



# HAM HUM

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Vol. XIII  
No. 9

September 1963

## SIX METER AIR FORCE MARS

This article is written as an open invitation for any and all Amateur Radio Operators, who have 6 meter capabilities, to join the Omaha Area MARS groups.

You may have a few questions about the MARS program which we hope to clarify.

- (1) What is MARS?
- (2) What can MARS do for me?
- (3) Who can join MARS?
- (4) What can I do for MARS?

(1) The primary purpose of MARS (Military Affiliate Radio System) is to supplement normal Air Force communications channels and to provide emergency back-up communications for all Air Force communications circuits.

(2) The MARS organization will train you to properly receive, transmit and handle official messages. You receive point credits for the time you spend on the MARS program. These points are redeemed for various types of surplus electronic equipment as it is released. You may have the option to do anything to this equipment, except sell it.

(3) Anyone who is 16 years of age or older and who has a current Amateur Radio License, of any class, may join.

(4) You can be of great assistance in helping the local MARS groups carry out their programs for the Air Force.

You can join by calling Bud Benak at 731-2665 or Ed Gutmann at 346-3665.

\*\*\*\*\*

Aug. 22, 1963

The IREE Class for the Professional Engineer exam is being held each Wed. night at 7:30 P.M. for any parties interested. The material covered would be at a level that continues where the 1st class phone license leaves off. These classes will meet at O.P.P.D. Transmission Offices, room 202, 43rd. and Leavenworth St.

This notice courtesy of Mr. Harold Becker of IREE.

John, W0WRT  
Assoc. Editor

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**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.



### QTC?

The use of priority designators on traffic handled during emergencies is becoming commonplace throughout the U.S.

The use of priority designators in routine traffic handling is a subject on which there are many opinions ranging all the way from outright hostility to vigorous enthusiasm.

Many operators feel that a message is a message and it should be put through to its destination as fast as possible, regardless of the message content.

Another school of thought is that most amateur message traffic is in the nature of "drill messages" with no intrinsic value at all, but which provide valuable practice in the art of message handling.

There are messages however, which are *not* strictly drill messages and which are handled on amateur circuits.

Normal amateur procedure is to get a message to the amateur station nearest the destination for delivery, even if this means keeping it on the hook for a week, waiting for the proper station to check into the net. This is OK for drill traffic but it becomes a little bit absurd when the message has intrinsic value which

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### By W4MLE

makes prompt delivery a strong consideration.

Take the recent flood of post-typhoon traffic from Guam, for instance. Most of it was in the ARL ONE, ARL FOUR, ARL SIX, ARL EIGHT category following an extremely devastating storm which wracked Guam from end to end.

To me, it didn't make sense to pick up this traffic from 4RN and RN5 less than 12 hours after it was filed in many cases, and then to kick it around the Florida nets for days trying to get it to the destination city entirely by amateur radio, to save collect charges amounting, perhaps, to fifty cents or so.

I know of cases where families had tried frantically for days to get through to Guam by overseas telephone and cable to get word of loved ones. The amateur radiogram was their first information that everybody was safe. It was received in many cases with literally tearful relief and gratitude.

It seems downright cruel in such circumstances to hold a message another 12 or 24 hours relay from Tallahassee to Ocala or Marianna.

Yet, nothing in the message preamble indicated that this traffic



20 August 1963

Dear Gang:

It seems like the changes come fast, but I was slow in my last notification. Please note the new QTH. We live close to Stanford University and I am now working the development lab at Precision Instrument located in Stanford Industrial Park. The work is exciting and interesting. Our product is Instrumentation Tape recorders/reproducers, solid state throughout.

Still operating six, just purchased a general coverage receiver to build up the code speed for a general. Hope to make it sometime this fall between college classes. Have to freshen up the old math. Sure enjoy Ham Hum, and old Louis on the cover of July-August issue. I can and do show the mag around with a wee bit of pride.

Best of 73's

Millard J. Edgerton, WA6VZZ

Ex WØNRT

QTH - 245 College Ave.

