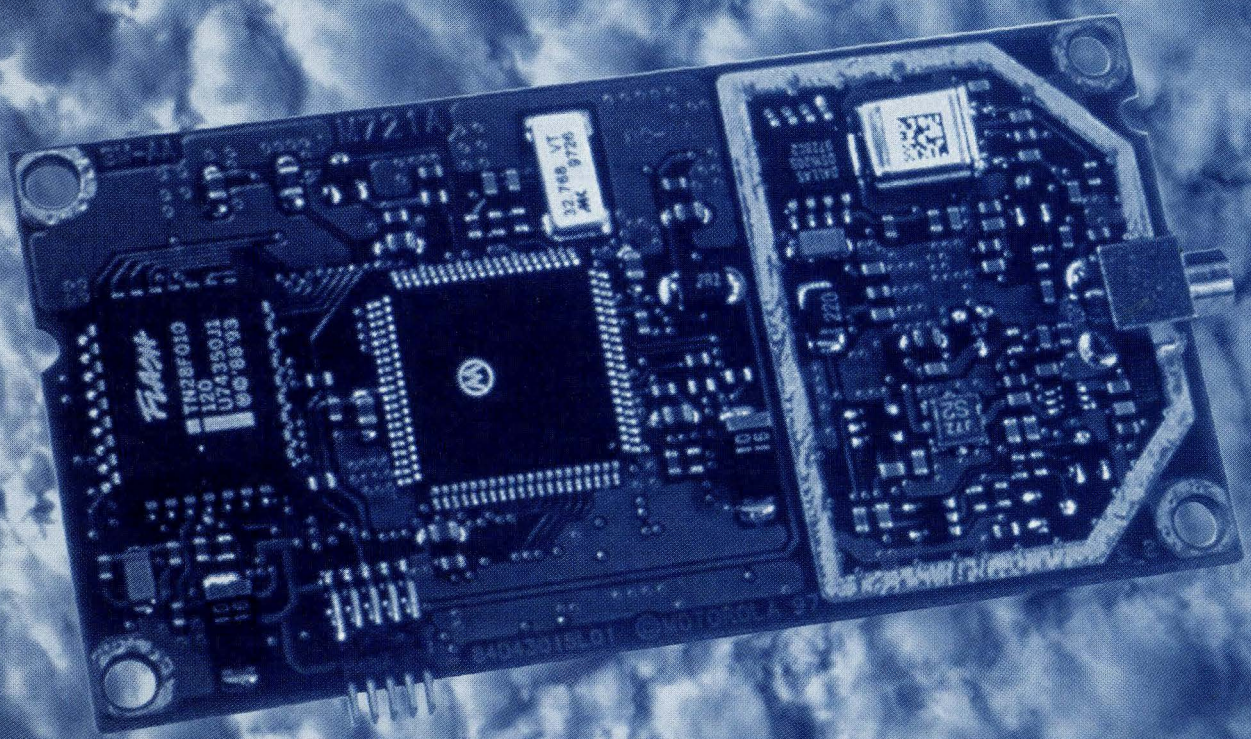
SCANFAX

October 1998
Volume 50, Issue 8

IEEE
Networking the World™

A publication of the
Institute of Electrical & Electronics Engineers
— Chicago Section —



Global Positioning...
Technology from the Heavens

IEEE
Networking the World™

A publication of the Institute of Electrical & Electronics Engineers — Chicago Section —

http://ieee.fnal.gov

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Printed By
Town & Country Printers
Columbus, WI

SCANFAX (ISSN #0018-1297) is a monthly publication (except July and August) of the Chicago Section Institute of Electrical and Electronics Engineers, 8196 Cass Ave., Darien, IL 60561, (800) 898-4333 or (630) 493-4333. It is published by **Slack Attack Advertising**, 6400 Gisholt Dr., Suite 203, Madison, WI 53713, (608) 222-7630. Printing is by **Town & Country Printers**, Columbus, WI 53925. For **advertising information**, contact Slack Attack Advertising.

Subscriptions included in IEEE membership dues; non-member subscriptions: $25 per year.

