IEEE
VEHICULAR TECHNOLOGY SOCIETY
NEWSLETTER

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Marriott Hotel
Pittsburgh/Monroeville

May 21-23, 1984

34th Annual Conference

President's Message

Sam McConoughey
President
IEEE Vehicular Technology Society

I hope that by the time you read this you will have completed your plans to attend our 34th Annual Vehicular Technology Conference in Pittsburgh. I look forward to seeing you there.

Your Board of Directors will be meeting a day prior to the conference to discuss some of the tasks assigned at our December meeting.

We should be hearing from Stu Meyer, Jr. Past President regarding his recommendations for an enhanced Awards Program; and from Board Members Jim Mikulski regarding the Fellow Awards; Chuck Lynk regarding Paper of the Year Awards; and from Al Goldstein regarding the Dan Noble Fellowship award.

In addition we will be hearing from Sr.Past President, Roger Madden regarding his committee's efforts at drafting a revised Constitution and By-Laws.

Board Members Fred Link and Al Goldstein will be reporting to us on future conferences of the VTS. In August, we expect to be participating, at the invitation of the EIA, in the Showcase for Land Mobile Communciations to be held in Las Vegas where we will be responsible for a technical session. In October, it is our biennial sponsorship of Convergence in Dearborn. The 35th VTC appears to be slated for Boulder, CO. Rumors have it, that Dallas-Ft.Worth is interested in sponsoring the 36th VTC.

We will also be receiving reports from other Committee Chairmen; Bob Fenton, VP heads our Planning Committee; Gaspar Messina, Chapter Activities; Bob Mazzola, Membership; George McClure Publications and Kent Johnson, Newsletter. Each has been asked to present their plans to improve and strengthen your Society.

Centennial medals and certificates; Fellow Awards and other Awards will be presented at the Awards luncheon during the Conference. Make your reservations early!

As part of our Centennial activities, we hope also to have available at the conference the first of the Society's IEEE Press Books, "Land-Mobile Communication Engineering." Our Ad Hoc Committee on Land Mobile Radio Propagation 806-947MHz" is planning a second IEEE Press Book, hopefully to be completed during the IEEE Centennial year.

Another of our goals is to assist the IEEE in meeting its objective of enrolling 250,000 members. I've set a modest objective of a 5% increase in Society membership. But we need your help. Sign up any of your associates that may need that little nudge from you.

The IEEE Board of Directors has approved the realignment of its Divisional structure. The VTS is now in Division III as are the Communications Society, the Broadcast Technology Society, and the Consumer Electronics Society. Alan Culbertson heads our new Division.

Again, I wish to take this opportunity to invite each of you to let the elected members of your Society hear from you. Also we need volunteers to serve on Committees; to run for vacancies on our Board. We are also asking that you nominate your colleagues for awards such as Fellow, IEEE Field Awards, or Society recognition. If you have views that you wish to express, send a letter to the Newsletter Editor. By all means, let us hear from you.

Best regards,

Sam

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Month of Issue	Final Copy to be Rec'd By VTS Editor	Target Mailing Date
August	6-09-84	7-13-84
November	9-13-84	10-15-84
February	12-21-84	01-27-85
May	3-10-85	04-14-84

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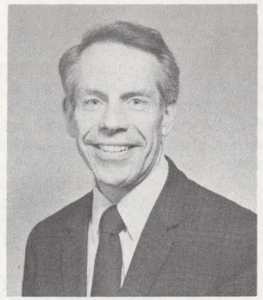
Editor's Notes



A. Kent Johnson
Newsletter Editor

George McClure to Receive Centennial Medal

In addition to those Centennial Medal recipients named in this column in the February Newsletter, we have learned that George McClure (VTS Board) has been named to receive the IEEE Centennial Medal and Certificate. He will be presented his award by the IEEE entity that nominated him, the Orlando Section. We extend congratulations to George.

34th VTS Conference Featured

We are pleased to feature the upcoming 34th Vehicular Technology Conference in this issue of the newsletter. The conference will be held May 21-23 at the Pittsburgh/Monroeville Marriott Hotel. We are reproducing much of the advanced program in this copy of the newsletter. Tom Selis and his staff have worked hard to prepare what looks to be an excellent conference for us and we look forward to seeing you there.

Fred Childs Available to Speak at Chapter Meetings

Reprinted below are a Biographical sketch of Mr. Fred E. Childs and the abstract of a talk, "The Progression of Narrow Band VHF/UHF Technology" which Mr. Childs is willing to present to interested VTS Chapter meetings. Those Chapter Chairmen who would like to have Fred speak at one of their meetings should contact Sam McConoughey to make the arrangements.

If you would like to contact Fred directly to obtain more details his address and telephone number are:

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2257 Fairmount Avenue
St. Paul, Minnesota 55105

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CSSB - ACSB
The Progression of Narrow Band
VHF/UHF Technology
by
Fred B. Childs

Abstract

Conservation of the radio spectrum has gained priority with the persistent demand for additional radio channels. Such demand prompted action by the FCC in 1976 to contract with the Communications Satellite Planning Center at Stanford University to investigate means for reducing spectrum waste, especially in the VHF region. The result was a compandored single sideband system with pilot tone replacing carrier and 5 kHz bandwidth replacing the conventional 20 to 30 kHz bandwidth, termed Amplitude Compandored Sideband or ACSB.

ACSB, however, is not the only form of narrow band technology because in 1961 Kahn Research Laboratories, now Kahn Communications Inc., developed a full carrier single sideband system presently applicable in the 900 MHz region for Airfone and Railfone operation, termed Compatible Single Sideband or CSSB.

ACSB also has promise in pending Mobile Satellite systems on file with the FCC, but will be confined to VHF highband application at this time. Other narrow band technologies have been proposed over the past 20 years; however, CSSB has been the prominent forerunner and ACSB the recognized newcomer in the narrow band field. Both technologies are explored in this report.

