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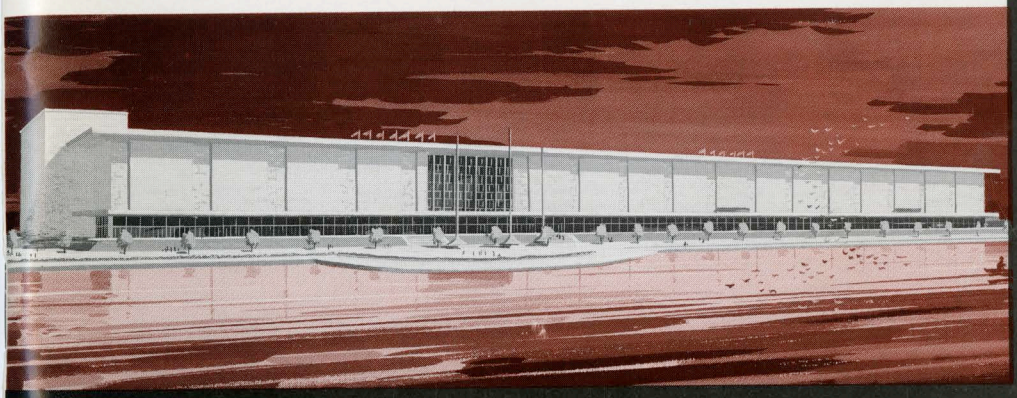
DIRECTORY
AND
TECHNICAL PROGRAM

1962 NEC

"Education and Industry—Partners in Electronic Progress"



McCormick Place, Chicago

OCTOBER 8-9-10

18th Annual
NATIONAL ELECTRONICS CONFERENCE AND EXHIBITION

OFFICIAL WELCOME

OTTO
KERNER
Governor of Illinois

Proclamation and Welcome from the Governor of Illinois

STATE OF ILLINOIS
EXECUTIVE DEPARTMENT

Proclamation

WHEREAS, The Art and Science of Electronics has become an integral part of our everyday life and a dominant force in this technical age, and

WHEREAS, The State of Illinois has won recognition as a center of Electronics research and development, manufacturing and education, and

WHEREAS, The City of Chicago will play host in 1962 to Electronic scientists, engineers, educators and members of industry from throughout the United States and overseas who will be attending the Eighteenth Annual National Electronics Conference and Exhibition, and

WHEREAS, At this major Electronic event of international significance, important Electronic technical information and exhibitions shall be presented,

NOW, THEREFORE, I, Otto Kerner, Governor of the State of Illinois, do hereby proclaim the week of October 8 through October 12, as NATIONAL ELECTRONICS CONFERENCE WEEK in Chicago, and urge our citizens to give recognition to Electronic educators, scientists, engineers, technical personnel and members of industry and to their continual striving to benefit Mankind through the advancement of the Art and Science of Electronics.

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the State of Illinois to be affixed.

Done at the Capitol in the City of Springfield, this NINTH day of AUGUST in the Year of Our Lord one thousand nine hundred and SIXTY-TWO and of the State of Illinois the one hundred and FORTY-FOURTH.

GOVERNOR

OFFICE OF THE GOVERNOR
SPRINGFIELD

July 23, 1962

Mr. R. J. Napolitan
General Manager
National Electronics Conference, Inc.
228 North La Salle Street
Chicago 1, Illinois

Dear Mr. Napolitan:

It is a pleasure to welcome members of the National Electronics Conference on the occasion of your 18th annual meeting on October 8, 9 and 10, 1962.

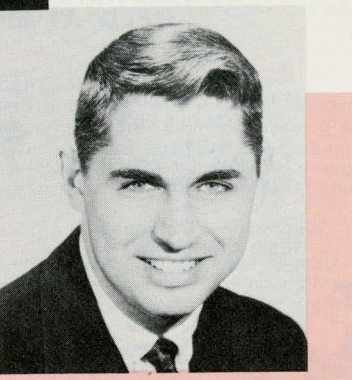
We are aware of the fact that electronic firms have placed increased emphasis on stimulating scientific, educational and industrial activity in this area. It is good to know that you have again selected Illinois and the city of Chicago as the site for your important Conference.

Our best wishes to you for a most successful meeting.

Sincerely,

Governor

NEC President's Message



JAMES H. KOGEN

On behalf of the Board of Directors, it is my pleasure to welcome you to the 18th annual NEC. This will be the largest, and we believe, the finest Conference in our history. The move this year to McCormick Place has provided NEC with one of the finest exhibition facilities available.

More than 500 firms will display equipment covering a cross-section of the electronic industry. The technical program will encompass a multitude of subjects and has been specifically arranged to appeal to both the advanced theorist and the practical engineer.

Recommendations of the NEC Industry Advisory Committee have been an important factor in the preparation of the technical program which includes a large number of sessions of a tutorial nature. The program this year includes many innovations. Two sessions are being devoted to short presentations on latest developments in research. Since these sessions do not require written papers, they will bring the very latest in development work. Additional sessions are being devoted to presentations by exhibitors of new products. A variety of panel discussions will be presented principally in non-technical areas. Top-level authorities are participating.

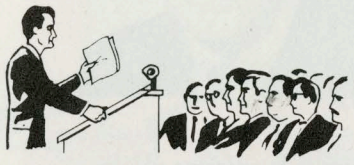
The National Electronics Conference theme this year is, "Education and Industry—Partners in Electronic Progress". This theme was selected to emphasize the importance of universities and industry in integrating their activities. For this reason three of the technical sessions, and a portion of the exhibition, will be devoted to the latest research work being done at Midwestern universities. NEC is most desirous of promoting a closer working relationship between education and industry.

We trust that you will have a rewarding stay at NEC.

President, NEC

ALL NEC EXHIBITS AND TECHNICAL SESSIONS HELD AT McCORMICK PLACE

EXHIBIT HOURS
Monday, October 8th
10:00 AM to 6:00 PM
•
Tuesday, October 9th
10:00 AM to 7:00 PM
•
Wednesday, October 10th
10:00 AM to 6:00 PM



TECHNICAL SESSION HOURS
All morning sessions start 9:30 AM
All afternoon sessions start 2:30 PM

TICKETS TO ALL NEC ACTIVITIES MAY BE PURCHASED AT THE CASHIER'S BOOTH IN THE LOBBY OF THE SHERMAN HOUSE AND CASHIER'S BOOTH IN THE REGISTRATION AREA OF McCORMICK PLACE.

	Each
Registration fee for NEC Technical Sessions	$3.00
Mon. Tues. Wed., NEC Luncheons	3.50
NEC Industry Cocktail Party Monday Evening	2.25
Guided Tour Tickets	1.00
NEC Proceedings Volume 18	5.00
NEC-AIEE/IRE Committee Dinner	3.00

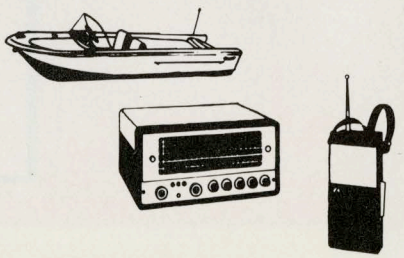
PRESS ROOM for the working press only is located at McCormick Place, Rooms 216-217. It will be open each day from 9:00 AM to 5:00 PM. Chairman Myron Noar and members of the Publicity Committee will be present during these hours. Press conferences and special events will be posted. Members of the press may register and obtain their badge in the Press Room.

VALUABLE VISITOR DOOR PRIZES
Each visitor to the 1962 Conference exhibits will be given a door prize ticket. Tickets must be validated at each of the two validating stamp machines located in the Exhibit Hall. One validating machine is located adjacent to Booth 1247, the other adjacent to Booth 178. Validated tickets are then deposited in a box located adjacent to the Information Booth in the Exhibit Entrance Area. Drawing for the valuable prizes will take place after the close of the 1962 NEC.

First Prize—Seamaid "Sprite" 14' Fiberglass Run-About Boat, complete with Dolphin Boat Trailer and Mercury "Merc 200" outboard motor.

Second Prize—Hallicrafters Model SX-62-A Communications Receiver

Third Prize—Hallicrafters Citizen's Band Fixed Station and Model CB-4 Portable Transceiver



1962 NEC PROGRAM HIGHLIGHTS

Technical Program
NEC visitors will wish to attend the many informative technical sessions scheduled during the Conference.

NO CHARGE TO ATTEND THE FOLLOWING:

Exhibitors New Product and Development Seminars
These seminars, which will be carried on concurrently with the technical sessions, cover presentations by manufacturers of new products and developments in their companies. Demonstration equipment and literature will be available. The seminars will be held in Meeting Room BB, located in the exhibit hall, and will be at no charge to NEC visitors. For subjects of interest to you, check the papers listing in the Technical Session directory.

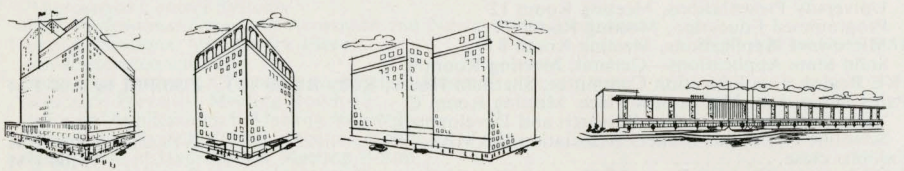
Digital Computer Workshop
Plan to attend the Digital Computer Workshop where you will learn the organization and programming of a digital computer. Operating digital computers are available in the computer demonstration area. Attendees will have an opportunity to actually program a digital computer.

10-Minute Capsule Research Presentations
A special electronic preview session has been arranged for Wednesday, October 10th, which includes presentations of last minute electronic developments. Topics of discussion are so current that they could not be included in the annual NEC Proceedings. See Listing of papers and time schedule in Technical directory.

University Program
Adding emphasis to the 1962 theme "Education and Industry — Partners in Electronics Progress" will be eleven universities participating in a university program. These universities, in addition to making presentations delineating university-industry cooperation and in-depth discussions of university research programs, have exhibits which include publications and technical equipment. See Technical Directory for schedule.

50 Years of Amateur Radio
NEC, recognizing the great contribution of radio amateurs to electronics, joins the Chicago Area Radio Council in celebrating fifty years of amateur radio. An amateur radio station will be in operation. In addition, a 1905 spark transmitting station will be on display.

NEC visitors will find it convenient to use the continuous
FREE EXPRESS SHUTTLE BUS SERVICE
between the Chicago Loop and McCormick Place
starting Monday and Tuesday at 8:00 AM and Wednesday at 8:30 AM



Starts	First Stop	Second Stop	Arrival
Hotel Sherman (LaSalle & Randolph)	LaSalle Hotel (LaSalle & Madison)	Pick-Congress (Congress & Michigan)	McCormick Place

INFORMATION • MESSAGES
NEC Information Centers are located as follows:
McCormick Place • Registration Area, Entrance to Exhibit Hall
Registration Area, Sherman House Lobby
Messages, Lost and Found, etc., will be handled from the McCormick Place Exhibit Level Information Booth

• For information, phone	326-6500	• Sherman House	FRanklin 2-2100
• NEC Business Office	FRanklin 2-0190	• Exhibit Floor Managers	326-6500
• NEC Management	326-6500	• General Manager, Rudolph J. Napolitan	326-6500

NEC Business Office, 228 N. LaSalle Street, FRanklin 2-0190

THE PROGRAM at a Glance

SUNDAY, OCTOBER 7

NEC Registration, Sherman House (lobby) open ..... 4:00 PM to 8:00 PM
CATS (Chicago Area Teleprinter Society) "CHI-RTTY" Meeting
McCormick Place, Meeting Room 7 ..... 10:00 AM to 6:00 PM
IRE Professional Group on Reliability and Quality Control
Sherman House, Byfield Room 641 ..... 7:00 PM
IRE/AIEE Student Chairman Reception, Knickerbocker Hotel ..... 7:30 PM

MONDAY, OCTOBER 8

FREE express shuttle bus leaves Sherman House ..... 8:00 AM
NEC Registration Desk at Sherman House (lobby) open ..... 8:00 AM to 5:00 PM
NEC Registration Desk at McCormick Place, open ..... 8:00 AM to 6:00 PM
Authors Breakfast, McCormick Place, Meeting Room "C" ..... 8:30 AM
Industry Advisory Committee Breakfast, McCormick Place, Meeting Room "D" ..... 8:30 AM
Ladies Program Registration, Sherman House, House on the Roof ..... 9:00 AM to 12:00 N
IRE Professional Group on Education, McCormick Place, Meeting Room 9 ..... 9:00 AM to 12:00 N
Press Room, McCormick Place, Rooms 216-217 ..... 9:00 AM to 5:00 PM
Panel Discussion. McCormick Place, Little Theater
"Reliability—Are We Spending Our Money Wisely?"
IRE Professional Group on Reliability and Quality Control ..... 9:30 AM
Technical Sessions, McCormick Place ..... 9:30 AM to 12:15 PM
(all sessions concurrent)
Energy Beams as Working Tools I, Meeting Room 6
University Presentations, Meeting Room 12
Digital Computer Applications and Components, Meeting Room 7
Solid State Applications—Varactors, Meeting Room 8
IRE Administrative Committee Professional Group on Circuit Theory
Sherman House, Gold Coast Room 111 ..... 9:30 AM to 6:00 PM
Exhibitors New Products Seminar, McCormick Place ..... 10:00 AM to 12:00 N
Exhibits open at McCormick Place (no charge) ..... 10:00 AM to 6:00 PM
Luncheon: McCormick Place, Chicago Room ..... 12:30 PM
Speaker: The Honorable Otto Kerner, Governor, State of Illinois
IRE "Student Quarterly" Board of Consultants Meeting
McCormick Place, Meeting Room 10 ..... 2:00 PM
Exhibitors New Product Seminar, McCormick Place,
Meeting Room BB (Exhibit Hall) ..... 2:30 PM to 5:00 PM
Panel Discussion, McCormick Place, Little Theater
"Euromart"
International Activities Committee ..... 2:30 PM
Technical Sessions, McCormick Place ..... 2:30 PM to 5:00 PM
(all sessions concurrent)
Energy Beams as Working Tools II, Meeting Room 6
University Presentations, Meeting Room 12
Programmed Education, Meeting Room 7
Microwave Applications, Meeting Room 8
Solid State Applications—General, Meeting Room 9
IRE Region Five Education Committee, Sherman House, Ruby Room 113 .. 2:30 PM to 6:00 PM
Panel Discussion. McCormick Place, Meeting Room C
"The Consultant's Role in Research and Development"
Scientific Apparatus Makers Association (SAMA) ..... 3:30 PM
Exhibits close ..... 6:00 PM
NEC Industry Cocktail Party, McCormick Place, Banquet Hall ..... 5:45 PM to 7:15 PM
SAMA Dinner, McCormick Place, Meeting Room C ..... 7:00 PM
National Electronics Conference AIEE/IRE Midwest Committee Dinner,
McCormick Place, Buffeteria ..... 7:15 PM to 8:15 PM
National Electronics Conference AIEE/IRE Midwest Section Gathering,
McCormick Place, Little Theater ..... 8:30 PM to 9:30 PM

TUESDAY, OCTOBER 9

FREE express shuttle bus leaves Sherman House ..... 8:00 AM
NEC Registration Desk at Sherman House (lobby) open ..... 8:30 AM to 5:00 PM
NEC Registration Desk at McCormick Place, open ..... 8:30 AM to 7:00 PM
ERA Workshop, McCormick Place, Meeting Room 11 ..... 8:30 AM
Title: "Forecasting Sales—Setting Quotas"
Authors Breakfast, McCormick Place, Meeting Room "C" ..... 8:30 AM
Ladies Program Registration, Sherman House, House on the Roof ..... 9:00 AM
NEC Exhibitors Coffee Hour, McCormick Place, Chicago Room ..... 9:00 AM
Press Room, McCormick Place, Rooms 216-217 ..... 9:00 AM to 5:00 PM
Technical Sessions, McCormick Place ..... 9:30 AM to 12:15 PM
(all sessions concurrent)

TUESDAY, OCTOBER 9 continued

Modulation Theory I, Meeting Room 6
Adaptive Systems, Meeting Room 7
Medical Electronics, Meeting Room 8
Microelectronics I, Meeting Room 9
University Presentations III, Meeting Room 12
Digital Computer Workshop, Meeting Room AA ..... 10:00 AM
Exhibitors New Product Seminar, McCormick Place,
Meeting Room BB (Exhibit Hall) ..... 10:00 AM to 12:00 N
Exhibits, McCormick Place, no charge, open ..... 10:00 AM to 7:00 PM
Luncheon: McCormick Place, Chicago Room ..... 12:30 PM
Speaker: Henry T. Heald, President Ford Foundation
Guided Tour to Dresden Power Plant ..... 1:15 PM to 5:00 PM
Bus leaves McCormick Place ..... 1:15 PM
IRE Region 4 Meeting Committee, Sherman House, Life Room 108 ..... 2:00 PM to 5:00 PM
IRE National Administrative Committee of the Professional Group on Military
Electronics Meeting, McCormick Place, Meeting Room "C" ..... 2:00 PM to 5:00 PM
Panel Discussion. McCormick Place, Little Theater ..... 2:30 PM
"The Role of R & D in Future Profits"
IRE Professional Group on Engineering Management
Exhibitors New Product Seminar, McCormick Place
Meeting Room BB (Exhibit Hall) ..... 2:30 PM to 5:00 PM
Technical Sessions, McCormick Place ..... 2:30 PM to 5:00 PM
(all sessions concurrent)
Modulation Theory II, Meeting Room 6
Digital Computer Workshop II, Meeting Room AA
Timely Aspects of Space Science, Meeting Room 7
Microelectronics II, Meeting Room 8
Student Engineer Program ..... 2:30 PM to 5:00 PM
"Microwave Magic and Satellite Communications"
McCormick Place, Meeting Room 11
IRE Region Five Committee Meeting
Sherman House, Time Room, 110 ..... 2:30 PM to 6:00 PM
Exhibits close ..... 7:00 PM

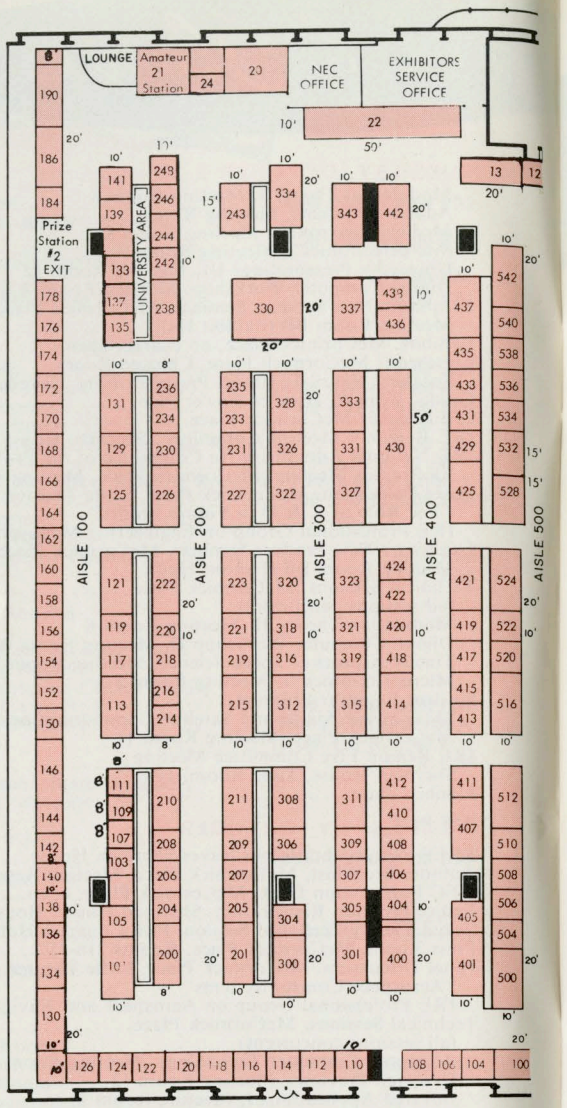
WEDNESDAY, OCTOBER 10

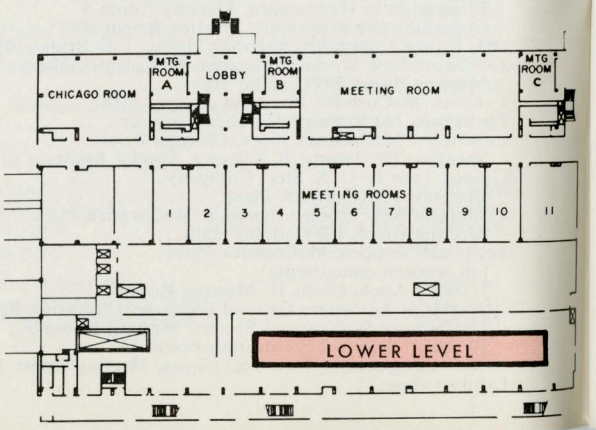
FREE express shuttle bus leaves Sherman House ..... 8:30 AM
Authors Breakfast, McCormick Place, Meeting Room "C" ..... 8:30 AM
NEC Registration Desk, McCormick Place, open ..... 8:30 AM to 6:00 PM
Ladies Program Registration, Sherman House, House on the Roof ..... 9:00 AM
Signal Theory Technical Session, Pick-Congress Hotel ..... 9:00 AM
Press Room, McCormick Place, Rooms 216-217 ..... 9:00 AM to 5:00 PM
Panel Discussion. McCormick Place, Little Theater ..... 9:30 AM
"Aerospace Control Systems"
IRE Professional Group on Aerospace and Navigational Electronics
Technical Sessions, McCormick Place ..... 9:30 AM to 12:15 PM
(all sessions concurrent)
Advanced Computer Technology, Meeting Room 6
Research Previews, Meeting Room 12
Infrared Applications I, Meeting Room 7
Circuit and System Theory, Meeting Room 8
Electronics in Hydrospace, Meeting Room 9
Communications Systems, Meeting Room 10
IRE Fellow Committee Sherman House, Life Room 108 ..... 9:30 AM to 5:00 PM
Exhibitors New Products Seminar, McCormick Place
Meeting Room BB (Exhibit Hall) ..... 10:00 AM to 12:00 N
Exhibits, McCormick Place, no charge, open ..... 10:00 AM to 6:00 PM
Eta Kappa Nu Eminent Member Initiation ..... 11:00 AM
Luncheon: McCormick Place, Chicago Room ..... 12:30 PM
Speaker: Dr. Jerome B. Wiesner, Special Assistant to President Kennedy
Guided Tour to U. S. Steel Company ..... 1:15 PM to 5:00 PM
Bus leaves McCormick Place ..... 1:15 PM
Exhibitors New Product Seminar, McCormick Place,
Meeting Room BB (Exhibit Hall) ..... 2:30 PM to 5:00 PM
Technical Sessions, McCormick Place ..... 2:30 PM to 5:00 PM
(all sessions concurrent)
Infrared Applications II, Meeting Room 6
Trends in Aerospace Ground Equipment, Meeting Room 8
Engineering Writing and Speech, Meeting Room 9
Research Previews II, Meeting Room 12
New Components, New Techniques, Meeting Room 10
Exhibits close ..... 6:00 PM

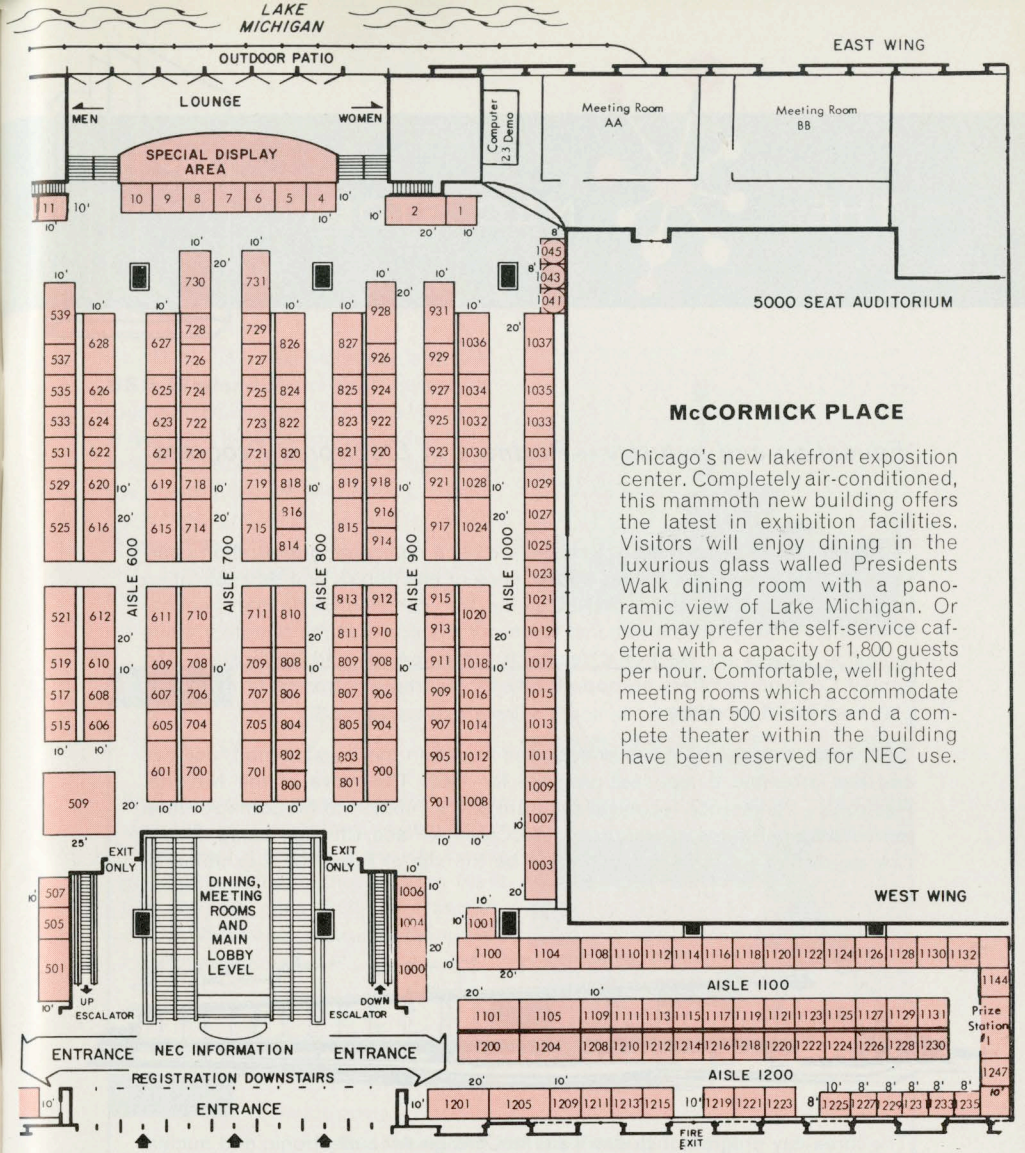
1962

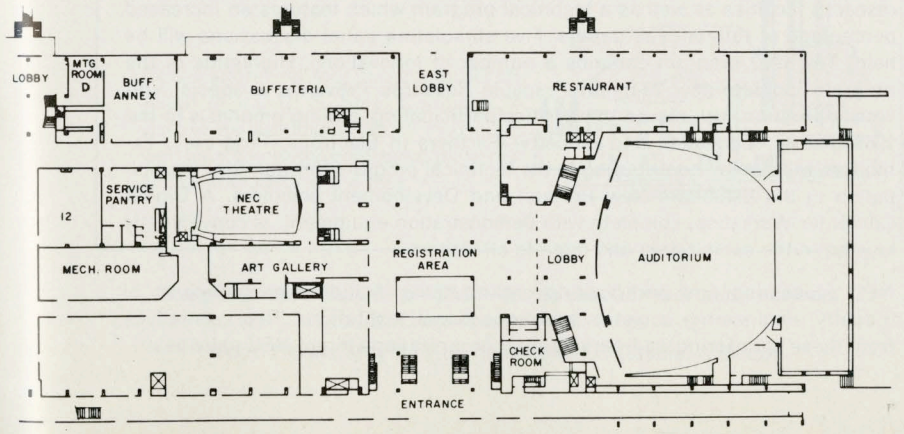
NEC

Floor Plans







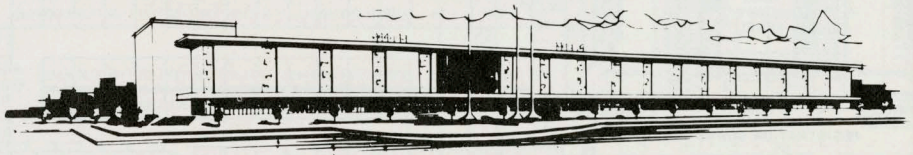


THE NEC STORY

"Education and Industry—Partners in Electronic Progress"

The National Electronics Conference, Inc., is a non-profit organization chartered in 1944 to advance the art and science of electronics and its application in the public interest. The 1962 NEC is the 18th consecutive annual meeting. In addition to serving as a national forum for the presentation of authoritative technical papers on electronic research, development and application, the annual Conference offers an opportunity for leading electronics firms to display their latest products.

Conference management has endeavored to obtain the finest exhibit facilities and has arranged a top-level program for 1962. The move of the National Electronics Conference technical program and exhibition to McCormick Place represents a milestone in NEC growth. McCormick Place, Chicago's magnificent new exposition center, will continue to be the site of future NEC exhibitions.



The three-day program includes visits to Chicago Area electronic and nuclear research facilities as well as a technical program which features an increased percentage of tutorial-type papers. Five stimulating panel discussions will be held. The 1962 program contains a number of innovations. Highlights of the program include: new 10-minute capsule Research Previews; a special university program with eleven universities participating, adding emphasis to the 1962 theme, "Education and Industry—Partners in Electronic Progress". Exhibitors will also be contributing to the technical program through their participation in the Exhibitors New Product and Development seminars. A Digital Computer Workshop, complete with demonstration equipment, is conveniently located in the exhibit area and open to all visitors.

NEC sponsoring and participating organizations include representatives of industry, engineering societies and educational institutions. Representatives from these sponsoring and participating organizations direct NEC activities.

Tours and Field Trips

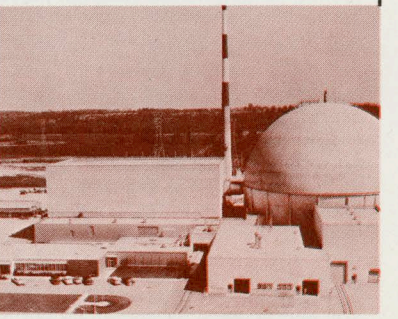
The U. S. Navy has made available the **USS Worland** Patrol Craft Escort for tour by NEC visitors. The USS Worland is available for tour during the full Conference period and is docked opposite the main patio at McCormick Place. Commanding Officer, Lt. W. A. Leird, Prospective Officer, Lt. L. A. Penny. NEC acknowledges the cooperation of the Ninth U. S. Naval District Commandant, Rear Admiral Ira H. Nunn.

Field Trip

Tuesday, October 9th, Dresden Power Plant

Bus leaves McCormick Place at 1:15 PM

NEC visitors will have an opportunity to view the facilities of the Dresden Power Plant. One of the latest nuclear power producing stations, the Dresden Plant has been recently completed and includes the latest instrumentation and control equipment.

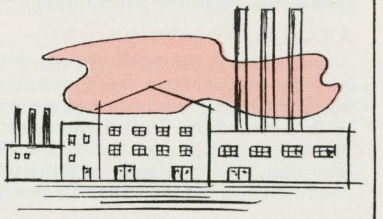


Field Trip

Wednesday, October 10th, U. S. Steel Company

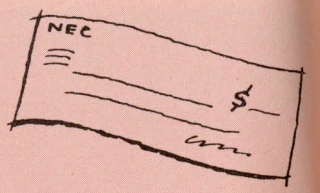
Bus leaves McCormick Place at 1:15 PM

NEC visitors will tour the computer division of the U. S. Steel Company. A visit to an automated stock house, as well as a computer controlled plate mill will be included in the tour.



Charge for each Field Trip—$1.00—No private transportation allowed.
U. S. Citizens only on all tours.
Tour Tickets May Be Purchased at NEC Cashier's Booth

Activities and Awards



ANNUAL AWARDS

Each year NEC honors two authors of outstanding papers who participated in the program of the preceding year. A check for $500.00 is presented to the author of the best original paper and a check for $500.00 is also presented to the author of the best tutorial paper. Both awards will be presented at the Wednesday luncheon, October 10th.

AWARD OF MERIT

From time to time the National Electronics Conference honors the author of a particularly influential paper given at any prior Conference, by presenting to him the NEC Award of Merit. Accompanying the award is a check for $750.00.

FELLOWSHIP AWARD

Each year NEC awards a fellowship in electronics for advanced study at any one of the eleven universities participating in the Conference. The Fellowship, worth $3,000, for 1962-63 has been awarded on the basis of national competition to Mr. William H. Harman of Philadelphia, Pennsylvania. Mr. Harman, a graduate of the University of Delaware, is completing his studies at the University of Michigan. Dr. P. E. Mast, Fellowship Committee Chairman, will introduce Mr. Harman at the Wednesday luncheon.

EXHIBITOR AWARD

The Board of Directors of the National Electronics Conference, in recognition and appreciation for continued participation as an exhibitor in the Conference, will present a plaque to those exhibitors who have displayed their products at NEC for 15 years. The presentation will be made to 15-year exhibitors at the Exhibitors Coffee Hour to be held in the Chicago Room at McCormick Place on Tuesday, October 9, at 9:00 A.M. Mr. Virgil H. Disney, NEC Chairman of the Board, will make the presentation.

ANNUAL PROCEEDINGS

A convenient permanent record of the technical papers presented at the 18th NEC are available at the Proceedings Booth in the Registration area. Engineers attending the technical sessions are urged to purchase the Proceedings so they may follow the author's presentation. Proceedings of the NEC, Volume 18, may be purchased during the Conference at a price of $5.00 each, or at a later date for the regular postage-paid price of $6.00 each. Purchase your Proceedings ticket at the cashier's desk in the Sherman House or McCormick Place.

STUDENT PROGRAM

This is the seventh year of student activities at the NEC. The 1962 student program has been expanded to include high school as well as university engineering students and their instructors. Engineering students will have an opportunity to attend interesting lectures and demonstrations. NEC believes that this practical introduction to a professional technical conference, the first such experience for many students, will heighten their interest in professional activities. All student meetings will be held in meeting room 11.

ACKNOWLEDGEMENT

The National Electronics Conference is grateful for the assistance it has received from the AIEE Technical Committees and IRE Professional Groups in the formulation of the 1962 program. The cooperation and assistance received from SAMA, Chicago Area Radio Council, U. S. Navy and other technical societies and industry organizations is also greatly valued.

SAMA Meeting—Scientific Apparatus Manufacturers Association: The SAMA Industrial Instrument Section will hold a panel discussion entitled, "The Consultant's Role in Research and Development," at McCormick Place, Meeting Room C, on Monday, October 8th. Mr. Douglas C. Strain will act as moderator with Mr. John R. Kirkpatrick, Arthur D. Little, Inc.; Mr. William D. McGuigan, Stanford Research Institute; Dr. Donald B. Sinclair, General Radio Company and Dr. Otto J. M. Smith, University of California, participating. A SAMA dinner and reception will follow.

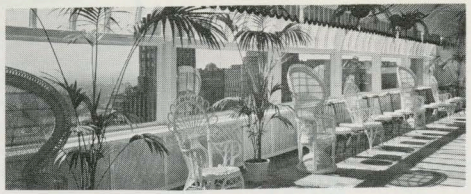
IRE Meetings—IRE Committee Meetings, scheduled to be held in the **Sherman House** are: IRE Professional Group on Reliability and Quality Control on Sunday evening, October 7th; IRE Administrative Committee Professional Group on Circuit Theory meeting on Monday morning, October 8th, IRE Region Five Education Committee meeting on Tuesday afternoon, October 9th; IRE Region 4 Committee meeting on Tuesday afternoon, October 9th. IRE Committee Meetings, scheduled to be held at **McCormick Place** are: IRE Professional Group on Education meeting on Monday morning, October 8th, IRE/AIEE Midwest Section meeting on Monday evening, October 8th; IRE National Administrative Committee of Professional Group on Military Electronics meeting on Tuesday afternoon, October 9th.

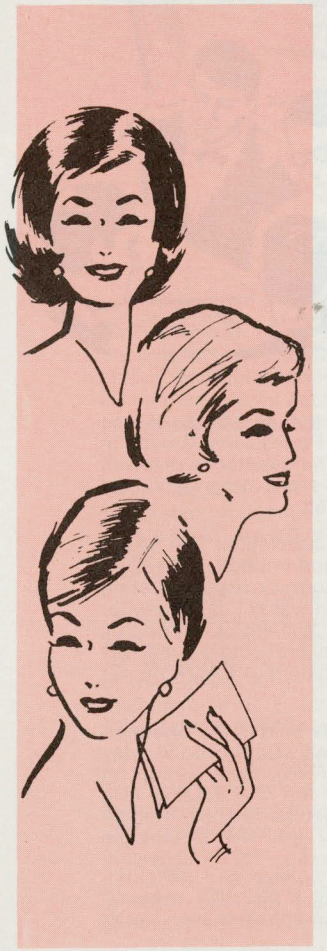
AIEE Meeting—The American Institute of Electrical Engineers (AIEE) is conducting its Fall General Meeting at the Pick-Congress Hotel. NEC registrants may register for the AIEE Fall General Meeting by the payment of the highest single fee which would apply. This can be done at the NEC or AIEE. AIEE registration fees are $6.00 for members and $10.00 for non-members. Payment of AIEE registration includes NEC registration. NEC registration will be credited as $3.00 part payment on subsequent AIEE registration.

Electronic Representatives Association—ERA will conduct its Manufacturers-Representative Workshop—"Forecasting Sales—Setting Quotas"—at McCormick Place on Tuesday morning, October 9th.

Eta Kappa Nu—The Eta Kappa Nu, an electrical engineering honor society, will be a participant in the luncheon on Wednesday, October 10th. Eta Kappa Nu will introduce at this time, Dr. Jerome B. Wiesner, Special Assistant to President Kennedy, as an "Eminent Member."

Ladies' Activities





Registration for all Ladies Events will be done at NEC Ladies Headquarters "House-on-the-Roof", Hotel Sherman. Registration will be $2 per day, including all expenses for the day's program. Ladies will be the guests of NEC for most activities. Registration by individual days permitted. Ladies are urged to check Ladies Headquarters in advance to confirm points of departure for the individual events on the Ladies Program.

Monday, October 8

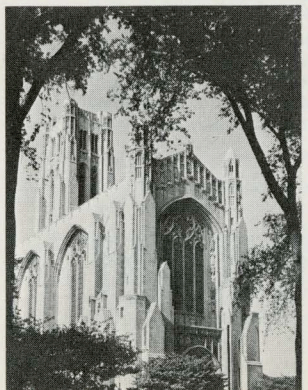
9:00 AM	Registration and Continental Breakfast, House on the Roof, Hotel Sherman.
11:30 AM	Board bus at LaSalle Street entrance of Hotel Sherman.
12:30 PM	Lunch in Chicago Room at McCormick Place (Governor Kerner of Illinois will speak).
2:20 PM	Board bus.
2:45 PM	Tour of various Houseware and Furniture Showrooms in the Merchandise Mart.
4:00 PM	Board bus for return to the Hotel Sherman.

Tuesday, October 9

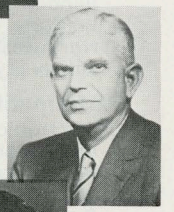
9:00 AM	Continental Breakfast, House on the Roof, Hotel Sherman.
10:00 AM	Board bus at LaSalle Street entrance of Hotel Sherman.
10:45 AM	Tour of Hinsdale Health Museum.
12:15 PM	Board bus.
12:30 PM	Lunch at Henrici's at Oak Brook. Shop at fabulous new Oak Brook Shopping Center.
3:00 PM	Board bus.
4:00 PM	Arrive at Hotel Sherman.

Wednesday, October 10

9:00 AM	Continental Breakfast, House on the Roof, Hotel Sherman.
10:00 AM	Board bus at LaSalle Street entrance of Hotel Sherman.
10:30 AM	Tour of University of Chicago points of interest.
12:00 Noon	Board bus.
12:30 PM	Lunch at the Empire Room of the Palmer House.
2:00 PM	Return to Hotel Sherman.



Social Activities



Luncheons

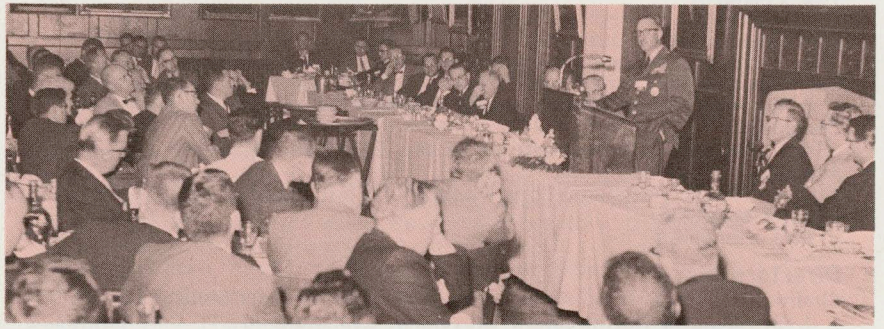
Each day a Conference luncheon will be held in the beautiful Chicago Room of McCormick Place. The Chicago Room is adjacent to the technical sessions meeting rooms, making it convenient for visitors to attend the luncheons. Nationally recognized speakers will discuss topics of major interest. The speakers are:

Monday: The Honorable Otto Kerner
Governor of Illinois

Tuesday: Henry T. Heald
President of Ford Foundation

Wednesday: Dr. Jerome B. Weisner
Special Assistant to President Kennedy

Tickets may be purchased at the NEC Cashier's Booth



NEC Industry Cocktail Party

Exhibitors, visitors and guests will be enjoying themselves and exchanging ideas at the NEC Industry Cocktail Party 5:45 PM in the Banquet Hall at McCormick Place on Monday evening, October 8th. Be sure to purchase your tickets early.

National Electronics Conference AIEE/IRE Midwest Section Gathering

The National Electronics Conference AIEE/IRE Midwest Sections Committee will have a group dinner on Monday evening at the McCormick Place Buffeteria, immediately following the NEC Industry Cocktail Party. Dinner tickets may be purchased at the NEC Cashier's Booth ($3.00). All AIEE/IRE members welcome. Following the dinner, members will adjourn and gather in the Little Theater.

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ADC Products, a Division of Maanetic Controls	146-150
Aemco, Division of Telex, Inc., Mankato, Minn.	701
Aerovox Corporation	536
Air Control, Inc., Narberth, Pa.	1027
Alford Manufacturing Co., Boston, Mass.	9 & 10
Allen-Bradley Co., Chicago, Ill.	1 & 2
Allied Electronics Corporation, Chicago, Ill.	516 & 520
Alpha Wire Corporation, New York, N. Y.	529
Alphaloy Corporation, Division of Alpha Metals, Inc., Chicago, Ill.	436
American Electronics Laboratories, Inc.	601-605
American Elite (Telefunken)	415
American Institute of Electrical Engineers, New York, N. Y.	1235
American Optical Co., Buffalo, N. Y.	704
AMP Incorporated, Harrisburg, Pa.	509
Amperex Electronic Corporation, Hicksville, N. Y.	708
Amphenol-Borg Electronics Corp., Broadview, Ill.	130, 134
Anadex Instruments, Inc.	706
Analab Instrument Corporation, Cedar Grove, N. J.	802
Jay C. Angel & Co., Chicago, Ill.	146-150
Angelica Uniform Company, St. Louis, Mo.	622
Applied Dynamics, Inc., Ann Arbor, Mich.	231
Argonne National Laboratory, Lemont, Ill.	Special Display
Armstrong Resins, Inc., Warsaw, Ind.	156
Artos Engineering Co., Milwaukee, Wis.	226
Assembly Products, Inc., Chesterland, Ohio	627
Associated American Winding Machinery, Inc., New York, N. Y.	320
Astro Electronics, Inc.	601 & 605
Astrodata, Inc., Anaheim, Calif.	908
Atlee Corporation	536
Augat, Inc.	131
Automatic Electric Sales Corp., Northlake, Ill.	525
Autotron, Inc.	601 & 605
Avnet Electronics Corp., Westbury, L. I., N. Y.	728 & 730
B & K Instruments, Inc., Cleveland Ohio	804
Babcock Relays, Inc.	333
Baird-Atomic, Inc., Cambridge, Mass.	327
Baldwin-Lima-Hamilton Corp., (Electronic & Instrumentation Division)	418 & 420
Balhorn & Welch, Inc., Chicago, Ill.	1216
Ballantine Laboratories, Inc., Boonton, N. J.	718
Ballastran, Division of Telex, Inc., Ft. Wayne, Ind.	701
Barber-Colman Co., Rockford, Ill.	121
Bard Associates, Inc., Riverside, Ill.	808
The Bead Chain Mfg. Co., Bridgeport, Conn.	109
Beckman Instruments, Inc., Offner Division, Schiller Park, Ill.	306
Belden Mfg. Co., Chicago, Ill.	323
Bell, Inc., F. W., Columbus, Ohio	607
The Bendix Company, South Bend, Ind.	1100, 1104, 1108
Bendix Semiconductor Division	1100, 1104, 1108
Berkeley Division of Beckman Instruments, Inc., Richmond, Calif.	900
Bird Electronic Corp., Cleveland (Solon), Ohio	524
Blue M Electric Co., Blue Island, Ill.	1115
Boesch Manufacturing Division of Waltham Precision Instrument Co., Danbury, Conn.	1035
Boonton Electronics Corp.	6
Boonton Radio Corporation, Boonton, N. J.	421
Boston Insulated Wire & Cable Co.	210
Bourns, Inc., Riverside, California	218
Bowmar Instrument Corp., Fort Wayne, Ind.	826
Brady Co., W. H., Milwaukee, Wis.	11 & 12
Brand-Rex Division of American Enka Corp., Concord, Mass.	1221
Branson Corp., Whippany, N. J.	925
H. Braun Tool & Instrument Co., Hawthorne, N. J.	438
The Bristol Co., Waterbury, Conn.	623
Buchanon Electrical Products Corp., Hillside, N. J.	172
Buckbee Mears Company, St. Paul, Minn.	158
Burndy Corporation, Norwalk, Conn.	626 & 628
Burroughs Corporation, Plainfield, N. J.	720
Bytrex Corporation	901 & 905
Calibration Standards Corp.	706
Cambridge Thermionic Corp., Cambridge, Mass.	162
Canada, Department of Trade & Commerce, Ottawa, Ont., Canada	1130
Cannon Electric Co., Los Angeles, Calif.	322
The Capitol Machine & Switch Co., Danbury, Conn.	140
Carlson Electronic Sales, Chicago, Ill.	333
Carpenter Mfg. Co., Inc., De Witt, N. Y.	1029
Central Scientific Company, Chicago, Ill.	236
Centralab, The Electronics Division of Glove-Union, Inc., Milwaukee, Wisc.	407
Chart-Pak, Inc., Leeds, Mass.	1224 & 1226
Chassis Trak, Inc.	131
Chester Cable Corp.	131
Chicago Area Radio Council, Inc., Chicago, Ill.	21
Cinch Manufacturing Co., Chicago, Ill.	931
Clare & Company, C. P., Chicago, Ill.	400
Clare Ceramics Inc., Cary, Ill.	1247
Cleveland Institute of Electronics, Cleveland, Ohio	318
Cognitronics Company	706
Coil Winding Equipment Co., Oyster Bay, N. Y.	528 & 532
Coleman Machine Company, Inc., Berkeley Heights, N. J.	168
Collins Radio Company, Components Division, Newport Beach, Calif.	227
Columbus Electronics Corporation	608 & 610
Commercial Plastics Company, Chicago, Ill.	142
Communications Measurements Laboratory, Inc.	601 & 605
Compo Shoe Machinery Corporation, Special Products Div., Waltham, Mass.	818
Computer Control Co., Framingham, Mass.	710
Computer Engineering Associates	601 & 605
Computer-Measurements Co., San Fernando, Calif.	114 & 116
Con-Elco Division, Edcliff Instruments	333
Conforming Matrix Corporation, Toledo, Ohio	531
Consolidated Avionics Corp.	415
Control Data Corporation, Minneapolis, Minn.	429, 431, 433
Cool-Fin Electronics Corp., South El Monte, Calif.	208
Corning Glass Works, Bradford, Pa.	731
Crossley Associates, Inc., Chicago, Ill.	418 & 420
Cubic Corporation, San Diego, Calif.	806

