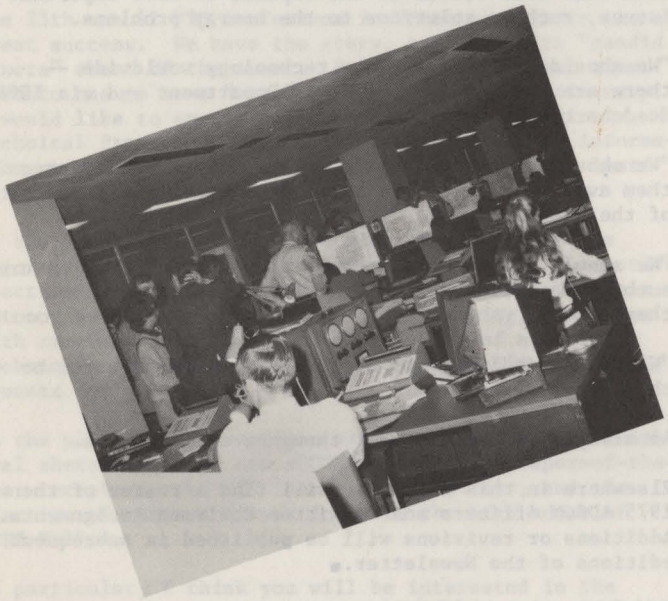
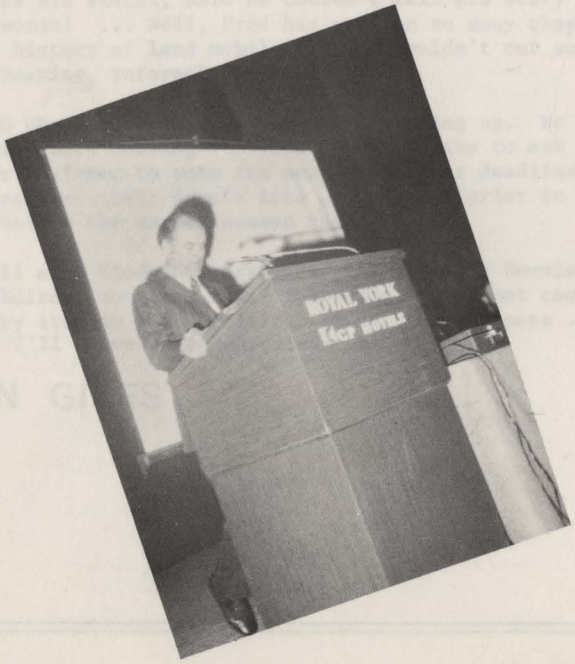
IEEE NEWSLETTER

VEHICULAR TECHNOLOGY GROUP

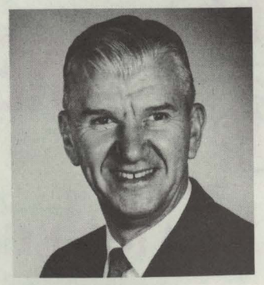
JANUARY 1975

...SCENES FROM 25th ANNUAL VTG CONFERENCE





MESSAGE FROM THE PRESIDENT



In any Group or Society, the fruits of all the yearly labors are reflected in and at the Annual Conference. The 25th annual Vehicular Technology Group Conference held in Toronto last January was no exception. Our Canadian friends put together a well organized technical program, drew a good diversified crowd (considering the economic conditions),showed us all some typical Toronto-type hospitality, and netted a handsome profit to boot. On behalf of the VTG ADCOM and the membership at large, I would like to express our appreciation to Neil MacKinnon, Chairman of the conference, the conference staff, and the Toronto Chapter for a job well done. Congratulations!

Starting in this issue you will be made aware of the 26th annual conference which is to be held in Washington, D.C. on March 24, 25, 26, 1976. ADCOM member, Stuart F. Meyer, is General Chairman of the conference and is already in high gear with the organizational aspects of the production. As though this is not enough, Stu is setting up a one day symposium in Washington in September. This will be a special venture of the VTG and the Electromagnetic Compatibility Group. The symposium should be a milestone in educational promotion for all chapters. In other areas of the VTG ADCOM arena, I will attempt to bring you up to date on some of the things that have been going on in IEEE and the VTG, in particular. You will read elsewhere that I have been re-elected to the Presidency of your Vehicular Technology Group for the remainder of the two year term, along with Sam Lane as Vice President, and Dr. John Cassidy as Treasurer. John is a welcome addition to the executive committee this year, and he reflects one of the basic tenets I have adopted while moving through the chairs of the Chapter, the Section, and now the Group. That is: infuse the organization with young and fresh ideas! You should expect to see similar additions to the ADCOM in the future. By way of a report, you should be aware that we are making good progress towards some of the goals adopted by your ADCOM at the June, 1974 ICC meeting.

I have mentioned it before, and I say it again, the Editorial area is making good progress. The Newsletter is getting first class treatment, and you are getting it on time. The Transactions have been lagging in time only, but the quality, thanks to the Editorial staff, has been exceptional. At this point, I should mention that I have appointed a new Editor -- George F. McClure. George is presently Chairman of the Orlando, Florida, VTG Chapter and has already made a number of contributions to the VTG. I would be remiss if I did not remind you that the reason for the quality of your present Transactions is due directly to the efforts of our present Editor, Carl Brooks. Carl will be moving into an equally important area of the VTG ADCOM shortly.

We now have three special issues of the Transactions in the works that should be getting underway by midsummer: Emergency Medical Services, Propagation, and Automotive Electronics.

In the important area of Transportation, I have appointed an Ad Hoc committee to define the scope of the VTG involvement in this area. The committee will be chaired by Dr. Fenton of Ohio State University.

Here are some thoughts at random that were expressed at a recent Technical Activities Board Meeting:

"We (meaning any Group or Society) may be spending too much time with trivia at the expense of more important issues, such as solutions to the energy problems.

"We should be spreading our technology worldwide -- there are avenues via the State Department and via IEEE Headquarters.

"We should establish meaningful goals and then pursue them avidly, even at the expense of a certain portion of the membership.

"We should adopt certain goals of a high caliber nature, such as mass transportation systems - or controls thereof.

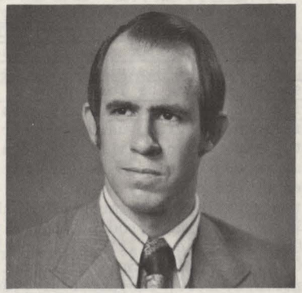
"We should dedicate our efforts towards a solution to the energy crisis."

As always, we solicit <u>your</u> thoughts and comments.

Elsewhere in this issue you will find a roster of the 1975 ADCOM officers and Committee Chairmen Assignments. Additions or revisions will be published in subsequent editions of the Newsletter.■

NICK ALIMPICH

EDITOR'S NOTES



As I survey this issue before sending it to press, I note that the news is dominated by conferences and personalities. Since VTG people have been involved in two conventions since the January issue of the newsletter, I suppose it is only fitting that this is the case.

The 25th annual VTG conference in Toronto, Ontario was a great success. We have the story, complete with "candid camera" shots of the event. Everyone had a great time. Toronto has to be a "must" on anyone's travel itinerary. I would like to express my appreciation to Art Dinnin, Technical Program Chairman, for providing timely information on the conference to the newsletter over the last six months.

On the automotive electronics side of the house, the major event was the five technical sessions on automotive electronics at the annual winter SAE meeting in Detroit. Automotive Electronics Editor, Bill Flemming, was there with camera. Bill covers the highlights of all the technical sessions and identifies the significant developments for you.

In the personality area, you will find news and biographical sketches on the new ADCOM members, the Paper-of-the-Year recipient, the VTG Lecturer of the Year, and the election of our own Trevor Jones to the high honor of IEEE Fellow.

In particular, I think you will be interested in the biographical sketch of Fred Link, who is one of our new (yes, new) ADCOM members. Fred suggested that I edit and condense his sketch, said he couldn't tell his story in fewer words! ... Well, Fred has written so many chapters in the history of land mobile, that I couldn't cut such a fascinating, informal biography.

Our VTG Chapter activity seems to be picking up. We are receiving more meeting reports. I would like to ask the Chapter chairmen to note the next newsletter deadline and to please get their inputs into John Dettra prior to this time, before the summer season recess.

You will also find interesting articles by the Newsletter Staff Editors covering their specialty. I cannot comment on every item in the newsletter in this short space ... ... so I'll leave a few surprises .... ■

OLIN GILES

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VTG NEWSLETTER DEADLINES

Month of Issue	Final Copy To Be Rec'd. By Editor*	Target Mailing Date
July	6-2-75	6-27-75
October	9-1-75	9-26-75
January	12-1-75	12-31-75
April	3-1-76	3-31-76

*Inputs for newsletter staff editors should be received 1-2 weeks before these dates.

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THE WASHINGTON SCENE

By ERIC SCHIMMEL

WASHINGTON NEWS EDITOR

THIS MONTH'S DESIGN CHALLENGE

Want to get rich quick? Design a reasonably priced, functional speech scrambler which can be retrofited to existing land mobile radio systems. Yes, I know that a variety of scramblers have been available for years. I also know that for one reason or another, you can count the systems incorporating these units on one hand. One thing is certain; the lack of acceptance is not due to the absence of a market. There isn't a Sheriff, Police Chief or Fire Chief who isn't climbing the walls because of the citizen "ambulance chasing" which has proliferated with the advent of commercial monitor receivers. Now I'm not taking sides on the issue of public information, just pointing out an opportunity. By the way, the last FCC annual report indicates that there are over one and one-half million transmitters authorized in the police and fire radio services alone.

THE LOGIC OF BUREAUCRACY?

Recently the FCC issued a notice that Congress had amended the Communications Act with respect to alien restrictions and that it was amending its rules to permit aliens and alien affiliated entities to be licensed in the Safety and Special Radio Services. That's fine, because now a corporation with an alien on its Board of Directors no longer has to go through the silly procedure of establishing a separate paper corporation for the singular purpose of holding an FCC license. Ironically, however, the restrictions against aliens holding a radio-telephone operators license were not deleted. Now does it make sense to you that an immigrant from anywhere in the world who can meet the U. S. technical requirements of his profession, can be authorized to practice that profession, including brain surgery, but he can't get a license to tune a transmitter? Is it possible that the CWA or IBEW is more powerful than the AMA? IEEE, where were you on this one?

TYPE ACCEPTANCE, TYPE APPROVAL, AND CERTIFICATION

If there is a prime area of confusion with FCC rules among design engineers, it seems to be on the subject of equipment authorizations. As noted in the heading, there are three types. These have existed for many years, but more recently the FCC put some teeth into their rules by the addition of paragraph 2.803.

> "In the case of a radiofrequency device, which, in accordance with the rules in this chapter must be type approved, type accepted, or certificated prior to use, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease) or import, ship or distribute for the purposes of selling or leasing or offering for sale or lease, any such radiofrequency device, unless, prior thereto, such device shall have been type approved, type accepted or certificated as the case may be."

