



RELIABILITY GROUP NEWSLETTER

October 1971 Vol. XVI · Issue 4

Paul Gottfried
Editor:
9251 Three Oaks Drive
Silver Spring, Md. 20901

"Material for the January issue must be in the editor's hands by November 24."

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Contents

This issue features a Guest Editorial by Duco Weytze, Chairman of the Montreal Chapter. The editorial originally appeared in the September issue of "Phase Courant", the Montreal Section publication.

The editorial's basic thought is not new; the cry for involvement by more members is a perennial one. What is unusual in the professional-society context is the call not just for town-meeting pure democracy, but for activism at the individual-member level. The call seems in keeping with the spirit of the times; it remains to be seen whether effective means for implementation can be found. Readers may address their comments to Mr. Weytze (CAE Electronics Ltd., P.O. Box 1800, St. Laurent, Montreal 379, P.Q.) or to the membership at large via the Newsletter.

EDITOR'S NOTES

CHAPTER CHAIARMEN

Baltimore	Mr. Charles Karr 5220 Brook Way Columbia, Md. 21043	New Jersey Coast	Mr. Bernard J. Meyer Product Assessment Agency U.S. Army Electronic Command Fort Monmouth, N.J. 07703
Binghamton	Mr. Joseph J. Rexford 20 Merrill Street Binghamton, N.Y. 13905	New York-Long Island	Dr. Martin L. Shooman 12 Broadfield Pl. Glen Cove, N.Y. 11542
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Canaveral/Daytona	Mr. Earle H. Barber 2517 S. Forrest Dr. Melbourne, Fla. 32901	Philadelphia	Mr. Edmund J. Westcott 834 Windsor Dr. Riverton, N.J. 08077
Chicago	Mr. Charles W. N. Thompson 240 Randolph Street Glencoe, Ill. 60022	San Diego	Mr. Thomas W. Wright Evaluation Research Systems and Management Systems 2001 Kettner Blvd., Suite 3 San Diego, Cal. 92101
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Los Angeles	Mr. George W. Wood 4155 La Junta Dr. Claremont, Ca. 91711	Twin Cities	Mr. V. Mike Jordal 3028 Ewing Avenue, South Minneapolis, Minn. 55416
Mohawk Valley	Mr. Jerome Klion 73 Taber Dr. New Hartford, N.Y. 13413	Washington	Mr. William A. Shortt 6640 Gainer St. Annandale, Va. 22003
Montreal	Mr. Duco W. Weytz 17 Howard Roxboro 970 Quebec, Canada		

GROUP CHAIRMAN:

Mr. V. R. Monshaw
RCA Astro Electronics Division
Box 800
Princeton, N.J.

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Recommended Book for anyone's Computer-Aided Design Reference Library: SCEPTR: A Computer Program for Circuit and System Analysis by James C. Bowers and Stephen R. Sedore - edited by Franklin F. Kuo, Prentice-Hall Electrical Engineering Series.

This book is well organized and presents the novice as well as the experienced analyst with all of the necessary information to solve circuit problems using the SCEPTR program. The six chapters include a description of the mathematical formulation of the program, the User's manual, circuit analysis examples and provide methods for measuring and obtaining parameters for semi-conductor devices.

CARAD REPORT

Warning: To all CDC-6600 SCEPTR users!! The Fortran Extended Compiler, being adopted as a Standard? by CDC to replace the RUN/FUN compiler used under Scope 3.3, kills the SCEPTR program because:

Fatal errors will be generated during pass two of SCEPTR which formulates the dimension, data and type statements in a format incompatible with the Extended Fortran Compiler.

Oh well that's progress - make sure that nothing is compatible with anything and always consider the needs of the "Users."

The current contact for SCEPTR is:

Lt. Raymond B. McBride
AFWL (EST)
KAFB, N. Mex. 87117

Lt. McBride is aware of the problem and is working on a solution which is several man-months in the future. Thanks a lot Mr. Manufacturer, your consideration of us "Users" is noted and deeply appreciated.

Clint Purdue, Chairman
CARAD Committee G7

PERSONALIA

Jim Goodman, past chairman of the multiple-national-award-winning Philadelphia Chapter, has been elected to a three-year term as IEEE Group Representative for the Philadelphia Section. Jim will be responsible for furnishing guidance in the operation and administration of local group chapters.

NEW IEEE GROUP FORMED

The IEEE is forming a new Group on Manufacturing Technology, which will have the internal code number of G-35 and the abbreviation G-Mfg T. The general field of interest of the new Group will be all aspects of manufacturing technology as it relates to the manufacturing of electrical and electronic equipment.

N E W I E E E G R O U P F O R M E D

G-R AdCom member George Ebel, who has been active as G-R representative to the predecessor Ad Hoc Committee, will serve as the new Group's chairman and can be reached at the Singer Company, 1150 McBride Avenue, Little Falls, N.J. 07424 for additional information. Lou Paddison and P. K. McElroy of G-R also are on the new Group's AdCom.

