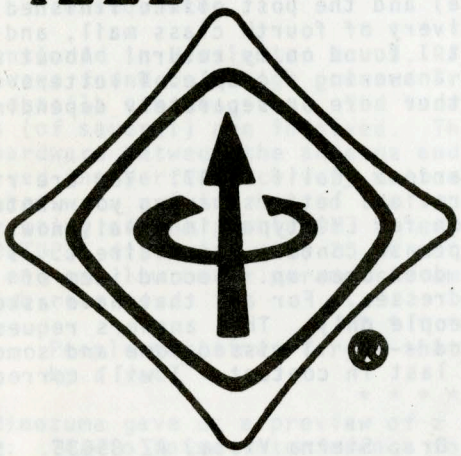
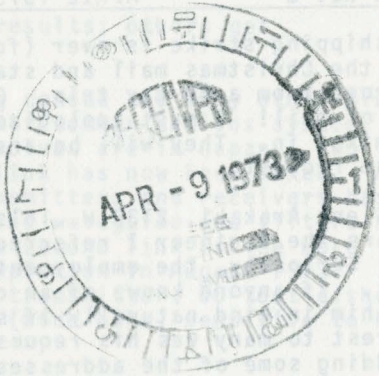
RMR 4/16

IEEE





G-EMC PAC

EMC
NEWSLETTER
PACIFIC AREA COMMITTEE
GEMC

ISSUE NO. 8 APRIL 1973 EDITOR: ROBERT R. FORD

The shipping strike is over (for a while) and the post office finished with the Christmas mail and started delivery of fourth class mail, and I returned from a 60-day trip. Guess what I found on my return! About six feet of mail! I must apologize for not answering a couple of letters that got mixed in. They will be answered either here or separately depending on the request.

1. Glenn Arakaki, 2139 W. 161st St., Gardena, Calif 90247. You are right! You are the engineer I referred to in previous letters saying you wanted my job. Seriously, the employment situation for EMC types in Hawaii now is bleak. If anyone knows of an opening, please contact Glenn direct. I will keep him in mind naturally if something does open up. Second item of interest to many was his request for addresses. For all that have asked I am adding some of the addresses. Key people only. This answers requests from Glenn and George and Fred and Al and ----. I missed some and some have probably been replaced since I was last in contact. I will correct it as time passes.

2. George Lane, Apt 2, 2633 Roadrunner Dr., Sierra Vista, AZ 85635. Sorry I haven't answered sooner! No time for a letter or check on AMP (will soon). Tech reports you requested - one soon. The next is by USAR in your old stomping ground; hope to get a copy sent to you directly.

3. Bob Kugler - I will visit you again in April. I'll bring money for your postage bill. Thanks!

4. Dr. Fumio Minozuma, 705 Aoyama Residence, 3-10 Shibuya 3-Chome, Shibuyaku, Tokyo 150. My home is open for your visit any time. I hope to see you on your visit on your way to ICC 73 in Seattle.

5. Several others have written and already received answers. Forgive me for not mentioning all the names specifically.

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Retirement is great if you are busy, rich and healthy.
Under those conditions so is work!

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Answer to SOS Problem: True meaning of the letters SOS in the international distress signal is nothing. The letters were chosen simply because they are easy to recognize, easy to learn and easy to receive. As expected, we did get a few other answers:

Save Our Souls, Save Our Ship, Squadron Officers School, Save Oklahoma Soil, Stuff On a Shingle, Save Our Surf, Some Old Souses, etc.

We were slightly involved recently with another satellite interference problem: A weather satellite receiving station (VHF) was having a lot of trouble getting good cloud coverage readout pictures from the satellite. With luck, perserverance and a lot of intense deep study it was determined that a nearby (≈1/2 kilometer) Madam was using an overdriven CB base

station as a control network to direct the activities of her employees. The harmonic output was sufficient to saturate the weather satellite receiver. Long, involved, interesting negotiations were then initiated with a resulting promise not to use that base station when the satellite was in position for readout. I expect we will hear more on this problem. Any volunteers?

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Some people go through life getting results; others get consequences.