Apt. B

Palo Alto, Calif. 94306

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FRENCH ACTOR, Francis Blanche explains the difference between an optimist and a pessimist this way: "Two frogs fell into a bowl of cream. One was a pessimist and soon drowned. The other being an optimist, kept swimming around around, for no reason he could logically explain. But in the morning he found himself high and dry on a pat of butter."

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### FREMONT HAM WINS TRIP

This is a picture I made showing Mr. and Mrs. Tom Bracket of Fremont, KØJFN, bottom step, on their way for a week-end at Las Vegas that they had won in a King Korn Stamp drawing. Also shown next in line, Mr. and Mrs. Dale Vetter, Aurora, Mr. & Mrs. John Shada of Grand Island, Mr. and Mrs. Philip Breen of North Platte, stewardesses and Mr. Ted Jamson of Grand Island, representative of King Korn.

Thought you might want to put it in Ham Hum.

Bob Miller, KØZLY

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## OCTOBER AUCTION

In October we will hold our annual auction so start cleaning the ham shack and get your gear ready to bring.

\*\*\*\*\*

## NEW ADDRESSES

John W. Hartung, WA6ZFD  
606 South Laurel  
Ontario, California

Major David A. Hollander, WØCJW  
3402 Mono Drive  
Riverside, California

\*\*\*\*\*

OFFICIAL BULLETIN NR 911  
FROM ARRL HEADQUARTERS  
NEWINGTON CONN AUG 22 1963  
TO ALL RADIO AMATEURS BT

All VHF minded amateurs are cordially invited to participate in the ARRL September VHF QSO Party, September 14 and 15. Novice and multiple operator entries may be eligible for awards, in addition to section leaders. Contest rules will appear on page 35 of September T. Convenient log reporting forms are available on request from the ARRL Communications Department, 225 Main Street, Newington 11, Connecticut AR

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You all received notice of the picnic. Hope you all came and had a good time.

\*\*\*\*\*

August 22, 1963

VHF News: Apparently there was a tropo opening for v.h.f. signals on the morning of Tuesday, August 20th, 1963. We had turned on our FM receiver on this morning and found stations coming in all over the 88 - 100 mc. dial including the FM stations at Beatrice, Nebr. as well as Morningside, Ia. and others not identified. This is quite unusual since our receiving antenna is on the 1st. (basement) level of the Eppley Research Bldg. and ordinarily don't even get very strong sigs. from local FM stations. About that time, I was wishing I could be home at the 2 meter rig giving out with some CQ's and listening!

John, WØWRT

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## 6 METER CERTIFICATES

Many clubs and groups are promoting 6 meter certificates, such as our VHF Slave Certificate. A new one just announced is from the Central California VHF DX'ers. The certificate will be sent to stations more than 50 miles from Fresno who contact 8 or more of their members.

This item is sent to us by Mary Mattaliano, WA6ITF, Secretary, Central California VHF DX'ers.

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Following is an article by Bob Schoening, WØTKX, which should help dispel the mysteries about co-axial baluns.

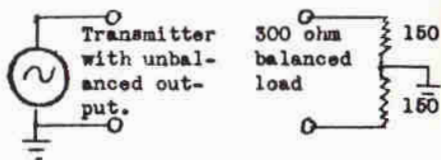
### THE CO-AXIAL BALUN - Bob Schoening (WØTKX)

All of the antenna books show how to build coaxial Balanced to Unbalanced transformers. They are broad enough in frequency response to work over an entire band, but they may be used at one band only. (Balun coils work over several bands, with slightly greater loss on each.

The balun will work either way. It will change a balanced resistive load to an unbalanced resistive load having  $1/4$  the impedance, or it will change an unbalanced resistive load of 4 times as many ohms. The most common application is to connect coaxial 75 ohm lines to 300 ohm antennas, or to connect balanced 300 ohm lines to transmitters, most of which today want to "see" an unbalanced load of around 75 ohms.