GUEST

"Participant or Parasite"
D. W. Weytze

Somebody once remarked that we are people who enjoy music, but cannot play an instrument; enjoy reading, but are not able to write a book; enjoy a game as a spectator, but not as a participant; enjoy living in a house, but would not know how to build one. Unrestrained, we would almost continue that we enjoy engineering, but don't know how to handle the obligations.

EDITORIAL

Our daily routine is starting again. Vacation time is behind us and many months will have to pass till the next one. The annual meeting of favorite friends, vacation spots or relaxation time has passed and so did our last IEEE Annual Meeting in June. At that meeting, Gilles Perron, Chairman of the Eastern Canada Council, made a passionate plea to the membership to become "involved." It is no longer the executive who dictates the course the IEEE should steer; it are the members themselves at the helm who determine the next port of call --. Then looking around at the half dozen members present, representing a Montreal membership of 1600, an ironical thought was born. "If it is true that the members really are the foundation of the IEEE, why not use this to everybody's advantage." "How about making it possible for each member to meet and to discuss, to examine and to advise policy and actions of the IEEE." "It could be called for instance a General Meeting and -- naturally -- nearly everybody would be there." "Why should the younger generation monopolize the Do Your Thing slogan." It was just an ironical thought, but ---.

"How can we solve this involvement gap," has been often asked; and the right solution never was found. The problem is too basic, its solution unfortunately too personal and too disturbing.

Let us look back. The Scientific Revolution which changed the orientation of our society from "man" to "technology" was executed by highly trained engineers, scientists, etc. Certainly highly trained scientifically to materialize the great technical thoughts, but also ill equipped in the art of applying this knowledge for the benefit of mankind. Bureaucratically oriented political authority took over, and notwithstanding the fact that without the supporting knowledge and skill of the technologist the politician is helpless, the atmosphere within our profession became and remained that of apathetic tolerance. What was done, individually or collectively, to prevent or to resist the present continent wide economic cruises? Was it unintentionally but nevertheless effectively supported by general indifference?

It is so true what Gilles Perron said about the power of the membership. Not unlike anti-pollutionists and conservationists, we will have to choose between a high responsibility to apply science and technology for the benefit of mankind or to slumber away. No longer are we members of the IEEE, we are the IEEE.

What are we going to be? Parasites, by definition someone going through a revolving door without pushing, or participants by helping to keep things rolling. In educating ourselves to to-day's realities, the IEEE stands ready with timely publications and with timely publications and with meetings reflecting the state-of-the-art. Use these so that no good man will be idle. Realize that the rate of obsolescence of our education is rapidly approaching the rate of obsolescence of a car. Every engineer owes it to himself and to his profession to pursue technical rearmament so that it may be used with the ethical and moral obligations for the benefit of all.

1972 Reliability Physics Symposium

April 5 - 7, 1972

The 1972 Reliability Physics Symposium cosponsored by the IEEE Professional Groups on Electron Devices and Reliability will meet at the Stardust Hotel, Las Vegas, Nevada. Papers on original work, not previously presented or published, describing contributions in Reliability Physics are invited. Specifically failure modes, failure mechanisms, failure analysis techniques, testing, and corrective action in any of the following or related areas are solicited:

- Silicon Surfaces
- Metal - Silicon Contacts
- New and Improved Failure Analysis Techniques
- MSI, LSI
- LSI Design for Reliability
- Silicon Chip Metallization
- Passive Components
- External Interconnect Schemes
- Multiple Layer Dielectric Effects
- Failure Mechanism Models
- New Technologies
- Hybrids
- Multilayer and Printed Circuit Boards
- Beam Leads
- Design for Reliability
- Process Control for Reliability
- Microwave Devices
- III-V Compounds
- Radiation Hardening
- Screening Techniques
- Optoelectronics (LED's, etc.)
- Consumer Product Reliability

Before November 22, 1971: Those wishing to present papers must submit both a 50 word description abstract and a 300-500 word summary appropriate to a 20-minute paper clearly stating: (1) the purpose of the work, (2) how much it advances the art of reliability physics, and (3) what results have been obtained.

Forward these to:

Jayne Partridge, Technical Program Chairman
1972 Reliability Physics Symposium
MIT Draper Labs MS35
75 Cambridge Parkway
Cambridge, Mass. 02142
(617) 864-6900 X821-478

NATO Reliability Conference

As part of its program for 1972, the NATO Advisory Panel on Operational Research is sponsoring a conference on Reliability Testing and Reliability Evaluation. The conference will be held in or near the Hague, Netherlands from September 4 to September 8.

The theme of the conference is very broad. It covers such aspects as confidence bounds for system reliability, military demonstration techniques and requirements, cost effectiveness and allocation of resources in testing, reliability of computer software and software for checking the reliability of complex equipment, overstress testing and accelerated life testing, exploitation of knowledge of relevant physical processes in modeling stochastic phenomena, etc.

