IEEE
VEHICULAR TECHNOLOGY SOCIETY
NEWSLETTER

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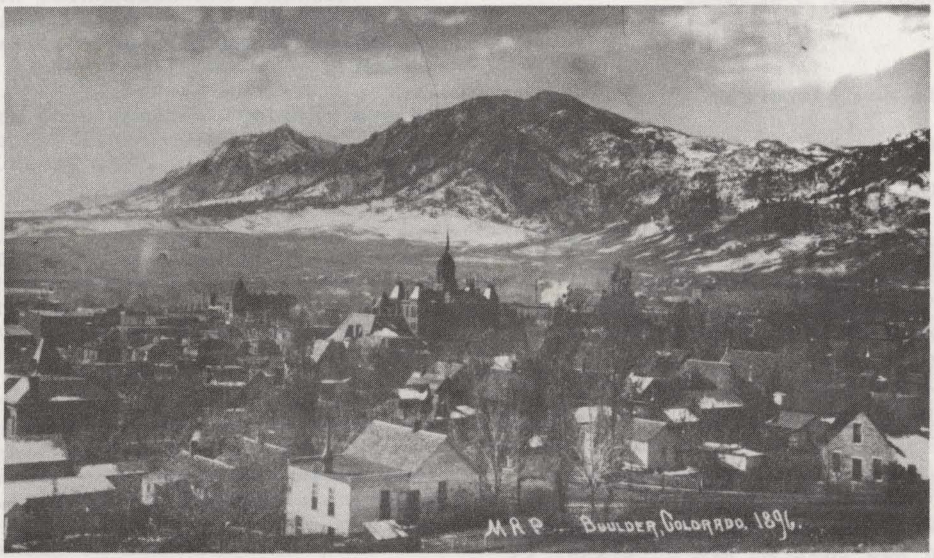
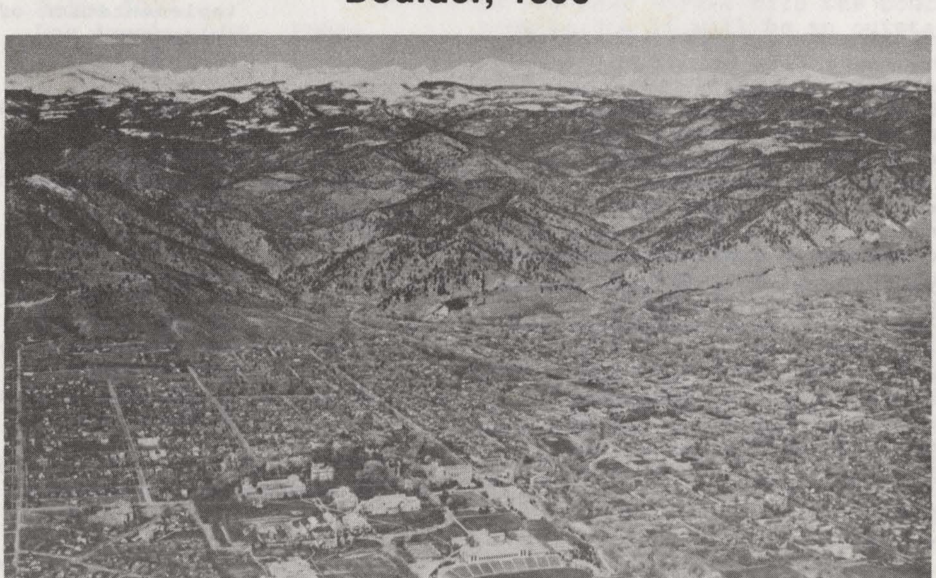


Boulder, 1896



Boulder, today

Be there—May 21-23, 1985 for the Annual VTS Conference.

President's Message

Sam McConoughey
President
IEEE Vehicular Technology Society

PRESIDENT'S MESSAGE

The year 1984 is now history.

The IEEE has celebrated its Centennial.

The Society celebrates its 35th year.

Reflections about the past, seem to this writer, to be mostly pleasant. We have come so very far in the fields of Vehicular Communications, Automotive Electronics, and Land Transportation...and in such a short time! Mostly gone are vacuum tubes, points and condensers, and trolley cars....and quoting from Gilbert & Sullivan, "and none of them will be missed."

Contemplating the future, and the Second Century of the IEEE, is far more exhilarating. While some characterize it as the Information Age that we are entering, it still will be the age of the electrical and electronic engineer.

The next century of progress lies largely in the hands of the young EE's around the world. But my word of advice to this coming generation is that active participation in the IEEE and its Societies, Groups, and Chapters is one of the most rewarding activities you will ever undertake. Engineering learning doesn't end with graduation...and the IEEE provides you with a means of maintaining your professional skills. But equally important, are the contacts you make and keep with other professionals. So if you have colleagues who are not members of the IEEE or this Society, take them along to a meeting, loan them a copy of your Transactions, the Spectrum, or this Newsletter. Show them what they are missing! (And don't forget to renew your membership if you've not already done so!)

Your Board of Directors met in Dearborn during the Convergence '84. Minutes of that meeting appear in this issue. Please take the time to read them. Your Board welcomes comments and suggestions from YOU.

Vice President, Bob Fenton, attended the TAB meetings in San Francisco as my alternate. He also attended the Centennial Keys to the Future Program where we sponsored an award recipient. This is also reported in this issue.

If you have not already done so, make plans to attend our next annual conference to be held in Boulder, CO, May 21-23. See inside for additional information.

The Society has again been invited to participate in the Electronic Industries Association's (EIA) second Land Mobile Showcase. This is to be held in Washington, DC, Sept. 26-28. More about this in upcoming issues.

The November issue of the Newsletter carried the names of IEEE Fellows, through 1984, who are Society members. I am pleased to announce that those VTS members named below have been elected, effective Jan.1, 1985, as IEEE Fellows.

Mr. Reed E. Fisher
Morris Plains, NJ
For contributions to the implementation of cellular telephony.

Mr. Ernest R. Freeman
Bowie, MD
For leadership in developing electromagnetic compatibility models.

Professor Fumio Ikegami
Kyoto University
Kyoto, Japan
For research in radio wave propagation, and for leadership in microwave link development.

We congratulate you, and are honored to have you as members of our Society!

Best Regards,

Sam

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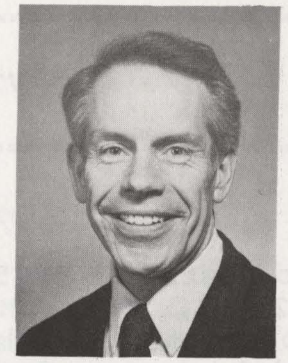
Month of Issue	Final Copy to be Rec'd By VTS Editor	Target Mailing Date
February	12-30-85	01-27-86
May	3-10-85	04-14-84
August	6-09-85	7-13-85
November	9-13-85	10-15-85

Editor's Notes



A. Kent Johnson
Newsletter Editor

The Newsletter this month looks forward to the Month of May and the Annual VTS Conference which will be held on the campus of the University of Colorado in Boulder. The cover this month feature two pictures of the Boulder area: on in the year 1896 and the other current.

Additional information about the conference is published elsewhere in the Newsletter. The people in Boulder have been hard at work and are preparing for an excellent conference. We will try to have detailed information for you in the May Newsletter which has the promise (of our publisher) of arriving at your homes before the conference this year.

Make your plans in advance to attend as those of us who have worked with the Boulder staff can promise you it will be an outstanding event.

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VTS - 85. PLAN ON IT

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Colorado hosts the 1985 Vehicular Technology Conference in Boulder on May 21-23, 1985. Make your plans to attend now and encourage your colleagues to join you. The program, both professional and social, has much to offer concerned professionals in their efforts to stay abreast in a field undergoing such dramatic change.

There are many reasons why a visit to Colorado is attractive. The program supplements a full range of technical papers with industrial presentations, meetings of related groups, and an excellent opportunity to meet leading people in the diverse fields which contribute to VTS. Here is your chance to participate in a constructive dialog betwen those who know and those who need to know.

If you are a regular participant in VTS programs and are familiar with Colorado, you already know why this is a very special opportunity. If you aren't, come join us and find out for yourself.

The conference schedule has been chosen to allow for relaxation and full enjoyment of springtime in the Rockies, either before or after the conference. The Hilton Harvest House Hotel (the conference center) is at the base of the Rockies and provides easy access to Rocky Mountain National Park, mountain fishing and hiking, and some of the most scenic drives in the world.

Arrangements have been made for special discounts for both travel and accomodations.

Plan to join us in May. A preliminary program and registration materials will be sent to you shortly. If you don't receive them or want more information, please write or call.

John Murray
Conference Chairman

John Murray Associates
1823 Folsom Street
Boulder, CO 80302

303 444 4871

VTC'85

Efficiency, Conservation and Productivity

Denver's Stapleton International Airport is served nationally and internationally by all major airlines and conference attendees may select either a bus, the limousine service or a rent-a-car to make the 45 minute, 25 mile trip to Boulder.

Nearing Boulder, the traveler will ascend a rolling hill and be suddenly presented with a view of the city in the valley below and the red tiled roofs of one of the most architecturally beautiful campuses in the nation.

Visitors to Boulder are captivated by the city's spectacular setting. Deer still graze at the base of the Flatirons, towering outcropping of red sandstone which lies along the mountains that rise abruptly on the west side of Boulder.

Over 10,000 acres of open space and 5,000 acres of mountain parks have ensured the beauty of this natural setting.

The city of Boulder itself still honors the spirit of its first settlers with rows of Victorian houses well preserved by local citizens in the Mapleton Hill area. A downtown pedestrian mall within walking distance of the conference site often rocks with the sounds of strolling musicians and assorted magicians in a spirit of enthusiasm that would have been well understood by the early prospectors.

Like Boulder's early settlers you will want to pack lightly but well prepared. Dress duringthe conference and at all Boulder's night spots is informal but you will want to bring a light jacket for the late spring evenings that follow a typical May day of 70 or 80 degrees. Boulder this time of year will have an occasional late afternoon rain shower.

Society Officers and Board of Directors

SOCIETY OFFICERS

Society President	Society Vice President	Society Secretary	Society Treasurer
SAM McCONOUGHEY Federal Communications Commission 2000 "L" St., N.W., Rm. 261 Washington, D.C. 20554 (202) 632-7500	ROBERT E. FENTON Ohio State University 2015 Neil Avenue Columbus, OH 43210 (614) 422-4310 (614) 457-0479 Home	SAMUEL A. LESLIE U.S. Mobile Radio Dept. General Electric Co. Mountain View Road Lynchburg, VA 24502 (804) 528-7115 (804) 525-7589 Home	ARTHUR GOLDSMITH 4303 Wynnwood Drive Annandale, VA 22003 (703) 941-1323

BOARD OF DIRECTORS

NAME	RESPONSIBILITY	TERM
Robert E. Fenton	Vice President	Jan83-Dec85
Arthur Goldsmith	Treasurer	Jan82-Dec84
Al Goldstein	Conference Coordinator	Jan82-Dec83
A. Kent Johnson	Newsletter Editor	Jan82-Dec83
Samuel A. Leslie	Society Secretary	Jan82-Dec83
Fred M. Link	Chairman, National Site Selection Comm.	Jan82-Dec83
Charles Lynk	Chairman, Paper of Year Comm.	Jan83-Dec85
Roger Madden	Senior Past President	Jan82-Dec84
Robert A. Mazzola	Chairman, Membership Committee	Jan82-Dec84
George F. McClure	Chairman of Publications Comm. and Transactions Editor	Jan83-Dec85
Samuel R. McConoughey	President	Jan82-Dec83
Stuart Meyer	Immediate Past President	Jan83-Dec85
James J. Mikulski	Awards Committee	Jan82-Dec84
Ronald G. Rule	Education Committee	Jan82-Dec84
Eric Schimmel	Chairman, Personal Radio Committee	Jan83-Dec85

Chuck Lynk-Board Member, William J. Misskey-Committee Chairman, Robert Powers-Chief Office of Science and Technology, FCC at the VTS Board Reception and Dinner held in Dearborn, MI, October, 1984.