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As mentioned in Newsletter No. 5, RFI, arcing corona and many other problems were found on a high powered Tropo Scatter communications system. Now more details can be given. The locations involved are in Japan. Two tropo links (of several) are involved. The first link has now been fixed. All new hardware between the antenna and the transmitters and receivers has improved the performance very noticeably. (The waveguide and filters and switches were running hot to the touch.) The second link is the more interesting of the problems. We estimate completion in August 1973. It has OCTUPLE diversity with 20 kW out of each transmitter, 60-foot dishes on each end and low noise parametric amplifiers (wide band, sensitive to RFI) on each receiver.

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People sometimes forget that a rat race can only be won by a rat.

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Dr. Minozuma gave us a preview of a paper he is going to present at ICC 73. Title: "Radio Noise Interference for Frequency Management --- Automobile Radio Noise and Its Suppression Methods." This was at the Tokyo meeting of GEMC PAC held 5 Feb 1973 at the Sanno Hotel Penthouse. Good meeting arranged by Bob Kugler - who naturally, was traveling and out of Japan at the time. Jim Greeves took over for him, and I accidentally (?) managed to get back just in time to make the meeting. I would like to say a lot more about Dr. Minozuma's paper but won't spoil it for those of you who can make ICC 73 and hear it for yourself. Some of his background research work has been going on sporadically for over 20 years. The amount of information presented in this short paper has to be experienced to be belived. Thank you again, Dr. Minozuma.

News Item: Drink a toast to the transistor. It's celebrating its 25th anniversary.

Plea: For the next several months Ye Ed is committed to one large project not closely involving EMC. This trip alone will require me to be away from my normal position for two months. This newsletter gobbles up RFI info at a rate faster than I can collect it unless I follow it regularly. SO - PLEASE any information you can provide - that is of general interest, would be greatly appreciated. Send it to: Robert Ford, 1268 Mokapu Blvd, Kailua, HI 96734. As you may have noticed we even publish RFI items that don't say Who, What, Where, When or Why. Details are interesting and sometimes important but the general background and solution can be informative without the famous five W's.

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This is not an ad for Hertz but their ad is OK - "traveling for a living is no way to live."

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Calculators: (Continued from last issue.) Still don't have any word on the new RICOH that was rumored due in Jan or Feb this year, but we're still watching for it. The HP-35 I called our standard of excellence lost a few points for EMC types. It radiates a lot more RFI than any other pocket calculator yet tested. Sorry about that!

EMI: Our old friend the pulse signal in HF is still with us. While in Japan we heard that it is still heard occasionally across the HF spectrum and fairly commonly around 20 to 22 MHz. No DF available this time. We still suspect the Fowliang area on mainland China (WSW of Shanghai). We did hear of one DF effort: A Navy crew on duty in the Antarctic heard it and say it is coming from nearly due North.

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Cold Remedy: Korean Kim Chee! The garlic might do some good medically and it will do you a lot of good in getting the isolation you need!

* * * * * * * * *

DB: Normally we have been trying to include a few hints and kinks - this time (only?) we would like to insert a short article that we hope most of you do not need. We have found several graduate engineers recently, who were hazy on our old friend the decibel. The major problems are two: (1) 20 $\log_{10}$ --- Vs 10 $\log_{10}$ ---, (2) reference points. Regarding problem (1); forget it - all you need to remember is "A DECIBEL IS TEN TIMES THE LOGARITHM OF A POWER RATIO." Simple? Yes! Also as a ratio it is dimensionless! The joker who first published: DB = 20 $\log_{10}$ E_1/E_2; did the whole industry an extreme dis-service! People (even including engineers) tend to get lazy in their thinking after a while and try to remember short cut formulae and/or use nomograms to eliminate the requirement for a common sense approach. OK, but don't ever forget the basic: DB = 10 log (PWR RATIO). We have one favorite DB ratio, in common use in screen room specification MIL-E-8881A, it is 250 DB. This is the difference in level between the "Least Discernable Signal" (1 µV/m) and the "Breakdown Voltage of Free Space" (3.16 kV/m). (Their figure not mine!) Years ago (exact source not remembered or available) one astute individual suggested discarding DB and substituting "LOGITS." Everything you can imagine as logarithmic ratios were Volt Logits, Power Logits, Distance Logits, Ratio Logits, Volume Logits, etc. Everything was 10 $\log_{10}$ ---. The trouble with that of course is that direct addition is impossible. Logic does not prevail in the use of Logits. Go back to the basic DB = 10 $\log_{10}$ (PWR RATIO).

(1) Remember (if you like) that the power varies as the square of the voltage ratio across equal impedances. Then, 10 log $(E_1/E_2)^2$ = 10 log (PWR RATIO).