A balanced load is one with neither end grounded. A 300 ohm transmission line, when properly matched, should present the source with an impedance exactly equivalent to two 150 ohm resistors in series, with their center tap at RF ground. Obviously if one terminal of your transmitter's output is grounded, it will appear to short out half the load. Even if a Q-section or other transformer is used to change the impedance to other than 300 ohms, the load is still balanced and the source is not. (See Fig. 1).

Fig. 1.



This transmitter will not be happy feeding the balanced 300 ohm load!!

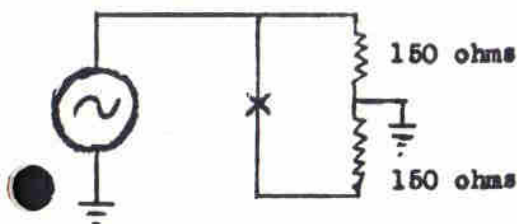
Fig. 2 shows how nice it would be to connect both wires of the 300 ohm line together and see the two 150 ohm resistors in parallel (as a 75 ohm resistor with one side ground). However, this obviously won't work, since the shorted line can have no voltage across it to force the current through the resistors.

If, at point X in Fig. 2, a device is connected which will delay the energy reaching one side of the line by one-half a cycle, both wires will always be at opposite polarities, and the desired current will flow, so that the transmitter can happily work into a 75 ohm unbalanced load.

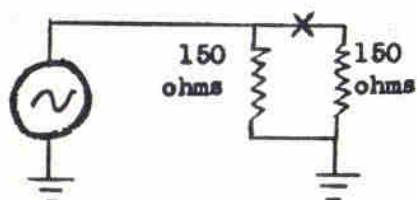
A piece of wire  $1/2$  wavelength long at X in Fig. 2 would have the desired delay, but would radiate, so we shield it (by making it of coaxial cable.) Since this length of coax is a one to one transformer, it

(Copy continued on P. 8)

Fig. 2.



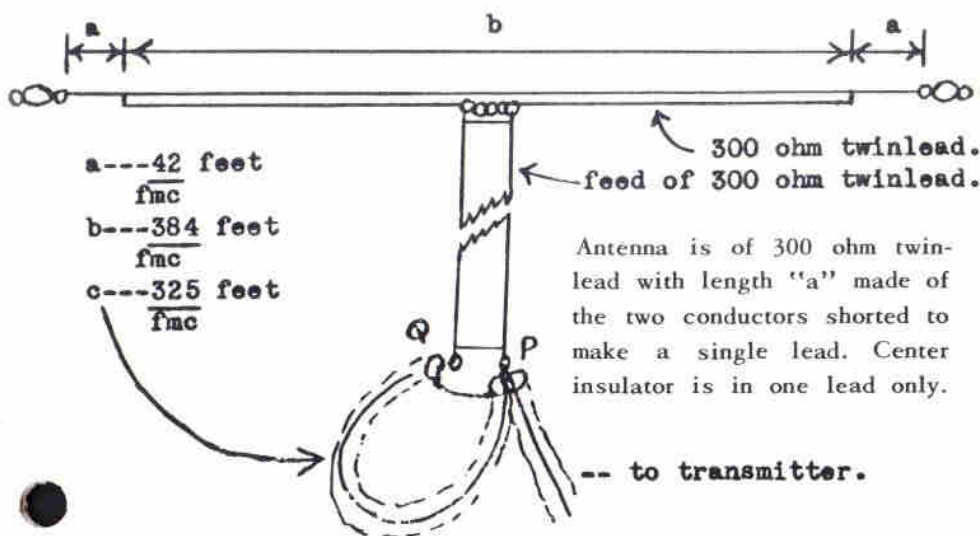
This would be nice if it would work, but we have shorted out our load.



Circuit above redrawn to show how it appears as 75 ohms, unbalanced. (But still shorted).

If at point marked X on above circuits a 180 degree time delay is put in the circuit will work.

Fig. 3.



The balun is a half wave of coax with the center conductor connected to points P and Q. The three shield ends are all connected together and may be grounded.