Address corrections should be sent to the IEEE office, 8196 Cass Ave., Darien, IL 60561.

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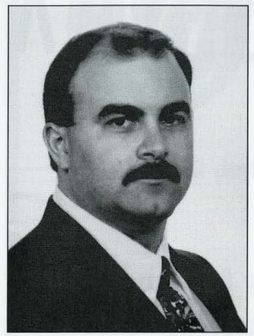
SCANFAX

Features

Departments

On the cover: Motorola's SL Oncore GPS Receiver:
Smallest in the Oncore line of GPS receivers.
Photo courtesy of Motorola.

Chairman's Message



Howard W. Penrose

IEEE Chicago Section, Chairman

Welcome to another exciting month with the IEEE Chicago Section. Several worthwhile programs have been developed by our chapters and associated IEEE and other engineering groups.

Along with our meeting announcements this month, we are also including notice of a meeting being sponsored by several IEEE groups and Chicago Section partners. One of these programs is a joint program with the Rockford Section of IEEE and the Signal Processing Chapters of both Chicago and Rockford. An IEEE Chicago/Rockford Consultants' Network conference is to be held on October 17, 1998 in Schaumburg. Also, the Electri '98 Show will be held at McCormick Place this October. The Electri show includes an IEEE Chicago Section booth in which any members who show at the booth will generate a $10 per person rebate to the section.

On August 23, 1998, I attended the Illinois Engineering Council (IEC) awards dinner at Hyatt O'Hare. The awards were for three projects: the Interstate Combustion Turbine; the State and Van Buren Elevated Transit Station; and the Lake Shore Drive Improvement Project. These three projects were selected out of four applicants. Candidates for next year's IEC awards should be brought to the attention of the section as soon as possible. The IEC represents 21 professional organizations within Illinois. IEC provides representation to the State of Illinois concerning issues related to engineering in general. The IEEE Chicago Section is a member of IEC and provides four volunteers: Jim Fancher (Treasurer of IEC), Norbert Orszula, Ed Capouch and John Waters. Please contact one of these individuals, or myself, concerning information about submitting projects for the awards, or for other IEC related issues.

In our continuing efforts to streamline the section services to our members, the executive committee has established a Re-Engineering Committee that is reviewing methods to: improve the effectiveness of the Chicago Section Executive Committee; bring the section leadership closer to the members and individual chapters; and reduce the operating costs of the section. The committee is lead by George Thomas and includes, but has not been limited to: Arup Bhuyan, Fox Valley Subsection Chair; Irwin Smiley, Past Chicago Section Chair; myself, Chicago Section Chair; and Dennis Lamonte. The matter was also reviewed as part of an open discussion held during the August Executive Committee meeting. We have been reviewing the successes of the sub-sections, chapters, and others in order to present effective recommendations.

I wish to take this time to recognize those individuals who have taken an active role in the section and activities related to the promotion of IEEE, and its members. These individuals who make up our IEEE officers, volunteers, and advertisers, allow us to have a voice, be recognized as a professional organization, and share ideas through presentations and discussion.

IEEE offers web-delivered course with University of Illinois

The IEEE has created an alliance with the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign (UIUC), Urbana, IL to offer a web-delivered course on antennas and propagation.

This four-week course, designed to serve as a refresher for practicing engineers, will be based entirely on the Internet. It will begin on Nov. 1 and run through Nov. 30 with enrollment starting on Aug. 15 and lasting through Oct. 31. Course capacity is limited to 30 students.

The course will provide learners with an analytical and intuitive understanding of antenna physics, expose them to antenna computer-aided design software, and introduce them to a variety of antenna structures of practical interest. The course will also cover recent developments in the wireless and personal communication systems. Those intending to register are expected to have a basic knowledge of electromagnetic wave theory outlining the general plane wave solution of Maxwell's equations, phenomena involving reflection and transmission of plane waves, transmission lines, and impedance matching techniques. Students who successfully complete the course will be awarded 3.6 IEEE Continuing Education Units (CEUs).