Strictly speaking, this means that the common practice of selling a new product while it is still in the breadboard stage is illegal. Furthermore, a recent FCC news release emphasized that displaying non-certified, etc., equipment at trade shows was a violation of Commission rules.

Space prohibits detailing the specific data requirements for the three types of equipment authorization, but the details may be found in Part 2 of the FCC Rules and Regulations. We can, however, make a few basic generalizations of interest to the land-mobile engineer. First, we can eliminate type approval from consideration because it is applicable only to certain special classes of equipment such as radar, microwave ovens, and video equipment operating directly on TV channels.

The primary distinction of the type approval procedure is that an equipment sample must be shipped to the FCC laboratory in Laurel, Maryland for testing by FCC personnel.

Type acceptance applies to devices such as transmitters, which are designed to emit controlled radiation in conformance with the specific technical standards of various radio services. The procedure, however, requires only the submission of test data performed by the applicant in accord with measurement techniques outlined in Part 2. It should be pointed out that the applicant does not have to be the manufacturer, but may be any party who can demonstrate competence in performance of the test requirements. Once type accepted, only limited changes may be made without filing a new application. These are listed in paragraph 2.1001 as follows:

> (1) A Class I permissive change includes those modifications in the equipment which do not change the equipment characteristics beyond the rated limits established by the manufacturer and accepted by the Commission when type acceptance is granted, and which do not change the type of equipment as defined in paragraph (a) of this section. No filing with the Commission is required for a Class I permissive change.
>
> (2) A Class II permissive change includes those modifications which bring the performance of the equipment outside the manufacturer's rated limits as originally filed but not below the minimum requirements of the applicable rules, and do not change the type of equipment as defined in paragraph (a) of this section. When a Class II permissive change is made by the grantee, he shall supply the Commission with complete information and results of tests of the characteristics affected by such change. The modified equipment shall not be marketed under the existing grant of type acceptance prior to acknowledgement by the Commission that the change is acceptable.

Continued...

BOOK REVIEWS

By CARROLL LINDHOLM

BOOK REVIEW EDITOR

MICROWAVE MOBILE COMMUNICATIONS

William C. Jakes, Jr., Editor,

John Wiley & Sons (New York) 1974

For those involved in mobile communications this month's book may be the most significant publication released in recent years. Nicely timed to appear with the turmoil of the initial decision under FCC Docket 18262, the authors have tried to pull together a great deal of the material, primarily from Bell Telephone Laboratories, which will apply to systems in the 900 MHz region and beyond. But don't rush out to buy the volume until you are sure it addresses your interests. If you want to know a lot, both theoretical and practical, concerning propagation to and from a mobile transceiver, about performance of some general antenna types, about modulation methods, about diversity reception techniques, or even about system aspects of cellular systems this volume will be valuable to you. The book has more graphs and equations per page than most engineering books. Whether this is good depends on whether you find your question answered by them. Don't look for design information at the circuit level. It's not there. Don't get too interested in a real commercial cellular system (as I am). General system models are about as specific as we get. The chapters offer numerous excellent references mostly to the published literature. Propagation (the first two chapters) is concerned with models for coping with multipath transmissions and

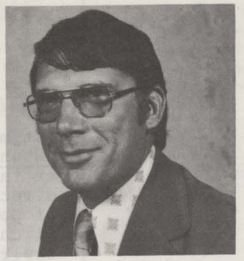
Continued from page 4...

Finally, certification applies to equipment such as receivers, which do not require individual licensing but which may generate radiation. The procedure is basically a simplified type acceptance filing, but requiring submission only of data pertinent to the levels of conducted and radiated RF energy. Details of the test site and measurement technique must either be on file with the FCC or be submitted with the test data. In general, EIA or IEEE standards are accepted. While the operating standards for equipment are set by the bureau responsible for regulating the service in which it is designed to operate, the authorization procedures described above are the jurisdiction of the Office of the Chief Engineer. The application fee for each certification is $150. The fee for each new type acceptance is $200. Information regarding type acceptance may be obtained by calling the laboratory on 301-725-1585. Inquiries regarding certification, and all applications, should be directed to the R.F. Devices Branch at 1919 M Street, N.W., Washington, D.C. 20554.■

estimating received signal strengths. Antennas (1 chapter) are viewed primarily at the mobile end except that the use of directive antennas at both ends and effects of polarization are treated. Modulation (1 chapter) treats primarily FM, noise and their properties under multipath considerations. AM and SSB are discussed but more to justify their dismissal. Digital techniques are reviewed. A variety of multiplexing methods are also discussed. Exactly 148 references complete the chapter. Diversity systems, (2 chapters) rather than bogging down in general settings, gets oriented to space diversity such as might actually be used. Performance of real systems is treated through actual field results reported in some depth. Cellular systems are introduced in the final chapter following a brief side trip into telephone trunking theory and associated measures of efficiency. The grid (square cell) and hex (hexagonal cell) systems receive good treatment reviewing much of what has been written on such systems. Methods of dynamic channel assignment are studied through simulations with interesting measurable results.

This book is not a handbook; it is not comprehensive but on the subjects it treats it is through. Typos are few. The writing style is typical "drab engineering", with little excitement emerging. But there is a lot of meat to nourish the engineer interested in learning how microwaves behave in two-way mobile applications. I recommend the work.■

CHAPTER NEWS



By JOHN DETTRA

CHAPTER NEWS EDITOR

Chicago

"The Implementation of the Spectrum Data Aquisition Van"
John B. Zinkus, FCC, on September 4, 36 attending.

"Electronic Systems in the 1975 Cars"
Claus Haage and Dennis Eade, VW of America, on October 23, 13 attending.

"The Chicago Police Communication System"
William L. Miller, C.P.D. on November 13, 23 attending.

"The Bell System High Capacity Mobile Telecommunications System"
Joseph Enenbach, Ill Bell, on December 11, 37 attending.

"The Future of Mobile Radio"
Martin Cooper, Motorola, on January 8, 55 attending.

Detroit

"Optoelectronics for Automotive Applications" on December 4, 32 attending.

Joseph Cutroneo of Vanzetti infrared and Computer Systems (Canton, Mass.) Described the used of Fiber Optics for remote Detection of High Temperatures.

Terence Brady of TRW, Inc. Camden, New Jersey
Discussed design features of the TRW "Lumenition" Electronic ignition system.

Bill Sahm of General Electric (Auburn, New York)
Reviewed the design tradoffs involved in design of optoelectronic circuits.

"Solving Communications Antenna Problems Through the Use of Site Geometry"
Alex F. Dolgash, Antenna Specialists Co., on Nov 14, 52 attending.

Columbus

"Report on FCC Yellow Sheets"
Paul Krumm, Columbia Gas, on Dec 11, 14 attending.

"The Everglades and After"
Ward Taylor, General Electric, on Jan 8, 21 attending.

Dallas

"Computer Aids for Mobile Radio Systems Design"
Dan Yost, Compucon, on Jan 9, 24 attending.

Philadelphia

"The MITRIX System"
David Willard, Mitre Corp. on Jan 21, 25 attending.

Washington

"Recent Developments in Communications for Emergency Medical Services"
John J. Renner, Advanced Technology Systems, Inc. on Dec 13, 45 attending.

Fort Worth

"VTG members are being included with the Dallas Chapter which has been having many good meetings. Check with Luther Pully, 214/351-1611 for meetings.

Continued...

Toronto

Chapter member were great hosts to the attendees of the 25th Annual Conference. Everyone there enjoyed themselves and we all greatly appreciate the work of the Toronto Chapter.

Los Angeles

Didn't slide in to the Pacific Ocean but is being re-organized. If there are other VTG members in the Los Angeles area who are interested in the chapter organization contact: Sam Lane, 213/974-2204, George Riggins, 213/598-7007, Stafford Schreyer 213/974-2306.

* * *

NEW CHAPTER CHAIRMAN

San Francisco

Robert N. Tellefsen
1170 Chess Drive
San Mateo, California 94404

■■

DENVER-BOULDER VTG
Chapter Established

A petition for the establishment of a Denver-Boulder VTG chapter was begun on July 29, 1974 by John F. Shafer of the National Bureau of Standards, Boulder, Colorado. The signers of the petition included members of the VTG employed by state government, the railroad, local university, private mobile communication consultants, Federal government and the telephone company. With this cross-section of interested members, the petition was unanimously approved by the Denver section Executive Committee on January 15, 1975 and submitted to IEEE headquarters. Miss Emily Sirjane, Manager Field Services, announced on January 23 that the petition had been checked and found to be in order. The official approval of the chapter is expected shortly.

The Denver section of IEEE has been a co-sponsor of the yearly Microwave Mobile Communication Symposium at Boulder since its inception three years ago. The attendance at these meetings has attracted mobile communicators from throughout the United States and Canada. With this background of membership participation in mobile communication activities, it was only proper that a local chapter was started within the Denver section. Geographically this section is unique as its 2500 members are contained in the four state area of Colorado, the western part of Nebraska, the southern part of Wyoming, and the southwest corner of South Dakota. Mobile communication in the remote sectors of these boundaries is a necessity and way of life.

Anyone wishing to become a member or desiring to have more information about the Denver-Boulder chapter of VTG are asked to contact John F. Shafer, 941 Teller Circle, Boulder, Colorado 80303, telephone: (303) 499-6855.

During a break in the APCO Meeting, Shafer discussed plans for the VTG Chapter with communication experts from the area.

Front row (left to right): John F. Shafer, Physicist, National Bureau of Standards; Joseph A. Hull, Associate Director, Institute for Telecommunication Sciences, U.S. Dept. of Commerce.

Back row (left to right): Louis D. Breyfogle III, Communication Consultant, Boulder; Lt. Earl J. Spenard Jr., Jefferson County Sheriff's Department, retiring president Colo-Wyo. Chapter APCO and candidate for 2nd Colorado State Patrol.

AUTOMOTIVE ELECTRONICS

DATELINE: DETROIT

By BILL FLEMING

AUTOMOTIVE ELECTRONICS, Part II

The major event of recent months was the special attention given automotive electronics for the second consecutive year at the annual winter meeting of SAE held in Detroit, Michigan, February 24-28, 1975. Approximately 32 papers were presented on various topics ranging from radar and microprocessors to sensors and connectors. A comprehensive program, designated as Automotive Electronics, Part II, was primarily organized by John Cassidy (GM Research Labs.) of VTG. Other VTG members who worked with John are: George Platzer of Chrysler and Ted Schaller of Allen-Bradley. Total attendance for these five technical sessions on automotive electronics was approximately 750 persons. An informal survey indicated that approximately 1/4 of the attendees were from the electronics industry, 1/4 were from automotive supplier industries, and the remaining 1/2 were from the automotive industry.

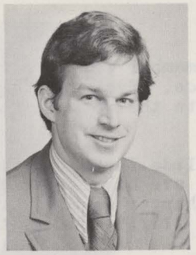
Complete proceedings of the Automotive Electronics, Part II, sessions are also available in a 203-page publication, number SP-393. This publication can now be obtained for $24.00 ($30.00 if nonmember of SAE or IEEE) from SAE Headquarters, 400 Commonwealth Dr., Warrendale, Pa. 15096. If ordered through IEEE, this publication is identified as catalog No. 75CH0976-1VT.