(Continued from P. 6)

is immaterial what sort of coax cable is used except it should be low-loss cable. In figuring the length of a half wave in RG8U or similar type of coax, don't forget that the signal travels only .66 times as fast as in space so a half wavelength will be about  $325/f$  in mcs, measured out in feet. The balun may be coiled up, folded, or placed anywhere since the outside is grounded. Fig. 3 shows its use with an ordinary 300 ohm folded dipole. It could be placed right at the antenna feed point and 75 ohm coax run into the shack, or (as shown), it could be at the transmitter end of the 300 ohm feed line (the latter arrangement is cheaper, and has less loss though). Many other applications will suggest themselves—remember the impedance ratio is always 4 to 1, or 1 to 4, and this system will work both ways. Also remember the lower impedance side is the unbalanced side.

Bob WOTKX

de Splatter - Minneapolis, Minn.

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A couple of years ago I needed a small oscillator, audio, for use as an AFSK oscillator for two meter RTTY. I ran across an ad from Irving Electronics, Texas, for a transistorized one on a printed circuit board, and the circuit also works as a single tone oscillator by leaving out the key and battery and diodes and condenser "C-1". It then makes a nice compact oscillator for code practice during your lunch periods,

or any other time you have a break. It can be made small enough to put into your pocket. I powered mine with a tiny mercury cell and could slip the whole unit in my shirt pocket.

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**OFFICIAL BULLETIN NR 908  
FROM ARRL HEADQUARTERS  
NEWINGTON CONN AUG 1 1963 TO  
ALL RADIO AMATEURS BT**

In recent years, amateurs have been electrocuted and others have had close call, caused by the failure of bypass capacitors in the primary circuit of AC power supplies. This type of accident can be avoided by the use of a common ground system linking all equipment chassis to a water pipe or other good ground connection. Send a stamped self addressed envelope with a note to ARRL requesting a copy of the Safety Code. Address your request to the ARRL Communications Department, 225 Main Street, Newington, Connecticut, 06111. Switch to safety and stay alive AR

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**WANTED** - Qualified instructor to teach General Class license exam at World Radio Lab.

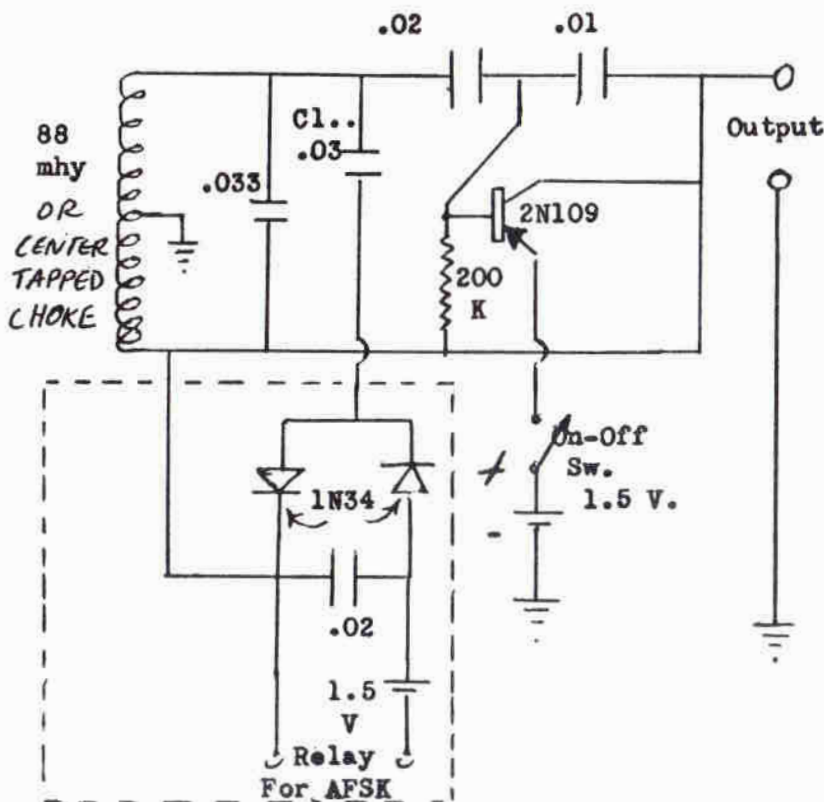
Omaha 342-4720

Council Bluffs 328-1851

Al McMillan

\*\*\*\*\*





Leave out all inside dotted lines if used just for an audio oscillator and put a key in place of the switch.