Chapter News

Gaspar Messina
Chapter News Editor

1985 IEEE Vehicular Technology Society Directory of Chapters and Chairpersons

Chapter	Chairperson	Chapter	Chairperson
BOSTON (CNEC)	Stuart J. Lipoff 192 Kirkstall Road Newton, MA 02160 (617) 864-5770, X2340	NEW YORK/NORTH JERSEY/ LONG ISLAND	George D. Graul 250 Ogden Avenue Jersey City, N.J. 07307 (201) 469-5504
CHICAGO	Gregory M. Stone 330 Melvin Drive Unit Four North Brook, IL 60062 (312) 564-1070	PHILADELPHIA	Robert C. Harper, Jt. IT-12/ COM-19 517 Marks Road Oreland, PA 19075 (215) 233-4100
CLEVELAND	Roy E. Christen 7935 Greenwood View Drive Apartment 1501 Parma, OH 44129 (216) 781-9400, X2431	PITTSBURGH	Raymond A. Bodnar, Jt. COM-19 109 Bellfield Court Greensburg, PA 15601 (412) 327-3131, X262
COLUMBUS	Saul Himelstein 5026 Smoketalk Lane Westerville, OH 43081 (614) 890-4800	SACRAMENTO	Maynard A. Wright, Jt. COM-19 6930 Enright Drive Citrus Heights, CA 95621 (916) 972-3384
DALLAS	William A. Conner, Jt. COM-19 4541 Newcombe Plano, TX 75075 (214) 996-7912	SAN FRANCISCO BAY COUNCIL	Gregory E. Austin 41449 Timber Creek Terrace Fremont, CA 94539 (415) 465-6000
DENVER	John J. Tary 7739 Spring Drive Boulder, CO 80303 (303) 499-2164	TOKYO, JAPAN	Hiroski Sakai 5-28-3 Narita Higashi Suginami-Ku Tokyo, Japan 03-238-3337
LOS ANGELES COUNCIL	Gary David Gray Orange County Communications 481 The City Drive South Orange, CA 92668 (714) 834-2123	TORONTO	Eric Meth Motorola Limited 3125 Steeles Avenue North York, Ont Canada M2H 2H6 (416) 499-1441
MIAMI	Richard F. Schroeder Jt. COM-19 9123 South West 78th Place Miami, FL 33165 (305) 263-3262	VANCOUVER	Brian J. Lutes 375 W. 18 Avenue Vancouver, BC Canada V5Y2A8 (604) 664-5813
MONTREAL	David Haccoun Ecole Polytechnique BP 6079 Succursale A Montreal Que Canada H3C 3A7 (514) 344-4889	WASHINGTON/ NORTHERN VIRGINIA	James R. Poppe 2402 Red Maple Lane Reston, Virginia 22091 (703) 899-0633
NEW JERSEY COAST	Luke G. Schimpf 31 Winding Brook Way Holmdel, N.J. 07733 (201) 946-8639		

Chapter Chairman Pro Tem

Denver VTS/Com Soc

Mr. John Tary, the first Joint Chapter Chairman 1980-81 of VTS/Com Soc has agreed to serve as Chapter Chairman Pro Tem in place of Chapter Chairman Mr. Bill Cheek. Mr. Tary has agreed to serve until a new slate of officers will be presented and voted on in May for 1985-86.

Elections

Cleveland VTS (Term of Office January 1, 1985 - December 31, 1985)

Chairman: Mr. Bryan Harris
Ohio Edison Co.
76 S. Main Street
Akron, OH 44308

Vice-Chmn: Mr. Dan Richards
Ohio Edison Co.
76 S. Main Street
Akron, OH 44308

Gaspar Messina
Editor and Chapter Activities Chairman
9800 Marquette Drive
Bethesda, Maryland 20817

Meetings

New Jersey Coast (EMC/VTS)

VDE Emission Compliance Testing
by Mr. V. Necker, Product Manager of field strength and EMI equipment for Rhode & Schwarz, Munich, West Germany, and
Instrumentation Demonstration, EMC equipment
by Mr. Sol Abrams, Product Manager, EMC Instrumentation, Polarad Company, Lake Success, New York.
Held on September 18, 1984, with 38 attending including 25 guests.

Connector and Cable Assembly, EMC Performance and Design
by Mr. Anatoly Tsaliovich, Fellow Engineer, Thomas & Betts Corporation, Raritan, New Jersey.
Held on October 16, 1984, with 18 attending including 4 guests.

Estimates of Expected Coverage For 930 MHz Paging Systems
by Mr. Luke G. Schimpf, AT&T Bell Laboratories, Retired. The method discussed by Mr. Schimpf can be used to estimate the distance to the reliable service boundary from one-way signalling transmitters.
Held on November 20, 1984, with 22 attending including 6 guests.

Christmas Party and Membership Drive
by EMC/VTS, Mr. Luke G. Schimpf, Presiding.
Held on December 18, 1984, with 28 attending including 10 guests.

Cleveland VTS/Com Soc

Tour of the Ohio Edison Operations Center
by Ohio Power.
Held on September 11, 1984, with 12 attending including 1 guest.

"Communication Satellites-Yesterday, Today & Tomorrow"
by Mr. Ronald J. Schertler, Physicist, with the Advanced Communications Technology Satellite Project of the Space Communications Division, NASA.
Held on October 18, 1984, with 23 attending including 1 guests.

Tour of LFE Corporation
by Mr. Bill Hess, LFE Corporation.
Held on December 11, 1984, with 8 attending including 4 guests.

Board of Directors Report

Samuel A. Leslie
VTS Secretary

MINUTES OF THE IEEE VTS BOARD OF DIRECTORS MEETING

The IEEE VTS Board of Directors met on October 23, 1984 at the Convergence '84 conference in Detroit. The Board meeting was called to order at 9:00 AM.

ROLL CALL

The following were in attendance:

#Samuel R. McConoughey	President
#Robert E. Fenton	Vice-President
#Arthur Goldsmith	Treasurer
#Fred M. Link	National Site Selection
Evan Richards	National Conf. Coord.
#Ron Rule	Education Committee
#Eric J. Schimmel	Personal Radio Chairman
William Misskey	Veh. Electronics Editor
#George F. McClure	Transactions Editor
#Stuart Meyer	Junior Past President
#Charles Lynk	Paper of the Year Comm.
#George F. McClure	Publications Chairman
#A. Kent Johnson	Newsletter Editor
#Samuel A. Leslie	Secretary

(# denotes elected Board member)

Twelve of the fourteen present were elected Board members, thus meeting the requirements for a quorum for voting on matters before the Board.

MINUTES OF LAST MEETING

Fred Link moved, George McClure seconded that the minutes of the last meeting be approved as published. The motion carried with all in favor.

BOARD ELECTION STATUS - Stu Meyer

Stu Meyer reported on the delays in getting the elections for VTS officers into ballot form for mailing to the membership. He stated that IEEE HQ suggests holding two elections simultaneously to get the elected Board Member schedule back on track. Stu Meyer then moved, Bob Fenton seconded that elections for the two terms, January 84 through December 86 and January 85 through December 87 be held simultaneously. The motion was unanimous in favor. Stu Meyer is to solicit candidates for the December 87 term as quickly as possible and get them to IEEE HQ for ballot preparation.

TREASURER'S REPORT - Art Goldsmith:

Art Goldsmith reported that the 1984 budget appears on track with a deficit still being projected due to the financing of the Convergence '84 conference. However, he noted that the Society is in better financial shape than originally anticipated due to an income of over $8,000 from the Pittsburgh annual conference last May. The projected budget for 1985 anticipates income from the 1984 Convergence which will result in a balanced budget.

The Board noted differences between the financial advisor's report and the treasurer's report on how the Noble Scholarship fund is treated as a budget item. Art Goldsmith is to resolve these differences the the Society's financial advisor, Dave Talley.

CONFERENCE COMMITTEE REPORT - Fred Link

Fred reported that things are well under way for the 1987 annual conference to be held in the Tampa Bay area. Fred Link moved, George McClure seconded that the Ad Hoc Tampa Chapter be authorized to proceed with arrangements for an annual VTS conference in their area. After discussion, George McClure offered a friendly amendment to Fred's motion to set the date of the conference to within plus or minus 30 days of May 15, 1987. The vote was unanimous in favor.

Some discussion concerning VTS Conferences from 1988 on ensued, with one possibility being to hold these conferences in the Fall time frame in conjunction with the EIA Land Mobile Showcase conference. Potential conflict with the Convergence '88 and '90 Conferences were noted; no further action on this subject was taken.

Evan Richards submitted a written report which stated that the final report for the 1982 San Diego Conference was finally completed, with a net surplus of $4,408.21 being achieved. Likewise, the final financial report for the 1984 Pittsburgh conference netted a surplus of $8,263.00 for the Society.

The 1985 Boulder Conference, scheduled for May 21-23 at the Harvest House in Boulder, is on schedule with the call for papers being publicized.

Fred Link noted that the 1986 Dallas Conference preparation is a bit behind schedule.

The Board resolved that Stu Meyer and Evan Richards are to follow up on publicizing the Boulder '85 Conference.

EIA SHOWCASE REPORT - Eric Schimmel

Eric reported that the seminars at the first EIA Land Mobile Showcase Conference were well attended, but that the traffic through the exhibitor's areas were less than anticipated. He indicated that EIA is going ahead with plans to hold its Land Mobile Showcase next year, probably October 29-31. Tentative plans are to hold the Showcase in New Orleans, although a conflict with the Expo East Conference was noted. Washington, D.C., will most likely be the location for the 1986 EIA Land Mobile Showcase.

Stu Meyer moved, Art Goldsmith seconded a motion to participate by having the Society to continue conducting its own seminars independently of but in conjunction with the EIA Land Mobile Showcase Conferences. The vote was unanimous in favor.

COMPINT '85 REPORT - Bob Fenton

Bob Fenton moved, George McClure seconded that the Society accept an invitation from the COMPINT '85 IEEE International Computer Conference and Exhibition to co-sponsor a Computer Aided Transportation Technical Session. No financial involvement with this conference is planned, and VTS is to publicize the conference in the VTS Newsletter. The vote was unanimous in favor. Bob Fenton will the the liaison for this session.

APPOINTMENTS - Sam McConoughey

Sam appointed Bill Misskey to be the Vehicular Electronics Editor for the Transactions and also the editor for the Canadian Report, to be printed in the VTS Newsletter.

TRANSACTIONS EDITOR REPORT - George McClure

George reported that the December 84 issue is together, and that final editorial corrections are in process. This issue will have a page count of approximately 50 pages to accommodate six papers and a cumulative index.

The joint August issue which was recently mailed will probably be the last joint issue that the Society will publish.

George indicated that surveys of VTS members as well as members of other Societies show that more applications-oriented papers are desired. Two possibilities of special issues were mentioned, with one being on cellular systems and the other being on SMRS (specialized mobile radio systems) being possibilities. Manufacturers could possibly write technical articles describing their implementations of systems for these special issues.

NEWSLETTER EDITOR REPORT - Kent Johnson

Kent noted that there had been delays of up to two months in getting the VTS Newsletter mailed after it has been submitted for publication, although the last issue (August) had a faster turn around. The November issue has been submitted and is awaiting publication.

Stu Meyer moved, George McClure seconded that an elected Board Member write an article for each Newsletter on a rotating basis. Vote was unanimous in favor.

PRESS BOOKS

The Board resolved that the IEEE Press Book on "Land Mobile Communications Engineering" continue to be advertised in the VTS Newsletter. As of July 31, 388 copies of the Press Book had been sold.

NEWSLETTER ADVERTISING - Stu Meyer

Stu reported that he is ready to go with ad copy for the Newsletter, but that he does not know the Newsletter page costs and therefore is not able to set a rate for the advertisers. Costs were estimated to be around $100 to $200 a page; George McClure is to contact IEEE HQ to determine the actual page cost.

VTS AWARDS PROGRAM - Stu Meyer

Stu reported that nine names have been added to the Avant Garde list.

It was noted that the Fellow Awards application forms have been revised; Sam McConoughey is to mail the revised forms to the Board members.

Bill Misskey has accepted an assignment to chair the IEEE Field Awards program. Stu Meyer continues on as the chairman of the Society Awards program, with Al Isberg chairing the Fellow Awards program.

DAN NOBLE FELLOWSHIP AWARD

IEEE HQ has forwarded the check for the first semester to Ms. Metzgar.

CENTENNIAL KEYS TO THE FUTURE - Bob Fenton

Bob reported that the money that the Board had approved at the last meeting for travel expenses for the recipient of the award was not needed since the IEEE Technical Activities Board provided the travel assistance.

STUDENT ACTIVITIES

Art Goldsmith moved that the VTS Board contribute $200 to the Student Activities Committee toward their publication of a student papers book. Ron Rule seconded the motion, and the vote was unanimous in favor.

Sam McConoughey noted that a bill of around $150 had been received for the preparation of camera-ready copy for the initial issue of the VTS ad for potential members in the IEEE Potentials magazine. To save reoccuring preparation charges, Sam is to inform IEEE HQ that the same camera-ready copy is to be used for subsequent ads.