(2) Remember also (please) that DB with respect to any good reference is only a logarithmic expression for a ratio of two powers. IN AN EQUAL IMPEDANCE (NOT COMMON!) SYSTEM this equates to either 10 log P_1/P_2, or 10 log $\frac{E_1^2/Z_1}{E_2^2/Z_2}$, or 10 log $\frac{I_1^2 \cdot Z_1}{I_2^2 \cdot Z_2}$. But only in an equal impedance systems does DB = 20 log E_1/E_2 or 20 log I_1/I_2.

(3) Remember (if you like) that antenna gain varies as 10 log (SPHERICAL AREA/AREA ILLUMINATED), with the radius held constant. Hemispheric coverage Zenith to Horizon for 360° of azimuth equates to 3.0103 DB gain - because only 1/2 of the sphere is illuminated. Put a reflector behind it; in addition to the earth below, and you only illuminate 1/4 of

the sphere to get a 6.0206 DB gain. This gain is 10 $\log_{10}$ (PWR RATIO). Without directivity, it would take twice the power for an omnidirectional (point source) radiator to produce the same signal as one which concentrated that same power to 360° azimuth and 0 to +90° elevation. Gains to over 50 DB are seen and they follow the same laws of spherical geometry and/or trigonometry; i.e., the directional gain is equivalent to the ratio of the area illuminated to the total area of a sphere. This can easily be proven to equate to a power ratio between a low power source with directional antenna and a higher power source with unity gain antenna.

(4) Remember (if you like) that the power density of an RF signal varies as the inverse square of the distance. Therefore, it varies as (-)20 $\log_{10}$ D. Remember also that free space is a constant impedance. Field intensity is somewhat simpler - it varies inversely with the distance (10 log D_1/D_2).

(5) Remember (if you like) that duty cycle is an absolute number (without dimensions). It can be expressed in DB! A POWER RATIO is also dimensionless: (WATTS/WATTS, and duty cycle is Peak Watts/Average Watts.)

(6) Many others come to mind as good examples, but we haven't seen one that couldn't fit the supersimple definition DB = 10 $\log_{10}$ P_1/P_2.

(7) Remember also (you must!): If a quantity of DB loss or gain is experienced, that it is the same change in power, voltage, current, etc. A DB is a DB!

The next stumbling block noted is references. These are very simple if you remember that anyone can make up his own reference point legally. We can imagine references of Volts, Amps, Watts, heat power, sound power, light power, absolute ratios of all sorts, capability to assimilate booze and any other units you can name. Standard abbreviations are in use and should not be violated if practical.

DBV is DB related to 1 volt regardless of impedance
DBI is DB related to 1 amp regardless of impedance
DBW is DB related to 1 watt regardless of impedance
DBm is DB related to 1 milliwatt regardless of impedance
DBG is DB related to 1 gallon of booze per hour regardless of impedance

In radio (and EMC) some idiots forget to say volts across 50 ohms, and so, create confusion. The same problem exists in telephone communications where the normal is milliwatts across 600Ω unless you are talking to old-timers that remember the old 500 ohm standard. The same problem occurs talking to EW or ECM or Space and Satellite types; they like to use DBW or DBm without all the rest of the references specified. Usually, they mean as referenced to a 50Ω system with unity gain antenna and do not convert to field intensity, volts on receiver output, or watts. (It works, but only among the groups of people that understand all the limits and references - I recommend more scientific and accurate methods.)

DB>1µV is DB related to 1 µV (regardless of impedance); by common acceptance, this usually means across 50 ohms. But, unless you know the author of the source material - be careful!

More exotic references are DB>1µV/m/MHz, DBm/m^2/MHz, DBRN, DBRNCØ, DB>KTB, etc. We have tables listing hundreds of STANDARD references. Look them up

as required. BUT, don't forget - they all equate to what we started from: DB = 10 $\log_{10}$ (POWER RATIO).

Another friend saw part of this in draft form and asked for a few words on DBMØ or other DB Ø units. They all refer to some point in the system that has been designated the "ZERO LEVEL TEST POINT." If this is followed by amplifiers, attenuators, etc., that change the new test point (by design, not by accident) to -13 DB from the Ø level test point, you still have Ø DBMØ. This really means you must know the system and its standard test point levels better but saves you effort because your bosses only have to know that the signal is above or below (hot or cold) by "X" numbers of DB. Remember that even the management forgets how to use DB. That problem is not restricted to engineers or technicians.