**OFFICIAL BULLETIN NR 912 FROM ARRL HEADQUARTERS  
NEWINGTON CONN AUG 29 1963 TO ALL RADIO AMATEURS  $\bar{B}\bar{T}$**

Irish amateurs will conduct transatlantic tests on 2 meters the last 2 weekends of September. Using the call EI4R/P, they will transmit on 144.22 Mc for 5 minutes in each quarter hour, from 1700 GMT through midnight GMT, September 21 22 28 and 29, listening for the balance of each 15 minute period. Receiving operators will concentrate on the first 300 kc at the low end of the band, and a similar segment from 145 Mc up, through the entire band

will be tuned in each receiving period. Stations on this side of the Atlantic should call no more than 2 or 3 minutes at a time, so that if their signals are heard a contact can be made without running into the next transmitting period. EI5AJ will be on 14.08 Mc c.w. and EI4AD on 14.18 Mc phone to work interested amateurs  $\bar{A}\bar{R}$

ARRL OES: Pse pass above info. around on VHF. Tks--73. F.E.H.

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Bob Schoening, WØTKX, has been very prolific with articles the past few months, and other than the three other articles that were put out WAØCQG, KØFHA, and KØZOG, the contributions to this column have been few and far between. Following is an article on tank coils and feedline which should give the answer to why some of the 100 watt rigs get maybe some 10 or 15 watts into the antenna.

## "50 WATT" COILS AND "KILOWATT" 300 OHM RIBBON by WØTKX

When manufacturers label their components for a certain power level, watch out! We sometimes read that RG-59U (the small type) or similar cable is satisfactory for receiving and low-power transmitting applications, but not for high power rigs. This is true--it will melt if it is used with a big rig! However, some hams don't know that the larger size cable is even more important at a low power station than at a high power one. When receiving, the power levels are low, that a good low-loss cable is even more important. If the transmission has a 3 db loss in a given application, you lose half of your power in it. If your transmitter puts out 10 watts, only 5 get to the antenna. A 2000 watt transmitter will, even with this loss, feed 1000 watts to the antenna--who can stand this loss? The high power station, of course.

Naturally, if the 3 db loss is in a component which can only get rid of the power safely at the rate of 20 watts, it can be used only with transmitters putting out 40 watts or less. This does not make it any more desirable, however, for a

40 watt rig than for a kilowatt. Components rated to handle more power are usually more efficient. "Kilowatt" size plug in coils are highly desirable in 5 watt rigs, since they are designed to lose a much smaller percentage of the transmitter's power than the "50 watt" variety. Losses can only occur in resistance. Coils and capacitors can have no loss, except that represented by their resistances. This is not just that resistance which an ohm-meter can show, but includes many factors: skin effect, dielectric losses in the insulation, radiation leakage, etc.

The moral is this: For a run of a few inches, or a couple of feet, go ahead and use the tiny coax (if it will stand the voltage and current), the TV type 300 ohm ribbon, or even twisted pair; but when the stuff is used to feed an antenna, use the very biggest and best line you can afford. For a small rig, sacrifice a measure of compactness to get a heavy-duty tank coil in the final at least. I suspect that an appreciable portion of the signal strength advantage enjoyed by high power stations is not due to their power,

but the fact that they are forced to avoid losses (to prevent fires and explosions) and inefficient components reveal their presence forcefully and immediately. Low power stations assembled with care can also profit from these same decibels.

