a connector for a receiver or an ATA or SCR-274N transmitter, pry out two of the IF can plugs from the chassis of a junked receiver. Break one up, and carefully file off the 'roll' holding the solder lug on the back of one of the pins. Drill a hole in the center of the other connector, insert the pin, and solder the lug on. Set the connector in water when you solder the wire to this pin so you won't melt the lug off so quickly.

For the ARC-5 transmitter, use the male connector from the RF coil receptacle in a junk receiver, instead of the IF can connector.

5. Soldering to the male pins on command set connectors ruins them. Instead, solder to pieces of 1/8" o.d. brass tubing (your local hobby or model shop has 1' lengths) or a tube socket pin pushed on to the pins. Cover the connection with shrink tubing and tag the lead to show what pin it belongs on; I sometimes use this 'field expedient' for a year or more while looking for the right connector.

6. You can use any FT-243 crystal to check transmitter calibration by plugging it in to pins 1 and 3 of the crystal socket.

7. The transmitters are designed to deliver twenty watts or less on voice. While you can increase this substantially by

raising the plate voltages (I have heard numbers as high as 100 watts!), stability will suffer.

8. Receiver selectivity could be better on 75 meters and (especially) on 40 meters. An external Q-multiplier will do the job; see CQ magazine, February '57, for the way to convert a 455 kc unit for the IF frequencies of command and other military receivers. Double conversion or addition of a crystal filter would also work; both would require more gain so transistors or subminiature tubes on a plug-in stage replacing the first IF tube might be the best method. Increasing gain by reducing the cathode resistors of the RF and IF stages will -- you guessed it -- make the set drift more.

9. Receiver warm up drift is excessive for copying SSB. It can be reduced by adding a second 3 uuf negative temperature capacitor across the existing one on the 12K8 socket. I got even better results on a 3 - 6 mc receiver by connecting an 1800 ohm resistor across 24 volts and tying it to the pair of caps with cotton twine. ARC-5 receivers with "S" in a circle above the tuning knob already have an extra capacitor inside the tuning capacitor shield; these sets were 'stabalized' for lock-tuned operation.

10. The ARA and SCR-274N receivers lack AVC; it can be added using any standard circuit.

An Old Military Radio Net?

Several readers have asked about a net for those interested in old military radios. I think this could be a lot of fun; here are a few thoughts coming from an attempt to do it last year.

1. The net could either be an SSB net for those interested in military sets or it could be an AM net and encourage actual use of military sets. As an SSB net, communication would be much easier, there are more frequencies available (3 unused kcs is easier to find than 8 kcs or so, in any band), and there will be less trouble with hecklers. On the other hand, actually using the old gear would be a lot of fun and some of us may not have modern equipment.

2. If such a net were to operate on AM and encourage the use of older military gear, it should be on 75 meters since that is the only band common to all such radios.

3. An AM net on 75 with a majority of low to medium power transmitters (and excessively broad receivers to go with them!) is limited to off peak hours. When I tried such a net at 2330 EST, it was near impossible to find a frequency and worse to hold it. Of course an AM net in an AM window at a popular time collects AM'ers and can easily lose focus and direction. A net of this type may have to meet at 0500 EST each Saturday or some equally unpopular time. Yes, I am willing to do this, if you are.

If you are interested in a net, drop me a note with your thoughts on SSB vs. AM, band, frequency, time, and anything else you like. I will summarize and report in a future column.

Editors Comments from page 1

Bill says that the Johnson family thinks Edgar would like this. Edgar will be 91 in early June. On my list of "Radio Pioneers" Edgar is right up there near the top. His company produced quality, classic gear. Please write him at the following address: 111 W. Elm Ave., Waseka, MN 56093.

The subscription price of ER goes up on June 1. This is necessary due to a lot of factors but mainly it is a result of increased printing costs and the 30% hike in postage coming next February. Up till June 1 subscriptions can be renewed - for up to 2 years at the present rates. I hope everyone understands that I am reluctant to raise the rates but have no other choice. However, ER will continue to get bigger and I hope better in the coming months and years.

On to the second year.....

ARRL Petition from page 3

I. Introduction

1. In 1982, the Commission issued a Notice of Proposed Rule Making, FCC 82-410, (released October 1, 1982) in Docket 82-624, which proposed to update the rules governing maximum transmitting power in the Amateur Radio Service. The premise was that the rules, which generally governed transmitter input power, were "archaic" and difficult to enforce because of the measurement techniques required. The Commission emphasized in the Notice that it desired to avoid changing the actual power that amateur stations use [1]. It was proposed that measurement of input power be replaced by an output power measurement, that maximum transmitter power would be stated in terms of peak envelope power.