CONSTITUTION AND BYLAWS REPORT - Sam McConoughey

Sam reported that the revised VTS Constitution is on the agenda for the December TAB meeting. Also, Roger Madden has prepared a draft of the revised set of bylaws; the secretary is to mail a copy of these bylaws to all Board members for review, with Board members to be prepared for discussion at the next meeting.

VTS NAME CHANGE - Sam McConoughey

The suggested name of "Mobile Communications and Transportation Society" made at the last meeting as a possible change from the current "Vehicular Technology Society" has met with resistance from several members. The Board therefore decided to abandon further consideration for a name change; however, it was decided that the three areas of interest (Mobile Communications, Vehicular Electronics, and Land Transportation) could be provided as headings on the VTS stationary; pending clarification of the VTS Charter that is pending before IEEE HQ.

ENGINEERING ACCREDITATION BOARD

Bob Fenton submitted one name for consideration.

EXECUTIVE COMMITTEE ELECTION

Fred Link moved, George McClure seconded that the current executive committee continue for the next year in its present form. The vote was unanimous in favor.

CENTENNIAL COMMITTEE

George McClure moved, Bob Fenton seconded that the centennial committee assignments be abolished at the end of this year. The vote was unanimous in favor.

PUBLIC RELATIONS COMMITTEE

Stu Meyer moved, George McClure seconded that a Public Relations Committee be formed. The vote was unanimous in favor, Stu Meyer is to chair this committee.

MEMBER-AT-LARGE POSITION

Sam Leslie moved, Stu Meyer seconded that the position of "member-at-large" be abolished since it appeared to serve no useful purpose. The vote was unanimous in favor.

1985 PLAN - Sam McConoughey

Stu Meyer moved, George McClure seconded that the following 1984 objectives which were not met (per Sam McConoughey's report) be retained for 1985:

1. Provide on-time Board elections,
2. Increase the VTS membership by five percent,
3. Complete the revision of the VTS Constitution and the VTS Bylaws,
4. Finalize the VTS Awards Program,
5. Complete the advertising program,
6. Provide a publicity program for VTS, and
7. Complete the IEEE VTS Radio Propagation Committee work.

The vote was unanimous in favor.

Stu Meyer then moved, Fred Link seconded that the 1985 objectives from Sam McConoughey's report, as shown below, be added to the above list of objectives that were carried over from 1984:

1. Improved service to our members by improving the Transactions, Newsletters, and Conferences, by adding educational programs, and broadening Society activities,
2. Greater recognition for contributors to IEEE and Society objectives,
3. Improving coordination and cooperation with other elements of the IEEE and within VTS by means of:
   a. Better communication with Chapter Chairmen,
   b. Closer ties with IEEE activities such as Transportation and Automotive organizations, related societies such as COMSOC, IEEE Sections, Division Directors, IEEE Headquarters, and non-IEEE organizations such as IEE, EIA, and others with related interests.

The Board vote was unanimous in favor.

CB RADIO COMMITTEE STATUS

After discussion, the board decided not to abolish the "CB Radio Committee" since a U.S. PRCS system was still under consideration at the FCC.

NATIONAL INVENTOR'S HALL OF FAME

Fred Link is to consider VTS-related nominations for the National Inventor's Hall of Fame.

TAB/USAB COMMITTEE ON COMMUNICATIONS AND INFORMATION

Eric Schimmel volunteered to write a letter to the "USAB Committee of Communications and Information Policy" requesting VTS representation or consultation on matters relating to communications that are to be filed before the FCC.

NEXT MEETING

The next Board meeting was tentatively set for the third week in February (1985), probably February 19.

ADJOURNMENT

Eric Shimmel moved, Stu Meyer seconded that the meeting be adjourned at 2:25PM. Vote was unanimous in favor.

Respectfully submitted,

Samuel A. Leslie
IEEE VTS Secretary

Professional Activities

Frank E. Lord
Professional Activities Editor

On October 8, last year as part of the program "IEEE: The Second Century Begins" our members were lauded by President Reagan in a videotaped message as follows:

> "You've been and you remain the pulse of America's technological power, the cutting edge of our worldwide technological leadership. You apply the theories and principles of science and math to practical problems, and your work serves as the link between scientific discovery and everyday application. You're the real heroes of high-tech, and you have good reason to be proud of your countless achievements... We look to you for innovation and excellence, and you've never let us down... We already benefit from a modern revolution in worldwide communications. We can anticipate tomorrow's weather and prepare for it. Space technology has brought one lifesaving breakthrough after another... And none of this would have been possible without the contributions of IEEE members."

Hearing this one might certainly expect clear sailing for H. R. 5172 which would amend the National Science Foundation charter to promote engineering research and education. This matter was described in a USAB Legislative Report reproduced below.

NSF MISSION STATEMENT CHANGED TO PROMOTE ENGINEERING RESEARCH AND EDUCATION

When two warring Senate committees came to agreement on amending the NSF charter to elevate engineering research, the way was cleared for enactment of a new law. But the law passed was not the NSF authorization act; it was the National Bureau of Standards Authorization Act.

That vehicle (H. R. 5172) turned out to be the all-purpose pack mule: besides the NSF item, it contains authorization for an entirely new set of programs on manufacturing technology and it contains the customary authorization for NBS programs. USAB and several of its committees had testified in support of the actions taken.

Because two standing Senate committees cannot agree on which has authority over the NSF, the NSF has had no authorization act since FY 1981. The charter amendment raising the status of engineering was first passed by the House last April as part of the NSF authorization. Sen. Dan Quayle introduced a Senate amendment to make the same change. However, because Sens. Orrin Hatch and Slade Gorton, the competing Chairmen, refused to concede jurisdiction over NSF, the charter change went in limbo.

The strong support for raising the status of engineering in the NSF caused key congressmen to seek a way out of the dilemma, and the package was transferred to the NBS bill. "There is a broad support among both scientists and engineers for this amendment," Sen. Gorton said (on Sept. 21). And "the incorporation of engineering into the NSF mission statement means a great deal to our nation's engineers, both in the private sector and in academia," Sen. Hatch said (on Oct. 11). "An objection would unnecessarily force them to begin their quest for recognition all over again."

Thus, on Oct. 4 Congress completed action on the bill when the Senate and House had reached agreement on all the details in the package.

The manufacturing technologies programs come about as a result of Congressional initiative; they were not part of the Administration's plan. The legislation was spearheaded by Rep. Don Fuqua and Sen. Slade Gorton. Dr. Russ Drew supported the Gorton bill (S. 1286) in testimony before a Senate subcommittee in June 1983. He said IEEE has a special interest in the subject "since our members work actively in many of the technologies that will support advances in manufacturing such as computers, integrated circuits and other sophisticated electronics... Simply stated, it is our work that has made the revolution in manufacturing technologies possible." Drew appeared as chairman of the Government Activities Council.

Drew followed up by addressing letters to several Administration officials on Oct. 22 urging the President to sign the bill."... the total benefit to be derived by this legislation greatly outweighs the increased Federal expenditures which its implementation entails," he wrote. "I will urge you to support the signing of H. R. 5172 by the President." The letters were sent to the OMB Director, Commerce Secretary Malcolm Baldrige, Dr. George Keyworth, and M. B. Oglesby, Jr., a Presidential assistant.

Gorton's bill, as he described it (on September 21) does not attempt to pick winners and losers in the areas of manufacturing technologies. "...the consortia seeking a Federal match must provide the lion's share of the funding for research... The bill operates through unsolicited proposals which come to the Secretary of Commerce from universities, industrial sectors, and state and local governments..."

The GOP's point man in the House, Rep. Robert S. Walker, had a different view. Speaking on the House floor (on Oct. 4) he said the Commerce Department opposes the bill. The Department's official position is that although it agrees that "selected manufacturing industries face serious problems, we believe the Federal Government should not be in the position of deciding the composition of U.S. industry. This Administration prefers to rely on the market to allocate resources..."

IEEE also addressed other items in the NBS authorization and was rewarded when Congress ultimately approved a $10 million appropriation for the Institute for Computer Science & Technology, a 100% increase over the Administration's request.

However, President Reagan vetoed the legislation on October 30. Thus the combined efforts of the engineering community and helpful members of Congress came to naught. As you will see in the following piece from a later Legislative Report, it was another aspect of the bill that caused the demise of an act that was bound to be beneficial to our profession.

PRESIDENT KILLS NSF AUTHORIZATION; SCORNS SECTION ON MANUFACTURING TECHNOLOGY

The portion of the National Science Foundation Authorization Act which amended the NSF Act of 1950 to place new emphasis on engineering research and education was passed by the Congress as part of the National Bureau of Standards Authorization Act (H. R. 5172). However, the President vetoed the bill because he disapproved the section on manufacturing science and technology.

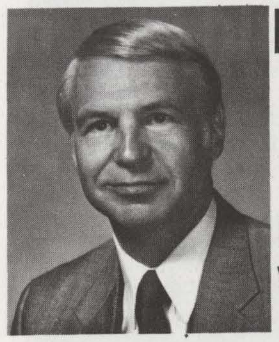
The Manufacturing Science and Technology Act was attached to the NBS Authorization Act in the last weeks of the 98the Congress. In his statement of disapproval, the President stated:

> Title III of H. R. 5172 would establish a new program providing Federal financial support for a variety of research, development, education, and training activities, whose purported purpose would be to improve manufacturing technologies, including robotics and automation. These activities would total $250 million during fiscal years 1985-1988, and represent an unwarranted role for the Federal government. The decisions on how to allocate investments for research on manufacturing technologies are best left to American industry. It is highly doubtful that this Act and resulting Federal expenditures would improve the competitiveness of U.S. manufacturing.
>
> The new role for the Federal government contemplated by Title III could also serve as the basis for a Federal industrial policy to influence our Nation's technological development. This Administration has steadfastly opposed such a role for the Federal government.

Staff people at NSF expect that special attention will be directed to the "engineering" amendments in the new Congress. Other items the NSF expects Congress to pursue are management of science and mathematics education programs, progress in the Engineering Research Center program, and plans to meet the instrumentation and facilities needs of university researchers. The issue of by-passing peer review of projects may also permeate Congressional consideration of the authorization and appropriation process.

Mixing too many items in bills frequently leads to situations like this. It is one of the reasons that Congress is still involved with an immigration bill and why the aspect of that bill which affects engineers remains unsettled. On this matter I would like to point out that it will, more than likely, be advantageous for engineers to track the action on this bill and get involved through available channels. Organizations that would benefit from low paid talent will be doing so.

Another important piece of legislative activity to track involves portability of pensions.



News from Washington

Eric Schimmel
Washington News Editor

FCC EMISSION DESIGNATORS REVISED

In a relatively obscure action, the FCC has amended Part g of its rules with the adoption of new emission designators which are the result of the 1979 World Administrative Radio Conference. The pertinent appendix from the Third Report and Order in FCC Docket 80-739 is reproduced below.

Appendix

A. Part 2 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. Section 2.2Ø1 is revised to read as follows:

2.2Ø1 Emission, modulation, and transmission characteristics.

The following system of designating emission, modulation, and transmission characteristics shall be employed.

(a) Emissions are designated according to their classification and their necessary bandwidth.

(b) A minimum of three symbols are used to describe the basic characteristics of radio waves. Emissions are classified and symbolized according to the following characteristics:

(1) First symbol - type of modulation of the main carrier;

(2) Second symbol - nature of signal(s) modulating the main carrier;

(3) Third symbol - type of information to be transmitted.

NOTE: A fourth and fifth symbol are provided for additional information and are shown in Appendix 6, Part A of the ITU Radio Regulations. Use of the fourth and fifth symbol is optional. Therefore, the symbols may be used as described in Appendix 6, but are not required by the Commission.

(c) First Symbol - types of modulation of the main carrier:

(1) Emission of an unmodulated carrier....................N

(2) Emission in which the main carrier is amplitude-modulated (including cases where sub-carriers are angle-modulated);

- -Double-sideband....................A
- -Single-sideband, full carrier....................H
- -Single-sideband, reduced or variable level carrier....................R
- -Single-sideband, suppressed carrier....................J
- -Independent sidebands....................B
- -Vestigial sideband....................C

(3) Emission in which the main carrier is angle-modulated

- -Frequency modulation....................F
- -Phase modulation....................G

NOTE: Whenever frequency modulation "F" is indicated, Phase modulation "G" is also acceptable.