I thought it would be of interest to report highlights of some of the presentations made at this meeting.

Electronic Control of Engines Session
(Approximate Attendance: 250 persons)

•Bob Spilski and Wendell Creps of General Motors Corp. reported a novel system for closed-loop control of a carbureted engine. The system was designed to lock onto the air-fuel ratio "window" at which a three-way catalytic converter will simultaneously decrease HC, CO, and NO_x emissions. Major elements of the system are as follows:

1. Two zirconia exhaust gas sensors, located at different points -- one sensor is installed close to the engine exhaust manifold, and the second sensor is installed at the output of the catalytic converter.
2. A vacuum regulator is used to position a special set of fuel metering rods in a modified four-barrel carburetor. Variation of the electronic actuator signal from 100 to 225 mA causes the metering rods to vary fuel delivery rate into the carburetor venturi such that air-fuel ratio is adjustable between the limits of 14:1 and 17:1.



3. Special control system override functions are included for conditions of wide open throttle, closed throttle, and cold start.
4. A solid-state electronic controller gives the control logic necessary to process feedback signals from various sensors and to generate command signals which regulate air-fuel ratio.

The system utilizes cascaded feedback control loops and includes integral-plus-proportional-plus-lead signal processing functions. Basically, the engine-output exhaust sensor provides speed of response and the converter-output exhaust sensor provides system accuracy. Significant features of this system are:

1. Adaptive automatic calibration was provided by use of the second exhaust sensor which compensated for car-to-car production variations, catalytic converter aging, and cylinder-to-cylinder air-fuel ratio maldistribution of the engine.
2. Vehicle emissions output levels were, at low mileage, reduced to 1978 EPA standard limits. This was done with no loss of fuel economy from 1975 levels (a 4500 lb sedan with a 400 CID engine was used in this work).

Major problems, however, remain to be solved. First, the catalyst three-way performance was found to rapidly deteriorate with age whereupon two-way oxidizing only performance resulted. Second, emissions performance did not surpass the 1978 EPA standard by a margin sufficient to insure certification or to allow for production variability and test repeatability.

•John Camp and Todd Rachel of Bendix Corp. described closed-loop systems for control of engine air and fuel metering. They utilized a technique called integrator limit control to extend the control range of a zirconia exhaust gas sensor to as much as ±1.5 air-fuel ratio away from stoichiometry. This work was done on vehicles equipped with electronic fuel injection. Basically, the system holds the time-averaged value of air-fuel ratio at, for example, a lean value of 16:1. However, it must periodically come back to the stoichiometric air-fuel ratio for brief time intervals to re-check its calibration by locating the transition step of sensor voltage which takes place at this point.

Other control functions described were as follows:

1. Use of a simultaneous "double-fire" method of fuel injection where all eight injectors were fired once for each 360 degrees of crank rotation. This control method gave improved engine transient response of air-fuel regulation during step changes of throttle.
2. A closed-loop air control system was also described where a bypass air valve on the intake throttle body was adjusted in such a way as to maintain constant engine speed. This function is especially important for proper engine warm-up at idle conditions.

Continued...

On-Board Microcomputer Systems Session
(Approximate Attendance: 180 persons)

•R. Oswald, N. Laurance, S. Devlin, D. Moyer, and S. Mangrulkar of Ford Motor Co. presented papers on vehicular microcomputer applications and design considerations.

Moyer and Mangrulkar described the use of a 12-bit word, digital electronic control unit for engine control. Engine spark timing and EGR flow were controlled as a function of engine speed and torque. These variables were optimally adjusted to give best fuel economy without exceeding specified emission levels. A 1975 production Mark IV vehicle showed 10 to 20% improved fuel economy when run on an emissions test cycle, and spark timing and EGR flow were computer controlled. During this test cycle, there was no loss in driveability, octane rating, emission levels, and performance when the computer control was used.

Oswald, Laurance, and Devlin selected the following components for their on-board computer:

1. A custom LSI circuit served as the central processing unit (CPU) of the system. A 12-bit address and data structure was chosen. This was done because a comparison of 8 vs. 12-bit processors for vehicular control tasks showed there was less than 5% difference in memory required between the two processors. The 12-bit gave superior speed and accuracy and permitted a hardware-divide instruction which further improved system speed.
2. The CPU included both RAM and ROM memories -- RAM was used for control calculations and dynamic data storage, whereas ROM was used for non-volatile storage of control programs.
3. The CPU had eight general registers, four addressing modes (to 4096 words of memory) four levels of priority interrupts, and a powerful arithmetic and logical instruction set.
4. Analog inputs to the computer were converted to digital values through an input multiplexer and an integrating 8-bit A/D converter.
5. Engine crank angle was updated every 90 degrees of rotation. Extrapolation functions generated a crank angle signal which had resolution of better than 0.4 degree. This signal was used for spark timing control purposes.
6. The EGR flow value was positioned by a pneumatic actuator which was controlled using interface driver circuits, and a direct digital control loop.
7. System operation was monitored at all times by a hardware default circuit. If defined malfunctions were detected, a series of fail-soft modes were implemented which permitted at least minimum vehicle operations to be retained.

•R. Colling, T. Jones, and T. Schlax of General Motors Corp. described the application of a 4-bit parallel microprocessor to various vehicular control functions. This work was done on the Alpha IV concept vehicle; this vehicle was used to demonstrate that available electronic hardware could adequately perform control functions on automotive vehicles. The following control functions were implemented:

Alpha IV Control Systems and Transducers

Function	Sensor	Actuator
1. Ignition Timing and Dwell Control	A,B	---
2. Cruise Control	C	D
3. Traction Control	C,E	D
4. Wheel Lock Control	C,E	F
5. Displays:		
a. Speed	C	---
b. Odometer*	C	---
c. Trip Odometer*	C	---
d. Clock Time*	---	---
e. Elapsed Timer*	---	---
f. Tachometer*	A	---
6. High Speed Warning and Limiter	C	D
7. Automatic Door Lock	C	G
8. Anti-Theft	H	---

*Display functions (b) through (f) were separately viewed on common readout panel.

Sensors and Actuators:
A = Magnetic Pickup to Detect Engine Speed
B = Manifold Vacuum Sensor
C = Front Wheel Speed Sensor
D = Throttle Positioner Servomechanism
E = Rear Wheel Speed Sensor
F = Brake Modulator (hydraulic)
G = Door Lock Solenoid
H = Door Lock Switch

Electronic Displays Session
(Approximate Attendance: 130 persons)

•Myron Trenne and John Stephan of General Motors Corp. reported a set of performance requirements for automotive electronic digital displays. The following list summarizes their findings.

Parameter	Desired Characteristics
1. Brightness	Able to read in sunlight (requires approximately 200 to 300 foot-lamberts of luminance).

Continued...

2. Contrast	Minimum of 5:1 ratio.
3. Viewing Angle	At least 120 degrees with no more than 25% loss from maximum luminance.
4. Dimming for Night Viewing	10:1 dimming ratio required.
5. Circuit Drive	Multiplexing.
6. Ruggedness	Must survive SAE environmental specifications (e.g., temperature ranging between -40°C and 85°C.
7. Lifetime	At least 3000 hours (equivalent to 10-year vehicular operation).
8. Digit Size	Prefer 0.3 to 0.7 inch height.
9. Output Format	Word legends and numbers, both desired.
10. Color	Prefer white on black, with use of optical filters to obtain desired color.
11. Input Power	Less than 100 mW.
12. Voltage Regulation	Operate over range, 12 V ± 4 V (dc)
13. Electromegnetic Compatibility	Prefer dc over ac, avoid use of rf radio band frequencies
14. Cost	Comparable to mechanical drum indicator (25¢ per digit) -- but can be higher if time-shared displays are used.

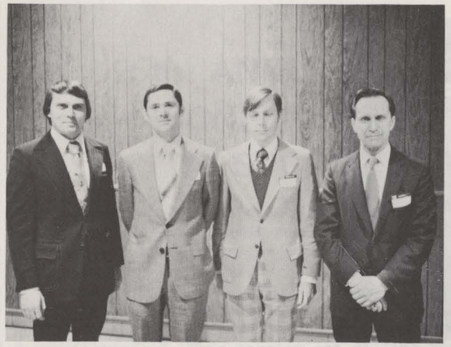
It was concluded that no single display, of the more than nine types now available for evaluation, could satisfy all of the automotive requirements. Upgraded driver circuits are desired which would be integrated into a single package in order to eliminate the number of external connections. Displays must offer pleasing performance and true value to the customer. An example of this need is the use of an adaptive driver circuit which would give fast response for initialization of the display at startup, but then would filter out flicker during normal operating conditions. This type of function is needed, for example, with a fuel level display.

Automotive Radar Session
(Approximate Attendance: 100 persons)

•Mark Krage, Bob Storwick, and Lou Nagy of General Motors Corp. presented two papers on automotive radar.

Mark Krage reported on the use of a binaural radar system which consisted of a centrally located transmit antenna and two outboard receive antennas. By focusing the receive antennas at a common point in front of the vehicle, the radar detection zone was restricted to an area immediately in front of the vehicle. It was concluded that this radar could discriminate crossing traffic and near-miss trajectories from true impact obstacles. Best agreement with theory was obtained for approaching obstacles of small lateral extent. However, for approaching obstacles of large extent, like vehicles, there is a possibility of error due to detection of signals from different scattering centers by each of the receive antennas.

Bob Storwick and Lou Nagy reported on a study of whether different obstacles on the road can be discriminated from other similar obstacles. Radar scattering measurements were made using CW radar which was beamed at both simple target obstacles and at an automobile. All measurements were done in an anechoic chamber. They found, for example, that spheres could be distinguished from cylinders. Analysis techniques of pattern matching, scattering matrix analysis, and doppler mapping were investigated. Microwave scattering data were reported for the following target obstacles: vertical cylinder, sphere, oil drum, corner reflector, stop sign, and an automobile.■



Automotive Electronic Displays Session
(Left to Right)

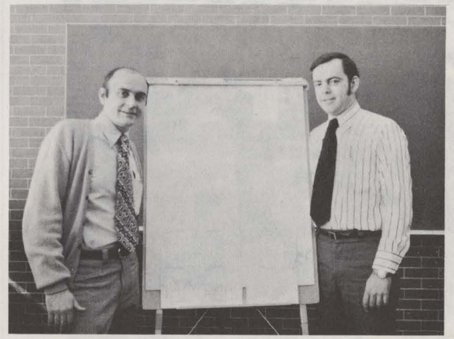
Myron Trenne (GM) -- "Display System Requirements"
Jim Nolan (Owen-Illinois) --"Survey of Displays"
Dave Wayne (Dionics) -- "Driver Circuits for Displays"
Harvey Nissley (Ford) -- "Instrument Panel Display Applications"

Closed-Loop Electronic Engine Controls Session
(Left to Right)

Wendell Creps (GM) -- "Closed-Loop Carburetor Control
Bob Spilski (GM) --
Paul Schweitzer (Optimizer Control Corp) -- "Optimizer for Most MPG at Any MPH"
Todd Rachel and John Camp (Bendix) -- "Closed-Loop Air and Fuel Control"

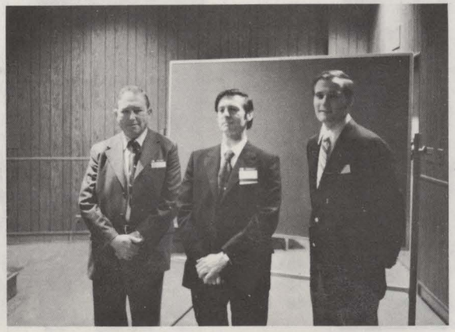
Automotive Electronics Session Organizers
(Left to Right)

John Cassidy (GM), Ted Schaller (Allen-Bradley), George Platzer (Chrysler), Hal Roth (Allen-Bradley), Marv Hartz (United Aircraft).