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Data Instruments Division, Telecomputing Corp.	601 & 605
Datapulse, Incorporated, Inglewood, Calif.	914
Davenport Mfg. Division, Duncan Electric Co., Chicago, Ill.	522
Daystrom, Inc., Weston Instrument Division, Newark, N. J.	330
Delco Radio Division, General Motors Corporation, Kokomo, Ind.	1129 & 1131
Delta Design, Inc., La Mesa, Calif.	911
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Russ Diethert Company, Inc., Chicago, Ill.	430
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Digitronics Corporation	706
Dilectric Corporation	430
Division of Nebraska Resources, Lincoln, Nebr.	24
Dodge Fibres Corp., Hoosick Falls, N. Y.	316
Drake Manufacturing Co., Chicago, Ill.	927
Dressen-Barnes Electronics Corp., Pasadena, Calif.	705
Dresser Electronics, H. S. T. Division	131
Du-Co Ceramics Co.	621
Allen B. DuMont Laboratories, Div. Fairchild Camera & Instrument Corp., Clifton, N. J.	1200
E. I. duPont deNemours & Co., Inc., Wilmington, Del.	401
Duramark, Inc.	621
Dymec, Division of Hewlett-Packard Co.	418 & 420
Dynamic Gear Co., Inc.	621
Dynamic Measurements, Inc.	415
Dynacsan Corporation, Chicago, Ill.	923
Dzus Fastener Co., Inc., West Islip, N. Y.	1125 & 1127
EEM—Electronic Engineers Master (United Catalog Publishers, Inc), Hempstead, N. Y.	1006
E-H Research Laboratories, Inc., Oakland, Calif.	126
ETC, Incorporated, Cleveland, Ohio	105
EMI/US	8
Eby Company, Hugh H., Philadelphia, Pa.	1110
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Elastic Stop Nut Corp. of America, Union, N. J.	13
ELCO Corporation, Philadelphia, Pa.	1014
Electra Manufacturing Co., Kansas City, Mo.	1008
Electric Regulator Corporation	210
Electro Devices, Inc., Newton, Mass.	160
Electro Instruments, Inc., San Diego, Calif.	425
Electro-Mechanical Instrument Co.	210
Electro Products Laboratories	418 & 420
Electro Scientific Industries, Inc., Portland, Ore.	1004
Electro-Seal Corporation, Des Plaines, Ill.	1121
Electronic Associates, Inc., Long Branch, N. J.	827
Electronic Enclosures, Inc., Los Angeles, Calif.	211
Electronic Engineering Co.	601 & 605
Electronic Industries Assn. of Japan, New York, N. Y.	1225
Electronic Measurements Co., Inc.	601 & 605
Electronic News, New York, N. Y.	435
Electronic Representatives Assn., Chicago, Ill.	20
ELIN Division, International Electronic Research Corp.	612
Ellinger Sales Corp., Chicago, Ill.	536
Emerson & Cuming, Inc., Canton, Mass.	811
Empire Devices, Inc.	601 & 605
Encyclopaedia Britannica, Chicago, Ill.	1233
Engineered Electronics Co., Santa Ana, Calif.	311
Karl D. Engle Co., Inc., Chicago, Ill.	621
The Eraser Company, Syracuse, N. Y.	822
ESC Electronics Corporation	333
Esterline Angus Instrument Co., Inc., Indianapolis, Ind.	328
Eubanks Engineering Company, Pasadena, Calif.	1033
Exact Electronics	808
F & M Scientific Corporation, Avondale, Pa.	166
Fairchild Semiconductor, Mountain View, Calif.	1204
Fansteel Metallurgical Corp., North Chicago, Ill.	700
Ferranti Electric Inc., Plainview, L. I., N. Y.	201
Florida Development Commission, Tallahassee, Fla.	184, 186, 190
John Fluke Mfg. Co., Inc., Seattle, Wash.	815
Forbes & Wagner	111
Formulabs Industrial Inks, Inc., Escondido, Calif.	1031
Fostoria Corporation	415
Frenchtown Porcelain Co.	430
Galaxy Laboratories, Inc.	808
General Electric Company, Syracuse, N. Y.	Special Display
General Electric Company, Capacitor Department, Hudson Falls, N. Y.	1201
Capacitor Department, Irmo, S. C.	1201
Specialty Control Department, Waynesboro, Va.	1205
General Purpose Control Department, Bloomington, Ill.	1211
Rectifier Components Department, Auburn, N. Y.	1213
Receiving Tube Dept., Owensboro, Ky.	1215
General Magnetic Corp., Detroit, Mich.	410
General Precision, Inc., Chicago, Ill.	23
General Radio Company, West Concord, Mass.	300 & 304
Genistron, Inc., Bensenville, Ill.	234
Gertsch Products, Inc., Los Angeles, Calif.	1017
Goe Engineering Co., Los Angeles, Calif.	534
GPL Division, General Precision, Inc., Pleasantville, N. Y.	1028
Grayhill, Inc., LaGrange, Ill.	326
Green Instrument Co., Inc., Cambridge, Mass.	619
Loren F. Green & Associates, Chicago, Ill.	706
Greyhound Van Lines, Inc., Chicago, Ill.	22
Gudebrod Bros. Silk Co., Inc., New York, N. Y.	538
Harry Halinton, Engineering Associates, Inc., Chicago, Ill.	715
Harman-Kardon, Inc.	920
Harowe Servo Control, Inc., West Chester, Pa.	918
Harper Electric Furnace Corp.	601 & 605
Harrison Laboratories, Inc.	418 & 420
The A. W. Haydon Company, Waterbury, Conn.	1101
The Heinn Company, Milwaukee, Wisc.	722
Helical Products Co., Inc.	621

EXHIBITORS LIST

EXHIBITOR	BOOTH NO.
Helipot Division, Beckman Instruments, Inc.	608 & 610
Heller Industries Inc., Orange, N. J.	1041
Hewlett-Packard Company, Palo Alto, Calif.	414
Hexacon Electric Company, Roselle Park, N. J.	820
Hi-G, Incorporated, Windsor Locks, Conn.	1219
The Hickok Electrical Instrument Co., Cleveland, Ohio	1024
Holt Instrument Laboratories, Oconto, Wisc.	907
Hopkins Engineering Co.	210
Hudson Tool & Die Co.	621
Huggins Laboratories, Inc., Sunnyvale, Calif.	813
Hughes Aircraft Company, Vacuum Tube Products Division	146 & 150
Hunter Sales Co., R. N., Santa Fe Springs, Calif.	821
Ideal Precision Meter Co.	536
IERC Div., International Electronic Research Corp.	612
Illinois Institute of Technology, Chicago, Ill.	135
Industrial Devices, Inc.	621
Industrial Electronic Engineers, Inc.	608 & 610
Industrial Test Equipment Co., New York, N. Y.	709
Ingersoll Products, Div. of Borg-Warner Corp., Chicago, Ill.	1003
Inland Motor Corp. of Virginia	333
The Institute of Radio Engineers, New York, N. Y.	1144
Instrument Development Labs	333
Instrument Specialties Co., Inc.	430
International Eastern Co., New York, N. Y.	235
International Electronic Research Corp., Burbank, Calif.	612
International Research & Development Corp., Worthington, Ohio	729
International Resistance Co.	601 & 605
International Telephone & Telegraph, Industrial Products Division, San Fernando, Calif.	814
ISOTRONICS, Inc.	621
Iowa State University, Ames, Iowa	242
JFD Electronics Corporation, Brooklyn, N. Y.	823
Jacobson Nut Mfg. Corp.	621
James Electronics, Inc., Chicago, Ill.	408
Japan Electronic Manufacturers Agency, Chicago, Ill.	103
Jerrold Electronics Corporation, Philadelphia, Pa.	802
Jettron Products, Inc. Hanover, N. J.	1112
Jiffy Manufacturing Company, Hillside, N. J.	221
Jonathan Mfg. Co., Fullerton, Calif.	1222
Johnson Co., E. F.	536
Johnson & Co., K. W.	415
Judson Bigelow, Inc.	608 & 610
Julie Research Laboratories, Inc.	415
Kay Electric Company, Pine Brook, N. J.	711
Keithley Instruments, Inc., Cleveland, Ohio	101
KEPCO, Inc., Flushing, N. Y.	714
Kester Solder Co., Chicago, Ill.	540
Key Resistor Corp.	210
Kin-Tel	1021 & 1023
The James Knights Company, Sandwich, Ill.	214
Kressilk Products, Inc., New York, N. Y.	1228
Kroch's & Brentano's, Chicago, Ill.	1123
Krohn-Hite Corporation, Cambridge, Mass.	1007
Ringland M. Krueger Co., Inc., Chicago, Ill.	131
Larson Instrument Company, Orangeburg, N. Y.	1113
Lavoie Laboratories, Inc.	601 & 605
Lebow Associates, Inc.	118, 120, 122
Leesona Corporation, Warwick, R. I.	334
Lenz Electric Manufacturing Co., Chicago, Ill.	413
Ling Electronics	1021 & 1023
Litton Industries, Inc., Beverly Hills, Calif.	1208-1212
Lumen, subsidiary of Telex, Inc., Joliet, Ill.	701
Luxo Lamp Corporation, Port Chester, N. Y.	178
MM Electronic Enclosures, Inc., Hicksville, N. Y.	721
Macdonald & Company, Glendale, Calif.	729
MacLean-Fogg Lock Nut Co., Chicago, Ill.	125
Magnecraft Electric Co., Chicago, Ill.	809
Magnetic Metals Company, Camden, N. J.	321
Magnetic Shield Division of Perfection Mica Company, Chicago, Ill.	519
Magnetics, Inc.	210
Magnuson Associates, Chicago, Ill.	608 & 610
Magnuson Electronics, Inc.	608 & 610
Malco Manufacturing Company, Chicago, Ill.	319
Mallory & Co., Inc., P. R., Indianapolis, Ind.	1034 & 1036
Marconi Instruments	4
Marsland & Co., Inc., Hugh, Chicago, Ill.	1021 & 1023
Marquette University, Milwaukee, Wisc.	244
Massa Division	1021 & 1023
Mast Development Co., Davenport, Iowa	176
Mauer Co., Inc., W. J., Evanston, Ill.	415
Maurey Instrument Corp., Chicago, Ill.	1030
Measurements, A McGraw Edison Div., Boonton, N. J.	515
Mechanical Products, Inc., Jackson, Mich.	1230
Mepco, Inc., Morristown, N. J.	606
Merquip Electronics, Inc., Chicago, Ill.	1001
Metex Electronics, Inc.	601 & 605
Methode Electronics, Inc., Chicago, Ill.	926
Metronix, Chesterland, Ohio	119
Meyers Co., Kenneth W., Chicago, Ill.	4, 5, 6, 7 & 8
Michigan State University, East Lansing, Mich.	246
Micon Electronics, Inc.	601 & 605
Micro State Electronics Corp., Murray Hill, N. J.	819
Microdot-Larco Division	333
Microdyne, Inc.	415
Microtan, Inc., Valley Stream, N. Y.	204
Mid-Eastern Electronics Corp.	6
Midland Engineering & Machine Co., Chicago, Ill.	1120
Midwestern Instruments, subsidiary of Telex, Inc., Tulsa, Okla.	701
Millivac Instruments, Inc., Schenectady, N. Y.	707
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.	1214
Mitronics, Inc.	621
Monroe Calculating Machine Co., Beverly Hills, Calif.	1208-1212
Moseley Co., F. L., Pasadena, Calif.	422 & 424
Motorola Semiconductor Products, Phoenix, Ariz.	1020
Moxness Products, Inc.	430
Murata Mfg. Co., Ltd., Kyoto, Japan	1223
NJE Corporation, Kenilworth, N. J.	906
National Connector Corp., Minneapolis, Minn.	209
National Union Electric Co.	5

EXHIBITORS LIST

EXHIBITOR	BOOTH NO.
New Hermes Engraving Machine Co., New York, N. Y.	412
Niemand Bros., Inc.	621
Nifel, Inc., Nickel Cadmium Battery Division	210
Nippon Electric Co., Ltd., Tokyo, Japan	517
Non-Linear Systems, Inc., Chicago, Ill.	308
North Atlantic Industries	333
Northwestern University, Evanston, Ill.	248
Ohmite Manufacturing Company, Skokie, Ill.	312
Pacific Electro Magnetic Co., Inc., Palo Alto, Calif.	909
Packard Bell Computer Corp., Los Angeles, Calif.	124
Palo Alto Engineering Co.	418 & 420
Panduit Corporation, Tinley Park, Ill.	625
Panoramic Electronics, Inc., Mount Vernon, N. Y.	800
Penta Laboratories, Inc., Santa Barbara, Calif.	816
Philbrick Researches, Inc., George A., Boston, Mass.	1013
PIC Design Corporation, East Rockaway, N. Y.	220
Pivan Engineering Company, Chicago, Ill.	118, 120, 122
Planet Instrument, Inc.	608 & 610
Plastic Capacitors, Inc., Chicago, Ill.	1016
Podgor Co., Inc., Joseph E., Masterscreen Printing Equipment Corp. Div., Philadelphia, Pa.	921
Polarad Electronics Corp.	706
Potter & Brumfield, Inc.	1216
The Potter Company, Skokie, Ill.	725
PRD Electronics, Inc.	8
Precision Electroplating Co., Chicago, Ill.	1045
Precision Instrument Co.	118, 120, 122
Prentice-Hall, Inc., Englewood Cliffs, N. J.	230
Preview Publications, Inc. Elmhurst, Ill.	1043
Price Electric Corporation, Frederick, Md.	405
Pryor Marking Products, Chicago, Ill.	1218
Purdue University, Lafayette, Ind.	137
The Pyle-National Company, Chicago, Ill.	620
Pyrofilm Resistor Co., Inc., Parsippany, N. J.	535
Quan-Tech Laboratories, Inc., Boonton, N. J.	810
RCA Electron Tube Division, Harrison, N. J.	928
Radio Distributing Co., Inc., South Bend, Ind.	113
Radio Frequency Laboratories, Inc., Boonton, N. J.	1009 & 1011
The Rauland Corporation, Chicago, Ill.	1032
Rayclad Tubes, Inc.	430
Raytheon Company, Microwave & Power Tube Division, Waltham, Mass.	100
Raytheon Company, Industrial Components Division, Newton, Mass.	104
Raytheon Company, Semiconductor Division, Lowell, Mass.	106
Red Bank Division of The Bendix Corporation	1100-1108
Reeves-Hoffman Division, Dynamics Corp. of America, Carlisle, Pa.	609
Reeves Instrument Corp., Garden City, N. Y.	611
Research, Inc.	415
Rheem Electronics Division	5
Richco Plastic Co., Chicago, Ill.	136
Ridgway Associates, Inc., Chicago, Ill.	901 & 905
Rixon Electronics, Inc., Silver Spring, Md.	726
Rockbestor Wire & Cable Co., Division of Cerro Corporation, New Haven, Conn.	205
Rohde & Schwarz, Passaic, N. J.	223
Ross Company, The Milton, Southampton, Pa.	719
Rotek Instrument Co.	118, 120 & 122
Rotron Manufacturing Company, Inc., Woodstock, N. Y.	215
Rowan Controller Co., Red Bank, N. J.	154
Ryan & Associates, Chicago, Ill.	111
San Fernando Electric Mfg. Co., San Fernando, Calif.	411
Sanborn Company, Waltham, Mass.	419
Sanders Associates	333
Sangamo Electric Co., Springfield, Ill.	915
Santini Bros., Inc., Franklin Park, Ill.	1220
Sarkes Tarzian, Inc., Bloomington, Ind.	824
Schwarzer Corporation, Framingham, Mass.	1231
Scintilla Division of The Bendix Corporation	1100, 1104, 1108
Seal-A-Matic Corporation	430
Sealectro Corporation	430
Semiconductor Specialists, Inc., Chicago, Ill.	929
Sensitive Research Instrument Corp., New Rochelle, N. Y.	406
Servomechanisms, Inc., Mechatrol Div., Westbury, L. I., N. Y.	1109
Shallcross Manufacturing Company, Selma, N. C.	152
Sherold Crystals, Inc., Kansas City, Mo.	1018
Shizuki Electric Works Co., Ltd., Tokyo, Japan	1227
The Sibley Company, Haddam, Conn.	164
Siemens New York, Inc., New York, N. Y.	1000
Sierra Electronic Corp.	118, 120, 122
Sigma Instruments, Inc.—Sigma Div., South Braintree, Mass.	521
Simpson Electric Company, Chicago, Ill.	616
Sippican Corporation	601 & 605
Skydyne, Inc., Port Jervis, N. Y.	615
Slaughter Company, Piqua, Ohio	174
Sola Electric Company, Elk Grove Village, Ill.	512
Solid State Products, Inc., Salem, Mass.	404
Sorenson, A Unit of Raytheon, South Norwalk, Conn.	110-112
Spaceonics, Inc., and Portable Electric Tools, Inc., (Motor and Electronics Division), Scarsdale, N. Y.	1114
Spectrol Electronics Corporation, San Gabriel, Calif.	219
Sperry Microwave Electronics Co., Div. of Sperry Rand Corporation, Clearwater, Fla.	913
Sprague Electric Company, North Adams, Mass.	500, 504, 506, 508
Standard Electronics Company, Chicago, Ill.	1117
Standard Rectifier Corporation	210
Steel Heddle Mfg. Co.	430
Stemm, Inc., R. Edward, Chicago, Ill.	601 & 605
Stevens-Evans, Inc., San Diego, Calif.	912
Stevens Mfg. Co., Inc., Geo., Chicago, Ill.	1037
Stevens Mfg. Co., Inc., Mansfield, Ohio	243
Struckhoff Eng. & Sales Co.	621
Struthers-Dunn, Inc., Pitman, N. J.	1118
Sun Electric Company, Chicago, Ill.	417
The Superior Electric Company, Bristol, Conn.	501, 505, 507
Switchcraft, Inc., Chicago, Ill.	533
Sylvania Electronic Products, Inc., Electronic Tube Division, New York, N. Y.	206

EXHIBITORS LIST

NEC EXHIBITORS

SPECIAL DISPLAYS

A number of Special Displays have been included in the 1962 NEC exhibits. The two displays listed below are located in the Special Display Area indicated on the floor plan.

ARGONNE NAT'L LAB.
Electronics Division
9700 S. Cass Avenue
Argonne, Ill.

Information Displays.

A. Radio Activity in Atmosphere
B. Instrumentation for Pulse-Height Analysis
C. Instrumentation Used in Basic Research

In Attendance:

Thams W. Hoffer, Acting Exhibits Manager
Richard B. Keener, Associate Physicist
Edward W. Johanson, Assistant Electrical Engineer
Joseph R. Haumann, Assistant Electrical Engineer

GENERAL ELECTRIC CO.
Bldg. #3—227 Electronics Park
Syracuse, New York

Applied Research and Advanced Development for Product Departments of the General Electric Company.

In Attendance:

Ralph Weisberg, Specialist-Public Information

NEC EXHIBITORS

Booths 1 & 2

ALLEN-BRADLEY COMPANY
136 West Greenfield Ave.
Milwaukee 4, Wis.

Products:

Fixed and Variable Hot Molded Composition Resistors
Sealed and Precision Grid (Film) Resistors
Multiplexers
Ferrites & Ceramic Magnets
Industrial Motor Control
Reed Relays & Switching Systems
Filters & Capacitors

In Attendance:

D. Fitzpatrick, Asst. Sales Manager
R. Wessling, District Sales Manager
D. Anderson, Sales Engineer
D. S. W. Kelly, Chief Engineer
G. W. Vater, Sales Manager
E. E. Liban, Application Engineer
P. Leow, Application Engineer
D. Bugalski, Application Engineer
R. Schmidt, Sales Engineer
E. Ragatz, Technical Director
L. Matthias, Vice President—Research
A. Pfister, Project Engineer
H. Zabel, Project Engineer
B. Tellkamp, Project Engineer
H. Schlicke, Manager—High Frequency Lab.

Booths 4, 5, 6, 7 & 8

KENNETH W. MEYERS CO.
6713 N. Oliphant Ave.
Chicago 31, Ill.

Products:

Manufacturers Representatives for:
Marconi Instruments—Sig. Generators, Q-Meter, LC & R Bridges
Rheem Electronics Div.—Photocell Punched-Tape Readers
National Union Electric Co.—Special Purpose Electron Tubes
Boonton Electronics Corp.—RF Voltmeters, L & C Bridges
Mid-Eastern Electronics Corp.—Power Supplies, Hi Resis. Bridges
Kenneth W. Meyers Co.—Test Equipment, Power Supplies, Microwave Instruments
EMI/US—Microwave Tubes
PRD Electronics, Inc.—Complete Microwave Test Equipment

In Attendance:

K. W. Meyers Co.—K. W. Meyers, W. G. Shuppert, John S. Powers
Marconi Instruments—Keith Elkins, Sales Mgr, Bill Buck, Mgr.
Rheem Electronics—W. G. Floyd, Sales Mgr.
National Union—Earl Ewald, Mgr.
PRD Electronics, Inc.—Harry Nelson, Sales Mgr.
Mid-Eastern Electronics, Inc.—L. C. Oakley, Pres.
Boonton Electronics Corp.—John Garthwaite, Sales Mgr.
EMI/US—Kipp Pritzlaff, Sales Mgr.

Booths 9 & 10

ALFORD MANUFACTURING COMPANY
299 Atlantic Avenue
Boston 10, Mass.

Products:

Slotted Lines, Coaxial Hybrids, Automatic SWR Meters, Automatic Impedance Plotters, RF Bridges, Terminations, Matching Networks, Reducers, Variable Attenuators, Line Stretchers and Dipoles.

In Attendance:

Harold H. Leach, Manager
Gerald Cohen, Engineer
Nelson Powers, Engineer

Booths 11 & 12

W. H. BRADY CO.
727 W. Glendale Ave.
Milwaukee 9, Wis.

Products:

Pressure-sensitive wire markers and component markers. Self-bonding name-plates of anodized aluminum and sub-surface printed and metalized Mylar*. Self-sticking tapes and shapes for printed circuit master layout. Tape Pen and automatic dispensing and application machinery. Narrow slit pressure-sensitive tape for charts, graphs, printed circuit layout. Nameplates of pressure-sensitive vinyl, plastic, cloth, paper, aluminum foil.
*TM DuPont

In Attendance:

W. H. Brady, Jr., President
T. W. Wise, Executive Vice President
F. C. Kluhsman, Sls. Prom. & Merch. Mgr.
P G. Vienot, Sales Mgr.
J. R. Poh, Sales Promotion
B. C. Koenitzer, Merch. Mgr. Specialty Products
W. J. Tuite, Sales Mgr.—Midwest District
R. A. Dame, Sales
J. F. Latek, Sales
N. D. Carpenter, Sales
W. S. Aldrich, Merch. Mgr.—Machinery Div.
R. D. Adams, Merch. Mgr.—Nameplate Div.

Booth 13

ELASTIC STOP NUT CORPORATION OF AMERICA
2330 Vauxhall Road
Union, N. J.

Products:

1. Elastic Stop nuts—A complete line of self-locking fasteners for the electronic and related industries covering temperature ranges from 65°F up to 1200°F.
2. Rollpin—A versatile pin type fastener, the Roll-pin is a slotted, chamfered, cylindrical spring pin which drives easily into a hole drilled to normal production standards.
3. The new NYQ, a one piece, nylon, Quick-Release panel fastener for industrial and avionic assemblies.
4. A complete line of self-locking Bearing Retainer hex nuts featuring extended reuse and positive one piece locking action.

In Attendance:

B. F. Linck, Director of Advertising
E. S. Holley, Asst. Sales Promotion Manager
D. E. Lally, Director of Marketing
J. M. Richards, District Manager
G. P. Stacy, Sales Engineer
R. W. Hayes, Sales Engineer
B. J. Swanstrom, Asst. Public Relations Manager.

Booth 20

ELECTRONIC REPRESENTATIVES ASSOC.
600 S. Michigan Ave.
Chicago 5, Ill.

Products:

National Trade Association with 23 Chapters who sponsor conferences, seminars, and other helpful activities. National Management Institutes, Trade Show Participation, industrial and public relations programs, part of long range planning to provide representative with the most modern sales and technical tools available. 900 member firms with 4500 employees.

In Attendance:

Robert J. Morgan, Executive Director
Mrs. Barbara Morgan
Mrs. Mary Bruen, Office Manager
Mr. Ray Hall, Administrator, ERA Ins. Trust
Mrs. Annie Hall
Mr. Al Buti, Buti-Roberts Advertising

Booth 21

CHICAGO AREA RADIO COUNCIL INC.
318 W. Adams St.
Chicago 6, Ill.

Products:

Representing 23 amateur radio clubs in the Chicago area. Station of the CARCC, W9TEM will be in operation. A 1909 Spark station will be on operational display, courtesy of Harry W. Houck, Head of Measurements, of Boonton, New Jersey.

In Attendance:

Jordan Kaplan W9QKE, President
Eve Cudia K9EMS, Exhibit Coordinator L.A.R.K. (Ladies Amateur Radio Klub)
Diane Price K9TRP (Ladies Amateur Radio Klub)
Roberta Kroulik K9IVB (Ladies Amateur Radio Klub)
Mary A. Koctur K9BWJ (Ladies Amateur Radio Klub)
Lynn Stedman K9IWR (Ladies Amateur Radio Klub)
Adeline Weiland W9LDK (Ladies Amateur Radio Klub)
Connie Kalinowski W9VON (Ladies Amateur Radio Klub)

Booth 22

GREYHOUND VAN LINES, INC.
57 West Grand Ave.
Chicago 10, Ill.

Products:

Specialized Transportation, Storage and Packaging of Electronic Equipment, Components, Displays and Household Goods.

In Attendance:

R. J. Burwell, Vice President
J. Waspi, Director of Marketing & Research
J. C. Daehling, Director of Transportation
Edwin Snider, Chicago Sales Manager
Tom O'Brien, National Account Executive
Anthony Molinari, Moving Counselor
Edward Bucinski, Moving Counselor
William Harrison, Moving Counselor
Phillip Martin, Moving Counselor
Oscar Wanner, Moving Counselor

Booth 23

GENERAL PRECISION, INC.
530 N. Lake Shore Drive
Chicago 11, Ill.

Products:

Digital Computer demonstration equipment.

In Attendance:

David T. Herrman, Jr., Technical Operations Manager
Patricia F. Theisen, Computer Programmer
Eilen Sweeney, Computer Operator
John F. Mulder, Computer Analyst
Lawrence E. Taylor, Computer Programmer
Z. H. Wagner, Computer Analyst
Frank S. Piedad, Field Engineering Specialist
Douglas Aden, Field Service Engineer

Booth 24

NEBRASKA RESOURCES
State Capitol, Room 1305
Lincoln, Nebraska

Products:

State Industrial Development Agency

In Attendance:

David Osterhout, Chief
James W. Monroe, Assistant Chief
David K. Peterson, Field Representative

Booth 100

RAYTHEON COMPANY
Microwave & Power Tube Division
Foundry Avenue
Waltham 54, Mass.

Products:

Complete line of backward wave oscillators, klystrons, amplitrons, isolators, and IR detectors, and Laser.

In Attendance:

P. Derby, Marketing Manager
A. Vacaro, Field Sales Manager
W. Widugiris, Regional Sales Engineer

Booth 101

KEITHLEY INSTRUMENTS, INC.
12415 Euclid Ave.
Cleveland 6, Ohio

Products:

Developers and manufacturers of precise electronic instruments: electrometers, micromicroammeters, microvoltmeters, instrumentation amplifiers, high voltage supplies, megohmmeters, milliohmmeters, megohm bridges.

In Attendance:

John A. Yeager, Senior Project Engineer
Thomas Brick, Marketing Manager
Anthony D. Oliverio, Field Sales Manager
Robert D. Wood, Field Engineer

Booth 103

JAPAN ELECTRONIC MANUFACTURERS AGENCY
1275 North Wood St.
Chicago 22, Ill.

Products:

All types of small transformers, All sizes of small speakers, All types of small motors, All types of microphones, All types of earphones, small mikes, Recording heads, batteries all types, rechargeable batteries, meters all sizes and types, test equipment, all types of receiving tubes, plugs and jacks, magnets for speakers, bulbs and xmas lights, headsets, ceramic capacitors, resistors, condensers, electrolytics, recording heads, pickup cartridges, hearing aids, tuners, amplifiers, tape recorders, radios, transceivers portable type.

Switches: Toggle miniature and standard sizes, Rotary Switches, Push Buton Switches, Antenna Switches, Volume Controls, L-Pads, Polyvaricons, Relays, Precision Vernier Dials, Variable Resistors and subminiature volume controls.

Variable Condensers, neon lamps, varistors, thermistors, wire wound resistors. Alligator clips.

In Attendance:

William Taki, President
George Taki, Managing Director
Yoshiko Taki, Assistant

Booth 104

RAYTHEON COMPANY
Industrial Components Division
55 Chapel St.
Newton 58, Mass.

Products:

Subminiature and miniature industrial receiving tubes, low-power transmitting tubes, gas and vapor tubes, light indicator modules, industrial cathode-ray tubes, storage tubes, printer tubes, control knobs, panel hardware, noise modules, accelerometers, Raysistor relays, magnetostriction filters, entertainment receiving tubes, L.C. filters, and delay lines, and ceramic headers.

Booth 105

ETC INCORPORATED
990 E. 67th St.
Cleveland 3, Ohio

Products:

Manufacturers of the most complete line of Solderless Terminals and Connectors for the #22 through #2 AWG Range.

Over 2,000 different U.L., C.S.A. and Military Approved Quality parts.

Featured at the ETC Booth are its new Hand and Power Production Crimping Tools, Large Size Insulated Terminals and Short Barrel Terminals.

In Attendance:

Edward M. Muldoon, President
John B. Redwine, Sales Manager
Al. S. Williams, Product Manager
Leonard Brazus, Advertising Manager
Fred J. Hoyle, Sales Engineer
Richard Freeman, Res. & Dev. Engineer

Booth 106

RAYTHEON COMPANY
Semiconductor Division
900 Chelmsford St.
Lowell, Mass.

Products:

Silicon transistors, PNP, NPN; germanium transistors, PNP, NPN; switching transistors, silicon rectifiers, silicon diodes, germanium diodes, Circuit Paks, MIL types, subminiature transistors, and Weld-Pak modules.

In Attendance:

W. S. Peters, Regional Sales Manager
H. F. Schunk, Marketing Manager
R. M. Broderick, Sales Engineer
K. R. Decho, Sales Engineer
R. W. Goedjen, Sales Engineer
L. J. Michael, Sales Engineer
A. W. Patterson, Sales Engineer
H. Merino, Sales Engineer

Booth 107

DESPATCH OVEN COMPANY
619 S. E. 8th St.
Minneapolis 14, Minn.

Products:

Combustion Tube furnaces. One unit utilizes silicon carbide elements; the second unit Kanthal elements. Both furnaces are zoned. Utilizing thyratron tubes and silicon controlled rectifiers. Uniformity obtainable in uniform sizes as close as ±½°C at maximum temperatures. One VU-5-33 forced convected laboratory oven maximum temperature 500°F.

In Attendance:

E. M. Burud, Sales Manager
Hans Melgaard, Engineer
T. E. Oelfke, Assistant Sales Manager
G. A. Newholm, Manufacturer's Representative
C. E. Wilson, Manufacturer's Representative
W. E. Swanson, Manufacturer's Representative
Art Hall, Manufacturer's Representative

Booth 108

TRANS-SIL CORPORATION
An Affiliate of Raytheon
55 Honeck St.
Englewood, N. J.

Products:

High power silicon diodes, rectifiers and rectifier assemblies.

In Attendance:

I. Weinstein, Vice President
A. Freeman, Sales Engineer

Booth 109

BEAD CHAIN MFG. CO.
110 Mountain Grove St.
Bridgeport 5, Conn.

Products:

Manufacturer of low cost pin type products for use in electro-mechanical applications. Product line includes Radio, T.V., Relay and Fluorescent Base Pins. Single and Multiple Connector Pins. Pivot, Stop and Spring Pins. Friction Contacts. Jacks. Wire End Terminals. Most economical Printed Circuit and Terminal Board Turret and Pin Terminals for Staking or Spinning Assy. Special Pins Made To Order. Bead Chain Drives.

In Attendance:

R. A. Schlicht, Electronics Sales Manager

Booths 110 & 112

SORENSEN, A UNIT OF RAYTHEON
Richards Avenue
South Norwalk, Conn.

Products:

Sorenson is introducing the new Q.B. series, a line of transistorized power supplies with nominal outputs from 6 through 28 volts, output from .5 through 8 amps. These exceptionally small units feature constant current, programability, series or parallel operation, voltage regulation of plus or minus 0.01 per cent (line and load combined) and transient response of 25 micro seconds or less.

In Attendance:

G. C. Williams, Operation Manager
J. D. Bowen, Manager of Marketing
R. E. Slater, Product Sales Manager
C. C. Woodhull, Regional Sales Engineer
R. F. Hostage, Manager of Advertising and Sales Promotion

Booth 111

RYAN & ASSOCIATES
2504 N. California Ave.
Chicago 47, Ill.

Manufacturers' Representatives for:
Forbes & Wagner, Inc.
Techn Laboratories, Inc.

Products:

Amplifiers, Attenuators, Audio Frequency Test Equipment, Automatic Control Equipment, Bridges, Coils, Decades, Coil Winding Equipment, Delay Lines, Computers and Accessories.

In Attendance:

Patrick J. Ryan, Manufacturers Representative
John Pontius, V.P. Sales—Forbes & Wagner
Jack Kurtz, Sales Manager — Forbes & Wagner
Magnus Bjorndal, President—Tech Laboratories
G. J. VanBaaren, V.P. Sales—Tech Laboratories
Alex Conrad, Chief Engineer—Tech Laboratories

Booth 113

RADIO DISTRIBUTING CO., INC.
1212 High St.
South Bend, Ind.

Products:

Distributor and assembler of electrical connectors by Cannon Electric and Winchester Electronics. Distributor of Transitron semi-conductors.

In Attendance:

Don Yates, Manager
George Barnes, Sales (So. Bend)
Harold Morris, Sales (Chicago)
George Medich, Sales (Chicago)
Joe Jaros
Irene Michalski

Booths 114-116

COMPUTER MEASUREMENTS CO.
12970 Bradley Ave.
San Fernando, Calif.

Products:

Frequency counters, timers, digital printers, automatic checkout system, preset controllers.

In Attendance:

E. C. Titcomb, Director of Marketing
C. E. Storie, Manager System Sales
E. L. Fensler, Manager Field Service

Booth 117

YOKOGAWA ELECTRIC WORKS, INC.
40 Worth St.
New York 13, N. Y.

Products:

Multi-Range Portable Standards, DC & AC Volt-Ammeters, Wattmeter, Power Factor Meter. Insulation Testers, Hand Cranking Type & Battery Operated Type. Ground Tester. Wheatstone Bridge.

In Attendance:

Yukio Horie, Sales Manager
Yasuo Karakisawa
Max Cahn
Y. Fujita
Karl A. Kopetzky
Seiki Hamada

Booths 118, 120 & 122

PIVAN ENGINEERING COMPANY
3535 W. Peterson Ave.
Chicago 45, Ill.

Manufacturers' Representatives for:
Computer-Measurements Co.
Dana Labs.
E-H Research Labs., Inc.
Lebow Associates, Inc.
Offner Electronics, Inc.
Packard Bell Computer Corp.
Precision Instrument Co.
Rotek Instrument Co.
Sierra Electronic Corp.
Sorensen & Co., Inc.
Tally Register Corp.
Vidar Corp.

Products:

Precision electronic test equipment; laboratory and industrial power supplies; strain gage instrumentation; paper tape perforator readers; digital logic systems; analog to digital converters; pulse generators.

In Attendance:
David B. Pivan
Thomas W. Phinney
Russell A. Dyer
Burton J. Shulhafer
Donald Duke
Edward Dervishian
Gordon Swanstrom
Donald Varner
Corliss Beck
Richard Loughran
James Trevorrow
John Trask

Booth 119

METRONIX
75 Wilson Mills Road
Chesterland, Ohio

Products:

Electronic Voltmeters, Temperature Controls & Recorders, Test Instruments.

In Attendance:
David J. Dolan, General Manager
Robert Conley, Sales Engineer
Bill Rasins, Representative
Louise Dolan, Secretary

Booth 121

BARBER-COLMAN COMPANY
1300 Rock St.
Rockford, Ill.

Products:

Precision permanent-magnet and split-series d-c motors, 400 cycle a-c motors, a-c and d-c tach generators, d-c battery-operated motors, a-c shaded-pole induction motors, gearheads, fans and blowers for cooling electronic equipment, and ultra-sensitive polarized d-c relays.

In Attendance:
W. F. Tice, Division Manager
S. D. Reed, Sales Manager
F. D. Utter, Manager, Application Engineering
M. H. Anderson, Sales Promotion Manager
D. D. Stephens, Application Engineer
M. R. Scheider, Application Engineer
W. R. Falk, Application Engineer
M. R. Cassaro, Sales Promotion Coordinator
R. J. Williams, Application Engineer
R. C. Allen, Chief Application Engineer
R. K. Warnimont, Chief Application Engineer
L. A. Tinsley, Application Engineer
R. W. Nicolaus, Application Engineer
C. L. Peterson, Application Engineer

Booth 124

PACKARD BELL COMPUTER CORP.
1905 Armacost Ave.
Los Angeles, Calif.

Products:

Analog to digital converters
Transistorized digital modules
Data acquisition and reduction systems
TRICE and high-speed digital computers

In Attendance:
Ted Smith, Director of Marketing
Dick Guldstrand
Richard A. Terry
Dick Musson
Richard A. Terry, Manager, Marketing Service

Booth 125

MacLEAN-FOGG LOCK NUT CO.
5535 N. Wolcott Ave.
Chicago, Ill.

Products:

Manufacturers of locking fasteners, flange nuts, weld nuts, stainless steel nuts, and other non ferrous nuts in sizes 4-40 through 2-4½. Locking fasteners include the "Uni-Torque" lock nut, "two-way" lock nut, "whiz-lock" nut and screw, the A1 lock nut, and the speed holding nut #2.

In Attendance:
Harry Bishop, Vice President, Industrial Sales
Vernon Stimpel, Chief Engineer
Bob Bowler, Sales Representative
John Lyons, Sales Representative
John A. MacLean, Jr., President
John A. MacLean III, Assistant to the President
Herman Koestring, Assistant Mgr. of Sales
Barry MacLean, Sales Department

Booth 126

E-H RESEARCH LABORATORIES, INC.
163 Adeline St.
Oakland 20, Calif.

Products:

Ultra-Fast Pulse Generators & Accessories, Switching Time Meters & Accessories, Coincidence Units, Signal Generators, Electrometers, Microwave Amplifiers, Microwave Sweep Generators.

In Attendance:
William D. Jordan, Vice President
J. George Rakonitz, Sales Department
Jack L. Griggs, Jr., Sales Department

Booth 129

TRIMM, INC.
400 W. Lake St.
Libertyville, Ill.

Products:

Manufacturer of headsets, audio-video jacks, plugs, panels, patch cords and terminal blocks which are used in broadcast and various communication and systems facilities. A wide variety of specials of these items are available according to specific design requirements.

In Attendance:
Paul A. Bottorff, Pres. and Chief Eng.
Edna Bottorff, Vice Pres.
Jack Horner, Ass't. to Pres., Sales
Renny Nelson, Sales
David Creaden, Ass't. to Pres., Eng.
Ben Dushek, Sales
Al Strack, Sales
Coy Casper, Sales

Booths 130 & 134

AMPHENOL-BORG ELECTRONICS CORP.
2801 S. 25th Ave.
Broadview, Ill.

Products:

Connectors, Potentiometers, Dials, Motors, etc.

In Attendance:
Amphenol Connector Division:
J. F. Leach, President
R. E. Hall, V.P. Marketing
N. W. Spangler, Gen. Sales Product Mgr.
L. E. Roby, Advanced Product Planning Mgr.
R. F. Dorrell, V.P. Engineering
D. D. Campbell, Adv. & Sales Promotion Mgr.
Borg Equipment Division
R. E. Ackerman, President
R. K. Johnson, Sales Manager
J. J. Arnold, Engineering Manager
Fred Zoeller, Adv. & Sales Promotion Mgr.
Corporate:
D. Scott Bowman, Director of Marketing
John Buchholz, V.P. & General Manager
Charles Mikl, Divisional Sales Manager
John Koys, District Sales Manager
Donald Turnquist, Sales Engineer
George Sher, Sales Engineer
John Svehla, Sales Engineer
John Jansen, Sales Engineer

Booth 131

RINGLAND M. KRUEGER CO., INC.
4738 N. Harlem Ave.
Chicago 31, Ill.

Manufacturers' Representative for:
Augat Inc.—Clips, Clamps, Electronic Hardware
Dresser Electronics—H.S.T. Division—Transformers, Mags. Amps. Power Supplies
Chassis Trak, Inc.—Chassis Slides
Chester Cable Corp.—UL and MIL Wire—Coax Cable
Western Devices, Inc.—Relay Racks—Universal Chassis
Technical Devices Co.—Wire Cutter and Stripper, Lead Former

In Attendance:
Ringland M. Krueger, President
Curt Vogtritter, Salesman
Tony Tedeschi, Salesman
Larry Vaughn, Sales Manager
Bob Laurence, Vice President
Ed Redgate, Sales Manager
Henry Loeber, Sales Manager
Pat Morrissey, Sales Manager
Mel Allen, President

Booth 133

UNIVERSITY OF NOTRE DAME
Notre Dame, Ind.

Products:

Exhibits of research and development work being carried on at University of Notre Dame in electronics and related areas.

In Attendance:
Dr. Eugene W. Henry, Assistant Prof. Elec. Eng.
Dr. Edward A. Coomes, Prof. Physics
Prof. Arthur J. Quigley, Assistant Prof. Elec. Eng.
Dr. Ruey-Wen Liu, Assistant Prof. Elec. Eng.
Prof. Anthony J. Evers, Instructor, Elec. Eng.
Prof. Kenneth Kempf, Instructor, Elec. Eng.
Dr. James Massey, Assistant Prof. Elec. Eng.
Dr. Leo V. Auth, Assistant Prof. Elec. Eng.
Dr. Harry Lafuse, Assistant Prof. Elec. Eng.
Dr. Norman Krohn, Assistant Prof. Elec. Eng.
Prof. Lawrence Stauder, Assoc. Prof., Acting Head Dept. E.E.

Booth 135

ILLINOIS INSTITUTE OF TECHNOLOGY
Technology Center
Chicago 16, Ill.

Products:

Literature and display outlining research and development activities at Illinois Institute of Technology.

In Attendance:

E. W. Jones

Booth 136

RICHCO PLACTIC COMPANY
3722 W. North Ave.
Chicago 47, Ill.

Products:

Plastic Cable Clamps—EZ Wire Tiles—Plastic Panel Channel—Harness Wrap—Custom Molding—Custom Extruding.

In Attendance:

Charles Richardson, Jr., President
Craig Richardson, Vice-President
Mark Pitt, Sales Mgr.
Wm. Schoolcraft, Eng.

Booth 137

PURDUE UNIVERSITY
Lafayette, Ind.

Products:

Literature and display outlining research and development activities at Purdue University.

In Attendance:

Professor J. E. Gibson

Booth 138

UNION SPECIAL MACHINE COMPANY
400 North Franklin Street
Chicago 10, Ill.

Products:

"Cable Lacer"—A device for tying wires to form a harness for the electronics industry. "Servo-Lift"—A pneumatic lift which saves costly lifting fatigue factor in production.

In Attendance:

Thomas H. Youngstrom
John R. Haugan

Booth 139

UNIVERSITY OF WISCONSIN
Madison, Wis.

Products:

(A) EDUCATION: Undergraduate and graduate engineering.
(B) SERVICE: Instrumentation power system analysis; computer services.
(C) RESEARCH: Microwave; Plasmas; Computers; Control Systems; Power Systems; Solid State Devices; Nuclear; Satellite Instrumentation; Vhf, Uhf radio; radar systems; electric machines.

In Attendance:

Charles Ranous, Assoc. Prof.
James Skiles, Prof.
Vincent Rideout, Prof.
B. N. Prasanna, Doctoral Candidate
J. Hurley, Doctoral Candidate
T. Grzelak, Doctoral Candidate
R. Dixon, Graduate Student

Booth 140

THE CAPITOL MACHINE & SWITCH CO.
36 Balmforth Ave.
Danbury, Conn.

Products:

Multiple Position, Push Button Strip Switches
Alternating Action, Strip Switches
Illuminated, Push Button Strip Switches
Illuminated, Single Position, Alternating Action, Push Button Switches
Illuminated, Alternating Action Strip Switches
Illuminated, Momentary Push Button Switches
Lever Switches
Single Position, Push Button Switches
Button Types
Contact Assemblies
Ted Felleisen, Manufacturers' Representative
5841 W. Montrose Ave., Chicago, Illinois
Tel.: SP 7-1060

In Attendance:

Arthur Wilson, Sales Manager
Michael Baldasare, Chief Engineer
Ted Felleisen, Manufacturers' Representative

Booth 141

THE UNIVERSITY OF MICHIGAN
Ann Arbor, Mich.

Products:

Research, development, graduate and undergraduate education in Engineering and the Sciences.

In Attendance:

Dr. Hansford W. Farris, Professor, Electrical Engineering
Dr. Thomas W. Butler, Jr., Associate Professor, Electrical Engineering
Dr. Joseph E. Rowe, Professor, Electrical Engineering
Mr. Ray Carroll, Director, UM Industry Program

Booth 142

COMMERCIAL PLASTICS CO.
945 George St.
Chicago, Ill.

Products:

Plastic cable clamps—molded and fabricated, electrical cable fasteners, plastic strapping, extruded nylon tape, extruded plastic tubing, electrical sleeving, cable lacing.

In Attendance:

Frank Allseits, President
Andrew Fischer, Vice President
Mary Kennedy, Secretary-Treasurer
William Jung
Joseph Trembach

Booth 144

TEST EQUIPMENT CORPORATION
1223 Waugh Drive (Box 13185)
Houston 19, Tex.

Products:

Model 1 Automatic Transistor and Diode Tester for incoming inspection. Model 2 Manual Transistor and Diode Tester for engineering evaluation. Model 3 In-Circuit Transistor and Diode Tester for maintenance & troubleshooting. Model 4 In-Circuit Transistor and Diode Tester for maintenance & troubleshooting.

In Attendance:

Richard Keyes, Vice President—Sales
Louis W. Erath, President
J. J. Keyes
G. N. Turner, Production Manager
R. E. Neal, Technician
J. H. Davis, Vice President & Treasurer

Booths 146-150

JAY C. ANGEL & CO.
2743 W. Peterson Ave.
Chicago 45, Ill.

Products:

Manufacturers' Representative for: ADC Products, a Division of Magnetic Controls Company. Products: Jacks, Plugs, Transformers, Filters—Hughes Aircraft Company, Vacuum Tube Products Division. Products: Electronic Welding Equipment—Technical Wire Products Inc. Products: RFI Shielding.

In Attendance:

ADC Products, a Division of Magnetic Controls Company.
D. E. Engebretson, Sales Manager
D. G. Watson, Sales Manager
J. M. Corbett, Manager Central Sales Region
W. G. Pree, Sales Engineer
Hughes Aircraft Company, Vacuum Tube Products Division
Gerald E. Woods, Sales Manager
Gary D. Wrench, Sales Engineer
Technical Wire Products Inc.
O. P. Schreiber, Sales Manager
W. W. Breindel, Sales Engineer
S. N. Nellis, Sales Engineer
Jay C. Angel & Co.
Jay C. Angel, Sales Representative
Roy Angel, Sales Representative
Les Angel, Sales Representative
Ed Mikita, Sales Representative
Don Healy, Sales Representative

Booth 152

SHALLCROSS MFG. CO.
Preston Street
Selma, N. C.

Products:

Rotary Switches
Precision Wirewound Resistors
RF & Audio Attenuators
Voltage Dividers
Resistance Decades
Delay Lines
Galvanometers
Resistance Bridges
Resistance Networks

In Attendance:

R. B. Crisp, Marketing Manager
R. E. Johnson, Vice President—Marketing
John Shallcross, President
R. C. Williams, Sales Engineer
J. C. Awbrey, Sales Engineer

Booth 154

THE ROWAN CONTROLLER CO.
30 Bridge Ave.
Red Bank, N. J.

Products:

Electrical Contactors and Relays. Motor Starters. Oil immersed equipment (elec.) Electrical Counters. Terminal Blocks. Panel Meters. Special Test Equipment. Circuit Protectors.

In Attendance:

John C. Ellis, Executive Vice President
Charles S. Morgan, District Manager
Carl D. Rao, Salesman
L. J. Wilkinson, Salesman

Booth 156

ARMSTRONG RESINS, INC.
Argonne Rd.
Warsaw, Ind.

Products:

Vibro-Flo® Powders—are one-packaged formulated epoxy powders for use as coatings for electrical insulation and corrosion-resistant applications.

Vibro-Fluidizers® — Specially constructed equipment for applying fine powdered coatings by the fluidized-bed method.

In Attendance:

Donald L. Slater, Products Manager
M. V. Rothschild, Technical Sales Representative

Booth 158

BUCKBEE MEARS COMPANY
245 E. Sixth Street
St. Paul 1, Minn.

Products:

Glass and metal reticles, fine mesh, micromesh sieves, evaporation masks, rulings, precious metal platings, printed circuits, thin-film memory circuits, thin metal parts, color TV masks, code discs, conductive flat cables, scales.

In Attendance:

Arnold T. Wicklund, Vice President, Industrial Division
Norman C. Mears, Vice President, Sales Manager
A. W. Amundson, Assistant Sales Manager
Gerald L. Werner, Engineering Representative

Booth 160

ELECTRO DEVICES, INC.
75 Adams Street
Newton 58, Mass.

Products:

EDI Model D-6 Toroid Coil Winder. Wire Size Range from AWG22 to AWG50. Core size range from .055 I. D. to 2½" O. D., 2" high. All 6" shuttles A.I.M. (Automatic Inductance Matching). EDI's Model D-6 with AIM comparator matches toroids to inductance and shuts off automatically. Winding and testing completed on machine without removing core or stripping turns. New solid state photoelectric counter provides positive count for the D-6 throughout its entire wire size range of AWG22 to AWG50.

In Attendance:

Paul J. Post, Director of Marketing
Paul J. Post, Jr., Sales
Harrison Blind, Sales
Daniel Hoxie, Chief Inspector
Dino Dicarlo, Treasurer
Harold M. Snow, Assistant Treasurer
Thomas Zoltek, Electrical Engineer
Edward Gratto, Chief Engineer

Booth 162

CAMBRIDGE THERMIONIC CORP.
445 Concord Avenue
Cambridge 38, Mass.

Products:

Complete line of components for the electronic industry consisting of terminals, terminal boards, internal hardware, external hardware, plugs and jacks, insulated standoff, press-mount terminals, IF and RF Coil, coil forms, RF and IF transformers, fixed ceramic capacitors and tunable capacitors.

In Attendance:

Darrell G. Miller, Regional Sales Manager, Cambridge Thermionic Corp.
Lawrence Erhard, Sales Engineer, Cambridge Thermionic Corp.
Ray C. Whitmore, Manufacturer's Rep., Whitmore Associates
Elliott A. Hutchinson, Manufacturer's Rep., Whitmore Associates
Al Quackenbush, Manufacturer's Rep., Whitmore Associates
Thomas E. Diener, Manufacturer's Rep., Whitmore Associates
Robert Horst, Manufacturer's Rep., Whitmore Associates

Booth 164

THE SIBLEY COMPANY
Bridge Street
Haddam, Conn.

Products:

Printed circuits: Flushed or raised, disc and drum commutators—plated-thru hole and multi-layer circuits—electronic assemblies. Engineering, research and development for circuitry conversion, miniaturization, and high-temperature applications. Precious metal plating of electronic parts.

In Attendance:

Hal R. Roffmann, Jr., Vice President—Sales
Daniel Dewey, Jr., Vice President—Production

Booth 166

F & M SCIENTIFIC CORP.
Starr Road & Route 41
Avondale, Pa.