U. S. residents wishing to contribute a paper should send an abstract to the American point of contact for the conference, Dr. Nancy R. Mann, Rocketdyne, North American Rockwell Corporation, 6633 Canoga Avenue, Canoga Park, California 91304, (213) 884-2095, no later than February 1, 1972. Authors whose papers are selected for presentation at the conference will be so notified during March 1972. They must send in the complete text of their talks no later than June 1, 1972 for publication in the proceedings. Persons wishing to attend the conference, but not present a paper should so inform Dr. Mann as soon as possible. Attendance is limited, and it may be that not everyone who wishes to participate can be accommodated. Residents of other NATO countries may obtain the name of their National Point of Contact from Mrs. G. Konstantis, Phys. Lab. TNO, O. Waalsdorperweg 63, The Hague, Netherlands.

Symposium on Fault-Tolerant Computing

1972 INTERNATIONAL SYMPOSIUM ON FAULT-TOLERANT COMPUTING

Boston, Massachusetts, June 19-21, 1972

Papers are solicited in the following areas:

- Fault-Tolerant System Architecture and Design
- Testing, Fault Location, Diagnosis, and Recovery
- Applications of Error Coding Techniques
- Methods of Design Verification
- Measures of Reliability and Related Parameters
- Mathematical Modeling of Fault-Tolerant Computers
- Error Control in Computer Networks
- Graceful Degradation of Multiprocessor Systems
- System Programs for Testing and Diagnosis
- Operating Systems for Fault-Tolerant Computers
- Hardware and Software Aspects of Software Reliability

Redundancy Methods in Logic Design

Current Fault-Tolerant Computing Practice

Prospective authors are asked to notify the Program Chairman before November 1, 1971 of their intention to submit a paper. The Program Chairman is:

Professor Gernot Metze
Coordinated Science Laboratory
University of Illinois
Urbana, Illinois, 61801

Papers of digest length (2,000 to 4,000 words) are to be submitted for review by December 1, 1971. Each paper is to be accompanied by a statement (not to exceed 500 words) explaining the problem approached and the nature of the contribution.

NBS News & Publications

The National Bureau of Standards Institute for Applied Technology has announced preliminary results in its two-year search for causes of and methods for minimizing defective bonds of wire leads to metallized semiconductor surfaces. Newly developed methods for calibrating the ultrasonic wire bonders on industrial production lines should result in devices having fewer failures. Accounts of the Institute's work on wire bond evaluation, as well as of its entire research in semiconductor technology, can be found in the series of quarterly NBS Tech. Notes entitled Methods of Measurement for Semiconductor Materials, Process Control, and Devices. These will continue to be announced in the Newsletter as they become available from the Superintendent of Documents.

NBS also has assisted in the formation of a new Section of Committee F-1 on Electronics of the ASTM. The Section was formed to develop standard test methods for microelectronic bonding. Persons interested in working with the new Section are invited to contact its Chairman, Kathryn Leedy, B328 Technology Building, National Bureau of Standards, Washington, D. C. 20234.

Time signals from station WWV can now be obtained via telephone by dialing (303) 499-7111. Shortwave signals from Fort Collins, Colorado, are relayed as received by NBS at Boulder, Colorado, and include voice announcements of GMT every minute as well as standard audio-frequency tones and special announcements. For callers from the 48 contiguous states, the signals should be accurate within 30-40 milliseconds.

Reliable physical science references data will be made available, beginning in 1972, in a new Journal of Physical and Chemical Reference Data. The output of the National Standard Reference Data System, consisting of compilations and critical reviews, will appear in the new Journal, which will be published jointly by the American Institute of Physics and the American Chemical Society. Subscription information may be obtained from the latter at 1155 16th Street, N.W., Washington, D. C. 20006.

The following NBS documents are available through the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402:

A Technique for Measuring the Surface Temperature of Transistors by Means of Fluorescent Phosphor, NBS Technical Note 591, July 1971; SD Catalog No. C13.46:591; 49 pages, \$0.50.

Methods of Measurement for Semiconductor Materials, Process Control, and Devices, NBS Technical Note 592 August 1971; SD Catalog No. C13.46:592; 70 pages, \$0.50.