(4) Emission in which the main carrier is amplitude and angle-modulated either simultaneously or in a pre-established sequence....................D

(5) Emission of pulses: 1/

- -Sequence of unmodulated pulses....................P
- -A sequence of pulses:
  - --modulated in amplitude....................K
  - --modulated in width/duration....................L
  - --modulated in position/phase....................M
  - --in which the carrier is angle- --modulated during the period of --the pulse....................Q
  - --which is a combination of the --foregoing or is produced by other --means....................V

(6) Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following modes: amplitude, angle, pulse....................W

(7) Cases not otherwise covered....................X

1/ Emissions where the main carrier is directly modulated by a signal which has been coded into quantized form (e.g. pulse code modulation) should be designated under (2) or (3).

(d) Second Symbol - nature of signal(s) modulating the main carrier:

(1) No modulating signal....................0

(2) A single channel containing quantized or digital information without the use of a modulating sub-carrier, excluding time-division multiplex....................1

(3) A single channel containing quantized or digital information with the use of a modulating sub-carrier, excluding time-division multiplex....................2

(4) A single channel containing analogue information....................3

(5) Two or more channels containing quantized or digital information....................7

(6) Two or more channels containing analogue information....................8

(7) Composite system with one or more channels containing quantized or digital information, together with one or more channels containing analogue information....................9

(8) Cases not otherwise covered....................X

(e) Third Symbol - type of information to be trans mitted: 1/

(1) No information transmitted....................N
(2) Telegraphy--for aural reception....................A
(3) Telegraphy--for automatic reception....................B
(4) Facsimile....................C
(5) Data transmission, telemetry, telecommand....................D
(6) Telephony (including sound broadcasting)....................E
(7) Television (video)....................F
(8) Combination of the above....................W
(9) Cases not otherwise covered....................X

1/ In this context the word "information" does not include information of a constant, unvarying nature such as is provided by standard frequency emissions, continuous wave and pulse radars, etc.

(f) Type B emission: As an exception to the above principles, damped waves are symbolized in the Commission's rules and regulations as type B emission. The use of type B emissions is forbidden.

(g) Whenever the full designation of an emission is necessary, the symbol for that emission, as given above, shall be preceded by the necessary bandwidth of the emission as indicated in Section 2.2Ø2(b)(1).

2. Section 2.2Ø2 is amended by adding subparagraphs (1), (2), and (3) to paragraph (b), and revising paragraphs (e) and (g) to read as follows:

2.2Ø2 Bandwidths

* * * * *

(b) * * *

(1) The necessary bandwidth, shall be expressed by three numerals and one letter. The letter occupies the position of the decimal point and represents the unit of bandwidth. The first character shall be neither zero nor K, M or G.

(2) Necessary bandwidths:

between Ø.ØØ1 and 999 Hz shall be expressed in Hz (letter H);
between 1.ØØ and 999 kHz shall be expressed in kHz (letter K);
between 1.ØØ and 999 MHz shall be expressed in MHz (letter M);
between 1.ØØ and 999 GHz shall be expressed in GHz (letter G).

(3) Examples:

Ø/ØØ2 Hz - HØØ2	6 kHz - 6KØØ	1.25 MHz -1M25
Ø.1 Hz - H1ØØ	12.5 kHz - 12K5	2 MHz - 2MØØ
25.3 Hz - 25H3	18Ø.4 kHz - 18ØK	1Ø MHz - 1ØMØ
4ØØ Hz - 4ØØH	18Ø.5 kHz - 181K	2Ø2 MHz - 2Ø2M
2.4 kHz - 2K40	18Ø.7 kHz - 181K	5.65 GHz - 5G65

(c) * * *

(d) * * *

(e) In the formulation of the table in paragraph (g) of this section, the following terms are employed:

B_n = Necessary bandwidth in hertz
B = Modulation rate in bauds
N = Maximum possible number of black plus white elements to be transmitted per second, in facsimile
M = Maximum modulation frequency in hertz
C = Sub-carrier frequency in hertz
D = Peak frequency deviation, i.e., half the difference between the maximum and minimum values of the instantaneous frequency. The instantaneous frequency in hertz is the time rate of change in phase in radians divided by 2
t = Pulse duration in seconds at half-amplitude
t_r = Pulse rise time in seconds between 10% and 90% of maximum amplitude
K = An overall numerical factor which varies according to the emission and which depends upon the allowable signal distortion.
N_c = Number of baseband telephone channels in radio systems employing multichannel multiplexing
P = Continuity pilot sub-carrier frequency (Hz) (continuous signal utilized to verify performance of frequency-division multiplex systems).

(f) * * *
(l) * * *
(i) * * *
(ii) * * *

(g) Table of necessary bandwidths:

Description of Emission	Necessary Bandwidth: Formula	Necessary Bandwidth: Sample Calculation	Designation of Emission
1. NO MODULATING SIGNAL			
Continuous wave emission			NØN (zero)
II. AMPLITUDE MODULATION			
1. Signal with Quantized or Digital Information			
Continuous wave telegraphy,	B_n = BK K = 5 for fading circuits K = 3 for non-fading circuits	25 words per minute; B = 2Ø, K = 5 Bandwidth: 1ØØ Hz	1ØØHA1A
Telegraphy by on-off keying of a tone modulated carrier,	B_n = BK+2M K = 5 for fading circuits K = 3 for non-fading circuits	25 words per minute; B = 20, M = 1ØØØ K = 5 Bandwidth: 2 1ØØ Hz = 2.1 kHz	2K1ØA2A
Selective calling signal, single-sideband full carrier	B_n=M	Maximum code frequency is: 2 11Ø Hz M = 2 11Ø Bandwidth: 2 11Ø Hz = 2.11 kHz	2K11H2B
Direct-printing telegraphy using a frequency shifted modulating sub-carrier single-sideband suppressed carrier	B_n =2M+2DK M = $\frac{B}{2}$	B=5Ø D = 35 Hz (7Ø Hz shift) K = 1.2 Bandwidth: 134 Hz	134HJ2B
Telegraphy, single sideband reduced carrier	B_n = central frequency + M + DK M = $\frac{B}{2}$	15 channels; highest central frequency is: 28Ø5 Hz B = 1ØØ D = 42.5 Hz (85 Hz shift) K = Ø.7 Bandwidth: 2.885 Hz = 2.885 kHz	2K89R7B
2. Telephony (Commercial Quality)			
Telephony double-sideband	B_n = 2M	M = 3ØØØ Bandwidth = 6ØØØ Hz = 6 kHz	6KØØA3E
Telephony, single-sideband, full carrier	B_n = 2M	M = 3ØØØ Bandwidth: 3ØØØ Hz = 3 kHz	3KØØH3E
Telephony, single-sideband suppressed carrier	B_n = M - lowest modulation frequency	M = 3ØØØ lowest modulation frequency is 3ØØ Hz 27ØØ Hz Bandwidth: 27ØØHz = 2.7 kHz	2K7ØJ3E
Telephony with separate frequency modulated signal to control the level of demodulated speech signal, single-sideband, reduced carrier	B_n = M	Maximum control frequency is 299Ø Hz, M = 299Ø Bandwidth: 299Ø Hz = 2.99 kHz	2K99R3E
Telephony with privacy, single-sideband, suppressed carrier (two or more channels)	B_n = N_cM-lowest modulation frequency in the lowest channel	N_c = 2 M = 3ØØØ lowest modulation frequency is 25Ø Hz, Bandwidth: 575Ø Hz = 5.75 kHz	5K75J8E
Telephony, independent sideband (two or more channels	Bn = sum of M for each sideband	2 channels M = 3 ØØØ Bandwidth: 6ØØØ Hz =6 kHz	6KØØB8E
3. Sound Broadcasting			
Sound broadcasting, double-sideband,	Bn = 2M M may vary between 4 ØØØ and 1Ø ØØØ depending on the quality desired	Speech and music, M = 4 ØØØ Bandwidth: 8 ØØØ Hz = 8 kHz	8KØØA3E
Sound broadcasting, single-sideband reduced carrier (single channel)	Bn = M M may vary between 4ØØØ and 1Ø ØØØ depending on the quality desired	Speech and music, M = 4 ØØØ Bandwidth: 4 ØØØ Hz = 4 kHz	4KØØR3E
Sound broadcasting, single-sideband, suppressed carrier	Bn = M - lowest modulation frequency	Speech and music, M = 4 5ØØ lowest modulation frequency = 5Ø Hz; Bandwidth: 445Ø Hz = 4.45 kHz	4K45J3E

Description of Emission	Necessary Bandwidth		Designation of Emission
	Formula	Sample Calculation	
		4. Television	
Television, vision and sound	Refer to CCIR documents for the bandwidths of the commonly used television systems	Number of lines = 525; Nominal video bandwidth: 4.2 MHz Sound carrier relative to video carrier = 4.5 MHz; Total vision bandwidth: 5.75 MHz;	5M75C3F
		FM aural bandwidth including guardbands: 25∅,∅∅∅ Hz	25∅KF3E
		Total bandwidth: 6 MHz	6M25C3F
		5. Facsimile	
Analogue facsimile by sub-carrier frequency modulation of a single-sideband emission with reduced carrier	$B_n = C + \frac{N}{2} + DK$ K = 1.1 (typically)	N = 1 1∅∅ corresponding to an index of cooperation of 352 and a cycler rotation speed of 6∅ rpm. Index of co-operation is the product of the drum diameter and number of lines per unit length C=19∅∅ D = 4∅∅ Hz Bandwidth = 2.89∅ Hz = 2.89 kHz	2K89R3C
Analogue facsimile; frequency modulation of an audio frequency sub-carrier which modulates the main carrier, single-sideband suppressed carrier	$B_n = 2M+2DK$ $M = N/_2$ K = 1.1 (typically)	N = 11∅∅ D = 4∅∅ Hz Bandwidth: 198∅ Hz =1.98 kHz	1K98J3C

Description of Emission	Necessary Bandwidth		Designation of Emission
	Formula	Sample Calculation	
		6. Composite Emissions	
Double-sideband, television relay	$B_n = 2C+2M+2D$	Video limited to 5 MHz, audio on 6.5 MHz frequency modulated sub-carrier deviation = 5∅ kHz: $C = 6.5 \times 1∅^6$ $D = 50 \times 1∅^3$ Hz M = 15∅∅∅ Bandwidth: $13.13 \times 1∅^6$ Hz = 13.13 MHz	13M2A8W
Double-sideband radio relay system,	$B_n = 2M$	1∅ voice channels occupying baseband between 1 kHz and 164 kHz; M = 164 ∅∅∅ bandwidth = 328 ∅∅∅ Hz = 328 kHz	328KA8E
Double-sideband emission of VOR with voice (VOR = VHF omnidirectional radio range)	$B_n = 2C_{max} + 2M + 2DK$ K = 1 (typically)	The main carrier is modulated by: - a 3∅ Hz sub-carrier - a carrier resulting from a 9 96∅ Hz tone frequency modulated by a 3∅ Hz tone -a telephone channel -a 1 ∅2∅ Hz keyed tone for continual Morse identification. C_{max} = 9 96∅ M = 3∅ D = 48∅ Hz Bandwidth: 2∅,94∅ Hz = 2∅.94 kHz	2∅K9A9W

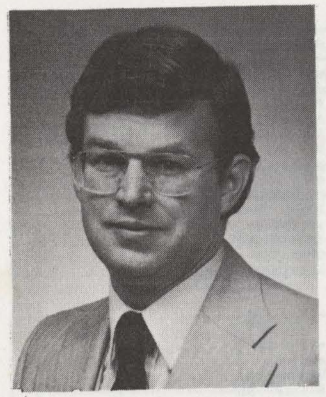
Description of Emission	Necessary Bandwidth		Designation of Emission
	Formula	Sample Calculation	
Independent sidebands; several telegraph channels together with several telephone channels	B_n = sum of M for each sideband	Normally composite systems are operated in accordance with standardized channel arrangements, (e.g. CCIR Rec. 348-2) 3 telephone channels and 15 telegraphy channels require the bandwidth 12,∅∅∅ Hz = 12 kHz	12K∅B9W
		III-A. FREQUENCY MODULATION	
		1. Signal with Quantized or Digital Information	
Telegraphy without error-correction (single channel)	$B_n = 2M+2DK$ $M = \frac{B}{2}$ K = 1.2 (typically)	B = 1∅∅ D = 85 Hz (17∅ Hz shift) Bandwidth: 3∅4 Hz	3∅4HF1B
Four-frequency duplex telegraphy	$B_n = 2M+2DK$ B = Modulation rate in bauds of the faster channel. If the channels are synchronized: $M = \frac{B}{2}$ otherwise M = 2B K = 1.1 (typically)	Spacing between adjacent frequencies = 4∅∅ Hz; Synchronized channels B = 1∅∅ M = 5∅ D = 6∅∅ Hz. Bandwidth: 142∅ Hz = 1.42 kHz	1K42F7B
	2. Telephony	(Commercial Quality)	
Commercial telephony	$B_n = 2M+2DK$ K = 1 (typically, but under conditions a higher value may be necessary	For an average case of commercial telephony, M = 3 ∅∅∅ Bandwidth: 16 ∅∅∅ Hz = 16 kHz	16K∅F3E