Products:

F & M Model 210 Microsignal Amplifier Converter
F & M Model 220 Power Proportioning Temperature Controller
F & M Model 240 Power Proportioning Temperature Pragrammer

In Attendance:

Dr. Fred J. Debbrecht, Development Section Manager
Nelson Armstrong, District Sales Manager

Booth 168

COLEMAN MACHINE CO., INC.
321 Snyder Avenue
Berkeley Heights, N. J.

Products:

Panto-DUPLICATOR — Semi-Automatic, high speed, precision hole drilling, for printed circuit and terminal boards, using solid carbide drills, and 17,250 RPMs, a production rate of 6000 holes an hour is easily attained. Drills materials such as epoxy and phenolics.

In Attendance:

James R. Coleman, President
John F. Lawson, Sales-Manager

Booth 170

TORIT MANUFACTURING CO.
1133 Rankin St.
St. Paul 16, Minn.

Products:

Specialaire Dust-Free Cabinets
Super Clean Work Spaces for:
Assembly Testing, Packaging of delicate or critical electronic components and assemblies.
TORIT High-Efficiency Type Dust Collectors. TORIT High-Efficiency Cyclone Dust Collectors

In Attendance:

Frank R. Chase, Vice President
Dick Bennett, District Sales Manager
Ed Girk, Representative
Ed Schuerer, Representative
Lane Peterson, Representative
Byron Confer, Representative
Andy Wands, Representative
R. R. Waites and Ed Berdeaux, Representatives
Walter Mackey, Representative

Booth 172

BUCHANAN ELECTRICAL PRODUCTS CORPORATION
225 Route 22
Hillside, N. J.

Products:

Manufacturers of terminal blocks, solderless connectors, cable and conduit fittings, hand and pneumatic crimping tools.

In Attendance:

H. Van Ysseldyk, Sales
Donald Anderson, Sales Representative
Robert L. Besser, Eastern Manager—Crimp Tool Marketing
Paul Rathje, Midwestern Manager—Crimp Tool Marketing

Booth 174

SLAUGHTER COMPANY
Young & College Sts.
Piqua, O.

Products:

Insulation Testers
Cable and Harness Testers
Coil Testers
Stroboscopes
Special Test Equipment

In Attendance:
Elmer Slaughter
Dick Kearney
"Mac" McDonald
Ed Malott

Booth 176

MAST DEVELOPMENT COMPANY
2212 East 12th Street
Davenport, Ia.

Products:
Rapid Random Access Strip Film Projectors
Teaching Machines
Oscilloscope Cameras
Special Purpose Counters
Portable Ozone Recorders
Ozone Test Chambers
Research and Development on Optical Systems and Film Handling Devices
Custom Fabrication

In Attendance:
Gifford M. Mast, President
Leo E. Hubner, Assistant General Manager
Richard C. Duley, Audio-Visual Products Manager
Francis G. Telshaw, Public Relations Director

Booth 178

LUXO LAMP CORPORATION
Dock Street
Port Chester, N. Y.

Products:
The firm will display its complete line of portable, incandescent, fluorescent, combination and magnifying lamps and also demonstrate their unique lens attachments for their magnifiers. These attachments increase magnification whenever required from 3, 7, 11 diopters. LUXO lamps are designed for use on assembly and inspection benches, machinery, drafting tables, office equipment in laboratories and institutions. They are available in different lengths and colors and have brackets, bases and stands which permit them to be mounted or positioned anywhere.

In Attendance:
S. F. Blake, Jr., Sales Manager
John B. Riis, President
John S. Sprenger, Mid-West Sales Manager
Herb Molk, Sales
T. Gabrielsen, Sales
Linc Horton, Sales Representative-Michigan

Booths 184, 186, 190

FLORIDA DEVELOPMENT COMMISSION
Carlton Building
Tallahassee, Fla.

Products:
Qualified state and local industrial representatives will be at Florida's new 50-foot exhibit to answer questions and tell the story of Florida's unlimited potential in the electronically-oriented Space Age. Factual, specific data on every phase of plant re-location and expansion to take advantage of this important market will be provided without obligation.

In Attendance:
John Jaycox, Industrial Representative
Ralph Peckham, Exhibit Coordinator
plus several representatives from local Florida communities

Booth 200

S.S. WHITE INDUSTRIAL DIV.
10 East 40th Street
New York 16, N. Y.

Products:
Airbrasive Unit and Plastic Products

In Attendance:
Charles Ingulli, Sales Mgr., Airbrasive Dept.
Jerry Buck, Sales Mgr., Plastic Dept.

Booth 201

FERRANTI ELECTRIC, INC.
Fairchild Court
Plainview, N. Y.

Products:
Tape Reader and Components
Computer Accessories
Delay Lines
Document Transcriber
Tubes, Special Purpose (Cathode Ray)

In Attendance:
D. G. Pacy, Sales Manager
B. Hollander, Sales Engineer
R. Chiodo, Sales Engineer
D. Arnold, Sales Representative
B. Butler, Sales Representative
W. Lower, Sales Manager
R. Blue, Sales Engineer
B. Clare, Sales Engineer

Booth 204

MICROTRAN COMPANY, INC.
145 E. Mineola Avenue
Valley Stream, N. Y.

Products:
1962 Catalog of off-the-shelf distributor stocked items. 400 cy. isolation and power transformers, transistor converter and servo transformers. Stock miniaturized transformers and toroids MIL-T-27A & industrial specs. Stock & custom-built items: Molded, encapsulated, hermetically-sealed, plug-in, printed-circuit, cased and open.

In Attendance:
Harold Edelstein, President
Al Eisenberg, Executive Vice President
Walter Benscher, Industrial Sales Manager
Richard K. Chaber, Vice-Pres. Chief Engineer

Booth 205

ROCKBESTOS WIRE & CABLE CO.
DIV. OF CERRO CORP.
Nicoll & Canner Streets
New Haven 4, Conn.

Products:
Insulated electrical wire & cable

In Attendance:
William E. Tierney, Manager, Chicago Territory
Roy S. Williamson, Manager, Upper Midwest Territory
E. S. Reed, General Sales Manager

Booth 206

SYLVANIA ELECTRONIC TUBE DIVISION
New York, N. Y.

Products:
CRT's Electronic Tubes
Microwave Devices

In Attendance:
Elmer Skahan, Advertising Staff

Booth 207

TED MANUFACTURING CORPORATION
11415 Johnson Drive
Shawnee Mission, Kas.

Products:
Coaxial Cable Connectors

In Attendance:
E. W. McGrade, President
H. W. Balmer, Vice President
John F. Guernsey, Chief Engineer

Booth 208

COOL-FIN ELECTRONICS CORPORATION
1717 No. Potrero Avenue
So. El Monte, Cal.

Products:
R-F tube shields and heat dissipators
Semi-conductor heat dissipators
Manufacturer's Representative:
Communications Engineers
George Richards
Marty Rosenthal

In Attendance:
Everett S. Nance, Vice-President
Donald K. Allison, Consulting Engineer
George Richards, Representative
Marty Rosenthal, Representative

Booth 209

NATIONAL CONNECTOR CORP.
Science Industry Center
Minneapolis 27, Minn.

Products:
A complete source of electronic connectors—of standard or special design. The following pages list generally what is available in the items most in demand. If you require a different type, style or configuration from what is shown in this catalog—ask us; we will be happy to work with you on design and production.

In Attendance:
F. L. Cahill, Vice President-Sales
H. C. Macnamara, Director-Engineering
Robert J. Siedare, Field Sales Engineering
Don Elliott, Regional Sales Manager

Booth 210

WITHERS, ROPEK & CAHILL, INC.
5439 W. Division St.
Chicago 51, Ill.

Products:
Manufacturers' Representative for:
Boston Insulated Wire & Cable Co.—Cable & Wire
Electric Regulator Corporation—Regulators
Electro-Mechanical Instrument Co.—Meters
Hopkins Engineering Co.—Capacitors: fixed
Key Resistor Corporation—Resistors

Magnetics Inc., Industrial Control Equipment —Magnetic Amplifiers
Nife Inc., Nickel Cadmium Battery Div.—Batteries
Standard Rectifier Corporation—Rectifiers
Transformer Technicians Inc.—Transformers, Coils

In Attendance:

Withers, Ropek & Cahill, Inc.
Lee Ropek
John Cahill
Lloyd Demel
Boston Insulated Wire & Cable Co.
Jack Ferrer
Electric Regulator Corporation
James Ettinger
Electro-Mechanical Instrument Co.
Ray Jones
Hopkins Engineering Co.
John Schlenger
Key Resistor Corporation
Andy Callanan
Magnetics Inc., Industrial Control Equipment
Lewis Martin
Nife Inc., Nickel Cadmium Battery Div.
Jacques Place
Standard Rectifier Corporation
Ted Phillips
Transformer Technicians Inc.
Charles Hahne
Mitchell Stevens
Laddie Lastovicka

Booth 211

ELECTRONIC ENCLOSURES, INC.
3629 Holdrege
Los Angeles 16, Cal.

Products:

Engineering Design, Industrial Design, Fabrication of consoles, cabinets for electronic industry. Also manufacture standard line of cabinets.

In Attendance:

M. M. Jacobs, President
Robt. Edelman, Eastern Mgr.

Booth 214

THE JAMES KNIGHTS COMPANY
Church and Wells Sts.
Sandwich, Ill.

In Attendance:

Glenn Munro, Sales Manager
Louis Dick, Chief Engineer
Blair Cutlip, Product Manager
Daryl Kemper, Product Manager
Clare Reynolds, Sales Engineer
W. R. Doede, Sales Engineer

Booth 215

ROTRON MFG. CO., INC.
Hasbrouck Lane
Woodstock, New York

Products:

Complete line of precision cooling devices, i.e., fans and blowers, for the electronics industry for use in ground, shipboard, aircraft and missile applications, both military and commercial quality units.

In Attendance:

Paul M. Beard, Vice President-Sales
J. J. McGowan, Mgr., Advertising & Sales Promotion
W. W. Blelock, Jr., Mgr., Application Sales
Percy S. Lyon, Jr., Mgr., Application Engineering
David Carlson, Mgr., Special Products

Booth 216

VITRAMON, INCORPORATED
P. O. Box 544
Bridgeport 1, Conn.

Products:

Microminiature ceramic and porcelain capacitors

In Attendance:

Clifford H. Tuttle, Vice President-Sales
Robert T. Jones, Eastern Regional Sales Manager

Booth 218

BOURNS, INC.
1200 Columbia Avenue
Riverside, Cal.

Products:

We produce the industry's most complete line of Adjustment Potentiometers, including the well-known Trimpot®, Trimit®, and E-Z® Trim Units. In addition, we are also now producing a line of high-quality precision potentiometers and a new subminiature relay series. Our Instrument Division produces potentiometric, reluctive, and strain gage transducers for position, pressure, and acceleration.

In Attendance:

R. C. Archer, Director of Sales, Trimpot Division
E. J. Goeppinger, Director of Sales, Instrument Division
Steve Skilnyk, Advertising Manager
Russ French, Dist. Sales Manager
Others to be determined.

Booth 219

SPECTROL ELECTRONICS CORP.
1704 S. Del Mar Ave.
San Gabriel, Calif.

Wirewound Precision, Miniature and Trimming Potentiometers, Counting Dials, Electromechanical Devices.

In Attendance:

R. C. Chase
D. P. Vaughan
D. C. Fleming
D. C. Hoos
R. B. Lewis Jr.

Booth 220

PIC DESIGN CORP.
477 Atlantic Avenue
East Rockaway, N. Y.

Products:

Precision Instrument gears and components for research and development, i.e.: anti-backlash gears, ball bearings, collars, shafts, cleats, couplings, dials, differentials, dowel pins, hangers, magnetic clutches, servo gear boxes, speed reducers, spacers, racks, etc. Also, breadboard kits for development. And, special precision gears and components per customer drawings or modifications of stock parts.

In Attendance:

P. J. Wellenberger, Sales
J. D. Wellenberger
Frank Tye, Sales
Frank Elam, Sales
F. L. Smith, Sales
E. D. McMahon, Sales
G. J. Smith, Sales
G. E. Poplar, Sales
Don Kraft, Sales
Bill Ingle, Sales
Morris Kobrin, Sales
Howard Girling, Sales
Don Harrison, Sales

Booth 221

JIFFY MANUFACTURING COMPANY
360 Florence Avenue
Hillside, N. J.

Products:

Broad line of Jiffy Shipping Bags, including Jiffy Regular Padded Shipping Bag, Jiffy Utility (Unpadded) Shipping Bag, and the Jiffy Lightning (indented) Shipping Bag.

Broad line of cushioning materials, including Jiffy Custom Wrap Cellulose Wadding, bleached and unbleached, water-resistant or absorbent, complying with Federal Specification PPP-C-843a. Kushion Kraft indented paper pads with or without soft facial tissue facings.

In Attendance:

M. C. Weisenhorn, Director of Distributor Sales
J. D. Farrington, Jr., Advertising Manager
R. G. Garland, Wadding Specialist
R. D. McMullin, Wadding Specialist
T. E. O'Shea, Sales Representative-Chicago area

Booth 222

DALE ELECTRONICS, INC.
P. O. Box 488
Columbus, Nebr.

Products:

Manufacturers of Resistors, Trimmer Potentiometers, Precision Potentiometers, Surge Arrestors, Custom Resistors, Matched Pairs, Networks, Cable Assemblies, Coils, IF Transformers, Filters, Chokes, Toroidal Inductors.

In Attendance:

I. E. Gates, V. P. Sales
J. D. Brandfas, Component Sales Mgr.
N. Newman, Sales Coordinator
R. Root, Adv. Mgr.

Booth 223

ROHDE & SCHWARZ SALES CO. (USA) INC.
111 Lexington Ave.
Passaic, N. J.

Products:

Electronic Test Equipment, Frequency & Time Standard, C- and L-Bridges, Teraohmmeters, Selective Voltmeters, Power Signal Generators.

In Attendance:

Rudolf Feldt, President & Sales Manager
Lucien Feldt, Sales Engineer
William Laub, Sales Engineer

Booth 226

ARTOS ENGINEERING COMPANY
2757 South 28th Street
Milwaukee 46, Wis.

Products:

Automatic wire stripper model CS-6 with new color coding device.

In Attendance:

Haakon T. Randar, Sales Manager
Wayne Baird, Sales Representative
H. W. Hagstrand, Sales Representative
Robert O. Dusel, Sales Engineer
Magnus Randar, Sales Engineer

Booth 227

COLLINS RADIO COMPANY, COMPONENTS DIVISION
19700 San Joaquin Road
Newport Beach, Cal.

Products:

Mechanical, crystal, LC filters, toroidal coils, inductors and networks, laminated precision and toroidal coils, magnetic amplifiers, magnetostrictive devices.

In Attendance:

V. A. Gill, Asst. to Gen. Mgr., Components Div.
J. W. Campbell, Sales Manager
J. Elliott, Sales Engineer
E. Schmeichel, Sales Engineer
J. Brickner, Sales Engineer
B. Warner, Jr., Advertising Manager

Booth 230

PRENTICE-HALL, INC.
Englewood Cliffs, N. J.

Products:

Publisher of Technical Reference Books for the professional engineer's library. Featured publications at the Prentice-Hall booth are: LINEAR ACTIVE NETWORK THEORY by dePian, a generalized matrix treatment of linear active networks . . . SEMICONDUCTOR DEVICE PHYSICS by Nussbaum, which presents an introduction to the physical theory of semiconductors and of diodes, transistors and other semiconductor devices . . . and, SWITCHING CIRCUITS FOR ENGINEERS by Marcus, which covers the design and simplification of combinational and sequential switching circuits.

In Attendance:

John H. Davis, Engineering Series Editor
Frank Enenbach, Field Specialist

Booth 231

APPLIED DYNAMICS, INC.
2275 Platt Road
Ann Arbor, Mich.

Products:

Special Purpose Analog Computers
General Purpose Analog Computers
Analog Computer Components

In Attendance:

G. F. Graber, Marketing Manager
J. D. Kennedy, President

Booth 233

THE TORRINGTON MFG. COMPANY
100 Franklin Drive
Torrington, Conn.

Products:

Centrifugal, Tube Axial, Vane Axial Blower units and Cooling Devices for Electronic Airborne and ground support equipment. Specialized designs for compact and high pressure applications.

In Attendance:

Adam M. Wilcenski, Mgr., Technical Service
Michael D. Conforti, Technical Service Representative
Leonard C. Lindstrom, Sales Manager
Merrill B. Hunting, Sales Repr.
Leonard J. Arnsten, Sales Repr.
William E. Cashen, Sales Repr.
David A. Guilda, Sales Repr.
Harold M. Sader, Sales Repr.
Ira J. Roy, Sales Repr.

Booth 234

GENISTRON, INC.
111 Gateway Rd.
Bensonville, Ill.

Products:

Radio Noise Filters
Electric Wave Filters
RFI Measurements Services
Electro-Magnetic Compatibility Management Services

In Attendance:

Fred J. Nichols, President
Millard Porter, Jr., Vice President
Robert E. Swift, Vice President
B. T. Mills, Sales Manager
Don Cooper, Engineering Manager
Don Purkey, Sales Engineer

Booth 235

INTERNATIONAL EASTERN CO.
801 Sixth Avenue
New York 1, N. Y.

Products:

Special Printing machines for all components. NEW: For the first time in Chicago, our Model RB/3 fully automatic high speed machine for printing cylindrical pieces with a single wire lead from either end.

In Attendance:

Henry Berez, President
Beatrice Berez, Secty., Sales
Jerry Devlin, Sales Manager

Booth 236

CENTRAL SCIENTIFIC COMPANY
1700 Irving Park Road
Chicago 13, Ill.

Products:

In addition to a wide line of research and industrial laboratory equipment and chemicals, Cenco manufactures over 100 different mechanical high vacuum pumps, the newest being the Hyvac 43 having a guaranteed vacuum of 0.1 microns and capacity of 430 liters per minute. Cenco's complimentary line of components necessary for building up vacuum systems include couplings, connectors, gages, pump plates, diffusion pumps and valves. The Cenco self-contained thin film metal coater with an 18 in. capacity features single control valve system, eliminating operator errors.

In Attendance:

Robert L. Bieser, Central Sales Manager
Lou Lupo, Sales Representative
Charles Sengstock, Public Relations Director
L. A. Miller, V.P.-Marketing
P. R. Dunne, Director of Market Planning
R. G. Picard, V.P.-Research
Bert Hill, Research Engineer

Booth 238

UNIVERSITY OF ILLINOIS
College of Engineering
Urbana, Ill.

Products:

Education, Research and Public Service for Illinois and the Nation.

In Attendance:

William L. Everitt, Dean, College of Engineering
Ross J. Martin, Director, Engineering Experiment Station
E. C. Jordan, Head, Dept. of Electrical Engineering
Wendell E. Miller, Associate Head, Dept. of Electrical Engineering
D. S. Babb, Professor
M. L. Babcock, Assistant Professor
Miss R. V. Chalmers, Research Assistant
E. W. Ernst, Associate Professor
H. W. Knoebel, Associate Professor
Edward Mast, Associate Professor
P. E. Mayes, Associate Professor
J. P. Neal, Associate Professor
M. D. Sirkis, Associate Professor

Booth 242

IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY
Department of Electrical Engineering
Ames, Ia.

Products:

Educational display, outlining University activities.

In Attendance:

Dr. W. B. Boast, Professor and Head, Electrical Engineering
Dr. A. A. Read, Associate Professor, Electrical Engineering
Other Faculty Members of the College of Engineering

Booth 243

STEVENS MANUFACTURING CO., INC.
Post Office Box 1007
Mansfield, O.

Products:

Complete line "Certified" thermostats designed for electronic applications, snap-acting, welded, hermetically sealed, narrow differentials (can be made to a total spread of 6°F. including tolerances and differential); small size, tested to MIL specs, positive acting strip type and snap-acting, semi-enclosed and epoxy sealed thermostats.

In Attendance:

Ernest N. Taylor, Representative
L. H. Buffam, Representative
R. H. Stevens, Vice President
R. L. Seibold, Salesman

Booth 244

MARQUETTE UNIVERSITY
1515 W. Wisconsin Ave.
Milwaukee 3, Wis.

Products:

Fetal Electrocardiography (Biomedical Engineering)

In Attendance:

Saul D. Larks, Professor
Golda G. Larks, Ass't Research Biologist
Carol Cramer, Res. Technician

Booth 246

MICHIGAN STATE UNIVERSITY
East Lansing, Mich.

Products:

The exhibit will display developments in the systems laboratory at Michigan State University, both in teaching methods and research, including operational electro-mechanical and electro-hydraulic systems.

In Attendance:

Dr. H. E. Koenig, Professor
Dr. Y. Tokad, Assistant Professor
Dr. R. C. Dubes, Assistant Professor
A. L. Duke, Instructor
T. E. Perfitt, Instructor
R. R. Lafrey, Instructor
D. J. Rauch, Instructor

Booth 248

NORTHWESTERN UNIVERSITY
E. E. Department
Evanston, Illinois

Products:

NU literature; pictures and displays of research projects in electrical engineering, including microwaves and superconductors.

In Attendance:

R. W. Jones

Booths 300-304

GENERAL RADIO COMPANY
22 Baker Avenue
West Concord, Mass.

Products:

Laboratory Standards
Precision Measuring Instruments
Test Equipment

In Attendance:

John Hersh, Development Engineer
Mac Holtje, Engineering Group Leader
Ivan Easton, Vice President for Engineering
Kip Adams, Assistant to Sales Manager
Bob Richmond, Manager NEO
Howard Dawes, Service Manager
Joe Belcher, Engineer/Exhibits
William M. Ihde, Manager Chicago District Office
Leroy C. Fricke, Sales Engineer
Robert P. Delzell, Sales Engineer
Lane W. Gorton, Sales Engineer
George R. Hanson, Service Supervisor

Booth 301, 305, 307

TEKTRONIX, INC.
P. O. Box 500
Beaverton, Ore.

Products:

Digital-Readout Oscilloscope
Pulse-Sampling Oscilloscopes
Special-Purpose Oscilloscopes
General-Purpose Oscilloscopes
Oscilloscope Auxiliary Equipment
Oscilloscope Accessories

In Attendance:

Jack Cassidy, Domestic Marketing Manager
George Edens, Field Engineering Manager
Geoff Gass, Field Information Engineer
Keith Williams, Regional Manager
Chuck Bouffiou, District Manager
Ralph Ebert, District Manager
Tom Evans, District Manager
Bill Ward, District Manager
John Mulvey, Field Information Manager
John Kobbe, Engineering Consultant
Norm Winningstad, Instrument Design Engineer
Oz Svehaug, Instrument Design
Ed Vaughan, Field Engineer
Bob Seaberg, Field Engineer
Bob Siegert, Field Engineer
Cliff Briesenick, Field Engineer
Irv Chambers, Field Engineer
Terrell Jamison, Field Engineer
Tom Clarke, Field Engineer
Mike Poindexter, Field Engineer
Tom Long, Field Engineer
George Lodge, Field Engineer
Chuck Spencer, Field Engineer
Dick Patterson, Field Engineer
Ted Anderson, Field Engineer
Joe Gardner, Field Engineer
Frank Elardo, Field Engineer
Ron Gantner, Field Engineer
Paul Whitlock, Field Engineer
Ken Parker, Field Engineer
John Hooper, Field Engineer

Booth 306

OFFNER DIVISION OF BECKMAN INSTRUMENTS, INC.
3900 River Rd.
Schiller Park, Ill.

Products:

Direct-writing oscillographs rectilinear & curcilinear Ink electric or bat.
D. C. amplifiers
Electroencephalographs

In Attendance:

F. F. Offner, Phd.
Geo. Little
Bruce James
Sol Mann
Abe Seigdman

Booth 308

NON-LINEAR SYSTEMS INC.
P. O. Box 728
Del Mar, Cal.

Products:

Digital Voltmeters, Digital Ohmmeters, Digital Multi-Purpose Meters, Digital-to-Analog, Analog-to-Digital Converters, Preamplifiers, Data Logging and Data Logging Systems.

In Attendance:

R. C. Wynne, Vice President
T. E. Kurtzer, Regional Manager
C. J. Leach, District Manager
J. B. Hale, Service Manager
R. L. Hocker, District Manager

Booth 309

TECH-OHM ELECTRONICS, INC.
36-11 33rd Street
Long Island City 6, N. Y.

Products:

Wirewound resistors, power and precision, fixed and adjustable. Film resistors, carbon and metal film Electro-Mechanical Components including gears, gearheads, differentials, speed reducers, clamps, precision couplings, magnetic clutches and magnetic brakes, bearings, shafting. Airpots, an air damping dashpot.

In Attendance:

Joseph G. Solari, Chairman of Board
Daniel E. Chaifetz, President
Arnold Sherman, Vice President
Richard Berry, Engineer
Miss Barbara Futch, Ass't Sales Manager

Booth 311

ENGINEERED ELECTRONICS CO.
1441 E. Chestnut Avenue
Santa Ana, Cal.

Products:

Modular transistorized electronic circuits for digital applications, decade counters, transistorized indicators, NOR modules, magnetic core circuits, high-density welded packaging and custom circuit packaging.

In Attendance:

James E. McCloskey, Vice President-Sales
Richard I. Baillargeon, Sr. Application Engineer

Booth 312

OHMITE MANUFACTURING CO.
3601 Howard Street
Skokie, Ill.

Products:

Rheostats
Resistors
Tantalum Capacitors
Relays
Variable Transformers
Germanium Diodes
Rotary Tap Switches
R. F. Chokes

In Attendance:

Roy S. Laird, Vice-President, Sales
Norman Hillman, Sales Engineer
Charles Dedera, Sales Engineer
Manny Forester, Sales Engineer
L. H. Ritzma, National Advertising Manager
M. A. Bergson, Product Advertising Manager

Booth 315

UNIVERSAL INSTRUMENTS CORP.
139 E. Frederick St.
Binghamton, N. Y.

Products:

Lead straightening and taping machines for axial lead components; positioning and straigthening units for transistors; conveyors for electronic parts; component inspection table.

In Attendance:

Perry J. Wilson, Show Manager
J. D. Ahearn, President
F. H. Lawson, Vice President
T. Gerlock, Sales-Service Engineer

Booth 316

DODGE FIBERS CORPORATION
John Street
Hoosick Falls, N. Y.

Products:

PTFE Extruded Tape and "Fluorglas" (PTFE-Coated Glass) Yarn for Coil and Wire Wrapping "Fluorglas" and PTFE Adhesive Tapes for Slot Liners, Splicing Wires, and Winding Cores. PTFE and FEP coated glass Fabrics and Tapes for Electrical Insulation. PTFE Thread Seal Tape for Pipe

and Electric Connector Threads. "Fluorglas" Round Tie Cords and Braided Flat Tapes for mall motors and electronic harnessing. "Fluorglas" Laminates, and Slipfoil (Aluminum Foil with PTFE coating). "Fluorglas" —Dodge Fibers Reg. for PTFE coated glass.

In Attendance:

Cleveland E. Dodge, Jr., President
William A. Petitt, Sales Manager
Danforth Geer, III, Advertising Manager
L. E. McGlaughlin, Central States Sales Manager
Chester A. Olson, Jr., Sales Representative
Richard T. Herdrich, Sales Representative
Roger Lundborg, Sales Representative
Charles W. Keiter, Distributor

Booth 318

CLEVELAND INSTITUTE OF ELECTRONICS
1776 E. 17th St.
Cleveland 14, O.

Products:

Electronics training programs designed for industry covering automation, instrumentation, industrial electronics, computers, radar, telemetry, FCC License preparation, pulse circuitry, aviation electronics, servomechanisms and communications.

In Attendance:

Ralph J. Schmotzer, Manager, Market Research and Advertising
Kenneth Ede, Assistant to the President

Booth 319

MALCO MFG. COMPANY
4025 W. Lake Street
Chicago 24, Ill.

Manufacturers of:
WASP Connectors
Wrap-A-Wire Connectors
Printed Circuit Hardware
Solder Lugs
Solderless Terminals

In Attendance:

Richard Krause, General Manager
George W. Roth, General Sales Manager
Walter N. Christiansen, Eastern Regional Sales Manager
Howard F. Wilson, Consulting Engineer
Raymond Hanus, Customer Service
Felix Keller, Sales Engineer
John L. Richardson, Office Manager
William Spencer, Assistant Purchasing Agent
Walter J. Kulins, Advertising Manager

Booth 320

ASSOC. AMER. WINDING MACHINERY
750 St. Ann's Ave.
New York 56, N. Y.

Products:

High speed bobbin winding
Semi-automatic stick winding
Fully automatic winding, bonding, lead tining, lead forming of single layer air wound coils.

In Attendance:

L. I. Guttman, President
George Embree, Sales Eng.
Dick Hanlon, Sales Eng.
Adolf Bohn, Sales Eng.
Max Boetschi, Chicago Branch Mgr.

Booth 321

MAGNETIC METALS COMPANY
Hayes Ave. at 21st St.
Camden 1, N. J.

Products:

Tape Wound Cores
Moly Permalloy Dust Cores
Transformer Laminations
Motor Laminations
Electromagnetic Shields

In Attendance:

C. L. Moyer, Mgr., Midwest Sales
W. T. Mitchell, Chief Electrical Engr.
R. E. Walters, Sales Consultant

Booth 322

CANNON ELECTRIC COMPANY
3208 Humboldt Street
Los Angeles 31, Calif.

Products:

Full line of Cannon Plugs including coaxials, hermetics, umbilicals, miniatures, printed circuit and rack and panel. Microminiature connectors. Connectors with rear-release retention system. Solenoids and magnetic devices.

In Attendance:

Alden C. Olsen, Western Regional Sales Manager
Ed Logan, District Sales Manager
Don Wilds, Sales Engineer
George Brady, Sales Engineer
Bob Borden, District Sales Manager
Joe Vatter, District Sales Manager
Jim Gillen, Sales Engineer
Harry Kane, District Sales Manager
Don Smith, Sales Engineer

Booth 323

BELDEN MANUFACTURING CO.
415 S. Kilpatrick Ave.
Chicago 44, Ill.

Products:

Manufacturers of Audio cables, Bonding cable, Broadcast Audio cable, Coin Operated Phonograph cable, Hook-Up Wire, Intercom System cables, Magnet Wire, Microphone cable, Mil Spec wire, Strain Gauge wire, Teflon Hook-Up wire, Portable Cordage and Cord sets, Lead wire.

In Attendance:

Les A. Thayer, Vice President-Sales
Warren M. Stuart, Sales Manager
Charles Atwater, Sales Training Manager
Wayne Hernly, District Manager
Hoyne Howe, District Manager
Charles Schreyack, District Manager
Les Bennett, Salesman
G. Shirreffs, Salesman
Myron Dare, Salesman
Jim Eaton, Chief Engineer
R. Hurban, Engineer
R. Jacky, Engineer
R. Sharp, Engineer
J. Wessell, Engineer
J. C. Belden, Jr., Secretary
H. W. Clough, Vice President Marketing
C. S. Craigmile, President
Robert Hawkinson, Vice President-Engineering
C. W. Hudon, Vice President-Treasurer
W. A. Rudolphsen, Vice President-Manufacturing
John McEwen, Manager, Advertising & Sales Promotion
Donald J. Walsh, Manager, Sales Service
Warren Howe, Manager, Marketing Analysis
J. Barthelmy, Ass't Mgr. Advertising & Sales Promotion

Booth 326

GRAYHILL, INC.
561 Hillgrove Avenue
La Grange, Ill.

Products:

Miniature rotary and push button switches, concentric shaft switches, custom switches, binding posts, push posts, transistor sockets, and coil forms.

In Attendance:

John M. Kikta, Chief Engineer
Gene R. Hill, Chief Production Engineer
Alan W. Kramer, Industrial Sales Manager
Gene Kennedy, Sales Engineer
William L. Fitzsimmons, Sales Engineer
David Holdsworth, Sales Engineer
Clifford J. Reesman, Advertising Manager
Ralph M. Hill, President
W. B. Hill, Treasurer
Bill Kobernus, Engineer
Tom O'Malley, Engineer
Don Kikta, Engineer
Pat Patterson, Production Engineer
Don DeShazo, Production Engineer
Lowell Erickson, Purchasing Agent
Phil Tylin, Sales Engineer
Casey Skvorc, Production Engineer
Al Urban, Production Engineer
Dave Foskett, Sales Engineer
George Scherry, Sales Engineer

Booth 327

BAIRD-ATOMIC, INC.
33 University Road
Cambridge 38, Mass.

Products:

Baird-Atomic will exhibit transistor test equipment and cold cathode tubes.

In Attendance:

Sy Futran, Product Development-Commercial Products
Sam Kenton, Product Sales Manager-Electronic & Special Products
Michael O'Malley, Engineer

Booth 328

ESTERLINE ANGUS INSTRUMENT CO., INC.
P. O. Box 596
Indianapolis 6, Ind.

Products:

Graphic Recording Instruments
Two-Channel Recorder
Analog-Event Recorder
Recorder with Digital Readout
Rectilinear Recorders

In Attendance:

Hugh Cameron, Sales Manager
Jim Gall, Application Engineer
Paul Lawall, Advertising Manager
Maurice Eastin, President
Diamond Dickey, Representative

Booth 330

WESTON INSTRUMENTS
Division of Daystrom, Incorporated
614 Frelinghuysen Ave.
Newark, N. J.

Products:

Relays—Elec'l Panel
Meters—Calibration Equipment
Laboratory Standards—Resistors—Potentiometers—Photocells

In Attendance:

L. H. Aricson, General Manager
H. L. Russell, Director of Marketing
E. G. Nichols, New Products & Market Development Mgr.
J. D. MacNamara, General Sales Manager
W. E. Matchett, Regional Sales Manager
J. H. Ruiter, Sales Promotion Manager
John Parker, Exhibit Manager
J. V. Stegenga, Product Manager
D. H. McGalliard, Product Manager
E. J. Stulpin, Product Manager
J. M. Edmonds, Product Manager
E. T. Higgons, District Manager
G. A. Dunn, Sales Engineer
W. Katt, Sales Engineer
C. G. Ketel, Sales Engineer
C. G. Miller, Sales Engineer
R. Perry, Sales Engineer
A. M. Schenone, Sales Engineer

Booth 331

UNIVERSAL MANUFACTURING CO., INC.
1168 Grove Street
Irvington 11, N. J.

Products:

Toroidal Coil Winding Machines
1. Model "S" Machine, with photoelectric digital read out counter and interchangeable winding heads.
2. Model LS-1 Machine, Bench Model with photoelectric counter and interchangeable winding heads.
3. Model U-14 Machine—Heavy winding machine #7 to 20 wire, 14″ O.D.
4. Model TVW-4 Machine—Automatic four segment vertical deflection yoke winding machine.

In Attendance:

William A. Bernau, President
Anthony O. Vicari, Sales Manager
Frank Tatro, (Chicago Representative)
Ted Bernau, Supervisor Toroid Machine Dept.

Booth 333

CARLSON ELECTRONIC SALES
7448 No. Harlem Ave.
Chicago 48, Ill.

Products:

1. Babcock Relays, Inc., Miniature Relays
2. Inland Motor Corp. of Va., DC Torque Motors & Amplifiers
3. Instrument Development Labs., Rotary Switches, Slip-Ring Ass'y.
4. WacLine, Inc., Panel Meters
5. Sanders Associates, Tri-Plate Microwave Components
6. North Atlantic Industries, Phase Angle Voltmeters & Ratio Boxes Converters
7. Microdot-Lerco Division, Cable, Connectors & Terminals
8. Con-Elco Div. Edcliff Instr., Trimming Potentiometers
9. ESC Electronics Corporation, Delay lines & Filters

In Attendance:

Carl Martin (Babcock), Vice President, Sales
Frank Joseph (Inland Motors), Application Engineer
Fred Gerring (Instr. Dev. Labs), Sales Engineer
William Winger (WacLine), Ass't Sales Manager
Charles Bucci (Sanders), Application Engineer
Phil Greenstein (North Atlantic), Instrumentation Sales Manager
Frank Criswell (Lerco), Sales Manager
Paul Lee (Con-Elco), Sales Manager
R. E. Mottola (ESC Electronics), Sales Manager

Booth 334

LEESONA CORPORATION
333 Strawberry Field Road
Warwick, Rhode Island

Products:

1. Leesona No. 116 Bachi Automated Bobbin Winder . . . Multi-head automatic coil winder that starts, tapes start lead, winds, waxes finish lead, ejects and sorts bobbin coils.
2. Leesona No. 115 Bachi Bobbin Coil Winder . . . Single-head bobbin coil winder featuring precision layer wound coils.

In Attendance:

W. T. Crocker, Manager Coil Winding Division
W. L. Rainford, District Manager
Robert Bachi, President, Bachi Company

Booth 337

THOMAS PUBLISHING COMPANY
461 Eighth Avenue
New York 1, N. Y.

Products:

Three services . . .
Thomas Register of American Manufacturers—annual directory of American industry.

Thomas Micro-Catalogs—catalog data retrieval system on microfilm cards.
Industrial Equipment News—monthly product news and information service.

In Attendance:

F. Morse Smith, V.P., Industrial Equipment News
R. C. Duff, V.P., Thomas Publishing
J. R. Huxley, V.P., Thomas Publishing
C. A. Burton, Representative, Thomas Publishing
E. Burton, Representative, Thomas Publishing
R. Baum, Representative, Thomas Publishing
J. Hynes, Representative, Thomas Publishing
A. Irvine, Representative, Thomas Publishing
J. Crawford, Representative, Thomas Publishing
J. Barry, Representative, Thomas Publishing
A. Marcenkus, Representative, Thomas Publishing
D. Slayton, Representative, Thomas Publishing
K. Arneman, Representative, Thomas Publishing
S. Miller, Representative, Thomas Publishing
J. A. Moloney, Representative, Thomas Publishing
J. W. Moss, Editor, Industrial Equipment News

Booth 343

U.S. SEMCOR, Solid State Divn.
Nuclear Corp. of America
3540 W. Osborn Road
Phoenix 19, Arizona

Products:

Temperature Compensated Reference Elements
Silicon Zener Diodes, Tolerances 10% through 1%
Silicon Glass Zener Diodes and Glass Computer Diodes
Silicon Rectifier Diodes
Solid Tantalum Capacitors, Polarized and Non-Polarized
Wet Tantalum Capacitors
Special Devices for Critical Applications
Military Approved Zener Diodes and Solid Tantalum Capacitors

In Attendance:

B. W. Gilmore, Vice President
R. H. Pridmore, Sales Manager
S. H. Kenyon, Factory Sales Manager
W. D. Carveth, Eastern Regional Mgr.
J. A. Toward, Midwest Regional Mgr.
G. D. Bayler, Western Regional Mgr.
R. R. Rutherford, Manager, Production Engr.

Booth 400

C. P. CLARE & COMPANY
3101 W. Pratt Blvd.
Chicago 45, Ill.

Products:

Clareed Control Systems Components for Counting, Selection and Logic
Mecury Wetted Contact Relays
Stepping Switches
Crystal Can Relays
Telephone Type Relays
Mercury Wetted Contact Coaxial Relays

In Attendance:

William F. Eich, Central District Sales Manager
Nord Onstad, Sales Engineer
William Vogel, Sales Engineer
Richard T. Paul, General Office Sales Engineer
Joseph Lobes, Customer Service
Roy Ekstedt, Project Engineer
Wyman Deeg, Senior Project Engineer
J. R. Stone, General Sales Manager
M. E. Prichard, Vice President—Operations
Robert Lydon, Advertising
R. L. Williams, Marketing Division

Booth 401

"FREON" PRODUCTS DIV.
E. I. du Pont de Nemours & Co. (Inc.)
Wilmington 98, Del.

Products:

"FREON" solvents for ultrasonic cleaning, vapor degreasing, etc.

In Attendance:

J. C. Feldmann, Manager, Solvent Sales
J. H. Grant
F. B. Hill
D. L. Schultz
C. B. Jacobson
J. C. Dilts, Advertising Assistant

Booth 404

SOLID STATE PRODUCTS, INC.
One Pingree St.
Salem, Mass.

Products:

I. Semiconductors: Advanced Silicon Devices, including PNPN Controlled Switches, PNPN controlled Rectifiers, PNPN Trigistors (Base Turn-off) PNPN Photrans (Photocells). Also—NPN Epitaxial Planar Power Transistors.
II. Sectron Output Driver Modules.

In Attendance:

R. W. Diamond, Sales Mgr.
J. McCusker, Sales Engineer
W. Schromm, Sales Engineer
R. Lucey, Sales Engineer
D. McQuillan, Sales Engineer
L. H. Dixon, Chief Applications Engineer

Booth 405

PRICE ELECTRIC CORPORATION
E. Church & Second Streets
Frederick, Md.

Products:

Electro-magnetic relays and relay assemblies

In Attendance:

R. J. Harrant, Vice President
T. McLaughlin, Sales Manager
D. B. May, Sales Engineer
R. C. Whitmore, Sales Representative
E. A. Hutchinson, Sales Representative
T. Diener, Sales Representative
R. Horst, Sales Representative

Booth 406

SENSITIVE RESEARCH INST. CORPORATION
310 Main Street
New Rochelle, N. Y.

Products:

Model FC Fluxmeter Calibrator Model ESX Expanded scale electrostatic voltmeter with 1 x 10^{14} input impedance Type 9180 5 figure DC vernier precision potentiometer, Model LDV Portable DC-AC RMS Voltmeter .05% accurate. Model CS Portable push button current calibrator .05% accurate. Primary Standards, portable and panel electrical indicating instruments and accessories.

In Attendance:

Ronald Wangerin, Sales Engineer
Yale Saffro, Saffro Associates
Art Sabitt, Saffro Associates
LeRoy Polz, Saffro Associates

Booth 407

CENTRALAB, THE ELECTRONICS DIV. OF GLOBE-UNION, INC.
900 East Keefe Avenue
Milwaukee 1, Wis.

Products:

Variable Resistors
Rotary Switches
Packaged Electronic Circuits
Capacitors
Engineered Ceramics

In Attendance:

Vern A. Kamin, Vice-President, Centralab
Walter E. Peek, Vice-President, Centralab
Frank L. Apple, Advertising Manager, Centralab
Richard F. Anderson, Asst. Advertising Manager, Centralab
Fred L. Tiegs
A. A. McDonald
F. Peter Perlini
Earl T. Champion
John Merchant
Jerry Vrbik
Robert W. Frank
Leslie M. DeVoe
Sam Hagenian
Richard Streng
Lee Price
Richard C. Taylor
Mike Roth

Booth 408

JAMES ELECTRONICS, INC.
4050 N. Rockwell Street
Chicago 18, Illinois

Products:

Mechanical Choppers, "PHOTOCOM" Choppers, "MICRO-SCAN" Relays, Precision Shielded Transformers, Miniature Transformers.

In Attendance:

John A. Kennedy, President
Robert C. Canning, Vice President
Robert M. Vaulman, Sales Engineer
Gerald W. Plice, R & D Director
Bernard Sommer, Senior R & D Engineer
Don Plishka, Supervisor Product Engineer
Jess Neil, Product Design Engineer
Alfred Glawe, Manufacturing Engineer
Leo Klimek, Plant Manager

Booth 410

GENERAL MAGNETIC CORP.
10001 Erwin Ave.
Detroit 34, Mich.

Products:

Alnico permanent magnets
Genox® permanent magnets
Metallic and ceramic permanent magnetic materials with the highest commercially available coercive force.

In Attendance:

Harold C Mattes, President
Webster E. Gilman, Exec. Vice President
Ray H. Campbell, Sales Manager
Ron Hall, Chief Engineer
Ralph F. Mentzen, Adv. & Prom. Manager

Booth 411

SAN FERNANDO ELEC. MFG. CO.
1509 First Street
San Fernando, California

Products:

Manufacture capacitors, radio noise filters, precision and trimmer Potentiometers.

In Attendance:

Lyle R. Smith, General Sales Manager
Wayne Potter, Sales Engineer
Bill Dahlgren, Sales Engineer
Michael Rosenberg, Engineer

Booth 412

NEW HERMES ENGRAVING MACH. CORP.
154 W. 14th St.
New York 11, N. Y.

Products:

The largest manufacturer of portable and bench type engraving machines in the world. Air actuated feed for rapid drilling of printed circuit plates, for making name plates, panels, dials, tags, signs.

In Attendance:

Henry Susskind, Vice President, Sales Mgr.
George Berland, Vice President, Sales Eng.
William C. Kamin, Chicago Representative
Bob Domito, Chicago Representative

Booth 413

LENZ ELECTRIC MFG. CO.
1751 N. Western Avenue
Chicago 47, Ill.

Products:

ELECTRICAL CABLES AND WIRE TO COMMERCIAL AND MILITARY SPECIFICATIONS for Manufacturers of component parts, electronic equipment, intercommunications, microphones, microwave communications systems, television test instruments, P. A. systems, radio and recorders, sound systems, stereo record changers, computers.

In Attendance:

Philip C. Lenz, Chairman of the Board
Raymond J. Sauer, President and Treasurer
R. G. Zender, Executive Vice President
Frederick K. Stamm, Secretary and Assistant to President
Hank Ratke, Sales

Booth 414

HEWLETT-PACKARD CO.
1501 Page Mill Road
Palo Alto, Calif.

Products:

True RMS Voltmeter—Level Output Signal Generator
High Frequency Wave Analyzer—Solid State Modulator
50 MC Transistorized Electronic Counter
50 MC Oscilloscope
High Sensitivity 500 kc Oscilloscope

In Attendance:

Don Teer, Assistant Advertising Manager
Jack Nally, Regional Sales Manager
Rick Reynolds, Sales Manager
Dick Negus, Applications Engineer
Bob Heller, Applications Engineer
Dean Morton, Product Manager
Gene Warrington, Product Manager

Booth 415

W. J. MAUER CO., INC.
2000 Harrison Street
Evanston, Ill.

Products:

American Elite (Telefunken): Tube and semiconductors
Consolidated Avionics Corporation: Power supplies, printed circuit modules, digital function generator
Dynamic Measurements Company: Accelerometers, differential transformers, pressure transducers
Electronic Associates, Incorporated: Fixed and adjustable capacitors
Fostoria Corporation: Precision plastic lenses
James Electronics, Inc.: Micro-Scan relays, choppers, transformers
K. W. Johnson & Co.: Shock mounts, vibration isolators
Microdyne, Inc.: Consulting engineers
Research, Inc.: Programmers, recorders, infra-red systems and controls, hydraulic machines and systems, regulators, transducers and cabinets
Julie Research Laboratories, Inc.: Synchro and resolver standards, computer components, standards and assemblies, resistor networks

In Attendance:

Ed Abramson, V. P. Sales, Research, Inc.
Frank Sposato, Sales Manager, Con. Avionics
Richard Tobey, Sales Manager, K. W. Johnson & Co.

Robert Vaulman, Sales Manager, James Electronics, Inc.
M. J. Mauer Sr., Marketing Advisor, Mauer Co., Inc.
Lee Zygmun, Sales Engineer, Mauer Co., Inc.
Dr. W. J. Mauer, Engineer
Don L. Mauer, Sales Manager, Mauer Co., Inc.
P. T. McCaully, Engineer
E. M. Haynes, Office Manager

Booth 417

SUN ELECTRIC CORPORATION INSTRUMENT DIVISION 6323 Avondale Avenue Chicago 31, Ill.

Products:

Panel mounted electrical indicating instruments, including ruggedized and commercial (bakelite and acrylic fronts) meters. Expanded scale frequency meters and expanded scale voltmeters with free zero position to which pointer automatically comes to rest when circuit is re-energized for any reason. Meter mechanisms for aircraft navigational applications plus 250° mechanism for special application or in standard meter case. Portable VTVMs (1% and 2%)-Specialty apparatus.

In Attendance:

Roy Putnam, V. P.-Director, Instrument Division
Bob Esvang, Sales Manager, Instrument Division
O. L. Rhoades, Chairman of the Board
Russ Malik, President
Fred Bender, V. P.-Director of Engineering
Maurie Shine, V. P.-Director of Manufacturing
Bob Theis, Chief Electronic Engineer
Miles Kunz, Chief Instrument Engineer
Ralph Morrison, Chief Industrial Engineer

Booths 418-420

CROSSLEY ASSOCIATES, INC. 2501 West Peterson Ave. Chicago 45, Ill.

Manufacturer's Representatives for:

Baldwin-Lima-Hamilton Corp. (Electronics & Instrumentation Division)
Boonton Radio Corporation
Dymec, Div. of Hewlett-Packard Company
Electro Products Laboratories
Harrison Laboratories, Inc.
Hewlett-Packard Company
F. L. Moseley Company
Palo Alto Engineering Company
Sanborn Company
Watkins-Johnson Company

Products:

Q-Meters; VHF Impedance Meters; Signal Generators; Test Equipment for Low Frequency Audio, RF, VHF, UHF, Microwave Ranges and Frequency Standards; FM Stereo Modulators; Digital Systems and Components; Microwave Test Sets; X-Y Recorders; Strip Chart Recorders; Direct Writing Oscillographic Recorders; Recorder Accessories; Strain Gages; Load Cells; Pressure, Force and Torque Transducers; Thermocouples; Strain Gage and Transducer Instrumentation; Proximity and Magnetic Transducers; Transistorized Tachometers; Regulated Power Supplies; Digital Voltmeters; Frequency Converters; Microwave Tubes, Components and Test Equipment.

In Attendance:

Chicago Office:
Frank Waterfall, President
Walt Wallin, Vice-President
Bill Harmsen, Business Manager
Fred Nearing, Regional Manager
Phil Conway, Regional Manager
Zeke Sadler, Regional Manager
George Zering, Field Engineer
Jim Addy, Field Engineer
Phil Wolf, Field Engineer
Don Overton, Staff Engineer
Gordon Kennett, Service Manager
Ron Dopke, Parts Manager
Fred Harvey, Staff Assistant
Dayton Office:
Dick Pitner, Branch Manager
Chuck Grohler, Field Engineer
Indianapolis Office:
Bob Arbuckle, Branch Manager
Jack Staite, Field Engineer
St. Paul Office:
Tony Pierce, Branch Manager
Woody Meyer, Field Engineer

Booth 419

SANBORN COMPANY 175 Wyman Street Waltham, Mass.

Products:

Oscillographic Recorders, Tape Recorders, Optical Recorders, Amplifiers and Transducers.

In Attendance:

S. Bilowich, Sales Manager
E. D. Pulsifer, Area Sales Manager

Booth 421

BOONTON RADIO CORPORATION Green Pond Road Rockaway, N. J.