CHAPTER NEWS

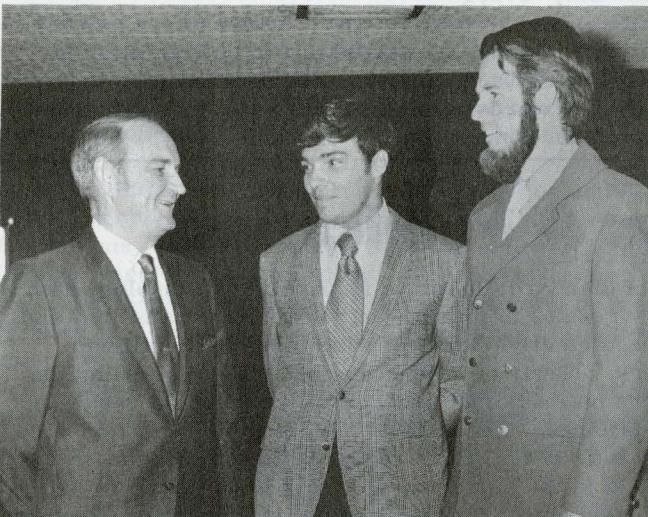
Canaveral

The Chapter met May 13 to hear Robert E. Hilton, Radiation Inc., speak on "Computer Prediction of MTTR in Systems Supported by Automatic Test Equipment." On July 21, a special film program featured the stories of Apollo XIII ("Houston, We've Got a Problem") and Apollo XIV ("Mission to Fra Mauro"). Immediate Past Chairman, Jack B. Freeman, installed the following officers for 1971-72:

Earle H. Barber	Chairman
Jack R. Lykins	Vice-Chairman
T. Mitchell Barlow	Secretary
Robert E. Hilton	Program Chairman

Messrs. Barber, Freeman and Hilton are shown (left to right) in one of the accompanying photographs. The other shows Lee R. Webster (left), 1969-70 Chairman, receiving a Certificate of Appreciation from Section Chairman John Cates. Mr. Webster's contributions included several papers, a training seminar in conjunction with Florida Institute of Technology, and leading the Chapter to third place in the G-R Chapter Award Competition.

Also recognized at the meeting was Miss Tatiana Prothoy, a special international guest from Paris, France. She holds a Reliability management position with the French aerospace firm Intertechnique, and is currently visiting Radiation, Inc., Melbourne, Fla., as part of a technical exchange program.



Montreal

As announced in the July Newsletter, four Chapter members are scheduled to speak at the Fifteenth Annual Quality Control All-Day Forum. To be held October 30 at the Queen Elizabeth Hotel, this Forum will be the first to be co-sponsored by the Chapter with ASQC and will be built on the topic of "Quality Control in a Changing Economy." The provisional program includes:

ACTIVITY 1 (ASQC)

Basic QC (English)
Basic QC (French)

ACTIVITY 3 (ASQC)

Design of Experiments
Consumerism Topic
Vendor/Customer Relations

ACTIVITY 5 (ASQC)

Inspection Workshop
Legal Topic
Data Systems

ACTIVITY 2 (ASQC)

Quality Costs
Quality Standards

TBD

ACTIVITY 4 (IEEE)

Practical Reliability
Reliability Status Report
Reliability Testing
Customer Support

Advance fees are \$13 member, \$16 nonmember, \$5 student; \$3 higher at the door, except for students. All fees include a copy of the proceedings; student fees do not include luncheon. Registration contact is Mr. Yves Traversy, Johnson and Johnson Ltd., 2155 Pie IX Blvd., Montreal 403, Quebec.

The second event of the season will take place December 6 and has been scheduled tentatively for 8:15 p.m. at McGill University. The first of a hoped-for regular series of interdisciplinary meetings, this will concern Microshock Hazard and will involve two engineers and a moderator arranged through the Chapter, two physicians arranged through the Biomedical Group Chapter. In view of economic conditions, no Reliability Course offerings are planned for this season.

Philadelphia

Regular meetings are scheduled for Sept. 16, Oct. 19, Nov. 17, Feb. 1, Mar. 9, and April 19, all at the Presidential Apartments. The September topic is "Management of Earth Resources" with E. M. Mazur as the speaker. The Annual Seminar will take place May 18 at the University of Pennsylvania and will concern failure mode analysis of integrated circuits.

San Francisco

The first meeting of the season will be held October 13 at the Stanford University Physics Lecture Hall, PH101, at 8 p.m. Mr. Kurt Breymayer of the Stanford Linear Accelerator Center will discuss "Reliability Planning for a Two-Mile Accelerator".

Twin Cities

The Chapter plans to continue its successful policy of luncheon meetings at the Jax Cafe in Minneapolis. The 1970-71 season concluded with a January 28 meeting addressed by Dr. Ken Thurber, Honeywell, who discussed "Fault Location in Cellular Arrays", and a May 20 meeting at which Donald Raupe, Univac Division of Sperry Rand, presented a paper on "Computer Aided Design Programs and Application Capabilities". 1971-72 meetings are scheduled for Sept. 22, Oct. 27, Jan. 19, Mar. 15 and May 17; topics have not been announced.