Description of Emission	Necessary Bandwidth		Designation of Emission
	Formula	Sample Calculation	
		3. Sound Broadcasting	
Sound broadcasting	$B_n = 2M+2DK$ K = 1 (typically)	Monaural D = 75 ∅∅∅ Hz M = 15 ∅∅∅ Bandwidth: 18 ∅∅∅ Hz = 18∅ kHz	18∅KF3E
		4. Facsimile	
Facsimile by direct frequency modulation of the carrier; black and white	$B_n = 2M+2DK$ $M = \frac{N}{2}$ K = 1.1 (typically)	N = 11∅∅ elements/sec; D = 4∅∅ Hz Bandwidth: 198∅ Hz = 1.98 kHz	1K98F1C
Analogue facsimile	$B_n = 2M+2DK$ $M = \frac{N}{2}$ K = 1.1 (typically)	N = 11∅∅ elements/sec; D = 4∅∅ Hz Bandwidth: 198∅ Hz = 1.98 kHz	1K98F3C
		5. Composite Emissions (see Table III-B)	
Radio-relay system, frequency division multiplex	$B_n = 2P+2DK$ K = 1	Microwave radio relay system specifications: 6∅ telephone channels occupying baseband between 6∅ and 3∅∅ kHz; rms per-channel deviation 2∅∅ kHz; pilot at 331 kHz produces 2∅∅ kHz rms deviation of main carrier. Computation of B_n : D = $(2∅∅ \times 1∅^3 \times 3.76 \times 1.19)$ Hz = $∅.895 \times 1∅^6$ P = $∅.331 \times 1∅^6$ Hz; Bandwidth: $2.452 \times 1∅^6$ Hz	2M45F8B

Description of Emission	Necessary Bandwidth		Designation of Emission
	Formula	Sample Calculation	
Radio-relay system frequency division multiplex	$B_n = 2M+2DK$ K = 1	Microwave radio relay relay systems specifications:12∅∅ telephone channels occupying baseband between 6∅ and 5564 kHz; rms per channel deviation 2∅∅ kHz; continuity pilot at 6199 kHz produces 140 kHz rms deviation of main carrier. Computation of B_n : $D = (2∅∅ \times 1∅^3 \times 3.76 \times 3.63) = 2.73 \times 1∅^6$; $M = 5.64 \times 1∅^6$ Hz; $P = 6.2 \times 1∅^6$ Hz; (2M +2DK < 2P; Bandwidth $16.59 \times 1∅^6$ Hz.	16M6F8E
Radio-relay system, frequency division multiplex	$B_n = 2P$	Microwave radio relay system specifications: multiplex 600 telephone channels occupying baseband between 6∅ and 254∅ kHz; continuity pilot at 85∅∅ kHz produces 14∅ kHz rms deviation of main carrier. Computation of Bn : $D = (2∅∅ \times 1∅^3 \times 3.76 \times 2.565) = 1.93 \times 1∅^6$ Hz; $M = 2.54 \times 1∅^6$ Hz; 2DK) > 2P Bandwidth: $17 \times 1∅^6$ Hz	17M∅F8E

		IV. PULSE MODULATION	
		1. Radar	
Unmodulated pulse emission	$B_n = \frac{2K}{t}$ K depends upon the ratio of pulse rise time. Its value usually falls between 1 and 1∅ and in many cases it does not need to exceed 6	Primary Radar Range resolution: 15∅ m K = 1.5 (triangular pulse where $t \approx t_r$, only components down to 27 dB from the strongest are considered) Then t = $2 \times \frac{\text{range resolution}}{\text{velocity of light}}$ $= \frac{2 \times 15∅}{3 \times 1∅^8}$ $= 1 \times 1∅^{-6}$ seconds Bandwidth: $3 \times 1∅^6$ Hz = 3 MHz	3M∅∅P∅N
		2. Composite Emissions	
Radio-relay system	$B_n = \frac{2K}{t}$ K = 1.6	Pulse position modulated by 36 voice channel baseband; pulse width at half amplitude = ∅.4 us Bandwidth: $8 \times 1∅^6$ Hz = 8 MHz (Bandwidth independent of the number of voice channels)	8M∅∅M7E

Evan Richards, National Conference Chairman and Fred Link, Board Member at VTS Board Meeting in Dearborn, Michigan.



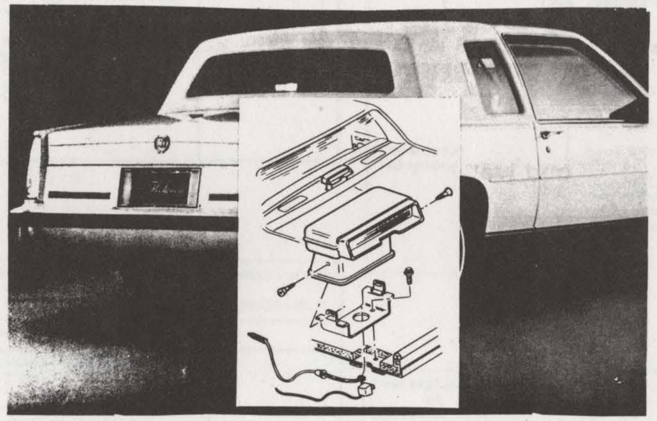
Automotive Electronics

Dateline: Detroit

Bill Fleming
Automotive Electronics Editor

GM's HIGH-MOUNT STOP LIGHT

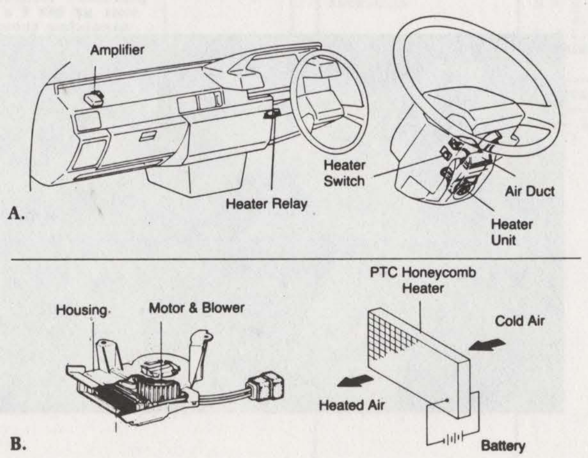
General Motors has introduced the high-mounted stop light for a number of its cars in advance of the Government regulation, which requires them on all 1986 models. The new lamp will be initially installed inside and low in the center of the cars rear window with a special light-shielding gasket. In future cars, GM intends to integrate the light into the car bodies. The 7-square inch high-mounted stop lamp exceeds the required minimum of 4.5-square inch visible area from 45 degrees to the left or right. In addition, its bulb can be replaced without need for special tools [1].



GM High-Mounted Stop Lamp

TOYOTA QUICK HAND WARMER

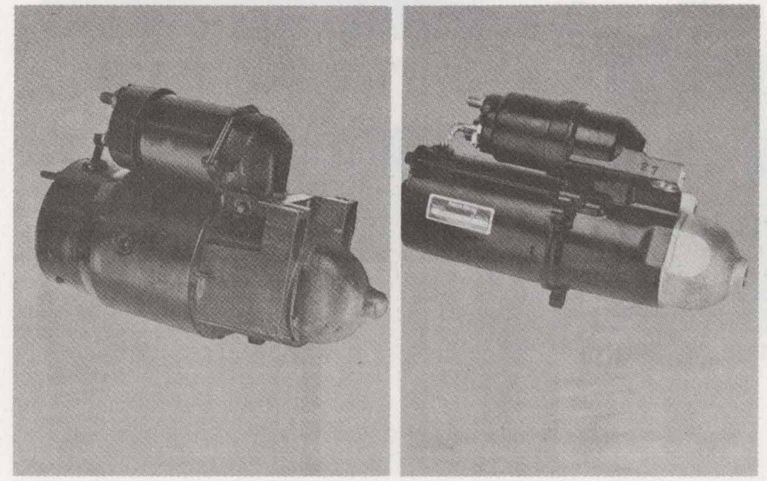
A feature called a quick hand warmer has been introduced by Toyota on its Cressida export models. The heater warms the driver's hands on the steering wheel in cold climates during start-up. The heater employs a PTC thermistor heating element, made of $BaTiO_3$, which has an electrical resistance characteristic that increases sharply when a certain temperature level is needed, making it very suitable for a safe heater with built in automatic safety switching to preclude overheating. The unit is mounted under the steering column, and sends warm air onto the driver's hands by means of a 5300 RPM electric motor. The heater automatically cuts off after a 6.5 minute operation, by which time the car heater should be feeding warm air into the vehicle [2].



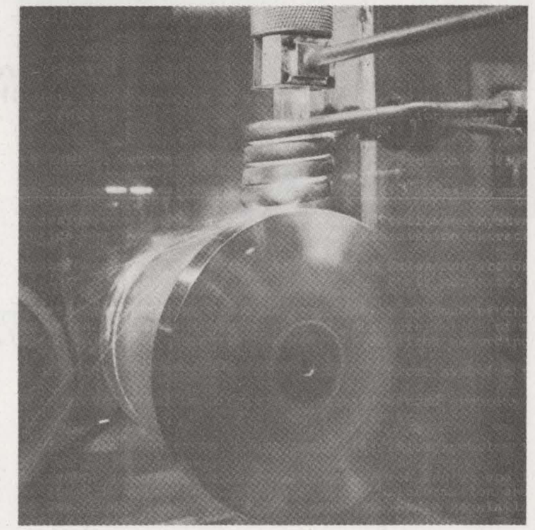
Essential Components in Toyota Quick Hand Warmer

GM DELCO-REMY PERMANENT MAGNET CRANKING MOTOR

A new class of high performance, permanent magnets called "Magnequench," have been discovered and developed by GM Research Laboratories. Use of this material can substantially reduce the size and weight of electric motors. The breakthrough is being translated into practical applications. GM's Delco-Remy Division has developed a new cranking (starting) motor which Magnequench has permitted a nearly 50% reduction of a previous motor size and a 45% reduction of weight. Reduced size and weight of automotive components translate directly into improved operating efficiency of a total vehicle. The cranking motor is only the first of many uses for the new magnet. Electric window motors, radiator and heater fan motors, windshield wipers, electric fuel pumps, and stereo speakers in automobiles can all benefit from use of this new material and its capability for miniaturizing the size of these components [3].



Size Reduction of Cranking Motor Made Possible by Use of New Permanent Magnet Material



Manufacture of High-Energy, Permanent Magnet Ribbon Material by Means of Spin-Melt Processing in a Controlled Atmosphere

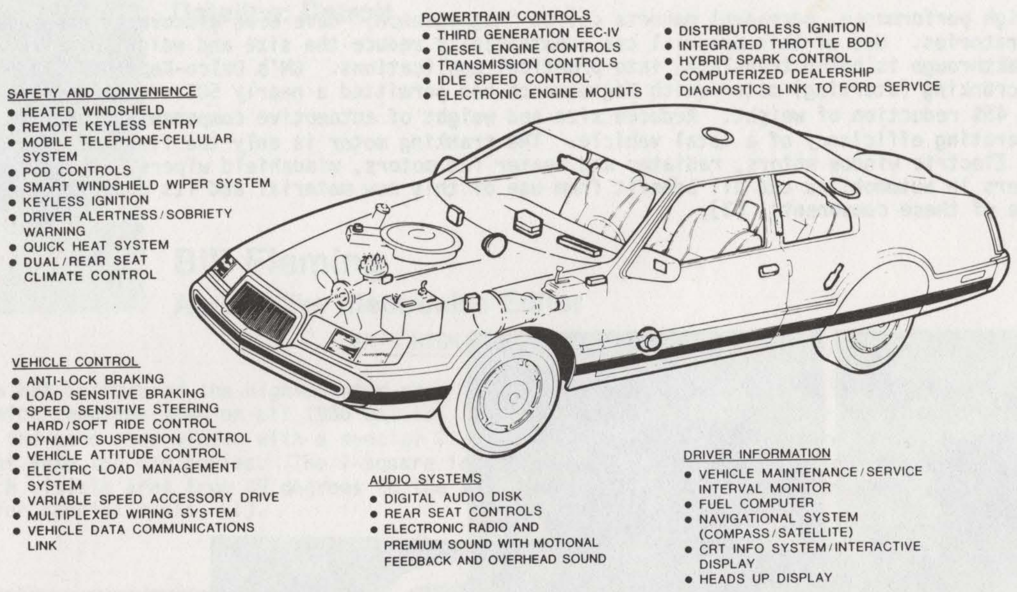
AUTOMOTIVE ELECTRONICS TECHNOLOGIES FOR THE '80's

Jerry Rivard, Chief Engineer of Ford's Electrical and Electronics Division, predicted that the dollar content of electronics in the average U.S. vehicle would more than double in the next decade [4].