2. In the Notice, it was stated that a single feature for authorized maximum 'PEP' output was difficult to ascertain, as the PEP output differs, assuming a constant input power, depending on the type of emission used. Ideally, the Notice stated, one maximum figure should be specified for all stations other than those operated by Novice licensees. Though the Commission initially considered an output power of 1000 watts PEP, that level was not proposed, because the Commissions intent was not to reduce existing operating privileges. Instead, 1500 watts 'PEP' output was proposed, which actually constituted an approximate 3 dB increase in maximum permitted power for CW and FM emissions [2].

3. With respect to AM DSB operation, however, the Notice stated that the proposed PEP power limitation would have a significant impact. Those operations, when subjected to the new power limit, would be restricted to approximately half of their former maximum operating power. Of this, the Notice stated that "(w)hile this power reduction might be appropriate for an emission type which, by today's standards, is spectrum inefficient, the Commission recognizes that there is still some interest in this mode." So, the Commission proposed to "grandfather" the existing power limitations for five years for amateurs using AM DSB, and asked for comment on whether that period would be an appropriate length of time for the "grandfather" term.

4. The Report and Order issued in that proceeding, FCC 83-345, released July 22, 1983, noted that a significant number of the comments received in the response to the Notice objected to the impact on AM DSB operation. The League's comments stated that "(t)his effort by the Commission to lessen the negative impact that its proposal would have on these amateurs (using AM DSB) is appreciated by the League. Nevertheless, the Commission should go one step further and make this grandfathering provision permanent". The Commission refused to do so, suggesting that the special measurement training which would be required for Commission staff in order to enable effective enforcement would not be justified, in view of the limited number of users of the mode. Thus, the June 1, 1990 cutoff date for the grandfather provision was established.

5. In its present form, Section 97.313(b) states, in relevant part, that:

Until June 2, 1990, a station transmitting emission A3E is exempt from[the 1.5 KW PEP transmitter power limitation] provided that the power input (both RF and direct current) to the final amplifying stage supplying the RF power to the antenna feed line does not exceed 1 KW, exclusive of power for heating the cathodes of vacuum tubes.

It is to the sunset provision of this rule that the instant petition is addressed. Paragraph 6 of the Report and Order in Docket 82-624 stated that "if it appears that there is any justification to do so, we will reconsider [the grandfather provision at [the cutoff date]". That cutoff date is rapidly approaching, and the League believes that there is justification for revisiting the matter at the present time.

II. The Leagues Proposal Would Maintain the Status Quo

6. Due to the imminence of the cutoff date for full power AM DSB operation, the concern of AM DSB enthusiasts about the rule has again been raised. They suggest, primarily, that the Commission agreed to institute a five-year grandfather period for the maximum power limitation based on the level of interest remaining in the mode at that time. Instead, that was the stated basis for the grandfather provision in the Report and Order in Docket 82-624. Judging from the comments received by the League urging that present AM power limits be maintained, and from observations of on-the-air activity, it

appears that interest in AM operation has not changed dramatically in recent years and certainly has not declined. Thus, it would appear that the same justification for creating the five-year grandfather period now supports revisiting the option of permanent grandfathering of AM DSB power limits.

7. From the League's perspective, the most important principle at stake is that privileges once earned should not be reduced, absent an overwhelming public interest justification for doing so. No such public interest justification appears to exist. AM operators, who constitute a relatively small minority of amateurs, voluntarily limit their operation to spot frequencies or to narrow segments of the telephony subbands; this reduces the potential for interference to users of other modes in the crowded high-frequency bands.

8. Elimination of the 'sunset' provision will have no significant effect upon the introduction of new AM DSB equipment in the amateur bands. New equipment that would be affected by implementation of the 1500-watt PEP output limitation invariably is either homemade or has been converted from commercial service. Linear amplification of the AM DSB signal is possible, but only at reduced efficiency. This limits the PEP output power, at less than 1000 watts DC input, to less than 1500 watts PEP output.

III. Conclusion

9. While the Commission's action in 1983 in changing to a PEP output measurement was entirely proper, and while the "grandfather" clause in effect for the last several years was a reasonable approach, given the Commission's assumption that there would be a constant decline in the amount of AM DSB operation during that period, the assumption has not proven correct. There is still in the Amateur Radio Service a small, but significant number of amateurs who enjoy the use and development of AM DSB operation. The League firmly believes that the privileges earned by these amateurs should not be reduced, absent a compelling justification for the reduction of the privileges. The proposed substitute rule set forth herein should be sufficient to alleviate any concern about interference, enforcement, and reasonable standards for maximum transmitter power in the Amateur Radio Service.