Chapter officers for 1971-72 are:

Chairman:	V. M. Jordal
Vice Chairman:	S. J. Pech
Secretary:	R. A. Rappel

CONFERENCES

October 31 - November 4	1971 Conference on Engineering in Medicine and Biology (G-EMB and many other sponsors), International Hotel, Las Vegas, Nevada
November 2-3	1971 IEEE Eastern Electronics Packaging Conference (in conjunction with NEREM), Sheraton-Boston Hotel and Hynes Auditorium, Boston, Massachusetts
November 8-10	1971 Joint Conference on Sensing of Environmental Pollutants (IEEE, AIAA, ISA, ACS, NASA, and NOAA), Cabana Hyatt House, Palo Alto, California
November 15-18	1971 Fall Foint Computer Conference (AFIPS), Las Vegas, Nevada
December 6-8	1971 IEEE Ultrasonics Symposium (G-SU), Carillon Hotel, Miami Beach, Florida
December 7-8	1971 IEEE Vehicular Technology Conference (G-VT), Sheraton-Cadillac Hotel, Detroit, Michigan
December 16-18	1971 IEEE Conference on Decision and Control (Control Systems Society, G-IT and G-SMC), American of Bal Harbour, Miami Beach, Florida
1972	
January 25-27	1972 Annual Symposium on Reliability (G-R, ASQC, IES), Sheraton Palace Hotel, San Francisco, California
January 31 - February 4	1972 International Symposium on Information Theory, Asilomar Conference Grounds, Pacific Grove, California
February 16-18	1972 IEEE International Solid-State Circuits Conference (Solid-State Circuits Council, Philadelphia Section and University of Pennsylvania), Philadelphia, Pennsylvania
March 20-23	1972 IEEE International Convention and Exposition, New York Coliseum and New York Hilton, New York City
April 5-7	1972 Reliability Physics Symposium (G-R, G-ED), Stardust Hotel, Las Vegas, Nevada
April 10-13	Tenth International Conference on Magnetics (G-M, Japan Society for the Promotion of Science), Kyoto International Conference Hall, Kyoto, Japan (See July Newsletter for charter flight information)
April 19-21	1972 IEEE Region Six Conference: "Microelectronics Systems and Applications," Hilton Inn, San Diego, California
May 8-10	26th Annual Technical Conference (ASQC), Washington Hilton Hotel, Washington, D. C.
May 16-18	1972 Spring Joint Computer Conference (AFIPS), Atlantic City, New Jersey
June 19-21	1972 International Symposium on Fault-Tolerant Computing (Computer Society and MIT C.S. Draper Laboratory), Boston, Massachusetts
September 4-8	NATO Conference on Reliability Testing and Reliability Evaluation (NATO Advisory Panel on Operational Research), The Hague, Netherlands

ROSTER

Region 1

BERKSHIRE	MORTON H LEVIN W E LOWERY ROBERT A MACK F J MAHONEY 3RD J P MALIZTA N A MARTEL W R MC CARTHY P R MCELROY T J MC NAMARA N P MILLAR DANIEL J MOMOT H B MORLEY ALMON R MOSES W E NAAS RICHARD J NAWROCKI J B NEWBOLD T B NEWMAN JR ELLIOOTT D NICHOLS NICHOLAS Y NIIEH WALTER D NISULA C L NOELKEE JR YASUSHI NOZAWA N G PARKE 3RD ANTHONY R PASTORE ARTHUR T PETERS JOSEPH J PLANTE A W POSTLETHWAITE D M POWELL R F POWELL L F REA V H READ ROBERT R REEDS H L RENROE GEORGE D REYNOLDS WARREN ROBERTS T B ROBINSON GERARD S ROCHELEAU GERARD T ROSS D F RUSSELL JR B A SACCO W L SEXTON I SHAPIRO JACOB M SHAPIRO JOHN C SIMONS JR DONALD V SIMPSON D B SINCLAIR B D SMITH TERRY M STARK A M SWASEY JR H P TAYLOR H D TWITCHELL JR C A WALANT P A WEMETT NORMAN R WHEELOCK LEWIS R WHITE THOMAS G WOOD DONALD W KANE M J KIRBY R KLEIN ARTHUR U KOPPEL JAMES LEGGIO E OLIVERS G R LEVY W J LIGHT COSMOS MARENTIS N J MAROLIS D M MASTELLER D W MATTESEN C W MEINEN ISRAEL C MILLER M J MINNEMAN HAROLD NADLER R E OAKES D M PASEK DAVID G PERSANS LEON E PHILIPS S PODOWITZ TRIFON PRASINOS G C RABIN H E REYHER S A RINKEL A RIPNITZ RAYMOND W FITZGERALD L F GILBERT ROY E GITTER DANIEL H GRANTHAM G O JOHNSON JR G C KALANDER S T KARACHUK M KERN J KICZUK R L LARSON ROBERT W LOISEAU P N MARTIN P PABIAN E L PAGANO J F PERRY THEODORE POLLOCK J F RAYE LEONARD E SEGAL J SHERMAN J SHOGREN R R SIEGERT P B SMITH B M TASHIAN JACQUES G VANDENBORRE A J VAN HOERKOM	HENRY YEE DOMINICK YODICE F R YOUNG MAINE FRED FERNANDEZ JAMES F GROCHMAL G C TIBETTS MID-HUDSON A S BUCHMAN ALLAN S COLE V A FISCHER S P GARBARCZYK J A GOETZ JR J GOLD J T GRINTHAL J E HARRIS STANLEY S KAFTAN N LANDAU R L PRATT V RAUCH SAUL TWICKEN MOHAWK VALLEY JOSEPH ARRANTE D F BARBER ROBERT B CHAMBERLAIN E O CODIER ANTHONY COPPOLA W H DICKSON BRUCE W DUDLEY R M EBERY ANTHONY J FEDUCIA ROBERT W FINK W R FRANCHELL D T GEISER ROBERT M GRAY MILTON HAUS PATRICIA A HUBER V C KAPPER R I GROSS ROBERT E GRUBER KENNETH A HALLER RAYMOND HASTINGS EDWARD B HORN DAVID HOROWITZ A HRYCYK R E JACK L JACOBSON A C JOHNSON DONALD W KANE M J KIRBY R KLEIN ARTHUR U KOPPEL JAMES LEGGIO E OLIVERS G R LEVY W J LIGHT COSMOS MARENTIS N J MAROLIS D M MASTELLER D W MATTESEN C W MEINEN ISRAEL C MILLER M J MINNEMAN HAROLD NADLER R E OAKES D M PASEK DAVID G PERSANS LEON E PHILIPS S PODOWITZ TRIFON PRASINOS G C RABIN H E REYHER S A RINKEL A RIPNITZ RAYMOND W FITZGERALD L F GILBERT ROY E GITTER DANIEL H GRANTHAM G O JOHNSON JR G C KALANDER S T KARACHUK M KERN J KICZUK R L LARSON ROBERT W LOISEAU P N MARTIN P PABIAN E L PAGANO J F PERRY THEODORE POLLOCK J F RAYE LEONARD E SEGAL J SHERMAN J SHOGREN R R SIEGERT P B SMITH B M TASHIAN JACQUES G VANDENBORRE A J VAN HOERKOM
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Continued...