Fred B. Childs
Biographical Sketch

Mr. Childs hails from the Twin Cities of Minneapolis and St. Paul where he attended the University of Minnesota and received a BEE degree while in the Naval V-12 Training Unit in 1945. He joined the Northern Pacific Railway following World War II, participated in both Mechanical and Communications Department field apprenticeships and functioned as System Radio Engineer for 12 years.

During that period he expanded a VHF radio network from six mobile and one base to 4000 mobile and 200 base units as well as being involved in a transcontinental microwave system spanning 2000 miles. Also during that time he became acquainted with prototypes of the Kahn system of Compatible Single Sideband, known as CSSB, as it could potentially apply to large FM systems.

In 1965 he became an Assistant Superintendent of Communications; and after two major rail mergers, completed his railroad communications career late in 1981 as Director Communications Engineering for the Burlington Northern Railroad. By that time the VHF radio network had expanded to 17,000 mobile and 600 base units and microwave facilities encompassed 8000 miles tying together the radio network as well as a labyrinth of telephone and data circuits.

Mr. Childs also served for 32 years as a member of the Radio and Microwave Committee, and its predecessors, for the Communication and Signal Division of the Association of American Railroads and ultimately served as committee chairman. He is a life member of the AAR and, although technically retired, has a keen interest in the integration of ACSB within the FM systems of large users.

He is an active radio amateur under the call WØWQ.

Society Officers and Board of Directors

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Ronald G. Rule	Education Committee	Jan82-Dec84
Eric Schimmel	Chairman, CB Radio Committee	Jan83-Dec85

Gaspar Messina
Chapter News Editor

Chapter News

Meetings

New Jersey Coast (EMC/VTS)

Chapter Christmas Party and Membership Meeting with slide show entitled "The Benefits of IEEE Membership"
by Charles Joly, Vice Chairman, N. J. Coast (EMC/VTS)
Held December 20, 1983, with 25 attending, including 9 guests.

Presentation/Demonstration of the Tempest Receivers including the Design Architecture of (ATTR/PTTR)
by John S. Greely, and other Marketing and Engineering personnel of American Electronics Laboratories (AEL)
Held on February 21, 1984, with 20 attending.

Gaspar Messina
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1984 IEEE Vehicular Technology Society Directory of Chapters and Chairpersons

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VANCOUVER	Alen R. Howatson 902 Fourth Street New Westminister, BC Canada V3L 2W6
WASHINGTON, D.C.	Dan Davies Motorola, Inc. 4710 Auth Place Suitland, MD 20746 (301) 849-3950

1984 Conference Program

COMMUNICATIONS SESSIONS

C1. CELLULAR SYSTEMS

Session Chairman : Kent Johnson

* "The Evolution of Cellular System Design" - J. D. Wells; GSC Systems Development Corp.
* "Detachable Mobile Radio Units for the 800 MHz Land Mobile Radio System" - K. Kobayashi, S. Nishiki, T. Taga, A. Sasaki; Yokosuka Electrical Communications Lab, Nippon Telegraph and Telephone.
* "Protocol Design in the MATS-E Cellular Radio System" - W. Schmidt ; Philips Communications Industries AG.
* "Enterprise Turnkey System for cellular Mobile Radio Application" - F. K. Ma, S. Chau; Bell Northern Research.
* "A New Method to Optimize Reusage of the Frequency Spectrum in Cellular Systems" - E. Niikura; Matsushita.

C2. GUIDE COMMUNICATIONS

Session Chairman : Al Isberg

* "Leaky-Feeder Radio Communications: A Historical Review" - D .J. R. Martin ; Consultant.
* "Medium Frequency Vehicular Control and Communications System for Underground Mines" - H. Dobroski, L. Stolarczyk ; A.R.F. Products.
* "Microwave Radio in Mines and Tunnels" - Q. V. Davis, D. J. R. Martin, R. W. Haining; University of Surrey.
* "Applying CATV Technology and Equipment in Guided Radio Systems" - R. A. Isberg, D Turrel ; Consultants.
* "Train Radio System Using Leaky Coaxial Cable" - T. Yuge, S. Sasaki ; Japanese National Railways.

C3. ANTENNAS AND PROPAGATION

Session Chairman : Al Davidson

* "800 MHz Propagation Test Results in the Pittsburgh Area" - R. T. Forrest ; General Electric.
* "Antenna Design for a Portable Data Terminal" - Q. Balzano, O. Garay ; Motorola.
* "Measurement of H-Field Near a Portable Data Terminal" - T. Babij, Q. Balzano, O. Garay ; Motorola.
* "Energy Deposition in Operators of a Portable Data Terminal" - T. Babij, Q. Balzano, O. Garay ; Motorola.
* "Pattern and Bandwidth Considerations for High-Gain Antenna Systems" - P. Blevins ; Phelps Dodge.
* "Mobile Antennas on Glass" - D. Horn ; Antenna Specialists.
* "Measurements and Analysis of Corner Reflector Backlobe Levels" - A. Davidson ; Motorola.

C4. COMMUNICATIONS SYSTEM DESIGN

Session Chairman : Sam Leslie

* "Analysis of the Probability of Interference During a Telephone Interconnect Call" - G. C. Hess ; Motorola.
* "Trunked Simulcast System Simulator" - G. Hess, L. Mohl, D. Green ; Motorola.
* "Evaluation of Performance of a Proposed PRCS" - V. Kolavennu. R. Duersch, H. Lester, C. Puckette ; General Electric.
* "ACSB System Design" - S. R. Lapin ; Contemporary Communications.
* "Audio Frequency and Amplitude Bandwidth Reduction Techniques" - G. M. Stone ; Sachs/Freeman.

C5. COMMUNICATIONS SYSTEMS DESIGN

Session Chairman : Robert Janc

* "Mobile Telephone Setup Channel Format for the MSAT System" - J. Cavers, H. Hafez, S. Mahmoud ; Simon Fraser University.
* "A Proposed Architecture for a Mobile Telephone System Utilizing Multi-Beam Satellite Coverage" - K. Chaddock ; Glenayre.
* "An Improved Modulation Format and Signal Processing Scheme for ACSB Systems" - C. Stevenson ; Jet Propulsion Laboratory.
* "High Performance Digital Communications in Mobile Channels" - F. Davarian ; Jet Propulsion Laboratory.

