



HAM HUM

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APRIL HAM AUCTION

The Annual Ak-Sar-Ben Radio Club Ham Auction will be held at the 4-H Building, Ak-Sar-Ben Field, 8:00 P.M. Friday, April 14, 1967.

The Ak-Sar-Ben Radio Club would like to remind its members and those attending the auction that we have some new rules slightly different than those of the past. Previously, one could set a minimum price on an article brought to the auction for sale. If the item didn't bring the price stipulated after a reasonable amount of bidding, it wasn't sold. This feature has been dropped. Instead, if an owner of an item sees that it is not bringing the desired price, he must bid on it himself. The Club charges a 10 per cent auction fee on all items sold. The Auction will be arranged so that the first items brought in will go on the auction block first. Come early so you may look over the selection of ham gear and get your consignments registered. The Auction begins promptly at 8 P.M. As the Club anticipates a sizable volume, there will be no "meeting" as such. Refreshments will be

available during the auction. Everyone attending should look through their junk box to find something to bring. The Club has a disassembled beam which will be put on the block. As of this writing, it's not sure if the Club has other items to sell or not, but we are checking our inventory to see if there are other items which the Club wants to sell. Remember, what you might consider as "junk" might be what the other guy is looking for, so bring it along.

Let's try to make this year's Auction an even bigger success than last year's.

Dear Radio Club:

I thoroughly enjoy receiving and reading your Ham Hum, and would like to advise you of my new address:

Frank E. Shopen, W7EBG
3811 North 27th Ave. #65,
Phoenix, Arizona 85017

Thank you.

HAM HUM is the official organ of the Ak-Sar-Ben Radio Club, Inc., of Omaha, Nebraska, mailed monthly to all members and to others upon request.



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AK-SAR-BEN RADIO CLUB, INC.
Post Office Box 291
Omaha 1, Nebraska
Editor: Dick Eilers, WØYZV

Phone HOME: 391-2255
BUSINESS: 342-1402 - EX. 327

Associate Editor: John Snyder, WØWB

Phone HOME: 556-1538
BUSINESS: 551-0669 - EX. 317

MARCH MEETING

The Ak-Sar-Ben Radio Club met at the Technical Institute of the University of Omaha, Friday March 10. One of the scheduled speakers, Jim Droege, WØYCP, was hospitalized earlier in the week and was unable to attend. Jim was to give a short talk on 2-meter repeater stations. We wish him a speedy recovery.

Our featured speaker of the evening was Dan Fahrlander, WØLGT, an instructor of the Technical Institute. Dan gave us a talk on the purpose and function of this fine school. Students who complete the two-year course are prepared to work as advanced electronic technicians. The school's goal is to train people to fill in the gap that exists between craft and engineering personnel in the electronics industry. Upon completion of the course, they are awarded an associate in science degree. The school is very well equipped with test equipment and training aids. Most of the equipment (signal generators, oscilloscopes, vacuum tube volt meters, tube testers, sweep generators, signal tracers and etc.) is of the latest design and of the finest quality. The train-

ing aids are plug-in and very versatile. By merely changing components around in their sockets, different effects can be achieved and analyzed. Two of their most recent training aids are a micro-wave system and a computer board which can be programmed many different ways.

The practical application of electronic theory and manual skills are combined at the Technical Institute. For example, the students are currently building individual projects which are entirely hand-made. They learn how to use metal working tools (lathes, metal benders, drills and etc.) as well as hand tools (soldering irons, chassis punches, wire strippers, etc.). They also experiment and build projects with transistors using the latest techniques in printed circuit layout.

The school has a student amateur radio club, WAØQHE. Several of the students are already hams, and there is a growing interest in the student body to become licensed amateurs.

The Ak-Sar-Ben Radio Club wishes to thank Dan Fahrlander and other University of Omaha officials

for the interesting tour of the Technical Institute facilities.

The door prize was won by Ed Donze, WQYEV. Our mystery man, "Mr. Ak-Sar-Ben" was Roger Sullivan, WAQETE. The third man to shake hand was Dave Watson, WAQDTT.

Refreshments were served and "eyeball" QSO's were struck up with some new faces attending this meeting. Let's hope that these people continue to attend meetings and become members of the Club!



Ed Kinney, Director of the Technical Institute, welcomes group to the University of Omaha.



Dan Fahrlander, WQJGT, explains electronic teaching equipment.





Janice N. DeWitt, KØRWX,
receives 10-Year Certificate
from President Erv.



Dave Watson, WAØDTT, (left) is the lucky
winner of a prize by being the third man
to shake the hand of "Mr. Ak-Sar-Ben,"
Roger Sullivan, WAØETE (right).



President Erv presents
20-Year Certificate
to Julie Eilers, XYL
of WQYZV.

FIELD DAY 1967 -
JUNE 24-25

Field Day is less than three months away. That seems like a long time, doesn't it? Don't let it fool you, for Field Day will be upon us before we know it. That is the reason we should start thinking real seriously about this great event.

In January I secured a nice long list of fellows who said they were interested in operating the rigs and helping out in any way they can on Field Day. I remind the membership that Field Day is a Club project. This means that participation by all, or as many Hams as possible, is essential if we expect to make a good showing. I urge you, therefore, to get behind this thing and pull together. Let's make Field Day 1967 the best ever for WØEQU. After our Field Day site has been secured, the Field Day Committee will meet at my QTH and go to the site to make plans for the placement of the various rigs. We will then return to my QTH and make our Field Day plans. We intend to know what we are going to do far ahead of time. A well organized Field Day plan gives us a chance for a better showing. Your Committee will keep you posted as to our progress in getting organized.

Remember, if we all put forth a little more effort, we can make Field Day 1967 the best ever.

Robert C. Lockwood, WAØDHU
Field Day Chairman

LET US STRENGTHEN THE AK-SAR-BEN RADIO CLUB!

Join the Ak-Sar-Ben Radio Club and think for yourself. It takes effort to be a thinker instead of a perennial "yes" Ham. But unless you take some initiative, you may be depriving other Hams of your good ideas. Study the various aspects of Amateur Radio issues so that you can make judgments on your own. Base your QSO's on theory, not emotion; on principles, not personalities; and on the common line, not narrow partisanship.

Any Amateur Radio Club can be crippled when the membership splinters into uncooperative or hostile cliques. But there is always hope! Even one Ham, by fair-mindedness and objectivity, can "bridge the gap" between opposing sides. You can draw members together into a working team for *Ham Quest*. No matter how diverse various Hams' backgrounds, ideas and personal interests, there is usually some common ground. And, for those interested in the facts, discussion is always possible. Promote a spirit of teamwork in your Ak-Sar-Ben Radio Club.