NORTH JERSEY
 HARVEY S HERSHKOWITZ
 GL HETZEL
 TA HJORTH
 R M JACOBS
 DAVID W JONES
 R L KELLY
 C C KIRCHENBAUER
 LEON J KOZLOWSKI JR
 EVERFETT L LABAGH
 JOHN D LEGGETT
 A LOBERT
 S A MALLARD
 ALAN K MALTZ
 EDMON MARKOWITZ
 FREDERICK A MENDEZ
 RAJ P MISRA
 ADRIAN G MOONS JR
 J A MORTON
 CONRAD R MULLER
 E C NEU
 R J NEWMAN
 J P ODOMONHUE
 G PAGE
 A G PRANGLEY
 GEORGE PROTOGEROU
 HENRY T RAND
 A J ROSENTHAL
 R L ROSS
 R L SAMSON
 A R SANTOPETRO
 SOL M SELTZER
 FREDERIC SHAKLAN
 D N SHAW
 EDWIN A SHELL
 NORMAN SLURZBERG
 DAVID W SMITH
 V C SULZBERGER
 GILBERT TINT
 R S ULLMAN
 H N WAGAR
 WALTER F WAGNER JR
 E A WEIGNER
 RICHARD N WENMAN
 G L WICKLAND
 RICHARD S WIENER
 JOHN F WILHELM
 ROBERT C WINANS
 PAUL WOJNICZ

JOHNNY E SARTIN
 M E SCOVILLE
 A J WOOD
 SPRINGFIELD
 JOHN H EMERSON
 ALAN J GROSS
 SYRACUSE
 KEITH E ABBOTT
 J R REVILLE
 M L BIENVENU
 BRIAN R CARROLL
 C J CLEARY JR
 D T DOHERTY
 E C ERNST
 E A HERR
 R C HOADLEY
 L F LEINWEBER
 F A OLSON
 JOHN F SCHENCK
 ALLAN B SINCLAIR
 DON D WARD
 C S YERIAN

VERMONT
 JOSEPH R ALTIERI
 ALBERT S BERGENDAHL
 L DUNLAP
 RICHARD R EMERY
 ANDRE C FORCIER
 A M FORSYTHE
 MORTON W HUGHES
 SOON K KWON
 ANTHONY J MANNINO
 ANDREW N MC LAREN
 DAVID C TRINADE

WORCESTER COUNTY
 F T FLOOD
 ARTHUR R SZEMORE
 NO ESTABLISHED SECTION
 IEEE STANDARDS OFFICE

Region 2

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 ALLEGHENY MOUNTAIN
 WILLIAM R STOCK
 WILLIAM J WINTERS
 BALTIMORE

PROVIDENCE
 JOHN J BAILEY JR
 W DANDRETA
 JOHN J DE FRANCO
 R P DEMEO
 DANIEL DRUMHELLER
 C D FLANAGAN
 ROBERT R HURLEY
 M F MC KEAG
 W C SCANLON
 RICHARD B TURCOTTE
 ROCHESTER