* "APTAX Computer Aided System for Taxi Applications" - Dr. Henricken ; Philips/MRMG Ltd.

C6. DATA COMMUNICATIONS

Session Chairman : Charles Lynk

* "Multiple Tone Interferers in an FM-MFSK Spread Sprectrum Communications System" - R. Agusti ; University of Barcelona.

* "Co-Channel Interference Comparison of Conventional Land Mobile FM and 2400 BPS LPS-FSK System" - S. Carney ; Motorola.

* "A comparison of Gaussian Minimum Shift Keying to FSK for Land Mobile Radio" - S. Goode ; Motorola.

* "Carrier Sense Multiple Access with Collision Detection for FH/FSK Spread Spectrum Mobile Packet Radio Network" - R. Sinha, S. Gupta ; Southern Methodist University.

* "Comparison of Sub-Band Coder Designs for the Rayleigh Fading Channel" - R. Zinser, S. Silverstein ; General Electric.

C7. CELLULAR SYSTEMS

Session Chairman : Ed Weingart

* "Interference Management in Cellular System Design" - G. L. Shrenk ; Comp Comm, Inc.

* "In-Building Signal Correlation for an Urban Environment" - R. J. Pillmeier : Bell Labs.

* "Alternatives in Cellular System Design for Serving Portables" - S. W. Halpern ; Bell Laboratories.

* "Cellular Mobile Phone System" - P. Frankenstein ; G. E.

AUTOMOTIVE SESSIONS

A1. AUTOMOTIVE SYSTEMS

Session Chairman ; William Fleming

* "A Dedicated Cheap Speach Recognition System for On-Board Application" - M. Junge, P. Andreas ; Volkswagen.

* "Guidelines and Some Developments for a New Modular Driver Information System" - W. Zimdahl ; Volkswagen.

* "The Second Century of Electric and Hybrid Vehicles" - V. Wouk ; Victor Wouk Associates.

A2. AUTOMOTIVE SYSTEMS

Session Chairman : Joseph Ziomek

This session will consist of presentations of five invited papers.

* "The 1984 Generation of Ford Electronic Instrumentation, Entertainment, and Convenience Systems" - L. A. Lopez, J. N. Preksta ; Ford Motor Corporation.

* "World Radio - Reality or Mith" - C. A. Altzelt; For Motor Corporation.

* "Microprocessor Instrument Cluster" - R. J. Danek, D. R. Buttle, D. J. Kotek ; TRW Transportation Electronics.

* "Application of Micro-Computers in Automotive Electronics" - J. Bereisa; Buick Div. General Motors Corp.

* "Fully Integrated Truck Information and Control System (TIACS)" - T. O. Jones , W. K. Tsuha ; TRW Transportation Electronics.

TRANSPORTATION SESSIONS

T1. TRANSPORTATION SYSTEMS

Session Chairman : Alan Rumsey

* "ICTS , A Technology Whose Time Has Come" - R. Smith ; Metro Canada Ltd.

* "The Detroit Downtown People Mover" - C. B. Morris ; Metro Canada Ltd.

* "An Overview of the Lille Automated Transit System" - F. Tremong ; MATRA.

* "Pittsburgh's Light Rail System" - H. Zwilling ; PPGH.

* "Potential Transit Technologies for Dallas" - H. Moore , T. Ryden, D. Elliott; Dennis Elliott Associates.

* "Expansion of AIRTRANS at Dallas-Ft. Worth Airport" - D. Cohner, W. Scott, A. Wetzel ; Dennis Elliott Associates.

T2. EQUIPMENT DESIGN AND SPECIFICATION

Session Chairman : Sam Lott

* "Solid Modeling and its Application to Transit Design" - D. M. Evans , Westinghouse.

* "Development of Guideway and Conductor Rail Protection for People Movers in a Winter Environment" - T. J. Burg ; Westinghouse.

* "Electromagnetic Compatibility Tests and Specifications for a Rapid Transit System" - C. Mokkapati ; American Standard Inc, Union Switch and Signal Div.

T3. PROPULSION SYSTEM TECHNOLOGY

Session Chairman : Mick McDonald

* "The VAL, Metro de Lille, Traction Equipment" - M. Passot ; TCO.

* "Study of a Linear Synchronous Motor for High Speed Transport Applications" - S. Lakhavani, G. Dawson : Westinghouse.

* "Choosing the Righ Converter System for Electric Traction Units Equipped with Three-Phase Traction Motors" - H. Iselle ; Siemens-Allis.

* "Comparative Evaluation of Thyristor Choppers for Railway Applications" - M. H. Rashid ; Concordia University.

T4. COMMAND, CONTROL AND COMMUNICATIONS TECHNOLOGY

Session Chairman : Bob DiSilvestro

* "Design Methodology for Development of a Computer-Based Automatic Train Control System" - N. W. May ; Westinghouse.

* "A Checked-Redundant Solid State Track Signal Reception Design" - R. DiSilvestro ; Westinghouse.

* "SELTRAC, A Universal Train Control System" - S. Allen ; SEL Canada Ltd.

* "LILLE Metro Control System Technology" - J. P. Derambure ; MATRA.

* "New Railway Control System Based on Autonomous Decentralization Concept" - S. Miyamoto, M. Nohmi, M. Yabushita ; Hitachi.

* "Automatic Control of Making and Breaking Trains - BART System" - C. Lowder ; Raymon Keiser Engineers.

T5. COMMAND, CONTROL AND COMMUNICATIONS TECHNOLOGY

Session Chairman : Denny Pascoe

* "Communication System for Control and Supervision of LA Metro Rail Trains and Facilities" - P. M. Burgess.

* "End-of-Train Monitor System" - J. Grosser ; American Standard Inc., Union Switch and Signal Division.

* "Vehicle TO Vehicle Communication System by Use of Laser/Optical Beam" - T. Tsumura, M. Hashimoto, S. Kemei, A. Takahashi ; University of Osaka.