Do you have any clips, connections, or other components getting hot (except resistors--that's their job)?? Replace them with something more efficient right away!

A good tank circuit can be over 95% efficient. Here's how it works. The tank (final plate circuit, for example) when tuned and loaded looks like two resistors in parallel. One is the loss resistance, the other is the desired loading effect. If the loss resistance is very high, losses will be low. This result is best obtained by using very good wire, good connections, good insulation, etc., in the tank. In this case the loading resistance need not be terribly low to accept most of the power. If the tank is inefficient, its resistance *effect* is great making low resistance *low* (a lower resistance is more effective in parallel). In this case, only heavy loading to increase the load resistor's effectiveness (make it lower, in ohms) can give reasonable efficiency. An efficient tank then should have very low losses, and should be heavily loaded. There is a limit to loading too, if we want harmonic attenuation, however. All this amounts to is the circuits "unloaded Q" must be high and its loaded Q

low for good efficiency. Did you think that high Q meant something good? Not always!

- WOTKX

To sum up the past fall, winter, and spring; we have had some articles covering 2 meter transceiver, 75 meter transceiver, many antenna articles, and a few circuits using solid state components. Several months ago when material was scarce I did a resume of various magazines and articles of especial interest to the VHF ham. I hope these articles have sparked some interest in the building end of the hobby. You now have two months to peruse the past 10 issues and see what you have built from them, and what you intend to build between now and Sept.

My construction has been much more limited than I had anticipated. Seems as though there were too many "re-building" and repair jobs to get done. The re-building consisted of the type such as taking a 30 to 50 mc 6 volt mobile FM transmitter and receiver and converting to 115 volts A.C. This has been accomplished as well as rebuilding a Communicator 4, a National HFS receiver, a 460 mc FM transmitter-receiver moved up to 449.8 mc, a 420 18 element beam up, a 4-element tribander up, a 1296 64 element antenna built but still not up, and also a lot of small "putz" jobs done. Doesn't seem much considering that nearly a year of time is

(Continued from P. 11)

involved. I have also built up 32 elements for 220 mcs, but have not assembled them to the boom. That is one of the early ones for this summer.

My QST just arrived today, and one of the first articles of great interest is a fully transistorized SSB transceiver for 14 mc. Looks fine for a future project.

73 til Sept. - Lin.

de Splatter  
Minneapolis, Minn.

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**OFFICIAL BULLETIN NR 913  
FROM ARRL HEADQUARTERS  
NEWINGTON CONN SEPT 5 1963  
TO ALL RADIO AMATEURS BT**

The annual Simulated Emergency Test will be held October 5 and 6. All amateurs and especially AREC and NTS members are urged to participate in local exercises and nationwide traffic handling activities, involving traffic for the Red Cross, civil defense and other agencies. Much ARRL administrative traffic will also be flowing through regular traffic channels. New ARRL precedence designations will be in use. Your local Emergency Coordinator will soon receive full details and additional information will appear in October QST. If you want to be part of this nationwide demonstration of amateur radio public service facilities, contact your Emergency Coordinator now and sign up in the AREC so you can be worked into the plans AR

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**By K7OGF**

The problem of Splatter...the kind one hears on the ham bands... gets quite bad at times...and in a lot of cases it is a case of receiver overload. The saying of "It can be my transmitter, it must be your receiver" is true part of the time. With Warren, K7TGR 4 blocks away with that 55 foot HyGain vertical and the 3,000 feet of ground radials, my HQ 180 goes dead for 300 kc. Only by removing the antenna from my receiver and backing off the R. F. gain can the interference be alleviated. In pondering over this one day, I took my wave meter, which is a O-1 ma. meter and a diode, I can get nearly half scale deflection from my antenna when Warren is on. Now that is a signal. So before you condemn a fellow Ham as being broad, cut the signal input to your receiver. It is true, there are some broad ones...I send out a couple of dozen Official Observer cards to alleged violations of 12.133 of the FCC rules last month, but before you criticize, stop and think of the mathematics of your receiver I.F. curve and the signal input at least. Most Single Side Band transmitters have anywhere from 20 to 60 DB. of suppression on the suppressed side band, but if the signal to your receiver is say 60 db over nine considering 50 mv as S9, of course you can copy the other side band anywhere from S9 and up. On the other hand a real 60 over 9 would probably set your shack on fire...A 60 DB. gain is equal to a voltage gain of

1,000 and a power gain of 10 to the 6th.