Eric Michielssen, Ph.D. will be teaching the course. Dr. Michielssen received his Ph.D. from the University of Illinois at Urbana-Champaign in 1992. He is an assistant professor in the UIUC Department of Electrical and Computer Engineering, associate director for the Center of Computational Electromagnetics, and a part-time faculty member in the Beckman Institute Photonic Systems Group. His professional interests are computational electromagnetics, photonic systems, high-speed digital circuits, fast algorithms, and stochastic optimization.

For more information about the course contents and requirements, contact Peter Wiesner, (732) 562-5500, fax (732) 981-1686, e-mail: p.wiesner@ieee.org. The web site address is http://www.ieee.org/eab/distance/webcourse.html. The tuition for this pilot offering of the course is $350 for IEEE members, $400 list price.

Global Positioning... *Technology from the Heavens*

by Christine M. Sloat, P.E.

Global Positioning Systems (GPS) had their beginnings, as with so many forays into new technology, with the federal government. Specifically, the Department of Defense funded, developed and instituted the infrastructure necessary to provide precise geodetic position measurement and state-of-the-art navigation capabilities for our country's military operations. Today, the DOD continues to fund and operate the system. However, from such "humble" beginnings, GPS has expanded into more applications, military and civilian, than you can imagine!

When one of the members of the IEEE Chicago Section suggested an article on GPS for SCANFAX, we started to research the project and soon realized that its complexity and far reaching applications would fill much more than a single article! And so, for now, we propose to give a very brief overview of the technology and highlight a few of the civilian applications that have grown out of a military scheme.

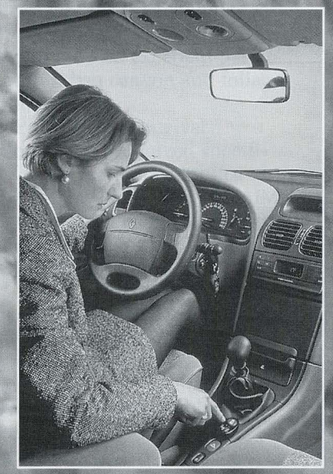
Just what comprises a global positioning system? The system's space *infrastructure* is comprised of a network of *space vehicles* (SVs) which transmit radio signals from space. The SV network, known as the Operational Constellation in GPS circles, consists of 24 satellites: 21 navigational satellites and three operational "spares." With precise orbits, these satellites cover each point on the earth approximately every 24 hours! And, as in the case of the Internet, the satellite system is serving to provide every square inch of the earth's surface with its own unique *address.*

Back on earth, a system of tracking stations, located around the world, comprise the *Control Segment* of GPS. And last, but certainly not least, is the *User Segment*, consisting of receivers and the actual users. Receivers convert the satellite signals into position, velocity and time. In very simplistic terms, GPS receivers triangulate information from the satellites. The receiver measures distance using the travel time of the radio signal, the position of the SVs in space, and corrections for signal delays due to travel through the atmosphere. Without getting into the technical side of the equation... complex digital code *(Pseudo Random Code)* sent between receiver and satellite, plus a very accurate atomic clock on board the SV, multiplied by the use of four satellites (versus three required for simple triangulation), and a little "spit and polish" to adjust for possible errors... equals an extremely accurate calculation by the receiver as to position and time. Whew! Like I said, to get into the details would take a lot more space than allotted for this article!

Now you have a feel for what GPS is. Where is it used? The most obvious applications for GPS relate to navigation, e.g. on aircraft, ships, tanks, and lots of other military vehicles. But, what about civilian applications? We spoke with people in the know at Motorola's GPS Products, a business unit of the Automotive and Industrial Electronics Group (AIEG). Blake Bulloch, Applications Engineering Manager, gave us a brief overview of the history of GPS applications at Motorola to better understand where applications are going today. Since 1985, Motorola has been a world leader in the development of GPS products and continues that leading role in the development of GPS products for consumer, transportation, wireless and precise timing applications.

As early as 1988, Detroit automobile manufacturers were bouncing around proposals for *in-vehicle navigation systems.* These "systems" were comprised of a computer, monitor, CD-ROMs with maps, etc. Of course, the automobile

Continued on page 4.