Automotive Radar Studies
(Left to Right)

Bob Storwick (GM) -- "Automobile Radar Signature Studies"
Mark Krage (GM) -- Binaural Automobile Radar"



Worldwide Progress in Automotive Electronics Session
(Left to Right)

Bob Cohen (RCA) -- "Semiconductor Suppliers Viewpoint"
Larry Phoenix (Lucas) -- "European Report"
Lauren Bowler (GM) -- "Detroit Report"

Exposition Area

Detroit SAE Congress Meeting, February 24-28, 1975.

Award Winning Student Exposition Booth
(Left to Right)

Lawrence Institute of Technology, Detroit, Michigan -- Bill Beck (L.I.T.), Sandy Bidwell (GM -- Student Relations), Tom Mandry (Chrysler -- L.I.T. Advisor)

25th ANNUAL VTG CONFERENCE A SUCCESS

The 25th annual VTG conference held in Toronto, Ontario January 21, 22 was a great success. Chairman Neil McKinnon and his conference staff did a fine job. The total attendance was 261.

The technical program consisted of four sessions, one of which was a panel discussion on "The Future in Vehicular Communications." This session got rolling and was only stopped by the impending dinner hour. Audience participation was heavy.

Abstracts of the papers presented at the technical sessions were carried in the January newsletter. A Conference Digest of all the papers will be mailed to all conference attendees. If you did not attend and want a copy, you can order Digest 75CH0915-9VT from: IEEE Publication Sales, 445 Hoes Lane, Piscataway, New Jersey 08854. The price is $15.00.

At the Tuesday luncheon, the conference was addressed by R. B. Hoodspith, Director General, Telecommunications Regulatory Service, Department of Communications. Mr. Hoodspith's address covered the Canadian land mobile scene today and the DOC's goals for improved service in the future. He challenged everyone to participate and contribute in reaching the goals. A complete text of his talk follows.

Neil McKinnon, Conference Chairman, and Art Dinnin, Technical Program Chairman, pause during a break.

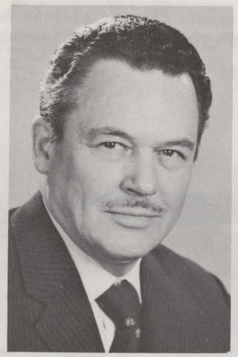
John Dettra presents Chapter-of-Year Award to Southeastern Michigan Chapter's Carl Kolenda

A question from the floor during the panel discussion

Panel Discussion on "The Future in Vehicular Electronics". L to R: Hinton, Eldridge, Higginbotham, Brooks, and Rypinski.

ADDRESS

By R R HOODSPITH



It is indeed a pleasure for me as representative of the Canadian Department of Communications to have this opportunity to speak to you, not only because it is your 25th Silver Anniversary, but also because of the fact that the activities of your group over the past years have contributed so much to the successful expansion of the mobile service which, as you are no doubt aware, is now the largest group of spectrum users in Canada and, I suspect, in the United States also.

I note that the theme of your conference is the "Future of the Vehicular Communications". In keeping with your theme and as the federal authority responsible for spectrum management, I wish to direct my remarks to the future utilization of those portions of the VHF/UHF spectrum occupied by the mobile service. In this regard, some questions come to mind such as:

- are we making efficient use of the spectrum now,
- how much longer will sufficient spectrum be available to meet the increased demands of the land mobile services,
- how do we, in the future, ensure that adequate spectrum is available?

At this juncture it might be timely to review the growth of the land mobile services. According to our records, the demand for mobile services began to increase about 1947 at which time we estimate that approximately 5,000 licenses had been issued. Last year, 1974, there were 212,000 (excluding 100,000) mobile/base OPS stations. It might be worth noting that between 1973 and 1974 an overall increase in applications of 19.7 percent was recorded. I think it is reasonable to state that, although the mobile service has been expanding at a rate much greater than the other services, a relatively stable situation has existed as far as the industry and the users are concerned, and that this has been due mainly to the fact that adequate spectrum and reliable and efficient mobile communications equipment has been available to all applicants. However, in looking ahead, we believe that this stable situation is beginning to change, and that if we continue to use the present spectrum management techniques and existing equipments, and if the rate of growth continues as forecasted, many of the major metropolitan areas will be completely saturated; in other words, the available frequencies will be fully utilized. In this connection, we estimate that this condition will be present in Toronto in 1979, followed by Montreal in 1980, and Vancouver in 1982. Furthermore, the remaining metropolitan areas in Canada, such as Calgary, Winnipeg, Edmonton, etc. will have reached the state of saturation by approximately 1992.

The fact that we are approaching saturation is clearly evident now as at the present time the selection of suitable frequencies, whether they are clear channels or shared channels, is becoming more and more difficult. Furthermore, it is readily evident that if we continue to use existing spectrum management methods for the allocation of frequencies, and if the mobile equipment is to remain as it is now, then we could reach a situation where an applicant would only be able to obtain a license when another license is cancelled. It is obvious that this would be a highly undesirable situation as it would deny service to the public, reduce user equipment requirements, and eliminate the stability that has been enjoyed by both the industry and the users of this service.

Then, as a result of growth, we are faced with a major problem; and that is, the possible lack of spectrum available to the mobile service within the next few years.

Realizing the problem, then, it is quite easy to set an objective. We believe the objective should be to ensure that maximum use is being made of the spectrum in order to extend the period of non-saturation in such a manner that not only will the stability that presently exists continue but also to provide additional time for the intelligent planning of future requirements.

We are confident that this objective can be met; and that in the broad sense, three possible courses of action which could alleviate the impending saturation and ensure continued stability are available:

- the first is to increase the utilization of the spectrum through the introduction of better spectrum management;

Continued...

- the second is by the introduction of technological innovation and system development to permit better use of the spectrum, and
- thirdly, the reallocation of the mobile services to other portions of the spectrum.

The introduction of any or all of these courses of action could be done simultaneously or as the situation demanded. However, for the immediate, I think that you will agree that better spectrum management has the least operational and financial impact on the industry and the user. We estimate that through better spectrum management we can increase the user population in the VHF/UHF mobile services by approximately 100 percent, which in turn would ensure that the present state of stability can continue into the foreseeable future.

Having made this rather bold statement one can ask how will this be accomplished? As mentioned yesterday, over the next three years our department will be developing a national spectrum management system in which, through the use of high speed data acquisition surveillance equipment, designed to provide a total picture of spectrum activity of the VHF/UHF bands in any given geographical area, coupled with the capability of analyzing the EMC aspects of frequency assignment, both feeding into a centralized data base, will not only assure efficient frequency utilization but also improve the response time for the processing and issuance of licenses.

I think you will agree that the statement 'Non-Saturation in the "Foreseeable Future" ' is the key to extending the present state of stability within the service in the fact that such an extension would accommodate the forecasted rate of growth, allow the continued use of existing equipments, and also provide adequate time for the orderly planning, development and introduction of new techniques, equipment and systems, as well as permitting the need for new spectrum requirements to be determined.

In regard to the other two courses of action - technical innovation and systems development and the re-allocation of spectrum - in Canada, as has been in the past, the department will be looking to your group's valuable contribution in the development of all phases of the mobile services. As you no doubt know, many of your member's papers have directly influenced the department's action in connection with vehicular communications. In fact - in our department, in many instances, your papers have become major reference documents. We sincerely trust that this form of valuable technical input will continue and that the list of awards and election of fellows (maybe 1 to 3) will increase as more sophisticated techniques, equipment and systems are researched, developed, produced and introduced to users. Also, it is hoped that in providing this extremely valuable support in your field of interest, you will have uppermost in your deliberations the need to conserve spectrum. If this is the case, then a major step towards the achievement of continued stability will result.

In regard to the third course of action - reallocation of spectrum for the use of vehicular communications - I can only speak with reference to the Canadian scene. The department is aware of certain steps taken by our neighbours to satisfy their requirements. As of this date, we have received a brief on reallocation from the C.R.T. P.B. As mentioned during yesterday's panel, after consultation with all interested parties, we hope to announce a proposal for the sharing of channels 14 to 20 in about 8 months and have the government's position in regard to reallocation of land mobile and TV channels 70 to 83 next year - hopefully before we run into saturation problems.

For the future then, as the responsible agency for spectrum management in Canada, not only will we be putting forth a major effort into this area, but also we will be looking to the continued support so ably provided by your group in the past. I am certain you will appreciate and meet the challenge of the future and in doing so will provide a further 25 years of outstanding contribution to the many activities associated with the developments of vehicular communications within Canada and elsewhere. By doing this, I am confident that we will achieve the stable future we all desire.

R. R. B. Hoodspith

■■

26TH ANNUAL CONVENTION SET FOR WASHINGTON, D. C. . . . MARCH 24-26, 1976

The Washington Chapter of the IEEE Vehicular Technology Group announces that it is hosting the 26th Annual Vehicular Technology Conference.

This most important event will be held at the Statler-Hilton Hotel in Washington, D.C., March 24, 25 and 26, 1976.

A broad spectrum of interests will be served in the program. Technical papers and seminars will include many aspects of land-mobile, marine, aircraft, CB and related automotive electronics. In addition, the conference will feature exhibits by leading suppliers of two-way radio equipment and accessories.

1976 is the bicentennial year and our nation's capitol city promises many varied and interesting activities to keep you (and your lady) entertained.