* "A New Method of Position and Heading Measurement of Ground Vehicle by Use of Laser and Corner Cubes" - M. Hashimoto, T. Tsumura, N. Fujiwara ; University of Osaka.

* "Consideration of the Various Error Sources in a Practical Automatic Vehicle Location System" - R. V. Janc ; Motorola.

T6. MICROPROCESSOR APPLICATIONS

Session Chairman : Dave Turner

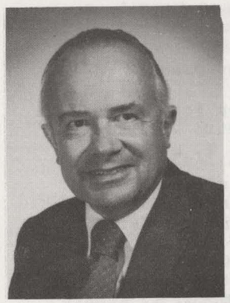
* "A Microprocessor-Based Vehicle Longitudinal Controller" - A. S. Hauksdottir, R. E. Fenton ; Ohio State University.

* "On the Optimal Design of a Vehicle Lateral Controller" - I. Selim, R. E. Fenton ; Ohio State University.

* "Microprocessor-Based Automated Mass Transit Test Equipment" - K. A. Karg ; Westinghouse.

* "Intelligent Automatic Train Control Operator's Console" - J. T. Cioletti ; Westinghouse.

* "Effects of System Architecture on Safety and Reliability of Multiple Microprocessor Control Systems" - R. C. Milnor, R. C. Washington ; Boeing.



Professional Activites

Frank E. Lord
Professional Activites Editor

IT'S 1984

George Orwell, in his novel "Nineteen Eighty-Four", visualized a society in which individuals were severly manipulated and misled. One Technique that was extensively used to do this was the use of a mythical language called "Newspeak", which was full of euphemisms and ambiguous phrases that were designed to confuse, pacify and hide the real message. Independent thinking was discouraged. Have you noticed that tax increases are now often referred to as "revenue enhancers" and that "negative patient-care outcome" is the bureaucratic way of referring to death?

If you wanted to find out what our members thought about the goals that the Institute should focus on this year, how would you go about it in such a way as to provoke thought? How many different ideas do you think members might have? Did you notice that there was a survey card included with your dues acknowledgement that made this inquiry as follows?

10. What do you believe should be IEEE's goals in this Centennial Year?

    ☐ Foster public awareness of the role of the engineer.

    ☐ Emphasize importance of continuing education for engineers.

    ☐ Encourage open exchange of scientific and engineering information.

    ☐ Encourage greater participation in technical meetings.

If you had wanted to express other ideas there was no room to do so. Someone may have wanted to suggest the goal of developing electrical engineering into a profession from which members do not defect in large numbers or a profession which had a respected place in and a responsible influence on national life. Someone else may have wanted to expand the item on continuing education to include the concept of retraining and to emphasize the importance of employer support. Do you know who designed this "survey" or why the possible responses of members of our learned profession were purposely restricted? It will be impossible to ever obtain an answer to this question, but it will be interesting to see how the results of this "survey" are presented.

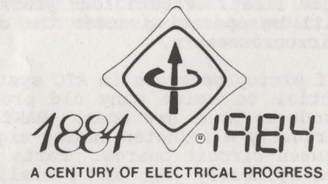
Did you notice the presentation in The Institute concerning the rewriting of the IEEE Position Paper, "IEEE Members' Professional Needs"? Unless you had been involved previously with this matter, it would have been easy to overlook the fact that the new version substitutes the word "Goal(s)" for "Need(s)" throughout. The presentation was such that no attention was called to this change and the previous version was not shown, thus preventing the interested reader from making comparisons. If nothing else were changed, this one change alone would have the effect of removing the element of strong concern that is attached to "needs". Needs were enumerated originally in the sense that Maslow and others referred to the needs that motivate people to performance and achievement. Higher level needs are items that have to be fulfilled by an individual if he is to maintain a level of performance involving noteworthy contributions for any sustained period. The needs of engineers, as expressed in the IEEE Position Paper, relate to those satisfactions which must be obtained by individuals if they are to function in that manner that we describe as professional. Our members are capable of performing as professionals, but many do not because employment circumstances are such that these needs, as presented in the Position Paper, are not being met. In using the term "needs", we can recognize that some members are having their professional needs met, for the most part, while others are not. We can, therefore, strive to create a professional environment for our members where the requisite needs compatible with professional performance are met for all members. "Goal" merely implies something that we would like to attain at some unspecified future time for no particular reason.

If we are to have a profession that can maintain technical leadership in world competition, then we must have members who can function at the level that Maslow describes as "self-actualization". If we are to attract talented young people to our profession, it must be apparent that it is a profession that is satisfying and provides rewards for the hard work that is required to enter it and to maintain competence in it. Goals are not a substitute for meeting needs. Meeting needs has more urgency and, when we are dealing with

world competition, energy self-sufficiency, health care, defense and standard-of-living, as engineers do, we are dealing with urgent matters in today's world.

I have written these views to the USAB Committee that is revising this Position Paper. Members are encouraged to read the item on page 10 of the February 1984 issue of The Institute and express their own views directly, as the matter is still under consideration.

A classic example of hiding the real message occurred in connection with the attempt to have the U.S. Postal Service issue a stamp to commemorate the centennial of the Institute and its predecessor organizations. It was difficult to miss the announcement in IEEE publications of the se-tenant issue of four stamps honoring the American inventors, Steinmetz, Armstrong, Tesla, and Farnsworth. However, the real message was that IEEE had failed in an effort to have the Postal Service issue a stamp honoring the Institute, the many contributions of its members, and its 100 years of service. The Postal Service was issuing the inventors stamps as a sop. Although the headlines for these announcements used phrases such as, "EE pioneers" and "honoring electrical engineers", as you read on, you came to realize that the official name given to the issue by the Postal Service was American Inventors. Upon examining the stamps, one notes that only one of the four used the word "electrical" and none referred to "engineer". After viewing this issue, I considered what a stamp honoring the Institute might look like and found the answer in our centennial logo.



It is certainly easy to imagine how the words "Institute of Electrical and Electronics Engineers" and "USA 20¢" could be added to create an effective postage stamp design in a horizontal format. Rendered in black and two tones of blue, the resulting commemorative could be most appropriate and attractive.

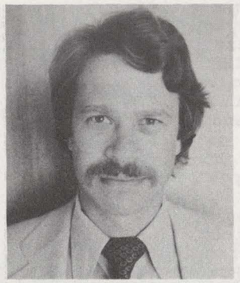
We must recognize that the public does not know that the American inventors were members of our predecessor organizations, and in the case of Farnsworth, the IEEE as well. Thus, there is no association to be made with IEEE. Also, there is no mention of 100 years of progress to imply a centennial of some kind. Consequently, it must be concluded that IEEE is not being recognized or honored in spite of the type appearing in our publications.

I though this situation was rather strange, to say the least, so I obtained what turned out to be a fascinating book from the Post Office for $3.50, entitled The Postal Service Guide to U.S. Stamps. This book is beautifully illustrated in color and provides a wealth of information on not only postal history, but U.S. history and graphic design as well. Stamps are identified by Scott numbers which originate in a catalog widely used by stamp collectors. In discussing my discoveries, I shall include the Scott number in parentheses.

Imagine how my disappointment was heightened to discover that the American Chemical Society was commemorated with a stamp which included their logo (1002), and the stamp honoring the "Centennial of Engineering" in 1952 included the logo of the American Society of Civil Engineers (1012). Other organizations honored with stamps which included their logo were Rotary International (1066), Disabled American Veterans (1421), Veterans of Foreign Wars (1525), and the Veterans Administration fifty years of service in 1980 (1825). Examples of other groups honored over the years include the Poultry Industry (968), Railroad Engineers (993), American Institute of Architects (1089), National Grange (1323), Postal Workers (1489-1498), Horse Racing (1528), and Organized Labor (1831). Most recently, it is difficult to erase from one's mind the ugliness of the 1983 stamp commemorating the 100 years of Civil Service (2053), especially in view of how attractive an IEEE commemorative could have been.

I have not written of anything remote or obscure. Most of the written material I've referred to has been presented to you by our Institute. The original needs statement is available from the Washington office and the book on stamps, which is a real bargain, is available at any post office. I'm suggesting that the concepts imagined by Orwell are becoming reality even in IEEE. We must prevent this from continuing to the point where we are deluged with nothing but "Instispeak" and "Spectrumspeak".

Transportation Systems



David B. Turner
Transportation Systems Editor

We have problems. We have the problem of complexity, where our works become knotted endlessly. We have the problem of simplicity, where we have not considered questions which are crucial to the matter at hand. Then there is the problem of costs rocketing out of sight, and the problem of a budget totally inadequate to the task at hand. There is the problem of overwhleming, destabilizing ambition, and the problem of complacency. We are troubled by a world in which nothing remains as it was, and by a world where nothing ever changes, no matter how mighty an effort we make.

Frank Sprague's fascinating paper "The solution of Municipal Rapid Transit," first presented in June 1888, is reprinted in the February issue of the Proceedings of the IEEE. It reminds us that only some elements of a solution to a past problem survive to the present. Sprague's innovative power collection devices and double reduction gear boxes are still with us; but his eloquent arguments against the horse-drawn streetcar are no longer relevant.

Neil Brumberger, Manager of the Train Control Division for the Bay Area Rapid Transit District, has sent us the following report on the solution of a key problem by the application of new technology, and the costs that must be paid to use that solution.

* * * * * *

Within the next year, the Bay Area Rapid Transit System will have a new and very special passenger on its trains; the microprocessor. What makes this new passenger so special is that it will be in full control of the sleek, 80 mph trains.

When BART was completed in 1972, it was the first new major rapid transit system built in the United States in 60 years. Befitting the era in which it was conceived, BART incorporated a number of technological innovations never before tried in rapid transit. The most notable was the sophisticated automatic train control (ATC) system. Designed for ultra-safe operation at 80 mph with 90 second headways, the ATC system was a major cornerstone in the new era of rapid transit that BART represents.

BART's startup was far from perfect. Many of the initial performance objectives were never achieved, and some problems have taken many years to overcome. Finally, however, the initial safety and reliability problems have been resolved, and daily patronage is rapidly climbing. The greatest remaining problem is increasing system throughput to meet the ever growing demand, while maintaining the high service reliability that has taken us so many years to achieve.

This is exactly the kind of problem that the microprocessor can help solve. BART's existing on-board ATC is the largest single cause of train delays, accounting for more than one-fifth of all train delays from all causes. It is based on failsafe design principles, using discrete, hardwired electronic components, with low level analog signal interfaces between circuit boards. A single ATC system contains more than 4000 components.

In 1980, BART began developing specifications for a new, microprocessor-based on-board ATC system. In 1982, proposals were received from two companies to develop and build the new ATC system: one from the SEL Division of ITT, and one from the Transportation Division of Westinghouse Electric. In September, 1982, the contract for the development of five prototype car-sets was awarded to Westinghouse. Delivery is expected late this year. Following prototype testing, BART plans to purchase nearly 300 production sets, to be installed on all control cars in the fleet. Within four years, all BART trains will be operating under the direct control of microprocessors.

The use of microprocessors in ATC systems offers the potential to solve many old problems, but also introduces some new ones. BART's new ATC design virtually eliminates analog signal interfaces between circuit boards. Parts count will be reduced by nearly 70%, and overall equipment failure rates will decrease accordingly. By using extensive internal diagnostics and automatic test equipment, repair times will be a fraction of their current levels.

Most dramatic of all, ATC caused train delays are expected to drop to less than 5% of their present levels. By reducing the overall parts count, the use of microprocessors makes it feasible to build in fault tolerance through redundancy. Each ATC car-set will consist of three processors, only two of which must be operational at any time. The third acts as a standby. Upon detection of a failure, the train operator will simply power down the failed channel, and switch control to the two remaining ones. In this way, many equipment failures which would normally cause a loss of automatic operation and a need to immediately remove the train from service, will now cause less than a one minute delay. The requirement that at least two microcomputer channels are operating and in agreement at all times provides for 'checked-redundancy.'

So much for the problems solved; consider the new problems. BART's new on-board ATC system departs from traditional failsafe design techniques. Traditional designs used specially selected components and circuit designs in which the individual failure modes of components and their effects on safety critical functions could be controlled. Unfortunately, these techniques can only be applied to discrete component, hardwired systems.

The very complexity of general purpose large scale integrated circuits means that traditional Failure Modes, Effects, and Criticality Analysis techniques for demonstrating the failsafety of a circuit or system can no longer apply. Having exceeded the scope of traditional tools, BART has adopted strict new safety criteria and analytical methodology as advanced as the hardware it evaluates. Instead of striving for absolute safety, BART recognizes that all systems, including the revered 'vital relay,' have some finite probability of unsafe failure.

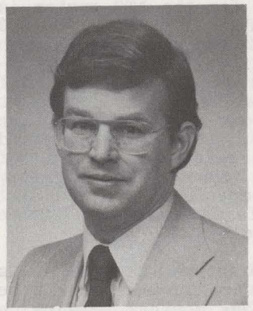
By employing the principles of checked redundancy, the system is designed so that at least two independent computers must be operatng and in full agreement on all critical inputs and outputs in order for the train to proceed. Any failure in which the two systems disagree puts the train into an emergency stop. These cross-checks are typically performed many times each second.

Using structured software design principles, extensive internal diagnostics, wrap around of critical inputs and outputs, and cross checking of all safety critical data and processes between two microcomputers, the probability of unsafe failures within a single computer channel can be evaluated. Then, by insuring that the two microcomputer channels are truly independent, and not subject to common mode failures, the probability of concurrent and compensating failures in both channels can be predicted.

The BART safety criteria for the ATC system is not more than one unsafe failure in 250,000 years per car-set. This is equivalent to a mean time between unsafe failures (MTBUF) of approximately two billion hours per car-set. Initial calculations indicate that this very stringent criteria can be met without sacrificing design simplicity and efficiency. It has been claimed that a traditional vital relay has a MTBUF of approximately 1,000,000 years when properly maintained. By way of comparison, the new BART ATC system will be as safe as a simple failsafe circuit using four vital relays.

Work on the prototype development program is proceeding, and final design reviews should be completed in the next few months. Following fabrication of the prototype car-sets, extensive factory testing will be conducted to demonstrate the equipment meets the functional, environmental and safety criteria of the specifications. By the end of this year, the prototype car-sets will be installed in revenue trains for extensive in-service testing. Production units are scheduled to arrive in early 1986 with full conversion of the fleet complete in late 1987.

BART is committed to taking full advantage of the many benefits of VLSI and microprocessors in its automatic train control systems. Power, versatility, reliability and economy are all well known forces propelling the microprocessor into so many areas of our society. These same forces apply in modern rail transit systems. With the marriage of checked redundancy for safety, and operational redundancy for reliable, fault tolerant service BART will become the first major rapid transit system in this country to rely exclusively on the microprocessor for on-board automatic train control.



Automotive Electronics

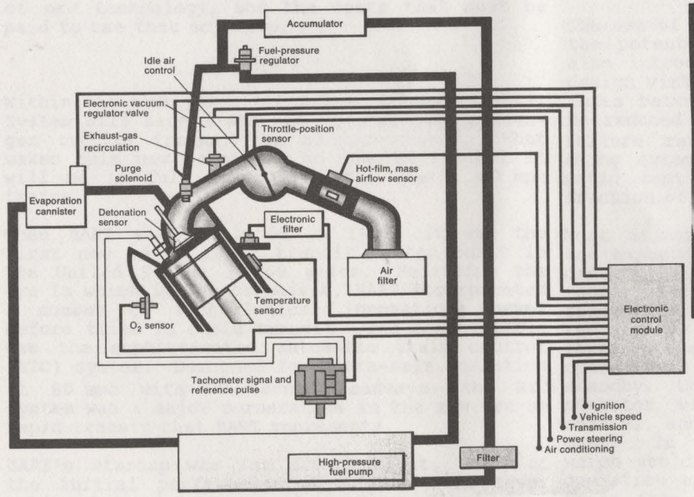
Dateline: Detroit

Bill Fleming
Automotive Electronics Editor

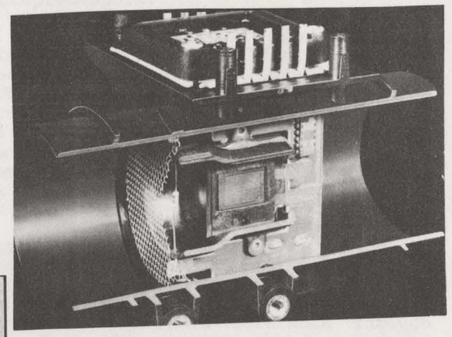
GENERAL MOTORS MULTI-PORT FUEL INJECTION SYSTEM

Multi-port fuel injection (MFI) is currently offered on GM's 3.8-liter V-6 engine in Buick Century and Oldsmobile Ciera model vehicles. Extra precision of fuel control provided by the system makes possible elimination of several pieces of emission control hardware -- including air injection, thermac air pre-heating, and early fuel evaporation. Also eliminated are the manifold and barometric pressure sensors. GM refers to the MFI system as "simultaneous double-fire" -- i.e., all six injectors fire once each engine revolution such that two injections of fuel are mixed with incoming air to produce the charge for each combustion cycle [1,2].

In place of the customary speed/density indirect estimates of engine air flow (based on inputs from engine speed, manifold pressure, and inlet air temperature sensors) which give slow response and become unreliable with engine aging and require mathematical calculations, direct measurement of mass air flow into the engine is provided by a newly developed mass airflow sensor. The sensor is located between the air filter and the throttle body, and operates on thermal heat transfer principles. A heated nickel film is maintained 75 deg C above the ambient temperature of inlet air. Mass airflow is directly given by the electrical power required to keep the heated film at temperature 75 deg C above that of incoming air [1,2].



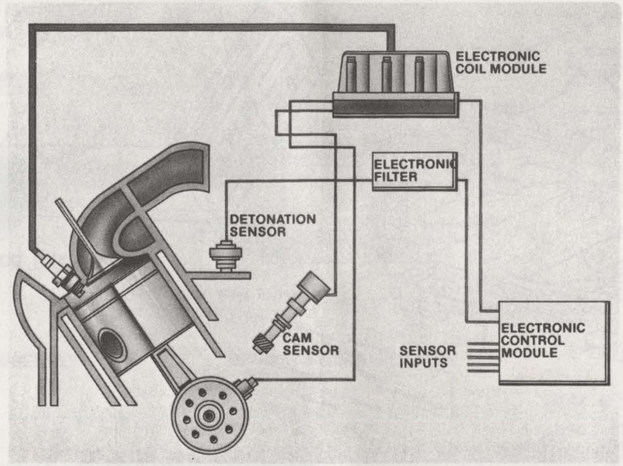
SCHEMATIC DIAGRAM OF MFI SYSTEM



MASS AIRFLOW SENSOR

GENERAL MOTORS DISTRIBUTORLESS IGNITION SYSTEM

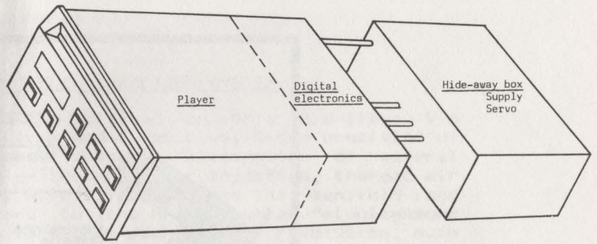
A distributorless ignition system was introduced on 1984 Buicks. Conventional ignition coils are replaced by an electronic control module which incorporates three separate coils, each of which fires two spark plugs simultaneously (one from the positive end of the coil and the other from the negative end). Cylinders are paired so that one spark plug is fired at the beginning of a power stroke and the other at the beginning of an intake stroke. Conventional distributor driveshafts and mechanical advance mechanisms are replaced by crankshaft and camshaft Hall-effect position sensors, which together with spark timing commands from the vehicle onboard computer, provide inputs to an ignition microcomputer. It then sequentially triggers each of the three coils to fire at the proper crank angle. Buick calls this a C3I system (Computer-Controlled Coil Ignition System) [1,2].



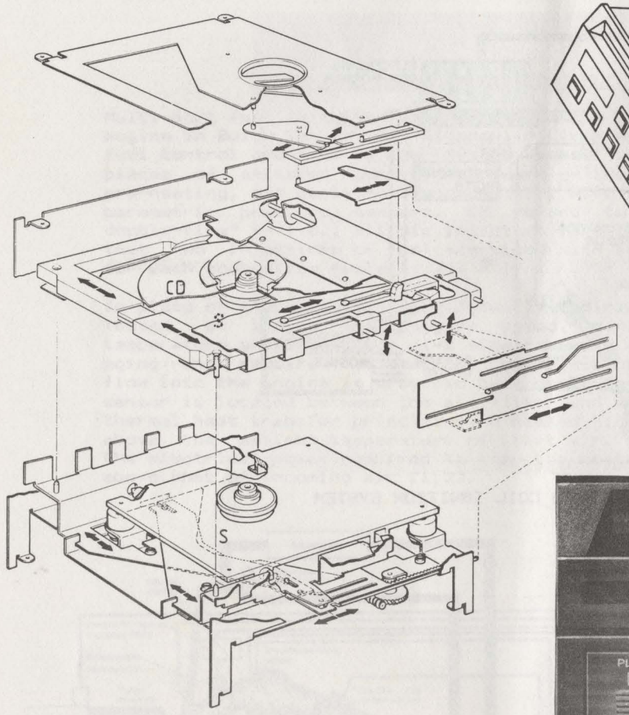
COMPUTER-CONTROLLED COIL IGNITION SYSTEM

PHILIPS DIGITAL "COMPACT DISC" AUDIO SYSTEM

Compact disc, laser-based audio systems use small discs, 1.2 mm thick and 12 cm diameter, each of which contains about one hour of recording. Because audio signals are recorded in digital form, extremely low distortion (<0.005%) and low noise levels (SNR > 90 dB) are obtained. Variations in disc speed do not lead to wow or flutter as the data read from the disc pass thru a buffer store and are read out from there in synchronism with the clock frequency. This insensitivity to speed fluctuations makes the compact disc particularly attractive for vehicular use. A special loading system, which uses trays to carry the compact discs, is proposed by Philips N.P.B.B.V. for vehicular applications. To read a disc, a tray is inserted into the player. Inside the player, the disc is disconnected from the tray and clamped onto a spindle, whereupon it can be read. When ejected, the disc is returned to its tray for removal [3].



DISC PLAYER COMPONENTS

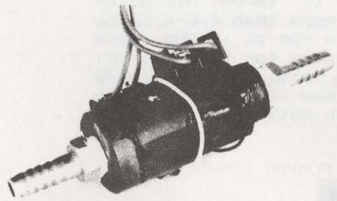


DISC LOADING SYSTEM

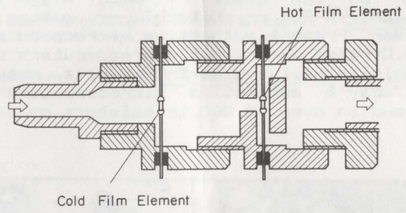
CONTROL PANEL LAYOUT

MITSUBISHI MASS FUEL FLOW SENSOR

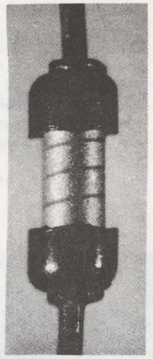
A new mass fuel flow sensor, based on thermal heat transfer principles, has been developed for vehicular applications by Mitsubishi Electric Corporation. Heat detecting film elements consist of 2000-Angstrom-thick platinum films coated onto 1-mm diameter ceramic bobbins. Room temperature resistances of each film are held at 20 ohm by laser trimming procedures. Fuel is directed through a nozzle such that nearly all the fuel flow directly impacts the hot film element. In addition, the nozzle maintains fuel flow in a turbulent flow regime over the entire flow range of interest; thereby providing uniform heat transfer properties (the absence of flow regime transitions makes possible greater accuracy of flow measurement) and insensitivity to external vibration of the vehicle (because laminar flow conditions are not required as is the case for other flow sensors). The sensor has wide 100:1 dynamic range (0.1 to 10 gram/s), high accuracy (3% of full scale), rapid response (100 ms time constant), and compact lightweight construction [4].



FUEL SENSOR ASSEMBLY



SENSOR CROSS SECTION

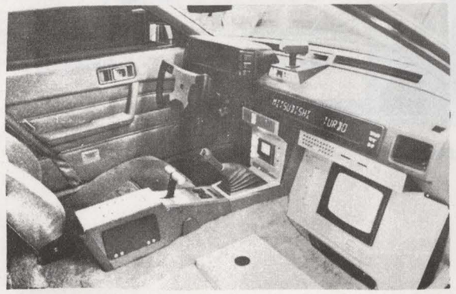


HEAT DETECTING FILM ELEMENT

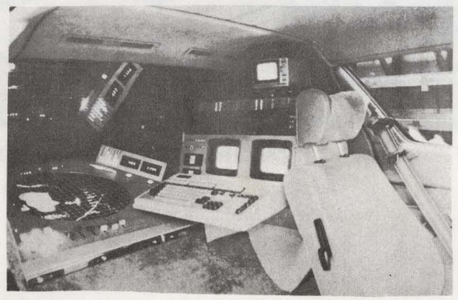
HEAT DETECTING FILM ELEMENT

IS THIS WHERE AUTOMOTIVE ELECTRONICS IS GOING?

Japanese penchant for elaborate use of electronics is personified in Mitsubishi's modification of its Starion model for the upcoming Hollywood movie, Cannonball Run II. This car contains over $40,000 worth of electronics, including a color radar screen, several video monitors and CRTs, 500 blinking lights, and five miles of copper wiring. The underwater maneuvering controls located aft of the stick shift are needed because the vehicle is water submersible [5].



FORWARD CONTROLS



REAR COMPARTMENT CONTROLS

GENERAL MOTORS PROCLAIMS THE ERA OF THE ELECTRONIC AUTOMOBILE

If the Beach Boys were still writing songs about cars, their lyrics would be a bit different today. "Little Deuce Coupe," for example, had a line that went, "She's got a competition clutch and a four on the floor and she purrs like a kitten till the Lake pipes roar." Today, that line could be replaced by, "She's got a micro-driven turbo and a vf display and she'll get you there fast and show you the way." GM, with bragging rights as the world's largest automobile maker, can also brag that through Delco Electronics Division, it is also one of the world's largest producers of electronics.

Since the late 1970s, Delco has been growing its own silicon crystals. Presently, Delco produces more than 600,000 silicon chips each day. In a high-security building, new special equipment are placing leadless capacitors and resistors on circuit boards at the rate of 100 components per second per board. With completion of its advanced manufacturing systems, Delco will have some 850 automatic machines -- 101 of them robots -- installed at a $115-million price tag. They are moving away from convential printed circuit board technology and toward thick-film hybrid circuit board technology [6-8].

It often surprises people to find out that GM is far and away the largest computer manufacturer on the globe -- much bigger, in terms of units manufactured, than IBM, H-P, or Hitachi -- making more than 4.5-million microcomputers each year. Present automotive microcomputers run at 1-MHz data rates and use 100 deg.C-rated parts, but microcomputers slated for introduction on 1986 model year vehicles will run at 2-MHz data rates and will use 120 deg.C-rated parts. Today's automotive microcomputers use 0.20-inch square silicon chips that crowd in over 10,000 transistors on each chip [6-8].

MICROCIRCUIT TEST LAB AT DELCO ELECTRONICS

End products include plug-in chips, engine-control computers, and entertainment systems.

SOME OF DELCO'S END PRODUCTS

REFERENCES

1. Givens, "3.8-liter V-6 gets MFI," Automotive Engineering, October 1983, pp. 40-42.

2. R. Jurgen, "Detroit Unveils Sophisticated Electronics," IEEE Spectrum, October 1983, pp. 33-39.

3. J. Schipper, "Design Considerations for an Automotive Compact Disc Player," SAE Paper 840157, presented at the International Congress, Detroit, MI, February 27, 1984.

4. H. Satoh, "Hot Film Type Fuel Flow Sensor," SAE Paper 840135, presented at the International Congress, Detroit, MI, February 27, 1984.

5. M. DeLorenzo, "Special Editions Bow at L.A. Show," Automotive News, January 30, 1984, pp. 52-53.

6. E. Keller, "Automotive Electronics Shift Into Overdrive," Electronics, January 26, 1984, pp. 101-112.

7. D. Sherman, "GM's Non-Chocolate Chip Factory," Car and Driver, June 1983, pp. 69-75.

8. "Delco Expands Chip Making," Ward's Engine Update, November 1, 1983, p. 5.

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Papers are being solicited for presentation at this Workshop. Emphasis will be on technical value, readability, and informational content.

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- ENGINE CONTROLS
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- ENGINE AND VEHICLE DIAGNOSTICS
- INSTRUMENTATION AND DISPLAY
- RIDE AND COMFORT CONTROLS
- SAFETY SYSTEMS
- ENTERTAINMENT SYSTEMS
- TEST EQUIPMENT
- SENSORS/ACTUATORS
- PLANT PROCESS AND QUALITY CONTROL

Those interested in presenting a paper at the Workshop should submit a 300-500 word summary (double spaced) in two copies to the address below. The summary should define the purpose of the work and what results have been obtained. The paper should be suitable for a 20 minute presentation. A proceedings containing the accepted papers will be distributed to the Workshop attendees. Accepted papers may be submitted for publication in the Industrial Electronics Transactions.

The summary deadline is March 30, 1984. Authors of accepted papers will be notified April 15, 1984. Final papers are due June 1, 1984.

Mr. Robert Martinsons, Technical Program Chairman, Motorola Automotive & Industrial Electronics Group, 1299 Algonquin Road, Schaumburg, Illinois, 60196.