Motorola, Renault and France Telecom developed a telematics system that links Renault drivers with emergency response and roadside services via an around-the-clock control center.

"As it turned out, the survey revealed most drivers have difficulty reading maps! And so a paradigm shift was in order, moving from a true navigation system to a computer capable of figuring out a route and displaying it in a very user-friendly format."

industry was quick to institute a market and driver survey process, to ensure that customers would purchase these expensive systems. And they are very thankful they did. As it turned out, the survey revealed most drivers have difficulty reading maps! And so a paradigm shift was in order, moving from a true navigation system to a computer capable of figuring out a route and displaying it in a *very* user-friendly format.

The second obstacle was that these first systems, which even included a voice synthesis function... "You should have reached your destination!," were far too expensive for North American markets. Consumers in the U.S., Canada and Mexico were driven not only by affordability and simplicity, but by the desire for a different kind of function... safety and security. And so, the civilian automobile GPS market shifted again, from navigation based to *communication based*. And, from navigation to telematics, or positional service. Motorola's GPS products are used in diverse and innovative telematics systems – wireless communication devices designed for automobiles providing drivers with personalized information, messaging, entertainment and location-specific travel and security services. Examples of these new types of systems include distress beacons for stolen or hi-jacked cars, central response centers that can dispatch roadside aid with a simple call from a driver, and even a beacon which starts as soon as an automobile's airbag is deployed! That airbag beacon would have given me a lot of piece-of-mind when, many years ago, my teenaged daughter got her driver's license! From the Lincoln Continental's RESCU, the first OEM emergency messaging system in the U.S., to the latest in-vehicle communication systems for Mercedes-Benz, General Motors, Nissan and Renault, Motorola has evolved technology to allow automotive manufacturers to successfully integrate GPS products into market-leading offerings. Other vehicle applications include tracking and dispatching taxi and long-haul truck fleets worldwide.

Interestingly, Mr. Bulloch explained that an entirely different paradigm exists in the Japanese automotive market. In Japan, addresses and roads are not organized well. And, the Japanese spend their money in different ways. With home ownership a luxury, and renting the option of choice, the absence of the more North American standard – the mortgage – allows for a lot more disposable income. And so, in Japan, the function is more that of an expensive navigation toy!

But wait! The automobile industry is not the only one to benefit from civilian applications of GPS. Motorola is also heavily involved in *precision timing* applications. These applications are a direct result of the access to extremely precise atomic clocks on board the GPS satellites. Low cost GPS receivers can replace the need for the more expensive atomic clocks. A sub-set of Motorola GPS capability, timing applications are becoming increasingly important to the telecommunications, computer networking and other industries where highly accurate synchronized timing devices are required. Motorola GPS precision timing applications include synchronization of cellular site signals to help expand cellular telephone coverage, radio frequency stabilization, synchronization of internal clocks across LANs and WANs, and timing of lightning flashes for meteorological tracking. Blake explained that GPS receivers make sure that cellular "hand-offs" are precisely timed and that the cell call doesn't get dropped.

For outdoor enthusiasts, handheld GPS units, selling for as little as $100, are becoming popular. Take hiking for example. In the mountains, weather can change drastically in a very short period of time. A hiker can set the "position" of where he parked his car by simply pushing a button before he sets off on his hike. The units can hold from 100 to 1000 stored points, depending on the type of unit. Later on, the hiker can recall a beautiful waterfall he saw on the way, and the unit will "direct" him back to the site with simple commands like... turn right and walk for 100 yards. Or, in a weather emergency where visibility is at a minimum, a hand held GPS could get the hiker back to his car or base camp!

Motorola GPS technology is used in other GPS applications including consumer marine units. They are also integrated for environmental applications, including chemical and nuclear radiation detection alert, hazardous materials tracking, weather balloon tracking and ice flow monitoring.