10. This proceeding will inevitably extend beyond the June 2, 1990, cut-off date for the elimination of the grandfather clause. To facilitate full consideration of the matters contained herein, the League respectfully requests an extension of the cut-off date, to and including, June 2, 1991, or for a shorter time if the rule proposed in the attached appendix, or similar, is adopted by the Commission.

Therefore, the foregoing considered, the American Radio Relay League, Incorporated respectfully requests that the Commission release a Notice of Proposed Rule Making at an early date, proposing to substitute the text of Section 97.313 (b) of the Rules contained in the attached appendix for that presently set forth in the Rules.

Respectfully submitted,
The American Radio Relay League, Incorporated
by Christopher D. Imlay
Its Counsel

Appendix

Section 97.313 (b) of the Rules is deleted and the following substituted therefore:

(b) No station may transmit with a transmitter power exceeding 1.5 KW PEP. A station transmitting emission A3E is exempt from this requirement, providing that the power input (both RF and direct current) to the final amplifying stage supplying RF power to the antenna feed line does not exceed 1 kw, exclusive of power for heating the cathodes of vacuum tubes.

1 See the Notice, at Paragraph 2.
2 Id., at paragraphs 13, 14.

Your Tubes, Parts and Supplies Headquarters

TUBES:
3000 audio, receiving and industrial types in stock, including early and foreign types. Discount Prices!

CAPACITORS:
High voltage electrolytic and mylar capacitors for tube circuits.

TRANSFORMERS:
Hard-to-find power transformers, audio transformers, and filter chokes for tube equipment.

LITERATURE:
Extensive offering of literature and books on antique radios, hi-fi, communications equipment, tube data, and circuit diagrams.

KITS:
Radio, transmitter, stereo amplifier and power supply kits for learning and experimentation with vacuum tube circuits.

PARTS:
Resistors, lamps, tube sockets, potentiometers, grill cloth, knobs, vibrators and more.

SUPPLIES:
Chemicals, test equipment, wire, batteries, tools, etc.

"Write or call for our 26 page wholesale catalog"

ANTIQUE ELECTRONIC SUPPLY

688 W. First Street, Tempe, AZ 85281. Phone **(602) 894-9503**, FAX **(602) 894-0124**

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free -30 word-adper month. **Extra words are .10.** Here's how to count the words in your ad: the heading - For Sale, Wanted,etc- count as **1 word**. Your name, call, address and telephone number count as **6 words**. Hyphenated words count as two words. **Please count the words in your ad and if you're over 30 words send payment for the extra words.**

Non-subscribers: $3 minimum for each ad (up to 30 words). Each additional word is.20. **PLEASE CALL OR WRITE FOR DISPLAY RATES.**

VINTAGE EQUIPMENT ONLY

E.R.
Box 139
Durango, CO. 81302 **303-247-4935**

DEADLINE FOR THE MAY ISSUE: MAY 5

FOR SALE: Gibson Girl Kites, M-357A, with two baloon inflation tubes and case, used - $30.Kite only - $25; RC-292 Antenna sets, 55 lbs, used - $95; AB-35 mast sections - $3.50, set of 12 for 30 ft - $36; AB-12, 22, 23, 24, antenna elements - $2 each. URM-120 wattmeters, used, 20 lbs - $140 plus shipping. Tartan Electronics Inc., POB 36841, Tucson, AZ 85740. (602) 577-1022

FOR SALE: Signal Generators, URM-25D, 10 Khz - 50Mhz, AM/CW; URM-26A 3 - 405 Mhz, AM/CW; other makes, styles, hundreds available, from $30. Send for list. URM-127 Audio Oscillator 20 - 200 Khz used Ex, 15 lbs - $45 plus shipping. Tartan Electronics Inc., POB 36841, Tucson, AZ 85740. (602) 577-1022

FOR SALE: Rare Hammarlund receiver, HQ-215 solid state unit with matching speaker and 500 Hz filter, in excellent condition - $325; HQ-129X receiver - $90. **WANTED:** Information on the Hammarlund HQX-300 transceiver. Charlie, KD4AJ, (404) 396-0276 after 7 PM

FOR SALE: Radio Broadcast Books catalog and Antenna/Radio Propogation Books list now available. Send $.25 stamp for each one wanted. Rainy Day Books, POB 775, Fitzwilliam, NH 03447.