Products:

Precision electronic laboratory instruments including Q Meters, RF Bridges, Signal Generators and Aircraft Navigation Calibration Equipment. Featured NEW products include a Low-Distortion 54-216 MC FM-AM Signal Generator, an FM Stereo Modulator, and a 10-500 MC Signal Generator Power Amplifier.

In Attendance:

Dr. G. A. Downsbrough, President
John Van Duyne, Engineering Manager
Harry J. Lang, Sales Manager

Booths 422-424

F. L. MOSELEY CO. 409 N. Fair Oaks Ave. Pasadena, Cal.

Products:

X-Y Recorders, Strip Chart Recorders, Curve & Line Followers, Servo Voltmeters, Logarithmic Converters, AC-DC Converters & Waveform Translators.

In Attendance:

James H. Burnett, Marketing Manager
Myron H. Hunt, Sales Manager
Marshall K. Hiner, Sales Engineer
Bruce G. Hall, Sales Engineer
Frank H. Beardsley, Chief Engineer

Booth 425

ELECTRO INSTRUMENTS, INC. 8611 Balboa Avenue San Diego 12, Cal.

Products:

Digital Voltmeters, Ohmmeter and Ratiometers
Graphic Recorders
Wide band DC Amplifiers
Monitor Oscilloscopes
Digital Data Loggers

In Attendance:

Rollo Flemons, Vice President Sales
Creighton Webb, Sales Manager
Stan East, Regional Sales Manager
Bud Edelman, Director of Marketing
Bob Beaudette, Advertising Manager
Bernie Halliwell, Sales Engineer
Bob Dambach, Sales Engineer
Glen Walls, Service Engineer
Jim Sutter, Sales Engineer
Rice White, Sales Engineer

Booths 429, 431 & 433

CONTROL DATA CORPORATION 8100-34th Ave. South Minneapolis 20, Minn.

Products:

Control Data will demonstrate live its 160-A Computer, 161 Electric Typewriter, new 606 magnetic Tape Transport, and new 166 Buffered Line Printer. A variety of routines, documented for hand-out will be run on this equipment.

In Attendance:

M. R. Kaiser
D. A. Ballstadt
J. T. Coyne, Advertising
R. D. Shober
J. A. Resca, Regional Mgr.
G. H. Larsen, Sales Engineer
R. M. Olson
C. L. Ricker, District Mgr.

Booth 430

RUSS DIETHERT COMPANY, INC. 2030 West Montrose Avenue Chicago 18, Ill.

Products:

Manufacturers' Representative for:

Dilectrix Corporation—Cast teflon film—plain, heat sealable adhesive backed, aluminum metallized and fabricated containers.

Frenchtown Porcelain Co.—Ceramics including Alumina, Beryllia, Sapphire, Quartz and Ceramic to Metal Seals.

Instrument Specialties Co., Inc.—Beryllium copper—springs (flat and coil) electrical contacts, stampings, and screw machine parts.

Moxness Products, Inc.—Silicone rubber—molded and extruded, and molded fluorocarbon products.

Northwest Plastics, Inc.—Custom molding in thermosetting and thermoplastic materials, and electrical component housings.

Rayclad Tubes, Inc. — Thermofit heat shrinkable polyolefin and teflon tubing, component encapsulation and harness encapsulation.

Raychem Corporation—Irradiated polyolefin hook-up wire, multi-conductor cable, and coaxial cable.

Peter J. Schweitzer Co.—Electrolytic tis-

sue, zinc metallized tissue, and paper for capacitors and coils.

Seal-A-Metic Company—Glass to metal seals—multipin headers, grid headers, diode housings, crystal bases, and transistor bases.

Sealectro Corporation — Press-Fit teflon insulated wiring terminals, Conhex RF subminiature connectors, and Sealectoboard programming boards.

Sexton Can Company—Component housings—fabricated and drawn from steel and brass.

Steel Heddle Mfg. Co.—Flattened wire tab stock and foil—aluminum tinned copper, and stainless steel—aluminum core boxes.

In Attendance:

Russ Diethert Company, Inc.
Russ Diethert, President
David Baldwin, Vice President
Fred Thiets, Salesman
Owen Jones, Salesman
Joe Dassing, Salesman
William J. Collins, Salesman
Robert Dotson, Salesman
Instrument Specialties Company, Inc.
Jim Roberson, Sales Manager
Frenchtown Porcelain Company
W. C. Beidelman, Assistant Sales Manager
Moxness Products, Inc.
Wilfred Lynch
Rayclad Tubes, Inc.
Damon Simpson, Technical Representative
George Irwin
Paul Sherlock
Steel Heddle Mfg. Company
Floyd E. Justice, Jr.
Sealectro Corporation
George Mohr
Milan Robich
Bill McNulty
Dilectrix Corporation
Michael Zangrillo
John Petriello
Seal-A-Metic Company
Malcolm Pelton
George Filchak

Booth 435

ELECTRONIC NEWS
7 East 12th Street
New York 3, N. Y.

Products:

Newspaper

In Attendance:

Henry Zwirner, Midwest Director
Zach Dicker, Sales Representative
Wade Fairchild, Publisher
Dan Newman, Ad Manager
Joseph Damico, Sales Promotion Manager

Booth 436

ALPHA METALS, INC.
56 Water Street
Jersey City 4, N. J.
ALPHALOY CORPORATION
2250 S. Lumber St.
Chicago 16, Ill.

Products:

Cen-Tri-Core Rosin Filled Solders, "Vaculoy"* Bar Solders, Fluxes, Solder Preforms, Ultra High Purity Spheres, Discs and Washers for Semiconductors, "CCC"* Coated Metal Strip, Base Tabs.
*Trademark

In Attendance:

Martin A. Boyle, Vice President
Harold A. Cohn, Vice President
William J. Hasek, Research & Quality Control
Allen Shargel, Sales Engineer
Michael Sleppin, Sales Engineer
Morris Wolin, Sales Engineer
Roy Bouda, Sales Representative
Louis Bruns, Sales Representative
William E. Burgoyne, Sales representative
Gene Clouse, Technical Representative
Gene Zaiser, Sales Representative

Booth 437

VACUUM-ELECTRONICS CORP.
Terminal Drive
Plainview, L. I., N. Y.

Products:

High and Ultra-High Vacuum Systems and Components; Leak Detectors, Evaporators, Residual Gas Analyzers, ELECTROMETERS.
EL-1 Electrometer
VE-401 Automatic High Vacuum Evaporator
GA-3 Residual Gas Analyzer
tion
TC-9 Automatic Vacuum Indicator/Controller
MS-9 AB Mass Spectrometer Leak Test Station
An exhibit of Veeco Tubes, Gauges, Valves and other High Vacuum Components

In Attendance:

William R. Meoli, Vice President
Marvin Eisenberg, Field Sales Manager
Donald J. Levinthal, Mid-America Regional Manager
Burchard M. Day, Mgr. Advertising & Public Relations
George F. Lawrence, Field Engineer

UHV-2 Ultra-High Vacuum Pumping Sta-
R. Dale Scott, Field Engineer
Douglas Lund, Field Engineer
Robert Yarbrough, Field Engineer

Booth 438

H. BRAUN TOOL & INSTRUMENT CO., INC.
140 Fifth Avenue
Hawthorne, New Jersey

Products:

Specialists in Beryllium Copper Precision Metal Stampings.

In Attendance:

W. K. Lange, President
W. A. Lange, Vice President
H. O. Kellerman, Production Manager
R. C. Boderck, Sales Manager
A. A. Ainsworth, Sales Engineer
A. V. Doran, Sales Representative

Booth 442

TELETYPE CORPORATION
5555 Touhy Avenue
Skokie, Ill.

Products:

Model 29 4-Row Keyboard Page Printer. 8 Level High Speed Tape to Tape Dataspeed 1050 Words per Minute—CX Reader and BRPE Punch.

In Attendance:

R. R. Bogdan, Product Sales Supervisor
G. G. Keyes, Product Sales Supervisor
R. A. Larsson, Chief Exhibiting & Marketing
D. J. Bobka, Sales Engineer
R. Sersen, Sales Engineer
L. W. Holtz, Sales Promotion Representative
E. E. Borys, Equipment Technician

Booths 500, 504, 506, 508

SPRAGUE ELECTRIC COMPANY
Marshall St.
North Adams, Mass.

Products:

NIOBIUM: Pulse Transformers; Indistors. PRODUCTS: Cordwood Components; ACROSIL® Resistors; ECDC, SPAT & MADT Transistors; Piezoelectric Ceramics; PACER®, Transmitting Mica, Micro-sized ceramic capacitors; Tantalum capacitors; Decade Inductors; Styracon® Precision capacitors. CERACIRCUITS: Thyracontrol; Silicontrol SCR; Control Packages.

In Attendance:

Neal W. Welch, Senior Vice President—Marketing and Sales
Carroll G. Killen, Vice President—Industrial and Military Sales
Sidney L. Chertok, Manager, Advertising and Sales Promotion
Albert H. Postle, Manager, Commercial Engineering
Albert B. Dall, Marketing Manager—Transistors
Leonard H. Wurzel, Marketing Manager—Resistors
Robert R. Jay, Manager of Product Marketing
Richard D. Tatro, Manager Application Engineering
Henry D. Hazzard, Product Specialist—Electrolytic Capacitors
Robert R. Warriner, Military Application Specialist
Walter M. Lamphier, Product Specialist
Jerrold D. Kowalski, Field Engineer
Harold Brafman, Product Specialist
Richard W. Young, Product Specialist
Ansel G. Ostrand, District Manager
Irving J. Kahan, District Manager
Edwin F. Pionkowski, Sales Engineer
Lawrence E. Cox, Sales Engineer
Robert L. Farnsworth, Regional Resistor Product Specialist

Booths 501, 505-507

THE SUPERIOR ELECTRIC COMPANY
383 Middle Street
Bristol, Conn.

Products:

POWERSTAT Variable Transformers, STABILINE Automatic Voltage Regulators, SOLIDSTAT Variable Voltage Controls, SLO-SYN Synchronous Motors and Translators, SUPERCON Electrical Connectors, SUPERIOR 5-WAY Binding Posts, DUB-L-PLUG Dual Electrical Connectors.

In Attendance:

J. S. Louden, Vice President for Sales
R. J. Caccavelli, District Manager
J. M. Russell, Field Engineer
J. C. Fitzgerald, Field Engineer
R. E. Spencer, District Manager
F. A. Molander, Exhibit Manager
R. F. Graham, Advertising Manager
A. D. Childs, Exhibit Coordinator
D. H. Thies, Exhibit Coordinator

Booth 509

AMP INCORPORATED
Eisenhower Blvd.
Harrisburg, Pa.

Products:

Maintainable Electronic Component Assemblies (AMP-MECA)
Termashield & Coaxial Connectors
AMPin-cert Pin & Socket Connectors
AMPin-cert Printed Circuit Edge Connectors
Patchcord Programming Systems
Capacitors & Panel Forming Networks
Multiple Apenature Devices (AMP-MAD)
Solderless Terminals

In Attendance:

Tom Wells, District Sales Engineer
Sel Friedlander, District Sales Engineer
Roy Hansen, District Sales Engineer
Dick Dexter, District Sales Engineer
Herb Nolan, District Sales Engineer
Bill Butler, Product Specialist
Oscar Rudolph, District Sales Engineer
Jack Norrie, District Sales Engineer
Don Springer, District Sales Engineer
Dick Kerman, District Sales Engineer
Jack Miller, District Sales Manager
Louis Clemens, Field Engineer
Raab Sechrist, Field Engineer
David Hajjar, Sales Promotion Manager
Jesse Taylor, III, Assistant to the Sales Promotion Manager
F. E. Howell, Vice President of Industrial Sales Div.
O. W. Holmes, Director of Product Sales Managers
W. B. Conner, Field Sales Manager
C. L. Stoup, Director of Sales Planning

Booth 510

VECTROL ENGINEERING, INC.
A Division of
SPRAGUE ELECTRIC COMPANY
85 Magee Avenue
Stamford, Conn.

Products:

SILICONTROL®; Firing Control; Packages for Silicon Controlled Rectifiers

In Attendance:

Gilbert B. Devey, Marketing Manager
Edward C. Jones, Sales Engineering Manager
Paul Maynard, Sales Engineer

Booth 512

SOLA ELECTRIC
1717 Busse Rd.
Elk Grove Village, Ill.

Products:

1. Standard 60 and 400 cycle Constant Voltage Transformers.
2. 60 cycle and 400 cycle Solatron Line Voltage Regulators.
3. DC-AC Power Supplies.
4. QSA Transistorized DC Power Supplies.

In Attendance:

Dick Jandl, V. P. Sales—Mkt.
Ralph Schlote, Field Sales Mgr.—Electronics
Clem Czapinski, Mgr.—Marketing Services
J. McGuire, V. P.-General Mgr.
D. McDonald, V. P.—Engineering
B. Jenkins, Sales Engineer
A. Steichen, Product Mgr.—Electronics

Booth 515

MEASUREMENTS
A McGRAW-EDISON DIVISION
Boonton, N. J.

Products:

Electronic test instruments, i.e. signal generators, deviation meters, frequency meters, square wave and pulse generators, bolometer bridges, Megacycle Meter.

In Attendance:

H. W. Houck, Vice President and Division Manager
N. W. Gaw, Jr., Chief Engineer
J. G. Ingalls, Advertising Manager

Booths 516-20

ALLIED ELECTRONIC CORPORATION
100 N. Western Avenue
Chicago 80, Ill.

Products:

Manufacturer and Distribution of Knightkit test equipment, audio hobby and communications equipment. Industrial distribution of electronic components.

In Attendance:

M. Bond, Sales Manager
R. Welch, Field Sales Mgr.
Geo. Smolinski, Field Sales Mgr.
Dan O'Meara, Regional Sales Mgr.

L. Brooks, Sales Engineer
M. Towler, Sales Engineer
J. Faulis, Sales Engineer
J. Rogers, Sales Engineer
H. Niszla, Sales Engineer
R. Gumm, Sales Engineer
R. Weisz, Sales Engineer
H. Mitchell, Sales Engineer
E. Bezronhoff, Sales Engineer
C. Stone, Sales Engineer
E. Douglas, Sales Engineer
C. Coren, Jr., Sales Engineer
R. Baldwin, Sales Engineer
P. Coolbaugh, Sales Engineer
M. VanAnsdale, Sales Engineer
J. Lyman, Sales Engineer

Booth 517

NIPPON ELECTRIC CO., LTD.
2 Shiba Mita, Shikoku-machi
Minato-ku Tokyo, Japan

Products:

Semiconductor Devices and Electron Tubes

In Attendance:

J. Mizutani, Assistant General Manager Overseas Operation Div.

Booth 519

MAGNETIC SHIELD DIVISION
PERFECTION MICA COMPANY
1322 N. Elston Avenue
Chicago 22, Ill.

Products:

NETIC and CO-NETIC alloys, sheet and foil, for magnetic shielding applications; shields for cathode ray, photomultipliers, data storage, scan converter and other display tubes; special design shields for magnetically sensitive components ranging from miniature sizes and up; tape transport and storage containers, including new sectional cabinet design; special shields featuring close dimensional control for retrofit applications.

In Attendance:

Glenn L. Powers, Sec. Treas.
Glenn Vance, Pres.
C. M. Jorgensen, Chief Engr.
Myron Colman, Plant Mgr.
Henry Hucksold, Sales Engr.
James Shafer, Sales Engr.

Booth 521

SIGMA INSTRUMENTS, INC.
170 Pearl Street
So. Braintree 85, Mass.

Products:

Sensitive Relays
General Purpose Relays
Industrial Relays
Military Relays
Magnetic Amplifiers
Temperature Controls
Magnetic Amplifier Controls
Cyclonome® High-Speed Motors
Stepping Switches

In Attendance:

John Spitzer, Marketing Services Manager
Clifford Heller, District Sales Manager
Robert Wolf, Sales & Marketing Manager
Waldo Holcombe, Application Engineering Manager

Booth 522

DAVENPORT MANUFACTURING DIVISION
DUNCAN ELECTRIC COMPANY, INC.
4363 West Montrose Avenue
Chicago 41, Ill.

Products:

Regulated Power Supplies
H. V. Power Supplies
Test Instruments
AC Voltage Regulators

In Attendance:

D. A. Davenport, Division General Manager
J. Rzeczkowski, Chief Engineer
W. Crawford, Sales Manager
Diamond Dickey, Representative
J. Fell, Representative
M. L. Potter, Representative

Booth 524

BIRD ELECTRONIC CORP.
30303 Aurora Road
Cleveland 39 (Solon), Ohio

Products:

THRULINE® RF Directional Wattmeters
TERMALINE Coaxial RF Loads and Load-Wattmeters
COAXWITCH® Coaxial Switches
Hi-pass, Lo-pass, and Band-pass Coaxial RF Filters

In Attendance:

J. H. James, V. P. Sales
F. B. Smith, V. P. Engineering
H. E. Stevens, Chief Engineer
W. S. Blackman, Director Advertising
W. H. Jaegar, Application Eng.
R. C. Chakarian, Project Eng.

Booth 525

AUTOMATIC ELECTRIC CALES CORPORATION
400 North Wolf Road
Northlake, Ill.

Products:

Relays, including Micro-Miniature, Wire Spring, Magnetic Latching and Mercury-Wet ted Contact relays. Rotary Stepping Switches. Sub Assemblies. Automatic Control Systems.

In Attendance:

D. W. Buehrer, District Manager
J. W. Ayers, Director, Military Equipment Sales
R. A. Gibson, Staff Engineer
H. E. Nelson, Staff Engineer
J. M. Bernstein, Staff Engineer
J. B. McCrumb, Staff Engineer
D. A. Dibbern, Assistant to Director of Control Equipment Sales
O. B. Ellison, Salesman
E. J. Brizzolara, Salesman
W. H. Breeden, Salesman
R. J. Bell, Salesman

Booth 528-532

COIL WINDING EQUIPMENT CO.
Railroad Plaza
Oyster Bay, N. Y.

Products:

Coil winding equipment and accessories ranging from the newest developments in high production and automatic equipment to versatile laboratory machines and relatively simple production designs.

In Attendance:

Howard A. George, Owner
John E. Gray, Field Engineer
Andrew Sallade, Sales Representative
Lloyd George, Sales Representative

Booth 529

ALPHA WIRE CORP.
200 Varick Street
New York 14, N. Y.

Products:

Manufacturer of electronic wire and cable, Alphalex insulating tubings, including many new types of irradiated heat shrinkable tubing, heat shrinkable molded shapes, temperature indicating materials.

In Attendance:

Jack Kirschbaum, Vice President—Sales
Nat Frost, Industrial Sales Supervisor
Al Bruning, Salesman
Russ Gawne, Salesman

Booth 531

CONFORMING MATRIX CORPORATION
830 New York Avenue
Toledo 11, O.

Products:

Production equipment to apply both fluid coatings and powdered rezin coatings to electronic components.

In Attendance:

G. D. Minnick, Director of Product Development
Hamilton E. MacArthur, President

Booth 533

SWITCHCRAFT, INC.
5555 N. Elston Avenue
Chicago, Ill.

Products:

Manufacturers of: Audio phone jacks and plugs; Military and telephone long and short frame jacks; Military and telephone phone plugs; Patch Cords; Jack Panels; Extension Jacks; Button Switches; Cord Switches; Lever Switches; Telephone-type Switches; Stack Switches; Multiple-Station Push-Button Switches, illuminated and non-illuminated; Audio and Microphone Connectors; Phono Jacks and Plugs; RF Jacks and Plugs; Custom Molded Cable Assemblies; Audio and Hi-Fi Accessories; Microphone Mixers; Hi-Fi Interconnecting Cables; Hi-Fi and Audio Adapters; Educational Equipment.

In Attendance:

W. L. Larson, General Sales Manager
W. E. Dumke, Vice President Engineering
J. R. Bailey, Chief Engineer
K. Kline, Sales Engineer
D. Vilter, Sales Engineer
W. Wheaton, Sales Engineer
T. Dowell, Distributor Sales Manager
F. Dumke, Treasurer
C. Schultz, Sales Promotion Manager
J. Dana, Sales Engineer
L. Galin, Engineer

Booth 534

GOE ENGINEERING COMPANY
219 S. Mednik Avenue
Los Angeles 22, Cal.

Products:

Turret Terminals, Insulated terminal and Feed Thrus, Handles (Oval, Round and 90° Folding-type), Shaft Locks, Banana Plugs and Sockets, Taper Pin Receptacle, Terminal Boards and Resistor Boards. Above in any desired finish.

In Attendance:

Al Linke, Sales
Dick Scholfield, Sales
Doug McKenzie, Sales
Frank Bowlin, Sales
Al Holte, Sales
Don Sharp, Sales
Jim Winkelblech, Sales
Doug Denman, Sales

Booth 535

PYROFILM RESISTOR CO., INC.
U. S. Highway 46
Parsippany, N. J.

Manufacturers' Representative: Lightner Assoc., 6322 No. Milwaukee Avenue, Chicago, Illinois

Products:

Mil Styled Resistors
PyroSeal Precision Resistors
Pyromet Metal Film Resistors
PyroSeal Resistor Networks
Carbon Film Microwave Resistors
Sub-Miniature Resistors
High Voltage Resistors
High Resistance Resistors

In Attendance:

Patrick B. Daniels, Executive Vice President

Booth 536

ELLINGER SALES CORP.
6540 N. Northwest Highway
Chicago 31, Ill.

Manufacturers' Representative for:
Aerovox Corp.
Atlee Corp.
Ideal Precision Meter Co.
E. F. Johnson Co.
Triad Transformer Corp.
Waldom Electronics

Products:

AEROVOX CORP.—right angle tube sockets, ceramic capacitors, capacitors, resistors, RF noise suppression filters
ATLEE CORP.—heat reducing tube shields and inserts, component holders, transistor clips, heat sinks
IDEAL PRECISION METER CO.—panel meters, measuring instruments
E. F. JOHNSON CO.—plugs and jacks, tube sockets, knobs, insulators, inductors, amateur equipment, variable capacitors, pilot lights
TRIAD TRANSFORMER CORP.—transformers, toroids
WALDOM ELECTRONICS — title plates, knobs, dials, fasteners and other hardware

In Attendance:

Al Linke and Dick Scholfield, Sales
Doug McKenzie and Al Holte, Sales
Frank Bowlin, Sales
Doug Denman and Don Sharp, Sales
Jim Winkelblech, Sales
W. E. Burgoyne Co. (representing Aerovox), Sales
W. E. Burgoyne and Roy Bouda, Sales
Thomas B. Hunter Associates (representing Hi-Q Division, Aerovox)
Thomas B. Hunter, Sr. and Thomas Hunter, Jr.

Booths 537-539

WESTINGHOUSE ELECTRIC CORP.
Research & Devl. Center,
Beulah Road
Pittsburgh 35, Pa.

Products:

Semiconductors Devices
Electronic Tubes
Specialty Transformers
Molecular Electronic Devices
Scientific Instruments
Copper-Clad Micarta
Metals
Magnetic Cores and Coils
Cryogenic Systems

In Attendance:

J. R. Walter, Sales Development Manager, Electronic Comp. and Spec. Prod. Group
John DeFazio, Semiconductor Division
Joseph Lane
J. E. Murphy, Manager, Exhibit Section

Booth 538

GUDEBROD BROS. SILK CO., INC.
225 West 34 Street
New York 1, N. Y.

Products:

A complete line of lacing tapes and tie cords for all types of harness and lacing cabling and tying of fine coils will be exhibited. Included are tapes of nylon, dacron, teflon, glass, as well as lacing tapes made of new silica fibre to withstand temperatures in excess of 1500°. Also shown will be the new GUDE-CORD, specially developed waxed nylon for tying motors of all sizes.

In Attendance:

C. C. Schrader, Manager
F. W. Krupp, Vice President
C. E. Haigh, Sales Department
George Fedderson, Sales Department

Booth 540

KESTER SOLDER COMPANY
4201 Wrightwood Avenue
Chicago 39, Ill.

Products:

KESTER Flux-Core Solders, Solid Wire and Bar Solders
KESTER "Solderforms" (Preformed Solder)
KESTER Soldering Fluxes

In Attendance:

F. C. Engelhart, President
F. Kaiser, Executive Vice President
J. M. Johnson, "Solderform" Sales Manager
P. Barreca, "Solderform" Sales
J. Huff, "Solderform" Sales
L. Kraft, Export Manager
C. L. Barber, Research Director
R. N. Moen, Research Chemist
H. E. Knoll, District Sales Manager
R. Malik, Sales Engineer
T. V. Churbuck, Sales Engineer

Booth 542

TRANSITRON ELECTRONIC CORP.
168-187 Albion St.
Wakefield, Mass.

Products:

A cross-section of our line of Silicon transistors, diodes, rectifiers, regulators, references, controlled rectifiers and switches, micro-components, encapsulations: Germanium diodes, circuit packages, multiple semiconductor assemblies.

In Attendance:

L. King, Sales Manager
G. Little, Distributor Sales Manager
T. Clark, Product Sales Manager
J. Smith, Distributor Advertising Mgr.
W. Levine, District Manager
M. Fox, Field Engineer
J. Sturgis, Field Engineer
A. Jacobs, Field Engineer
T. McLeod, Field Engineer

Booths 601-605

R. EDWARD STEMM, INC.
5681 W. Lake Street
Chicago 44, Illinois

Manufacturers' Representatives for:
American Electronic Laboratories, Inc.
Astro Electronics, Inc.
Autotron, Inc.
F. W. Bell, Inc.
Communication Measurements Laboratory, Inc.
Computer Engineering Associates
Electronic Associates, Inc.
Electronic Engineering Co.
Electronic Measurements Co., Inc.
Empire Devices, Inc.
Engineered Electronics Co.
Harper Electric Furnace Corp.
International Resistance Co.
Lavoie Laboratories, Inc.
Metex Electronics, Inc.
Micon Electronics, Inc.
Sippican Corporation
Technibilt Corp.
Data Instruments Div.—Telecomputing Corp.
Waugh Engineering Div.—Foxboro Company
Wyle Laboratories

Products:

Analog Computers; Analog-digital conversion; Attenuators; Automatic Circuit Testers; Coaxial and Waveguide: Crystal detectors, mixers, power dividers, switches; Components (microwave and rf); Computers (analog); Computer Modules (analog and digital); Controls (electronic); Counters: Crystal Ovens; Data Transmission and Processing; Digital Voltmeters, AC & DC; Digital Modules and Systems; Frequency Meters; Gaussmeters; Generators (audio, pulse, power, signal); Instrument Carts; Noise and Field Intensity Measuring Equipment; Oscilloscopes; Packed Circuits; Power Supplies (voltage and current stabilized, programmable, variable frequency); Pulse Generators; Shielding (rf gasketing, electronic weatherstripping); Signal Generators; Spectrum Analyzers; Strip Wiring; Tape Readers and Recorders; Transducers; accelerometer, pressure, displacement, flow Welding Equipment and Services; X-Y Recorders.

In Attendance:

R. Edward Stemm, President
Richard F. Klem

Warren E. Pugh, Jr.
James O. Schock
John G. Hollister
Robert H. Johnson
Walter L. Zaida
M. E. Martin
M. T. Harges, Vice Pres., Empire Devices, Inc.
J. B. Craft, Sales Mgr., Electronic Measurements Co.
E. L. Lavine, Vice Pres., Communication Measurements Laboratory
J. G. Friedman, Sales Mgr., Lavoie Laboratories, Inc.
Harry Friedman, Sales Mgr., Micon Electronics, Inc.
W. A. Baylies, The Sippican Corporation
Richard Crepeau, Sales Mgr., Computer Engineering Associates

Booth 606

MEPCO, INC.
35-37 Abbett Avenue
Morristown, N. J.

Products:

Precision metal film, carbon film, wirewound and power resistors. Also packaged passive circuits. The product line encompasses High Reliability Resistors used in the foremost of missile and satellite programs as well as standard Mil spec. parts and commercial type resistors.

In Attendance:

Jack Mervin, District Sales Engineer
George Cooper, District Sales Engineer
Edward Mehm, Distributor Manager

Booth 607

F. W. BELL, INC.
1356 Norton Avenue
Columbus 12, O.

Products:

Gaussmeters, Magnetic Circuits, Hall devices, Digital Voltmeter, Printed circuitry, Instrumentation.

In Attendance:

F. W. Bell, President
Robert L. Delaplane, Vice President—Sales
Edward Sisson, Vice President—Research & Engineering
Raymond H. Stevens, Vice President—Semiconductors

Booths 608-610

MAGNUSON ASSOCIATES
5639 W. Fullerton Ave.
Chicago, Ill.

Manufacturers' Representatives for:
Columbus Electronics Corporation
Fairchild Semiconductor Corporation
Helipot Division, Beckman Instrument, Inc.
Industrial Electronic Engineers, Inc.
International Electronic Research Corp.
Judson Bigelow, Inc.
Magnuson Electronics, Inc.
Mepco, Inc.
Planet Instrument, Inc.

Products:

Representing:
Columbus Electronics Corporation
Double Diffused Silicon Rectifiers and Rectifier Assemblies.
Fairchild Semiconductor Corporation
See Booth 1204
Silicon Planar Transistors and Silicon Planar Diodes.
Helipot Division, Beckman Instrument, Inc.
Precision Single and Multi-Turn Potentiometers, Dials, Panel Meters, Servomotors and Assemblies, Hall Generators.
Industrial Electronic Engineers, Inc.
In-Line Digital Display Units, Binary to Decimal Converters.
International Electronic Research Corp.
See Booth 612
Heat Dissipating and Vibration Damping Tube Shields, Transistor Heat Dissipators and Heat Sinks.
Judson Bigelow Inc.
Charts and Recording Supplies for Recorders, Ocillographs and Meters. Kodak Linagraph Recording Paper.
Magnuson Electronics, Inc.
Local stocks of Fairchild Semiconductor, Helipot, Industrial Electronic Engineers, Inc. and I.E.R.C. Products.
Mepco, Inc.
See Booth 606
Precision wirewound, Carbon Film and Metal Film Resistors and Resistor Networks.
Planet Instrument, Inc.
Gearheads, Speed Reducers, Servo and Electro Mechanical Assemblies.

In Attendance:

Roy J. Magnuson, Magnuson Associates
William, E. Wenger, Magnuson Associates
Jerry J. Kasper, Magnuson Associates
George A. Meyers, Magnuson Associates
R. C. Walker, Magnuson Associates
Harry M. Grider, Magnuson Associates
Martin G. Moody, Magnuson Associates
Fred T. Kozak, Magnuson Associates

D. C. McNeely, Helipot
Karl Heller, Helipot
Frank Witte, Helipot
Harvey Riggs, IERC Division
John Markley, IERC Division
Ray Gebhardt, Mepco, Inc.
George Cooper, Mepco, Inc.
Ernie Cornelius, Planet Instrument
R. K. Burtner, Industrial Electronics Engineers, Inc.

Booth 609

REEVES-HOFFMAN DIVISION
145 Cherry Street
Carlisle, Pa.

Products:

Crystal Units, Oscillators, Ovens, Filters, Standards.

In Attendance:

C. M. Rahn, Sales Manager
F. N. Gross, Engineer

Booth 611

REEVES INSTRUMENT CORP.
East Gate Blvd.
Garden City, N. Y.

Products:

Analog Computers; Standard Resolvers; Pancake Resolvers; Size 23 Precision Synchros; Inertial Gyros; Mechanical Differentials; Servo Mechanical Components; Acceleration Switches; Antenna Pedestals; Gyro Packages.

In Attendance:

Charles Lax, Advertising Manager
Irwin B. Goldberg, Commercial Engineer
Edward Magnuson, Sales Representative
Earl Marcussen, Sales Representative

Booth 612

INTERNATIONAL ELECTRONIC RESEARCH CORPORATION
135 West Magnolia Blvd.
Burbank, Cal.

Products:

IERC DIVISION—Heat dissipating tube shields for miniature, subminiature, octal and power tubes. Transistor heat dissipators for low, medium and high power transistors featuring the new forced-air package for multiple power transistor mounting and a new low power transistor heat dissipator for thermal control of low power transistors.

ELIN DIVISION—Precision single and multiple phase AC power sources, power amplifiers, signal generators and square wave power sources.

In Attendance:

John E. Markley, Jr., Vice President (IERC), (ELIN)
John C. McAdam, Vice President-Engineering, (IERC)
Otto G. Leichliter, Director of Research & Production, (ELIN)
John Foster, Regional Sales Manager, (IERC), (ELIN)
Walter R. England, Administrator-Technical Sales (IERC)
Ted Rafalovich, Coordinator, Marketing & Engineering, (IERC), (ELIN)
Frank Weirick, Coordinator, Military Sales, (IERC), (ELIN)

Booth 615

SKYDYNE, INC.
River Road
Port Jervis, N. Y.

Products:

Cases; instrument, combination, reusable. To Military Specifications. Test benches, consoles.

In Attendance:

W. F. McCallum, Sales Manager
Edward G. Magnuson, Sales Representative
Earl Marcussen, Sales Representative

Booth 616

SIMPSON ELECTRIC CO.
5200 W. Kinzie St.
Chicago 44, Ill.

Products:

Panel meters and test equipment for industrial, communications, radio and TV, and automotive applications.

In Attendance:

Mel Buehring, Director of Sales
Ted Franks, Sales
Bill Johansen, Sales Manager
Jim Langhoff, Sales
Art Stephens, Sales
Vito Raconelli, Advertising Manager

Booth 619

GREEN INSTRUMENT COMPANY, INC.
295 Vassar Street
Cambridge 39, Mass.

Products:

Model 106 and Model D2 Green Pantograph Engraving Machines. Cutter Grinders, Rotary Tables, Compound Slides and Production Fixtures. Special Air Attachment for high speed drilling of Printed Circuit Boards.

In Attendance:

Edwin T. Green, President
W. Frank Fullerton, Sales Manager
Edward G. Magnuson, Chicago Area Mgr.
Anthony R. Satullo, Detroit Area Mgr.
Howard N. Heasley, Cleveland Area Mgr.
Earl C. Marcussen, Sales Engineer

Booth 620

THE PLYE-NATIONAL COMPANY
1334 N. Kostner Ave.
Chicago 51, Ill.

Products:

Electrical Connectors, MIL-C-5015-D, MIL-C-26500.

In Attendance:

J. Shearer, V.P. & Gen. Mgr.—Connector Sales
J. Nava, Engineer
R. Thomas, Field Engineer
A. Ganzert, Engineer
N. Matviuw, Field Engineer
M. Lewend, Application Engineer
R. Stokes, Application Engineer
L. Rudisill, Field Engineer
A. Wheat, Field Engineer

Booth 621

KARL D. ENGLE CO., INC.
3621 W. Devon Ave.
Chicago 45, Ill.

Manufacturers' Representatives for:
"Acoustone" Newcastle Fabrics Corp.
Du-Co Ceramics Co.
Duramark, Inc.
Dynamic Gear Co., Inc.
Helical Products Co., Inc.
Hudson Tool & Die Co., Inc.
Industrial Devices, Inc.
L. L. Constantin ISOTRONICS, INC.
Jacobson Nut Mfg. Corp.
Mitronics, Inc.
Niemand Bros., Inc.
Struckhoff Eng. & Sales Co.
Zierick Mfg. Corp.

Products:

Steatite and Alumina Ceramics, Wire Markers, Precision Gears and Couplings, Deep Drawn Cans, Indicator and Pilot Lights, Nuts: Steel, Brass, Aluminum and Stainless Steel, Metallized Ceramics, High Temperature Housing, Ceramic Printed Circuits. Terminals. Glass-to-Metal Hermetic Terminals, Solder Terminals, Lugs and Clips. Solderless Terminals. Speaker Grille Cloth, Solder Iron Tips.

In Attendance:

Karl D. Engle, Karl D. Engle Co. Inc.
Bernard Engle, Karl D. Engle Co. Inc.
W. W. Gurner, Karl D. Engle Co. Inc.
Jack Davis, Karl D. Engle Co. Inc.
J. J. Duke, Du-Co Ceramics Co., President
Allan Davis, Mitronics Inc., Sales Manager
Ernest Isler, Hudson Tool & Die Co., Inc., Sales Manager
Herb Degan, Isotronics, Inc., Sales Manager

Booth 622

ANGELICA UNIFORM COMPANY
1427 Olive Street
St. Louis 3, Mo.

Products:

Angelica Uniforms, Non-linting, Acid-resistant, Static-free, for Clean Rooms and other dust controlled areas.

In Attendance:

Stanley A. Weiser, Vice-President of Sales
John D. Levy, Vice-President, Executive
Ted Roupas, Regional Sales Mgr.
Ben Frohlichstein, Sales Service Mgr.
Arthur Rubin, Sales Representative
Richard Saunders, Sales Representative

Booth 623

THE BRISTOL COMPANY
Waterbury 20, Conn.

Products:

Syncroverter Subminiature Chopper, Series F; Syncroverter Miniature Choppers, featuring DPDT and low noise choppers; Syncroverter High-Speed Relays; Miniature Adjustable Pressure Switches; Capsular Pressure Elements; Precision Socket Screws for instruments and electronic components.
W. H. Faeth, President
H. E. Beane, Vice-President, Sales
W. C. Juram, General Sales Manager

W. D. Calvert, Sales Manager, Aircraft Products
G. P. Lonergan, Sales Promotion Manager
S. E. Gewin, District Manager, Chicago
R. R. Varsell, Application Engineer
T. M. Lampert, Aircraft Sales, Chicago

Booth 624

DAGE ELECTRIC COMPANY, INC.
67 N. Second St.
Beech Grove, Ind.

Products:

Coaxial cable connectors, glass-to-metal hermetic seals.

In Attendance:

A. N. Strickland, Sales Manager
M. H. Burdett, Chief Engineer

Booth 625

PANDUIT CORP.
17301 Ridgeland Ave.
Tinley Park, Ill.

Products:

Wiring components: clamps & ties, cable, adjustable. Duct: plastic wiring. Duct system for modular relays. Sheath, cable, spiral wrapping.

In Attendance:

J. E. Caveney, President
F. Caveney, Treasurer
R. Moody, Chief Engineer
D. L. Schofield, Sales Manager
D. Baltzer, Salesman
L. Stamper, Salesman
R. Holwick, Salesman
B. Doran, Salesman

Booths 626-628

BURNDY CORP.
Richards Ave.
Norwalk, Conn.

Products:

Connectors — electrical and electronic, printed circuit, miniature round to MIL-C-26982, coaxial, rack and panel, terminal blocks, hermetically sealed, terminals and splices. Associated tooling for crimping compression types—hand pneumatic, automatic.

In Attendance:

Alan Aune, Sales Manager
Jim Risk, Manager, Burndy Midwest
Don Lacross, Sales Eengineer
Russ Williams, Sales Engineer
Les Thompson, Sales Engineer
Ray Smith, Regional Sales Manager

Booth 627

ASSEMBLY PRODUCTS, INC.
7100 Wilson Mills Road
Chesterland, O.

Products:

Meter-relays for indicating and controlling virtually any electrically measurable variable; panel meters, including "Super-Calibrated" models with taut band movements and individually fitted dials which are available with both accuracies and linearities of 0.5 per cent; complete "package" controls; flaw detection equipment.

In Attendance:

Robert H. Pugsley, Vice President
W. I. Collart, Sales Engineer
Lou Issel, Sales Engineer
Dick McGinnis, Sales Engineer

Booth 700

FANSTEEL METALLURGICAL CORPORATION
North Chicago, Ill.

Products:

Tantalum capacitors: (Wets)—High Reliability; general purpose, high-temp; economy; CL military series. (solids)—regular and high capacitance in polarized and non-polarized series; CS military series. Silicon rectifier diodes and stacks. Silicon controlled rectifiers. Zener diodes. Selenium rectifier stacks and surge suppressors. Subminiature, snap-action "cricket" switches. Electrical contacts. Semiconductor disks.

In Attendance:

Rectifier-Capacitor Division
Glen Ramsey, Vice Pres., Gen'l. Mgr.
H. Paul Weirich, Ass't Gen'l. Mgr.
Glen Iaggi, Ass't. Sales Mgr.
C. S. Blanchard, West. Reg. Sales Mgr.
T. O. Doner, East. Reg. Sales Mgr.
E. S. Weil, Midw.
F. L. Barron, Sales Engineer
E. Crary, Sales Engineer
C. De Jan, Sales Engineer
J. Egan, Appl. Engineer
P. Evans, Sales Engineer
J. H. Hall, Staff Engineer
E. H. Lutter, Sales Engineer
G. Menold, Appl. Engineer
T. P. Quinn, Sales Engineer
C. Seyer, Sales Engineer
Electrical Contacts & Specialties Division
Dr. J. D. Kleis, Vice-Pres., Gen'l. Mgr.
F. M. Cessna, Sales Mgr.

A. O. Capp, Ass't. Sales Mgr.
R. J. Haley, Prod. Sales Mgr.
C. F. Friese, Sales Engineer
R. H. Trowbridge, Sales Engineer
D. E. Parr, Sales Engineer
Joseph V. Di Masi, Adv. Mgr.
R. G. Christophersen, Publ. Editor

Booth 701

TELEX, INC.
3054 Excelsior Blvd.
Minneapolis 16, Minn.

Products:

Telex/Communications Accessories
Language-learning, communications, dictating, high-fidelity, headsets, pillow-speakers, miniature jacks and plugs, hospital intercoms.
Telex/Aemco
Relays, motor driven timers, time switches, flashers, switches.
Telex/Ballastran
Power supplies, transformers, wave filters, magnetic amplifiers, delay lines.
Telex/Lumen
Magnetic, electronic and servo amplifiers, power supplies, instruments, electrical switch gear, projectors, government systems.
Midwestern Instruments
Oscillographs, galvanometers, galvonometer amplifiers, telemetering equipment, tape instrumentation systems, power supplies, data repeaters, servo valves, torque motors and tape recorders.
Telex/Special Products
Multiple array switches, modular switches, sub-miniature switches.

In Attendance:

Telex/Special Products
Telex/Communications Accessories
P. T. Millunzi, Sales Manager
D. W. Flygstad, Dir. Engr.
Telex/Aemco
F. Nelson, General Manager
A. P. Pitzl, Sales Manager
W. Klammer, Dir. Engr.
Telex/Ballastran
A. B. Coburn, General Manager
W. Weir, Sales Manager & Dir. Engr.
Telex/Lumen
J. T. McGrath, General Manager
D. Marcks, Dir. Engr.
Midwestern Instruments
G. R. Morrow, President
W. F. Wells, Exec. V. P.
H. E. Felix, Dir. Engr
B. M. Brown, Mark. Adm.

Booth 704

AMERICAN OPTICAL COMPANY INSTRUMENT DIVISION
Eggert & Sugar Rds.
Buffalo 15, N. Y.

Products:

AO direct writing recorders, AO trace-master portable recorders.
Manufacturers' Representative:
Midwest Electronic Sales
4938 West North Ave.
Chicago 39, Illinois

In Attendance:

C. F. Ivins, Elect. Marketing Manager
F. C. Zusi, Electronic Sales Manager
J. Rado, Electronic Development Engineer
R. Heiser, Sales Representative

Booth 705

DRESSEN-BARNES ELECTRONICS CORPORATION
250 N. Vinedo Avenue
Pasadena, Cal.

Products:

DC power supplies, modular and laboratory custom power supply assemblies.

In Attendance:

L. M. Purcell, President
E. J. Scheuler, General Sales Manager
Paul K. Bennett, Staff Engineer
Richard Johnson, Engineer

Booth 706

LOREN F. GREEN & ASSOCIATES
5218 W. Diversey Avenue
Chicago 39, Ill.

Manufacturers' Representative for:
Anadex Instruments, Inc.
Calibration Standards Corp.
Cognitronics Company
Digitronics Corporation
Polarad Electronics Corp.
Transistor Specialties Inc.

Products:

High speed tape perforators, potentiometric voltmeters, magnetic storage drums, perforated tape readers, microwave instruments, solid state digital timer-counter-frequency meters.

In Attendance:

Holley B. Dickinson, President—
Anadex Instruments, Inc.

Richard T. Campbell, Sales Mgr.—Calibration Standards Corp.
Paul Seckendorf, Sales Mgr.—Cognitronics
Anthony Mauro, Sales Mgr.—Digitronics Corp.
Joseph Schindler, Sales Mgr.—Polarad Electronics
Frank J. Finnegan, V.P. Sales—Transistor Specialties, Inc.
Loren F. Green, Loren F. Green & Associates
John W. Anderson, Loren F. Green & Associates
James E. Priest, Loren F. Green & Associates
Henry R. Stocker, Loren F. Green & Associates
Arthur E. Howe, Loren F. Green & Associaites

Booth No. 707

MILLIVAC INSTRUMENTS, INC.
P. O. Box 997
(1100 Altamont Ave.)
Schenectady, N. Y.

Products:

Electronic test & measuring equipment, including Preamplifiers & Amplifiers (Transistor and Vacuum Tube), Direct-reading Ohmmeters, Electronic Wheatstone Bridges Microvoltmeters, Millivoltmeters, Multimeters, Micro-Micro-Ammeters, Micro-Volt-Ammeters, Vacuum Tube Voltmeters, Transistor Voltmeters, DC Modulators.

In Attendance:

Donald P. Morey, Vice President & Sales Manager

Booth 708

AMPEREX ELECTRONIC CORPORATION
230 Duffy Avenue
Hicksville, L. I., N. Y.

Products:

Power and Transmitting Tubes, Rectifiers and Special Purpose Tubes, Microwave Components.

In Attendance:

Roger E. Gabbei, Midwest Regional Manager
Glenn Anderson, Sales Engineer
Dean Bonnell, Sales Engineer
Earle Fraser, Sales Engineer
Donald Tompkins, Technical Expediter
Edward Feinberg, Product Mgr., Semiconductors & Special Purpose Tubes
Robert Lehnert, Technical Services, Nuclear Products

Booth 709

INDUSTRIAL TEST EQUIPMENT
55 E. 11th St.
New York 3, N. Y.

Products:

Phazor Phase Meters, Powertron AC Power Supplies, Null Meters, Impedance Comparators, Frequency Standards, Phase Shifters, Automatic Hi-Pot Testers, and other electronic test equipment.

In Attendance

M. Schreibman, Sales Manager
Loren Green, Sales Representative
Hank Stocker, Sales Representative
John Anderson, Sales Representative
Arthur Howe, Sales Representative

Booth 710

COMPUTER CONTROL COMPANY
Old Connecticut Path
Framingham, Mass.

Products:

Digital Special Purpose Systems, Digital Logical Modules: H-PACs—d-c to 20 megacycles; S-PACs—d-e to 1 and d-c to 5 megacycles; T-PACs—one megacycle. Sonic delay lines: Sonilines, Encoders: Dicotrons, Code Bar Switches.

In Attendance

A. Carr, District Manager
M. J. Fitzgerald, District Manager
S. J. Halligan, Manager, Applications Engineering
J. I. Leabman, National Sales Manager
Paul Lingard, Public Relations

Booth 711

KAY ELECTRIC CO.
Maple Avenue
Pine Brook, N. J.

Products:

Sweeping oscillators, frequency markers, random noise generators, precision attenuators, audio spectrum analyzers, pulse carrier generators.

In Attendance

Irving Silberg, Sales Manager
Larry Dolan, Sales Engineer
Harry R. Foster, Partner
Elmo E. Crump, Partner

Booth 714

KEPCO, INC.
131-38 Sanford Avenue
Flushing 52, N. Y.

Products:

Voltage and Current Regulated Power Supplies.

In Attendance

Max Kupferberg, General Manager
Ken Kupferberg, Director of Engineering
Arthur Chasen, Advertising Manager
Herb Claeson, Rep.—Sales Engineer
Bob Lang, Rep.—Sales Engineer

Booth 715

HARRY HALINTON ENG. ASSTS., INC.
6418 No. Central Ave.
Chicago 46, Ill.

Manufacturers' Representative for:
Mica Corp.—Micaply printed ckt Epoxy materials
Hysol Corp.—Epoxy resins for Electronic
Metalglass—Metal to glass terminals and headers
Birtcher Corp.—Tube clamps—Heat sinks
Enflo—Teflon materials
American Aluminum—Alum. cases, boxes, etc.
Warwick—Instrument cases.
Dimonite—Alumina bodies

In Attendance:

Harry Halinton, Sales Engineer
Henry J. Batha, Sales Engineer
W. C. Jenner, Senior Engineer
Bernie Kessler, Sales Manager

Booth 718

BALLANTINE LABORATORIES, INC.
P.O. Box 97
Boonton, N. J.

Products:

Sensitive Electronic AC Voltmeters; True R M S Voltmeters; AC-DC Precision Calibrator; Linear AC-DC Converter; Electronic Capacitance Meter; Laboratory Voltage Standards to 1,000 Megacycles.

In Attendance:

A. W. Parkes, Jr., President
Frank R. Zayac, Vice-President
Wallace White, Engineer
Henry Kruger, Engineer
Robert Lang, Sales Engineer
Herbert Claeson, Sales Engineer

Booth 719

THE MILTON ROSS COMPANY
511 Second Street Pike
Southampton, Pa.

Products:

Transipads, Module assemblies—Diallylphthalate, alkyd, nylon
Metal parts—Stampings, Wire Formed, Cold
Converters—Heading, Plating
Cases
Connectors, Headers, Knobs
Shells

In Attendance:

Milton I. Ross, President
Eugene D. Ross
Robert J. McGonigal

Booth 720

BURROUGHS CORPORATION ELECTRONIC COMPONENTS DIVISION
Mount Bethel Road
P. O. Box 1226
Plainfield, N. J.

Products:

NIXIE® Indicator Tubes; Beam-x Switches and Modules; Plug-in Counter, Decoder, and Encoder Modules; BIPCO® Modules—Micro-packages containing BUILT-IN-PLACE Silicon Diodes; Magnetic Thin Film Memory Planes.

In Attendance:

John Bethke, Sales Manager
Carl Porter, Midwest Regional Sales Mgr.
Dick Brady, Advertising Manager

Booth 721

MM ELECTRONIC ENCLOSURES, INC.
111 Bloomingdale Road
Hicksville, L. I., N. Y.

Products:

Manufacturers of military cases and containers to military specifications MIL-T-945A, MIL-T-4734, MIL-T-21200, MIL-C-4150, MIL-C-22443 (WEP), MIL STD-108C. Pre-

cision contract metal fabrication to customers' specifications.