And imagine just a few of these other applications for GPS – surveying, geodetic control plate tectonics, astronomical observations, laboratory standards, even research projects to measure atmospheric parameters. According to information on the Net, one investment banking firm uses GPS to guarantee their transactions are recorded simultaneously at all offices around the world. And a major North American utility company makes sure their power is distributed at just the right time along their 14,797 miles of transmission lines. Chicago developed a GPS tracking system to monitor emergency vehicles through their streets, enhancing response time in their 911 system. And rural hospitals are quickly incorporating GPS receivers to facilitate access by major hospital's medflights in severe weather, a situation that used to put access to these trauma centers from rural locations out of reach.

And so, I hope that this overview has shown you that a technology from the heavens is changing how things work here on good old "terra firma!" ■

We would like to thank the experts at Motorola who provided us with a lot of the background for our article on GPS in this month's issue of SCANFAX. The following is a timeline of Motorola's involvement in civilian GPS applications, as well as an overview of some of their products.

Timeline

1984 Receiver tracks 1st satellite
1985 Single channel correlator ASIC completed
1986 Intro of 4-channel Eagle
1988 Intro of 8-channel Eagle & geodetic product
1991 PVT6 receiver introduced
1992 Completion of world's 1st single chip–L-band down converter
1994 Intro of VP Oncore 8-channel receiver, foliage tracking software
1995 VP Oncore establishes itself as premier standard in timing market
1996 GT Oncore technology introduced
1997 Chipset product introduction
1998 SL Oncore introduced (DIN sized GPS)
1998 Oncore 12 family of products introduced (will be launched in mid-September)

Products

Motorola's GPS products include:

- SL Oncore Receiver: Smallest in the Oncore™ line of GPS Receivers, the SL Oncore, it measures just 40 x 80 x 12.2 mm and weighs 22 grams. This latest receiver includes support for inverse differential GPS, allowing for improved correction positioning at a central base station for services requiring higher accuracy such as route finding in vehicle tracking and telematics applications.
- GT Plus Oncore Receiver: Motorola's most cost effective GPS receiver developed specifically for vehicle positioning and tracking applications. Features include DGPS operation, NMEA output, fast startup times, and excellent performance in urban canyon and foliage environments.
- UT Plus Oncore Receiver: Developed and optimized specifically for precise timing applications. Features include Time RAIM, 50 ns timing accuracy, 100PPS output, automatic site survey, and industry leading jamming immunity.
- Oncore ChipSet: Allows the highest level of integration of GPS for high volume applications.
- Oncore Active GPS Antenna: Motorola's recommended high-performance antenna for use in various applications.
- Oncore Remote GPS Precision Timing Receiver: Easily mounted on top of a building or antenna mast, this new product has been designed specifically for high accuracy timing applications requiring long cable lengths.
- Oncore Evaluation Kits: A quick start kit with everything required to get started with your GPS application development.
- WinOncore™: Motorola's Windows® controller software for use in developing, testing and evaluating Motorola Oncore GPS receivers.

Newly Elected IEEE Chicago Section 1998-1999 Officers and Committee Chairs

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Gerry Ryan

Recognition Dinner
Frank Lakowski

Special Events
Frank Lakowski

Student Activities
Peter Look

IEEE-USA

IEEE CHICAGO/ ROCKFORD CONSULTANTS' NETWORK

National Consulting Workshop

October 17, 1998

IEEE-USA NATIONAL CONSULTING WORKSHOP

About the topic:

The workshop is designed for practicing or aspiring consultants in the electrotechnology and information-technology fields. Expert consultants will explain their secrets and give practical how-to information on such topics as the following:

- getting started;
- employed full-time, consulting part-time;
- finding clients;
- financial aspects, fee setting, taxes;
- 30 years consulting experience: a perspective;
- the changing consulting arena and the Internet;
- intellectual property; and
- networking and referrals.

Time & Location:

The workshop will be held from 8:30 a.m. to 4:00 p.m. at the Chicago Marriott-Schaumburg on 50 N. Martingale Rd.

Directions: From the I-90, go south on 53, exit at Higgins Rd., west 2 blocks, then left or south on Martingale.

Registration:

The registration fee is $65 for IEEE members and $75 for non-IEEE members, minus a discount of $10 for early registrations received by October 9.