D R BARTHOLOMAY
 JAMES H BEMENT
 CHARLES A BERTSCH
 T F BRANDT
 DAVID M BRENDER
 RODNEY L DOUD
 MALCOLM DRUMMOND
 C B DURGIN
 A C GOLDENBERG
 D L GRIEGER
 W P KARAS
 F D MAC DONALD
 R M MALKMEN
 IRWIN NATHAN
 RAYMOND W NUPP
 THOMAS F OLTORIK
 JAY D TEBO
 MYRON TRIBUS
 SCHENECTADY

H CHESTNUT
 W J DEVER
 W E FASAKE
 L K KIRCHMAYER
 BERND K KNIDER
 JOSEPH G KUZAWINSKI
 T M LIIMATAINEN
 ALBERT A LOSCHIAVO
 CHARLES B MAYER
 RUSSELL A MEERMANS
 RUBEN OREN
 P J SANTORO

J E VICTOR JR
 J T WALSH
 R L WILLIAMS
 CANTON
 TERRY L KING
 CHARLES M WEEMS JR
 CENTRAL PENNSYLVANIA
 H W DURRWACHTER 2ND
 MICHAEL W HYMAN
 ROBERT G MC INTURFF
 A F PIEPER
 E W SCHMIDT
 JAMES M VOGELSONG
 CINCINNAII
 H M FULDNER
 ROBERT A HEDINGER
 CLEVELAND
 LYNN A BLYTH
 JOHN A CIULA
 R C CRAFT
 JOHN W GROSS
 R H KUHNAPFL
 L M NAGYOSZY-WOLF
 E W REASH
 GEORGE G SAMIJLENKO
 FRED R SCHRAFF
 F C SILLAG
 C P STOCKER
 L R STONE
 J V WERME
 COLOMBUS
 R H BRIGGS
 JAMES E BUEHLER
 H R CHOPP
 J L EASTERDAY
 CHARLES W HEFNER
 G V PHILLIPS
 MICHAEL J STEFANIK
 L H STEMBER JR
 G G SVALA
 JOHN J THORNTON
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 P R MASON JR
 ROBERT F MATTHEWS
 N J MC AFEES
 M A MCGREGOR
 L G MC PHERSON
 J H MILLER

OKLAHOMA CITY
ROBERT L ANDERSON
STEPHEN A HUNTER
J J POLLACK

ST. LOUIS

GERALD GARDEN
W R CUTHILL
C S CZEKANSKI
LINDON F FINLEY
D R JANNING
G M JOHNSON
FRED KORTRIGHT
W C MARSH
J J MC GARRY JR
KEYHAN MOLAVI
J H MUTCHIK
RAYMOND J NEVENNER JR
C G PIEL
W R RIGGEE
J H SCHMICKLEY
M C SINK
M STITCH
W T SUMERLIN
J R TUDOR

SHREVEPORT
T F HOWTE
JOHN D MEYER
J T MILLER
F R POTTER
THOMAS R ROGERS

SOUTH PLAINS
R H SEACAT

TULSA
J E HAWKINS

Region 6

ALBUQUERQUE
P H BIRCHER
JACKSON L HICKS
ROBERT L HUTCHINS
EDWARD L LANE
L J PADDISON
C H PURDUE
JOHN O SPENCER
W M SUNDT
H E WALKER
J D WILLIAMS

HAWAII
STEVEN P GOUVEIA
KATSUMI HOSOKAWA
CLARENCE K KUBO

IDAHO
G W YOUNG

LAS VEGAS
JOHN J O CONNOR

MONTANA
T L BENES

PHOENIX
F A APPLEGATE
P C BOYD JR
R D BRADLEY
MELVIN D BRAMAN
G U BRIGGS
ROBERT E CHRISTENSEN
PHILIP CLAR
JOHN H DENNY
FRED E DRESTE
J L DURSO
GLENN S EVENSEN
WILLIAM T FITCH
T J GLEICHAUF
P H GREER
M C HALLECK
THOMAS H HOWELL
M C JENSEN
E A JONTRA JR
H P KENYON JR
FREDERICK H KOST
V I MINKE
DANIEL E NOBLE
THOMAS PHINNEY
LOUIS PLOTKIN
ALLAN G RIKER
R E SAMUELSON
FRANK A SCHNEIDER
D H SCOFIELD
DAVID E UTTER

PORTLAND
JAMES W DEER
J D GRIMES
V S LAVA
R A POULIN
CARLYLE J SCHWARTZ
R E SHOW
J L STOLL

RICHLAND
M L FAUGHT
E J OBLACK
SACRAMENTO
R W ANDERSON
P J DUGAL
W P FREDELL
A F HOEFLICH
RICHARD L MCKINNEY
J T R WILSON