In Attendance:

Michael C. Presnick, President
Harry Halinton, Sales Representative
Henry Batha, Sales Representative

Booth 722

THE HEINN COMPANY
326 W. Florida Street
Milwaukee 4, Wis.

Products:

Manufacturers of: Loose-leaf binders for Catalogs, Technical Manuals, Sales, Parts, and Instruction Manuals, Price Lists, Indexes, Zipper Cases, Acetate Envelopes, and other related sales equipment.

In Attendance:

Elroy Baum, Sales Manager
Anthony Bell, Sales Promotion Manager
Harry Ehman, Sales Representative
John Field, Sales Representative
Glenn Steiner, Sales Representative
Fred Gilomen, Sales Representative

Booth 723

VICTOR BUSINESS MACHINES CO.
3900 N. Rockwell St.
Chicago 18, Ill.

Products:

Automatic Line Printers; Calculators; Scanning Printers; Timing Printers; Serial and Parallel Entry Models; Punch Tape Preparation Machines.

In Attendance:

G. W. Hasbach, Manager, Electronics Sales Section
R. E. Daniel, Electronics Sales Section
H. O'Hara, Electronics Sales Section
R. F. LaVay, Central Dist. Mgr., Electronics Division
G. E. Sandgren, Research Director

Booth 724

THE THOMAS & BETTS COMPANY
36 Butler Street
Elizabeth 1, N. J.

Products:

Connectors and accessories for flat conductor cable—both military and commercial applications; solderless terminal box for use in telemetry, signal control, guidance systems, communications, etc.; solderless rack and panel connector for round wire transition to flat conductor cable—applications include pull-out drawers, drawer hinge and quick disconnects; nylon cable ties, straps, clamps and accessories for wire harnessing; standard and custom designed solderless terminals and connectors for #26 wire through 1000MCM —self-insulated or bare.

In Attendance:

H. C. Moses, Jr., VP Western Division Sales
J. David Parkinson, Assistant Sales Manager
James J. Boyle, OEM District Sales Manager
George Young, Salesman
Stewart Beyer, Salesman
John Walsh, Ty-Rap Specialist
Edward Mack, Government Sales Specialist
Richard Daus, Ty-Rap Specialist
Edward Finn, Market Manager, Industrial Electronics
William Miller, Market Manager, Industrial O.E.M.

Booth 725

THE POTTER CO.
7351 North Lawndale
Skokie, Ill.

Products:

Capacitors—All types of layer wound and micro-miniature ceramics
Radio Interference Filters
High Voltage Power Supplies
Radio Interference Testing
RFI Consulting Service
Cable and Wire

In Attendance:

John P. Ruane, President
Bill Johnson, Sales Engineer
Lanny Quigley, Sales Manager
Dave Youngquist, V.P. Director of Engineering

Booth 726

RIXON ELECTRONICS, INC.
2121 Industrial Parkway
Silver Spring, Maryland

Products:

Rixon Electronics, Inc. specializes in high speed data communications systems using voice quality channels, wireline and HF radio paths, as transmission media. Aside of complete capability for system research, engineering, and development, Rixon maintains state of the art facilities for hardware production. Proprietary equipment that is manufactured at Rixon include the SEBIT 24B data MODEM, the DD line of basic data communication modules, and Delay Equalizers, A-D converters for facsimile transmission (ADFAX), and Serial to Parallel converters.

In Attendance:

James L. Hollis, President
Charles J. Seeley, Senior Vice President
Joseph M. Burt, Manager, Marketing Department
Marvin Frank, Manager, Applications Engineering
Ricardo J. Alfaro, II, Manager, Marketing Services
Earl Seely, Applications Engineer
Joseph A. Zimmel, Applications Engineer
Vincent C. Keyser, Applications Engineer
Gerard Cunningham, Applications Engineer

Booth 727

ACRO PRODUCTS CORPORATION
1410 South Aberdeen Street
Chicago 8, Ill.

Products:

Modular Cabinet Enclosures — Featuring *Built-in-Blower Cabinet, Instrument Cabinets, Extended Arm Console with Turret Top, Large Vertical Frames, *Custom 12 GA. Heavy Duty Frames, Custom and Modified Enclosures. All the above Enclosures shown in Various Finishes.

In Attendance:

Adolph Letke, Manager
Anton Monge, Sales Manager
L. E. Tanner, Sales Representative
Val Newman, Sales Representative
Gordon Wilson, Sales Representative
Bill Turner, Sales Representative

Booths 728-730

AVNET ELECTRONICS CORP.
70 State Street
Westbury, L. I., N. Y.

Products:

Avo, H. W. Sullivan, Test Equipment—Widney Dorlec Enclosures, Shaw Casting Process, Multi Core Solders, Bendix Connectors, Babcock Relays, Sperry & Semcor Semiconductors, Microdot & Gremar Connectors, King & Sprague Capacitors, Telequipment Scopes.

In Attendance:

Lester Avnet, President
Clark J. Grey, General Manager
John B. Grey, Asst. to the President
Richard T. Erhardt, Sales Manager
A. J. Reynolds, Sales Manager
Jack Howe, District Sales Manager (Illinois)
Jack Nelson, Corporate Administrator
Roy Olson, Sales Engineer
Dave Parker, Sales Engineer
Phyllis Lukin, Advertising Manager
Christa Stephani, Executive Secretary

Booth 729

MACDONALD & COMPANY
714 East California Ave.
Glendale, Cal.

Products:

Sleeving Cutter and other labor-saving gadgets.

In Attendance:

D. G. Macdonald, President

Booth 729

IRD CORPORATION
Subsidiary of
H. H. ROBERTSON CO.
6150 Huntley Road
Worthington, O.

Products:

"ROTOMATOR", Automatic Assembly Table for the production of electronic parts and components. Methods and procedures for teaching the operator as a built-in feature. Table requires only 40" square area and along with this, we will show final assembled IRD Vibration Analyzing Unit.

In Attendance:

Eugene G. Hart, President
John W. Connor, Engineer
Female Operator (To be selected later)

Booth 731

CORNING
3900 Electronics Drive
Raleigh, N. C.

Products:

High reliability capacitors and resistors, fixed and variable capacitors, metal-oxide film resistors, inductors, trimmers, printed circuits, micro circuits, ultrasonic delay lines, diode and transistor housings.

In Attendance:

J. F. Riley, Sales Manager
H. W. Hanson, Advertising Manager
J. O. Cummiskey, Sales Engineering
R. E. Rahill, Sales Engineering
R. V. Hamjian, Distributor Sales Manager

M. H. Hunt, General Manager
L. S. King, Resistor Engineering
A. J. Hotte, Capacitor Engineering
J. G. Curtis, Application Engineering

Booth 800

PANORAMIC ELECTRONICS, INC.
520 South Fulton Avenue
Mount Vernon, N. Y.

Products:

Panoramic Spectrum Analyzers ½ cps to 44 kmc; Communications Systems Analyzers; Frequency Response Plotters ½ cps to 15 mc; IRIG Telemetry System Analyzers and Calibrators; Telephone Measuring Sets. New: SPA-10 Low Cost High Sensitivity Wide Dispersion Spectrum Analyzer 10 mc-43 kmc; one tuning head. New: 3 Telemetry Indicators for 350 cps-120 kc subcarrier analysis TMI-1b/120, TMI-2/L, and TMI-3/Li.

In Attendance:

Bob Bard, Field Engineer
Al Morris, Field Engineer
Ed Feldman, Manager, Applications Engineering
Steve Charleston, Application Engineer
Kiven Plesset, Project Engineer
Bela Ranky, Senior Engineer

Booth 801-803-805-807

VARIAN ASSOCIATES
611 Hansen Way
Palo Alto, Cal.

Products:

Microwave Tubes, Components, Graphic Recorders and Vacuum Products.

In Attendance:

Emmett Brownell
Jack Brower
Luther Lorence
Will Polich
Dick Stark
Dan Allen

Booths 802 and 920

THE JERROLD CORPORATION
Jerrold Bldg., 15th & Lehigh
Philadelphia, Pa.

Subsidiaries:
Jerrold Electronics Corporation
Analab Instrument Corporation
Harman-Kardon, Inc.
Technical Appliance Corporation (TACO)

Products:

Wide and Narrow Band, Video, VHF, and UHF Sweep Generators; Marker Generators, Precision Attenuators; Comparators and other devices and instruments for performing RF measurements; RF Logarithmic Amplifiers.

In Attendance:

Caywood C. Cooley, Vice President & Manager, Industrial Products Div.
Don J. Cinalia, Assistant Sales Mgr., Industrial Products Div.

Booth 802

ANALAB INSTRUMENT CORPORATION
30 Canfield Rd.,
Cedar Grove, N. J.

Products:

New Type 701 Sampling and Sweep Plug-In; new Type 1220 dual-trace storage scope and X-Y recorder; new Type 3020 35 mm continuous motion camera; new Type 3030 electric-pulsed film advance camera; new Type 9003 and 9004 scope carts; complete line precision oscilloscopes and scope recording cameras.

In Attendance:

Morton G. Scheraga, President

Booth 804

B & K INSTRUMENTS, INC.
3044 West 106th St.
Cleveland 11, Ohio

Products:

Model 2203 Precision Sound Level Meter
Model 1613 Octava Bud Filter Set
Model 2211 Noise & Vibration Production Test Set

In Attendance:

James Smiley, Sales Mgr.
Jack Mowry, Asst. Sales Mgr.
Robert Bard, Engr. Representative
Alan Morris, Engr. Representative
Bill Butler, Engr. Representative

Booth 806

CUBIC CORPORATION
9233 Balboa Avenue
San Diego 23, Cal.

Products:

A display of digital equipment featuring the first digital voltmeter designed and built to MIL Specifications and featuring all solid state circuitry with miniature reed precision potentiometer switching. Also, a new reed relay multimeter providing volt, ratios, and resistance measurements to a sensitivity of one millivolt.

In Attendance:

William Boyd, Sales Manager
Jerry Simpson, Sales Engineer

Booth 808

BARD ASSOCIATES, INC.
328 Selbourne Road
Riverside, Ill.

Manufacturers' Representative for:
Exact Electronics—Function Generators and Waveform Synthesizers Transistor
Galaxy Laboratories — Portable wide-band Oscilloscopes and Curve-Generator
Techi-Rite Electronics — Event and Analog Recorders

In Attendance:

Frank Thomas, President (Exact Electronics)
Kenneth Dellinger, Vice-President (Galaxy Laboratories)
Al Ondis, President (Techni-Rite Electronics)
Al Morris, Engineer (Bard Associates)
Don Mott, Engineer (Bard Associates)
Bob Bard, Engineer (Bard Associates)

Booth 809

MAGNECRAFT ELECTRIC CO.
5575 No. Lynch Co.
Chicago 30, Ill.

Products:

Relays: Telephone type, latching, general purpose, ac-dc, sensitive, hematically sealed, crystal can, low cost general purpose, printed circuit, time delay, rotary, antenna switching, high speed, military, subminiature, 50 amp miniature power, standard and encapsulated magnetic reed relays, adjustable time delay relays.

In Attendance:

John Deimel, Sales Manager
Herbert Steinback, President
Morton Steinback, Chief Engineer
Dave Dolin, Sales Engineer
Bob Monroe, Sales Engineer
Harold Jacobs, Sales Engineer
Joe Kunzelman, Sales Engineer
William Doerr, Sales Engineer

Booth 810

QUAN-TECH LABORATORIES, INC.
60 Parsippany Boulevard
Boonton, N. J.

Products:

Manufacturers of Instruments for measuring electrical noise in components, Wave Analyzers, Instrumentation Amplifiers, Regulated Power Supplies.

In Attendance:

J. M. vanBeuren, President
Alan P. Stansbury, Chief Engineer
Richard H. Snyder, Engineer

Booth 811

EMERSON & CUMING, INC.
869 Washington Street
Canton, Mass.

Products:

Plastics and Ceramics for electronics including potting compounds, surface coatings, adhesives, impregnants and laminating resins. Complete line of microwave absorbers and anechoic chambers with or without RF shielding. Manufacturers of Luneberg type microwave lenses and reflective devices.

In Attendance:

W. R. Cuming, Vice President
J. R. Copley, Sales Manager—Dielectric Materials Division
Robert Lothrop, Sales Engineer

Booth 813

HUGGINS LABORATORIES, INC.
999 East Arques Ave.
Sunnyvale, Cal.

Products:

Tube Division:
Low and Intermediate Power Traveling Wave Tubes
Low Noise Traveling Wave Tubes
Backward Wave Oscillators and Amplifiers
Instruments/Subsystems Division:
Traveling Wave Tube Amplifiers
Electronically Swept Oscillators

In Attendance:

V. D. Varenhorst, Sales Manager

Booth 814

ITT INDUSTRIAL PRODUCTS DIVISION
15191 Bledsoe Street
San Fernando, Cal.

Products:

Large Screen Oscilloscope and Display Devices.

In Attendance:

L. M. Green, Sales Manager
Don Foreman, Sales Engineer

Booth 815

JOHN FLUKE MFG. CO., INC.
P. O. Box 7428
Seattle 33, Wash.

Products:

Differential Voltmeters, True RMS Voltmeter, Thermal Transfer Standards, Bridge, Power Supplies, Precision Potentiometers.

In Attendance:

John Zevenbergen, Vice President, Marketing
Richard Buell, Service Manager
Doug Sleeth, Project Engineer
Walt Prue, Project Engineer

Booth 816

PENTA LABORATORIES, INC.
312 No. Nopal Street
Santa Barbara, Cal.

Products:

Electron Tubes—transmitting and special purpose tubes; Beam Pentodes and Tetrodes; Grounded-grid Triodes; Vacuum Switches.

In Attendance:

D. L. Norton, Vice President
F. F. Van Wickle, Advertising Mgr.
W. B. Cozzens, Sales Representative
M. J. Cudahy, Sales Representative

Booth 818

SPECIAL PRODUCTS DIVISION COMPO SHOE MACHINERY CORP.
125 Roberts Road
Waltham 54, Mass.

Products:

Equipment for automatic wave or jet soldering and other processing of printed circuit boards
Custom machines for electronic equipment processing or assembly
Soldering Supplies and Materials

In Attendance:

J. A. Vitka, Compo Special Products Division—Manager
C. F. Schultz, Compo Special Products Division—Sales & Service Supv.
D. V. Consalvo, Compo Special Products Division—Engineer
E. M. Freedman, The EMF Company
J. V. Cusimano, The EMF Company
W. W. Wood, The EMF Company

Booth 819

MICRO STATE ELECTRONICS CORP.
152 Floral Ave.
Murray Hill, N. J.

Products:

Low Noise "L" Band Tunnel Diode Amplifier—3.5db Noise Figure
X Band ½ Nenoselond Solid State Switch
80db Isolation Solid State Switch
X 36 Sieve State Multiplier
Microwave Solid State Components and Semi-conductor Products

In Attendance:

Robert C. Kocts, Gen. Sales Mgr.
William Finberg, Sales Engineer

Booth 820

HEXACON ELECTRIC CO.
161 W. Clay Avenue
Roselle Park, N. J.

Products:

HEXACON Industrial Soldering Irons, Instrument Irons, Durotherm-Extradur and Hexclad Long-Life Tips, Instant Heating Soldering Guns and Hexacon Hornet, World's smallest Soldering Iron for Industry.

In Attendance:

Richard O. Johnson, General Manager
James L. Grindrod, Sales Manager
Gene R. Clouse, Representative—Metro. Chi.
George R. Hamilton, Representative
Louis E. Bruns, Representative
Gene Zaiser, Representative
Vernon Gummert, Representative

Booth 821

HUNTER TOOLS
9851 Alburtis Ave.
Santa Fe Springs, Cal.

Products:

Electronic Assembly Tools and Components.

In Attendance:

Bob Hunter Jr., V. P. of Sales
Bob Fish, Sales
Jack Spiri, Sales
Wayne Hunter, Sales
R. N. Hunter, Pres.

Booth 822

THE ERASER COMPANY
1068 South Clinton Street
Syracuse 4, N. Y.

Products:

RUSH Wire stripping equipment for removal of insulation, film or built up, from conductors prior to making connection. Equipment utilizes RUSH FybRglass stripping wheels, rotary knife, rotary blades and rotary insert.

RUSH Wire twisting equipment for twisting stranded conductors after they have been stripped. Twisting makes them easier to handle.

RUSH Industrial FybRglass Products.

In Attendance:

Ralph E. BeVard, Exec. V. Pres. and Gen. Manager
Malcolm E. Mullen, Sales Engineer
Edward M. Freedman, Chicago Sales Representative (EMF Co.)
Joseph Cusimano, Salesman for EMF Company
William W. Woods, Salesman for EMF Company

Booth 823

J. F. D. ELECTRONICS CORP.
1462 62nd Street
Brooklyn 4, N. Y.

Products:

Variable Trimmer Piston Capacitors
LC Tuners
Metalized Inductors
Delay Lines

In Attendance:

William Bellenkes, Sales Mgr.
David Taub, Dist. & Export Sales Spvr.
Sarge Barkett, Midwestern Dist. Sales Mgr.
Jerome Brick, Sales Engineer
Howard Hanok, Sales Engineer

Booth 824

SARKES TARZIAN, INC.
415 North College Avenue
Bloomington, Ind.

Products:

Silicon Rectifiers
Silicon Voltage Regulators (zeners)
Silicon Controlled Rectifiers
Silicon Light Activated Switches
Silicon Voltage Variable Capacitors
Silicon Assemblies
Selenium Rectifiers
Transient Suppressors
Magnetic Tape
Television Tuners
FM Tuners

In Attendance:

Stan Niciejewski, Sales Manager
Hank Anderson, Asst. Sales Manager
John Young, Applications Engineer
Earl Riggs, Research Manager

Booth 825

DAHLSTROM MANUFACTURING CORP.
Jamestown, N. Y.

Products:

Custom built cabinets, chassis, panels, cases and other precision sheet metal components for the electronics industry. On display is the "Unicabinet", a new custom built cabinet of standard design enabling the engineer to specify exact size, finish, trim, internal structures and many other criteria without extensive engineering and usually without tool charge.

In Attendance:

R. Quintus Anderson, Vice President-Sales Manager
Carl Theirfeldt, Chief Engineer
Kermit G. Nelson, Advertising Manager

Booth 826

BOWMAR INSTRUMENT CORPORATION
8000 Bluffton Road
Fort Wayne, Ind.

Products:

Precision Mechanical Components, Bowmar Instrument Corporation
Precision Electromechanical Devices
Precision Servo Packages
Precision Potentiometers, TIC Division of Bowmar Instrument Corporation
Precision Vari(f)unction Pot Clutch Modules, TIC of California
Precision Potentiometers
Phase Meters and Standards, Acton Laboratoires, Incorporated
Delay Measurement Devices
Precision Dial, Drives, Couplings, Precision Knobs
Environmental Testing Facilities

In Attendance:

E. A. White, President
G. F. McCarthy, Vice President—Corporate Marketing
S. W. Knapp, Corporate Advertising Manager
R. H. Smith, Manager, Contract Sales, Corporate Co-ordinator
W. S. Caley, Canadian & European Sales
L. D. Temple, Manager, Components Sales
R. M. Camillone, Field Sales Engineer
N. M. McCullough, Field Sales Engineer
R. C. Westerman, Coordinator — Contract Sales
D. R. Castro, Components Engineer
J. H. Rusler, Components Engineer
D. Gustafson, All Midwest Field Sales Engineer
D. Lawton, General Sales Manager
E. G. Schwarm, Manager of Marketing—Action Laboratories, Inc., Subsidiary of Bowmar Instrument Corp.
Leo Seilsch, Sales Manager

Booth 827

ELECTRONIC ASSOCIATES, INC.
Long Branch Ave.
Long Branch, N. J.

Products:

General Purpose Analog Computers, Process Control Computers, Instruments, X-Y Recorders, Precision Capacitors, Bar Chart Recorder.

In Attendance:

Bert Johnson, Mgr. Central Regional Office
Ben Beckes, Technical Representative
Bernard Lavene, Technical Representative
Paul Kaufmann, Technical Representative
Richard Mulligan, Product Publicity

Booth 900

BERKELEY DIVISION OF BECKMAN INSTRUMENTS, INC.
2200 Wright Avenue
Richmond, Cal.

Products:

Electronic Digital Instruments and Analog Computers.

In Attendance:

L. R. Keenen, Marketing Manager
R. Swift, Product Line Manager
W. Dawes, Product Line Manager
F. P. Schmidt, Advertising & Sales Promotion Asst.

Booth 901

RIDGEWAY ASSOCIATES, INC.
6100 W. North Avenue
Chicago 39, Ill.

Manufacturers Representatives for:

ASTRODATA, INC.—Solid State Floating DC Amplifiers, Nanovolt Meters, Time Code Generators
BECKMAN / BERKELEY DIVISION — EPUT Meters, Electronic Counters, Digital Voltmeters, Printers, EASE Analog Computers
BYTREX CORPORATION—Semiconductor Strain Gages and Transducers, Instruments
JAMES CUNNINGHAM, SON & CO., Inc. —Crossbar Switches, Scanners and Switching Systems
DATAPULSE, Inc.—Pulse Generators
DELTA DESIGN, Inc.—Portable Temperature Chambers
DELTA SEMICONDUCTORS, Inc.—Semi-Conductor diodes
HAROWE SERVO CONTROLS, Inc. — Servo Components, Servo Motors, Synchros, Gear Heads
HOLT INSTRUMENT LABORATORIES —Precision AC Calibrating Source, AC-DC Transfer Standards
NJE CORPORATION—DC Power Supplies, AC Regulators
BECKMAN / OFFNER DIVISION —Recorders, Computer Accessories, Amplifiers, Bio-Medical and geophysical apparatus
PACIFIC ELECTRO MAGNETICS CO., Inc.—Portable Tape Recorders
SANGAMO ELECTRIC COMPANY—Magnetic Tape Recorders
SPERRY MICROWAVE ELECTRONICS CO.—Microwave Instruments and Accessories
STEVENS-EVANS, Inc.—AC Line Voltage Regulators
TELONIC INDUSTRIES, Inc. — Sweep Generators, RF Filters, Current and Voltage Regulators
THOMAS ELECTRONICS, Inc.—Cathode Ray Tubes
VOLTRON PRODUCTS—Taut-band, Expanded Scale, and Ruggedized Meters
WAVEFORMS, Inc. — Audio Oscillators, Signal Generators

In Attendance:

George Knackstedt, Application Engineer
Wm. J. Anderson, Application Engineer
Eugene R. Stanley, Application Engineer
Jack Russell, Application Engineer
Merle J. Ackerman, Application Engineer
Donald R. Hudson, Application Engineer
Wayne Golder, Application Engineer

Burton L. Frankel, Application Engineer
Myron J. Hill, Application Engineer
Philip C. Alderton, Application Engineer

Booth 904

TELONIC INDUSTRIES, INC.
60 North First Avenue
Beech Grove, Indiana

Products:

Sweep/Signal Generators from 20 cps to 3000 mc, TV test equipment for the production line or laboratory for VHF, UHF and all world standaards, RF Attenuators, both toggle-switch and turret, RF Detectors, RF Filters, crystal-controlled CW sources and coaxial switches.

In Attendance:

Bob Shevlot, Sales Manager
R. L. Welsh, Assistant Sales Manager
L. W. Abbott, General Manager
C. R. Wainwright, Director of Engineering
A. W. Reuter, Chief Engineer
W. E. Greeson, Sales Engineer

Booth 905

WAVEFORMS, INC.
333 Sixth Ave.
New York 14, N. Y.

Products:

Line Wave Generators, Square Wave Generators, Vacuum Tube Voltmeters, Audio Gain Sets.

In Attendance:

Allen Byers

Booth 906

N J E CORPORATION
20 Boright Ave.
Kenilworth, N. J.

Products:

*Frequency Changer, *converters, *inverters. *TC supplies; dc power supplies transistorized; silicon controlled rectifier; transistor regulated, low-cost half-rack transistorized; solid-state; silicon brute force; transistor-driven magnetic-amplifier regulated, tunnel-diode, regulated high-voltage vacuum-tube regulated, high-stability, high-voltage; current-regulated transistorized power supplies.

In Attendance:

H. J. Lutz, General Sales Manager
J. Robert Hoeffler, Regional Sales Engineer

Booth 907

HOLT INSTRUMENT LABORATORIES
Oconto, Wis.

Products:

Standards, Calibration and Test Instruments.

In Attendance:

R. C. Rouzie, Sales Manager
C. P. Dewitt, Technical Director
Leighton Rama, Director of Engineering
D. J. Stemper, Project Engineer
N. J. Wachal, Head, Standard Laboratories
Vernon Jackson, Machine Shop Supervisor
Donald Augustine, Assembly Supervisor

Booth 908

ASTRODATA INC.
240 E. Palais Rd.
Anaheim, Cal.

Products:

ASTRODATA Inc. designs, manufactures and markets data acquisition systems, telemetry data reduction systems, calibration and conditioning systems; instrumentation amplifiers—wideband, differential and floating dc —operational, potentiometric amplifiers, and namovoltmeters.

In Attendance:

R. Melsheimer, Staff Engr.
Ridgway Associates, Mfr. Reps., 6100 W. North Ave., Chicago 39

Booth 909

PACIFIC ELECTRO MAGNETICS CO., INC.
942 Commercial St.
Palo Alto, Cal.

Products:

Portable Instrumentation Magetic Tape Recorders and Related Equipment.

In Attendance:

Ralph S. White President
Roland L. Buckmaster, Sales Manager
John A. Martin, Chief Engineer

Booth 910

THOMAS ELECTRONICS, INC.
122 Eighth Street
Passaic, N. J.

Products:

Standard and special cathode-ray tubes on short delivery cycle. Modification of stand-

ard types for more brightness, improved deflection factor, and higher resolution. Special designs to customer specification. Specialists in tubes with large-screen electrostatic deflection, dark-trace self-erase storage, electrostatic-focus high-resolution, and large-screen fiber optics.

In Attendance:

Eugene Ecklund, President
John Wolke, Sales Manager
Peter Seats, Manager Research & Development
George Knackstedt, Sales Representative—Chicago
Burton Frankel, Sales Representative—Cleveland
Phil Alderton, Sales Representative—Detroit
Eugene Stanley, Sales Representative—Dayton
Don Hudson, Sales Representative—Minneapolis

Booth 911

DELTA DESIGN, INC.
8000 Fletcher Parkway
La Mesa, Cal.

Products:

Environmental testing and control equipment. Temperature chambers, temperature controllers.

In Attendance:

Paul L. Vasques, Sales Manager

Booth 912

STEVENS-EVANS, INC.
3801 Hicock Street
San Diego 10, Cal.

Products:

A. C. Line Voltage Regulators, Digital Voltmeters and accessories, A. C. power sources, Frequency Changers.

In Attendance:

Allen R. Heishman, Marketing Manager
Jon Jenkins, Sales Engineer

Booth 913

SPERRY MICROWAVE ELECTRONICS CO.
Division of
SPERRY RAND CORPORATION
P. O. Box 1828
Clearwater, Fla.

Products:

MICROLINE—precision microwave test instruments. Solid State Devices: isolators, circulators, parametric amplifiers, limiters, duplexers, switches, attenuators.

In Attendance:

Jack Newitt, Sperry Application Engineer
C. J. Brown, Assistant Manager of Marketing—Microline
George Knackstedt, Representative, Ridgway Associates
W. J. Anderson, Representative, Ridgway Associates
D. Hudson, Representative, Ridgway Associates
B. Frankel, Representative, Ridgway Associates
E. R. Stanley, Representative, Ridgway Associates
M. Hill, Representative, Ridgway Associates
J. Russell, Representative, Ridgway Associates
P. Alderton, Representative, Ridgway Associates

Booth 914

DATAPULSE INCORPORATED
509 Hindry Avenue
Inglewood 1, Cal.

Products:

Model 102 Pulse Generator: Repetition rates to 3 mc; 5v into 50 ohms at 10 nanosec. rise time.

Model 104 Pulse Generator: Rep. rates to 10 mc; ±40v into 50 ohms; pulse width from 20 nanosec. to 50 microsec; Delay from 5 ns to 10 ms.

Model 200 Data Generator: Programmed serial data in one or two channels; cycle length selectable up to 100 bits; clock rate variable to 2 mc.

Model 202 Data Generator: Two data channels, 16-bit cycle length; clock rate variable to 5 mc. 50 ns—50 ms duration—±15v into 50 ohms, 30v into 600 ohms.

Model 103 Pulse Generator: Rep. rates to 5 mc; delays variable to 5 ms, rise times to 50 nanosec depending on plug-in output amplifier selected.

Model 100 Pulse Generator: Compact, economical unit with rep. rates to 500 kc (to 1 mc externally triggered); delay 0.2 usec. to 0.1 sec.; durations 0.1 usec. to 0.1 sec.; outputs to 150v or ±10v into 5 ohms; rise times to 3 nanoseconds.

DATAPULSE INCORPORATED will also display NESCO Graphic Recording Instruments.

In Attendance:

J. E. "Ed" Niebuhr, Sales Manager

Booth 915

SANGAMO ELECTRIC COMPANY
P. O. Box 359
Springfield, Ill.

Products:

Magnetic Tape Recorder/Reproducer
Capacitive and Inductive Components

In Attendance:

Richard Hadley, Asst. Mgr. Application Eng. Electronic Systems
Tom Kruska, Engineering Asst. Electronic Systems
Roger Miller, Sales Manager, Electronic Components
John Rilling, District Manager, Electronic Components Sales
Jack Damewood, Asst. District Manager, Electric Components Sales
J. H. Woolard, Sales Engineer, Chicago District

Booth 916

JAMES CUNNINGHAM, SON & CO. INC.
10 Carriage St.
Honeoye Falls, N. Y.

Products:

Mfg. of Crossbar Switches, Crossbar Scanning Systems, RF Information Systems.

In Attendance:

George R. Appleton, Asst. Sales Manager
George Knackstedt, Sales Representative
Wm. J. Anderson, Sales Representative
Wayne Golder, Sales Representative
Jack Russell, Sales Representative

Booth 917

EDGERTON, GERMESHAUSEN & GRIER
160 Brookline Avenue
Boston 15, Mass.

Products:

Millimike 2000 MC Traveling Wave Oscilloscope, associated camera system, nanosecond rise-time Pulse Generator. High Speed Flash Equipment. Laser Stimulators. Xenon Flashtubes. Ceramic Hydrogen Thyratrons. Triggered Spark Gaps, Krytrons, Underwater Light Sources, Cameras Pingers, Boomers, Special Transformers and Chokes.

In Attendance:

B. F. Roberts, Applications Engineer
J. Murachver, Director of Applications Engineering
J. Mulrey, Applications Engineer
R. Yeiter, Staff Marketing
H. Berger, Applications Engineer

Booth 918

HAROWE SERVO CONTROLS INC.
Westtown Road at West Chester Pike
West Chester, Pa.

Products:

Manufacturers of Servo Motors, Motor Generators, Special Purpose Motors (Synchronous, Velocity Damped, Stepper Motors, Magnetically Braked Motors, Inertially Damped), Brush and Brushless Syncros, Gearhead Units, Servo Systems.

In Attendance:

Frank J. Stevens, Marketing Manager
Earle R. Hart, President
John J. Rozmus, Vice President, Engineering
Charles E. West, Vice President, Quality Control
(Representatives: Ridgway Associates)
George Knackstedt
Eugene R. Stanley
Don Hudson
Phil Alderton

Booth 920

HARMON-KARDON, INC.
DATA SYSTEMS DIV.
Ames Court,
Plainview, L. I., N. Y.

Products:

Encapsulated digital logic modules for all frequency ranges. Unique Flexi-Card functional assemblies offering 40,000 stock digital logic configurations. Plug-in test equipment digital logic units for systems breadboarding and personnel training meet mil-specs for logic descriptions, and feature extreme versatility and ease of use.

In Attendance:

Larry Torn, General Manager, Data Systems Div.
Bob Schramm, Sales Manager, Data Systems Div.

Booth 920

TECHNICAL APPLIANCE CORP. (TACO)
DEFENSE & INDUSTRIAL DIV.
1 Taco St.
Sherburne, N. Y.

Products:

High frequency and communication anten-

nas, telemetry antennas, ruggedized yagi for severe environmental conditions, wave guides and accessories. Mounts and de-icing equipment.

In Attendance:

Don Vincent, Marketing Mgr., Defense & Industrial Div.
Doug Vining, Sales Mgr., Defense & Industrial Div.

Booth 921

MASTERSCREEN PRINTING EQUIPMENT CORP. DIVN.—JOS. E. PODGOR CO., INC.
16 S. Marshall St.
Philadelphia 6, Pa.

Products:

#1218 Silk Screen Electronic Circuit Printing Press—Cam operated, Printing Area 12" x18". Prints on all flat surfaces up to 6" in thickness holding exceptional tolerances to .0002 between prints, Uniform Ink Flow Controlled by patented Fountain.

#2430 Silk Screen Press—Same specifications as above, size, Printing Area 24"x30"x ½" for flat surfaces only up to ½" thick. Both presses have speeds varying up to 1,000 impressions per hour. These can be adjusted so that as few as 100 prints per hour are practical.

In Attendance:

Joseph E. Podgor, President
Fred C. Kline, Sales Manager
George Ward, Production Manager
George Lipko, Sales Engineering

Booth 922

UNITED SHOE MACHINERY CORP.
140 Federal St.
Boston, Mass.

Products:

Dynasert Component Inserting equipment —A line of component equipment that automatically feeds, cuts, bends, inserts, and clinches axeol lead components to P.W. boards. Two models will be shown at this show, plus the pantograph positioning attachment.

In Attendance:

Dallas R. Knight, Dynasert Product Manager
Thomas R. Peterson, Chicago Regional Sales Manager
Joe E. Beauregard, Sales Technician
Jerry Crowley, Manager, General Industry Group
Irwin L. Svoboda, Sales Representative
Roy J. McGahan, Sales Representative
Robert L. Kennedy, Sales Representative
Donald F. Cirillo, Sales Representative

Booth 923

THE DYNASCAN CORPORATION
1801 West Belle Plaine Ave.
Chicago 13, Ill.

Products:

Dynascan Digital Voltmeter Model 111
Dynascan AC-DC Converter Model 125
B&K Viomatic VOM Model 360
B&K VTVM Model 375
Mark Microwave Antennas

In Attendance:

Carl Korn, President
Ed Harris, Executive Vice President
Robert M. Karet, Vice President, Sales
William Grossman, Vice President, Engineering
Bernard J. Golbus, Sales Manager
Samuel B. Horberg, Treasurer
Mel Byron, Engineer
Scott Bartky, Engineer

Booth 924

DeVRY TECHNICAL INSTITUTE
4141 Belmont Avenue
Chicago 41, Ill.

Products:

Home and laboratory training programs for various branches of Electronics.

In Attendance:

T. J. Lafebar, President
W. R. McGowen, Dir., Industrial Training Div.
W. A. Robinson, Advertising Mgr.
H. A. Kein, Regional Manager
E. H. Bach, Representative
M. A. Lane, Representative
H. S. Lebeaw, Representative
W. W. Weiner, Representative
T. F. Hogan, Representative
M. A. Burch, Representative
J. J. DeMunnick, Representative
F. Chomko, Representative
P. Chomko, Representative
R. Stone, Representative
G. Dryer, Representative
T. Koch, Representative

Booth 925

BRANSON CORP.
41 So. Jefferson Road
Whippany, N. J.

Products:

Type SR Four-Pole and Two-Pole Half-size Crystal Can Relay
Type JR Transistor Sized Relay
Type AR Four-Pole and Two-Pole Crystal Can Relay
Type MTRH Time Delay Relays
Sockets and Hardware

In Attendance:

C. G. Braun, Sales Manager
G. L. Richards, Sales Engineer
M. B. Rosenthal, Sales Engineer

Booth 926

METHODE ELECTRONICS, INC.
7447 W. Wilson Avenue
Chicago 31, Ill.

Products:

Connectors—Miniature AN per MIL-C-26500, "RELI-ACON" Printed Circuit Card Receptacles per MIL-C-21097, Rack and Panel Connectors with closed entry contacts. Custom Printed Circuitry for Military and Commercial Applications. "PLYO-DUCT" Flexible Wiring. Tube Sockets and Tube Shields for Standard and Printed Wiring Applications, Switches and Jacks.

In Attendance:

W. J. McGinley, President
W. T. Jensen, Executive Vice President
C. R. Conner, Vice President—Printed Circuits
E. E. Gehrt, Vice President—Operations
W. E. Stubbings
V. Brown
J. Barrett
F. Hutton
L. Scott
L. J. Pilkington
D. W. Mellen
C. Leski
W. Booth
P. Meyer
A. Weiss

Booth 927

DRAKE MANUFACTURING COMPANY
4626 North Olcott Avenue
Chicago 31, Ill.

Products:

Specialists in Miniature Lighting, Drake Manufactures: Indicator and Read-Out Lights, Lampholders, Metal Stampings, Wire Harnessing, Brackets and other acessories used for dial, indicator, instrument, pilot and other illuminant uses in commercial and military projects. The sizes include midget, miniature, candelabra and intermediate, for standard or high brightness neon and incandescent lamps. Drake products include "Bi-Pin Cartridge Lamps", "Econoglos", "E'lite", "Flushlites", "Glo-Lites", "Mineon", "Postlites", "Tinylites", and "Titelights".

In Attendance:

H. Kenneth Foute, President
Jack Krutek, Vice President, Sales
John D'Amico, Ass't Sales Manager
William Wolfe, Sales
Lorraine Dowling, Credit Manager
Ronald Hempel, Purchasing Agent
Melvin Klingenberg, Secretary
Ray Reynolds, Sales Promotion

Booth 928

RCA ELECTRON TUBE DIVISION
415 S. 5th Street
Harrison, N. J.

Products:

Nuvistors, traveling wave, display storage, protosensitive, camera and industrial receiving tubes.

In Attendance:

Howard Hafker, District Manager
B. Battaglia, Field Engineer
R. P. Schmidt, Field Engineer
N. R. Hangen, Field Engineer

Booth 929

SEMICONDUCTOR SPECIALISTS, INC.
5700 W. North Ave.
Chicago 39, Ill.

Products:

Germanium and Silicon diodes, Silicon Rectifiers, Germanium and Silicon Transistors, Controlled Rectifiers, Layer Diodes, Zener Diodes, Reference Diodes, Tantalum Capacitors, Thermo Electric Devices, Integrated Circuitry, Special Products and Accessories as manufactured by CLEVITE, FAIRCHILD, MOTOROLA, PHILCO, SHOCKLEY, WESTINGHOUSE, GEN-

ERAL ELECTRIC, THERMALLOY, and DELBERT BLINN.

In Attendance:

Paul F. Carroll, President
Robert Bode, Vice President
Max Robinette, Field Sales Manager
Hal Choisser, Industrial Sales
Dick Swanson, Sales Engineer
Richard Dahlem, Applications Engineer

Booth 931

CINCH MANUFACTURING COMPANY
1026 S. Homan Ave.
Chicago 24, Ill.

Products:

Electrical Connecting Devices.

In Attendance:

E. J. Pool, President
G. J. Hunt, General Sales Manager
Lee Ballangee, V. P. Marketing
Roy Witte, V. P. Engineering
John Ralph, Engineering
Ben Becker, Sales
Wm. Graham, Sales
Perie Villani, Sales
Dave More, Sales
Barry Hasterck, Sales
Robert Corner, Sales
John Todd, V. P.
John Topel, Adv. Mgr.
Clyde Nelson, Adv.

Booth 1000

SIEMENS NEW YORK INC.
350 Fifth Avenue, Rm. 6810
New York 1, N. Y.

Products:

Communication Measuring Instruments
Microwave—Receiving—Special Purpose and Transmitting Tubes

In Attendance:

Dr. R. E. Zimmermann, Vice-President
Dr. N. W. Steinke, Sales Manager, Tubes Division
H. Melcher, Sales Engineer, Tubes Division
A. Oprotkowitz, Sales Engineer
B. T. Sanders, Jr., President of Sanders & Associates
D. Seidel, Sales Engineer
D. J. Morris, Applications Engineer, Sanders & Associates

Booth 1001

MERQUIP ELECTRONICS, INC.
4939 N. Elston Avenue
Chicago 30, Ill.

Industrial electronic distributors of the following major manufacturers:

Amphenol—Connectors
Bourns—Trimpots
Cambridge Thermionic — Terminals & Hardware
Cannon—Connectors
Cinch—Plugs & Connectors
C. P. Clare—Relays & Switches
Delco Radio—Semi-Conductors
Ohmite—Resistors
Sprague—Capacitors
Triad—Transformers
Tungsol—Semi-Conductors & Tubes
Westinghouse—Electron Tubes

In Attendance:

Howard B. Franklin, Vice-President
Obbie Sheade, Vice-President
Neal M. Gertz, Sales Manager
Jerry Romain, Plant Manager
Sanford Nathan, Sales
Robert Baier, Sales
Lou Knudson, Sales
William H. Bylaska, Sales
Al Levy, Sales
Chet Given, Sales
Jerry Sachin, Sales

Booth 1003

INGERSOLL PRODUCTS
DIV. BORG-WARNER CORPORATION
1000 W. 120th Street
Chicago 43, Ill.

Products:

The Standard EMCOR I Modular Enclosure System
The all new EMCOR II Modular Enclosure System
The new EMCOR heavy duty line of enclosures
The Standard EMCOR Slim-slide chassis slides

In Attendance:

Blaz A. Lucas Jr., Vice President & Sales Manager
James W. Tretheway, Marketing Manager
J. Michael Votava, Technical Service Manager

Harold N. Bowen Jr., Field Sales Manager
James B. Miller, Sales Supervisor
Richard W. Leach, Service Representative
John G. Jaworski, Service Representative
Wayne Campbell, Service Representative
George Deifel, Service Representative

Booth 1004

ELECTRO SCIENTIFIC INDUS.
7524 S. W. Macadam
Portland 19, Ore.

Products:

Instruments:
  Bridges (all types)
  Generators & Detectors for bridges
Components:
  Decade Resistors
  Decade Capacitors
Computers:
  Analog (ESIAC)
Voltage Dividers:
  Resistive, Decade
  Transf-ormer, Decade
Specials

In Attendance:

Jim Kirwan, Marketing Manager
J. A. Hoppler, Sales Manager
Edward J. Swenson, ESIAC Applications Engineer
Tom White, Applications Engineer

Booth 1006

EEM-ELECTRONIC ENGINEERS MASTER
(United Catalog Publishers, Inc.)
60 Madison Avenue
Hempstead, N. Y.

Products:

1962 Edition—eem—Electronic Engineers Master, CATALOG-DIRECTORY of the industry. 1962 Edition—The Radio-Electronic Master, catalog of standard products sold by electronic parts distributors. ELECTRONIC PRODUCTS Magazine, the industry's new product monthly. eem File System, the industry's first and only organized method of filing product data.

In Attendance:

Arthur I. Rabb, General Manager
Harry Birse, Marketing Director
Wayne Cargile, Midwest Manager
Bill Pattis, District Manager
Ralph Bergen, District Manager

Booth 1007

KROHN-HITE CORPORATION
580 Massachusetts Avenue
Cambridge 39, Mass.

Products:

Wide-range programable stable-amplitude ultra-low distortion oscillators; low-distortion stable-amplitude variable frequency power sources; multi-function variable electronic filters; ac voltage monitors; ultra-high regulation transistorized power supplies; ultra-low distortion and wide-band direct-coupled power amplifiers.

In Attendance:

W. L. Bixby, Vice President for Marketing
J. A. McLaughlin, Sales Engineer

Booth 1008

ELECTRA MANUFACTURING CO.
Independence, Kas.

Products:

Precision Carbon Film Resistors
Precision Metal Film Resistors
Tantalum Capacitors
Integrated Circuits

In Attendance:

G. D. Butler, President
R. E. King, Director of Marketing
E. L. Beaudry, Field Sales Manager
W. R. Ayers, Advertising Manager
J. A. Cook, Product Specialist—Resistors

Booths 1009-11

RADIO FREQUENCY LABORATORIES, INC.
Powerville Road
Boonton, New Jersey

Products:

Precision AC/DC Instrument Calibration Standards
Precision AC/DC Power Supplies
Magnet Chargers and Treaters
Absolute and Differential Gaussmeters

In Attendance:

R. H. Denton, Vice President
H. J. Pyle, Sales Manager
J. N. Austin, Sales Engineer

Booth 1012

WECKESSER COMPANY, INC.
5701 Northwest Highway
Chicago 46, Ill.

Products:

ELECTRONIC HARDWARE: Butyrate, Ethocel, Nylon, and Teflon Cable Clamps; Nylon Wedge Lock Band Clamps; Nylon Tab-Loc Clamps; Nylon Half Clips; Snap Clips; Flat and Strap Clamps; Nylon Perforated Strapping; Ratchet Buckles, and Mounting Tabs; Nylon Plain Washers; Nylon Threaded Rod; Molded Nylon Screws, Hex Nuts and Cap Nuts; Plastic Molding and Extrusion; Plastic & Metal Stamping.

In Attendance:

Harry A. Ewalt, General Manager
F. W. Bertram, Sales Manager

Booth 1013

GEORGE A. PHILBRICK RESEARCHES
127 Clarendon Street
Boston 16, Mass.

Products:

Electronic Analog Computing Equipment; DC Operational Amplifiers, including vacuum tube and solid state versions; Regulated Power Supplies for complete range of requirements.

In Attendance:

Daniel H. Sheingold, Director of Applications—Engineering
Walter Nolan, Marketing Administration
Sunil Mukherjee, Applications Engineer
Hugh Marsland, Engineering Representative
Carl Novorska, Engineering Representative
Walter Bergstrom, Engineermg Representative
Robert Rinaker, Engineering Representative
Joseph Gray, Engineering Representative
John Blonigan, Engineering Representative

Booth 1014

ELCO CORP.
Willow Grove, Pa.

Products:

Manufacturer Varicon Contacts & Connectors—Rack & Panel—Printed Circuit—Subminiature — Microminiature — Varipak Card Cage. Complete wire wrap contacts in various spacings. Contacts available for solder, taper pin, crimp & insert Varilok.

In Attendance:

Leo Kagan, V. P. Mktg.
Wm McKay, Sales Mgr.
Ronald Lyons, Field Sales Supervisor
Herbert Ruehlemann, V. P. Engrg.

Booth 1015

TRYGON ELECTRONICS, INC.
111 Pleasant Avenue
Roosevelt, L. I., N. Y.

Products:

A wide line of transistorized DC power supplies ranging from a 0.5A laboratory supply to 80 ampere systems supplies. Trygon's exclusive Automatic Overvoltage Protection feature will be demonstrated.

In Attendance:

Peter J. Reuter, Vice President, Sales

Booth 1016

PLASTIC CAPACITORS INC.
2620 North Clybourn Avenue
Chicago 14, Ill.

Products:

High voltage, high reliability paper mylar capacitors; close tolerance polystyrene, metallized mylar capacitors from 50 v to 120 kv. Mylar, polyethylene, teflon, paper dielectrics exceeding MIL requirements. High voltage P.F.N.'s, low current transistorized, tube oscillator, line voltage type power packs to 100 kv. Variable A.C. supply & kilovoltmeter.

In Attendance:

S. Meskan, President
H. Francis, Sales Manager
T. Brown, Factory Sales
D. Dolin, Representative—Sales
H. Jacobs, Representative—Sales
W. Doerr, Representative—Sales
P. Berry, Engineer
K. Yahiro, Engineer

Booth 1017

GERTSCH PRODUCTS, INC.
3211 South La Cienega Blvd.
Los Angeles 16, Cal.

Products:

Electronic Instruments: Frequency Meters, Frequency Dividers, Frequency Multipliers, AC Voltage Dividers, Special Transformers, Voltmeters, Complex Ratio Bridges, Null Indicators, Deviation Meters, Band Pass Filters, Coaxial Ratio Transformers, Percent Deviation RatioTrans, Phase Standards, Synchro and Resolver Equipment, Standards Receivers.

In Attendance:

E. W. Watts, Vice President—Sales
H. F. Richardson, Sales Manager

Booth 1018

SHEROLD CRYSTALS, INC.
1510 McGee Trafficway
Kansas City 8, Mo.

Products:

Quartz Crystals, Crystal Filters, Ovens, Crystal Oscillators

In Attendance:

K. B. Thomson, President
Robert L. Owens, Vice-President
Faye Davis, Purchasing Agent

Booth 1019

TRIO LABORATORIES, INC.
80 Dupont Street
Plainview, L. I., N. Y.

Products:

Precision test equipment consisting of vacuum tube and transistorized voltmeters for panel mounting or portable use. Complete manual or automatic limit detection systems to exact specifications.

In Attendance:

John R. Crawford, Sales Manager
Nicholas A. Christian, Sales Engineer

Booth 1020

MOTOROLA SEMICONDUCTOR PRODUCTS INC.
5005 E. McDowell Road
Phoenix 8, Arizona

Products:

Integrated Circuits
Silicon Controlled Rectifiers
Power Transistors
Milliwatt Transistors
Silicon Rectifiers
Silicon Epitaxial Switching Trans.
Silicon Epitaxial Amplifying Trans.
Zener Diodes
Germanium Switching and Amplifying Transistors

In Attendance:

C. J. Goodman, Central Area Manager (Acting)
R. Kimbell, Regional Sales Manager
D. Garner, District Sales Manager
F. Soufal, District Sales Manager
J. Cook, District Sales Manager
G. Schafer, District Sales Manager
R. Damm, District Sales Manager
W. Brady, District Sales Manager
H. Onsager, Account Executive
L. Altobello, Sales Engineer
G. Weiler, Regional Distributor Manager
J. Semmer, Sales Engineer

Booths 1021-1023

HUGH MARSLAND & CO., INC.
6699 Lincoln Ave.
Chicago 45, Ill.