Registration includes continental breakfast, refreshments at breaks, lunch, and copies of the speakers' handout materials. A special room rate of $88 for the night before or after is available by calling the hotel reservation line at 847-240-0100 by Sept. 17.

An informal concurrent program is available for spouses/companions. It includes shopping at nearby Woodfield Mall and several excellent Chicago Tours. It is not necessary to sign up in advance, but we would like an approximate advance count so we can plan adequate transportation.

To register for the IEEE National Consultants' Conference, send check (payable to IEEE) or credit card info, along with member number if applicable, to Dr. Gary L. Blank, garbon@ix.netcom.com; at 847-464-4081, (fax); or P.O. Box 70155, Plato Center, IL 60170.

IAS
IEEE INDUSTRY APPLICATIONS SOCIETY

IAS/IES

Grounding of Power Systems

Wednesday, Oct. 21, 1998

IAS/IES DINNER MEETING

***D. D. (David) Shipp, P.E.**, Advisory Engineer, Power Systems Engineering, Cutler-Hammer*

About the topic:
Mr. Shipp will present an overview of current power system grounding methods both in theory and in some typical applications. He will then discuss the proper application of each method and the inherent limitations
of each method. Attendees are encouraged to prepare related questions from their own experience for analysis and discussion.

About the speaker:
After graduating with his BSEE from Oregon State University in 1972, David held a succession of positions with Westinghouse Electric in the Industry Services Division performing a variety of power system studies and teaching courses on power systems equipment and applications. From 1985 to 1989 he was a Product Line Manager and Business Development Manager for Westinghouse Engineering and Instrumentation Services Division. Until January 1998 he was Senior Consulting Engineer for Westinghouse, and is now an Advisory Engineer for Cutler-Hammer's Engineering Services and Systems Division. He occasionally serves as an expert witness.
David is a registered professional engineer in Pennsylvania, a member of the IEEE and the Industrial Applications Society, and a member of the Society of Petroleum Engineers. He is a past chairman of the IEEE Power System Protection Committee, and has served on Power Quality and Brown Book (Power System Analysis) subcommittees. Currently, he is helping to write the next edition of the Buff Book (Protection and Coordination) and the pending Violet Book (Short Circuit Currents).

Location:
Como Inn, 564 N. Milwaukee Ave, Chicago, IL
Directions: The Como Inn is located on Milwaukee Avenue just off the expressway on the east side of 90/94.

Time: Social: 5:30pm.
Dinner: 6:00pm.
Presentation: 7:00pm.

For reservations:
Cost: $20 includes the presentation and your choice of a chicken or pasta four course dinner. Please call the IEEE Business Office at (800) 898-IEEE or (630) 493-4333 with your entree preference.

NOTE: Attendance at IEEE Technical Meetings is acceptable as one PDH (Professional Development Hour) per meeting, where continuing education is required for renewal of the P.E. licenses.

Upcoming meetings:

The 1998/99 IEEE - IAS meeting dates are: Oct. 21, Nov. 18, Jan. 20, Mar. 24, Apr. 21, and May 12.

Your 1998/99 IEEE - IAS Executive Committee is:

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FOX VALLEY SUBSECTION AND THE COMPUTER SOCIETY

The Y2K Bug on the Shop Floor, How big is it and can it be squashed?

Wednesday October 21, 1998

IEEE DINNER MEETING

***John N. Jackiw**, Automation Horizons, Inc.*

About the topic:

The subject of the Y2K or the Millennium Bug has been in the media now for several years, from congressional hearings to comic strips. The problem was first identified when systems failed, due to the expiration dates on items like credit cards and driver's licenses that were already into the next century. The problem is being addressed in many sectors of the economy, such as financial services, transportation, utilities, and government agencies. Today's highly automated manufacturing processes require computer systems with high availability and reliability. Awareness of the Y2K problem on the shop floor has been growing steadily for a little over a year. Most of the anticipated problems with shop floor equipment will not occur until we get closer to the year 2000.