This month for our theory series, I am going to talk about a little understood thing called Alternating Current. A.C. is in many forms but today I am going to talk about the useful Values of Alternating Current and how they are arrived at.

There are at least Four very important and useful values associated with Sine Waves. The A.C. I am talking about now is in the form of Sine Waves only. We will go into the other forms, Phases etc. latter. Sine Wave Alternating Current is continuously changing in magnitude. This means that at every instant of the cycle the value is different from the value of the preceding or following instant. The value of the voltage or current at any one instant may be referred to as the INSTANTANEOUS VALUE. The instantaneous value of current depends upon the instant at which it is desired. The sine wave curve diagram illustrates the meaning of instantaneous value. Value at 10 degrees is 1.7 amps or volts depending on which is being considered for the 20 degree point 3.4 and for the 30 degree point 5 amps or volts.

From the sine curve you can see that there are two instants where the current or voltage (to make it shorter from now on we will assume voltage only) is greater than at any other instant during the cycle. When reference is made to these greater values the term PEAK or MAXIMUM are used interchangeably. Peak and

maximum are indicated by writing E peak or I peak or E max. or I max. When you speak of these terms the proper way is to say, E sub peak or I sub peak. So because of the difficulty in typing mathematical terms, I will say E sub peak or in the other case of 10<sup>6</sup> say 10 to the 6th (power). Also anything above a base line of Zero will be a positive voltage and that below the base line a negative voltage. This could be current as well.

Now to the AVERAGE VALUE. Since one half of the instantaneous values of an A.C. voltage are positive and the other half negative, the average over a complete cycle is Zero. One cycle is also called a Period. But, since the signs only indicate direction, the actual average value is not zero and it can be determined by averaging all the instantaneous values for a positive cycle or negative cycle. Current flowing in a negative direction...it has been determined that the Average value is .637 times the max. value. On page 16 are the formulae that will give you the average value. Although it is evident now???

Effective Value, is that Value of a Sine Wave voltage which produces the same heating effect in a circuit as will be produced by an equal value of direct voltage and this is called the EFFECTIVE VALUE. This value is also called Root-Mean-Square, abbreviated rms. This means that the average of the sum of the instantaneous I squared

(Continued on P. 15)

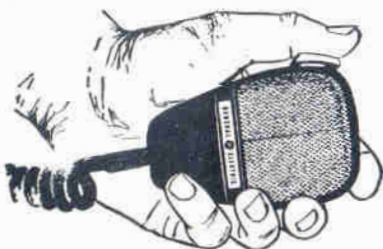
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R losses in a resistor is equal to one I squared R loss, where I represents the effective value of the sine wave current or voltage and of course R representing Resistance. To understand the justification of the effective value, compare an alternating current having a maximum value of 10 amps with direct current. If a direct current of 10 amps is caused to flow through a resistance of 2 ohms, the resulting energy converted into heat is 200 watts, (W equals I squared times R). It is not logical to expect an alternating current with a max. value of 10 amps to produce the same heating effect, because the A.C. current does not maintain a constant value of 10 amps. It reaches 10 amps at its highest pos. or neg. direction but at all other instants it is less, even Zero at two instants. The effective values make it possible to reduce the A.C. to the same comparable basis as direct current. For example, suppose 1 amp of direct current is caused to flow through 5 ohms of resistance. The power dissipated will be 5 watts. Now suppose that an alternating current is sent through the same resistance and its amplitude is adjusted until the power that is dissipated is also 5 watts. It is then said that 1 amp. of A.C. is flowing through the resistor and it becomes apparent that it is possible to convert average and maximum to effective values. It has been determined that the effective value of alternating current and voltage is .707 times the max. value. Alternating current meters are usually