The General Chairman for the conference is Stuart F. Meyer. For further details, contact him at: RCA, Suite 953, 1901 N. Moore Street, Arlington, Virginia 22209. Telephone: (703) 558-4611.■

PAPER OF THE YEAR AWARD

Jim Mikulski, Chairman - Paper of the Year Committee, announced at the annual convention that the paper "Magnetic Gradient Vehicle Detector" by M. K. Mills has been selected as the paper of the year. This paper was presented at the 1973 annual conference and was published in the August 1974 Transactions. A second place award and two honorable mention awards were also announced. Details on the awards are as follows:

First Prize - Certificate and $250 cash award

Author: Milton K. Mills
"Magnetic Gradient Vehicle Detector"
IEEE Transactions on Vehicular Technology
August 1974, vol. VT-23, no. 3

Second Place - Certificate and $35 cash award to each author

Authors: Robert J. Mayhan
Thomas R. Brinner
James G. Bender

"Synchronous Longitudinal Reference Signal Generation - an Experimental Study of Its Use in Automatic Vehicle Control"
IEEE Transactions on Vehicular Technology
August 1974, vol. VT-23, no. 3

Honorable Mention - Certificate only (2 papers chosen)

Author: D. O. Reudink
"Properties of Mobile Radio Propagation Above 400 MHz"
IEEE Transactions on Vehicular Technology
November 1974, vol. VT-24, no. 4

Author: R. A. Shepherd
"Measurements of Amplitude Probability Distributions and Power of Automobile Ignition Noise at HF"
IEEE Transactions on Vehicular Technology
August 1974, vol. VT-23, no. 3 ■

CONGRATULATIONS TO TREVOR JONES - ELECTED TO IEEE FELLOW GRADE

Effective January 1, 1975 Trevor Jones of General Motors Corp. has been elevated to the IEEE Fellow Grade. This grade is the highest within the Institute and is attained by invitation only. A mark of unusual distinction, it is conferred only upon persons of outstanding and extraordinary qualifications in their particular fields. Each newly elected Fellow receives a certificate and special recognition during IEEE INTERCON in New York City.

Trevor is the only VTG member to receive this high honor in 1975. He was cited for leadership in the application of electronics to the automobile. For the past five years, Trevor has been responsible for overseeing the integration of electronic devices into GM's cars and trucks.

Several specific contributions of Trevor Jones were noted in the award:

- A Phystester - a machine for screening intoxicated drivers. The Phystester displays a sequence of random numbers which the driver must correctly punch-in, in sequence, to start his car.

- The Alpha and Sigma automobiles. As state-of-the-art examples of the miniaturization necessary to the application of electronics to automotive functions, they are to the ultimate computer car what the monstrous computers of 25 years ago are to the modern hand calculator.

  Alpha I, one of the first attempts at controlling an automobile by computer, was a 1971 Pontiac Grand Prix with a central processor about the size of a two-drawer filing cabinet and enough auxiliary electronics to fill the trunk. In all, there were 4,000 electronic components.

  Four years and a batch of Greek-lettered gadgets later, the single digital processor on Alpha V contains only four micro-electronic packages.

- Crash Sensors - An electro-mechanical sensor that triggers air bags in a vehicle collision.

TREVOR OWEN JONES

Trevor Owen Jones was appointed Director of General Motors Proving Grounds on November 1, 1974. Reporting to the Vice President - Engineering Staff, he is responsible for directing the operating of the GM Proving Ground at Milford, Michigan, (4,009 acres), the GM Desert Proving Ground at Mesa, Arizona (4,400 acres), and the GM Pike's Peak vehicle test headquarters at Manitou Springs, Colorado.

Mr. Jones was born at Maidstone, England, November 3, 1930. Prior to moving to the United States in 1958, Mr. Jones completed his formal engineering education at Aston Technical College in 1952 and Liverpool Technical College in 1957. While in England, he was associated with General Electric Company, Limited as a rotary electrical machine and controls engineer for power system applications. During this period he was sent to the United States for six months as an international exchange engineer. Before joining General Motors in 1959, Mr. Jones was Allis-Chalmers Manufacturing Company' project engineer for the Nuclear Ship Savannah, with responsibility for the primary nuclear pumps.

From 1959 to 1950, Mr. Jones was totally involved in General Motors aerospace activities at the Delco Electronics Division in Milwaukee, Wisconsin. During this period, he directed many of their major programs, including head of the B-52 Bombing Navigational System Production Program, Advanced Military Avionic Systems and Apollo Lunar and Command Module Computers.

Continued...

In 1969, he was selected to direct Delco's program at bringing aerospace technology to automotive safety systems. In this position, he was responsible for the development of air bag crash sensors and the experimental physiological testing device (Phystester), which is designed to prevent operation of motor vehicles by motorists who are under the influence of alcohol.

In 1970, Mr. Jones was appointed director of the newly-organized corporate Electronic Control Systems group at General Motors Engineering Staff, GM Technical Center, Warren, Michigan. The group was assigned corporate responsibility for the integration of electronic systems in General Motors vehicles. This responsibility encompasses advanced safety and emission control systems.

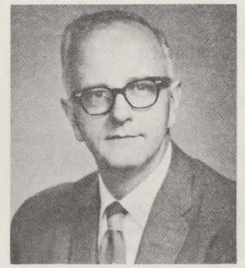
In June of 1972, he was appointed director of Advance Product Engineering, GM Engineering Staff. In this capacity he directed many major engine, vehicle, and component development programs.

He is a Fellow of the British Institute of Electrical Engineers and received its Hooper Memorial Prize for his paper, "Hydrogen Cooled Alternators." He is also affiliated with the Institute of Electrical and Electronic Engineers, and was elected a Fellow by the IEEE in 1975. Active in the affairs of the Society of Automotive Engineers, he is permanent chairman of the SAE's Committee on Passenger Protection, and received their Arch T. Colwell award for his paper "Alcohol Impairment Detection by the Phystester."

Active in civic affairs, Mr. Jones was appointed to the National Motor Vehicle Safety Advisory Counsil by the U. S. Secretary of Transportation in 1971, and elected vice-chairman of the Council in 1972. He is a Trustee of Lawrence Institute of Technology, and member of the Oakland-Macomb Area Council of the Boy Scouts of America. ■

KENNY GUTHRIE LECTURER OF THE YEAR

A. K. (Kenny) Guthrie has been named the VTG Lecturer of the year. The VTG Adcom has made funds available to send the Lecturer to the various chapters who request him. Those chapters interested may contact Mr. Guthrie, General Electric Company, Lynchburg, Va. 24502, (804) 846-7311 Ext. 2711.



INTRODUCING A. K. GUTHRIE

Kenny Guthrie grew up in Bedford, Indiana. Following high school there, he attended Dodge Radio-Telegraph Institute (since renamed Valparaiso Technical Institute) at Valparaiso, Indiana. His first experience in mobile radio was with the Hannibal (Missouri) Police, back in the medium-frequency, AM, era of police radio. He was, at the same time, working as an engineer for Radio Station KHMO in Hannibal.

After serving in the US Army, Kenny joined the Indiana State Police as a communications man in mid-1947. Operating ('phone dispatch, CW and teleprinter) and maintenance assignments were at Indianapolis, initially, and later at Seymour. An intense interest in the rapidly-expanding two-way radio field led to a part-time business in mobile radio sales and service and, eventually, to employment with General Electric Company.

Kenny joined GE as Communications Engineer at the Indianapolis office in November, 1953. Responsibilities included customer relations, service station relations, system design, and sales support. Moving to St. Louis in 1960, he became a Regional Communication Engineer. The work at St. Louis involved application engineering and technical training over much of the mid-West and included "turnup" of full-dial mobile telephone systems in that area.

Moving to Lynchburg early in 1962, he served as product planner. He transferred to Product Service in mid-1963.

In Product Service, Kenny has held a number of managerial positions with involvement in customer relations, service station relations, installation and maintenance planning and supervision, and service center management. Currently Manager, Product Service Engineering, his responsibilities include technical support to field service forces and service training.

A member of IEEE and its Vehicular Technology Group, he has held FCC 1st-class telephone and 2nd-class telegraph licenses since 1944. He has been a radio amateur for the same period, with assigned calls W9LVQ, WØAMC and, currently, WA4JXY. Many of his articles concerning system design and radio frequency interference have appeared in GE publications and trade journals.

Kenny is currently serving on the VTG Newsletter Staff as Communications Editor. ■

ADCOM HIGHLIGHTS

By TOM McKEE
ADCOM NEWS EDITOR

Winter Meeting

The Winter meeting of the VTG Administrative Committee was held on January 20, 1975, at the Royal York Hotel in Toronto, Ontario.

The following people attended the Adcom meeting:

Nick Alimpich	Sam Lane
Bob Bloor	Roger Madden
Carl Brooks	George McClure
Marty Cooper	Tom McKee
John Dettra	Stu Meyer
Bill Elder	Jim Mikulski
Dick Emberson	Don Nelsch
Bob Fenton	Jack Neubauer
Olin Giles	Jack Renner
Joe Jordan	Neal Shepherd

The following elected Adcom members were unable to attend the meeting:

Arnold Brennar	Sam McConoughey
John Cassidy	Dick Moore
Fred Link	

* * *

President Alimpich deferred his report, preferring to discuss the items of importance as they arose.

* * *

The Vice President (Sam Lane) gave a short report which focused on the interlinking of the quality of publications and annual conferences with increased VTG membership. Sam made a number of suggestions concerning ways in which the quality of VTG services could be improved, and additional membership attracted. One of Sam's suggestions, concerning the possibility of VTG, obtaining government grants for certain activities, was discussed in more detail. It was concluded that VTG might be able to qualify for grants in connection with the sponsorship of certain types of conferences or meetings. It was felt that VTG might be able to make a positive contribution in certain areas with this type of activity.

* * *

Bill Elder gave the Treasurer's report. He indicated that VTG continues in good financial health, with income about as budgeted but expenses up slightly from the budgeted amounts. In connection with Bill's report, there was discussion of VTG's lack of financial involvement in two conferences in which VTG participates. The pros and cons of financial involvement in the Convergence '75 and the Carnahan Crime Conference were discussed, but the Adcom took no action to increase financial involvement in these conferences.

* * *

Joe Jordan gave a short report concerning the Toronto Conference. The statistics he referenced indicated that a successful conference was likely.

* * *

John Dettra discussed Chapter Activities. Emphasis was placed on selection of a new Lecturer-of-the-Year for VTG. Ken Guthrie's good articles in the Newsletter led to his consideration for this position, and he was selected. Local chapters wishing to have Ken appear at one of their meetings should make arrangements directly with Ken.

* * *

The progress of a program to solicit members for VTG via a direct mailing to 2000 likely prospects was briefly discussed.

* * *

Jack Neubauer reported on the work of the awards committee with emphasis on the need for Adcom and membership involvement in the nomination of candidates for Honorary membership. To be considered for this honor, a candidate must: (1) Have made a significant technical contribution in the field of vehicular technology, (2) Have a history of service to IEEE and/or VTG, and (3) Be a 5 year member of VTG.

* * *

An updating of the VTG Bylaws was mentioned. Bob Bloor agreed to chair the Constitution and Bylaws Committee, and get the work underway.

* * *

Future annual VTG conferences were discussed. Stu Meyer reported that the 1976 conference would be in Washington, D.C. during the third week of March. Possible locations for the 1977 conference were discussed, but no selection was made.

* * *

In the publications area, there was extensive discussion of steps which could be taken to improve the flow of papers, which provide the bulk of the material published in the VTG Transactions. Moves to decrease the time from submission to publication were suggested as being important in getting authors to favorably consider the VTG Transactions as a medium for the publication of their papers. Goals of three months for the first review of the paper and 9 months to publication were suggested. These were considered reasonable goals by the Publications Committee members. Each of the three Associate Transactions Editors reported on the status of papers in his field.