Erv Heinz, WAØEEM
President

CORRECTION - AIRMAIL FLIGHT

G. E. Scott, KØWFG, rather than WØOHK handled the traffic at Maxwell the night of February 22nd. Sorry that we had the wrong information!

IF YOU LIKE
PHONE PATCH TRAFFIC...

... Here is a real opportunity for you. OPERATION HELLO, the Omaha MARS project sponsored by the Navy and Air Force, needs them badly. Here's the pitch. All patch traffic going through Omaha is *prepaid*, hence there is *no expense* to the families for the calls. Marine traffic comes in three days a week directly from the combat zone, three days a week from casualties in the hospital at DaNang and one day a week from the rear echelon troops. Air Force traffic is more uniform in nature, originating from bases in South Vietnam and Thailand.

... IF you're interested, and,
... IF you and your equipment qualify,
Drop us a card.

Here's what you need:

1. Single side band equipment running maximum power.
2. An efficient antenna system capable of consistent high performance into the Orient.
3. Frequency capabilities of antennas and gear at 19.9 20.8 megs. Also 14.8 if possible.
4. Time to operate---skip is into Omaha from 1500 to 2200 GMT.

We prefer someone who can set aside one or two days a week instead of one or two hours a day.

The administrative side of the project will be handled for you.

Letters go to every family receiving a patch explaining how the project works. Financing of the calls is handled through a credit card. A high degree of operating skill will be expected though a training period is available. If you are interested and can meet the requirements, send along the enclosed card.

73,

Hugh Tinley, KQGHK

STATE of NEBRASKA
Lincoln 68509

March 27, 1967

Mr. Erv Heinz
Ak-Sar-Ben Radio Club
P. O. Box 291
Omaha, Nebraska 68101

Dear Erv:

Thanks for the copies of "Ham-Hum" containing pictures of the Night Air Mail Flight Re-Enactment. I have sent one copy of this to Nancy Griffin and enjoyed looking through my copy.

You amateur radio operators across the state should feel very proud of your participation in this successful Centennial activity.

With best personal regards,

Sincerely,

(Signature)

Norbert T. Tiemann
Governor

LT:sjs

ARRL MIDWEST DIVISION CONVENTION
and
NATIONAL QSL BARBECUE
June 24 & 25, 1967
North Platte, Nebraska

June 24, 1967 the ARRL Midwest Division Convention is to be held at the Holiday Inn. Programming is under way, but not completed. A business meeting will be held in the early p.m. The Banquet will be held at 6:30 p.m. Talk-in Stations will be at the Convention site, with 3.950 and 3.982 as talk-in frequencies. Two meter operations will also be active at this time. We are asking all Midwest Region Clubs to participate in Field Day from these events. Requests for speakers from different branches of the Services and from the FCC have been sent out, and ARRL will be well represented. A program for the handicapped that cannot be in attendance is being processed.

All Nebraska Amateur Radio Clubs are asked to participate in the Nebraska Amateur Radio Hall of Fame program--so choose one or more O.T.'s who are eligible. Fill out the application blanks and mail them to W0FZZ, 1101 South Ash Street, North Platte, Nebraska, not later than May 27, 1967, as June 4th the Hastings Amateur Radio Club will host the Selections Committee Meeting at Clarks Hotel in Hastings. A new member will be chosen for 1967, and will be honored at the Convention June 24, with the Cen-

tennial supplying a trophy for this program. All applications will be kept on file for the next year's program. The Clubs chosen to supply a Committeeman for the Selections Committee are: North Platte, Hastings, Crete, Lincoln, and Northeast Radio Club. Any applications for this program made in these Clubs may be given to their Committeeman. So, let's honor another O.T. that has given much of his time and effort so many others could enjoy this wonderful hobby. LET'S PUT AMATEUR RADIO ON THE MAP!

June 25, 1967 is the date for the Centennial Nationwide QSL Barbeque, with prime Nebraska Beef being prepared western style at the Lincoln County Fairgrounds, starting approximately at 11:00 a.m. The Nebraska Beef will be supplied by the Nebraska Stockgrowers Association for this event. Amateurs will be eligible for door prizes. We will also have displays and speakers. The famous BUFFALO BILL RODEO will be in progress for four days during this weekend. Those Amateurs desiring to attend the RODEO following the barbecue will have time to do so.

Four electronic firms have expressed a desire to participate with

March 17, 1967

displays, demonstrations, etc. at these events. Two transceivers have been purchased for Convention prizes, and more amateur gear will be added. These events are being advertised nation-wide--radio, magazines, brochures, etc. A Convention or picnic is as good as the Amateurs and Electronic Firms want to make them. So let's make this one of the best. A TROPHY FOR THE AMATEUR THAT TRAVELS THE FURTHEST DISTANCE WILL BE GIVEN! (There is plenty of parking accommodations available for trailers and campers.) Lend us your support for your Midwest Division Convention. Another Bulletin will follow, when programming is completed about May 15, 1967.

Best 73's

Charles Kucera, WQFZZ

Program Chairman

North Platte Amateur Radio Club

**OFFICIAL BULLETIN NR 103
FROM ARRL HEADQUARTERS
NEWINGTON CONN MARCH 9 1967
TO ALL RADIO AMATEURS BT**

The annual meeting of the ARRL Board of Directors will be held in Hartford on May 5, 1967. League members and affiliated clubs having suggestions about the course of ARRL affairs during the coming year should communicate with their appropriate division director at the address shown on page 8 of any 1967 QST. If time is short, you may write to your director in care of ARRL Headquarters, 225 Main Street, Newington, Connecticut 06111 AR

Ham Hum

Ak-Sar-Ben Radio Club, Inc.

Omaha, Nebr.

Hi:

The VHF Gang of Amateur Radio Operators met at Fred Evans home; Wayne Moore of Ogallala was host. Eight hams, their XYL's and one wudbe ham, were present.

Discussion of Field Day, and and two meter gear were topics; Wayne and Ron, of Ogallala showed some of their gear; Ogallala is getting several operators on 2 meters. A mobile test run was made, using different transmitters, power supplies, etc.

Joe, KØYRL, and Dayton, WØVEA, reported experience with trouble and cure of BCI from voltage doubler circuits. KØYRL with a Knight T-150 and WØVEA with a HW-30, (Heathkit lunch box) had found the rigs caused BCI on 1410 kc, a local broadcast station frequency. The cure, it is in the book, high voltage .01 mfd capacitor and 470k resistor in parallel with each diode in the voltage doubler power supply. Parts are not critical, larger or smaller capacitors work ok, but use plenty of resistance, 1/2 watt is ok. Just one of those freak things that plague the amateur, but gives us to suspect the need of bypassing diodes in voltage doubler circuits.