Manufacturers' Representative for:

DeMornay-Zonardi, Microwave Instr.
Allen B. Bumont, Oscilloscopes, Cameras
Gertsch Products, Freq. Meters, Ratio Trans.
Ingersoll Products, Metal Enclosures
Kin-Tel, Amplifiers, Volt. Stds., Dig. Voltmts., Closed Circuit TV
Krohn Hite, Power Supplies, Amplifiers, Filters, Oscillators
Ling Electronics, Shaker Systems
Massa Div., Oscillographs, Amplifiers
Geo. Philbrick, Computing Instr. & Components
Radio Frequency Labs., Magnet Chargers, Treaters, Calibrators, Imp. Meters
Tenney Engineering—Environmental Chambers
Trio Laboratories, V.T.V.M.'s & Power Supplies
Trygon Electronics, Transistorized Power Supplies

In Attendance:

William Cockerill, Sales Engineer
Wally Bergstrom, Sales Engineer
Jerry Berk, Sales Engineer
Jack Blonigan, Sales Engineer
Joe Gray, Sales Engineer
Bob Marach, Sales Engineer
Baird Marsland, Sales Engineer
Carl Novorska, Sales Engineer
Bud Riedy, Sales Engineer
Bob Rinaker, Sales Engineer
Dorothy Saska, Secretary
Hugh Marsland, President

Booth 1024

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10514 Dupont Avenue
Cleveland 8, Ohio

Products:

Electronic Test Equipment including tube testers, transistors testers, oscilloscopes, VOM'S, VTVM's, signal generators, color TV test equipment, panel meters, new core mag taut-band meter movement, card programming devices, automatic and motorized and automatic feed.

In Attendance:
R. D. Hickok, President
David Hughes, Vice President
Tomas P. Clements, Sales Manager—Distributor Div.
Lloyd Owens, Sales Manager—Meter Div.
J. O. Nagle, Sales Manager—Control Equipment
Harry Zimmerman, Sales Manager—RD Div.
J. W. Siringer, Advertising Manager
Henry Kroeger, Sales Representative

Booth 1025

UNITEK CORP., WELDMATIC DIV.
950 Royal Oaks Drive
Monrovia, Cal.

Products:
Welding systems, precision resistance welder power supplies, heads, control units, accessories.

In Attendance:
Richard L. Major, Sales Manager
O. W. Sailer, Division Manager
J. R. Sosoka, Manager, Technical Services

Booth 1027

AIR CONTROL, INC.
450 Narberth Avenue
Narberth, Pa.

Products:
MICROVOID (Plexiglas and Metal) Dust Control Hoods & Cabinets
HYDROVOID (Plexiglas) Dust and Atmosphere Controlled Hoods & Cabinets
Storage Boxes (Plexiglas)
Custom Built Enclosures and Work Stations

In Attendance:
A. K. Neff, Sales Manager
William A. Cockerill, Sales Representative
Baird Marsland, Sales Representative
Hugh Marsland, Sales Representative
Jerry Berk, Sales Representative
Joe Gray, Sales Representative
Jack Blonigan, Sales Representative
Wally Bergstrom, Sales Representative

Booth 1028

GPL DIV.—GENERAL PRECISION, INC.
63 Bedford Road
Pleasantville, New York

Products:
Introducing GPL's new Precision 800 Closed Circuit High Resolution TV System and Wideband Microwave Relay Link for the 12.7 to 13.25 KMC Band.

In Attendance:
Vern Bertrand
Marshall Ruehrdanz
Richard Arthur
Kenneth Weinreich
Bob Churchill

Booth 1029

CARPENTER MFG. CO., INC.
P. O. Box 9, Highbridge Road
DeWitt 14, N. Y.

Products:
Rotary Swing Blade units for stripping extruded and wrapped insulations—especially Teflon. Bench and portable models
Wheel Type units, fiber glass or wire brushes, for stripping film insulations. Bench or portable models
Flash stripper. Strips and end-fuses shielding wires on coax, shielded cable, etc. First Chicago showing

In Attendance:
Louis M. Carpenter, President
Jerry Maloney, Sales Manager

Booth 1030

MAUREY INSTRUMENT CORPORATION
4555 West Sixtieth Street
Chicago 29, Ill.

Products:
Precision potentiometers, single turn wirewound, linear, non-linear
Precision slip ring switches, multi-pole, multi-throw, phasable, gangable

In Attendance:
E. Maurey, Jr., President & Chief Engineer
Joseph Popp, Central Regional Sales Manager
Thomas Morris, Assistant Sales Manager
John Ruzzier, Project Engineer
Floyd Menze, Mfrs. Rep.

Booth 1031

FORMULABS INDUSTRIAL INKS, INC.
529 W. 4th Ave.
Escondido, Calif.

Products:
Wire Coding Inks and applicator equipment

In Attendance:
Maynard C. Marwede, Marketing Manager
Vernon Hunt, Chief Chemist
John Raymond, Asst. Manager

Booth 1032

THE RAULAND CORPORATION
4245 North Knox Avenue
Chicago 41, Ill.

Products:
Scan Converter Storage Tubes, Radar Display Tubes, Image Intensifier Tubes, High Resolution-High Brightness Display Tubes, Special Purpose Cathode Ray Tubes, T. V. Picture Tubes.

In Attendance:
W. E. Phillips, Vice President & General Manager
Dr. C. S. Szegho, Vice President in Charge of Research
Tom Snow, General Sales Manager
Joe Babula, Liaison Engineer
Elmer Bastian, Engineering Specialist
Ted Noskowicz, Project Engineer

Booth 1033

EUBANKS ENGINEERING COMPANY
260 N. Allen Ave.
Pasadena, Cal.

Products:
Automatic Wire Stripper and Prefeed

In Attendance:
Edward F. Eubanks, General Manager

Booths 1034-1036

P. R. MALLORY & CO., INC.
3029 E. Washington St.
Indianapolis 6, Ind.

Products:
Batteries, Capacitors, Controls, Resistors, Rheostats, Switches, Jacks and Plugs, Silicon Rectifiers, Packaged Semiconductor Circuits, Zener Diodes, Vibrators, Communications Equipment, Power Supplies, Timing Devices, Sensing and Switching Devices, Contacts, Relays, Resistance Welding Materials.

In Attendance:
H. C. Buell, Vice-President—Customer Relations
R. H. Andrew, Customer Relations Manager
K. M. Schaefer, Midwest District Manager
C. H. Woodward, Sales Engineer
D. Mischler, Sales Engineer
R. E. Zucker, Sales Engineer
R. H. Rinehart, Sales Engineer
R. A. Carnell, Sales Engineer

Booth 1035

BOESCH MANUFACTURING DIVISION WALTHAM PRECISION INSTRUMENT CO., INC.
45 River St.
Danbury, Conn.

Products:
New Model T 100C and Model T 100B Automatic Toroidal Coil Winding Machines
New Model T 600 Tape Winder
Controls and Counters

In Attendance:
F. D. Schatzle, Sales Manager
Leon Yarrish, Sales Service Technician
Howard Wallner, Sales Service Technician
Les McKeen, Sales Service Technician

Booth 1037

GEO. STEVENS MFG. CO., INC.
6001 N. Keystone Avenue
Chicago 46, Ill.

Products:
The most complete line of coil winding machinery featuring latest designs in automatic and semi-automatic bobbin and single layer winders, continuous resistor winders, precision pot winders and armature winders.

In Attendance:
George Stevens, President
Jack Stevens, Vice President
Paul Cappello, Ass't to Vice Pres.
John Sadorf, Chief Mechanical Engineer
Walt Donaldson, Electrical Engineer
Harrison Blind, Indiana Sales Representative

Booth 1041

HELLER INDUSTRIES INC.
15 S. Essex Ave.
Orange, N. J.

Products:
Leadmaster—Cuts and Forms Axial Leads of Electronic Components
Busmaster—Cuts and Forms Wire for Electronic and Other Industries

In Attendance:
Martin G. Heller, President
J. M. Heller, Vice-President
Joseph Kerner, Sales Manager
H. Marsland, Midwest Sales
W. Cockerill, Midwest Sales

Booth 1043

ELECTRONIC PREVIEW & SCIENCES REVIEW
526 South York Street
Elmhurst, Ill.

Products:
Trade Magazine

In Attendance:
S. M. Gaskins, Publisher
C. W. MacLeod, Communications Manager
Ruthe Hauber, Production Manager

Booth 1045

PRECISION ELECTROPLATING CO.
6045 N. Keystone
Chicago 46, Ill.

Products:
Precious Metal Electroplaters

In Attendance:
James Zacharias, Vice President
Richard Zacharias, Secretary
James Anderson, Sales
Gerald Lipton, Chief Chemist

Booths 1100-1104-1108

THE BENDIX CORPORATION

Products:
Participating Divisions:
Scintilla Division, Sidney, New York, Electrical Connectors, Capacitors & Cabling
Bendix Semiconductor Division, Holmdel, N. J., Semiconductor Devices
Red Bank Division, Eatontown, N. J., Special Electron Tubes

In Attendance:
Scintilla Division:
Oscar Forsberg, Reg. Sales Manager
M. C. Gilbert, Application Engineer
Ralph M. Cecil, Application Engineer
Fred Bulken, Product Sales Engineer
S. B. Merritt, Product Sales Engineer
Dave Newcomb, Product Sales Engineer
Bendix Semiconductor Division:
R. R. Meijer, Mgr. Marketing
Ralph Miller, Sales Engineer
H. Newman, Sales Engineer
J. Harrison, Sales Engineer
Red Bank Division:
J. F. Bozzelli, Sales Manager
T. B. MacCulough, Midwest Representative
E. Swenerton, Sales Engineer
O. Moore, Sales Engineer

Booth 1101

THE A. W. HAYDON COMPANY
232 North Elm Street
Waterbury 20, Conn.

Products:
AC and DC Timing Motors, Elapsed Time Indicators, Repeat Cycle Timers, Time Delay Relays, Stepping and Encoding Devices, Electronic and Electro-Mechanical Timers and Controls, Automation and Portable Test Equipment.

In Attendance:
Ronald G. Nicholson, Sales Engineer
Everett W. Heintz, Sales Engineer
John Kenney, Assistant Sales Manager
P. Famiglietti, Sales Manager

Booth 1105

DIGITAL EQUIPMENT CORP.
146 Main Street
Maynard, Mass.

Products:
Digital Logic Modules for systems, laboratory, and training applications—available in 10 megacycle, 5 megacycle, and 500 kilocycle ranges. General purpose, solid state computers and associated equipment. Special systems including automatic memory testers, memory exercisers, memory core testers, and buffers.

In Attendance:
K. H. Olsen, President
H. A. Anderson, Vice President
S. C. Olsen, Sales Manager
R. Doane, Design Engineer

Booth 1109

MECHATROL DIVISION SERVOMECHANISMS, INC.
1200 Prospect Avenue
Westbury, L. I., N. Y.

Products:
Metal Film Products; Precision Potentiometers, *Filmtrim Trimmer Potentiometers. Precision Rotating Components; Servo Motors, Hysterisis Synchronoys Motors; Dyal Speed Synchronoys Motors, Dumping Tachometers, Temperature Compensated Tachometers, Magnetic Detent Stepper Motors, Accessories—Gearheads, Viscous and Inertial Dampers. Precision Electronic and Mechanical Breadboard Parts.
*tradename

In Attendance:
Victor See, Sales Manager
George Dinger, Senior Sales Coordinator
Ernest Meder, Project Engineer

Booth 1110

HUGH H. EBY COMPANY
4701 Germantown Avenue
Philadelphia 44, Pa.

Products:
The Hugh H. Eby Co. is a source of electronic, communications, radio, and television components and sub assemblies. Among its many dependable products, Eby manufactures tube sockets, tube shields, connectors, binding posts, jacks, in-line fuse holders, printed circuits, plugs, and terminal strips.

In Attendance:
A. Robert Masters, President
Edward Feder, Advertising Manager
Martin Lyon, Representative
Ceril Datlow, Representative
Ralph Robin, Representative
Rita Lyon, Representative
William Telmosse, Sales Manager

Booth 1111

WABER ELECTRONICS INC.
Hancock & Somerset Streets
Philadelphia 33, Pa.

Products:
Master Power Controls
Electrical Outlet Boxes
Fume Hood Monitors

In Attendance:
Isadore Waber, Sales Manager
Arnold Goldman, V. P. Engineering
Thomas Christo, Sales Engineer

Booth 1112

JETTRON PRODUCTS, INC.
56 Route 10
Hanover, N. J.

Products:
"Push-Button" Transistor Test Socket; "Flip-Top" Test Socket for Micro, Pico, Transi-T; 7 & 9 Pin Miniature-Tube "Production" Socket (complete line of Sockets for G.E. Micro-Miniature Ceramic) Tubes; Special Sockets for Special Purpose Tubes: Beam Power, Lighthouse, Pencil, Forced Air Cooled, Water Cooled; Cable Assemblies, Anode Connectors, Magnetron Connectors, Micromodule Sockets, Transistor Sockets; UHF Sockets for Machlett Labs. *Pallets for Automated Testing of Semi-Conductors.

In Attendance:
Kenneth Johnsen, Sales Manager
John M. Schill, Advertising—Marketing Mgr.
William F. Hamilton, Sales Engineer
Robert Sloan, Sales Engineer

Booth 1113

LARSON INSTRUMENT CO.
Greenbush Rd.
Orangeburg, N. Y.

Products:
Contactless and Contact Type Meter Relays, Sizes 2½, 3½ & 4½"
also
30 and 60 Styli Inkless Event Recorders, ½" per hour to 10" per second chart speeds.

In Attendance:
Louis H. Larson, Chief Engineer
G. Adams, Sales

Booth 1114

SPACEONICS INC.
and
PORTABLE ELECTRIC TOOLS, INC.
(Motor and Electronics Division)
Laboratory—Two Overhill Road
Scarsdale, N. Y.
Motor and Electronics Division
1200 East State Street
Geneva, Ill.

Products:
Small, Fractional HP Electric Motors
Microminiaturized Modules
Data Recording Systems
Components for Telemetry Systems
Electro-Mechanical Actuating Systems
Monitoring Equipment

In Attendance:
Robert E. Merriam, President
Mel F. Ryan, Vice President-Treasurer
Alfred D. Gronner, Vice President of Engineering

Marcel L. Brailey, Vice President of R & D
Herbert Hanft, Manager of Technical Services
Sheldon S. Thaler, Manager, Instrumentation Systems
Robert Porthan, Staff Engineer
Imre Olah, Staff Engineer

Booth 1115

BLUE M ELECTRIC COMPANY
138th & Chatham Street
Blue Island, Ill.

Products:

Life Test Ovens equipped with POWER-O-MATIC 60, Saturable Reactor Control System
"Super Fast" Vacuum Oven equipped with POWER-O-MATIC 60, Saturable Reactor Control System
Cam Type Programming, Recording, Controlling of temperature and humidity with Saturable Reactor Control.

In Attendance:

Philip Lazzara, President
Angelo Lazzara, Vice President—Sales
Jack Lawler, Vice President—Engineering
Harold Mathews, Sales Engineer
Robert Hedges, Technical Sales
Fred Volkman, Technical Sales
William F. Wilde, Sales Manager (S. & L. A. Div.)

Booth 1116

TERADYNE, INC.
87 Summer Street
Boston 10, Massachusetts

Products:

Production and Evaluation Equipment for both users and manufacturers of electronic components with emphasis on highly reliable industrial electronic instrumentation.

In Attendance:

Nicholas DeWolf, President
Alexander V. d'Arbeloff, Sales Manager

Booth 1117

STANDARD ELECTRONICS COMPANY
1611 W. 63rd Street
Chicago 36, Ill.

Products:

Radio Interference Filters
Testing and Certification (Laboratory) Radio Interference

In Attendance:

Carl L. Scheirman, President
Emil Skocypec, Engineer
Fran Loucopulos, Purchasing Agent
Larry Galimski, Engineer

Booth 1118

STRUTHERS-DUNN, INC.
Lambs Road
Pitman, N. J.

Products:

Electromechanical Relays & Timers

In Attendance:

R. L. Hellmund, District Sales Mgr.
E. C. Wilson, District Sales Manager
J. W. Lighthall, Manager of Industrial Prod. Sales
L. R. Morrow, Sales Promotion Mgr.
G. B. Conger, Jr., Vice-President, Sales Manager

Booth 1119

U. S. INDUSTRIES, INC.
EDUCATIONAL SCIENCE DIVISION
250 Park Avenue
New York 17, N. Y.

Products:

AutoTutor Mark II, teaching machine and various TutorFilms, among which are TutorFilms that constitute a year's study in Electronics.

In Attendance:

James Stratton, Sales Manager
Lloyd Seidman, President

Booth 1120

MIDLAND ENG. & MACHINE CO.
7517 W. Belmont
Chicago 34, Ill.

Products:

Equipment to automatically apply pressure sensitive tape to electrical components, such as relay and solinoid coils, capacitors, motor coils, etc. Several different types of equipment having different features will be shown.

In Attendance:

Robert T. Larsson, Sales Manager
Robert S. Scott, Sales

Booth 1121

ELECTRO-SEAL CORP.
946 North Avenue
Des Plaines, Ill.

Products:

Power Supplies, Voltage Regulators, Voltage Controls, Electronic Timers, Rocket Firing Devices, Bomb Releases, Hermetic Sealing.

In Attendance:

H. U. Hjermstad, President
F. C. Ullrich, Vice President
C. J. Kopp, Chief Engineer
W. W. Kribble, Sales Manager
J. T. Keefe, Marketing Manager
B. Burt, Production Supt.
R. Schumacher, R. & D. Engineer
R. W. King, Product Engineer
H. Lock, Purchasing Agent

Booths 1122, 1124, 1126, 1128

U. S. DEPARTMENT OF COMMERCE
226 W. Jackson Blvd.
Chicago 6, Illinois

Products:

In addition to displays illustrating types of services available to business, we will feature the Topside Sounder satellite scheduled for launching late this summer. Also present will be exhibit showing latest information on voltage measurements. It will include both AC and DC measurements, the latter covering frequency range from 5 cycles to 900 megacycles.

In Attendance:

Anthony J. Buchar
Joseph C. Fasulo
Robert H. Perry
Michael V. Simon

Booth 1123

KROCH'S & BRENTANO'S
29 South Wabash Avenue
Chicago 3, Ill.

Products:

Books. From the Major Technical and Scientific Publishers.

In Attendance:

William McCarthy, Special Sales
Lyman Newlin, Buyer—Technical Book Division
Terry Wybel, Manager—Technical Book Division
Morton L. Levin, Vice President
Henry M. Fujii, Special Sales

Booths 1125 & 1127

DZUS FASTENER CO., INC.
125 Union Street
West Islip, L. I., N. Y.

Products:

DZUS Spiral cam ¼" turn self locking, standard, supersonic and panel fasteners; also DZUS fast acting thread fasteners for high tensile and shear loads.
Ralph M. Nelson, Inc.
Engrg. Sales Associated
New England Service

In Attendance:

Theodore Dzus, President
L. F. Acker, Sales Manager
Jack Mahler, Assistant Sales Manager

Booths 1129-1131

DELCO RADIO DIVISION, GMC
700 East Firmin Street
Kokomo, Indiana

Products:

Manufacturers of Solid State electronic equipment and components, including power transistors, rectifiers, digital circuit modules and cords, power converters, computer peripheral equipment and communications equipment.

In Attendance:

M. J. Caserio, General Manager
H. M. Stelzl, Dir. of Sales & Engineering
D. A. Sandberg, General Sales Manager
F. W. Young, Manager, Semiconductor Sales
D. L. Billiet, Manager, Marketing Services
E. J. Marx, Advertising Manager
J. C. Crawford, Manager, Military Sales
F. E. Jaumot, Dir. Semiconductor R. & E.
E. H. Lemler, Manager, Chicago Office
J. S. Toney, Sales Engineer, Chicago Office
W. C. Letsinger, Supervisor, Customer Assistance
C. H. Baker, Marketing Specialist
R. H. Wright, Distributor Sales

Booth 1130

CANADA—DEPARTMENT OF TRADE AND COMMERCE
Canadian Consulate
111 N. Wabash Avenue
Chicago 2, Ill.

Products:

Manned Information Booth for Promotion of Canadian Electronics.

In Attendance:

H. J. Horne, Consul and Senior Trade Commissioner
V. B. Chew, Consul and Trade Commissioner
N. L. Currie, Consul and Assistant Trade Commissioner
J. M. Knowles, Vice-Consul & Assistant Trade Commisioner
T. M. Felgen, Commercial Officer
I. M. Wild, Office Manager
Mrs. I. M. Wild, Office Manager
J. A. Colvin, Consul and Information Officer

Booth 1132

F. D. THOMPSON PUBLICATIONS, INC.
201 N. Wells Street
Chicago, Ill.

Products:

Research/Development, Publication
Western Electronic News, Publication
Datamation, Publication

In Attendance:

Gilbert Thayer, Vice President-Publication Manager
William Dwyer, District Manager — Research/Development
James Widaman, District Manager — Research/Development
George A. Whittington, Editor—Research/Development
Stuart J. Osten, District Manager—Western Electronic News
John Brennan, District Manager—Datamation

Booth 1144

THE INSTITUTE OF RADIO ENGRS.
72 W. 45 Street
New York 36, N. Y.

Products:

Services: IRE Directory, Proceedings of the IRE, IRE Transactions, Membership order forms and all information pertinent to IRE.

In Attendance:

William C. Copp, Exhibits Manager
Lillian Petranek, Reservations Manager
Scott Kingwill, Sales District Manager
John Morgan, Sales Representative
Merle Halper, Secretary

Booth 1200

ALLEN B. DU MONT LABORATORIES DIVISIONS FAIRCHILD CAMERA AND INSTRUMENT CORPORATION
(Industrial Electronics Division & Electronic Tube Division)
750 Bloomfield Avenue
Clifton, N.J.

Products:

INDUSTRIAL ELECTRONICS DIVISION—New Type 765 series transistorized, high-frequency oscilloscope with variety of plug-ins including calibrated and uncalibrated delay sweep plug-ins; Type 403-B, most sensitive available oscilloscope; Type 401-B, low-frequency general purpose laboratory oscilloscope with X and Y amplifiers; Type 404-B, pulse generator; and new low cost highly versatile series of 453 oscilloscope record cameras for Polaroid and film record photos in varied sizes.

ELECTRONIC TUBE DIVISION—Multiplier phototubes featuring two new types with S1 response—K2290 and K2276; Industrial cathode-Ray tubes; power tubes.

In Attendance:

Instrument Division:
Fred Katzmann, Instrument Engineering Manager
John W. Scheck, Instrument Marketing Manager
George Tirone, Marketing and Automotive Equipment Sales
Tube Division:
Robert W. Deutsch, Sales Manager, Electronic Tubes
Richard J. Sparnon, Advertising Manager, Electronic Tubes

Booth 1201

CAPACITOR DEPT.
GENERAL ELECTRIC
John St.
Hudson Falls, N.Y.

Products:

Tubular film capacitors in military computer and commercial grades and Microflat Miniature and Flat-dipped Lestrofilm R-B capacitors plus capacitors for LASER and SCR applications.

In Attendance:

G. E. Ormson, Mgr. Sales—Electronic Capacitors
F. L. Johnson, Sales Specialist

P. W. Bisaha, Sales Specialist
J. B. Maher, Sales Specialist
P. N. Goldthwaite, Mgr. Advertising & Sales Promotion

Booth 1201

GENERAL ELECTRIC COMPANY
P.O. Box 158, Irmo, S.C.

Products:

Computer-Grade Alumalytic Capacitors
QSR Porous-Anode Tantalytic Capacitors
450V High-Voltage Foil Tantalytic Capacitors
125°C Foil Tantalytic Capacitors
High Reliability Solid Tantalytic Capacitors
High Reliability Foil Tantalytic Capacitors
KSR Foil Tantalytic Capacitors
85°C Foil Tantalytic Capacitors "A Case"
85°C Foil Tantalytic Capacitors
85°C Foil Tantalytic Capacitors "AB Case"
Rectangular Foil Tantalytic Capacitors

In Attendance:

D. F. Lefler, Senior Product Specialist
H. Brunton, Manager—Marketing
W. C. Bakes, Manager—Alumalytic Sales

Booth 1204

FAIRCHILD SEMICONDUCTOR
545 Whisman Road
Mountain View, Calif.

Products:

Design, Manufacture and Testing of Silicon Planar Epitaxial Transistors and Diodes; Microplanar Devices; Micrologic Elements; Industrial Silicon Transistors and Diodes; Transistor Test Equipment.

In Attendance:

Robert J. Major, Regional Sales Manager
Robert Shultz, Manager—Applications Engineering
Ran Johnston, Engineer
Jack MacIntosh, Engineer
Dick Lane, Engineer
Jerry Sanders, Sales
Mason Wood, Advertising

Booth 1205

G. E. CO., SPECIALTY CONTROL DEPT.
Waynesboro, Va.

Products:

Microminiature relays, low-level to 2 amps, 2 and 4-pole, featuring welded construction; crystal can, grid-spaced, and magnetic latching types. Unimite relays, 1 amp, SPDT; miniature relays, 5 amp and heavy duty, military and industrial types.

In Attendance:

D. F. Cross, Sales Manager
R. D. Hawkins, Application Engineer

Booths 1208-10-12

MONROE CALCULATING MACHINE COMPANY
Orange, N.J.
Division of the Business Machines Group of Litton Industries

Products:

Calculating, adding, accounting, data processing machines.

In Attendance:

James Du Bois, Branch Manager
J. Cadmus, Representative
P. Nivling, Asst. Branch Manager
A. Catlin, Asst. Branch Manager

Booth 1211

GENERAL ELECTRIC CO.
GENERAL PURPOSE CONTROL DEPT.
P.O. Box 913
Bloomington, Ill.

Products:

Magnetic Counters
Reed Switch Relays

In Attendance:

F. Carlson, O.E.M. Sales Spec.
T. L. Mayes, Manager O.E.M. Sales
G. R. Archer, Advertising & Sales Prom.

Booth 1213

RECTIFIER COMPONENTS DEPT.
GENERAL ELECTRIC CO.
W. Genesee St.
Auburn, N.Y.

Products:

Semiconductor Rectifiers
Silicon Controlled Rectifiers
Semiconductor Stacks
Light Activated Devices

In Attendance:

G. R. Curtiss, Regional Manager
F. W. Gutzwiller, Manager — Application Eng.
J. E. Mungenast, Manager—Market & Distributor development

R. C. Rogers, District Sales Manager
L. A. Mooney, District Sales Manager
C. K. Huyette, District Sales Manager
J. F. Munson, District Sales Manager

Booth 1214

MINNEAPOLIS-HONEYWELL REGULATOR CO.
2747 - 4th Ave.
South Minneapolis, Minn.

Products:

Germanium Power Transistors
Silicon Power Transistors
Microelectric Circuits
Germanium Resistance Thermometers (Cryogenic)

In Attendance:

John C. Alexander, Market Manager
Richard F. Wittman, Product Manager
Lorin Fortier, Regional Sales Manager
Ed Robbins, Field Sales Engineer

Booth 1215

GENERAL ELECTRIC RECEIVING TUBE DEPT.
316 E. Ninth Street
Owensboro, Ky.

Products:

Ceramic Tubes, TIMM (Thermionic Integrated Micro Modules), Compoctrons, Photoconducline Cells, Ivy Reed Switches.

In Attendance:

G. O. Crossland, Regional Sales Manager
K. E. Uleitzel, District Sales Manager
R. F. Long, District Sales Manager
C. J. Biner, District Sales Manager
B. S. Weiss, District Sales Manager

Booth 1216

BALHORN & WELCH, INC.
7185 W. Armitage Ave.
Chicago 35, Ill.

Products:

1. Potter & Brumfield, Inc., Div. of American Machine and Foundry Relays—General Purpose, telephone type, latching, sensitive and microminiature.
2. Welwyn International, Inc. Resistors—Carbon film and metal oxide.

In Attendance:

Richard Welch, Sales Engineer
Fred Poppe, Sales Engineer
Dean Balhorn, Sales Engineer
T. B. White, Sales Mgr. Mil. Potter & Brumfield
John Buchspice, Welwyn International Sales Mgr.

Booth 1218

PRYOR MARKING PRODUCTS
434 S. Wabash Avenue
Chicago 5, Ill.

Products:

Movichart Visual Graphic Chart Systems for Production, Safety, Inventory, Sales Quality Control, Stock Control, etc. Plastic Signs for Identification in Plants, Rubber, and Steel Type, and Holders for Imprinting; Consecutive Numbering Machines, Special Printing Inks, Conveyor Markers.

In Attendance:

D. J. Wilken
I. Simon
S. E. Johnson
S. Greene

Booth 1219

HI-G INCORPORATED
Spring St. & Rt. 75
Windsor Locks, Conn.

Products:

Electro-Mechanical relays — Electronic Switching devices—Time Delay relays—Voltage Sensors.

In Attendance:

John A. Pfingsten, Sales Engineering Manager
D. L. Brubaker, Sales Engineer

Booth 1220

SANTINI BROTHERS, INC.
3310 North Manheim Road
Franklin Park, Illinois

Products:

Long Distance Moving & Storage

In Attendance:

James J. Lippert, Branch Manager
Jack E. Sesco, Office Manager
George Marmaro, Operations Manager
Ed Short, Sales Representative
Frank Sullivan Sales Representative
Dominick Cocciemiglio, Warehouse Manager
Janet C. Bong, Private Secretary

Booth 1221

BRAND-REX DIVISION
31 Sudbury Road
Concord, Mass.

Products:

Hook-up Wires for Electrical and Electronic Equipment—U. L. and Military Approved.
Electrical Insulation Tubing and Sleeving—Plastic and coated, U. L. and Military Types.

In Attendance:

C. R. Riordan, General Sales Manager
E. J. McIntyre, Central Region Sales Mgr.
J. C. Callahan, Manager, Comm'l Markets
W. B. Wasson, Chicago Representative
R. J. Gallagher, Chicago Representative
T. V. Ward, Chicago Representative
J. H. Clark, Ohio Representative
N. J. Clark, Michigan Representative

Booth 1222

JONATHAN MFG. CO.
720 E. Walnut Avenue
Fullerton, Calif.

Products:

1. Thinline Ball Bearing Chassis Slides for Packaging Electronic Instrumentation.
2. Power Lock Handle with Adjustable Keeper.
3. Power Track Cable Carrier.
4. Associated Electronic Hardware.

In Attendance:

John Meyer, V. President
Charles Meyer, President
Richard Becker, Distr. Mgr.
Jerry Brandt, Sales
Wm. Wachtel, Sales Mgr.
Wm. Turner, Sales
Leo Rusz, Sales
Wally Sparf, Sales
Bob Dowling, Sales

Booth 1223

MURATA MFG. CO., LTD.
Kyoto, Japan

Products:

Ceramic Condensers, Mechanical Filters, Piezo Products.

In Attendance:

A. Murata, President

Booths 1224-1226

CHART-PAK, INC.
One River Road
Leeds, Mass.

Products:

Manufacturers of pressure sensitive tapes and die-cut symbols for printed circuit layouts. Originator of the new TRANS-PAK method of die-cut symbol placement. Also, precision polyester grids and special printed pressure sensitive tapes and polyester sheets for printed circuit and schematic layouts. All pressure sensitive products may be reproduced by the diazo or photographic method.

In Attendance:

E. E. White, District Manager
L. A. Frohbach, Vice President
Alan Brooking, District Manager

Booth 1225

ELECTRONIC INDUSTRIES ASSN. OF JAPAN
389 5th Avenue
New York 16, N.Y.

Products:

Information on electronic components available from Japan.

In Attendance:

Makoto Toida, Director
Yohei Fukuchi
Robert E. Gerson

Booth 1227

SHIZUKI ELECTRIC WORKS CO., LTD.
10 Araijuku, 7-chome, Ota-ku
Tokyo, Japan

Products:

Capacitors and Condensers

Booth 1228

KRESSILK PROD., INC.
73 Murray Street
New York 7, N.Y.

Products:

Complete line of equipment and supplies necessary for the manufacture of printed circuit boards. Exposture units; Misomex Step and Repeat equipment; Arc lamps; Quincy ovens; Baron Degreasers; Jefferson Dip Soldering Equipment; Drill Machine and Pin Router; Drying Racks; Screen Washers; Screen emulsions and film; Squeegees; Circuit Etching and Plating Resists; Screen Fabrics; Dia Print Screen Chase.

In Attendance:

Joe Slater, Sales Manager
Jim Casagrande, Sales & Production Eng.
Doug Zuker, Salesman

Mike Katz, Salesman
Teall Coonradt, Pres. Wyrco Projects
S. A. Catone, V. P. Kressilk Prod., Inc.

Booth 1229

VACO PRODUCTS CO.
317 E. Ontario St.
Chicago 11, Ill.

Products:

Manufacturers of VACO Screwdrivers, Nutdrivers, Bulldrivers, Pliers, Wrenches, Solderless Terminals and Crimping Tools.

In Attendance:

Roy Vetzner, V.P., Sales
Ray Silverstein, Asst. Treasurer
Harry Silverstein, President
J. R. Greist, Asst. Sales Mgr.
Ed Davis, Sales Engineer
Walter Wolf, Chief Engineer
E. J. Leutzow, Asst. Engineer
Robt. Shipp, Asst. Engineer

Booth 1230

MECHANICAL PRODUCTS, INC.
1824 River St.—P.O. Box 29
Jackson, Mich.

Products:

Various types of protective devices including . . . Electro-Mechanical Circuit Breakers, Motor Protectors and Electronic Circuit Protectors designed for use in Military or Commercial Aircraft, Ground Support Equipment and Electronic Systems. Temperature Sensing Devices designed for use in areas demanding critical control, and for signaling circuits. Operation range up to 2200°F.

In Attendance:

C. E. White, General Sales Manager
P. R. Watson, Engineer
G. A. Roberts, Consultant

Booth 1231

SCHWARZER CORPORATION
46 Salmi Road
Framingham, Mass.

Products:

Schwarzer Corporation will present and demonstrate the Schwarzer line of direct writing multi-channel recording instruments: the PHYSIOSCRIPT and CARDIOSCRIPT in various sizes, the OSCILLOSCRIPT as well as the new 10 Channel Large Screen Scope. See Schwarzer's direct carbon-transfer writing method—dry, rectilinear, economical, which proves to be most advantageous in all fields of recording.

In Attendance:

Dieter F. Schwarzer, President
Gerhard Lipfert, Engineer
Hermann Hennig, Engineer

Booth 1233

ENCYCLOPAEDIA BRITANNICA
185 N. Wabash Avenue
Chicago 1, Ill.

Products:

A great New Edition of the Encyclopaedia Britannica and its fact finding and technical research services.

In Attendance:

E. S. Raffey, Exhibit Manager
C. N. Cobb, Sales Representative
G. Grover, Sales Representative
D. M. Philp, Secretary

Booth 1235

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
33 W. 39th Street
New York 18, N.Y.

Products:

AIEE Services, Publications Membership Requirements.

In Attendance:

R. S. Gardner
R. C. Mayer

Booth 1247

CLARE CERAMICS INC.
15 W. Main Street
Cary, Ill.

Products:

Hermetic Seals
Glass-to-Metal Seals
Ceramic-to-Metal Seals
Metallized Glass and Ceramics
Brazed Semi Conductor Assemblies

In Attendance:

Martin J. Weldin, Sales Manager
Edward Skwarlo, Director of Research & Development
Miss Bonnie Tomm, Sales Correspondent
Tom Lyon, General Manager
Augie Natalino, Sales Representative
Allan McMillan, Sales Correspondent

NEC TECHNICAL PROGRAM

(McCormick Place)

All Sessions Start at 9:30 a.m.

Digital Computer Workshop—Tuesday, October 9

All lectures in Meeting Room AA (exhibit floor.) No charge to attend

Digital Computer demonstrations in special display area adjacent to meeting Room AA

Morning lectures repeated each afternoon

Panel Discussions

Exhibitors New Product & Development Seminars (no charge to attend)

Meeting Room BB, Exhibit Level

Technical Sessions—3 full days

Morning sessions start at 9:30 a.m. — Afternoon sessions start at 2:30 p.m.

10-Minute Capsule Research Previews—Wednesday, October 10

Morning and Afternoon Session—Meeting Room 12

Student Programs

All student lectures in Meeting Room 11

University Presentations

Luncheons start at 12:30 p.m.—Cocktails—Cash Bar Open at 12:00 Noon

Chicago Room, McCormick Place

Guided Tours start at 1:15 p.m.

Dresden Power Plant—Tuesday, October 9th
U. S. Steel Company—Wednesday, October 10th

NEC Industry Cocktail Party starts at 5:45 p.m., Monday Evening, October 8

Banquet Hall, McCormick Place

National Electronics Conference AIEE/IRE Midwest Section Gathering

Monday Evening, October 8th, 8:30 p.m.—Little Theater

EXHIBITORS NEW PRODUCT AND DEVELOPMENT SEMINARS

A highlight of the Conference will be a series of technical seminars presented by NEC exhibitors. These seminars, which will be carried on concurrently with the technical sessions, will permit manufacturers to make presentations covering new products and developments in their companies. Seminars are open at no charge to all NEC visitors.

Monday morning, October 8

A. TEACHING MACHINES

B. RAPID RANDOM ACCESS PROJECTOR

Meeting Room BB—10:10 a.m.

Presented by: Mast Development Co.

New concepts of education and learning are rapidly developing through the use of programmed learning and teaching machines in the field of industry, education and government.

INTEGRATED CIRCUITS

Meeting Room BB—11:00 a.m.

Presented by: Motorola Incorporated (Semiconductor Products Division)

The subject integrated circuits and thin film technologies will be discussed.

Monday afternoon, October 8

PARTICULATE TECHNOLOGY

Meeting Room BB—2:30 p.m.

Presented by: F. R. Chase, Torit Manufacturing Company

Presentation of the test results on fractional efficiency of cloth type dust collectors. Tests are of a truly new type and represent a breakthrough in particulate technology. Never before has it been possible to measure filtration efficiencies with uniform flows of uniform submicron particulate. Topic is of importance to all of those in the electronics field who are confronted with the danger of product damage due to uncontrolled dust particles, especially in the sub-micron range. The Specialaire* Dust-Free Cabinet will also be discussed.

*tradename

SOLID STATE POWER SUPPLY

Meeting Room BB—3:45 p.m.

Presented by: Electro-Seal Corporation

This presentation covers the development of a new type entirely solid state standby power supply which will maintain continuous A-C power to a load in event of power line fluctuation or failure. With the increased use of high speed data processing equipment, an absolutely uninterrupted, highly reliable source of A-C power is becoming increasingly important and developments in this area should be of interest to a great many engineers.

CIRCUITRY FOR HIGH ALTITUDE GAMMA SPECTROMETRY SYSTEM

Meeting Room BB—4:35 p.m.

Presented by: Argonne National Laboratory

This paper will describe a system for obtaining gamma spectra in the upper atmosphere. The circuitry involved in a balloon borne instrument package will be discussed. The means for transmitting the data back to the surface also will be discussed, as will the ground equipment used for processing it. Also described will be means of calibrating the equipment and observations of circuit behavior during field operations.

Tuesday morning, October 9

ELECTRONIC CIRCUIT PROTECTOR

Meeting Room BB—9:30 a.m.

Presented by: G. A. Roberts and P. R. Watson, Mechanical Products, Inc.

Existing protective devices are reviewed to provide a base for further discussion. Both circuit breakers and fuses are discussed. Characteristics of these devices are explained and terms defined. Advantages and disadvantages of various protectors when used in electronic circuits are summarized. Desirable characteristics for improved devices are then discussed, and the Mechanical Products, Inc., Model 7000 Electronic Circuit Protector is exhibited as a new development which meets these characteristics. After an explanation of the Model 7000 operation, it is demonstrated and compared with conventional circuit breakers.

DEVELOPMENT OF G AND HG POWER RESISTORS

Meeting Room BB—11:15 a.m.

Presented by: Dale Electronics, Incorporated

This presentation outlines the development of high efficiency power wirewound resistors. This was accomplished without increasing the physical size or raising the operating temperature limits above that of conventional resistors having the same physical dimensions. This presentation covers the development of special coating techniques and a core material, upon which the resistors are wound. Resistors are available in which the wattage rating is increased from 50% to 150% over the other standard constructions having the same physical dimensions.

Tuesday afternoon, October 9

APPLICATION AND ASSEMBLY OF ELECTRONIC PELLET COMPONENTS — PANEL

Meeting Room BB—2:30 p.m.

Chairmen: Mr. C. Heaton, P. R. Mallory and Company, Inc.
Mr. Goodykoontax, S.T.L.

The panel, featuring four major users and four major suppliers of pellet components will discuss the overall Pellet Concept.

Included in the discussion will be a description of Pellet Construction, Pellet Packages, and Pellet Package Applications.

NEW PRODUCT SEMINARS

Wednesday morning, October 10

Topic 1—MEASUREMENTS ON LOW LOSS MATERIALS USING BENZINE CELLS

Topic 2—FM MEASUREMENTS TECHNIQUES

Meeting Room BB—10:10 a.m.

Presented by: Marconi Instruments

Topic (1) A method of measurement of dielectric loss of plastic materials per ASTM specifications using benzine cells and high Q coils will be described. A demonstration will be made on polyethylene and other low loss materials.

Topic (2) A description of dependable measurement for FM distortion, deviation, etc., will be discussed. A demonstration of equipments to make these measurements will be included.

RADIO FREQUENCY INTERFERENCE CONTROL USING RF GASKETS

Meeting Room BB—11:00 a.m.

Presented by: Technical Wire Products, Incorporated

Radio Frequency Control using RF Gaskets, is unfamiliar to most designers. This talk will bring out the pertinent points of RF shielding and gasketing and will include a live demonstration of the use of RF Gaskets. Since RFI is always a "hot" subject, it should be of interest to most engineers.

Use the convenient PRODUCT LISTING section printed on the colored pages at the back of this book to rapidly locate products and services you are interested in.

PANEL DISCUSSIONS

Monday Morning, October 8: 9:30 a.m. Little Theater

RELIABILITY—ARE WE SPENDING OUR MONEY WISELY?

Panelists represent a variety of informed positions questioning the complacency with which reliability attainment is related to increased dollar spending. It is expected that the panel will be a controversial airing of the key question of how reliability efforts can be evaluated and justified economically.

Sponsored by IRE Professional Group on Reliability and Quality Control

Chairman: George Rappaport, Warnecke Electronic Tubes, Inc.

Panel Members: James H. Allen, Aerospace Corporation, El Segundo, California

G. H. Beckhart, Radio Corporation of America, Moorestown, New Jersey

E. F. Dertinger, Raytheon Company, Waltham, Massachusetts

Benjamin Ellison and Mr. A. J. Finocchi, International Telephone and Telegraph Corporation, New Jersey

V. L. Grose, Litton Systems, Incorporated, Woodland Hills, California

William J. West, Autonetics, Downey, California

M. P. Smith, Minneapolis-Honeywell Regulator Company, St. Petersburg, Florida

L. N. St. James, Bell Telephone Laboratories, Whippany, N. J.

Monday Afternoon, October 8: 2:30 p.m. Little Theater

EUROMART

THE COMMON MARKET AND ITS EFFECTS UPON THE ELECTRONIC INDUSTRY IN THE UNITED STATES

Each participant on the panel will give a brief statement of his views. A discussion by the panel will follow covering both the direct effects of European consolidation and the indirect effect of tariff revisions. Qustions by the audience will be answered.

Sponsored by the International Activities Committee

Moderator: John H. Wills, Northern Trust Company

Panel Members: Thomas P. Collier, Motorola Overseas Corporation

Thomas H. Miner, Thomas H. Miner and Associates, Inc.

Robert Higdon, The Chase Manhattan Bank

E. Mac Donald Nyhen, U. S. Department of Commerce

PANEL DISCUSSIONS

Monday Afternoon, October 8: 3:30 p.m. Meeting Room "C"

THE CONSULTANT'S ROLE IN RESEARCH AND DEVELOPMENT

This program is intended to provide insight into the effective use of consultants in company sponsored research and development. It should be of interest to both managers of research and development programs as well as to the scientists involved.

Several leading consultants have been invited to serve on this panel to discuss effective ways in which their services can be utilized to enhance company research and development programs.

Sponsored by Scientific Apparatus Makers Association, Industrial Instrument Section

Moderator: Douglas C. Strain, Electro Scientific Industries, Inc.

Panel Members: John R. Kirkpatrick, Arthur D. Little, Inc, Chicago, Illinois

William D. McGuigan, Stanford Research Institute, Menlo Park, California

Donald B. Sinclair, General Radio Company, West Concord, Massachusetts

Otto J. M. Smith, University of California, Berkeley, California

Tuesday Afternoon, October 9: 2:30 p.m. Little Theater

THE ROLE OF R AND D IN FUTURE PROFITS

Each panelist has been asked to summarize what he considers to be the important factors leading to a well-balanced research and advance development program which will provide a satisfactory return to the corporation and will at the same time provide the future growth areas so essential to assure future profit position. Formal presentations, plus the opportunity to ask questions from the audience in areas not covered, will provide an unusual opportunity to study patterns of success in applications of practical research and development programs in various segments of the electronics industry.

Sponsored by IRE Professional Group on Engineering Management

Chairman: Gene Mathers, Purdue University.

Panel Members: John Haanstra, International Business Machines Corp., White Plains, New York

P. E. Haggerty, Texas Instruments, Inc., Dallas, Texas

W. R. Hewlett, Hewlett-Packard Company, Palo Alto, California

Emery Rogers, Varian Associates, Palo Alto, California

PANEL DISCUSSIONS

Wednesday Morning, October 10: 9:30 a.m. Little Theater

AEROSPACE CONTROL SYSTEMS

The rapid advancement in control system concepts, both for air traffic control and military command and control applications, has introduced new requirements for electronic communication, navigation, surveillance, and computing equipments. Particular emphasis will be laid on new systems and system concepts through report from prominent speakers actively engaged in this field. Reports of these speakers will be followed by a panel discussion during which the audience is invited to participate.

Sponsored by IRE Professional Group on Aerospace and Navigational Electronics

Chairman: Norman Winter, Motorola, Inc.

(a) "Air Space System Design and the Resolution of Conflicts," Dean F. Babcock, Stanford Research Institute

(b) "Air Traffic Control System Plans," Neal Blake, Federal Aviation Agency, Aviation Research Service, System Design Team

(c) "Flight Line of the Future," Harold Johnson, Directorate of Telecommunications, Air Staff, USAF

(d) Panel discussion

DIGITAL COMPUTER WORKSHOP

A highlight of the 1962 NEC Technical program is the Digital Computer Workshop. This Workshop, complete with demonstration equipment, is intended primarily for the engineer and technician who would like to become familiar with the principles and applications of computers. Computers are available at the Conference for engineers to program and solve problems.

All Computer Workshop meetings will be held in Meeting Room AA. No charge—open to all NEC visitors.

Tuesday morning, October 9: 9:30 AM to 12:15 PM

Chairman: W. J. Eccles—Purdue University

(a) "Organization of a Digital Computer," D. T. Herrman, Jr., General Precision, Inc.

(b) "Programming of PINT," (tutorial) W. J. Eccles, Purdue University

(c) "Problem-Oriented Languages," C. H. Davidson, University of Wisconsin

Tuesday afternoon, October 9: 2:30 PM to 5:00 PM

Repeat of morning session.

NOTES

10-MINUTE CAPSULE RESEARCH PREVIEW

The Research Preview sessions, consisting of ten-minute papers from both industrial and university laboratories, include research topics which are of current interest in the midwest area. The papers describe recent research results which, though interesting to us now, have not been completed to the extent of a more formal presentation.

RESEARCH PREVIEWS I

Wednesday Morning, October 10

9:30 a.m.

Construction and Testing the Electric Quadrupole Mass Spectrometer Used as a Vacuum Leak Detector, Michael Grimes, Department of Electrical Engineering, University of Illinois, Urbana, Illinois.

An inexpensive non-magnetic vacuum leak detector may be easily constructed by using a quadrupole mass spectrometer (massen-filter) and an ionizing device. Its operation is relatively simple. After the pressure in the system has been reduced, a gas is sprayed on the atmosphere side. If a leak exists, the gas leaks through, becomes ionized by an electron beam, and the positive ions are accelerated into the quadrupole field created by the rf and dc voltages imposed on the four rods of the spectrometer. At one frequency and voltage only the charge to mass ratio corresponding to the gas is detected.

9:42 a.m.

High Performance, Extremely Broadband Coaxial Microwave Switching Structure, Norbert J. Sladek, Amphenol-Borg Electronics Corp., Broadview, Illinois.

A novel coaxial switching structure for the rapid, selective coupling of either one of two output lines to a single input line (SPDT) is described. Switching is accomplished by using a two tier center conductor arrangement. A simple up and down motion disengages a strip center conductor from one output and the common input while the second strip center conductor couples the second output and the input. Crosstalk between output lines is $<$-98.db to 500 mc/s and $<$-60 db to 10 Gc/s. VSWR $<$1.50 to 10 Gc/s and Insertion Loss $<$.5 db to 10 Gc/s. Microwave performance of the structure is superior to "prior art" electromechanical coaxial switches.

9:54 a.m.

Noise Figures of Millimeter Wave Reflex Klystron Amplifiers, Koryu Ishii, Dept. of Electrical Engineering, Marquette University, Milwaukee, Wisconsin.

Applications of commercially available millimeter wave reflex klystrons (QK295, QKK838 and VA99) for amplifiers have been investigated. For comparison, three different reflex klystrons were tested in the same waveguide circuit configuration which consisted of an H-plane tee with the EH tuners connected at the input and output waveguides. A new method of noise figure measurement was proposed. The method had better accuracy and was simpler than the conventional method for noise measurement of millimeter wave reflex klystron amplifiers. Typical data obtained are: for the QK295, a noise figure of 18.5db with a gain of 14db at 58.2kMc; for the QKK838, a noise figure of 44.3db with a gain of 5.6db at 74 kMc; and for the VA99, a noise figure of 5db with a gain of 26db at 70.4 kMc.

10:06 a.m.

Microwave Frequency Photodetection Utilizing Dynamic Crossed-Field Secondary Electron Multiplication, O. L. Gaddy and D. F. Holshouser, Dept of Electrical Engineering, University of Illinois, Urbana, Illinois.

The Basic Principles of dynamic crossed-field electron multiplication are first discussed in which it is shown how electron multiplication occurs in a uniform microwave electric field and a crossed steady magnetic field configuration near a single secondary emitting electrode. Several highlights of the analysis of this multiplication system are briefly discussed including the rigid transit time control of the system which makes it useful for microwave frequency applification.

An experimental photomultiplier based upon this principle is described and results of an experiment in which the device is utilized to directly detect low-level light signals in-

tensity modulated at 3000 mc are presented.

Finally, the application of the device to communication system utilizing coherent light is briefly discussed.

10:18 a.m.

Operation of Commercial Microwave Tunnel Diodes Beyond Cutoff, Cordell C. Hoffins and Koryu Ishii, Dept. of Electrical Engineering, Marquette University, Milwaukee, Wisconsin.

Tunnel Diodes designed for use in the microwave bands are commercially available at present. These diodes are rather expensive, however, and it is therefore desirable to extend the operating frequency of the diodes designed for the lower frequency microwave bands to the higher frequencies.