WANTED: BC-729 antenna tuner; DY-31 dynamotor; MT 421 mount for RT91/ARC2; BC-653 xmtr and BC-652 rcvr. Paul Thekan, 335 Rutherford, Redwood City, CA 94061. (415) 367-1499

WANTED: RCA models 816K and ACR-111. Chuck Dachis, WB5EOG, 4500 Russell Dr., Austin, TX 78745.

FOR SALE: Repair and restoration on all vintage equipment; 35 years experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

WANTED: Federal parts, radios and restoration info; loose coupler; VT-2's (good). Send SASE for my old QST and book list. Glen Fritz, N4WDX, 1516 1st Place, Vero Beach, FL 32962.

CLASSIFIEDS

WANTED: Military and Brown Bros keys, and Autronic paddle. Tom French, W1IMQ, 120 Great Road, Maynard, MA 01754. (508) 897-6622, (508) 897-2226

WANTED: GPR-90 or 92 receiver. FOR SALE: Clean, F.W. Valiant I - $150; clean Ranger - $90. W7IYG, (208) 466-2803 after 8:30 PM MT

FOR SALE: Hammarlund HQ-100 - $85; Ameco PCL-P nuvistor preamplifier - $25; 4D32 tube - $45; Drake C-4 - $395. Don Bishop, NØEA, Box 4075, Overland Park, KS 66204-0075.

FOR SALE: New 6146A (GE) tubes - $8 each; Hickok 6000 tube tester - $90; RCA AVR-5 comm. receiver. **WANTED:** Pilot and German radios and tube type Hi-Fi gear. Bill Moore, 1005 Fieldstone Ct., Huntsville, AL 35803.

WANTED: AM filter and speaker for Collins 75A-4. FOR SALE: Gonset 2 meter vfo which matches Commicators I and II - $40. Clem Duval, W8VO, 33727 Brownlea, Sterling Heights, MI 48077. (313) 268-2467

WANTED: PC boards from Harris Corp. RF-716 xmtr. Also Collins TD-1, CP-1 and Hallicrafters S-36. Gary Cain, 1775 Grand, #302, St. Paul, MN 55105.

FOR SALE: Modulation transformers; PP4 -125A , 22.2K CT to 8.3K, PP805 Class B, 45 lbs - $20 each plus shipping; smaller ones; NC303, Courier, Invader - $200 each; few new/used 211, 805 etc. G.M. Cassie, VE6TR, 286 Connaught Dr. S.W., Medicine Hat, Alberta, Canada, T1A 5H8

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

WANTED: For WW-II aircraft restoration: SCR-585; any RCA AV?-##, (AVT-15, etc.); some Command: dual receiver trays, modulator, manuals and related. Ken Gillis, 27217 Garden Way, Franklin, MI 48025. (313) 851-3240

WANTED: Any information on a Western Electric WW-II BC-455B ARC-5 receiver, model CBA that covered 28 to 41 Mcs. Sam Hevener, W8KBF, Automation Services, 16765 Park Circle, Chagrin Falls, OH 44022

FOR SALE: Heath DX-60B, clean - $45; Globe Chief 90, fair - $30; Heath DF rcvr - $50. Pat, WB9GKZ (414) 499-1336

WANTED: Commercial grade modulation reactor for 1 KW transmitter, 50 Henrys at 1 ampere. Also filter reactor, 10 Henrys at 1.5 amperes. Must be in good condition. Jim, KA6MMQ, (602) 924-3396 (leave message)

FOR SALE: Tubes, new in box. Please send $1. for list of 300+ tubes. Refundable. Wilson Hauck, BTB Inc., E.R., 6820 Stout Rd., Memphis, TN 38119.

FOR SALE: HF mobile rigs: 10m AM - $45; 10m AM/FM rptr offset - $70; 12m AM/CW/SSB - $95. I pay shipping. These are first-class conversions from CB service; they look and work great. SASE for details. WB5NVM, 371 Edwards, Lewisville, TX 75057.

WANTED: Manual TM11-227; Army Extension Course, 1933 edition, Special Text 233; Army Radio OperatorTraining Manual 26, Part One, 1924. Tajima, c/o Toshiba, 701 Westchester Ave., Whiteplains, NY 10604.