WØDNW, KØYRL, KØFRU, using RTTY on 2 and other bands, and having a ball with it.

Did you ever hear a Ham claim he had operated high power for years

and had *no* TVI complaints? True too, he worked the 4:00 p.m. to midnite shift, then got on the air when he came home from work.

73

Dayton L. Phifer, WQVEA

Boys Town, Neb.
March 30, 1967

Board of Trustees and Members
of the Ak-Sar-Ben Radio Club
of Omaha
P.O. Box 291, Omaha, Neb.

Gentlemen:

I would like to express my appreciation for the cooperation and the assistance of the members of the Ak-Sar-Ben Radio Club in connection with the recent Awards Dinner for the Boys Town Radio Society.

73,

Pat Nolan, WAØPCD

March 17, 1967

Ak-Sar-Ben Radio Club
Omaha, Nebraska

Dear Friends,

I enjoy Ham Hum and read just about every word of it. I flinch now and then because I formerly was an editor and publisher, but its an excellent mag on the whole.

I was particularly interested in your Air Mail Flight re-enactment activities and commend your Club on its imagination. I wish I could

have heard the traffic on that spectacular night. Unfortunately, I am without antenna at the moment, but that will be corrected as soon as the weather improves.

I belong to the Connecticut Wireless Society, not to be confused with the Connecticut Wireless Association, and we are strictly social, although we do talk technicalities occasionally at our meetings.

Here at the Museum (The Stamford Museum and Nature Center) I am trying hard to get a class in amateur radio started and set up a good ham station here. The defunct Stamford Radio Club had a station here when it was in existence, but all that is outmoded today and the station has been cannibalized and the parts given to young sub-novice Hamsters.

If any of your members travel to this part of the country, I hope they will stop in and make themselves known. There is no admission charge at the Museum, but we do charge out of state cars \$1 for parking. When your members are stopped by our attendant, tell them to say they are coming to see me and there will be no charge. Week-days are the best time to come--we are crowded on weekends.

Finally, please tell Leo Meyerson that my friend Bill Leonard (not a ham) is driving around Connecticut in an old Cadillac with the license plate WRL. It startles me every time I see it.

73,

Frank Phillips

K1JZU

ETCHED CIRCUITRY FOR THE HAM WORKSHOP

Ralph Erts, WOSMY

Etched circuits in "home-brew" ham gear are not new, but have not been widely used because the processes are generally complicated, messy, and critical. The method described here is simple, fast, and for the most part, can be done with equipment that can be found in the average shop and home. Probably the only purchases which will be necessary are the etchant (ferric chloride), and the laminate board. Ferric chloride is commonly available through local chemical suppliers in either liquid or crystal form.

Other materials and tools needed are: plastic electrical tape, scissors (a razor blade or hobby knife may be even better), a paper punch, a square glass baking dish large enough to hold the board to be etched, and a sheet of glass or waxed paper. Once the process is clear to you, you may want to use other tools or modify the method to your own needs.

To begin, the layout of the etched circuit is drawn. This is almost as interesting and challenging as the total project. To illustrate the procedure a simple audio oscillator circuit will be used. Figure 1 is the schematic diagram of the circuit to be used. The problem of layout is retaining efficient layout design within the board area and component size. You will note that in an etched circuit, connections do not cross each other as

simply as do the lines in a schematic diagram. Two choices are open in the case of a connection having to cross another connection. One is the long path as illustrated in the emitter to speaker connection in Figure 2, the other choice is that of making a jumper in the layout design as shown in Figure 3. The same considerations to be observed in chassis-style building are used in etched circuits, short leads, component placement, and similar problems must be watched. Take a look at Figure 2. This is the etched circuit layout of the schematic in Figure 1. It consists of lines and dots, the lines are connecting circuitry, and the dots are tie points to which the parts are soldered. This layout is designed to allow the connections terminating in tie points along the edge to connect to components mounted on the box. It could just as well have been designed to provide for mounting these parts on the board itself.

Now, how is it done? First a scale drawing of the circuit is made just as it is to be in the finished product. Then with a paper punch, punch out enough circles of plastic electrical tape to provide one for each of the tie points. A good way to store these dots is to stick them to a piece of glass or waxed paper. Then cut a piece of tape as long as the longest run in your drawing, this is then cut into strips about a

sixteenth of an inch wide and stored with the dots. Now put your scale drawing under a piece of glass or waxed paper and place the dots of tape over each of the tie points. Next connect the tie points with strips of tape according to the layout. Pre-layout like this allows precise cutting and fitting without the possibility of damage to the surface of the laminate board. Now cut your board to the size indicated by the drawing. This piece of board must now be degreased. A household detergent used with plenty of rinsing will do a good job. Dry the board completely, let it air dry for an hour just to be sure. Then transfer the cut pieces of tape from your mock-up to the copper surface of the laminate. You may want to lay out your design on the copper face by tracing it with carbon paper if a great deal of precision is necessary. Be careful to get all joints to butt close. If you suspect that the etchant will leak into the joint, seal it with rubber cement worked into the crack.

After the cement has dried, carefully clean the surface of the board around the joint with the point of a knife. Take care to see that the tape adheres to the surface of the board. When the layout is complete you are ready to etch. Pour enough ferric chloride into the dish to cover the board, a half an inch or less. Slip the board, tape and all up, into the acid. Now gently agitate the pan to bring fresh acid solution into contact with the surface of the board. When the surplus copper has been etched away, remove

the board and rinse thoroughly. Twenty to thirty minutes is about average etching time. Strength and temperature of the solution are variables in the etch time, warmth speeds the process, 150 degrees is optimum temperature. The solution can be reused from two to three times before it becomes saturated, but it is so cheap that it is best to flush it down the drain with plenty of water after use. Now dry the board and carefully remove the tape. Drill the tie points with a drill large enough to clear the leads of the part to be mounted and gently buff the surface with fine steel wool to prepare it for soldering. Now mount the parts, and if you wish, spray the board with coil dope or lacquer to waterproof it. The board is now ready for installation.

This type of circuit construction is very good for trouble-free, compact design requirements. The oscillator illustrated can be constructed in a two-inch cube! The method lends itself to simple circuits such as audio oscillators, VFO's, and pre amps very well. I am sure a twelve or sixteen stage receiver could be designed if your sanity will stand the strain of the design layout.

Let me say that very little of the procedure outlined above is original with me. It is a combination of ideas gained from a number of articles on the subject from which I have taken those parts that seem best adapted to the ham workshop. Give etched circuitry a try, it's fun, and it does a job that no other construction method can do as well within its limitations.