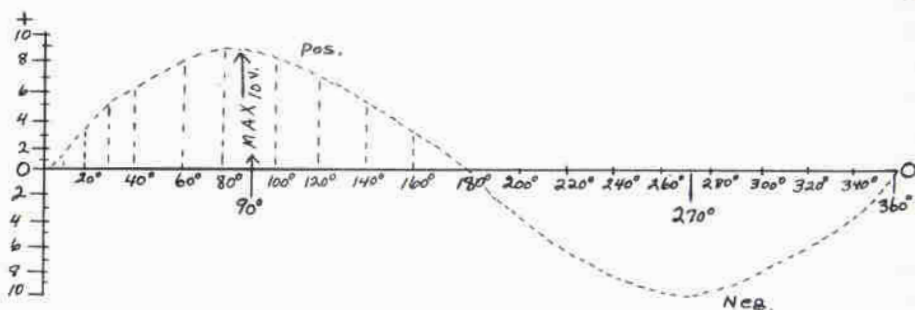
calibrated to read effective values unless stated otherwise. Therefore if an A.C. meter reads 10 amps it means the effective value is 10 amps; the current actually varies between plus 14.14 and minus 14.14. Remember the following. Effective value equal RMS and Maximum value equal Peak. Now all you linear fans, think about your peak power and average power and quit trying to make the current meter swing up to the C.W. value of current. The proper point is just a little over half. Observe a scope and you can see that increasing the plate current does not increase the total carrier voltage, only the distortion, it may in some cases increase the carrier, but think about what increasing your carrier by say 20 or so percent means in the S meter reading at the distant receiver. Might be as much as the width of the meter needle, but the side bands could go out another 20 kc. If you want a demonstration some time I can with the 32A and Thunderbolt, vary my power from less than one watt to 1500 watts...the 1500 of course only into a dummy load, and with a steady C. W. carrier you might be surprised what happens.

The following are the formulae and graph needed to follow the above discussion. See you all next month and am open to any suggestions as to the theory content of my pages... will research anything you want and do the best I can. See you non-hams on 3820 Kc at 7 P.M. MST on Mon., Wed. and Friday, pass the word around TNX.

Max. equals Eff. times 1.414      Eff. equals Max. times .707

Max. equals  $\frac{\text{Eff.}}{.707}$       Eff. equals  $\frac{\text{Max.}}{1.414}$

Max. equals  $\frac{\text{Av}}{.637}$       Av equals .637 times Max.



de Yellowstone R.C.

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(Continued from P. 2)

was any different from an ARL SIXTY message to be kicked around from liaison to liaison for practice.

This, in my personal opinion, is the basis for using a precedence designator in regular amateur traffic net procedure. For the sake of starting a discussion, I offer three categories for regular traffic net use:

**ROUTINE:** The usual amateur greetings traffic, etc.

**RUSH:** Traffic with a strong time element, such as arrival times, skeds, etc.

**PRIORITY:** Traffic which would have been filed on a commercial telephone or telegraph circuit if one had been available. Such traffic should be delivered by collect phone or telegram from the first amateur station which has these facilities available.

The *original station* always assigns the precedence rating, in

consultation with the sender of the message.

Comments, anybody?

Mississippi -- long missing from NTS for want of a CW net -- is now ably represented in RN5 and has a nightly section net of its own going. Net Manager W4JDF advises the Mississippi Magnolia Emergency Net (MMEN) meets nightly at 0300 GMT on 3760 kc.

-0-

A recent FCC report lists the handling of non-permissible foreign traffic among the more common violations for which citations have been issued this year.

Be sure to check the latest list of countries with which we *can* exchange traffic before you handle stuff outside the U.S. and possessions. We haven't checked the point with the FCC but chances seem pretty good that it's a violation QSP traffic for, say Bermuda, even if you pick it up from a KO and QSP to a K4.

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