Adding and/or Multiplying DB's: You may add or subtract DB's without hesitation as long as a single standard reference unit is utilized. Don't add DBV and DBG without expecting trouble! Also don't add like units (with reference), ex: 140 dB>1μV/m + 140 dB>1μV/m is above "breakdown voltage of free space." While the implication seems to be direct in phase addition of two voltages that will result in a 146 dB>1μV/m field. It is OK to add DB (PWR RATIO) directly to any standard valued DB unit with a reference. Multiplication and division are more exotic and should not be used unless "running logarithmic mean values" (or something similar) are required. In general - DON'T. Ex: 10 DBm/cm^2 times the area of a human body does not result in an impressed power of +50,000 DBm. An article we recently read seems appropriate here (though I don't agree in most cases - misuse of DB's makes it appropriate). "An engineer is so narrow-minded, he can look through a keyhole with both eyes." We hope those who did not need the above were not offended by our inclusion. We also hope we have helped in some way the few others who may have learned something from it. We would appreciate your comments.

IEEE Announcements:

1. ManageGame Service: "A new career-expanding correspondence program that trains you in ALL managerial areas with simulated 'on the job activity.'" Monthly service for $3.75 (in US) or $5.00 (other countries) that lasts 12 months and gives you "a comprehensive knowledge of corporate operations."

2. EMC Symposium: June 20, 21, 22, 1973, at the New York Hilton, NY, NY. Theme: "One World, One Spectrum, Pollution-Free."

3. "IEEE Standard Dictionary of Electrical and Electronic Terms:" The title is quite descriptive. Reviews say it is great. We don't have our copy yet but will buy. Price $14.95 for members, $19.95 non-members. (Another good reason for you non-members to join!)

4. AD COMM: New officers for calendar year 1973 have been announced.

President:
Joseph F. Fischer, Jr.
769 - 33rd Street
Manhattan Beach, CA 90266
(213)545-4617

Vice-President
Eugene D. Knowles
2566 - 128th Ave., S.E.
Bellevue, WA 98005
(206)655-9839

Treasurer
Warren A. Kesselman
31 Hope Road
New Shrewsbury, NJ 07724
(201)535-1703

Secretary
Leonard W. Thomas, Sr.
1604 Buchanan St., N.E.
Washington, DC 20017
(202)526-2545

5. Major IEEE Periodicals: Now available in microform. Current issues are all available at the same rates on microfiche as the full-size editions. A complete back file of all Transactions Journals and Proceedings may be ordered on microfilm. Prices are not available yet to GEMC PAC but this looks like a good opportunity to build up our libraries. May be GEMC can get price info and list it in a future newsletter?

6. New IEEE Standard: "Measurements of Radio Noise from Overhead Power Lines, IEEE Trial-Use Standard Procedures for The" (IEEE STD 430-1972)(ANSI C63.11) SHO 4309. Member price $3.30; non-members $4.40.

7. Forthcoming: EMC Transactions for May 73 will concentrate on ground currents.

8. Hawaii Section IEEE, April 18, 1973: Will conduct their regular monthly meeting at Ala Moana. GEMC PAC will provide a speaker talking about the organization of GEMC PAC. Dick Snell will probably be the speaker (if he isn't traveling like Bob Ford expects to be).

9. Hawaiian Section IEEE, May 2-4, 1973, Region 6 Conference "Minicomputers and Their Applications." Register early.

10. ICC 73: 1973 International Conference on Communications, June 11-13, 1973. Joint IEEE, SAE-AE4, + + conference. EMC will be represented well, we understand.

11. Walsh Functions: Fifth Annual Symposium in Washington, D.C., April 16-18, 1973.

12. NTC 73: National Telecommunications Conference, Atlanta, Georgia, November 26-28, 1973.

13. GEMC Transactions: New type of composition and looser editing has been approved. The February edition was an example. Richard Schulz, editor, has asked for comments but the decision is pretty firm. Our opinion: Looks very good! We hope it will allow an increase in size of the transactions and have no complaints on quality.