Continued...

* * *

Neal Shepherd reported on activities in the standards area. The most significant item concerned the availability of a new standard covering personal and portable radio equipment (RS-316A) from EIA, 2001 Eye Street, N.W., Washington, D.C. 20006. The price is $4.70 each.

* * *

In the Emergency Medical Services area, the Adcom voted to help organize an EMS equipment display at an upcoming EMS meeting in Omaha, Nebraska.

* * *

Jim Mikulski reported on the selection of the VTG Paper-of-the-Year. Details on this award are reported elsewhere in this issue of the Newsletter.

* * *

There was extensive discussion of VTG's involvement in the Transportation Systems field. While there have been a number of articles in the Transactions covering this field, other VTG activities in the field have been at a very low level. The number of IEEE members interested in the field is large, but they do not seem to have found a home in any one of the Groups or Societies. The number of VTG members interested in this field is thought to be quite low compared to the number interested in either the vehicular communications or automotive electronics fields. An ad hoc committee of Fenton, Cooper, Renner, and Elder was appointed by President Alimpich to investigate the feasibility of increasing VTG's involvement in this field.

* * *

The Adcom elected the following as VTG's officers for 1975:

President	Nick Alimpich
Vice President	Sam Lane
Treasurer	John Cassidy

President Alimpich asked Tom McKee to continue to serve in the appointed position of Secretary.

* * *

Your AdCom in Session. L to R: Bloor, Shepherd, Dettra, Fenton, Meyer, Nelsch, Madden, Neubauer, Lane, Alimpich, McKee, Elder, Renner, McClure, Brooks, and Emberson (IEEE Headquarters). Cooper absent at time of photo.

MEET NEW ADCOM MEMBERS

FRED LINK

INFORMAL BIOGRAPHY OF FRED M. LINK, FELLOW IEEE, AND MEMBER OF VTG ADCOM

Fred has been around so long that many industry people forget that he initially 'retired' or thought he did, in 1950 when he sold Link Radio Corporation -- this being 25 years ago. He has un-retired himself several times since, and Fred is still very active on a full time schedule as an independent Consultant, active in the Land Mobile and related field, with a number of key accounts.

Born October 11, 1904 in York, Pennsylvania -- a Pennsylvania Dutchman, he will celebrate his 45th anniversary in June, 1975 with Mildred Coover Link, another York native. His surviving daughter, Joanne Link Sotres, heads up her own business in New York City. Another daughter, Daryl Link Morrow, died suddenly six years ago.

Early educational effort for Fred Link was limited to York High School in the very valuable 'Industrial Course' that combined classroom work with field work as an apprentice electrician -- ultimately completing a five year program as a journeyman electrician -- a program that had a lot to do with his later success. Fred graduated from Penn State in 1927 with BSEE credit. He is a member of Eta Kappa Nu and Tau Beta Pi honorary fraternities, and Pi Kappa Alpha social frat.

Possibly the most important stepping stone after Fred's early work as a regular electrical apprentice was his association with the Boy Scouts where, striving to become one of the very first Eagle Scouts in Pennsylvania, he developed an interest in amateur radio. This was in 1917, during World War I. His first amateur call was 3OV, a non-sync spark system -- this led to 3BVA, a CW effort from about 1921 through 1927. After graduation from Penn State, and the move to New York to work with the New York Telephone Company, the amateur effort with W2ALU, in association with John Knight (just recently retired NBC Chief Engineer in Los Angeles), led Fred to leave the Telephone Company and move into the field of radio communications. This was in early 1928.

The first direct effort in commercial radio was the association with DeForest Radio Company, under Dr. Allen B. DuMont, the Chief Engineer of the Company. From 1928 through 1930, as Engineer of the Power Tube Division of DeForest Radio, the very important lifetime association with Dr. DuMont started. In 1931, with the liquidation of DeForest Radio during the 'depression' of that era, Dr. DuMont, along with practically all his engineering staff, left DeForest and went out on their own. This was the beginning of Link Radio. For the next twenty years, Link Radio activity progressed ..... till 1950. Then, the Corporation -- now an accepted success in the industry -- was sold by the sole owner, Fred Link, with the intention that retirement was in order. In this twenty year span, Link Radio followed through on the DeForest Radio experimental mobile trials of 1928-29 and soon became known as one of the then major producers and marketers of 'Two Way Radio' equipment -- at the initial stages, Police 1600-2500 KHz AM systems; later the 30-40 MHz AM systems; and by 1937, the initial FM effort, developed in conjunction with Dr. Dan Noble, who at the time was Consultant to the State of Connecticut Police. This has been accepted as the first totally successful FM Communications System applied to Emergency and Public Safety requirements. The success of this initial FM Radio System had a lot to do with the important steps taken by the U.S. Signal Corps and Navy in utilizing FM for basic military communications in World War II.

After World War II, Link Radio exploited know-how in the field and became the first commercial group to produce and offer 450 MHz mobile radio systems in the industry. This was in 1947-48. At this same time, in conjunction with DuMont Laboratories, the early designs and the production of both VHF and UHF Television transmitters for DuMont helped expand the interest in TV on a national basis.

Following Fred's move to retire in 1950, he began a new association with DuMont, as Director of Operation, Mobile Communications, for DuMont Labs. He held this position between 1953-1959. This was followed in turn by a six year tie as Consultant with RCA Corporation, through 1965. The past ten years to date have been exploited as an independent Consultant in the mobile radio and related industries.

During the move up the business ladder, Fred Link became involved with American Saddle Bred Show Horses. Under Robin Hill Stable and Robin Hill Farm, he has been successfully raising, training and showing saddle horses with rather acceptable success, including fourteen national AHSA titles. Most of the championship showing was handled by daughters Joanne and Daryl, between 1947-1965. Also in this same period, a minor activity in politics included a three term, nine year, elected position as Mayor of the Borough of Westwood, New Jersey.

Although not currently an active 'amateur', there are rumors that Fred will again get back on the air, providing time permits. Currently, a major off-beat activity is the Radio Club of America, the pioneer and granddaddy of all Radio Societies. As a Fellow and as President of the Club for the past seven years, the international activity and interest in the Club have required most of Fred's spare time and effort.

In addition to the Radio Club of America, membership is maintained in other related societies, such as IEEE, VWOA, DeForest Pioneers, APCO and AHSA -- all of which have accorded special honors of one type or another.

Robin Hill Farm, the horse breeding and training facility located in Hunterdon County, New Jersey, is the main point of operation for Fred Link these days.

Fred M. Link,
Fellow - IEEE
Hon. Life Member VTG
Pittsdown, New Jersey
08867 ■

BIOGRAPHICAL SKETCH
Samuel R. McConoughey

Just named by the Federal Communications Commission as Chief, of the Mobile Services Division of the Common Carrier Bureau, Mr. McConoughey previously served as Supervisory Electronics Engineer for the Industrial and Public Safety Rules Division of the Safety and Special Radio Services Bureau since joining the Commission in 1971.

Previously, he was Assistant Director of Marketing for Northrop/Page Communications Engineers, Inc., where he headed a department of engineers, cost accountants, and support personnel. He participated in many of the company's world-wide communications-electronics projects from 1965-1971.

Prior to 1965 he held various engineering and marketing assignments with LTV-Continental Electronics Manufacturing Co., Prodelin, General Electric Company, Michigan-Wisconsin Pipeline Co., and AT&T Long Lines.

During World-War II he served with the U.S. Navy as an Aviation Radioman and later with the Iowa National Guard and U.S. Army Reserve, including a MOBDES assignment as captain with the Siganl Corps Engineering Agency.

Sam has been active in IRE and IEEE activities since 1946. He was Chairman and founder of the IRE PGCS Chapter in Syracuse, N.Y. In the late 1950's,he was Chairman of the Southwest-IRE and IEEE convention entertainment activities. He is also a member of the Radio Club of America and Washington Technological Society.

Born in Melvin, Iowa, Mr. McConoughey received his Bachelor of Science degree in Electrical Engineering from Iowa State College. He is a Registered Professional Engineer in Iowa and Texas and has held FCC Commercial Radiotelephone and Radiotelegraph licenses since 1942. He is a private pilot and former radio amateur.

Sam and his wife, the former Helen James of Des Moines, Iowa, are the parents of six children and make their home in Gaithersburg, Maryland. His hobby interests include photography, camping and gardening.■

CALL FOR CANDIDATES FOR NOMINATION

In accordance with Part 2, Section 2 of the Vehicular Technology Bylaws, this call for candidates for nominations for the election to the Administrative Committee (ADCOM) is being provided to the entire group membership. On January 1, 1976, five newly elected members will be seated on the ADCOM for a three year term and will participate in the first ADCOM meeting in Washington, D.C. during March, 1976.

Any member of the VTG is eligible for election to the ADCOM and may submit his name, or have his name submitted, providing he meets the following criteria:

1. He shall be actively engaged in or interested in the "field of interest" of the VTG.
2. He shall be able to attend all scheduled meetings each year of the ADCOM. The location and time of these meetings is determined by the ADCOM.
3. He shall be willing and able to participate in some ADCOM sub-committee activity.
4. All candidates shall provide the Nominating Committee Chairman a 150 to 200 word summary of their IEEE and professional background by May 15, 1975.

The name, including address, business affiliation, and telephone number of any person to be considered for nomination shall be submitted to the Chairman of the Nominating Committee before May 15, 1975. The slate of nominees (at least 10 members) will be prepared by the Nominating Committee and presented to ADCOM for its acceptance at the June, 1975 ADCOM meeting.

Nominating Committee Chairman,
R. E. Bloor
24338 Smith Avenue
Westlake, Ohio 44145
Telephone: 216*777-2999 ■

EDITOR GOOFS

Reference: January issue, page 9, Radio Club of America photo -- Chan Rypinski was mistakenly not identified as a VTG member. Chan has been an active VTG member for years. My apologies to him for this omission.

* * *

Reference: January issue, page 13, ADCOM Members --- The term of Brenner, Cassidy, Meyer, Neubauer, and Shepherd was indicated as ending 12-31-74. This date should have been 12-31-76. Incorrect information was received from IEEE Headquarters.

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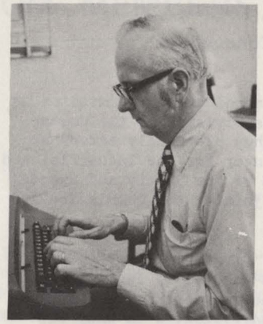
CAPTURE EFFECT
A REVIEW OF PRINCIPLES

By A. K. GUTHRIE
COMMUNICATIONS EDITOR



In the early days of FM, the so-called "capture effect" was a source of great wonderment. If you read the early history of our business, you'll learn of repeated demonstrations which proved the point. Two co-channel stations would be set up several miles apart and a mobile receiver taken to some "magic point" in-between. The mobile would be shifted a few feet, and the receiver would seemingly switch from clean output from Station A to clean output from Station B.