This talk will discuss the Y2K problem as it relates to the shop floor and embedded systems. A few specific examples will be discussed. Since there are only fourteen months left to effectively execute a Y2K solution, an overview of a methodology will be presented. The methodology includes identification of the problems, analysis, repair, testing and returning systems to production. The sue of existing standards and practices will be emphasized to minimize the effort in undertaking a Y2K problem. This talk will conclude with a brief discussion on the latest Y2K compliance reports required to complete this effort.

About the speaker:

John Jackiw is a Distinguished Member of Technical Staff at Automation Horizons Inc. During his 19 year career, he has worked in discrete and analog controls for process manufacturing operations. Additionally, he has expertise in strategic planning and system development, with team coordination of large-scale systems. John is currently leading Y2K efforts at one of Automation Horizons Inc. customers.

John has a BS in Electrical Engineering from Illinois Institute of Technology. He is also a member of both IEEE Fox Valley Subsection and ISA Will-Dupage section.

Location:

Wyndham Hotel, 1837 Center Point Circle, Naperville, IL 60563

DIRECTIONS: The Wyndham Garden Hotel is located just off Diehl Road, between Washington Blvd and Naperville Rd. From I 88, take the Naperville Rd. exit. Turn right off the ramp onto Naperville Rd. Make a right at the first stop light onto Diehl Rd. Turn right onto Center Point Circle.

Time:

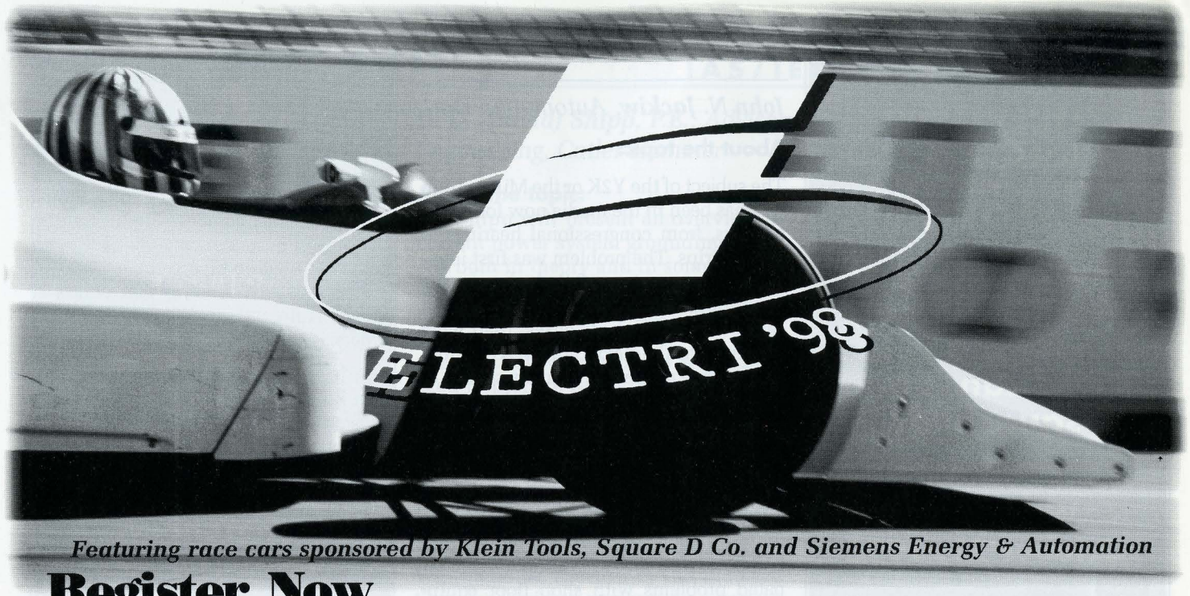
Cash Bar: 6:00pm.
Dinner: 6:30pm.
Presentation: 7:30pm.

For reservations:

Please call Norma Mackay at 630-979-1010 or Adrienne Novick at 630-713-4362 before Friday, Oct. 16 with your choice for dinner.
Choice of Chicken Piccatta $19, or Baked Vegetarian Lasagna $16. Dinner includes Soup or Salad, Dessert, Coffee, Tea or Milk.
As always, the presentation is free of charge.