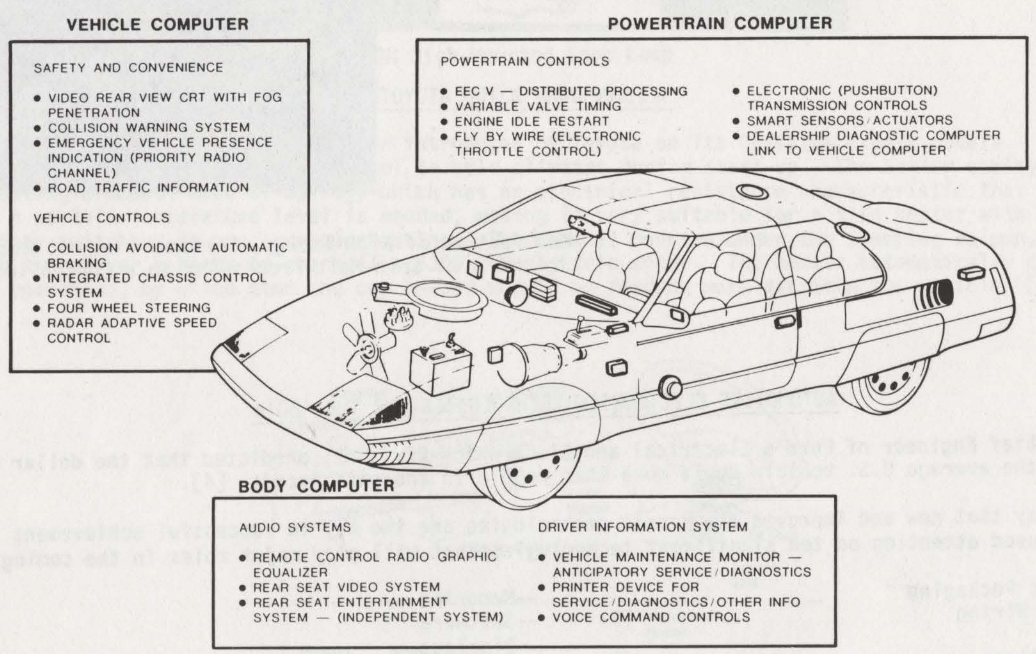
He went on to say that new and improved electronic technologies are the key to successful achievement of this vision. He focused attention on ten significant technologies that will play major roles in the coming decade:

--Electronic Packaging
--Multiplex Wiring
--Sensors
--Power Devices
--Microprocessors
--Memories
--Software
--Displays
--Voice Synthesis and Recognition
--Mobile Communication

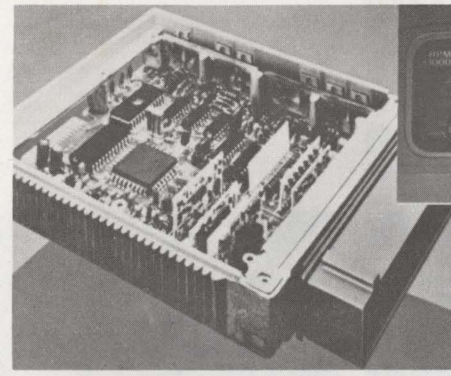
He cited a broad range of new product ideas, such as: satellite navigation, CRT information systems with on-screen controls and voice command control of vehicle functions, keyless ignition, vehicle attitude control, and computer controlled suspensions.



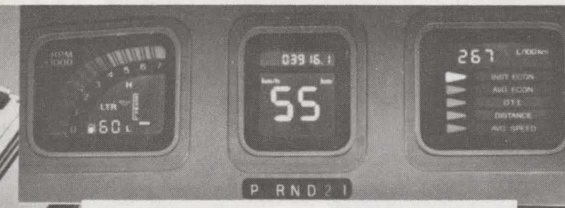
New Electronic Systems Expected to Appear on Vehicles Within the Next Five Years



A Ten-Year Vision of New Electronic Systems Which Can Be Expected to Appear

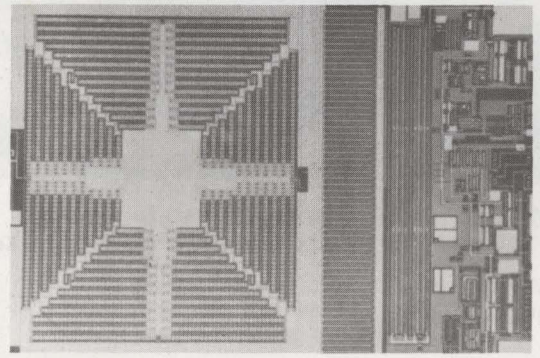


Technology: Electronic Product Packaging
Product: Ford EEC-IV Engine Computer

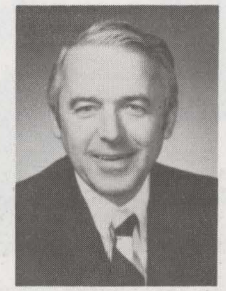


Technology: Displays
Product: 1985 Thunderbird Liquid Crystal Display

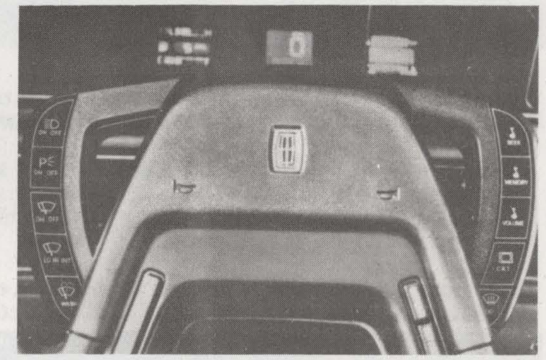
Technology: Mobile Communications
Product: 1985 Mark VII Cellular Phone



Technology: Power Devices
Product: Smart Powered Integrated Circuit



J. G. Rivard



Technology: Multiplex Wiring
Product: 1985 Mark VII Comtech Pod Controls

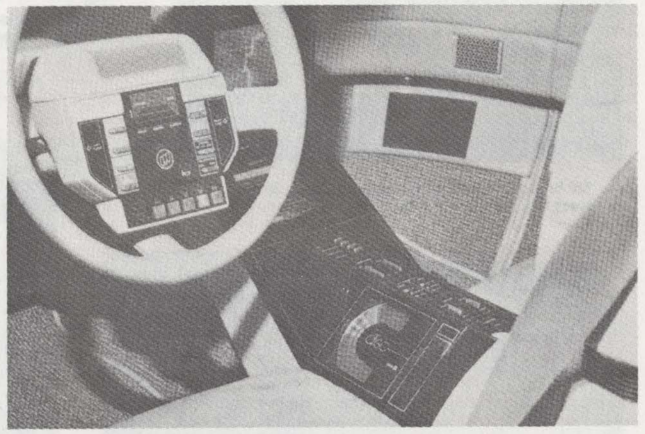
Current Electronic Technologies Appearing on Ford Vehicles and Developed Under the Direction of J. G. Rivard

ADVANCED INSTRUMENTATION, CONTROL, AND INFORMATION SYSTEMS

The Big Three automakers in the U. S. are experimenting with advanced instrumentation, control, and information systems that feature multifunctional touch-sensitive cathode ray-tube screens. Both Ford Motor and Buick Motor are planning to build prototype cars equipped with CRTs as well as other special features this year for tests under actual driving conditions. CRT instrumentation systems will probably appear next fall in standard production automobiles [5--7]. Ford's Lincoln-Mercury Division will build 50 Comtech prototype vehicles--experimental modifications of the current Continental Mark VII--that include 7-inch diagonal CRTs mounted in the center of the instrument panel. The Zenith-supplied CRT is equipped with an infrared beam touch system. Similarly, GM plans to build 50 experimental cars to evaluate CRT technology [7]. The system will include functions of climate control, audio system control, and trip information. Although Chrysler Corporation has not yet announced plans, a company spokesman did say that dashboard CRTs are the way to go.

To counter the recently introduced GM Delco-Bowes audio system, Chrysler has introduced Ultimate Sound Stereo. The new system features 36 watts of power, a five band graphic equalizer, six speakers with joy stick speaker control, and soft touch buttons. This radio was designed cooperatively with Mitsubishi Electric in Tokyo. At this time Chrysler is the only car maker of the Big Three to continue to offer its voice-alert system that uses speech synthesis chips to provide verbal diagnostic or safety messages to the car driver and/or occupants. A means for disconnecting the system is now provided by Chrysler for customers who are annoyed by the eleven message system. GM has yet to incorporate speech synthesis systems in its cars and Ford Motor last year discontinued its voice system, introduced in 1983, after customers complained [5].

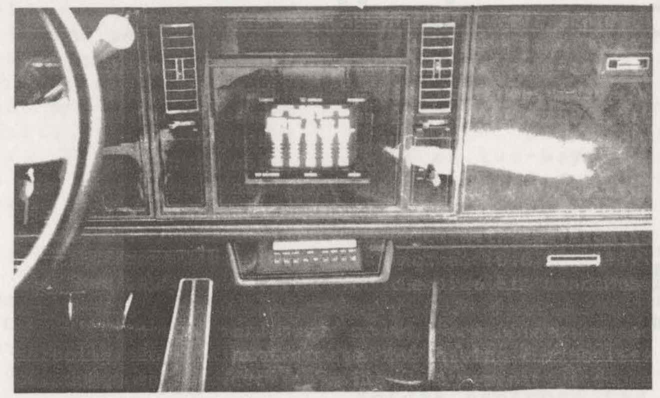
Ford Motor Comtech Instrumentation System
Which Includes Steering Pod Mounted Multiplex Control



Buick Motor Questor Electronic Concept Vehicle Interior
Includes a Voice Actuated Radio Telephone and a Laser Light Key

Chrysler Laser Atlas and Satellite System Which Uses a Color TV
Monitor and Includes an Electronic Compass and 12-Function Navigator

Renault Dialog Instrumentation Includes Multifunction CRT,
Cordless Telephone, and Compact Disk Player



Buick Motor CRT Display Which Can Show Trip Information
or Control a Radio, or Control the Air Conditioning

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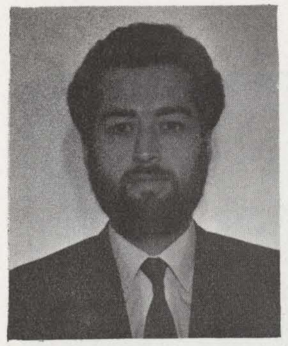
Communications



J. R. Cruz
Communications Editor

With this issue we start what we hope to be a continuous series of tutorial articles on timely subjects of interest to our readership. The first article of this series is an overview of spread spectrum techniques and its applications to mobile radio. The topic could not be more timely or controversial. The author, Dr. William W. Chapman is with Sperry Corporate Technology Center, and has just completed a study of an overlaid spread spectrum communication system for mobile radio applications. We thank him for his willingness to share his views with the VTS membership. Other articles, on topics such as pilot-based SSB, are currently under preparation by recognized contributors in the field.

We continue publishing our regular features on abstracts and new literature. With your help we hope to expand our features to conference announcements, meetings and conference reports, new products, listing of books and book reviews and thesis abstracts.

Any suggestions or comments you may have on the content or format of our contributions are sincerely welcomed. Please address your correspondence to:

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ABSTRACTS

"BER Degradations Caused by Switching in Digital Mobile Radio Systems Using Base Station Diversity", B.S. Glance, AT&T Bell Laboratories Technical Journal, vol. 63, no. 4, April 1984.

This paper presents a study of the Bit Error Rate (BER) degradation resulting from base station switching in digital mobile radio systems using base station diversity to combat shadow fading. The degradation is caused by the discontinuities of the signal received by the mobile unit when transmission is switched from one base station to another. To evaluate this effect, a simple statistical model has been devised for the spatial variations of shadow fading. It consists of a one-parameter spatial autocorrelation function for the (Gaussian) decibel value of the fading loss, which can be easily simulated. The single parameter is a correlation length, which can be varied to emulate different fading conditions in the urban environment. The shape of the autocorrelation function can similarly be varied. This model was used to evaluate the BER degradation of mobile radio systems using Phase-Shift-Keying (PSK) modulation. The results show that, in worst-case conditions, the BER is insignificantly affected by switching for BER values above 9×10^{-5} for two-PSK and 1.5×10^{-4} for four-PSK. Adding a threshold into the switching test can reduce or increase the switching degradation, depending on the threshold value.