Capture is the communication man's best friend! We use it to pack 'em tighter--to do more communicating per megahertz per square mile. We use it to communicate in the presence of interference. We use it to minimize pain and strain on the user--we let him hear the better of two signals instead of an unintelligible mixture.

Capture effect can work against us, too. Capture effect, plus an interfering signal, can completely obliterate a desired signal which would, otherwise, be quite useful.

There are equipment-related factors which make for clean capture. There are system-related factors which enhance clean capture. There are tricks in system design which exploit the capture effect, and there are pitfalls to be avoided. To appreciate the applications, we must understand the mechanism. Like 'most everything else, capture effect isn't as simple as it looks at first glance. On the other hand, it isn't as "far out" as some treatments tend to indicate. Let's shed some light on the subject.

We talk of capture in terms of a power ratio between desired signal and undesired signal, which allows us to use the desired in the presence of the undesired. Assuming both signals are above the threshold established by receiver sensitivity and the site noise ambient, their absolute levels are not germane. You have the same degree of capture with 10 uV Vs. 5 uV (6 dB) as with 3.0 uV Vs. 1.5 uV (also 6 dB). Table I shows capture effect in practice.

Power Ratio	Observations
Less than 6 dB	NO capture. Forget it!
6dB-10dB	Capture starts. Lessening degradation with increase in ratio.
10 dB	Capture virtually complete.
More than 10 dB	Undesired is virtually obliterated.

Table I. CAPTURE EFFECT SUMMARIZED

Our first pass at the explanation is graphical. We work with Figure 1. We show a desired signal, B, and an undesired signal, A. These signals are not at the same level. Signal B is shown at twice the voltage of Signal A. A voltage ratio of 2 corresponds to 6 dB. The power level ratio, desired-to-undesired, is 6 dB. Signals A and B are not at the same frequency. We show 12 cycles of Signal B. We show only 11 cycles of Signal A during the same time interval.

Next, we show the effect of combining Signals A and B, just as happens when the two signals getinto the same receiver. We obtained the waveform marked "A + B Before Limiting" by plotting the algebraic sum of the values of A and B at many instants within the time interval represented.

There is anobvious amplitude variation. The highest peak voltage which helps to trace the envelope occurs at instants when both Signal A and Signal B are at maximum in the same direction. The troughs in the envelope occur when both Signal A and Signal B are at maximum but in opposite directions. The voltage at the peaks is the voltage of A plus the voltage of B. The voltage in the valleys is Voltage B minus Voltage A.

Common misconceptions notwithstanding, a typical FM discriminator DOES respond to amplitude variations. If we present the waveform "A + B Before Limiting" to the typical FM discriminator, we will hear the beat note which is traced by the envelope.

Continued...

The beat frequency, by the way, is equal to the frequency difference--in this case, Frequency B minus Frequency A.

In practice, we run received signals through heavy limiting before presentation to a discriminator. We show a typical limiting level at 3 in Figure 1. The limiters "chop off" those peaks which exceed the established limiting level. After limiting we give the discriminator a waveform like the one marked "A + B After Limiting." This waveform is free of amplitude variations. The amplitude variation corresponding to the beat frequency is gone.

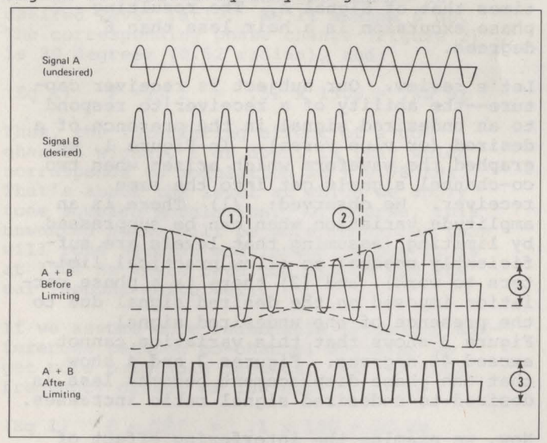


Figure 1. Capture Effect in Graphical Form. Signal Radio, 6 dB

The beat is suppressed because the limiting level is lower than the voltage at the troughs in the combined signal. If Signal A and Signal B were at identical levels, the beat could not be suppressed. In such a case, the voltage in the troughs could fall to zero. We don't know how to limit to zero voltage and still get something through the system!

Sometimes, we want to listen to the combination of two nearly-equal signals, as when we're in the "overlap" area between base transmitters in a multi-transmitter personal radio system. Receiver limiters cannot suppress the beat. Instead, we must eliminate the beat by eliminating the frequency difference. This calls for ultra-precise frequency control--more about this later. It also calls for phase equalization of the audio facilities which feed the two transmitters. We return, now, to the general case.

Although the waveform "A + B After Limiting" is free of amplitude variations, it is not free of variations in frequency or phase. The frequency (over a long time period) is that of the capturing signal, Signal B. There are 12 cycles in the combined wave--count 'em! But, the zero crossings do not occur at the same instants as do the zero crossings in sinusoidal Signal B. We indicate the instants of maximum offset at 1 and 2. At 1, zero crossing in the combined signal lags that of Signal B. At 2, zero crossing in the combination leads that of Signal B.

At these instants of maximum phase difference (comparing zero crossings of Signal B to those of the combined signal), the phase difference is 30 degrees. Restated, the phase of the combined signal departs from that of the desired signal by 30 degrees, maximum. As we will see later, the misery created by co-channel interference is related to, among other things, the magnitude of this phase difference.

We obtained a 30 degree phase difference because we used 6 dB (2-to-1 voltage) as the desired-to-undesired ratio in our example. Different ratios of desired-to-undesired will yield different phase changes, but never more than 45 degrees.

To see the relationship between signal level ratio and the resulting phase displacement, we shift from graphical representation to vectors.

The relationship shown by the graphs of Figure 1 is repeated in Figure 2, this time in vectorial form. Signal B is represented by Line B. The length of Line B corresponds to the voltage of Signal B. We visualize line B to be rotating, counter-clockwise, tethered at its left end,at a rate corresponding to the frequency of Signal B. Signal A is represented by Line A. The length of Line A corresponds to the voltage of Signal A. For our 6 dB ratio, the voltage (and thus the length) is one-half that of B. We visualize Line A to be rotating counter-clockwise at a rate corresponding to the frequency of Signal A, while hanging on to the moving right end of Line B.

The dotted circles trace the relationships which can exist between A and B as the whirling dervish operates. A can add to B, A can subtract from B and A can be anywhere in-between.

In Figure 2, we show the resultant A + B at the two specific instants which are marked in Figure 1. The phase of the resultant A + B is retarded (at instant 1) or advanced (at instant 2) from the phase of desired Signal B. The displacement is maximum when Signal A is at right-angle to Signal B. For a 6 dB ratio, the angle (and, therefore, the phase displacement) cannot exceed 30 degrees.

Figure 3 shows the limit on phase displacement when we combined a desired signal with an undesired. Signal A is equal in level to Signal B; the desired-to-undesired ratio is 0 dB. Again, maximum phase displacement occurs at instants,such as that shown, when the forces are at right angles. The angle, and corresponding phase offset, is 45 degrees. More than that, you just can't get!

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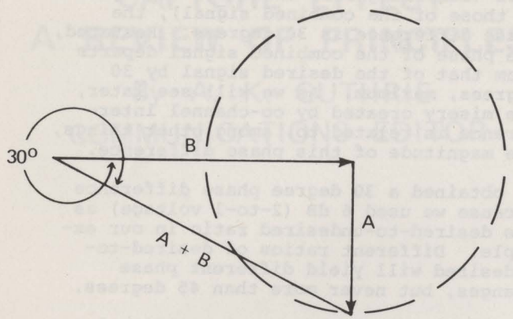
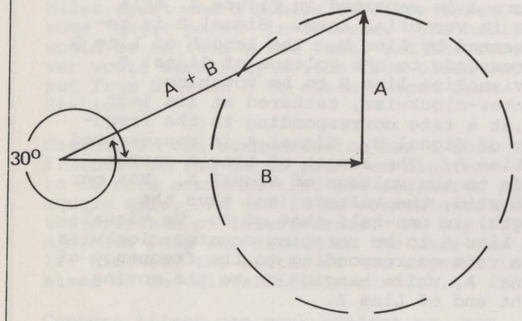


AT INSTANT 1



AT INSTANT 2

Figure 2. Capture Effect in Vectorial Form. Signal Ratio, 6 dB

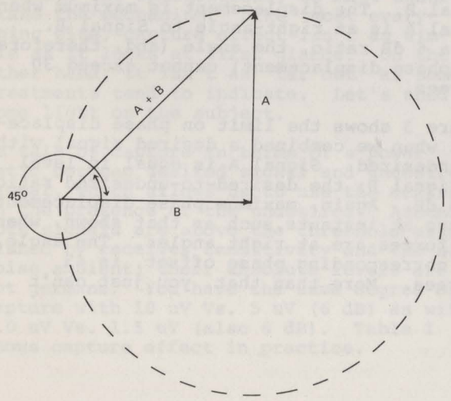


Figure 3. Combined Signals. Signal Ratio, 0 dB

We've already pointed out that equal levels of desired and undesired are a hopeless case. The receiver limiters can't clip off the amplitude variations since the envelope of combined signals can reach zero voltage. Nevertheless, the maximum phase displacement which results from an equal-level interfering signal is 45 degrees. As we'll see later, 45 degreesdoes not, in itself, create an impossible situation.

As the desired-to-undesired signal ratio becomes large, the resulting phase displacement becomes small.Figure 4 illustrates a 20 dB ratio. The voltage of Signal B is ten times that of Signal A. The resulting phase excursion is a hair less than 6 degrees.

Let's review. Our subject is receiver capture--the ability of a receiver to respond to an undesired signal in the presence of a desired (or vice versa). In Figure 1, we graphed the waveform which arises when two co-channel signals get into the same receiver. We observed: (1) There is an amplitude variation when can be suppressed by limiting (assuming that levels are sufficiently unequal to allow practical limiters to work), and (2) there is a phase variation imposed on the desired signal due to the presence of the undesired signal. Figure 3 shows that this variation cannot exceed 45 degrees. Figures 2 and 4 show that the phase displacement becomes less as desired-to-undesired signal ratio increases.

Now, we examine the interfering effect of this phase displacement. We start with the general description of phase modulation:

(Equation 1) $\Delta F = \Delta\phi f$, where

ΔF = the $\pm$ modulation swing in Hz

$\Delta\phi$ = the $\pm$ phase change, in radians (1 radian = 57.3°)

f = the modulating freq in Hz.

In assessing the impact of the interference the phase change of concern is that which was added to the desired signal by the undesired signal. The "modulating freq" for this purpose is the difference between the Frequency of Signal A and that of Signal B. If the two signals are exactly equal in frequency, their difference is zero. In Equation 1, when f = 0, the resulting FM modulation is also zero; the effect on the desired signal is nil. This supports an obvious conclusion: for best capture, keep co-channel transmitters as nearly as possible to the same transmitting frequency.