Several tunnel diode waveguide mounts have been designed to extend the frequency capabilities of an S-band diode to the X-band, and have performed satisfactorily as oscillators.

An investigation is being carried out on the use of these mounts as amplifiers, and on an extention of S- and X-band diodes to millimeter-wave frequencies.

10:40 a.m.

Electric Contacts, A Current Research Review, Louis P. Solos, Amphenol-Borg Electronics Corp., Broadview, Illinois.

Since 1959 Amphenol-Borg has been conducting fundamental studies to improve electric contact reliability by making available basic data pertaining to the characteristics of wear and sliding friction of copper-base alloys. The evaluating procedure and analysis of data have encompassed the new concepts in electrical and friction phenomena.

This paper reviews some of the major research studies currently being conducted to establish a fundamental knowledge governing the selection and behavior of materials necessary for predicting high electrical connector reliability.

10:52 a.m.

Transistor Constant Current Characteristics, T. E. Perfitt, Dept. of Electrical Engineering, Michigan State University, East Lansing, Michigan.

The analysis and design of vacuum tube class C amplifiers generally employs a graphical technique that is based on the constant current characteristics of the vacuum tube. An identical technique may be used effectively in the design and analysis of transistor class C amplifiers. Since transistor manufacturers do not provide these characteristics, some method must be devised by the designer to obtain this information.

This paper describes a continuous plotting technique that was used to obtain the constant current curves of a 2N351A transistor and very briefly describes how these curves are employed in Class C transistor amplifier design.

11:04 a.m.

High-Sensitivity Automatic Exposure Control for Cameras, Stephen F. Bushman, Bell & Howell Company, Chicago, Illinois.

Limitations on the sensitivity of photovoltaic cells have generally dictated the use of broad acceptance angles for the scene-measuring photocell in automatic exposure controls for photographic cameras, thus resulting in metering errors when the photocell acceptance angle exceeds that of the picture-taking lens.

Increased accuracy is obtained by exposing the photocell only to a light sample from the bundle of rays passing through the lens to the film. However, use of this sampling technique, along with the reduction in acceptance angle, has required a thousandfold increase in photocell sensitivity, obtained through the use of high-conductivity photoconductive cells.

11:16 a.m.

Selected Topics in Cathode-Ray Tube Research, C. S. Szegho, The Rauland Corp., Chicago, Illinois.

1. In television tubes, high perveances of 8 and $25\mu a/V^{\frac{3}{2}}$ can be achieved; the former with guns resembling conventional construction and the latter with guns having a mesh grid. 2. In high resolution cathode-ray tubes, brightness of the fluorescent screen and its resolution are reciprocal. Resolution with adequate brightness, around 100 line pairs/millimeter, can be obtained with gravity settled phosphors. 3. For biological applications, a family of U.V. flying-spot cathode-ray tubes has been developed. 4. A 10 μ thick, 1″ diameter mica Lenard window led to the development of a 125 KV beta ray source. 5. Bakeable .1 μ thick Al_2O_3 membranes are suitable substrates for high resolution storage tube targets.

11:28 a.m.

New Image Intensifiers for the Visible to Gamma Ray Spectrum, W. F. Niklas, The Rauland Corp., Chicago, Illinois.

New image intensifiers and converters are being developed for a wide coverage of the electro-magnetic spectrum. Image tubes for astronomy permit extending the range of telescopes by orders of magnitude. High gain, double stage, strongly minifying image intensifiers detect nuclear particles utilizing the associated Cherenkov radiation. Improved medical X-ray image intensifiers assist in protecting populations against an overdose in radiation and make early diagnosis possible. Novel X-ray and gamma-ray image intensifiers have been developed for production testing of automobile tires, rocket nose cones, jet engines, etc. In the future, image intensifiers can be visualized which will find widespread use as navigational aids, in traffic control and for the detection of neutrons in crystallographic and cancer studies.

11:40 a.m.

The Role of Mechanical Imperfections in Solid State Light Emission, Herbert N. Hersh, Zenith Radio Corp., Chicago, Illinois.

Phosphors are solids which emit stored energy in the form of light. It is well known that many materials become phosphors only when they contain impurities. It is also known that the addition of impurities to a solid is attended by a decrease in its mechanical perfection. Since impurities and mechanical imperfection go hand-in-hand, it is not possible to attribute all of the properties of an impurity-activated phosphor to the impurity alone. What is the role, if any, of imperfections? In this study it is demonstrated that phosphors can be made containing mechanical imperfections alone (i.e. no impurities at all). Supporting evidence is presented and it is concluded that imperfections act as electron traps capable of storing energy or changing the kinetics of recombination, much the same as impurities.

11:52 a.m.

Open discussion on any paper.

RESEARCH PREVIEWS II

Wednesday Afternoon, October 10

2:30 p.m.

High-Speed Photomicrographs of Electrically Spraying Liquids, R. S. Carson, A. H. Cho, C. D. Hendricks Jr., J. J. Hogan and J. M. Schneider, Dept. of Electrical Engineering, University of Illinois, Urbana, Illinois.

A series of high-speed photomicrographs of several electrically spraying liquids are presented. These photographs indicate the mode of spraying of good conductors (liquid metals), fair conductors (glycol), and non-conductors (oil). The spraying takes place both in air and in a vacuum (pressure less than 10^{-5} torr). The significance of these results in the field of electrical propulsion is discussed.

2:42 p.m.

A Method for the Measurement of Ion Density, Robert Adler, Zenith Radio Corp., Chicago, Illinois.

It has been found that the presence of ions causes phase shift of cyclotron waves in proportion to ion charge density. Cyclotron waves appear on electron beams traveling in a magnetic field; they are generated by transverse signal fields, usually at low microwave frequencies. Positive ions generate a centripetal force, simulating an increase in the magnetic field.

This is a sensitive method; ions produced by a 100 volt beam of a few milliamperes, at a pressure of about 10^{-6} mm Hg, give a large, easily measured phase excursion. The method is particularly useful for observing transient phenomena.

2:54 p.m.

A Linear Phase Shifter Using Cyclotron Waves, G. Ryan and W. Sackinger, Zenith Radio Corp., Chicago.

A simple electron beam tube provides wide-angle phase modulation at UHF and microwave frequencies. Suitable for modulation rates from DC to VHF, it achieves phase excursions up to several cycles with excellent linearity.

The phase constant of a cyclotron wave carrying signals from input to output is modulated by a tiny solenoid inside the tube. Output phase varies linearly with control current.

Data are presented on an L-band model working at low power level. The small solenoid in this tube has an inductance of 0.16 microhenries and a sensitivity of 4.5 radians per ampere.

3:06 p.m.

Phase Instability, William J. Williams, Dept. of Electrical Engineering, State University of Iowa, Iowa City, Iowa.

The launching of satellites and space probes has generated interest in the phase stability of signals. Information such as distance to an object can be obtained from the phase of the incoming signal. Here the degree of resolution or accuracy of the information is dependant on the phase of the signal. If the exact phase angle is obscured by random "jitter" the resolution becomes accordingly poorer. The object of this research is to: (1) Discover the causes of phase instability in oscillators, frequency multipliers and dividers etc. (2) Extend the present mathematical theory to describe the physical situation. (3) Use the results to achieve a rational criteria for future development in this area.

3:18 p.m.

Simplified Interference Predictions of Coupling by Antennas in the Near and Far Zones, David K. Adams, John A. M. Lyon, and Wilbur R. DeHart, Dept. of Electrical Engineering, University of Michigan, Ann Arbor, Michigan.

A brief survey is made of some current research studies on the possible power interference when two or more antennas operate in or over a common ground plane. One or more of the antennas have been made on two rectangular slots arranged in any orientation in a common ground plane. The experimental data on the power coupling corresponds very closely to the power coupling predicted by a simple analysis based upon the Huygens-Kirchoff formula. Sufficient information is presented so that power couplings can be predicted with any arrangement of rectangular slots in a common ground plane. In addition, some information concerning spiral antennas mounted in a common ground plane is presented.

3:40 p.m.

Industrial Solid State Telemetering and Supervisory Control Systems, Frank C. Giarrizzo, Automatic Electric Laboratories, Inc., Northlake, Illinois.

The systems discussed represent a solution to many of the monitoring and control problems connected with single or multiple industrial operations involving a number of remote stations controlled from a central location.

Modern telephone switching techniques have been adapted to these systems for the oil, gas, power transmission and railroad companies that are making their operations more efficient, economical and safe.

Many types of auxiliary equipment are also in the production or development stage such as Automatic Electric's Analog-to-Digital Converter, special purpose digital computers and tone transmission equipment. The system with its peripherial equipment is capable of virtually complete remote control of many industrial processes and operations.

3:52 p.m.

Electronic Telephone Switching System—#1 EAX, William C. Miller, Automatic Electric Laboratories, Inc., Northlake, Illinois.

An electronic telephone switching system —applicable to multi-thousand line central offices and large toll tandem centers—is presently being readied for field trial by the Automatic Electric Laboratories, Inc. This system provides space division switching networks implemented with glass encapsulated reed contacts. The electrically alterable semi-permanent switching program is stored on magnetic drums. Ferrite core memories operating in a time division mode provide temporary memory during call extension. System logic building blocks consist primarily of eight basic configurations of resistor-transistor logic. The automatic maintenance administration for the system includes fault location to the plug-in circuit card level. Computer derived wiring information is provided for automated production.

4:04 p.m.

Research on Automata and Artificial Intelligence at Purdue, K. S. Fu, School of Electrical Engineering, Purdue University, Lafayette, Indiana.

This is a report of the recent progress in the research area of automata and artificial intelligence at Purdue University. Current research in this area at Purdue includes mainly the problems of pattern recognition and learning systems. Problems of pattern recognition have been studied using statistical decision theory and sequential analysis. In the case of incomplete a priori information, the learning process has been introduced to the operation of the pattern recognition machine such that the machine will improve its performance as a result of its experience. Application of learning process to the game-playing machines and the adaptive control system has also been investigated. Several models of adaptive control systems with learning have been proposed. The adaptive capability of the control system will be improved as the system gains experience.

4:16 p.m.

Computer Simulation of the Human Respiratory System, J. D. Horgan, Dept. of Electrical Engineering; R. L. Lange, Dept. of Medicine, Marquette University, Milwaukee, Wisconsin

The human respiratory system, particularly in its dynamic aspects, has been simulated on both the high speed analog computor and the digital computer. The model, which includes the effects of both carbon dioxide and oxygen in controlling respiration, is well suited to the study of the chemical and circulatory factors involved in periodic breathing. A classical clinical experiment, in which periodic breathing is induced in a normal subject by hyperventilation, has been successfully simulated. In addition it has proved possible to simulate subject exhibiting persistent periodic (Cheyne-Stokes) respiration by varying sensitive parameters in the model.

4:28 p.m.

A.D.C. Pulse Defibrillator, Walter S. Druz, Zenith Radio Corp., Chicago, Illinois.

Ventricular fibrillation is a frequent occurance during open-heart operations, following myocardial infarcts and, as a result of electric shock or asphyxiation. Ventricular fibrillation is marked by the non-synchronous, high frequency motion of the ventricles in response to incoherent ventricular pacemakers and results in failure of the normal blood pumping function.

A low energy D.C. pulse defibrillator has been developed and has been extensively evaluated at the University of Illinois College of Medicine.

A portable transistorized battery operated defibrillator will be described, comparative tests with conventional A.C. countershock defibrillators will be discussed and application to treatment of some cardiac arrhythmias is suggested.

4:40 p.m.

An Instrument for the Study of Repetitive Pseudo-Transient Signals such as Speech, Murray L. Babcock, Dept. of Electrical Engineering, University of Illinois, Urbana, Illinois.

To aid in a search for machine invariants of speech, a Dynamic Signal Analyzer consisting of 96 low "Q" filters has been constructed. This allows very rapid response times which are essential for transient analysis of signals such as speech. To recover the information about the specific frequency components present in the signal which is lost by the transformation from the time domain to the frequency domain by the low "Q" frequency smearing action of the filters, the resulting data is processed by two networks known as "property detector nets" which produce the second and fourth derivatives with respect to frequency of the response of the 96 frequency filters. The result is essentially complete recovery of the frequency component information, thus demonstrating the resovability of the so-called "Q-paradox" of the mammalian auditory system. In addition, some interesting preliminary results of studies of speech are presented.

4:52 p.m.

Open discussion on any paper.

TECHNICAL PROGRAM

Monday Morning

October 8

All sessions start at 9:30 a.m.

ENERGY BEAMS AS WORKING TOOLS I

Sponsored by AIEE Electronics Committee

Meeting Room: 6
9:00 a.m.

Chairman: Peter B. Myers,
Martin Company

(a) Electron, Ion, and Light Beams as Present and Future Materials Working Tools, Helmut Schwarz and Anthony J. DeMaria, United Aircraft Corporation, Research Laboratories.

A comparative evaluation of the fundamental and technical limitations of focused electron, ion, and light beams for the application of welding, cutting, and surfacing tools on different materials will be attempted.

Advantages and disadvantages of the three kinds of beams at different applications will be pointed out. Fundamental limitation of beam diameter and penetration depths at the workpiece will be considered; power, power density, and the yield of the three kinds of beams will also be described.

The resolution or definition of lines or holes cut in the material by the beams is fundamentally a function of the wave length of the photons and particles of the beam. Better results for this purpose should be achieved with electron and ion beams because of their much shorter wave lengths.

Experiments will be reported which will corroborate some of the ideas presented in this paper.

(b) Recent Electron-Optical Developments in the Recording Field, P. H. Gleichauf, General Electric Company.

A brief review of the gun requirements for different electron beam techniques, such as for recording on thermoplastic, photographic film and other media, and of the imposed limitations, will be followed by descriptions of several electron optical design approaches. Storage and printing tubes will not be discussed, although some of the techniques are also applicable to these tubes. Discussed in more detail will be the techniques for obtaining the required gun demagnifications, such as the use of relay lens systems, crossed cylindrical lenses, pre-focus deflection; beam deflection for one and two-dimensional scan and micro-storage array recording; emission current density requirements including cathode environmental conditions and other basic design problems.

(c) Ion Beam Formation and Control for Reflected Ion Beam Deposition, L. R. Bittman and J. Litton, Jr., Martin Company

The reflected ion beam deposition technique is described. Factors influencing the formation and focussing of the ion beam are discussed. Current progress in the determination of ion trajectories is related to resolution of deposition patterns is reported. The trajectory equations are derived from the general formulation of Fourier-Bessel integrals applied to the electrostatic field created by the charges. Conditions establishing the requirement to use beam switching techniques in place of mixed beam operation are given.

(d) Application of Electron Beam Techniques to Electronics, J. W. Meier, Hamilton Standard Division, United Aircraft Corporation.

The general characteristics and advantages of electron beam welding and cutting will be outlined. The application of these techniques in the electronics field will be discussed in some detail. The first area covered will be the assembly of microelectronic circuitry. The relative advantages of welded circuitry over soldered will be given with particular emphasis on those characteristics of electron beam welding which make this process ideal for this application. Specific examples of microminiature packaging techniques will be presented. A brief discussion will be given of two-dimensional or thin film devices using electron beam techniques for evaporation, scribing, and the attachment of leads. Brief mention will be made of several applications in solid circuitry fabrication. Examples will be given of the successful application of electron beam techniques in the fabrication of various discrete

electronic devices or components. The discussion will be illustrated with pertinent colored slides.

(e) Electron Beam Welding Applied to Today's Technology, Robert Bakish, Electronics and Alloys, Inc.

In a period of less than five years, electron beam joining has achieved the distinction of making the transition from the unknown to the accepted. After a brief survey of the milestones which lead to the acceptance of electron beams as a powerful tool for joining of materials, the present status of the technology is presented. This is followed by a discussion of the most recent and significant advances brought by this technology. For example, electron beams as tool for post-treatment of joints, electron beams in joining of ceramics, etc. The presentation will be concluded with a critical evaluation of the process in terms of its advantages, its shortcomings and its expectations analyzed with the desire to establish the long range significance of the process.

UNIVERSITY PRESENTATIONS I

Meeting Room: 12
9:30 a.m.

Chairman: Warren B. Boast,
Iowa State University

Presentations delineating university-industry cooperation, current interdisciplinary programs of the universities, in-depth discussions of university research programs, and discussion of intensive short-course opportunities for practicing engineers. Each university will be allotted approximately 45 minutes for its presentation.

(a) University of Illinois—E. C. Jordan, Chairman of the Electrical Engineering Department

(b) University of Wisconsin—Education and Research of the University of Wisconsin
"Graduate Education" T. J. Higgins
"New Undergraduate Curriculum" J. J. Skiles
"Department Research" V. C. Rideout

(c) University of Michigan—Science-Based, Professionally-Oriented University Research
W. G. Dow, Chairman of the Electrical Engineering Department

DIGITAL COMPUTER APPLICATIONS AND COMPONENTS

Meeting Room: 7
9:30 a.m.

Chairman: Roy O. Sather,
Wayne State University

(a) Basic Principles of Some Pattern Recognition Systems, L. Kanal, F. Slaymaker, D Smith, and W. Walker, General Dynamics/Electronics.

In this paper we report on the development of two devices and the results of some computer programs for pattern recognition. The basic principles used are some methods of statistical inference, orthogonal expansions for time functions, joint probability functions and some procedures for functional interation.

(b) Electronics of a Precision Comparator, W. Heacock, Fairchild Camera and Instrument Corporation.

To permit the location of points on aerial photographs to the degree of accuracy required by advanced photogrammetric target location and map production systems, a radically new approach has been conceived and incorporated in the Fairchild Cartographic Comparator. Fundamentally the entire process of indexing and target point location has been automated. All sources of large, unpredictable and random human errors have been eliminated and the speed with which data can be handled has been greatly increased.

(c) On the Digital Computer Classification of Geometric Line Patterns, Herbert Freeman, New York University.

The paper is concerned with techniques for the systematic classification of planar geometric line patterns of arbitrary configuration. Two aspects are considered: (1) the development of a classification hierarchy, and (2), the procedure for assigning subjects to their unique places in the hierarchy. The classification techniques are based upon the use of so-called **direct** and **indirect** properties. The former are the conventional geometric properties such as height, length, or area. The latter are spectra which express the information-bearing characteristics of the contours in various ways. Four such spectra are considered.

(d) Statistical Techniques in Circuit Optimization, C. Clunies-Ross and S. S. Husson, Data Systems Division, International Business Machines Corporation.

If each of the several criteria that a cir-

cuit must satisfy is expressed as a function of the circuit components, then a Monte Carlo computer program can be used to evaluate specific designs. The Monte Carlo output provides a starting point for design optimization.

The program must retain the generated circuits which lead to failure. The criteria are fitted with linear approximations to the component values of those circuits. Such approximations will be good within the regions of the failure criteria.

(e) Design of Digital Control Systems, K. S. Fu and R. M. Kline, Purdue University.

Two techniques for the design of digital control system are presented with particular emphasis on the effect of quantization on system performance. The first technique leads to closed form solutions, but appears to be applicable to a smaller class of systems. On the other hand, the second is a numerical method based on the state transition method of analysis; it uses a digital computer to carry out the calculations. Using the second technique system design charts are prepared. Examples of control system design using both techniques are presented with specifications on static accuracy, response time, and presence or absence of either overshoot or limit cycle oscillations.

SOLID STATE APPLICATIONS—VARACTORS

Meeting Room: 8
9:30 a.m.

Chairman: A. L. Aden,
Motorola, Inc.

(a) Parametric Amplification by Phase Modulation, D. K. Adams, Cooley Electronics Laboratory, University of Michigan.

Conventional parametric amplifiers are more generally described as a case of single sideband reactive mixing, and optimum performance in this mode calls for a high pump-to-signal frequency ratio. As this ratio increases, however, a point is reached where the individual sidebands are no longer separable, and then the mixing characteristics change radically.

A study has been made of this effect and a number of interesting properties observed. The sidebands themselves constitute phase modulation, and power gain equals the **square** of the pump-to-signal frequency ratio. Therefore when properly detected, the sidebands can be converted back to signal frequency with large net gain. A design example is considered for an ultra-wideband video amplifier with 20 db transducer gain and bandwidth from dc to 100 Mc, for a gain-bandwidth produce of 1000 Mc. This configuration uses one varactor and X-band pumping. Its noise figure is less than 1 db.

(b) Varactor Fabrication for Microwave Applications, W. F. Epperly, American Electronics Laboratories.

This paper discusses characteristics of varactor diodes that are desired in various microwave device applications and the techniques employed in diode fabrication to achieve these characteristics. Requirements for such devices as parametric amplifiers, harmonic multipliers, duplexers, limiters, switches and phase shifters are reviewed. It is then shown how trade-offs in diode characteristics are made through fabrication technique to arrive at the optimum varactor.

(c) Solid State Microwave Signal Sources Using Varactor Harmonic Generation, M. E. Hines, Microwave Associates, Inc.

Varactor diodes are now being extensively used to generate harmonic power throughout the microwave spectrum. By using several stages in tandem, high order harmonics are obtainable with enough efficiency so that useful power at microwave frequencies can be obtained from VHF transistor oscillators and amplifiers without the necessity of interstage amplification. All solid-state sources such as this have provided power as great as 200 mw at X-band with dc input only.

Advantages of these devices include crystal-controlled frequency, compact dimensions, and a promise of high reliability and long life through the use of silicon devices exclusively.

The paper will describe the techniques used and data will be given on the performance of a complete X-band source of this type.

(d) Cascading Low-Gain Parametric Amplifier Stages, Carl Blake, Lincoln Laboratory, Massachusetts Institute of Technology.

A cascade of several low-gain parametric amplifiers offers a number of attractive features. The gain of the cascade is less sensitive to pump power variations than is the case of a single stage amplifier exhibiting the same gain. By stagger-tuning the individual stages, bandwidths of 10% or more may be achieved without critical adjustments. Arbitrarily high gains may be realized at no loss in stability as long as the gain per stage is kept low. The use of a cascade permits a greater dynamic range than that afforded by a single stage. All these advantages accrue with little or no loss in noise performances.

(e) High Order Broadband Varactor Multiplier, R. J. Bauer, Aircraft Armaments, Inc.

The increasing requirements for extremely stable microwave oscillators with milliwatt outputs have stimulated the use of solid state harmonic multipliers. This paper describes the design and performance of a high order, broadband varactor multiplier. The basic approach is analyzed for designing a times eight harmonic multiplier with an output frequency of 5.4 - 5.9 KMC. A conversion loss of approximately 10 db was achieved with an input power of 300 milliwatts. The use of idler circuits is reviewed in maximizing the frequency conversion efficiency. Experimental results are listed with and without the use of these idler circuits. The advantages of using strip transmission line for the multiplier circuitry is also considered. Low pass and band filters were used as the idler and output frequency selecting circuitry to achieve the 10 percent bandwidth required

Monday Luncheon

The Honorable Otto Kerner, Governor, State of Illinois

Chicago Room
McCormick Place
12:30 p.m.

Address by The Honoraable Otto Kerner
Governor, State of Illinois

Monday Afternoon

October 8

All sessions start at 2:30 p.m.

ENERGY BEAMS AS WORKING TOOLS II

Sponsored by AIEE Electronics Committee

Meeting Room: 6
2:30 p.m.

Chairman: Loran R. Bittman,
Martin Company

(a) Electron Beam Phenomena Associated with Perforated Wall Hollow Cathode Discharges, H. L. L. vanPassen, E. C. Muly, and R. J. Allen, Martin Company.

Perforated wall hollow cathode structures operated in reduced pressure gas atmospheres have produced well defined electron beams. Some of the characteristics of these perforated wall hollow cathode discharges are presented. The physical properties of the electron beams and their interactions with un-ionized gases and plasmas are discussed.

The effects of cathode geometry pressure, voltage, and other variables on the operating characteristics of the electron beam mode gas discharge are investigated. Electrostatic field shaping techniques used in producing high power operation of the electron beam mode are presented. The production of high power level electron beams (greater than 10^6 watts/in.^{2}) in a low pressure gas atmosphere affords an opportunity for experimental studies which is not otherwise readily available. Several interesting effects associated with the electron beam mode have been observed during the experimental work which may suggest applications in various fields of experimental plasma physics.

(b) Cold Hollow Cathode Discharge Welding, E. C. Muly, H. L. L vanPassen, and R. J. Allen, Martin Company.

A perforated wall hollow cathode structure gas discharge device has been successfully used as an electron beam welder. A simple spherical structure operated without a filament, as the cathode in a low pressure gas discharge is the source of a high power well collimated beam of electrons. This beam may be focussed to produce the power densities necessary for welding refractory

metals such as tungsten and tantalum, and various ceramics.

The operational characteristics of the electron beam mode welder will be presented. The electron beam mode gas discharge is produced over a wide range of pressures and voltages in a low pressure gas atmosphere. In addition to several other effects, it has been noted that a well focussed electron beam can be produced with power levels of at least several kilowatts in a gas atmosphere.

The four major components of an electron beam welder, i.e., the electron gun, the power supply, the vacuum system, and the welding chamber, each have less stringent design requirements in the case of the gas discharge device than that of the traditional equipment. Both the initial cost and maintenance of the gas discharge device are lower.

(c) Some Aspects of Laser Beam Welding, R. Fairbanks and Robert L. Martin, Technical Research Group, Inc.

The beam requirement for welding high temperature refractory metals and super alloys will be discussed along with the results obtained to date.

The ruby Laser as a heat source has an equivalent temperature in excess of 100,000°K. As such it has applications for fusion welding of all metals including high temperature refractory metals. The output beam of the Laser for this application occurs in a series of high power pulses. The average power output is presently much less than that of many other welding heat sources. However, there are many advantages of light as the heat source for fusion welding in some applications.

The general result of focussing the Laser beam on any surface is vaporization of that surface. For the welding application the light flux per unit area must be controlled such that melting occurs without vaporization of the metal. Preliminary attempts to butt weld two 21 mil thick sheets of Ti metal in a series of overlapping spot welds have been successful.

(d) High Power Laser for Welding Applications, G. W. Dunlap and David Williams, General Electric Company.

Rapid advances in the development of pulsed ruby lasers have produced devices capable of delivering peak power in the order of many kilowatts. True, these high-power pulses are very short, but significant amounts of energy—in the range of tens of joules—can be obtained.

The ruby laser produces a beam of highly collimated, coherent light that is essentially monochromatic. This beam can be focussed by simple optics to an extremely small spot. Of course, the "burning glass" technique is ancient and in recent years rather high temperatures have been obtained by imaging an intense light source, such as an electric arc, on the spot where the heat is desired. With the laser, however, much higher energy concentration is possible. Since the radiation is emitted as a plane wave, the limitation on spot size is imposed by the wavelength of the radiation—in this case approximately 0.7 micron.

(e) Metallurgical Applications of Lasers, Richard D. Engquist and C. J Bahun, Hughes Aircraft Company.

The development of the laser has made available to the materials scientists a new and powerful tool. Electromagnetic radiation from solid state lasers is the most intense form of radiant energy developed by man.

This tool can be utilized in a broad range of metallurgical applications. Experiments performed at the Hughes Aircraft Company demonstrating the feasibility of laser welding and cutting are discussed.

Fundamental principles of laser technology are reviewed together with a discussion of heat transfer and the pertinent thermophysical characteristics of metals governing the absorption of optical energy and its conversion of thermal energy.

UNIVERSITY PRESENTATIONS II

Meeting Room: 12
2:30 p.m.

Chairman: H. W. Farris,
University of Michigan

Presentations delineating university-industry cooperation, current interdisciplinary program of the universities, in-dept discussions of university research programs, and discussion of intensive short-course opportunities for practicing engineers. Each university will be allotted approximately 45 minutes for its presentation.

(a) Iowa State University—A. A. Read

(b) University of Notre Dame—Lawrence Stauder

(c) Michigan State University—H. E. Koenig

(d) Purdue University—J. E. Gibson

PROGRAMED EDUCATION

Sponsored by IRE Professional Group on Education

Meeting Room: 7
2:30 p.m.

Chairman: Joseph J. Gershon,
DeVry Technical Institute

(a) Teaching Machines in Programed Instruction, (tutorial) L. M. Stolurow, University of Illinois.

American Education has not been subject to greater pressures than exist today. It is torn between urgency on the one hand and inadequate resources on the other.

In this paper I plan to analyze the problem of instruction, treating it as a systems concept. While teachers do not normally think of themselves as engineers, in a larger sense the kind of thing they do whenever they teach is a type of engineering. In other words, the teachers' task is to develop or engineer an educational environment within which students can learn efficiently.

Within this framework, educational TV, tape recorders, language laboratories and systems will be examined. Emphasis will be placed on the teaching machine and programed instruction as a tutorial system of education. The discussion will describe the 10 basic functions of a teaching system and these will be related to the concept of adaptation to individual differences in needs and performance. Basic programing strategies will be described and flow charts of programs displayed. The need for research on strategies of teaching will be pointed out and the potential contribution of teaching machines and programed instruction to this need will be indicated.

(b) Undergraduate EE Via Video Tape and Closed Circuit TV, W. H. Hayt, Jr., Purdue University.

The first EE Circuits course at Purdue is being offered to sophomores in EE and ME on closed circuit TV in the fall of 1962. The two lectures given each week were video-taped the previous spring. Each twenty-five student lecture section is monitored by one junior staff member who also conducts a recitation-problem session the following day. One off-campus instructional center is also on the TV-link.

Faculty time demands, costs, production methods, advantages and disadvantages of TV compared to the large, live lecture, and student comments are discussed.

(c) Use of Closed Circuit Television in Graduate Teaching, D. L. Dietmeyer, R. A. Greiner, V. C. Rideout, and W. B. Swift, University of Wisconsin.

For a number of years evening graduate courses in Electrical Engineering have been offered in Milwaukee, and taught by professors from Madison. In an attempt to overcome the instructional problems which result from the use of a three hour lecture once each week, and to save on staff time, a closed-circuit TV link was proposed by W. B. Swift. As a result of efforts by him and the College of Engineering Administration, and through the cooperation of our University TV station, the Wisconsin Bell Telephone Company, and others, an experimental course in linear circuit theory was presented three mornings a week during the first semester of 1960-61.

During the second semester of 1960-61 two courses were presented in this manner to three classes in Milwaukee and two in Madison, one being in the TV studio and the other in an Electrical Engineering Classroom.

(d) Description and Use of a Computer-Controlled Teaching System, D. L. Bitzer and P. Braunfeld, Coordinated Science Laboratory, University of Illinois.

PLATO, an automatic teaching system, is described. This system uses a single, general purpose digital computer programed so as to tutor a number of students concurrently. Each student has an electronic keyset for communicating to the central computer and a TV set to view materials selected or written by the computer. Since the students share the digital computer, a more sophisticated set of teaching rules can be programed than could be instrumented in an economic way at each student station. Moreover, the use of a central computer makes it possible to change the teaching rules by modifying the computer program instead of rebuilding each student site.

Several preliminary studies used two student stations connected to ILLIAC, the University of Illinois digital computer. Data obtained from these studies are discussed from the system-design as well as the educational viewpoint.

MICROWAVE APPLICATIONS

Meeting Room: 8
2:30 p.m.

Chairman: Joseph A. Boyd,
Radiation Incorporated

(a) Analysis of the Miniaturization of Resonant and Nonresonant Antennas Utilizing High "Q" Materials, J. A. M. Lyon, A. T. Adams, and R. M. Kalafus, Cooley Electronics Laboratory, University of Michigan.

This paper shows the advantages and limitations resulting from the use of ferrite and dielectric materials as part of resonant antenna structures. The miniaturization involved is that corresponding to the reduced wavelength in a material medium as compared with the wavelength in free space.

Two theoretical viewpoints are pursued. One is the detailed study of energy density including any collimating effect due to metallic elements being encapsulated in a ferrite or dielectric medium. The other approach is the analysis of mode conversions present in antennas with emphasis on the critical locations of material—air interfaces. Impedance concepts are used in this second viewpoint.

Considerable emphasis is placed on the necessity for high "Q" materials. The basic types of antennas studied include the cavity backed resonant rectangular slot, the half-wave biconical electric dipole and the infinitesimal dipole. The paper offers experimental confirmation of many of the theoretical conclusions.

(b) Pattern Gain of Phased Arrays, R. K. Thomas, Martin Company.

Phased array techniques are required for antenna systems involving large apertures and high scanning rates. Single and multi-beam patterns capable of being steered at electronic time rates are achieved by such means. The patterns differ in one important respect from those produced by a mechanically scanned antenna, the beam shape of which is invariant with scan. In the case of the phased array the beam degrades with increasing scan angle, and this effect is commonly measured by a cosine law of variation. The present paper examines this relationship and deduces the limiting case of a 90 degree scan angle, for which the cosine law gives zero gain as an incorrect answer.

When the array is scanned in the direction of the element null the gain may be expected to vanish. This paper shows how the energy is redistributed to achieve, in a slightly different direction, gain compatible with the nominal scan angle.

(c) Efficiency, Phase Shift and Power Limiting in Variable-Pitch Traveling-Wave Amplifiers, J. E. Rowe and C. A Brackett, Electron Physics Laboratory, University of Michigan.

It has been shown recently that considerable efficiency enhancement can be achieved in broadband traveling-wave amplifiers through tapering of the circuit phase velocity near the r-f output. Efficiency enhancement factors of 1.4 to 2.0 to 1 have been realized on an S-band power tube with a resultant electronic interaction efficiency of 48 percent (over 40 percent for 25 percent bandwidth). Efficiency improvement for different degrees of tapering will be discussed in relation to theoretical and experimental results obtained on broadband high-power tubes.

(d) Microwave Modulation of Light with ADP, M. C. Watkins, Aircraft Armaments, Inc.

When a basal section of ADP crystal is placed within a strong R.F. field it exhibits similar biaxial characteristics as found for a d.c. field. This material may therefore be used to intensity modulate a light beam at a high frequency rate. This paper discusses a technique which has been successful in modulating light at 756 Mc/sec. By placing the crystal in a re-entrant type cavity sufficient voltage has been produced with a reasonable amount of power to provide an operational system.

Two schemes for detecting this high frequency modulated light are briefly presented analytically. One method is the detection of the time averaged intensity value and the second is a proposed optical heterodyning system. Experimental data is given for both the modulator and the detector to show its correlation to that theoretically calculated.

SOLID STATE APPLICATIONS—GENERAL

Meeting Room: 9
2:30 p.m.

Chairman: Harold W. Katz,
General Electric Company

(a) Transient Response of Forward Biased Diffused P-N Junctions, Howard K. Cooper, Pacific Semiconductors, Inc.

Forward transient response studies are conducted on P-N junctions by rapidly switching an initially unbiased junction into the conductance region of the characteristic curve. These studies are extremely important where computer and logic circuits are synthesized with semiconductors.

This paper will show the forward transient response of various types of diffused silicon junctions obtained from two distinctly different processes.

1. Single junction diffused process.
2. Triple diffused process producing state-of-art results.

(b) A General Synthesis of Tunnel Diode Amplifiers and Sensitivity Minimization, B. A. Shenoi, University of Minnesota.

Several authors have studied lossless networks with one or more tunnel diodes embedded as active elements. In this paper, a different technique of synthesizing a grounded net work which (1) is lossy, (2) realizes transfer function poles and zeros anywhere in the finite s-plane, (3) requires at most two tunnel diodes but no ideal transformers and (4) can be provided with different amounts of dissipation in the capacitors and inductors, is described. The transfer characteristic of the network so designed is not affected by biasing the diodes, since a d-c bias can be applied to them through an integral part of the network.

(c) A New Feedback Broadbanding Technique for Transistor Amplifiers, M. S. Ghausi, New York University, and D. O. Pederson, University of California.

A new broadbanding technique for low pass transistor amplifiers has been obtained using local resistive feedback together with a simple RC interstage coupling circuit. A design procedure has been developed and examples are given for both medium and high frequency transistors. The design procedure is based on feedback amplifier principles and is applicable to either a single stage or a cascade of similar stages. It is shown that better gain-bandwidth performance is obtained with the new techniques in comparison with other existing broadbanding techniques such as those using shunt-peaked interstages or shunt local feedback (R-L). Agreement between predicted and experimentally obtained results is very good.

(d) Asymmetrical Scattering from a Ferrite Cylinder, J. C. Palais, Cooley Electronics Laboratory, University of Michigan.

The asymmetrical aspect of the fields scattered by an infinitely long, longitudinally magnetized, ferrite cylinder are investigated. Previously derived solutions to the problem, characterized by a complex Fourier expansion of the field, are evaluated using an IBM 709 computer for several sets of frequency normalized parameters. These parameters correspond to realizable ferrite materials. The resultant asymmetrical patterns suggest several new device applications. They also explain the mechanism of symmetric junction type circulators. Design curves are obtained showing values of ferrite diameter, ferrite magnetization, and applied fields for circulator performance. In addition, bandwidth, frequency, and material limitations are discussed. The cylinder is also analyzed as a received and reflector of energy. The two dimensional gain and cross section are developed and tabulated for a number of cylinder parameters. A method of electronic scanning of the scattering pattern is shown. Synthesis of the scattering pattern is also discussed.

(e) The High Speed Collector Steered Quinary Counter, A. Hemel, Hallicrafters Co.

The transistorized bistable is one of the basic circuits in digital electronics and computer systems. It works admirably well for binary calculations where 0 and 1 are the only two digits, but encounters certain difficulties in the decimal system, primarily because 10 is not a power of 2.

Hallicrafters' Research and Development Division has worked on this and developed a 25 mc quinary counter. This paper describes the problems that were encountered in the process, the specific circuit techniques that were developed, and the mathematical procedures that indicated the limits of component values. It also shows how the quinary counter ties in with a binary circuit to form the widely used decade counter. The specific savings that are realized in comparison with the standard binary decade counter are also shown.

Tuesday Morning

October 9

All sessions start at 9:30 a.m.

MODULATION THEORY I

Sponsored by IRE Professional Group on Circuit Theory

Meeting Room: 6
9:30 a.m.

Chairman: W. R. Bennett,
Bell Telephone Laboratories

(a) On Comparing the Modulation Systems, John C. Hancock, Purdue University.

Numerous investigators in the past have compared the various modulation and detection systems from different viewpoints.

The purpose of this paper is to unify these comparisons for analog and digital systems. Fundamental concepts of the modulation and detection process are discussed as well as figure of merits for comparison. A comparison on a signal-to-noise ratio basis is made for the analog systems; whereas, probability of error is used for the digital systems. Analog systems considered include AM-DSB, AM-DSB/SC, AM-SSB and FM. Digital systems considered are PAM, PSK, PSK (differentially coherent), and FSK. Finally a comparison between digital and analog systems is made on a required energy per bit basis.

(b) Hilbert Transforms and Modulation Theory, F. F. Kuo and S. L. Freeny, Bell Telephone Laboratories

Hilbert transforms are important in representing certain modulated signals. In this tutorial paper we will explore the use of Hilbert transforms in modulation theory. The subject matter can be divided as follows:

(1) Properties of Hilbert Transforms
(2) Single sideband and vestigial sideband signals
(3) The concept of the pre-envelope; envelope detection
(4) Band-limited noise representation
(5) Signal-to-Noise ratio of a single sideband system with homodyne detection.

(c) Signal-to-Noise Effects and Threshold Effects in FM, Mischa Schwartz, Polytechnic Institute of Brooklyn.

This paper is meant to be a tutorial discussion of threshold effects in wideband FM receivers. Comparison is made between the analytical approaches used independently by Rice, Middleton, Wang and Stumpers. Their analyses show the existence of two thresholds: (1) The noise at the output of the detector increases rapidly when the carrier-to-noise ratio drops below about 10 db. (2) A signal suppression effect takes place when the carrier-to-noise ratio drops below 0 db. Some recent experimental verification of the theoretical results is presented. The application of the threshold phenomena to FM frequency feedback receivers, and to the study of digital error rates in fading FM systems is considered.

(d) Problems and Progress in PCM, M. R. Aaron, Bell Telephone Laboratories.

Recent progress in the design of PCM systems is traced. Since band-limited sampling is basic to PCM, the design of fllters for this application is considered. A simple approximation technique is sketched that reduces a switched network to a stationary network for purposes of design.

Several restricted-ternary codes suitable for base band PCM transmission are displayed. Advances in the understanding of the timing performance of self-timed reconstructive repeaters are given brief coverage.

DIGITAL COMPUTER WORKSHOP I

Meeting Room: AA
10:00 a.m.

Chairman: W. J. Eccles,
Purdue University

(a) Organization of a Digital Computer, D. T. Herrmann, Jr., General Precision, Inc.

(b) Programming of PINT, (tutorial) W. J. Eccles, Purdue

(c) Problem - Oriented Languages, C. H. Davidson, University of Wisconsin.

ADAPTIVE SYSTEMS

Sponsored by AIEE Electronic Circuits and Systems Committee

Meeting Room: 7
9:30 a.m.

Chairman: George E. Karres,
Martin Company

(a) Design Capabilities of Model Reference Adaptive Systems, H. P. Whitaker, Massachusetts Institute of Technology.

This paper reviews the research results achieved in the development of Model Reference Adaptive Control Systems with the objective of describing the performance capabilities, design procedures, and potential applications of these systems. The Model Reference concept permits closed loop adjustment of any number of controllable parameters of a control system so that the system will meet its specifications. Flexibility is achieved in that performance tolerances can be allowed for, so that the system can be designed to meet the desired engineering specifications rather than an abstract mathematical performance index. The problem of identification of operating performance is transformed into the much simpler problem of design of the model, and thereby a great reduction in adaptation time is achievable.

(b) Convergence Properties of a Model Reference Adaptive Control System from a Simple Stability Criterion, J. Bongiorno, Polytechnic Institute of Brooklyn.

The ability to establish convergence properties is extremely important in connection with the analysis and design of adaptive control systems. When the relationship between convergence time and adjustable system parameters is known, a more intelligent design procedure is available.

Recently, a Nyquist-like stability criterion for linear lumped-parameter time-varying systems was developed. The stability criterion states that a sufficient condition for system stability is that the rms loop transmission be less than unity when the time-varying elements vary periodically and when the lumped constant-parameter system obtained with all time-varying parameters identically zero is asymptotically stable. The stability criterion permits the establishment of bounds on the periodic time-varying parameters in terms of the maximum value of the real-frequency amplitude response of the time-invariant parts of the system. A nonrigorous extension of the stability criterion to include systems whose parameters do not vary periodically was also made.

(c) Aerospace Vehicles and Adaptive Flight Control, Milton Reed, Minneapolis-Honeywell Regulator Company.

An adaptive flight control system developed by Honeywell is currently being flight-tested in the X-15 aerospace vehicle. This paper reviews the adaptive concept used in this system, its early application in an F101A supersonic jet airplane, and its present operation in the X-15.

(d) Pulse Frequency Modulation for Adaptive Control, Gordon Murphy, Northwestern University, and R. L. West, McDonnell Aircraft Company.

Although it is well known that the transmission of information in physiological systems is affected by frequency modulation of a pulse train and that such systems are capable of adapting to significant changes in their environment, no great effort has yet been made to incorporate pulse-frequency modulation in the design if adapting control systems. The purpose of this paper is to illustrate the effectiveness of pulse-frequency modulation as an adaptive mechanism and to stimulate additional research on the use of this form of information transmission in control systems.

(e) Adaptive Learning Systems, J. E. Gibson, Purdue University.

The hierarchy of control may be described as follows:

1) open loop—most primitive and widely used.
2) conventional closed loop—more and more in use. Many processes now in existence cannot operate open loop. Conventional practice satisfactory so long as process does not undergo large and/or unexpected parameter changes.
3) adaptive — designed to optimize response of system continuously in face of new and unexpected parameter changes.
4) learning — designed to optimize response of systems by learning about the changes in environment and storing basic characteristics of these changes so that when faced with a change it has seen before will recognize pattern and quickly optimize.

This paper discusses the basic characteristics of adaptive control, learning systems and presents the future of the learning and adaptive concepts of the systems industry.

MEDICAL ELECTRONICS

Meeting Room: 8
9:30 a.m.

Chairman: George Zacharopolous,
Lafayette Clinic

(a) Design Toward a Chronic Artifical Heart, Victor W. Bolie, Iowa State University, and Jacob Kline, University of Rhode Isalnd.

This subject falls within the broad category of biomedical engineering in the design of artifical body organs—in particular the problem of long-term substitution of myocardinal function. Some of the serious biological aspects of the problems are considered in the paper, and the state of the art is summarized briefly.

(b) Medical Electronics at the Mayo Clinic, R. J. Hansen, Mayo Clinic.

The Mayo Clinic in Rochester, Minnesota, because of the large number of patients treated (over 176,000 in 1961), is resorting to electronic instrumentation to a greater degree with each passing year. When the desired equipment is commercially available, it is purchased and, if necessary, modified to suit the application. Otherwise the Clinic designs, develops and constructs the equipment in its Engineering Section.

A portion of the Mayo Clinic activity is

devoted to medical research where increasing sophistication and complexity of instrumentation is event. Such items as multichannel analog to digital converters and multi-channel FM tape recorders are in use. Where technicians painstakingly plotted curves and compared data point by point, the information can now be fed into a digital computer and analyzed in the desired fashion with a fineness of detail previously not practical.

This paper presents some of the work currently in progress at the clinic.

(c) Comments Upon Problems Encountered in Electronic Monitoring of Uncooperative Patients, John T. Martin, M.D., Mayo Clinic.

The contributions of electronics to medical practice are commented upon.

Hospitals today are faced with many problems arising from shortages of skilled personnel and increasing costs of material and services. As a result much attention is being devoted to altering physical facilities and professional care technics to provide more service at less cost. Automatic data processing is a key to this effort.

Physiologic monitoring is now conducted in the doctors office, the operating room, the laboratory, or on the hospital ward. When patients are anesthetized or can cooperate voluntarily, modern equipment and technics already well developed can produce useful information. Patients who are critically ill or have recently had severe stresses such as anesthesia, surgery, or major trauma can rarely cooperate. In this group, current monitors often interfere with nursing care by diverting attention from the patient to maintenance of equipment.

Successful equipment for monitoring the physiology of the uncooperative patient has specific requirements. These factors are detailed to serve as a guide in evaluating the usefulness of a product. The skill level of the nursing staff in relation to the function of electronic equipment is examined. Experience is related with reference to the tragedy of invalid advertising claims for physiologic data monitors. The buying power of hospitals is discussed.

(d) A Review of Air Ionization and Its Effect on Living Systems, H. F. Schulte, Jr., University of Michigan.

Since 1900 when it was established that electrically charged particles are always present in the atmosphere, the effects of ionized air on plants, animals, and human health and behavior has been the object of much investigation, both here and elsewhere in the world. It has generally been reported that an excess of negative ions has a salutary effect on living systems while just the opposite occurs in the presence of an excess of positive ions. Literature references to this subject number in the hundreds, and claims regarding observed effects, and theories to explain them are rampant. It is unfortunate however, that except for a limited amount of recent work, most of the results and conclusions should be discounted because of lack of sound scientific methodology.

Problems associated with the generation and accurate measurement of air ions are considered and the role of the electrical engineer is improving the rigor of future research in this field is discussed.

(e) A Computer System for Hospital Medical Record Data, Vergil N. Slee, M.D., Professional Activities Study.

Since 1952 the Professional Activity Study, PAS, has been using punch-card equipment and later a Honeywell 400 computer for handling abstracts of clinical records of hospital patients. A standardized coded case abstract is prepared by the medical record librarian for every hospital patient after discharge and these case abstracts are submitted to PAS for processing. The Commission on Professional and Hospital Activities, Ann Arbor, Michigan, which operates this program returns to the participating hospital listings of its case abstracts grouped by diagnosis, operation and physician; it compiles the individual hospital's statistics; and it uses the abstracts from all hospitals as a source of research data. A total of over six million cases have now been processed and are on file. Presently 250 hospitals in 33 states, District of Columbia, Puerto Rico and Canada are participating with annual discharges totaling 2,100,000 per year. In addition to giving improved access to clinical record information, and permitting extensive research at low-cost, the program reduces the cost of operating the hospital record departments.

MICROELECTRONICS I

Sponsored by AIEE Electronic Circuits and Systems Committee

Meeting Room: 9
9:30 a.m.

Chairman: Arthur P. Stern,
Martin Company

(a) Design of Integrated Radio Frequency Amplifiers, Glen Madland, Motorola, Inc.

Integrated RF Amplifiers have been designed and constructed for the frequency ranges of 120 Mc, 12 Mc and 455 Kc. The design is based on planar epitaxial silicon technology. The transistors are high frequency NPN types. Back biased PN junctions are used for capacitors. Resistors are formed with diffusion technology.

Various techniques for isolating transistors in single silicon substrate will be discussed. Performance data, including gain bandwidth and other important parameters will be discussed. The completed amplifiers are capable of withstanding 300° C. Packaging is done in a multilead TO-5 header.

(b) Using Decision Theory Techniques for Optimum Selection of Thin Film Packaging Concepts, Donald L. Brisendine, Martin Company.

This paper recognizes thin film interconnections as a problem of optimizing tradeoffs of cost, density, maintainability and reliability. Increases in component parts density inherently tend to raise costs, reduce reliability; increases in reliability tend to raise costs and reduce maintainability. Decision Theory, a tool of Operations Analysis, can be usefully employed in choosing an optimum packaging technique.

Six alternate packaging techniques for a thin film high-speed digital computer are examined and evaluated by using a decision theory matrix chart. This analysis is developed by selecting importance factors such as cost, reliability, density, etc. Each of these factors is weighed in accordance to their relative importance. The alternate packaging techniques are compared in each category. A summation of this weighed comparison yields an importance number for each alternate packaging technique. The optimum concept is that which has the highest importance number.

(c) Design and Performance of Tantalum Thin Film Circuits, P. Thomas, J. A. Ekiss, J. Roschen, and M. Walker, Philco Corporation.

The thin film program at Philco/Lansdale has centered around the use of tantalum for fabrication of resistors, capacitors and interconnection. Passive network arrays are interconnected with silicon diodes and transistors in the fabrication of ditigal circuits.

In this paper, the fabrication of tantalum resistors and tantalum pentoxide capacitors will be described. The characteristics of these components will be given with respect to tolerance, network representation, temperature coefficient and reliability. The resistor and capacitor values fabricated in conjunction with a circuit development program are 100 ohm $\leq$ Rs $\leq$ 100 K ohm and 30 pf$\leq$ C $\leq$ 1000 pf. This range of component values is compatible with the requirements for a large class of digital circuits.