SAN DIEGO
F M BARNES
W H BARNHART
SAMUEL BRAUN
ARNOLD BROUNSTEIN
C E BURGI
MARTIN CADEMY
B R CORSON
F P HOLMAN
HERMAN H HUSBANDS
MICHAEL P LEE
ROMIN T LO
EDWARD B MORRISON
W C NAGY
W F PICKETT
WILLIAM A PLOCK
ROBERT A POLL
ALVIN L RHINER
KEITH N SARGENT
R R SAYLOR
ROGER A SHORACK
J P SILVERSTEIN
ALOIS E SMITH
G I SOUCY
G L STIEHL
ROBERT J STOKELY
H B STURTEVANT JR
RICHARD J TOMMEY
ROGER E TURNAGE JR
F VIRGADAMO
W I WOOLFORD
T W WRIGHT

SAN FRANCISCO
W R ABBOTT
J R ALLGAIER
J K AMUNDSON
ROBERT L ANDERSEN
RICHARD W ANDERSON
ALBERT F AUGUSTINE
M H BAER
ARTHUR E BAYCE
R N BEAN
R C BECKLUND
ELLIOTT L BERSHODSKY
C R BIROSSL
R A BLOCKINGER
ROBERT R BLDISK
BARRY R BORGERSON
G BOWERS
HOWARD H BRAUER
J T BROTHERS
BERTRAM M BURRISS JR
JAROSLAV BYMA
H M CHANKIN
KING S CHAW
WILLIAM C CHOW
A D CONNER
RICHARD C CORNWELL
W P CRAINA
ALAN F CULBERTSON
E S DEAN JR
WILLIAM S DRUMMOND
JOHN ESTATHIOU
A P EGGERMAN
H A EIMSTAD JR
A F EMRICH
W L FINCH
DESMOND J FITZGERALD
EUGENE M FLICK
R A FOLSON JR
THOMAS R FORRER JR
L G FREDERICK
RONALD FUNG
WARREN GELLER
P J GUILLOT
PRADEET C GUPTA
FREDERICK M HALF
BRUCE J HARRIS
J D HOFFMAN
M HONDA
I M JACOBS
JULIANNE J JEDEKA
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R L JONES
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KENNETH D KELLY
V G KIDD
JAMES H KING JR
R C KING
THOMAS J KING
MELVIN B KLINE

SEATTLE
ROBERT J BURNS
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ARNOLD BRANFF

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SAN FERNANDO VALLEY
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L M BAUM
I BAZOVSKY
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DEGEDERTON JR
D J FINN
H M GORDY
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J A HARRINGTON
R J HERST
P L HILLMAN
WILLIAM J HODGES
S J HORNYAK
J R ISKEN
HERBERT G JACKS
K K KASAI
G F KUJAWSKI
W X LAMB
G R LANE
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J C MC ADAM
D R MEYER
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K F MORICK
MARY F NOLLMAN
D M PAYNE
STAN PRO
I QUART
W M QUINN
SAMUEL M RICE
D R RINGOLD
L G ROBERTSON
ALBERT L ROSENBERG JR
D K RUBIN
E E SULLIVANT JR
B W GRIER
D SWISHER
JOHN VISSER
E M WEINSTEIN

ANTELOPE VALLEY
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C M DE WITT 3RD
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E A KOHLER

CHINA LAKE
V C BESANCÓN
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VIRGIL L LOVITT

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M L SANDELL
P C LEAKE
R F LEWIS
DIRK P LYSEN
ROBERT D MAGATAGAN
W R MALAUN
RE MANWARING
L C MAUDENS
H J MC INTYRE
T G MOLESKI
R B MULOCK
HURSCHELL MUSGROVE

MET. LOS ANGELES
G HENSEL
F J HUBERT
CHARLES E JOYCE
BRUCE J MORGAN
D PLUMMER
EDWARD H VIDALES
G W YIM
L J ZOTTARELLI

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G I OLIVIER
A M OPSAHL
A R PARK
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JOHN PESCHON
E A POLGAR
J H RAU
KENNETH A REYNOLDS
GIORGIO RIGA
FRANCISCO R RODRIGUEZ
WESLEY L ROME
M B RUDIN
W C SEELBACH
RICHARD J SEGERSTROM
V SIEGRIED
R G STEWART
LESLIE F TAYLOR
ORLIN D TRAPP
V J VAN VELZER
F R VAN WAGNER
R E VEHN
R J VITERAITIS
W H WAHRHAFTIG
P A WALLACE
O R WELCH
HAROLD G WERNER
H E WESTGATE
SIDNEY WIESNER
J L WILLOWS

SANTA BARBARA
ROBERT A ANDERSON
H S HALL
CLAUDIA A HUNTER
WILLIAM OLIVERI
C N STOLL

SANTA MONICA BAY
JOEHE COOLIDGE
DOROTHY COTORA
C F DEININGER
JOHN R DONAN
J J DUFFY
A EPP JR
DONALD E EWING
J G FOUNTAIN
LESLIE FUNG
J ROBERT FUNK
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