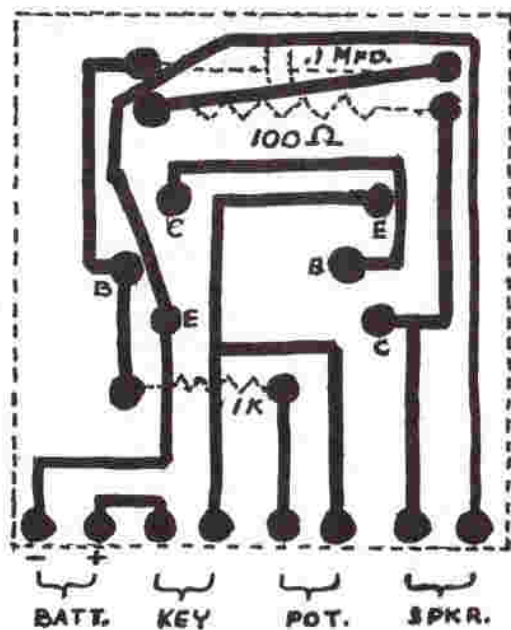
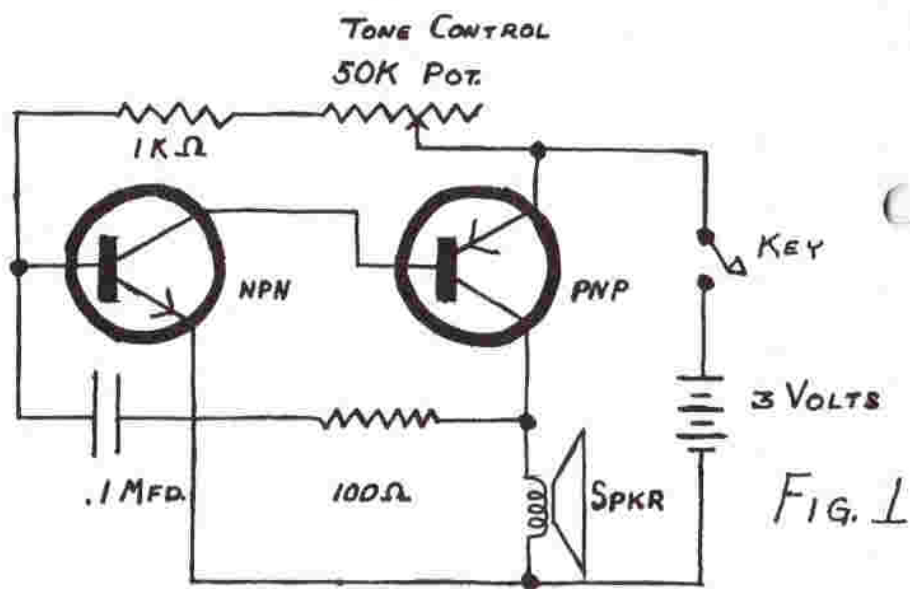


FIG. 2

NOT TO SCALE



FIG. 3

HAM JAMBOREE - WRL STYLE

You've probably noticed the announcement on the back cover, that WRL is having a big affair over in Council Bluffs on May 20th. They tell us that they are having this big affair because there has been a lack of BIG ham gatherings in this area of late.

It seems like a good opportunity for meeting many of our outstate friends that will attend. And it sure seems like there will be plenty of people in attendance, what with over \$3,000 worth of free prizes at last count. Major prizes include: A Swan 500, Galaxy V mk2, National NC200, and Gonset 910A transceivers, SBE SB2LA linear, Drake 2C receiver, and many more. There will be manufacturers' displays from nearly every company too, so here is your chance to find out what you want from them about their products. See you at the WRL "Ham-Jamboree" May 20th.

Al McMillan, W0JJK

A WORD TO THE WISE

There's recently been some action by the FCC relative to proper signing of calls during transmission, not only of mobiles or portable operation, but also base station operation. While operating mobile, one must include in the signing, identification of the station to whom you are talking, your geographical location with reference to state routes and major cities. Portable operation must include the name of the city or general location

in reference to a nearby city. All operations must include along with your call -- identification of the station with whom you are in communication. In the case of round robins or Net operation, this takes on the aspects of a big and tedious job. FCC recognizes this and you are permitted to identify your station as being in communication with a recognized or definite group -- such as Ohio Side Band Net, Ohio Traffic Net, Brown Sugar Net. This will identify to whom you are talking.

In the general round robin in which there is no recognized or nominal group, one must then recognize another station and the pattern has been indicated -- that once in 10 minutes each station accepts a call from a member of the group and identifies being in communication with a third station. Again, this must be accomplished at the beginning and end of a transmission or in transmissions over ten minutes long, each ten minutes during the transmission. In the case of phone patch operation or general interchange similar to phone calls, it is not necessary to identify with the assumption that each transmission is very short. In this instance, the ten minute rule will hold.

ONE WORD OF CAUTION, identity must be in plain language, English, using plain letters and International synonyms. Fancy words, local interpretation of letters not acceptable. Phonetics may be used for clarification.

de R.F. Carrier
Dayton A.R.A., Ohio

ELECTRONICS DATA

1. Conversion Factors and Constants

$$\pi = 3.14 \quad 2\pi = 6.28$$

$$\pi^2 = 9.87 \quad (2\pi)^2 = 39.5$$

$$\epsilon = 2.718 \quad \sqrt{2} = 1.414$$

$$\sqrt{3} = 1.732 \quad \log e = 0.497$$

$$1 \text{ meter} = 39.37 \text{ inches} = 3.28 \text{ feet}$$

$$1 \text{ kilometer} = 0.621 \text{ mile (about } 3/5 \text{ mile)}$$

$$1 \text{ inch} = 2.54 \text{ centimeters}$$

$$1 \text{ kilogram} = 2.2 \text{ pounds}$$

$$1 \text{ liter} = 1.06 \text{ quarts}$$

$$1 \text{ ounce} = 28.35 \text{ grams}$$

$$1 \text{ horsepower} = 746 \text{ watts}$$

2. Ohm's Law Formulas for D-C Circuits

$$I = \frac{E}{R} = \sqrt{\frac{P}{R}} = \frac{P}{E} \quad R = \frac{E}{I} = \frac{P}{I^2} = \frac{E^2}{P}$$

$$E = IR = \frac{P}{I} = \sqrt{PR} \quad P = I^2R = EI = \frac{E^2}{R}$$

3. Ohm's Law Formulas for A-C Circuits

In these formulas θ is the angle of lead or lag between current and voltage and $\cos \theta = P/EI =$ power factor.