(d) Thin Film Active Devices, W. Tantraporn and K. K. Reinhartz, General Electric Company.

Based upon the function of the control electrode, thin film amplifiers may be classified into three catagories: the field-effect triodes, the space-charge-limited triodes, and the hot-electron triodes. In the field-effect triode the control (gate) electrode modulates the conductivity of the region between the source and drain electrodes. Various mechanisms for such modulation will be discussed, with sample experimental results. In the space-charge-limited triode the control mechanism is very similar to the vacuum triode, whereas in the hot-electron triode the control electrode not only affects the emission of the electrons, but also must permit appreciable transfer of such electrons to the anode. Recent theoretical understanding of the hot-electron triode based on experiments will be discussed briefly.

The experimental performances of all three classes of thin film triodes will be described.

(e) Integrated Circuitry Embodying Thin Film Passive and Active Components, Thomas E. Harr, Martin Company.

Integrated circuitry, in one form or another, is being investigated or pursued by nearly every electronics organization presently in existence in the United States. To justify the faith, effort and financial investment that have supported these programs, a brief historical review will be presented which predicts the continued inevitable industrial adoption of future techniques of fabricating electronic circuitry that possess the attributes of increased reliability, reduced size and weight and improved economic advantages.

One approach to integrated circuitry will be described. It involves the fabrication of thin film passive components by conventional vacuum deposition techniques, the fabrication of active thin film semiconductor components by hetero-epitaxial techniques and the union of these components to form functional electronic circuits.

Finally, some comments will be made concerning the future concepts and applications of integrated circuitry.

UNIVERSITY PRESENTATIONS III—COMMENTS FROM INDUSTRY

Meeting Room: 12
9:30 a.m.

Chairman: Lawrence J. Giacoletto,
Michigan State University

Presentations delineating university-industry cooperation, current interdisciplinary programs of the universities, in-depth discussions of university research programs, and discussion of intensive short-course opportunities for practicing engineers. Each university will be allotted approximately 45 minutes for its presentation. In this session an opportunity will be afforded an industry representative to picture the needs of industry in these cooperative endeavors.

(a) Marquette University — "The Fetal Heart Station at Marquette University: a Biomedical Engineering Contribution" Saul D. Larks
"Simulation Studies in Biological Systems" James D. Horgan

(b) Illinois Institute of Technology—Alva Todd

(c) Northwestern University — "Microwave Diagnostic of Materials," Morris E. Brodwin
"Thin Film Materials." Rudolph Frerichs "Physiological Control Systems," Richard W. Jones

(d) Industry's Views on Universities as Resources—Marvin E. Krasnow, Director of Research and Development, The Hallicrafters Co., Chicago, Ill.

Tuesday Luncheon

Henry T. Heald
President Ford Foundation

Chicago Room
McCormick Place
12:30 p.m.

Address by Henry T. Heald,
President of Ford Foundation

Tuesday Afternoon

October 9

All sessions start at 2:30 p.m.

MODULATION THEORY II

Sponsored by IRE Professional Group on Circuit Theory

Meeting Room: 6
2:30 p.m.

Chairman: J. B. Cruz, Jr.
University of Illinois

(a) Transient Response of Narrow-Band Networks to Angle-Modulated Signals, J. J. Hupert, DePaul University.

This paper deals with the problem of evaluating the transient response of linear networks to angle-modulated signals. Narrow-band approximation applies but asymmetric pole pattern is admissible.

Network response to a step in frequency is first obtained in a convenient form; next the response to a function other than a step is developed by the use of convolution integral with the answer represented as a sum of quasistationary response and of transient response.

(b) Transmission of FM Signals Through Linear Filters, Donald T. Hess, Polytechnic Institute of Brooklyn.

In this paper, the problem of the transmission of F. M. signals through linear networks is considered. The response of the network to an F. M. Excitation is written in the form of a "Quasi Static" response plus an error term on which a tight bound is kept. The "Quasi Static' response, however, is not the usual sinusoidal steady state response of the network but rather a modified version of it. The modified response gives rise to an exceptionally small error term for F M. signals with modulating frequencies

which are small compared with the frequency deviation.

With the aid of the linear network response, the design of F. M. bandpass filters is also considered. The minimum filter bandwidth which keeps the distortion of the demodulated F. M. signal below a specified value is determined. It is shown that the filter bandwidth required to transmit commercial F. M. signals with less than one percent distortion of the information is just 225 kc, the existing experimentally determined bandwidth.

(c) Frequency Feedback Demodulators, L. H. Enloe, Bell Telephone Laboratories.

The frequency feedback (frequency compression) demodulator is capable of extending the threshold of signal-to-noise improvement beyond that of conventional frequency modulation demodulators. The importance of this property in situations, such as space communication, where signal power is expensive, is obvious. It has recently been shown that the threshold of this demodulator depends upon the closed-loop characteristics and in particular upon the closed-loop noise bandwidth. Left unanswered, however, was the problem of synthesizing optimum or near optimum demodulators which will meet specified requirements on threshold, baseband signal-to-noise, and baseband signal-to-distortion ratios. Of particular interest in the design of wide band large feedback demodulators is the problem of taking into account the excess phaseshift of the open-look transfer function caused by poles near infinity. This paper will discuss and present solutions to these problems.

(d) Optimum Coherence Demodulation for Continuous Modulation Systems, Andrew J. Viterbi, Jet Propulsion Laboratory, California Institute of Technology.

A comparative study of coherent demodulation and amplitude, phase, and frequency modulated signals is presented. A coherent demodulator performs a two-fold function of producing a replica of the transmitted signal carrier and of utilizing this locally generated carrier to recover the modulation. It is assumed that the modulating signal is a stationary random process and that only its spectrum is known a priori. For phase and frequency modulation the coherent demodulator is a combination of a multiplier, a voltage-cotrolled oscillator and linear filters known as a phase-locked loop. The demodulator will be called optimum if it produces minimum variance estimates of the carrier and the modulation; the optimization procedure reduces to the synthesis of the linear filters.

(e) Phase-Lock Demodulators, B. J. Miller and L L. Kocsis, Zenith Radio Corporation.

The factors determining noise bandwidth and permissible delay times in phase-lock loops for various anticipated signal frequency deviations are considered, for steady state modulation conditions. Numerical trends are displayed for several simple filter types. Threshold signal-to-noise ratios (for FM improvement) are estimated.

The possibility of using an electron beam parametric amplifier (EBPA) as the preamplifier for a phase-lock receiver is discussed. The phase-lock receiver furnishes the information necessary for synchronous pumping of the EBPA. It is shown that such systems can be constructed, and that a noise factor improvement is achieved.

DIGITAL COMPUTER WORKSHOP II

Meeting Room: AA
2:30 p.m.

Chairman: W. J. Eccles,
Purdue University

(a) Organization of a Digital Computer, D. T. Herrman, Jr., General Precision, Inc.

(b) Programming of PINT, W. J. Eccles, Purdue University.

(c) Problem-Oriented Languages, C. H. Davidson, University of Wisconsin.

TIMELY ASPECTS OF SPACE SCIENCE

Meeting Room: 7
2:30 p.m.

Chairman: F. B. Llewellyn,
University of Michigan

Four survey talks to bring everyone up to date on the applications of satellites in the following areas:

(a) Telstar Satellite System Earth Station at Andover, Maine, Irwin Welber, Bell Telephone Laboratories.

The Telstar Satellite System Earth Station at Andover performs three major functions:

1. Acquisition and tracking
2. Command and telemetry
3. Communications

This paper describes the performance of the station with respect to these functions as measured with the Telstar Satellite. Acquisition is accomplished by a quad helix antenna which has a 20° beam and the tracking by a precision tracker with a 2° beam. The horn antenna which is used for communications has an aperature of 3600 square feet and has a 0.2° beam at 4 KMC. Command and telemetry is performed by the quad helix antenna. The communications facilities include a 2 KW traveling wave tube, a broad band maser and an fm feed back receiver. Overall system noise performance has been measured to be 32° at zenith.

Tracking of the horn antenna has been accomplished in the following modes:

1. Tape drive.
2. Full auto-track.
3. Slaving the horn to the precision tracker.
4. Combinations of the above.

Results of communications tests will be discussed including one-way and two-way message as well as television.

(b) Navigation Satellite Progress, A. B. Moody, National Aeronautics and Space Administration.

Some 20 techniques have been suggested for use of artificial earth satellites for navigation of ships and aircraft. A study of these indicates that range, range rate, and angle mesurement are most promising for general navigation. The range rate method, using the Doppler shift of signals from a stable oscillator in the satellite, is used in the TRANSIT system under development by the Navy to meet military requirements for submarines and certain special purpose surface ships. The four operational satellites for this system are scheduled to be launched before the end of 1962. Nonmilitary ship and aircraft navigation requirements have been studied by NASA, and it appears that navigation satellites can make a significant improvement in the present situation. A thorough test of TRANSIT equipment and possible development of equipment uisng other techniques separately or in combination is considered desirable to develop optimum non-military capability.

(c) Weather Satellites, D. J. Johnson, U.S. Weather Bureau.

Satellites provide the meteorologist with an unprecedented observational tool by which he can observe the entire atmosphere surrounding the earth. The successful series of TIROS meteorological satellites has provided data of considerable use in operational weather analysis and forecasting as well as in research.

As a result of the success of the TIROS series and the tremendous potential of weather satellites, a National Operational Meteorological Satellite System is now under development. This system will provide complete global observational coverage at least twice a day which will contribute significantly to improve weather analysis and forecasting in the United States and in other countries of the world.

The full development and exploitation of an operational meteorological satellite system requires the solution of many problems, including the development of new types of sounding techniques, data processing systems, increasing the reliability and lifetime of spacecraft, and the development of new techniques for applying satellite data to weather analysis and forecasting.

(d) Space Astronomy, F. T. Haddock, Radio-Astronomy Laboratory, University of Michigan.

The advent of space technology has opened up immense possibilities for astronomy since ground astronomy is seriously limited by the earth's atmosphere. The atmosphere absorbs or reflects all incident radiation from space except in a few transmission regions in the optical and radio regions of the spectrum. Even in the most transparent parts of the optical window the atmosphere distorts the incoming images so that it is difficult to photograph features less than about a second of arc. This dynamic distortion also seriously increases the exposure required, especially on spectra of faint stars. Furthermore the air glow of the night sky about doubles the sky brightness and thus sets the upper limit to exposure time and hence the limiting the detectable magnitude of stars, nebulae and galaxies.

Below a few Mc/s the earth's ionosphere reflects back incident solar galactic and cosmic radio waves. The radio spectra of the galaxy and bright radio sources increases rapidly with decreasing frequency. It is important to determine the spectra at low frequencies in order to understand the physical processes involved. This requires that radio telescope be located above the F-region of the ionosphere.

Various space astronomy programs, both optical and radio, and their associated space crafts will be described.

MICROELECTRONICS II

Meeting Room: 8
2:30 p.m.

Chairman: James R. Black, Motorola, Inc.

(a) Thin Film Technologies for Electronic Components, W. D. Fuller, Lockheed Missiles and Space Company.

Thin film technologies have been proposed for the design and fabrication of electronic systems to meet the requirements of improved reliability, simplified producibility, reduction of physical parameters and economy. It has been assumed that thin film technologies are synonymous with and only desirable for microminiaturizations, but actually such technologies are applicable to a full range of power levels and circuit types compatible with those parameters of component-type assemblies. Indeed, size reduction is an important byproduct of the application of thin film technologies to improve reliability of electronic systems.

(b) The Impact of Microelectronics and Solid State Technology on Electromechanical Control Systems, T. Mitsutomi and W. F. DeBoice, Autonetics.

Effective utilization of microelectronics in electromechanical control systems demands an overall system viewpoint. The multiplicity of methods by which microelectronics can be achieved, the rapid discoveries of new processes which promise even greater things, and the integrated character of microelectronics are matters which must be seriously considered in planning an evolutionary and systematic program of developing future systems.

In view of these matters, the need is for the electronic engineer to review the entire electromechanical system and determine the essential functional requirements of the system. He is then faced with the important task of expressing these requirements in terms of basic microelectronic functions. In doing so, he is confronted with not only engineering considerations but also economics, logistics, and schedules. These aspects of the development of the basic electronic functions required in a complex inertial navigation system are presented in this paper.

(c) Semiconductor Networks for Use in Electro-Mechanical Control Systems, C. Abbott, L. Bohan, L. Housey, and L. Regis, Texas Instruments, Inc.

One year ago, Texas Instruments announced the availability of a compatible line of digital semiconductor Networks.

The area of linear circuit design presents a somewhat more formidable challenge. The more paramount advantages to be gained in utilizing the network technique are: 1) the ability to match components and their various parameters in a particular circuit. 2) the "tracking"' of these parameters over wide temperature excursions. 3) the inherent reliability of the monolithic structure. 4) the volume reduction and its attendant features. However, linear circuits, in general, require components of greater precision, a wide range of absolute value, accurately matched components, and devices of an inductive nature.

(d) A Novel Solution to the Interconnection Problem in Microsystem Circuits, T. L. Robinson, Cornell Aeronautical Laboratory, Inc.

Serious problems exist in the interconnection of microsystem circuit devices. At present, modules cannot be tested or replaced without great difficulty due to the interconnection methods employed. Plugs, sockets and wiring harnesses occupy more space than the equipment they connect.

A solution to the interconnection problem based on a versatile printed circuit transfer process is described. Additional applications of the transfer process are discussed including multi-layer circuitry, flexible circuitry, flush circuitry, and encapsulated circuitry.

A unique "printed-hole" forming technique is described which eliminates all drilling, punching and blanking operations in fabricating circuit boards, thus reducing costs.

The subject of heat sinks is considered at elemental circuit levels. Experimental procedures are outlined for making prototypes of microsystem circuits based on the printed circuit transfer process. Automation methods are discussed and a comparison is made with the conventional etched circuitry concept.

Several applications of the circuit transfer process are listed, such as its adaptation to shadow masks for vacuum deposited materials.

(e) Thin Film Integrated Components for Telemetry Subsystems, A. J. Nichols and W. D. Fuller, Lockheed Missiles and Space Company.

Thin film integrated components fabricated from refractory materials will contribute greatly to meeting the space electronic requirements of improved reliability, versatility of reproduction, wide product range, size

reduction and economy. A thin film technology based upon a titanium, titanium-oxide system and chemical fabrication processes has been developed in the Microsystems Electronics Laboratory of LMSC particularly to meet those requirements. A particular telemetry subsystem consisting of a four and sixteen channel sequencer has been designed and fabricated as a thin film integrated component assembly and demonstrates the applicability of thin film technologies in space electronic systems.

The characteristics of the sequencers and the thin film design and fabrication processes are detailed to show the integration of design and fabrication processes that result in a subsystem meeting the task requirements.

MICROWAVE MAGIC AND SATELLITE COMMUNICATIONS

(Student Engineer Program)

Meeting Room: 11
2:30 p.m.

Chairman: Alva Todd,
Illinois Institute of Technology

Wednesday Morning

October 10

All McCormick Place sessions start at 9:30 a.m.

Signal Theory session, held at Pick Congress Hotel, starts at 9:00 a.m.

(NEC Badges will be honored for this session ONLY at the Pick Congress)

SIGNAL THEORY

Pick Congress Hotel
9:00 a.m.

Chairman: Herbert Sherman,
Lincoln Laboratory,
Massachusetts Institute of Technology

(a) The Space of Essentially Time and Bandlimited Signals, H. O. Pollak, Bell Telephone Laboratories.

The present paper examines the size and structure of the collection of signals which are: (i) of finite energy; (ii) concentrated in time to an interval of length T; (iii) concentrated in frequency to a bandwidth W. One intuitively expects that there are about 2WT independent signals ϕ_i under the above restrictions. It turns out that with the best possible choice of the ϕ_i (prolate spheroidal wave functions) this intuition is approximately correct, but that it is further from the truth if the ϕ_i are chosen to be sampling functions of the form $\frac{\sin(2\pi Wt-n\pi)}{2\pi Wt-n\pi}$. It is possible to discuss rather completely what can be achieved with a given number of either prolate spheroidal wave functions or sampling functions.

(b) Orthonormal Exponentials, D. C. Ross, IBM Federal Systems Division.

A generalization of the Kautz method of orthonormalizing a given set of exponentials is described. The generalized functions provide flexibility which may be used to design bases of lower dimensionality in some signal representation applications than would be required by the earlier method.

A simple and effective procedure for the construction of a set of orthonormal exponential functions has been described by Kautz. The importance of discrete orthonormal functions, exponentials in particular, in the representation and analysis of signals has been discussed by Huggins and Lai. Recent applications of orthonormal exponential bases to the representation of speech and ECG waveforms have been described by Dolansky and by Young and Huggins. The purpose of the present paper is the description of some extensions to the Kautz procedure for the design of a set of orthonormal functions based on a given set of exponentials.

The extensions described are applicable at any point in the sequence of construction of the set. For the sake of simplicity in presentation, the extensions are described first as applying to the construction of the first function in the set. Application to the construction of any function in the set is presented by means of a numerical example.

(c) A Note on Orthogonal Digit Coding, L. Kurz, New York University.

This paper considers some general ideas pertaining to multisignal coding for digital communication systems perturbed by additive Gaussian noise which may be non-white. The signals are formed from weighted sums of the orthogonal set of eigenfunctions generated by an integral equation with its kernel corresponding to the inverse Fourier transform of the Gaussian noise power density spectrum. The orthogonal digit codes thus generated are more efficient than binary digit codes when used in fixed data rate communication links with average power limited transmitters. A method for generating specific codes is given for the detection scheme which does not require estimation of the signal or the noise levels at the receiver (defection independent of fading). Performance results are given for several different codes when the demodulated Gaussian noise power density spectrum increases with increasing frequency. The latter noise power density spectrum acts as a weighting function which confines the generated signals to the available band of frequencies. A new interpretation of the results in terms of the matched filter theory is given. Two methods for implementing an optimum receiver for these codes are suggested.

(d) Two Dimensional Signal Representation Using Prolate Spheroidal Functions, D. A. Landgrebe and G. R. Cooper, Purdue University.

Two separate methods for defining two dimensional signal representations are presented, using time- and bandlimited forms of the prolate spheroidal functions in order to maintain the desired two dimensional conceptual qualities as well as mathematical convenience. Both representations will converge to either a time- or a bandlimited portion of the represented signal upon inclusion of the proper terms. Due to the peculiar properties of the prolate spheroidal functions, as the number of orthogonal function terms is increased, the representation of a time limited function tends to converge first in a specified bandwith and the representation of a bandlimited function tends to converge first in a certain time interval.

ADVANCED COMPUTER TECHNOLOGY

Sponsored by AIEE Electronic Circuits and Systems Committee

Meeting Room: 6
9:30 a.m.

Chairman: Ferdinand P. Diemer,
Martin Company

(a) Research Input-Output Equipments for General Purpose Computers, W. S. Holmes and H. M. Maynard, Cornell Aeronautical Laboratory, Inc.

Many modern research topics demand the injection of data for unusual forms into a general-purpose computer. For example, investigation of automatic photo-interpretation can be effectively carried out in a general-purpose computer provided the basic pictorial information can be efficiently quantized and injected into the computer memory.

This paper will discuss some specialized input devices designed and constructed at Cornell Aeronautical Laboratory for use with its IBM-704 and will present some of the unusual applications for which these devices have found utility. The applications range from automatic photo-interpretation to high speed reduction of information from hypersonic shock tunnels. The paper will cover the basic principles on which the devices were designed, limitations in their operation, and several illustrative examples of their employment.

(b) A Bit Oriented Sequential Access Memory, C. H. Fischer, Hughes Aircraft Company.

A bit oriented sequential access memory can be used to replace a multiplicity of serial shift registers at a considerable saving in components and power. This paper discusses the organization of such a memory and shows how it can be used to function as a single word or a multiple word register and to provide for the operations of "left" or "right" shift of one bit.

(c) Two-Dimensional Spatial Filtering Research in General Purpose Computers, W. D. Fryer and G. E. Richmond, Cornell Aeronautical Laboratory, Inc.

The use of a general-purpose computer to explore essentially non-numeric research problems such as problems in automatic photointerpretation presents an interesting challenge. Many of the well-established concepts of one-dimensional filtering are no longer applicable in the field of two-dimensional spatial filtering. It turns out that the general-purpose computer is a highly useful tool in this research. This paper will cover some of the fundamental problems in filtering aerial photographs for the silhouetting and isolation of objects, not only blob-like objects but also ribbon-like objects. Some of the problems in the design of recursive, two-dimensional filters will be touched upon, and preliminary results will be described.

(d) A Zero Loss Capacitor Storage Device, C. H. Fischer, Hughes Aircraft Company.

Capacitors with high impedance loads have customarily been used to provide for the storage of analog output quantities of digital computers. The principal difficulty with this device is that there is a finite leakage current which results in a loss of voltage and necessitates frequent updating of the analog quantities. This paper describes a method of mechanizing a zero loss capacitor storage device by providing a "quantized feedback" to restore the charge which leaks off the capacitor. By this means it is possible to provide for the storage of an analog voltage for an essentially infinite period of time.

(e) HCM-202 Thin Film Computer, M. M. Dalton, Hughes Aircraft Company.

This paper describes the functional and physical characteristics of the Hughes HCM-202 General Purpose Digital Computer. The HCM-202 is a parallel, internally programmed general purpose digital computer. Word length is 24 bits (23 bits plus sign). Clock rate is 500 kc and addition requires eight microseconds. The HCM-202 is designed around a modular concept which allows a wide variety of memory types and quantities to be used with the computer; different input-output units may be attached to the computer to provide optimum systems coupling for a wide variety of aerospace guidance and control applications.

RESEARCH PREVIEWS I

Meeting Room: 12
9:30 a.m.

Chairman: Donald S. Gage,
Northwestern University

National Electronics Conference is including in its 1962 program a type of session new to the Electronics field-sessions of short (10 Minute) papers.

The purpose of these sessions is to include information concerning the most recent developments in industrial and university laboratories.

INFRARED APPLICATIONS I

Sponsored by AIEE Electronics Committee

Meeting Room: 7
9:30 a.m.

Chairman: Frank J. Kocsis, Jr.,
Servo Corporation of
America

(a) A Rugged, Low-Noise Solid State Infrared Detection System, Matthew C. Baum, Mnemotron Corporation.

A system is described which combines the best properties of transistors and lead sulphide detectors. Signal-to-noise ratios close to those set by the noise limit of the cell itself are obtained. By paying careful heed to selection of components and devices used, the preamplifier is made exceptionally rugged and nonmicrophonic. Integration time may be varied for optimum match to the particular application at hand, and the pulse output has rapid recovery under severe overloads. A noise sampling circuit adjusts system sensitivity, so as to maintain optimum performance under varying conditions of ambient noise.

In addition to the original application, many of the techniques outlined are applicable to systems using other types of detectors, such as bolometers, cooled and uncooled doped crystals, and indium antimonide. Some typical suggested uses are in medical electronics, ASW, industrial process monitoring, and chemical analysis instrumentation for both production and laboratory.

(b) Terrain Mapping by Use of Infrared Radiation, David E. Harris and Casper L. Woodbridge, HRB-Singer, Inc.

In the last decade much progress has been made in the development of techniques for obtaining thermal maps of terrain using airborne scanning devices. To date, the spectral region from visible light to about 14 microns has been exploited.

Present state-of-the-art restricts the system designer to the use of single element infrared detectors or to very simple arrays of a few elements.

This paper describes a line scanning technique that has been successfully applied in obtaining thermal terrain maps from the air. Pertinent design parameters are discussed and various factors that limit performance are analyzed. Thermal maps of various types of terrain illustrate the usefulness of the mapping technique.

(c) An Infrared Signal Generator, Arthur Glaser and Allan Ross, Telewave Laboratories, Inc.

A discussion of the specifications, design, and applications of a self-contained signal generator for the Infrared region between 1 and 14 microns. The first section deals with the factors that were considered in choosing the final system specifications. This is followed by a description of the components that are used to achieve the desired results. The emphasis in this description is on the

design of the optical system. Factors such as the choice of system configuration and materials are discussed.

Finally, some of the applications of this instrument to practical problems are presented.

(d) Infrared Hot Box Detectors, William M. Pelino, Servo Corporation of America.

One of the railroad industry's most important problems, detrimental to efficient movement of freight, is alleviated by the introduction of an infrared system designed to detect and locate overheated bearings on rolling stock. The overheated bearing is known as a "hot box."

The nature of a hot box is defined and its characteristics relative to the detection problem are explored.

Components of the system are described. The territorial distribution of system componentts are considered in view of the railroad's operational needs.

Conclusions are drawn with respect to the economic advantages enjoyed by one industry through the first major commercial application of the infrared art.

CIRCUIT AND SYSTEM THEORY

Meeting Room: 8
9:30 a.m.

Chairman: S. Louis Hakimi,
Northwestern University

(a) Theoretical Basis and Practical Implications of Band-Pass Sampling, C. L. Ackerman, C. S. Miller, and J. L. Brown, Jr, Pensylvania State University.

The classical Shannon sampling theorem for low pass band limited signals may be extended to the band-pass case. An expression for the minimum sampling rate for a signal of bandwidth W centered about a frequency f_c is derived. A formula about a frequency f_c is derived. A formula for the reconstruction of the signal from its band-pass samples is developed and an equivalent filter configuration indicated. These concepts of band-pass sampling are applied to a correlation system and the effect on the correlation function is shown. Practical aspects are discussed and a means of eliminating signal-to-noise processing gain degradation by quadrature sampling is explained. A formula indicating the improvement of the correlation system performance with respect to noise with an increase in the sampling frequency is derived.

(b) Discrete Orthonormal Exponentials, T. Y. Young and W. H. Huggins, John Hopkins University.

In dealing with the problem of signal analysis, one set of very useful component functions is the orthonormal exponential functions. Previous studies have concentrated mostly on continuous exponentials with real exponents. With recent progress in high-speed digital computers, it is desirable to perform the signal analysis on digital computers. This requires the transformation of orthonormal exponentials from the continuous form into the sampled data form, i.e., the z-transformation.

In this paper, we deal with digitizing the orthonormal exponentials with complex exponents. The z-transforms of continuous orthonormal exponentials are not themselves orthogonal in z-domain. This is due to the fundamental property of sampling with a signal with a frequency spectrum higher than the sampling frequency is not exactly reproducible from its sampled data. For this reason, we introduce the Krautz process in the z-domain to define a set of discrete orthonormal exponentials. These discrete orthonormal exponentials approach the ordinary continuous orthonormal exponentials in the limit as the sampling interval T aproaches zero.

(c) Adaptive System Identification by State Variable Operations, H. M. Estes, U.S. Air Force Academy.

A new method is established for the measurement of changes in response characteristics of a class of linear systems due to the effects of time and environment. The basis of the method lies in the fact that any state variable of the system may be related to some reference state vector of the system by a proper linear transformation. This transformation will, in general, be a function of the parameters chosen to describe the response characteristics of the system.

Implementation of the method requires measurement of a reference state vector and measurement of an additional state variable for each response parameter to be determined. Writing the transformation equations relating these quantities yields a

set of non-linear equations whose solutions are the desired values of the system response parameters. Two methods of solution are presented. Each allows rapid determination of system characteristics without use of special test inputs.

(d) Analysis and Design of Sampled-Data Systems Via State Transition Flow Graphs, B. C. Kuo, University of Illinois.

Analysis and synthesis of linear and some nonlinear dynamic systems can be carried out based upon the characterization of the systems by sets of simple first order differential equations describing the state variables. The purpose of this paper is to introduce the concept and the use of the "state transition flow graph" of dynamic systems. The state transition flow graph is defined as the signal flow graph portraying the computer simulation of the system with the initial state transition conditions applied to the state variable nodes. The state transition equations of the system are then written out directly from the state transition flow graph by mere inspection. The method is applicable to continuous-data systems as well as discrete-data systems.

The state transition flow graphs may be used in the design of linear as well as some nonlinear systems. The system parameters are presented clearly on the flow graph, and the effects of variation of a given parameter on the state variables may be studied. Sensitivity of the state variables with respect to the variation of a system parameter is defined and can be evaluated directly from the transition flow graph.

(e) Miyata's Method Applied to Active Network Synthesis, R. E. Thomas, U.S. Air Force Academy

In this paper the technique of passive network synthesis, known as Miyata's method, is extended to active networks where the available network elements are positive and negative resistors and capacitors.

The process inherently contains considerable freedom of development because of the key role played by the even part zeros which are only distantly related to the given impedence function. A trade-off between passive and active elements is usually available. Finally, the method illustrates a close tie between active and passive network synthesis which is largely unexploited.

ELECTRONICS IN HYDROSPACE

Sponsored by IRE Professional Group on Military Electronics

Meeting Room: 9
9:30 a.m.

Chairman: R. L. Miller,
University of Chicago and
Woods Hole Oceanographic Institute

(a) New Concepts for Intense Sound Transducers, R. R. Whymark, Armour Research Foundation.

An electronic-ultrasonic image converter is described for producing CRT displays of sound fields. The converter relies on the secondary emission of a quartz receiving plate scanned by a 200 ev electron beam. The sound frequency is 7 mcps, and the converter is capable of resolving 10 mil diameter, water immersed, metallic, wires. Techniques are described for operating the converter at sonar frequencies.

Magnetostrictive transducers are discussed in the light of recent developments. Sound intensities of 1 kw/cm^2 now are feasible and the conversion efficiency of a metallic transducer can be as high as 50 percent at extreme power densities.

(b) Airborne Bathythermograph System, G. Gruener and A. Leumpert, Sparton Electronics.

This paper describes an airbourne system which has been specifically designed for obtaining and recording the vertical distribution of water temperature in the oceans to depths of 1000 feet. The system utilized both permanent recording equipment, which is installed in an aircraft, and expendable sensing equipment, which is deployed in flight by the same aircraft. An overall system philosophy description, including equipment engineering and circuit performance, is presented. In addition, an operating description, which outlines the operation of the system from the point of view of the operator, indicates the simplicity of operating the equipment. Finally, an example of data output is included.

(c) Electronic Instrumentation for the Great Lakes Water Quality Study, J. L. Verber, U. S. Public Health Service.

(d) The Hall Compass, E. A. Keller, Motorola, Inc.

Unmanned remotely operating oceanographic instruments and detection devices in Undersea Warfare require azimuth references for vector-type variables under investigation. Solid state compasses and especially the Hall Compass are particularly well suited to withstand the rough environment in the sea. Design and performance data are described.

(e) Radio Communication Within the Hydrosphere, R. C. Becker, Amphenol-Borg Electronics Corporation.

The nature of the electromagnetic problem together with the restrictions imposed by the electrical properties of the underwater environment and its boundaries are reviewed. Certain physical constants of the underwater medium which may pose practical problems in designing hardware for this environment are also mentioned. Propagation characteristics of typical transmission paths for underwater radio comunications are presented.

Radio wave transmission within the hydrosphere is shown to be useful for purposes of communications, navigation and worldwide timing. Typical radio communication systems for submarine applications are described.

COMMUNICATION SYSTEMS

Meeting Room: 10
9:30 a.m.

Chairman: Ira Jacobs,
Bell Telephone Laboratories

(a) The Status of Statistical Decision Theory, John C. Hancock, Purdue University.

Statistical decision theory has been applied to the problem of determining the functional forms of optimum receivers for communication systems over the past decade. In this paper, the current status and applications of this theory to the digital communication problems is briefly reviewed. Systems having multiplicative as well as additive types of disturbances are considered. Assumptions necessary to realize functional receivers are discussed and related to experimental results.

(b) Signal Design, Robert M. Lerner, Lincoln Laboratory, Massachusets Institute of Technology.

(c) Adaptive Communication With Feedback, Leonard S. Schwartz, New York University.

Adaptive principles can be of extreme importance in optimizing the performance of communication systems because input message rates and channel capacities may not be constant and, in fact, may vary randomly. Input messages rates vary with changing traffic demands; channel capacities vary because of time-varying parameters in the transmission media, as in fading caused by multi-path.

This paper discusses methods for achieving:

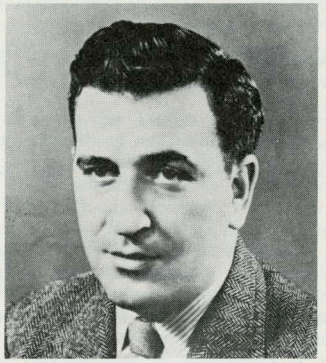
(1) adaptive control in receivers without feedback; (2) adaptive control in communication systems with a feedback loop from the receiver to the transmitter; and (3) adaptive control in systems employing both an adaptable receiver and a feedback loop from the receiver to the transmitter. In all cases the methods are considered from the point of view of the merit criterion of minimizing the error probability while maintaining a constant average information bit rate. Their performance is compared with that of a non-adaptive unidirectional system.

(d) Method and Merit of Binary Coding for Analog Channels, Irwin M. Jacobs, Massachusetts Institute of Technology.

Current engineering practice for achieving a low bit error probability in a binary transmission system is to utilize pulses with a duration sufficient to ensure the required receiver-signal-to-noise ratio and, if necessary, to employ diversity. From the viewpoint of signal selection, this practice is identical to obtaining a reliable pulse by repeating each information bit a fixed number of times. Although optimum for the transmission of a single information bit, such repetition is inefficient for the transmission of a sequence of bits. The selection of more efficient signals is called coding.

In this paper, we consider the improvement in rate and signal-to-noise ratio offered by coding and decoding for three values of detector quantization; $Q = 2$ (binary detection), $Q = 3$ (ternary or null-zone detection), and $Q = 00$ (continuous or unquantized detection). A qualitative insight is then provided into convolutional encoding and sequential decoding as one means, adaptable to any value of Q, for realizing these gains.

Wednesday Luncheon



Dr. Jerome B. Wiesner
Special Assistant to President Kennedy

Chicago Room
McCormick Place
12:30 p.m.

Address by Dr. Jerome B. Wiesner
Special Assistant to President Kennedy

Wednesday Afternoon

October 10

All sessions start at 2:30 p.m.

INFRARED APPLICATIONS II

Sponsored by AIEE Electronics Committee

Meeting Room: 6

Chairman: T. E. Harr,
Martin Company

(a) Some Electronics Problems in Infrared System Design, Frederick G. Whelan, Martin Company.

The new long-wavelength quantum detectors employed in the infrared region of the electromagnetic spectrum have characteristics which impose on the associated electronic circuitry a rather unique set of requirements. This paper discusses the detector, the mechanical scanning, the target detection, and the data presentation problems as they affect the electronic circuitry for a typical passive infrared detection system. Particular attention is given the detector-preamplifier combination and the use of the field effect transistor for this application. Discrimination against background radiation is always a problem in any infrared system, and various means of enhancing the signal to-noise ratio, such as matched filters, correlation techniques, pulse length discrimination, MTI, and temperature discrimination are discussed. Data transmission and display problems are also considered.

(b) Optical Techniques for Target Enchancement and Background Rejection, R. S. Neiswander, The TE Company.

By trend and by necessity, space reconnaissance and surveillance sensors will become non-mechanical scanning devices, typically utilizing image converters, electronic scan tubes as their basic transducers. In this general category of sensor systems, data processing that enhances targets and suppresses backgrounds can be performed both on the radiant energy pre-conversion and upon the electronic signals post-conversion. The purpose of this paper is to discuss special techniques related to data processing of the radiant energy. The processing approach discussed here accommodates the full three dimensions of data available (two dimensional image space plus color), and it is adaptable to and emphasizes nonlinear operations. For example, where linear processes reduce sharp semi-infinite discontinuities in favor of point or line targets, appropriate nonlinear operations fully eliminate this class of unwanted backgrounds. Throughout the examined approach, practically, recognizing the limitations even of future components, is emphasized.

(c) Recent Advances in Infrared Detectors for the 8.5 - 13.5 Micron Spectral Band, Jack K. Lennard, Martin Company.

This paper describes photoconductive infrared detectors based on cadmium-mercury-, and antimony compensated zinc-doped germanium. These materials are shown to have high detectivity and rapid response time constants for infrared radiation in the 8.5 to 13.5 micron spectral band. The steps used to prepare uniformly doped single crystals by zone leveling in sealed ampules are described. Methods of electrical contacting and formation of multiple element arrays of detectors, each 0.1 x 0.1 mm^2 in sensitive area, are described. Experimental data on spectral detectivity, resistance, time constant, and noise spectrum are presented. Equations used to estimate cryogenic operating temperature and maximum detectivity for these

materials when used with cooled filters, narrow fields of view, and cold backgrounds are discussed and compared with recent experimental data.

(d) Status Report on Infrared Thermistor Detectors, Israel J. Melman and Irving M. Meltzer, Servo Corporation of America.

The development performance and applications of infrared thermistor detectors are discussed. The performance criteria for use in infrared reconnaissance and space vehicles are described. Data on performance amassed from a recent Industrial Preparedness Program are given.

TRENDS IN AEROSPACE GROUND EQUIPMENT

Meeting Room: 8
2:30 p.m.

Chairman: Harold Flowers,
Avco Corporation

(a) Analog Checkout of Large Systems—The Digital Solution, W. R. McCormack, Martin Company.

This paper describes a Computer Controlled Checkout System which does testing and evaluation of large systems (e.g., weapon systems).

The basic reason for digital equipment is the need to separate the unit under test from the test operators and the difficulty in transmitting analog quantities over this distance. Elapsed test time and human deficiencies in digital comparison and coordinated execution of detailed tasks require that the tasks and comparisons be automated. Human deficiency in accurate, legible record keeping and in voluminous detail comparisons require that permanent records be machine recorded on the spot and machine analyzed. These requirements and the need for flexibility dictate that the central control unit be a general purpose binary digital computer.

(b) Digital Computer Checkout of Inertial Navigation Systems, J. L. Henry, Autonetics.

Checkout techniques used in operational systems by the Armed Services are described. These systems use a digital computer to control checkout operations and precision calibrations, and to perform associated computations. The use of the system digital computer greatly simplifies the required highly precise automatic checkout equipment. The evolution of the checkout system is also covered. Servo phase margins are checked by generating loop disturbances ad measuring their net effect. Precision inertial instruments are calibrated by comparing their actions to known natural phenomena, and examples of calibration equations are given. Computer general purpose and digital differential analyzer functions are discussed. Personnel with extensive experience have developed a system which provides highly sophisticated and consistent checkout and calibration techniques in a form usable by relatively inexperienced personnel. Other advantages of the system are enumerated.

(c) Use of Integrated Circuitry in Digital System, Lloyd Thayne, Martin Company.

This paper discusses integrated circuit application in a missile checkout and ground control system. Integrated circuitry refers to any technique that presents in some miniaturized form a basic building-block circuit. This application has evolved from unique circuits using standard components to preferred circuit building blocks also using standard components, and finally, to the use of solid-state integrated circuitry. This paper contains a brief analysis of the sequence. The advantages and disadvantages, as viewed by the author, of the change to integrated circuits for a given use are considered.

The system used to compare the two approaches is a solid-state computer used in ground checkout of an ICBM, and more specifically, in a time interval, phase, and period measurement system requiring digital logic. The system has been under development at Martin Company, Denver, Colorado. The particular type of integrated circuitry now being used and the possible choices for future use are compared.

(d) A Simulation — Calibration System for Space Flight, Landing and Rendezvous Control Systems, William J. Hollandswirth, Missouri Research Laboratories, Inc.

As space programs expand in the fields of highly accurate earth orbits, circumlunar and circumplanatory orbits, the requirements for very accurate determination of range and range-rate become increasingly important. With the advent of new prime equipment, there also arises the need for accurate checks on these systems prior to launch, precise calibration, and simulated missions prior to actual flight.

This paper describes in detail a system for target simulation suited to space track-

ing equipment. It has digital accuracy with analog smoothness being essentially unlimited as to maximum parameters of range and its derivatives. The system combines known digital counting techniques with a unique driver clock generator which generates, with negligible delay, both the range counting pulses and phase shifts these pulses in the rate and acceleration modes.

The entire system provides a target with a versatile capability for meeting modern space requirements.

ENGINEERING WRITING AND SPEECH

Sponsored by IRE Professional Group on Engineering Writing and Speech

Meeting Room: 9
2:30 p.m.

Chairman: A. A. Canfield,
Bendix Corporation

(a) The Conditions of Communication, Joseph D. Chapline, Philco Computer Division.

Communication presupposes at least two people: a sender and a receiver. In addition there is, of course, a mutually agreeable coding system. The conditions for communication, then, are measured by the skill of the sender with the coding system or language and on the receptivity of the receiver.

The receptivity of the human being to language is not alone a function of his understanding of the language. It is also a function of the whole psychological frame of the recipient. Reception of a message involves acceptance. Even in the Shannon theory of information, there is no information if the message is already known. Therefore, there must be a new encounter that requires assimilation and adoption if communication is to occur. Something new must be added.

In order to improve communication we must learn more about the nature of the receiver; any knowledge of his reasons for **not** understanding is helpful. An analysis of the psychological mechanism of human reception of a message constitutes a study of the conditions for communication.

(b) Reports as a Measure of Competence, Walter B. Dennen, Radio Corporation of America.

This paper will consider means by which the engineer may prepare an effective report which will reflect credit upon himself as well as upon his company. The determination of the reporting level is of primary importance in proper reporting. Such factors as contractual limits, responsiveness to all contractual requirements, a full understanding of the customer himself, and a knowledge of the various levels of reports will be discussed as the basis for selecting the report level which will provide optimum impact.

(c) Better Report Writing Pays, Robert M. Woelfle, Bendix Mishawaka Division.

This paper considers the importance of adequate engineering reports, the various types of reports that are commonly prepared, their practical use in industry and government, and general rules for simplifying the preparation of complete, concise reports.

(d) The Poor Writer, R. G. Marolf, Research Laboratories, General Motors Corporation.

RESEARCH PREVIEWS II

Meeting Room: 12
2:30 p.m.

Chairman: Donald S. Gage,
Northwestern University

National Electronics Conference is including in its 1962 program a type of session new to the Electronics field—sessions of short (10 minute) papers.

The purpose of these sessions is to include information concerning the most recent developments in industrial and university laboratories.

NEW COMPONENTS, NEW TECHNIQUES

Meeting Room: 10
2:30 p.m.

Chairman: Daniel G. Dow,
Varian Associates

(a) The Avalanche Injection Diode and Its Application as a Switch for High Frequency Signals, John R. Szedon and Angel G. Jordan, Carnegie Institute of Technology.

The avalanche injection diode (AID), proposed by J. B. Gunn, has appeared attractive for high frequency operation due to the

inherent speed of the ionization collision mechanism. Below several milliamperes, the characteristics of the device exhibits a high incremental resistance; but with larger currents, avalanche multiplication of carriers and the associated diminution of the high field region produce a current-stable negative resistance followed by a region of small positive resistance. With signals in the 250-920 mcs range, the encapsulation reaction of the devices examined forced using the change in radio-frequency resistance with bias to effect switching. Preliminary tests in the 360-900 mcs range show that switching UHF signals with AID devices is feasible. Isolations of 14 db and insertion losses of 1 db have been indicated with switching times of the order of 0.20 microsecond. Admittance data indicate that switching at higher frequencies (in the microwave range) should be possible. At these higher frequencies, the reactances of the active region of the device and the sample holder—with proper design—should permit a more efficient use of the switch.

(b) An Anti-Storage Clamp and a Method of Increasing I_p/I_v Ratio of Tunnel Diodes, W. T. Rhoades, Hughes, Aircraft Company.

A clamp circuit is described which eliminates the effects of inertial inductance and diffusion capacitance in ultra-high speed switching tunnel diodes. The operation of the clamp is explained in detail. The clamp circuit essentially consists of a backward diode to provide the clamping action, a transistor to provide a low voltage reference source, and an inductance. The inductance prevents capacitive loading of the tunnel diode, and its value is found through the use of Fourier spectrum analysis. A method of effectively increasing the tunnel diode I_p/I_v ratio to 50-to-1 or higher with the clamp is also described. Photographs and waveform traces are shown which show a significant reduction in switching time. Since the clamp does not affect normal operation of the tunnel diode, the clamp has potential uses in many applications.

(c) Design of a High Performance S-Band Varactor Frequency Multiplier, L. Kenneth Staley, The Bendix Corporation.

It is now well-established that a varactor frequency multiplier must contain idler circuits to obtain the maximum conversion efficiency when the multiplication is greater than 2. Utilizing the idler circuits as part of the impedance matching sections, a quintupler has been designed and tested which has a conversion loss of 2.8 db at an output frequency of 1825 MC.

This paper presents the design equations necessary to define the input and output impedence, varactor conversion loss (excluding circuit losses and input power expressed as a function of the varactor's Q and its reactance at the input frequency.

From the design equations it is shown that, for high Q varactors, the impedances which the varactor requires at its input and output terminals are independent of Q and a function solely of the varactor's reactance when it is adequately pumped.

Further it is shown why this same device can be operated as a tripler or quadrupler as well as a quintupler.

(d) Ceramic Bandpass Filter with Unsymmetric, Tuned Hybrid Lattice Structure, F. L. Sauerland, Clevite Corporation.

Unsymmetric hybrid-lattice bandpass filters sometimes incorporate a tuned transformer. To avoid distortion and narrowing of the passband, the transformer tuning is kept broad, resulting in a small selectivity contribution of the additional resonant circuit.

The paper describes the performance of a hybrid lattice filter with one tuned transformer as a function of the tuned-transformer parameters. The filter selectivity may be improved considerably if the transformer loaded Q is approximately equal to the inverse relative filter bandwidth. Further, by combining the tuned circuit with a lattice of unsymmetric response, the bandpass characteristic may be symmetrized.

The design has been applied to the development of a series of small, two resonator ceramic filters for transistor circuit application, with a 60/3db shape factor of 5, center frequencies of 200 to 600 kc, bandwidths of 1 to 20%, and flexible impedance transformation.

(e) A Study of Optimum Switching of On-Off Control Systems Through Logic, O. I. Elgerd, University of Florida, and L. B. Scheiber, AC Spark Plug Division, General Motors Corporation.

Boolean algebra, the mathematics of switching circuit theory, is used to develop the switching logic necessary to optimize the response of second-order, fixed-parameter, On-Off type control systems.

The output of the On-Off controller which will optimize the response of the system is shown for each region in the phase plane. The phase plane is completely described in terms of logic variables from which truth tables are constructed. Using Boolean algebra, the required switching logic equations are developed. Block diagram illustrations of the switching logic circuitry and the complete control system with detailed optimum controller are shown.

PRODUCT LISTING

The following alphabetical list of products and services has been arranged for your convenience. Exhibitors' booths are listed beneath the applicable product and service heading.

Phonographs, Pick-Ups, Record Changers, Etc.
103, 516, 520, 537, 539, 1225

Plastics
136, 142, 146, 150, 156, 200, 316, 516, 520, 537, 539, 811, 1012, 1224, 1226

Point to Point Equipment
537, 539, 726

Power Supplies
118, 120, 122, 146, 150, 415, 601, 605, 700, 705, 810, 901, 905, 906, 1007, 1015, 1025

Printed & Packaged Circuits
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Publishing-Technical, Educational
230, 337, 435, 1006, 1043, 1123, 1124, 1126, 1128, 1132, 1144, 1233, 1235

Radar Equipment
136, 537, 539, 611, 800, 1021, 1023

Radio Frequency Test Equipment
9, 10, 101, 111, 114, 116, 118, 120, 122, 126, 223, 300, 304, 330, 406, 418, 420, 421, 515, 601, 605, 706, 711, 718, 728, 730, 800, 802, 808, 901, 904, 905, 907, 1000, 1017, 1021, 1023, 1024, 1100, 1104, 1108

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Rectifiers
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Semiconductors Materials
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Semiconductors
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Hermetic Seals
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Insulating Materials
142, 156, 316, 529, 537, 539, 715, 811, 1029, 1110, 1221, 1223

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Laboratories & Custom Builders
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Lights & Displays
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Machinery
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Magnets
1, 2, 103, 408, 410, 537, 539, 601, 605, 607, 1034, 1036

Marine Equipment
136, 537, 539, 800

Metals
426, 428, 430, 432, 434, 436, 537, 539, 540, 700, 1034, 1036

Meters (Indicating Instruments)
103, 119, 300, 304, 330, 333, 406, 417, 418, 420, 516, 520, 536, 537, 539, 601, 605, 616, 627, 706, 707, 728, 730, 800, 815, 826, 901, 905, 913, 920, 923, 1001, 1009, 1011, 1019, 1021, 1023, 1024, 1101, 1113, 1225

Microminiature Devices
130, 134, 158, 162, 407, 418, 420, 516, 520, 525, 537, 539, 542, 601, 605, 607, 700, 719, 731, 819, 901, 905, 1001, 1008, 1021, 1023, 1034, 1036, 1112, 1114, 1204, 1215

Microphones & Stands
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Microwave Communications Equipment
9, 10, 126, 333, 418, 420, 429, 431, 433, 516, 520, 537, 539, 601, 605, 904, 923, 1021, 1023, 1100, 1104, 1108

Microwave & Radar Test Equipment
4, 5, 6, 7, 8, 9, 10, 101, 118, 120, 122, 126, 223, 418, 420, 516, 520, 537, 539, 601, 605, 706, 711, 800, 808, 811, 901, 904, 905, 913, 1021, 1023

Military Equipment
111, 136, 509, 537, 539, 611, 718, 800, 813, 825, 917, 1001, 1034, 1036

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Molded Products
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Monitor Equipment
300, 304, 418, 420, 425, 537, 539, 601, 605, 800, 901, 905, 911, 1007, 1017, 1028, 1114, 1231

Motors & Synchros
103, 121, 130, 134, 333, 501, 505, 507, 521, 537, 539, 611, 706, 826, 901, 905, 918, 1001, 1101, 1109, 1114

Nuclear Equipment
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Oscilloscopes
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PRODUCT LISTING

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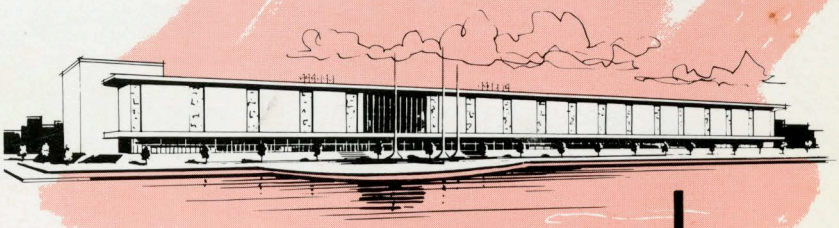

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