"Preemphasis/Deemphasis Effect on the Output SNR of SSB-FM", E.K. Al-Hussaini and E.M. El-Rabhie, IEEE Trans. Comm., vol. COM-32, no. 7, July 1984.

The effect of preemphasis/deemphasis on the noise power output of FM detectors for SSB-FM is studied. Two cases are considered: namely, when the modulating signal is assumed to be sinusoidal and when it is a Gaussian random process. For both cases the noise is random process. For both cases the noise is assumed to be stationary and Gaussian. For a sinusoid modulating signal, the improvement of $(S/N)_o$ for SSB-FM detectors is obtained when the modulation index β lies in the interval (0.1-12.0) with negligible improvements for higher β. For a Gaussian modulating signal, improved results are obtained for a modulation index in the interval (0.1-0.6).

"Adaptive Multiplication - Free Transversal Equalizers with Application to Digital Radio Systems", G. Pirani and V. Zingarelli, IEEE Trans. Comm., vol. COM-32, no. 9, Sept. 1984.

Recently, multiplication-free digital filters have been proposed for different applications to digital radio systems and signal processing. The absence of multiplication is obtained by constraining each coefficient to be sum of powers of two. In this way, multipliers are substituted by shift registers and, if appropriate, some adders. The optimal power-of-two coefficients must be computed through a nonlinear optimization procedure.

Until now the problem of adapting the power-of-two coefficients of baseband transversal equilizers in the case of time-varying channels had not been considered. In this paper two algorithms are proposed to cope with this problem and are compared from the viewpoint of complexity, accuracy, and convergence speed. As an application example, transmission of a biphase PSK digital radio system over a multipath fading channel is considered.

"800-MHz Attenuation Measured In and Around Suburban Houses", D.C. Cox, R.R. Murray and A.W. Norris, AT&T Bell Laboratories Technical Journal, vol. 63, no. 6, July-Aug. 1984.

The signal levels around and within eight suburban houses were measured at 800 MHz. These measurements are needed in refining the requirements for portable-radio communication systems that can accommodate low-power radiotelephone sets. The measurements were made from an instrumentation van having an erectable 27-foot-high antenna. Large-scale distributions of the small-scale signal medians are approximately log normal. The decrease in median signal level with distance ranges from d^{-3} to $d^{-6.2}$ for the eight houses. Signal decreases as $d^{-4.5}$ for the overall data set. At 1000 feet, regressions to signal levels range from 12.5 to 37.1 dB below free-space propagation levels for locations outside and locations inside on first and second floors. In basements, regression levels at 1000 feet range from 29 to 48.2 dB below free space. For the overall data set, regression signal levels at 1000 feet are 27.7 dB below free space. For all the basements, this value is 39.6 dB. Other signal statistics are given in this paper.

"A New Robust FM Demodulator Reducing Adjacent Radio - Channel Interference Noise", M.L. Dukic, Z.D. Stojanovic, and I.S. Stojanovic, IEEE Trans. Comm., vol. COM-32, no. 11, November 1984.

A new proposed robust FM demodulator (RFMD) is a simplified version of the recently reported demodulator (FMD) [1] which improves FM system interference immunity. The RFMD is applied to combat the adjacent channel interference and its improvement factor is only negligibly smaller than that of the FMD.

"An Integrated Voice and Data Multiple-Access Scheme for a Land-Mobile Satellite System", V.O.K. Li, T.Y. Yan, Proc. IEEE, vol. 72, no. 11, November 1984.

A Land-Mobile Satellite System (LMSS) is a satellite-based communications network which provides voice and data communicatons to mobile users in a vast geographical area. By placing a "relay tower" at a height of 22300 mi, an LMSS can provide ubiquitous radio communication to vehicles roaming in remote or thinly populated areas. LMSS is capable of supporting a variety of services, such as two-way alphanumeric service, paging service, full-duplex voice service, and half-duplex dispatch service. A Network Management Center (NMC) will handle the channel requests, channel assignments, and in general the network control functions. A pool of channels is managed at the NMC to be shared by all mobile users.

An integrated demand-assigned multiple-access protocol has been developed for the experimental LMSS. The pool of channels is divided into reservation channels and information channels. The information channels can be assigned by the NMC to be either voice channels or data channels. Each mobile user must send a request through one of the reservation channels to the NMC via the ALOHA random-access scheme. Once the request is received and processed, the NMC will examine the current traffic condition and assign an informaton channel to the user. NMC will periodically update the partitions between the reservation channels, voice channels, and data channels to optimize system performance. Data channel requests are queued at the NMC while voice channel requests are blocked calls cleared. Various operational scenarios have been investigated. Tradeoffs between the data and voice users for a given delay requirement and a given voice call blocking probability have been studied. In addition, performance impacts of such technological advancements as satellite on-board switching and variable bandwidth assignment are discussed.

"Packet Switching for Mobile Earth Stations Via Low-Orbit Satellite Network", K. Brayer, Proc. IEEE, vol. 72, no. 11, November 1984.

A potentially valuable implementation of a satellite computer communication packet switched network is one which is survivable and distributed. That is, a system which dynamically adapts to changing network element connectivities, changing interconnections of users, and is not dependent on any central unit for its own internal command and control. A laboratory prototype of such a system has been constructed of a group of computers which when given communication circuits between them will, acting autonomously, create a computer communication packet switching network and which will continually adapt to changes in connectivity. In this paper, an adaptive computer communication routing algorithm is described, its application in space including a space segment design is presented, its actual implementation in real physical hardware is discussed, and system performance results as parameters are varied are presented.

NEW LITERATURE

Field Strength Levels.

Results on an exploratory study to measure the electric field strength levels inside an automobile from communicatons equipment are the subject of a report from the National Institute of Justice Technology Assessment Program. Mobile radio equipment users, engineers and planners might find this publication of interest. The report entitled "Field Strength Levels in Vehicles Resulting From Communications Transmitters" is authored by John F. Shafer from the National Bureau of Standards. Using an NBS-designed, calibrated probe, field strength measurements were made at 10 locations within the test vehicle, with and without front seat occupants, at frequencies representing the frequency bands of 25 to 50, 150 to 174, 400 to 512, and 806 to 866 MHz. Also included, as an appendix, are field strength measurements of speed measuring radar devices used in vehicles. For a copy, write to Marshall J. Treado, Manager, Communication Systems Program, Law Enforcement Standards Laboratory, Building 221, Room B157, National Bureau of Standards, Gaithersburg, MD 20899.

Spread Spectrum Applications to Mobile Radio: Past, Present and Future

William W. Chapman

Recent regulatory actions draw attention to the promises and limitations of this evolving technology

Nowhere has the impact of modern technology been more pronounced than in the areas of voice and data communications. From ELF transmission to underwater submarines to lightwave transmission over fiber optic cables, it seems as if no region of the frequency spectrum has gone unnoticed by this ongoing revolution. It is, therefore, not surprising to find that even such established technologies as VHF/UHF radio systems are being looked at anew.

A case in point is the recent attention being paid to spread spectrum* techniques. These systems, which were originally developed for military use, have benefited tremendously from recent advances in the areas of integrated circuit technology and surface acoustic wave devices, and the concurrent increases in signal processing capabilities. With the reduced cost of signal processing equipment it was only a matter of time before attention turned to possible applications in the civilian sector. Such has been the case, and the variety of systems which have been proposed emphasizes the potential these systems might hold. Among the suggested applications are cellular mobile radio systems, wireless data terminals, cordless telephone, radiolocation systems, multiple access to satellite resources, and packet radio networks. The common link between these systems is that each would enjoy one or more benefits by utilizing spread spectrum techniques that would not be obtainable through more conventional modulations.

In this context the most commonly quoted benefits are a resistance to cochannel interference in areas of high spectral occupancy, multiple access capability with little inter-user coordination, improved performance over multipath channels, and a potential increase in spectral efficiency in interference limited environments. For example, a wireless data terminal, developed and tested by Hewlett-Packard [5], allows for indoor transmission at relatively high data rates among multiple terminals even in severe multipath environments (e.g., a warehouse structure with a large steel content).

However, a considerable debate has arisen over the detrimental effects which might occur (primarily to nearby or collocated non-spread spectrum systems) as a result of employing wide-band signals of this form (more on this later). Before considering further the role spread spectrum techniques might play in future radio systems it will be instructive to define certain terms and characterize various concepts fundamental to the theory of spread spectrum systems.

* Spread spectrum systems employ modulation techniques which result in a transmitted bandwidth far in excess of that required by conventional methods. While several forms of spread spectrum modulation exist, the two most common are pseudo-noise and frequency hopping. See refs. [1] and [2] for an introductory discussion.

Spread Spectrum — An Overview

The history of spread spectrum systems makes for very interesting reading, a detailed account of which is presented in [6]. Originally developed to resist intentional jamming and provide low-probability-of-intercept (LPI) communications, these systems have since been recognized as capable of providing a multitude of additional services. Because the signals employed have extremely high time-bandwidth products the waveforms can be designed so as to have very favorable correlation properties, and as such can be used to provide precise radionavigation services, and can further be used to provide a code-division multiple access (CDMA) capability. Systems such as the Global Positioning System (GPS) have capitalized upon the properties of spread spectrum signals to provide extremely accurate navigational services to mobile users (e.g., planes and ships at sea).

In order to achieve time-bandwidth products on the order of 10^2 to 10^5 (higher in some cases) two approaches are commonly used. The first, called direct sequence (DS) or pseudo-noise (PN) modulation, multiplies the information bearing carrier (typically BPSK modulated by the message data) by a pseudo-random sequence of +1's and -1's at a much higher bit rate (commonly referred to as the chip rate) than that of the baseband message. As such, the resulting signal bandwidth is predominantly determined by the bandwidth of the PN sequence. At the receiver the PN sequence is removed from the received signal prior to message recovery by again multiplying by the original pseudo-random waveform (which requires that code synchronization be achieved and maintained for the duration of the transmission). Code-division multiple access capability is achieved by modulating the signal of each user by different PN sequences, the set being appropriately choosen to provide low cross-correlation between all possible members of the set. Fig. 1 depicts a typical transmitter/receiver pair for direct sequence spread spectrum systems.

The other method commonly employed, called frequency hopping (FH) modulation, shifts the frequency of the transmitted carrier at a relatively fast rate. Prior to hopping, the message data is typically modulated onto the carrier by standard frequency-shift-keying or phase-shift-keying, neither of which requires coherent demodulation at the receiver. Again, code-division mutliplexing is provided by assigning users different hopping patterns, and by error correction coding to offset the effects of frequency "hits". A typical transmitter/receiver pair is shown in Fig. 2. If the carrier hops at a rate faster than the message bit rate the system is referred to as a fast-hop system. Conversely, if the rate is slower it is referred as a slow-hop system.

Other techniques have been employed to spread the transmitted bandwidth, among these are time hopping, whereby the message is transmitted in bursts at pseudo-random time increments, and chirp (or swept) FM. Hybrids of the above are also possible and are, in fact, becoming the preferred approach in many military applications. The amount by which the bandwidth of the original signal is expanded determines to a great extent its ability to resist interference, whether intentional or simply cochannel noise. As such the ratio of the transmitted signal bandwidth to that of the original "unspread" signal is referred to as the processing gain (PG) of the spread spectrum system. The interested reader is referred to refs. [1], [2], [3], and [4] for further information on spread spectrum techniques.

Applications to Mobile Radio

One of the first civilian applications to be seriously proposed for spread spectrum systems was that of cellular mobile radio in 1977 (see ref. [7]). Among the potential benefits which Cooper and Nettleton sighted in their original paper was message privacy, ease of digital data transmission, and a claimed higher spectral efficiency as compared to more conventional FM approaches. While the actual efficiency of such a system has never been varified by field trials, subsequent analyses indicated the potential for substantially higher user populations, see ref. [10].

The impetus behind the development of cellular mobile radio systems has been the need to provide mobile telephone service to large numbers of users. Until recently most systems typically employed a single high power base station with a coverage area that spanned the entire service region. As such, each frequency channel could be used at most once throughout the service area. Thus, the number of simultaneous users in any large urban area was limited by the number of channels within the assigned allocation. Consequently, large groups of users were denied access to the mobile radio network. This situation has been drastically altered by the recent FCC ruling to open up large portions of the radio spectrum between 800–900 MHz for cellular radio systems. The results of this action have already been felt with the proliferation of cellular systems being set up in most of the large urban areas of the country.