$$I = \frac{E}{Z} = \sqrt{\frac{P}{Z \cos \theta}} = \frac{P}{E \cos \theta}$$

$$E = IZ = \frac{P}{I \cos \theta} = \sqrt{\frac{PZ}{\cos \theta}}$$

$$Z = \frac{E}{I} = \frac{P}{I^2 \cos \theta} = \frac{E^2 \cos \theta}{P}$$

$$P = I^2Z \cos \theta = IE \cos \theta = \frac{E^2 \cos \theta}{Z}$$

4. Resistors in Series

$$R_{\text{total}} = R_1 + R_2 + R_3 + \dots$$

5. Two Resistors in Parallel

$$R_t = \frac{R_1 R_2}{R_1 + R_2} \quad R_1 = \frac{R_t R_2}{R_2 - R_t}$$

6. Equal Resistors in Parallel

$$R_{\text{total}} = \frac{R}{n} \text{ where } n \text{ is the number of resistors}$$

7. Resistors in Parallel, General Formula

$$R_{\text{total}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots}$$

8. Sinusoidal Voltages and Currents

$$\text{Effective value} = 0.707 \times \text{peak value}$$

$$\text{Average value} = 0.637 \times \text{peak value}$$

$$\text{Peak value} = 1.414 \times \text{effective value}$$

$$\text{Effective value} = 1.11 \times \text{average value}$$

$$\text{Peak value} = 1.57 \times \text{average value}$$

$$\text{Average value} = 0.9 \times \text{effective value}$$

9. Conductance, Susceptance, and Admittance

$$G = \frac{1}{R} \text{ (for D-C circuit)}$$

$$G = \frac{R}{R^2 + X^2} \text{ (for A-C circuit)}$$

$$B = \frac{1}{X} \text{ (when resistance is 0)}$$

$$B = \frac{X}{R^2 + X^2}$$

$$Y = \frac{1}{Z} = \frac{1}{\sqrt{R^2 + X^2}}$$

10. Reactance Formulas

$$X_C = \frac{1}{2\pi fC} \quad C = \frac{1}{2\pi fX_C}$$

$$X_L = 2\pi fL \quad L = \frac{X_L}{2\pi f}$$

11. Resonant Frequency Formulas

$$f = \frac{1}{2\pi\sqrt{LC}} \text{, or } f = \frac{159.2^*}{\sqrt{LC}}$$

$$L = \frac{1}{4\pi^2 f^2 C} \text{, or } L = \frac{25,330^*}{f^2 C}$$

$$C = \frac{1}{4\pi^2 f^2 L} \text{, or } C = \frac{35,330^*}{f^2 L}$$

*where in the second formula f is in kc and L and C are in microunits.

12. Impedance Formulas

$$Z = \sqrt{R^2 + (X_L - X_C)^2} \text{ (for series circuit)}$$

$$Z = \frac{RX}{\sqrt{R^2 + X^2}} \text{ (for } R \text{ and } X \text{ in Parallel)}$$

13. Power Factor

$\text{pf} = \cos \theta$, where θ is the angle of lead or lag

$$\text{pf} = \frac{\text{true power}}{\text{apparent power}} = \frac{P}{EI}$$

$$\text{pf} = \frac{R}{Z}$$

14. Q or Figure of Merit

$$Q = \frac{X_L}{R} \text{ or } \frac{X_C}{R}$$

15. Transformer Relationships

$$\frac{N_P}{N_S} = \frac{E_P}{E_S} = \frac{I_S}{I_P} = \sqrt{\frac{Z_P}{Z_S}}$$

16. Efficiency (for any device)

$$\text{Eff} = \frac{\text{output}}{\text{input}}$$

17. Decibel Formulas

When impedances are equal,

$$\text{db} = 10 \log \frac{P_1}{P_2} = 20 \log \frac{E_1}{E_2} = 20 \log \frac{I_1}{I_2}$$

When impedances are unequal,

$$\text{db} = 10 \log \frac{P_1}{P_2} = 20 \log \frac{E_1 \sqrt{Z_2}}{E_2 \sqrt{Z_1}} = 20 \log \frac{I_1 \sqrt{Z_1}}{I_2 \sqrt{Z_2}}$$

DECIBEL TABLE

DB	Power Ratio	Voltage or Current Ratio	DB	Power Ratio	Voltage or Current Ratio
0	1.00	1.00	10	10.0	3.2
0.5	1.12	1.06	15	31.6	5.6
1.0	1.26	1.12	20	100	10
	1.41	1.19	25	316	18
	1.58	1.26	30	1,000	32
3.0	2.00	1.41	40	10,000	100
4.0	2.51	1.58	50	10 ⁵	316
5.0	3.16	1.78	60	10 ⁶	1,000
6.0	3.98	2.00	70	10 ⁷	3,162
7.0	5.01	2.24	80	10 ⁸	10,000
8.0	6.31	2.51	90	10 ⁹	31,620
9.0	7.94	2.82	100	10 ¹⁰	10 ³

18. Frequency and Wavelength

$$f_{kc} = \frac{3 \times 10^8}{\lambda_{meter}} \quad \lambda_{meter} = \frac{3 \times 10^8}{f_{kc}}$$

$$f_{Mc} = \frac{3 \times 10^4}{\lambda_{centimeter}} \quad \lambda_{cm} = \frac{3 \times 10^4}{f_{Mc}}$$

$$f_{Mc} = \frac{984}{\lambda_{feet}} \quad \lambda_{feet} = \frac{984}{f_{Mc}}$$

19. Length of Antennas

Formulas assume velocity of propagation equal to 95% of the velocity of light.

$$L_{feet} = \frac{234}{f_{Mc}} \quad (\text{for quarter-wave antenna})$$

$$L_{feet} = \frac{468}{f_{Mc}} \quad (\text{for half-wave antenna})$$

20. Color Code

0 Black	4 Yellow	8 Gray
1 Brown	5 Green	9 White
2 Red	6 Blue	5% Gold
3 Orange	7 Violet	10% Silver
	20% No Color	

Third color band indicates number of zeros to be added after figures given by first two color bands. But if third color band is gold, multiply by 0.1 and if silver multiply by 0.01. Do not confuse with fourth color band that indicates tolerance. Thus, a resistor marked blue-red-gold-gold has a resistance of 6.2 ohms and a 5% tolerance.

21. Color Code for Power Transformers

Primary Leads - Black or black-red
Primary Tap - Black-yellow
High Voltage Winding - Red (C. T. - Red-yellow)
Rectifier Filament - Yellow (C. T. - Yellow-blue)
Amplifier Fil. No. 1 - Green (C. T. - Green-yellow)
Amplifier Fil. No. 2 - Brown (C. T. - Brown-yellow)
Amplifier Fil. No. 3 - Slate (C. T. - Slate-yellow)
de Signal Report

THUMBNAIL TECHNICAL REVIEW
- W5EHC -

October VHFER has a follow-up on silicon diodes as noise generators, a 432 MHz transistorized converter, and much on antennas. BREAK-IN for September discusses what constitutes a true radio amateur; for October it describes a very elaborate device for sweeping the 144 MHz band and locking on any signal encountered and an unusual two-transistor oscillator that can be crystal or VFO.