14. GEMC Symposiums:

1973 New York, June 11-19 CISPR; July 20-22 GEMC
1974 San Francisco
1975 San Antonio
1976 Washington, D.C., July 13-16
1977 Seattle, Washington, July 26-28

15. IEEE Group Insurance Program: Did you know members have received dividend credits averaging 46% over the last 5 years? That should more than cover the expense of IEEE membership. Those non-members reading this should note that, IEEE is expensive but when all benefits are counted the cost is low. Write for an application blank! Now!

KEY EMC PERSONNEL
PACIFIC

(List constantly changing; not responsible for accuracy. As of 1 Apr 73)

CURRAN, Gordon, Lt Col, USFJ/J6, APO 96525 (Japan Freq Mgt)
DeWEIL, Richard, COMUSKOREA/J6, APO 96301 (Korea Freq Mgt)
FORD, Robert R., 1268 Mokapu Blvd, Kailua, HI 96734 (GEMC PAC, also Pac Comm Area/EIESM (EMC & Meas Branch Chief), APO 96515)
GNAGY, John, DCA-PAC, APO 96515 (Temporarily out for medical reasons, about 1 year - rumored to be returning soon.)
GRAY, Robert, Capt, PACAF/DO (USAF, Pacific Freq Mgt)
HAMILTON, Tommy J., SMS, 1962 Comm Gp/ROKF, APO 96239 (Freq Mgt Okinawa)
HOLLINGSWORTH, Bob, Comdr, 14 Coast Guard Dist, 677 Ala Moana Blvd, Honolulu, HI 96813
HOVIS, Sheldon D., RMC, COMNAVFORJAPAN, FPO S.F. 98762
HUEY, Richard M., Prof, University of NSW, Kensington, NSW 2033 Australia
KLEPPER, I.C., Lt Col, was CINCPAC/J6; now in Washington, D.C., HQ DA (name included because of specific request)
KUGLER, Robert, Jr., NSA Pac Ofc Japan, APO 96343 (will depart in mid year; substitute will be Mr. James Greeves, same office). GEMC PAC Vice Chairman
LEAMING, Harold, Capt, USAF, CINCPACREPPHIL/JFCC, FPO S.F. 96528 (Freq Mgt Philippines)
LOOK, Michael, NAVSEEACT Pacific, FPO 96610 (US Navy EMC Ofc for the Pacific)
MERTZ, John W., MSgt, 2146 Comm Gp, Box 5062, APO 96570 (USAF Freq Mgt Korea)
METZ, Norman, Haw Elect Co., Sys Operation Dept, P.O. Box 2750, Honolulu, HI 96803
NOGUCHI, Thomas T., 99-606 Aliipoe Dr, Aiea, HI 96701 (US Army Freq Mgt Hawaii)
PACE, Addison N., Maj., CINCPAC/J641, FPO 96610 (Freq Mgt all DOD in Pacific) (Replaced Col Klepper)
PLASMAN, Duncan, PMR Det, Mauna Kapu, Box 129, FPO 96610 (Chief Engineer of PMR Monitoring Facility)
ROSE, Donald, E.J., LtJG, CINCPACREPGUAM/TTPI, Box 15, FPO 96630 (Freq Mgt Mariannas)
SCHUELER, Al, NAVSEEACTGUAM (Navy EMC Guam)
SIMPSON, Charles E., Maj., COMUSTDC/J6, APO 96263 (Freq Mgt Taiwan)
SPRINGER, Richard, AFC Hawaii Barking Sands, Kekaha, Kauai, HI 96752 (Freq Mgt Hawaii area)
SPURGEON, Sidney L., Lt., CG 1st Mar Bde, FPO 96602 (Freq Mgt USMC Hawaii)
SUGIYAMA, Masao, 1956 Comm Gp, Box 139, APO 96525 (Freq Mgt USAF Japan)
TALLANT Irby C., Jr., FCC, P.O. Box 1035, Waipahu, HI 96797 (Chief Engineer FCC Monitoring Station Hawaii)
TAKAHASHI, Richard, FAA Pacific, 500 University Ave, Apt 329, Honolulu, HI 96814 (Freq Mgt & EMC FAA Pacific)
TAYLOR, E.KENT, CINCPACREPKWAJ, Box 181, APO 96555 (Freq Mgt Kwajelein Atoll)
TENNIS, Joseph E., Haw Telephone Co., P.O. Box 2200, Honolulu, HI 96805 (EMC Engineer, Haw Telephone Co)
VITTUM, Melvin S., FCC, Federal Bldg, Honolulu, HI 96813 (Mr. FCC Hawaii)