FOR SALE: Vibroplex Collector's Guide. W1IMQ's new illustrated reference includes key histories, identification guide, patents, more. 87 pages. Only $14.95 plus $2 s/h. Free info. Artifax Books, Box 88-E, Maynard, MA 01754

CLASSIFIEDS

WANTED: Tubes: 810s, T-125s and 6B4G's; HV cap near 0.02 mfd at 25 kv for Tesla coil primary; Thordarson Multi-match xfmr. Many parts and tubes here. What do you need? **TRADE:** Mint 75A3, Valiant, and 2B w/2AQ for absolute mint 75A4. Mike Carroll, NI4N, 108 Wessington Ct., Hendersonville, TN 37075. (615) 822-0082

FOR SALE: Parts for old time transmitters such as; tuning condensors, high voltage filter capacitors, etc. Also have small variable voltage transformers - $15 and up plus UPS; GE SCR-515A, Navy AB-1, operation manual, in original export packing - $100 shipping paid; Bendix type MP-74A power supply with dynamotor plug - $10 ppd; **WANTED:** Ceramic plate cap connectors for 866A tubes. James Fred, R1, Cutler, IN 46920.

WANTED: AI'S-10 radar; SCR-511 horsey talky; ARR-5 & ARR-7; antenna AS-410/URD-2 for URD-2 RDF; manuals for SPA-1/APA-6A pulse analyzer, and TS-1971/FPN spectrum analyzer. Wm. Van Lennop, POB 211, Pepperell, MA 01463. (508) 433-6031

FOR SALE: Clearance Sale. Must sell my excess collection of vintage radios from the fourties thru the seventies. Send LSASE for large three page list. George Hawrysko, K2AWA, POB 568, Boro Hall, Jamaica, NY 11424.

FOR SALE: BC-375 antenna tuners - $15; 1KW Bendix Micromatch power SWR meters with couplers (2) - $35 each; 18 inch rack enclosures - from $25 to $40 each; 115 variacs powerstats CDR antenna rotators with control unit, new, only - $75; 613 finals - $20; 807 - $3; 1625 - $2. Inquire on others. **WANTED:** Collins manuals for 30S1, 30L1 and KWM2. Reasonable please. Levy, W5QJT, 7600 Blanco Road, San Antonio, TX 78216. (512) 341-9549

WANTED: Swan VFO model 508; Vox model VX-2; phone patch model FP-1; 1960 callbook. Jack, KJ6KI, (714) 686-5407

FOR SALE: Bigelow Electronics has been in the electronic mail order business since 1954. Vintage parts and equipment available. Request free "Vintage Flyer". Bigelow Electronics, Box 125, Bluffton, OH 45817.

WANTED: Heathkits Mohican GC-1/Mohawk RX-1. Must be good physically/work or repairable. **FOR SALE OR TRADE:** Johnson Viking Valiant, excellent - offers. Prefer P.U. Bill Colligan, N1DJR, 35 Quail Run, Hampstead, NH 03841.

FOR SALE: BC-1066A VHF receiver (40's) - $40; BC-1333 rcvr - $10; Shure 70H mike (30's) - $30; 866 tubes N.I.B. - $10 ea.; QST's 20's and 30's - $3 - $6 ea.; other tubes 20's to 50's - reasonable. Victor C. Smith, 147-29 Hoover Ave., Briarwood, NY 11435. (718) 523-7059

FOR SALE: Johnson Viking Ranger I, has been refinished, all dark crackle finish, working 100% - $125; old tube type aviation transceiver, Super Homer, Narco mod. VHT-2, 108 - 126 Mcs - $50. Mart, K8PJR, 1104 Sunset Lane, Norton Shores, MI 49444. (616) 733-4177

WANTED: Gonset G-50, G-28 for parts. Also need manuals for G-50, Johnson 6N2 VFO, 122 VFO, 6N2 transmitter and 275 w matchbox. J.M. Roseman, 2716 W. 3rd St., Coal Valley, IL 61240.

WANTED: B&W TVL series coils for my "old" AM rig; BVL series jack bar with variable link. What have you? Tim Walker, N2GIG, 19 Woodside Ave., Westport, CT 06880. (203) 454-4376

WANTED: Like new condition trim rings and cabinets for my KWM-2A and 30L-1. Premium price will be paid for like new condition. Jerry Brower, AB8U, 3041 Rising Springs, Bellbrook, OH 45305. (513) 429-5457

Please remember to count the words in your ad and send .10 for each extra word.