December RADIO-ELECTRONICS has useful information on tracking down strays and other interference; another idea on using dual transistors as direct replacements for tubes; and a description of the new Westinghouse WX-4733A tube, which is designed to eliminate cross-modulation in the first RF amplifier stage.

November ELECTRONIC PROCUREMENT has a listing of microwave tubes available; this should interest the chaps who talk a good game of UHF. December 73 has what would have been an excellent article on field-effect transistors had they not goofed up on the diagrams; beware of them! There are several other readable articles, too, mostly on VHF.

CQ for December has good information on a 100-kHz frequency standard, circuit boards, linear amplifiers, and a half-wave vertical antenna. Nov-Dec FREQUENCY goes deep into solid-state microwave sources and polarization diversity.

November SHORT WAVE MAGAZINE has info for those who want to revive a failing HRO receiver. RSGB BULLETIN for November gives partial information on constructing a simple converter for 432 MHz.

POPULAR ELECTRONICS for January describes an RC substitution box. January ELECTRONICS WORLD has an article on VSWR similar to "The Mythology of Transmission Lines" that appeared in the COLLECTOR & EMITTER some months ago; it also describes the construction of a heterodyne receiver..... which proves that at least one of their contributors reads QST! December ELECTRONIC INDUSTRIES has a very good article on measuring SNR of receivers. November VHFER shows a noise limiter for IF application. ELECTRONIC PRODUCTS for December has a very complete report on solder, soldering technique, and soldering tools. January RADIO-ELECTRONICS shows an audio Q-multiplier for CW and a device for measuring inductance, etc., when teamed with a signal generator.

An advertisement in the December IEEE SPECTRUM describes a superconducting preselector for use in HF or VHF region; the unloaded Q runs as high as 600,000! This gives utterly fantastic selectivity at the input of a receiver, down to 60 Hz, with 500 Hz an easily-reached figure and having only one db insertion loss. SYSTEMS DESIGN for December gives details on a voltage regulator (for low voltages) that uses silicon diodes.

de Signal Report

March 19, 1967

President ASBRC, Inc:

Dear Mr. Heinz:

I would like to offer my congratulations to members of your Club and all others who participated in the CENTENNIAL RE-ENGAGEMENT of the FIRST NIGHT AIR MAIL FLIGHT as reported in the March issue of HAM HUM. It was truly an outstanding job on the part of all amateurs and excellent publicity was obtained -- which is so important to us all nowadays.

Best of luck and continued success in the amateur field of public service.

73,

Andy Clark, W4IYT (Ex-W9KCS)
Editor, FLORIDA SKIP
SEC E. FLA. ARRL

P.S. Congts on best issue of HAM HUM I've ever seen.

If anyone is interested in getting on 2 meters with used FM gear, call me at 556-7545. I think I have a lead on some equipment.

James C. Droege, WØYCP
6328 Hamilton Street
Omaha, Nebraska 68132

WANTED

1 Model W-36 Beam.
This is a 3 element 6 meter Beam.
Boom length 4½ feet.
Will pay new price for one in good condition.

Royce E. Johnson, WAØKIL
558-4941

REFLECTED AND DIRECTED

George H. Goldstone, W8MGQ
1010 Burnham Road
Bloomfield Hills, Mich. 48013

THE HELPING (?) HAND

Not too many years ago - about 10 - we met a very pleasant young dentist, who had just acquired his Novice license. Enthusiastic he was, and his ambition was to LEARN something about amateur radio; to learn what makes ham equipment tick. No, HE wasn't going to buy a ready-made transmitter; he was going to build one. And at that point we bit; we offered to help by giving him a chassis and parts for a 35 watt Novice rig. He was delighted; and it took only a few hours in the basement workshop of yours truly to cut out the tube socket holes and a big square for the power transformer. We gave him a simple circuit diagram, and knowing that he had wired a couple of Hi-Fi amplifier kits, assumed he was on his way. Incidentally, he was especially pleased, so he said, that he wouldn't have to explain to his wife what the hobby was costing him, since so far, the transmitter was obviously free.

It took about two weeks for me to get a telephone call from the toothjerk, sadly stating that he had wired it exactly according to the diagram and my instructions, -- and it didn't work. So (and you know it) he was invited to bring the rat's nest over to my workbench, which is always overloaded with

half-finished projects, and why worry about one more, you know! It took no more than five minutes to see his error, and get the rig generating RF. But it seemed a good idea to clean up his wiring, so another hour was devoted to making the rig ship-shape with re-wiring. Then, to prove the Little Nemo that it DID work, we put it on the air at W8MGQ, using my call (and my fist), working three stations without any particular sweat. Thereupon, he went home (to a rather plush shack, it might be mentioned). And what do you think happened next?

Came Saturday, and W8MGQ visited a couple of surplus stores, as was his habit when a bachelor. One such store did a fair business in horsetrading used ham equipment; and in its display was what-do-you-think? Yes, you're right! It was the Novice's rig that I had designed, for which I provided all the parts, and which I had made to work! The poor dentist had traded it in on a "Globe Scout," one of the more well-known TVI generators on the Novice bands. This experience pushed my button marked "Sad Mistake," and kept the bell ringing for years. Henceforth, I recited to myself, I will not do another ham's work for him; I'll just give him ADVICE.

But I weakened three years ago, when a high school lad in our radio club saw a linear I built from surplus for about \$30 (4-811A's, a la Gonset), and asked me if I would help him build a linear. So I did...and the story almost repeated

itself. I hacked out the metal, etc., leaving the wiring to him. He brought it back looking like a nest built by a drunken seagull. With the 838's soft as custard pie, too. (That really takes talent, with a zero bias tube). He had conned someone out of a pair of 813's - and as long as I was going to shoot the trouble in it, could I change the tubes too? So I did, and in the re-wiring process used his output coax terminal for input; and vice versa (he was that bad about his underchassis layout). One of his 813 sockets had a loose contact due to a loose rivet, but we replaced that too. It ended up looking respectable - and although he didn't turn around and sell it, he did enter it in his school's science fair as a "project" and won an honorable mention prize.

At this point the worn-out record was still playing "Never again, never again, never again." At least, until my wife mentioned some young lad, all of 11 years old, who was a neighbor of one of her good friends, etc., etc. Would I help him get started? The rest of the story follows another branch of the same line. I loaned him a little 2 tube regen receiver for code practice; but he soon borrowed an SX-110 from someone else. I gave him the Novice code test, which he flunked miserably; but in a month, one of the newer generation gave it to him and he passed. Now, would I help him build a transmitter?