Now, a practical example. Assume co-channel high-band transmitters. The FCC-imposed frequency tolerance is 5-parts-per-million. We'll assume one at the high

Continued...

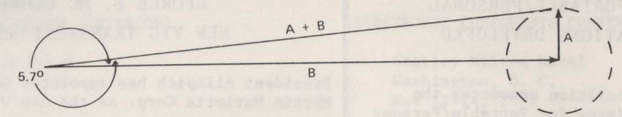


Figure 4. Combined Signals. Signal Radio, 20 dB

end of tolerance the and other at the low end. Therefore, the frequency difference is 10 ppm or about 1500Hz. The phase change is related to the desired-to-undesired level ratio. We'll assume 6 dB. The corresponding phase change (Figure 2) is 30 degrees (0.52 radian), and:

(Eq 1) $F = \Delta\phi f = .52 \times 1500 = 780$ Hz

Thus, the interfering effect of a co-channel signal, 6 dB down, is that which corresponds to modulation at $\pm$ 0.78 KHz. That's about the level at which we apply tone squelch modulation. Of course, this unwanted noise will be more obnoxious than will tone squelch modulation, since it is at 1500 Hz where both the system and the ear respond quite well.

If we assume more reasonable frequency differences between co-channel signals, we get more palatable results. With a total frequency offset of 100 Hz:

(Eq 1) $F = \Delta\phi f = .1 \times 100 = 10$ Hz

Our final example involves combination of two signals of equal level.No "capture" takes place. However, the receiver output, such as it is, is degraded by a product created through simultaneous presence of two signals. The magnitude of this degrading component becomes very important when we attempt to listen within the overlap areas in a multi-transmitter system. We've already noted (Figure 3) that the phase change resulting from equal signals (0 dB ratio) is 45 degrees (0.78 radians). Assuming 100 Hz total frequency difference between the transmitters, we have:

(Eq 1) $F = \Delta\phi f = .78 \times 100 = 78$ Hz

We've now shown quite a range of examples, each obtained by plugging different assumptions into Equation 1. The audio which a receiver delivers after demodulation of the desired signal is degraded by an undesired (noise) product which is introduced by the undesired. We've defined this noise product in absolute terms. It is equivalent to the output which would be produced in the receiver by modulation, when the modulating frequency is the frequency difference, and the modulating deviation is that we calculated using Equation 1.

A certain frequency difference between co-channel transmitters, and a certain desired-to-undesired signal ratio produces a certain undesired component in the output of the receiver. For a 6 dB ratio and 100 Hz frequency difference, the undesired component is equivalent to that produced by a 100 Hz tone at $\pm$ 52 Hz (0.052 KHz) modulation deviation. For a 6 dB ratio and 1500 Hz frequency difference, the undesired component is equlvalent to modulation at 1500 Hz with deviation of $\pm$ 0.78 KHz.

How important is this degrading component? We already know an absolute level, so we compare it to the modulation of the desired signal. Compared to desired modulation at an average deviation of $\pm$ 3 KHz, a $\pm$ 0.78 KHz component is down by 3.8 times or only 11.5 dB. At the 1500 modulating frequency of the "noise", noise down only 11.5 dB is pretty potent! If, however, we consider the same degrading component in an FM broadcasting situation where average modulation may be $\pm$ 40 KHz, the "noise" is down by 51 times or about 34 dB.

You may have observed that the FM broadcasters seem to get sharper capture than we do. 'Tis true, but there's no black magic. We both deal with the same degrading influence which isdetermined by signal ratio and frequency offset. We degrade from $\pm$ 5 KHz peak deviation. They degrade from $\pm$ 75 KHz. They start with an advantage of 23.5 dB!

Now, another almost obvious observation. For capture with minimum degradation from the co-channel undesired signal, keep the average modulation of the desired signal as high as you can. Each dB increase in desired signal modulation level is a dB more in capture.

Capture is a valuable tool in system design. Really, it is about all that prevents chaos. When transmitter frequency difference is held to 100 Hz, the effect of an interfering signal which is only 6 dB down is to create "noise" which is 35 dB down from the desired output. 6 dB to 35 dB is real leverage!

To make maximum use of capture effect, push in these directions:

Get good limiting in your receivers so that amplitudevariations are wiped off, ahead of the discriminator. Keep IF gain where it belongs.

Minimize frequency difference between co-channel transmitters. Operators of systems with overlapping transmitters should approach frequency setting with precision.

Keep average modulation up. The noise component generated by a co-channel signal is fixed. The modulation of the desired signal establishes the signal-to-noise ratio.■

REVISED STANDARD FOR PORTABLE/PERSONAL LAND MOBILE COMMUNICATIONS DEVELOPED

The Electronic Industries Association announces the new revision of "Minimum Standards for Portable/Personal Land Mobile Communications FM or PM Equipment 20-1000 MHz," RS-316-A. RS-316-A was developed by the EIA Engineering Department's TR-8.13 Subcommittee on Personal and Portable Land Mobile Communications Equipment, headed by Randall J. West of Motorola.

The revised standard is designed to improve the organization of the original document, bring it up to the present state-of-the-art, reduce the number of differences between RS-316 and other standards covering mobile communications, and incorporate methods of measurement covering important performance parameters not covered in the original RS-316 standard.

The new RS-316-A will provide the user and manufacturer of portable and personal radio communications equipment with a modern standards document covering both methods of measurement and minimum performance standards.

Among the industrymen making key contributions in the revision of RS-316 were Hugh Barnes of E. F. Johnson Co., Norm Mortensen of RCA, Inc., and Fred Mann of General Electric Company.

The parent committee of the Personal and Portable Land Mobile Communications Equipment Subcommittee is the EIA TR-8 Land Mobile Engineering Committee. The TR-8 committee has 6 other standing subcommittees covering electronic equipment (and antennas) used in the land mobile services.

RS-316-A as well as the other standards are available from the EIA Standards Sales Office. RS-316-A costs $4.70 per copy. Orders should be addressed to Standards Sales Office, EIA, 2001 Eye Street, N.W., Washington, D.C. 20006. An Index of EIA and JEDEC Standards and Engineering Publications is also available free from this office.

(Editors Note: A complete listing of the EIA standards covering the land mobile communications field was carried in the January issue of this newsletter.)■

GEORGE F. MC CLURE NAMED NEW VTG TRANSACTIONS EDITOR

President Alimpich has appointed George F. McClure of Martin Marietta Corp. as the new VTG Transactions Editor. In this capacity, George will head the VTG Publications Committee (PUBCOM), where he will carry the overall responsibility for the VTG Transactions and Newsletter. A short biography follows.

* * *

George F. McClure heads the Systems Analysis group for Martin Marietta Corporation's Communications and Electronics, participating in the development of proprietary telecommunications systems. His activities include mobile telephone system design, computer-controlled switching, and emergency communications, including motorist aid and '911' system design. He is the author of filings dealing with land mobile radio service in the 900 MHz band, and the co-author of two patent disclosures covering system techniques for mobile telephone service.

Earlier, he developed a system concept providing telephone-type multiple access discrete address radio communications within a tactical military force, defined a multi-channel digital signaling communications device with military and law enforcement applications, and developed a system concept and design for both radio net and telephone-type service in naval amphibious operations.

George has served as chairman of the Orlando chapter of the IEEE Communications Society and has recently organized a new chapter for the Vehicular Technology Group within the Orlando section. He received the Bachelor of Electrical Engineering degree in 1954 and the Master of Science in Engineering in 1961, both from the University of Florida. He has completed additional courses in communication theory, mathematics analysis, and computer programming and has published papers on vehicular communications and amphibious communications.

George also serves on the Land Mobile Services subcommittees of the Electronic Industries Association, dealing with System Standards and Selective Calling. He has remained active in the Naval Reserve, working in the areas of Oceanography and Antisubmarine Warfare, and most recently as Command Duty Officer for a Naval Air Reserve Staff and as Administrative Officer for a Naval Air Station organization. He currently holds the rank of commander.■

CONFERENCES

IEEE INTERNATIONAL CONVENTION (INTERCON)

Coliseum & Americana Hotel
New York, New York
April 8-10, 1975

* * *

INTERNATIONAL CIRCUITS AND SYSTEMS SYMPOSIUM

Marriott Motor Hotel
Newton, Massachusetts
April 20-23, 1975

-- Electronic circuit design for both active and passive circuits in low frequency, intermediate, and microwave areas. State-of-the-art presentations in the design of mechanical and crystal filters are included.

-- Computer aided design techniques, including procedures for optimizing manufacturing tolerances to maximize yield and minimize cost. The impact of automated techniques for effective tuning and testing procedures to improve yield and minimize repair is discussed in detail.

-- The growing interest in digital filtering concepts, applications, and hardware is also well represented.

-- In the rapidly developing microprocessor area, both tutorial presentations and in-depth application sessions are being held.

-- Developments in the analysis of systems and networks of various complexity will be presented.

* * *

RADAR INTERNATIONAL CONFERENCE

Washington, D.C.
April 21-23, 1975

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OFFSHORE TECHNOLOGY CONFERENCE

Astrohall, Astrodome
Houston, Texas
May 5-8, 1975

* * *

CARNAHAN CONFERENCE ON ELECTRONIC COUNTERMEASURES

Carnahan House
Lexington, Kentucky
May 7-9, 1975

-- The theme of the conference is safety, security, and protection of person and property of the private citizen. Topics of the coverage: EDP security, police systems, automatic vehicle monitoring, contraband detection, alarm systems, personnel identification, security equipment standards, and progress reports of current research and development work.

ELECTRONIC COMPONENTS CONFERENCE

Statler Hilton Hotel
Washington, D. C.
May 12-14, 1975

* * *

29TH ANNUAL FREQUENCY CONTROL SYMPOSIUM

Atlantic City, New Jersey
May 28-30, 1975

-- Topics: Fundamental Properties of Natural and Synthetic quartz, Theory and Design of Piezo electric Resonators, Resonator Processing Techniques, Filters Quartz Crystal Oscillators and Frequency Control Circuitry, Atomic and Molecular Frequency Standards, Laser Frequency Standards, Frequency and Time Coordination and Distribution, Radio and Systems Applications of Frequency Control Devices, Specifications and Measurements.

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CHICAGO SPRING CONFERENCE ON BROADCAST AND TELEVISION RECEIVERS

Mariott Hotel
Chicago, Illinois
June 9-10, 1975

* * *

INTERNATIONAL CONFERENCE ON COMMUNICATIONS

Fairmont Hotel
San Francisco, California
June 16-19, 1975

-- Wire Transmission
Radio Transmission
Satellite Communications
Digital Carrier Systems
Data and Computer Communications
Error Control Techniques
Communication Switching
System Economics
Communication Theory
Signal Processing
Voice and Image Processing
Radio Interference
Communication Electronics
Microwave, Millimeter and Optical-Wave Technology

* * *

WESTERN ELECTRONIC SHOW AND CONVENTION (WESCON)

Civic Auditorium and Brooks Hall
San Francisco, California
September 16-19, 1975

* * *

IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

El Tropicano Motor Hotel
San Antonio, Texas
October 7-9, 1975

■

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