CLASSIFIEDS

WANTED: Correct cabinet for Collins 51J4. Will trade cover for rack mounting of same. Sam, N4VIB, Rt 3, Box 3469, Chatsworth, GA 30705. (404) 695-5658

FOR SALE: Collins 51J4, good condition, manual - offer; Grundig Majestic 1060, manual - offer. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

WANTED: Heath HG-10B VFO in clean and working condition. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (404) 748-5968

WANTED: E.F. Johnson speed key; 122 VFO/manual; Viking Navigator or Ranger II; Hammarlund Comet Pro; Hammarlund Four Twenty transmitter; HRO-5 LF coils. Brian Roberts, 3068 Evergreen, Pittsburgh, PA 15237. (412) 931-4646

FOR SALE: Signal Corp BC-342N in military packing wood box, spare tubes, like new; surplus 1000 volt dynamotor; transmitting tubes, parts. SASE .45. K4UJZ, 608 W. Thompson Ln., Murfreesboro, TN 37129. (615) 893-5344

FOR SALE: WW-II military radios/parts/peices/accessories of all types, aircraft and field sets. My collection is expanding and so is the excess. What do you need? Send SASE with wants. Have ARC-5s and 274Ns for sale. **WANTED:** Pieces for BC-274 set. Henry Engstrom, POB 5846, Santa Rosa, CA 95402. (707) 579-2070

WANTED: Telegraph bugs, keys and old paddles for private collection. I need most models pre-1960. I also need old bugs for parts. Herb Spivey, NF5Y, Box 27, Baldwyn, MS 38824. (601) 365-5594

CLASSIFIEDS

"REAL RADIOS GLOW IN THE DARK"®

Bumper sticker -$1 each with a #10 SASE. We service American made amateur radio products circa 1940's, 50's and 60's. Manuals and/or schematics available for most rigs and radio sets back to mid 1920's.Call or write for a quote on your service or tech data requirements. **Classic Radio,** PO Box 3486 Eureka, CA 95502. 24 hour phone (707) 444-3911. K6VHP

WANTED: Hallicrafters SX-115 & HT-32B; Collins 32V-3, KWS-1, 75A-4. Alan Gray, W3VL, 212 Penn Valley Terrace, Yardley, PA 19067. (215) 295-6331

WANTED: ARC-5 xmtr, 1.3 - 2.1 Mcs; info on Australian AMR-101 HRO receiver; APR-1 or similar rcvr. Hank Brown, W6DJX, POB 3187, Lancaster, CA 93586.

WANTED: Collins S-line: 312B-4, MP-1, PM-2, 516E-1, 516E-2, 351D-2, DL-1, working or not but complete, w/data. J. Orgnero, Box 32, Site 7, SS 1, Calgary, AB T2M 4N3 Canada.

FOR SALE: 6 khz Collins mechanical filters, S-line style, modified with plug for installation in 75A-4. Spec. sheet included - $55 each. **WANTED:** 4-5 KV rated variable capacitor, minimum capacity 6-8 pf, maximium 40-60 pf, or original plate tuning cap for 30K1. Skip Green, K7YOO, (507) 452-4989 home or 800-533-8008 at work

---

WANTED: Western Electric speech and theatre sound gear, parts and literature. Also need audio xfmrs, other tube audio parts. Consider trade nice Collins gear for prime specimens. Joe Roberts, N4WQC, Box 19302, Alexandria, VA 22320. (703) 683-2955

WANTED: Hickok SA-11 Universal Adaptor (PN 1050-135) or wiring diagram for same. Jack Meade, 12711 Pinebrook Lane, Hudson, FL 34667

WANTED: Old National and Hammarlund receivers and accessories. Cash or trade for above my old SW, BC or telegraph sets. Robert B. Enemark, W1EC, Box 1607, Duxbury, MA 02331. (617) 934-5043

FOR SALE: Newly published instruction books, authorized by Rockwell International, are now available for the Rockwell/Collins S-Line. These instruction books are brand new and have been printed from the latest editions -- complete in every detail, including the front and rear color covers. A money-back guarantee of the purchase price ensures your complete satisfaction. Instruction books for the following models are currently available. KWM-2/2A ($35); 75S-3B/C ($30); 32S-3A ($30); 75S-3/3A ($25); 32S-3 ($25); 312B-4/5 ($20); 516F-2 ($15). For U.S. orders, include 7% of the purchase price for shipping and handling. (Canada and Mexico add 12%; all other international countries add 25%.) Ohio residents add 6% sales tax. VISTA Technology Incorporated, 3041 Rising Springs, Bellbrook, OH 45305. (513) 426-6700