He had already gotten a few spare parts from an old TV. Once more I dug into the junk heap,

and came up with a power transformer, a new aluminum chassis, a couple of TV sweep tubes, etc. More hole cutting, and I pushed him on his way. He was on his way, all right; the same old track as before. He found an Eico Novice rig, wired, for only \$25; he bought it; and didn't I think it was a good buy? I told him it was a good buy, provided it worked. A phone call a few days later informed me it didn't; the transformer simply hummed rather loud when the B plus was turned on, and he had blown some fuses. I suggested a routine series of voltage checks, and he eventually found the short at the plate meter of the PA stage. (I'm sure he doesn't know what PA means, but possibly some of our readers will.) About the same time, his picture appeared in the local blurb, identifying him as President of his school's science club. If mooching is a science, this kid richly deserves the honor. But don't think his early success has gone to his head. Last weekend he called to advise that he was building up a Heathkit SB-100 kit, and had broken one of the switch wafers. Could I save him the \$1.96 cost of a new switch by finding one in my surplus junk? No, I couldn't; I suggested he save time by buying one from Heath. By now, he has probably written the gnomes at Heath that the switch section was badly cracked when packed.

Now all of the above related experiences would simply simmer in my cranium except for the fact that Auto-Call carried an advertise-

ment by one of the Water-Bucket boys (WB's) suggesting that someone "who personifies Part Four of the Amateur Code" should put his Heath transmitter and receiver on the air, and even hook up the phone patch!

has, so the ad says, a "newly acquired General license." Is this not the very license which the FCC repeatedly says is the equivalent of the old Class A? And as an example of more saliva being projected in your face, you are told that "only a go-getter willing to get things done and work for the gratitude as a mark of the Amateur Spirit need apply." Now, there are many of us willing to "get things done" -- and first things first, we say. Like taking a redhot Wouff-Hong and flashing his getter a few times until he starts reading QST and the ARRL Handbook.

Li's Water Bucket should read the Amateur's Code again. Part Four reads: "The Amateur is Friendly..... slow and patient sending when requested, friendly advice and counsel to the beginner, kindly assistance and cooperation for the broadcast listener; these are the marks of the amateur spirit." There is nothing to suggest that "friendly advice and counsel" means setting up an amateur station for someone who is supposedly qualified by passing a General Class license exam to do it himself. Paul Segal, Ex-3EEA, who wrote the "Amateur's Code" could have found a more opposite meaning.

Perhaps the ad is an appeal to a sense of charity, which we all have in some degree or other. Every

man's thoughts on charity are his own; but we have long admired the classification of the eight degrees of Charity by Maimonides, a 12th century Hebrew scholar who said that the highest degree of Charity was to help a man through a gift, or loan, so that the man might thereafter be able to sustain himself. Applying this standard to amateur radio, it would seem that the greatest help we can give an unskilled beginner is to steer him on the road to understanding his equipment, all the way from his key knob to the antenna insulator. We've never heard of very many people who learned to become competent drivers by always riding in the back seat of a chauffer-driven car, have you?

de Auto-Call

**OFFICIAL BULLETIN NR 105
FROM ARRL HEADQUARTERS
NEWINGTON CONN MARCH 23 1967
TO ALL RADIO AMATEURS BT**

Many rare countries were active in the Thirty Third ARRL International DX Competition held over four weekends in February and March. Those who took part are reminded that convenient reporting forms are still available from the ARRL Communications Department, 225 Main Street, Newington, Connecticut. Please be sure to indicate the number of contacts made and number of bands worked. Entries must be postmarked by April 22, 1967, to be eligible for certificate awards and QST listings AR

Early in January, League Headquarters issued a call for applicants to fill three vacancies which have occurred in the Headquarters staff. These vacancies result from Ed Handy's retirement with George Hart's stepping up to take his place, together with Ellen White's (W1YYM) promotion to Deputy Communications Manager, and Pete Chamalian, WIBDG's resignation to return to college for completion of work towards a degree. The flyer announcing the vacancies states that salaries will be commensurate with the qualifications of the applicant. If interested, contact League Headquarters as soon as possible.

With the move of WWV to Colorado from Beltsville, Md., stations in the eastern part of the U.S. may have difficulty in receiving time signals on certain frequencies when propagation precludes reception from WWV. There is a good substitute which should serve amateur purposes almost as well as the WWV signals. This is station CHU, operated by the Canadian Dominion Observatory, Department of Mines and Technical Surveys, Ottawa, Canada. CHU time signals are continuous on 3330, 7335, 14,670 kHz. The carrier and pips are under the control of an oscillator monitored against a caesium standard.

The League's operations, especially publication of QST magazine and the supply of materials, is one of the targets of "Associated Business Publications" who has asked the Internal Revenue Service to close a tax "loophole" which al-

lows certain non-profit groups to escape a tax bite on their publishing incomes. Some 700 periodicals, noteworthy among which are Nations Business, Journal of the American Medical Association, and the National Geographic enjoy this tax-free status. The Treasury Department is currently holding the IRS request for a study in abeyance.

With negative progress reported on FCC Docket 15928, it is suggested that a re-reading of two very pertinent articles in QST should appear on the agenda of every serious U. S. Amateur. They are: A. Prose Walker, W0DCA, W4CXA, item "Two Plus Two Equals Four" on page 48 of the October 1963 issue, and "Amateur Radio and the public Service" by Ivan H. Loucks, W3GD, on page 82 of the December 1963 issue.

73,
Van, W3ECP
Assistant Director
de Auto-Call

Then there was the fellow who murdered both his parents, and then, when sentence was about to be passed, pleaded for mercy on the grounds that he was an orphan!

FOR SALE

- 1 HE45B Lafayette 6 meter Transceiver.
 - 1 3 ring 6 meter Halo with matching Transformer.
- Both for \$70.00.

Royce E. Johnson, WA0KIL
558-4941

REFLECTED AND DIRECTED

When the Old Man (and by Old Man we are referring to Hiram Percy Maxim, W1AW, the founder of ARRL) used to write about "Rotten Operating" in the pages of QST, membership read what he had to say because they knew that "T.O.M." - whose identity was not revealed until after his death -- was the voice of authority. Maxim is dead these many years; but if there was a rumbling noise in Connecticut during The Florida Hurricane emergency, undoubtedly it was T.O.M. rolling over in his grave while the lids carried on "as usual" during the emergency.