The layout of a typical cellular radio system is depicted in Fig. 3. As shown, the region to be serviced is subdivided into a hexagonal lattice of cells each of which contains a base station. In mobile-to-mobile or mobile-to-fixed site communications all transmissions are routed through these bases. Also shown is a central controller which serves to implement the control strategy chosen, assign base stations, route calls between bases, and manage the load on the system. Regardless of the modulation method employed, full duplex operation of cellular mobile radio systems is achieved by dividing the frequency allocation into two equal sub-bands, one for base-to-mobile transmissions (downstream), the other for mobile-to-base transmissions (upstream).

In narrowband FM systems a considerable increase in spectral efficiency over that obtainable by a single base station configuration is made possible by reassigning channels to multiple base stations, these being sufficiently far enough removed from one another as to result in acceptable levels of cochannel interference. In order to implement this the service area is grouped into "clusters" of N contiguous cells, within which no channel assignments are duplicated (see [8] for more on the topology of FM cellular systems). In a spread spectrum cellular system the use of multiple base stations uniformly distributed over the service area allows for a considerable decrease in transmitted power during both upstream and downstream transmission, while the use of spread spectrum modulation techniques results in more uniformly distributed interference levels. Thus, while each user utilizes the entire frequency allocation, the interference resulting from any given source is greatly reduced as compared to that in a single base station configuration.

To date both differentially coherent phase-shift-keyed systems and frequency-shift-keyed systems have been proposed for mobile radio applications, see [9]. In either implementation all users would be assigned a distinct hopping sequence to be used for transmission from the base, and in frequency translated form to the base. The signal sets employed are typically generated from an algorithm which seeks to minimize the number of frequency coincidences between user codes and, hence, to minimize "code noise" within the system. In order to further reduce inter-user interference these systems would employ power control techniques to adaptively adjust transmitted power levels during upstream transmission so as to maintain the average received signal power constant.

Why Spread Spectrum?

From a technical perspective there are numerous reasons to consider spread spectrum techniques for mobile radio applications. Limited space precludes a comprehensive examination of all of these, but several of the major considerations are as follows:

1) Multipath fading, a fundamental characteristic of radio wave propagation over urban channels, provides one of the primary motivations for considering spread spectrum techniques. Also referred to as Rayleigh fading, this phenomenon results from the multiplicity of paths over which the received signal has traversed before arriving at the receiver antenna. When the original signal is narrowband in nature (e.g., a CW carrier) this results in an envelope which is Rayleigh distributed at any given position [11] (hence its name). This fading component is very frequency selective (carriers separated in frequency by more than the coherence bandwidth of the channel, typically 100–300 kHz, will experience almost uncorrelated fading), and exhibits a great deal of positional dependence. Since these fades result from the standing wave patterns set up by the reflected and refracted waves, the relative maxima and minima can occur at distances as close as one half of a wavelength apart. Thus, at 900 MHz a vehicle traveling at 60 mph can experience 50 to 100 fades over a period of one second!

In order to combat this fading, narrowband systems must either include a considerable margin in their power budget (typically around 20 dB), or employ some form of spatial diversity. On the other hand, fast frequency hopped signals exhibit an inherent resistance to multipath fading since successive hops will typically be separated in frequency by more than the channel coherence bandwidth. Hence, the required fading margin that must be included in the power budget for these systems is only on the order of 2–3 dB. (A tutorial on the use of spread spectrum techniques to combat multipath fading can be found in [12].)

2) As previously alluded to, spread spectrum techniques allow large groups of users to simultaneously access a centrally located resource by employing code-division multiplexing. Such an implementation has the desirable property of requiring little inter-user coordination (required in most frequency-division or time-division multiple access schemes).

3) Spread spectrum systems are by nature digitally oriented (with a few exceptions). As such, there is little difficulty in transmitting digital data, digitized voice, automatic status updates, etc. The pace with which all communications are transitioning to digital formats presents a strong argument for considering a system which is inherently oriented towards digital transmissions.

Spread Spectrum Overlays

The ability of spread spectrum systems to suppress interference within the received signal's bandwidth occurs whether the interference is an intentional jammer, or simply unintentional cochannel noise. Thus, there is every reason to believe that systems which employ spread spectrum techniques could operate in the presence of multiple cochannel signals, as might be characteristic of operation in urban areas. Consequently, there has been considerable recent discussion over the possibility of employing spread spectrum systems in an overlaid manner. For our purposes we will define an overlay to consist of the collocated operation, both spectrally and geographically, of a spread spectrum system(s) and a more conventional narrowband system(s).

The feasibility of overlaid operation is very much a function of the application considered, and the level of spectral occupancy within the proposed band. While the near-far problem would render many such systems (either individually or jointly) inoperable for unacceptable periods of time, certain applications might be quite amenable to such an implementation. The potential benefits of overlaid operation include flexibility of spectrum allocation, concurrent use by several user groups of the same frequency band, and the possibility of increasing spectral efficiency in under-utilized allocations.

One application which has been studied in some detail (e.g., see refs. [13] and [14]) is that of overlaid mobile radio. In [13] an analysis of overlaid cellular mobile radio systems is presented. The spread spectrum system considered is an adaptation of the differentially coherent phase-shift-keyed frequency hopped system originally proposed by Cooper and Nettleton. It is concluded that overlaid operation with existing narrowband FM systems appears feasible under suitable restrictions (e.g., proper frequency hop signal design, collocated FM and spread spectrum base stations, and the inclusion of power control techniques within the spread spectrum system). Furthermore, in [14] favorable results are also arrived at regarding overlaid operation in the UHF television bands.

Regulatory Issues

The recent interest in spread spectrum technologies has not gone unnoticed by the Federal Communications Commission, which recently released a Notice of Inquiry requesting comments from the public on the suitability of these wideband emissions for civilian use, see [15]. Currently the FCC regulations do not contain any sections that explicitly govern the use of spread spectrum systems, and as such anyone desiring to implement such a system typically must obtain special permission from the FCC.

As a result of this, and in response to the replies received to the Notice of Inquiry, the commission released a Further Notice of Inquiry and Notice of Proposed Rulemaking (see [16]) which set forth certain proposed regulations governing the operation of low power spread spectrum devices. The proposed rules would allow spread spectrum systems to operate essentially on all frequencies (with certain exceptions) above 70 MHz under Parts 15 and 90 of the FCC rules.

Obviously such a blanket use of the spectrum would create havoc were it not for additional restrictions, as such power limitations are included within the proposed rules. However, the nature of the proposed power restrictions have been the source of some concern among parties interested in developing spread spectrum systems for civilian use. As currently stated the regulations would provide for the operation of frequency hopped systems limited to a field strength of between 500 and 5000 μv/m (depending upon the frequency of operation) at a distance of 3 meters from the transmitting antenna. Furthermore, direct sequence systems would be limited to a field strength of 33 μv/m regardless of the operating frequency. Consequently, manufacturers interested in developing spread spectrum systems for applications such as radionavigation or mobile radio would not be able to operate their systems under the proposed rules.

It remains to be seen how the regulatory issues will be settled, but in the mean time it should certainly be the source of many interesting debates. One thing that is certainly true is that this issue has potentially wide sweeping ramifications for the future use of the radio spectrum, and as such should be given serious consideration by anyone involved in the design or development of RF systems.

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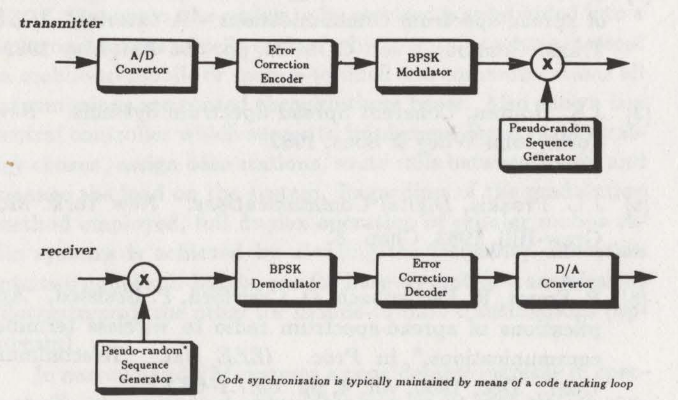

Fig. 1. Typical pseudo-noise transmitter/receiver pair.

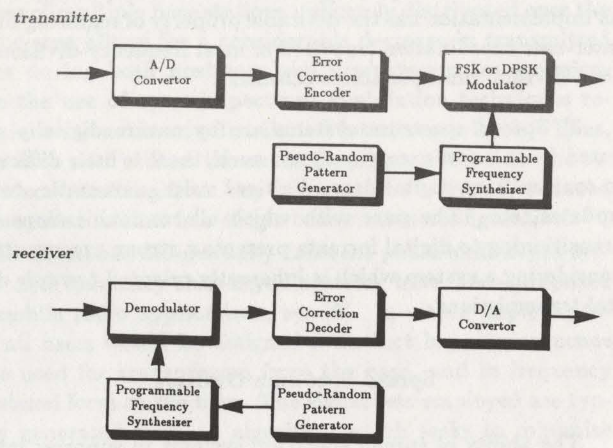

Fig. 2. Typical frequency hopped transmitter/receiver pair.

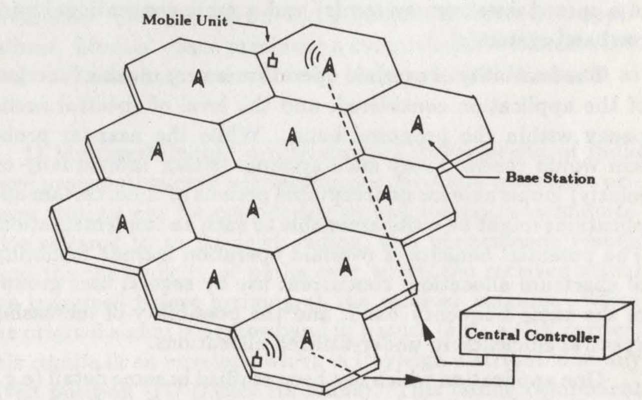

Fig. 3. Topology of a hexagonal grid cellular radio system

ISATA 1985

INTERNATIONAL SYMPOSIUM ON AUTOMOTIVE TECHNOLOGY AND AUTOMATION

Graz, Austria, 23rd — 27th September, 1985

Graz, the capital of the province of Styria, will be the venue for the 1985 ISATA Symposium. This will be held from 23rd — 27th September 1985, with the collaboration of AVL LIST Ges.m.b.H., Graz, which, for over 35 years, has been dedicated to research, development and design of internal combustion engines, as well as the development and production of automotive testing and diagnostic equipment.

Technical sessions will be held in the Congress Centre of Graz, where the papers presented will cover the whole range of automotive technology and automation, including: computer aided testing; engine and emission testing; component testing; lubricant testing; automation of manufacturing processes; robotics, flexible manufacturing systems; diagnostics; quality control; computer aided engineering; future product development; instrumentation and sensors; fuel economy; vehicle management systems; safety; microprocessors and microelectronics. SPECIAL EMPHASIS WILL BE PLACED ON INTEGRATED COMPUTER-AIDED ENGINEERING AND MANUFACTURING. There will be a special session for the exhibitors and suppliers to the automotive industry.

The official language of the Symposium will be English.

One day and a half will be set aside for technical visits to various facilities at AVL, BMW Steyr and General Motors Austria.

Evening activities arranged include a reception by invitation of the Lord Mayor of Graz and a dinner offered by the Provincial Governor at Eggenberg Palace, a banquet and a Styrian Folklore evening.

There will be a special ladies programme for delegates' wives.

The Symposium will, once again, be drawing on the expertise and support of the ISATA coordinating commitee, which is responsible for vetting the papers submitted.

Authors wishing to give papers at the Symposium should submit the title and a short summary of 100 — 150 words to the organisers before 25th January 1985. In order to allow sufficient time for printing, the full manuscript should be received by 16th May 1985. IT SHOULD BE STRESSED THAT AUTHORS WILL BE REQUIRED TO PAY FULL REGISTRATION FEES.

Space at the Congress Centre of Graz will be set aside to provide a static exhibition area. Car manufacturers, suppliers of equipment and other companies wishing to exhibit should contact the Symposium organisers as soon as possible.

Advertising space is available in the Symposium programme, which is distributed on a worldwide basis to 15,000 executives in the automotive field. Advertising space is also available in the Symposium proceedings, which are distributed to all delegates and used as standard reference works all over the world. Companies wishing to advertise should contact the organisers as soon as possible.

Following the success of recent ISATA symposia with over 400 delegates from 24 countries attending, the 1985 Symposium should be an even more important and successful event.

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