FOR SALE: Century 21 (like new) - $200; Johnson 275 watt Matchbox with coupler - $90; Heath balun - $10; Century 400-12, universal mobile supply - $50; original Drake 1-A manual - $10. **WANTED:** E - F coils for HRO-60; tubes: 6B4G, 6AX5, 807, 6SL7, 5Z4, VR-75 (OA3),5V4, 5BY5. Mac, WK7U, 3413 Keir Lane, Helena, MT 59601. (406) 475-3355

FOR SALE: TM repros for Command Sets, ART-13, BC-348, TM11-487, other TM 11's to 08's. Replacement pages and some originals available. LSASE for list. Robert Downs, WA5CAB, 2027 Mapleton, Houston, TX 77043. (713) 467-5614

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

CLASSIFIEDS

FOR SALE: Ham building parts of 1940's - coils, switches, condensors, transformers, tubes, sockets, chassis and cabinets. Everything! F. Yonker, 7 Old Farms Rd., Saddle River, NJ 07458.

FOR SALE: Collins R-388, clean, with tm - $350 or trade for Johnson 500; Johnson SSB adaptor with manual and ps - $200. Bill Jenkins, WA5MWJ, (501) 646-3859

WANTED: Heathkit Apache and Johnson Ranger transmitters. Also a NC-303. Glenn Bell, N5CHK, 2870 N. Main, Paris, TX 75460. (214) 784-6584

WANTED: Johnson Matchbox; Johnson transmitters and accessories. FOR SALE: HA-14 mobile, compact KW amp, with AC/PS and new 572Bs - $325. Bob Sloan, KK4GO, 2340 S. Puckett Mill Rd., Dacula, GA 30211. (404) 945-8642

FOR SALE: Military radios in original condition; BC-348R - $175, BC-312D - $175, BC-645 - best offer; 1500 volt power supply, uncompleted, has Thordarson T46861, for more info call - $100. All plus UPS. Following photocopies, postpaid; WE tube data 101D to 284A - $20; WE 10A outfit - $12; Sodion tube data - $8; DeForest D10 manual - $12; Zenith 3R-4R - $12. **WANTED:** wire recorders, Pye radios and Grebe CR18. Peter Dieguez, 36-48 - 34th St., L.I.C. NY 11106. (516) 625-0429

WANTED: National NC-109 (or NC-188), condition not important; October 1953 QST; manual for Lafayette Explor-Air and Conar 400 novice transmitter. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Wireless set #19, Mark II dynamotor unit, need not be working; any other model 19 related accessories; power supply/dynamotor for TCS-12 series. Chris Bowne, AJ1G, 3 Carnot Ct., Pawcatuck, CT 06379. (203) 599-5262

WANTED: 3 to 6 and 6 to 9.1 command set receivers in repairable condition. Please, condition and price in your reply. Jim Hanlon, W8KGI, Box 581, Sandia Park, NM 87047.

FOR SALE: BC-939 tuner - $75; RBM, HF rcvr - $60; ARR-15 rcvr - $60; RMC AR-8712 rcvr - $40; TS-173 VHF freq. meter - $40. **WANTED:** SB-10 manual, copy ok; RAX LF rcvr. Steve Davis, KD2NX, 2372 84th St., Brooklyn, NY 11214. (718) 265-2390

FOR SALE: Swan 500C w/spkr and PS - $200; Swan 117-X PS w/DC converter - $45; S-38, VG - $27. All items plus shipping. Parting out Ranger, Valiant and Viking II. Joe Sloss, 4732 119th St. SE, Belleview, WA 98006 (206) 747-5349

WANTED: Collins Radio book entitled "The First 50 Years, History of Collins Radio". Bill Mills, KC5PF, 1740 Tonys Court, Amissville, VA 22002. Office: (703) 818-3955, Home: (703) 937-4090

WANTED: Johnson Viking 500 or a well made homebrew (shippable by UPS) 500 watt AM transmitter. Unit must be in very good to excellent condition. Bob, K7NWB, (602) 833-7786

WANTED: 800 Kc mechanical filter for 75A-4 in good condition. William Shaw, W2HYN, 3282 Oakmount Road, Holcomb, NY 14469.

WANTED: Pre-1942 transmitter. Any condition or parts considered. Examples: Gross, Stancor, Collins, Thordarson etc. Also want SX-88. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528. (914) 691-6247

CLASSIFIEDS

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

WANTED: Buy and Sell all types of electron tubes. Harold Bramstedt, C & N Electronics, 6104 Egg Lake Rd., Hugo, MN 55038. (800) 421-9397, (612) 429-9397

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: General Radio Company instruments in wooden cases. Especially want laboratory type equipment. Also need GR experimenter magazines, manuals, and catalogs. Frank R. White, KBØTG, POB 2012, Olathe, KS 66061.