The Florida gang seemed extremely well organized for the hurricane, perhaps because the price for their usual fair weather is an annual hurricane season. (It may be that they have a superior crew of organizers, including W4IYT, et. al.). The Florida SSB Net was cooking nightly in an orderly fashion on 3940 kc.; and they had the excellent sense to divert all agony traffic - the inquiries concerning welfare of individuals -- to a separate net on a well-removed frequency.

Now, with propagation conditions what they are in this part of the sunspot cycle, Florida signals can be heard just about anyplace east of the Mississippi; AND THE CONVERSE IS TRUE. Signals from about anyplace east of the Mississippi can cause QRM in Florida. Since the Florida Hurricane emergency was as well headlined as the Presidential election, would anyone but a

LID go on the air without listening carefully for use of his intended frequency by an emergency net? Would anyone but a real LID go on the air on 75 phone with a receiver so insensitive he could hear local stations only? Would anyone but a LID operate SSB only 3 kc away from an emergency net, assuming every other station in the emergency area had a receiver available with 3 kc selectivity or better?

If there is a better (or should we say WORSE) way to put amateur radio's foot in our mouth before the government than to act like LIDS in an actual emergency, we don't know what it is. This new breed of amateur - sometimes called the "pure hobbyist" - who says that amateur radio is only a hobby, is a breed that could very well be extinguished, or allowed to operate only in the UHF (yes, UHF, not VHF)! Without reference to disagreement over RM-499, it is high time the FCC put some questions into every amateur license examination that would test the applicant's knowledge of what must be done, and what must NOT be done, in a communications emergency. Lids are a form of lice that we should lose rather than live with.

George Goldstone, W8MGQ
de Auto-Call

OFFICIAL BULLETIN NR 102
FROM ARRL HEADQUARTERS
NEWINGTON CONN MARCH 2 1967
TO ALL RADIO AMATEURS BT

Among the many operating aids available without charge from ARRL

23 March 1967

are the following, all designed to aid your operating effectiveness: Pointers for Good Operating, WAS map and card record, net directory, phonetic alphabet, ending signals, RST system, DX code, contest QSO record, safety code, ARRL DXCC Countries List, QN Signals for c.w. net operation and GMT time conversion card. Any or all of these are available from the ARRL Communications Department, 225 Main Street, Newington, Connecticut, 06111. Be sure to include your zip code with your mailing address \overline{AR}

**OFFICIAL BULLETIN NR 104
FROM ARRL HEADQUARTERS
NEWINGTON CONN MARCH 16
TO ALL RADIO AMATEURS \overline{BT}**

Four times a year, during the ARRL quarterly CD Parties, many amateurs become interested in the activity called a CD Party. This operating event is limited to competent radio amateurs in the ARRL Communications Department Field Organization. These appointees serve amateur radio and the public in the many fields of VHF, emergency planning, bulletin transmissions, traffic handling on all modes, etc. Only ARRL appointees may participate in the quarterly CD Parties, but all qualified amateurs are urged to contact their Section Communications Manager, page 6 QST, to see how best they too can serve along the lines of their natural operating interest \overline{AR}

Hi Gang:

Been enjoying southern California for almost 2 years now. Enjoy reading HAM HUM every month and extract some of the articles for the "RF", the Orange County Radio Club paper which I publish. I am now V.P. and entertainment chairman of this club. Get to QSO some of the Omaha gang from time to time, particularly with WQYZK and some of the gang on Sundays in the A.M. (too early for me out here). Pearl drew the call of W6COM (California Old Maid) and I am now W6COJ (California Orange Juice). May make a trip back to Omaha this summer, will try to be there for a meeting nite to eyeball everyone. Any of the gang coming this way this summer can find us at: 225 So. Prospect St., Orange, California, 92667, Fone (714) 532-5340. We are not too far from Disneyland in the Santa Ana area.

Keep the HAM HUM coming, the gang here thinks it is a great publication.

73's

Dave Hollander
W6COJ ex-W6CJW

Look, young fellow, do you want to do something real nice. Real sweet like, and gratifying? Send your mother a bouquet of flowers on your birthday.

From NVARC QRM (Neosho Valley
A.R.C. - Emporia, Kansas) Musty
Musgrave, WOZGB, Editor

Some of the fellows copying commercial stations for code practice have
come up with some odd characters not

commonly used by hams, and it's just as well. We've had requests for meanings of several. They are:

di-dah-di-di-dah	fractions follow or separator sign
di-di-di-dah-di-di-dah	dollar sign - \$
dah-di-di-di-di-dah	hyphen
dah-di-dah-di-dah-di	semicolon
dah-dah-dah-di-di-di	colon
di-dah-dah-dah-dah-di	apostrophe

ARNS Bulletin

**OFFICIAL BULLETIN NR 106
FROM ARRL HEADQUARTERS
NEWINGTON CONN MARCH 30 1967
TO ALL RADIO AMATEURS BT**

With the coming of the travel season, amateurs will be taking advantage of reciprocal operating agreements. Amateurs traveling across Canadian/U.S. border should apply 30 to 40 days in advance. W/K licensees apply to the Department of Transport in Ottawa or its six regional offices. Canadians apply to the FCC, Washington, D.C.

554. Travelers visiting elsewhere should allow at least two months for processing of requests. Write to ARRL headquarters for details on a particular country AR

THE AMPEREX 6KG6

Amperex has a new TV horizontal deflection tube that looks interesting for Amateur applications. It's rated at 34 W plate dissipation. The plate current can go up to 310 mA, and the maximum plate voltage is 24 kV; better keep it just a wee bit under that if you don't want to go beyond 34 W plate dissipation, though!

Via Collector & Emitter

I've been hunting that silver lining for half a century. Why is it always easier to find in someone else's cloud?

COME TO
WRL'S
"HAM Jamboree"
MAY 20, 1967
8:30-5 P.M.

Your Ham License admits you
and your family.

• **OVER \$3,000.00
IN PRIZES TO BE
GIVEN AWAY!**

Here are just a few of them!

\$359.95	.....	NC-200
\$495.00	.....	SWAN-500
\$354.62	.....	Gonset 910-A and 911-A
\$420.00	.....	Galaxy V Mk 2
\$269.95	.....	Hallierafter SX-146
\$249.50	.....	SB2LA
\$229.00	.....	Drake 2C Revr

• **SPECIAL ONE-DAY PRICES
ON HAM EQUIPMENT!**

Example: Hy-Gain Tri-Band beam
and 50' tower.....Both \$99.95!

• **Meet and Talk to all the
Leading Manufacturers'
Representatives!**

• **Meet and Talk with all the
Midwest HAMS!**

No Registration Fee Required.
Prizes and Specials good only in
World Radio Lab store May 20, 1967.

WORLD RADIO LAB

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