Calendar of Events

DATE	EVENT
Oct. 13, 1998	IEEE-Chicago Section EXECUTIVE COMMITTEE MEETING
Oct. 17, 1998	IEEE-USA NATIONAL CONSULTING WORKSHOP
Oct. 21, 1998	Fox Valley Subsection and The Computer Society THE Y2K BUG ON THE SHOP FLOOR, HOW BIG IS IT AND CAN IT BE SQUASHED?
Oct. 21, 1998	IAS/IES GROUNDING OF POWER SYSTEMS
Oct. 29, 1998	IEEE-Signal Processing Society IEEE DSP SEMINAR



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IEEE SIGNAL PROCESSING SOCIETY

Chicago, Milwaukee, Madison & Rock River Valley Sponsored Signal Processing Seminar

IEEE DSP Seminar

Thurs. October 29, 1998

IEEE DSP SEMINAR

About the topic:

Track 1: DSP in Modern Motor Controls, An Overview of New and Emerging EDA Technologies for DSP Design
Track 2: Bridging the Implementation Gap - A New Approack to FPGA Based DSP Design
Track 3: DSP Fundamentals, Real-Time DSP –Applications and Implementation, DSP for Sensorless Motor Controls
Track 4: (Prof. Activities) Secure IP Distribution and Delivery, 6 Sigma Defined and Deployed, Employee Personal Liability, How to Become a Consultant

Location:

Clock Tower Resort and Convention Center, Rockford, IL

Registration:

The registration fee is $75 for IEEE members and $100 for non-IEEE members, student rates available.

Registration includes continental breakfast.
For more information e-mail dspseminar@ieee.org.
Web site: www.dspseminar.org

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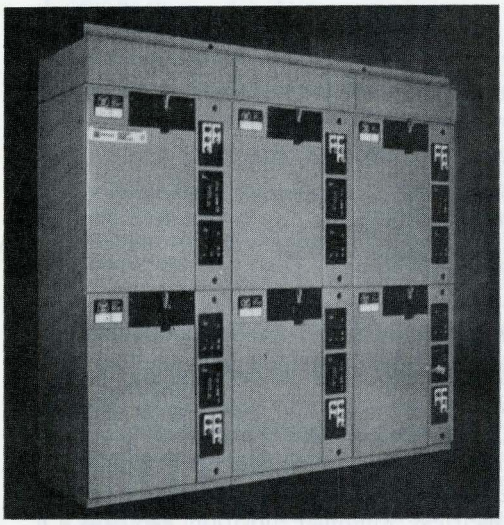

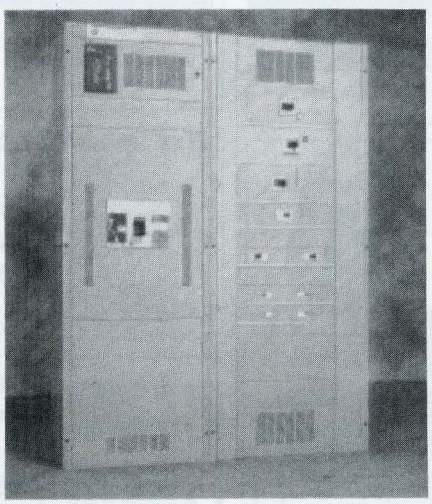

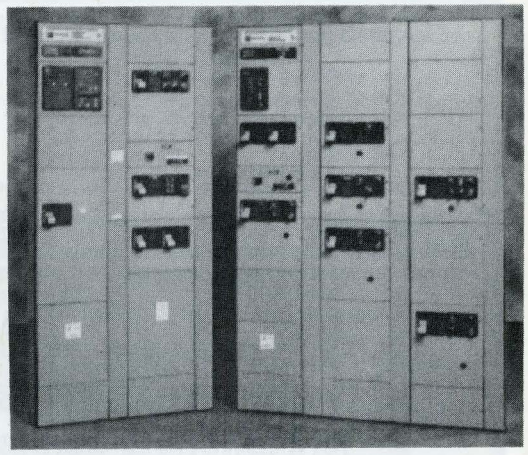

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