FOR SALE: DuMont Oscillograph - $55 plus shipping. Also offering machine shop service for restorers. Universal, Box 5044, Greeley, CO 80631. (303) 353-8561

FOR SALE: Hallicrafters manuals, copies - $4.50 postpaid. Some Hammarlund, Gonset, Johnson. Miller Radio, POB 6604, Erie, PA 16512.

WANTED: Telegraph bugs, keys and old paddles for private collection. I need most models pre- 1960. I also need old bugs for parts. Herb Spivey, NF5Y, Box 27, Baldwyn, MS 38824. (601) 365-5594

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

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

WANTED: We need 800 and 8000 series transmitting tubes. Also Taylor types and receiving tubes of all types. All must be new and in original boxes. Mail or FAX your list for our offers. Antique Electronic Supply, 688 W. First ST., Tempe, AZ 85281. Phone (602) 894-9503 FAX (602) 894-0124

SPAM

THE SOCIETY FOR THE PRESERVATION OF AMPLITUDE MODULATION

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

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

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

CLASSIFIEDS

FOR SALE: Parting out Heath Apache TX-1: mod. transformer, power, dial, switches, panel etc. **WANTED:** Slides of you and your station for AM presentation at Hamvention. Marty Drift, WB2FOU/5, 108 Hickory Ln., Hickory Creek, TX 76205. (817) 497-6023

WANTED: McIntosh tube type hi-fi gear for my collection! Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53220-0803.

WANTED: Any components for an SCR 183 radio to include: Radio Control Box BC-AR-231; Antenna Switching Relay BC-AR-198, Control Box BC-AR-198, complete Dynamotor BD AR 83 and Mounting Bases FT-99, FT-100 and FT-141 and any associated cabling. William Howard, 219 Harborview Lane, Largo, FL 34640. (813) 585-7756

WANTED: Hallicrafter SR-500; manual for NC-173; B&W 5100B; EMC model 801. Please contact me before mailing manuals. Clyde Sakir, N7IOK, 4243 E. First St., Tucson, AZ 85711. (602) 323-1120

FOR SALE: APR-1 receiver, 80 to 300 Mc - $75; APA-41 panadaptor - $35; new Navy RF/AF signal tracer TS-673U with associated probes/manual - $50; Precision 650 tube tester - $40. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

FOR SALE: Halicrafters SX-24, needs restoration, cabinet ok, works ok - $60; R-392 w/ps, manual - $140; NIB JAN 3B28's, gas rectifiers, replace 866's, no flashback - $10; factory manuals for HRO-50-1, HRO-60, NC-183D vg cond - $10 each. All plus shipping. Bill, KDØHG, POB 1456, Lyons, CO 80540. (303) 823-6438

WANTED: Excellent - mint Ranger I, II; WRL Globe Chief or Scout; Viking Navigator; NC-303. Please call or write. Richard Cohen, 11802 Willow Pt. Way, Tampa, FL 33624. (813) 962-2460

WANTED: Manuals for Hammarlund HX-50 or HX-50A and HQ-100A. Fred Emerson, 627 Illinois Ave., Elgin, IL 60120.

FOR SALE: Johnson Thunderbolt with PL 175A's. Excellent condition. Also spare Thunderbolt with 4-400's for parts. Can deliver both to Dayton. Dick Truax, K8GVU, 3003 Gleeson Ln., Louisville, KY 40299. (502) 491-2871

FOR SALE: Hallicrafters SX-111 rcvr with R-46B speaker and manual, mint condition - $ 85 for all. Chuck, K6KDZ, 20335 Casaloma Rd., Grass Valley, CA 95945. (916) 273-6847

FOR SALE: Transmitting/receiving tubes, new and used, mostly old surplus. Exa: OA2, OC3, 2E26, 3B28, 4X150, 4-65A, 4-125A, 12A6, 803, 809, 812A, 813, 815, 829, 832, 836, 872, 1619, 1625, 1626, 5894, 6130, 6146, 6336, 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: AX 9909 tubes for Globe Champion, Amperex 6083 and 8643. Bill Smitherman , KD4AF, Rt 4, Box 79, East Bend, NC 27018.

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

Renewal Information: Renew before June 1 (for up to 2 years) at the present rates.

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

SECOND
CLASS

TO: