

EDITOR'S PROFILE of this issue

from a historical perspective ...

with Paul Wesling, SF Bay Area Council GRID editor (2004-2014)

March, 1968:

Cover: Test probes align to IC pads of an undiced device on a silicon wafer.

Page 3: Engineers are invited to travel to San Luis Obispo to attend the Poly Royale, now in its 36th year. It's a chance for their engineering departments to show off student projects and hold tours. In later years, Poly Royale expands and gets out of control, until it is finally cancelled.

Page 6: Arie (Harry) Kurtzig speaks about domain walls in orthoferrites (Bubble Memories), the topic of his Stanford PhD thesis (under advisor William Shockley). This phenomenon was developed by Andy Bobeck of Bell Labs as an analog to the recently discovered charge-coupled device (CCD) electron storage technique. Harry goes on to work at Bell Labs. I visited Bell Labs in 1970 to discuss licensing this technology for my company, Information Storage Systems (ISS), since we understood that disk drives would soon be driven out of business by this new high-speed data storage technology (but that didn't happen). We hired Harry, and he moved to the Santa Clara Valley with his wife Sandra (also a Stanford grad school alum). At a BBQ on their apartment's balcony, Gail and I discussed Sandy's hope to leave GE Timeshare and start her own company; we encouraged her. She founded ASK Computing ("ASK" stands for **Ari** and **Sandy Kurtzig**), focused on software for manufacturing management running on the HP computer. This becomes a multi-million-dollar software company, one of the first founded and run by a female entrepreneur. She is featured in a chapter in Leslie Berlin's book, "Troublemakers: Silicon Valley's Coming of Age". When their first son was born (a year to the day after our son Andrew), I told Ari that their new Andrew Paul was a nice compliment to me and my son. We went to their Andrew's first birthday party.



Archive of available SF Bay Area GRID Magazines is at this location:

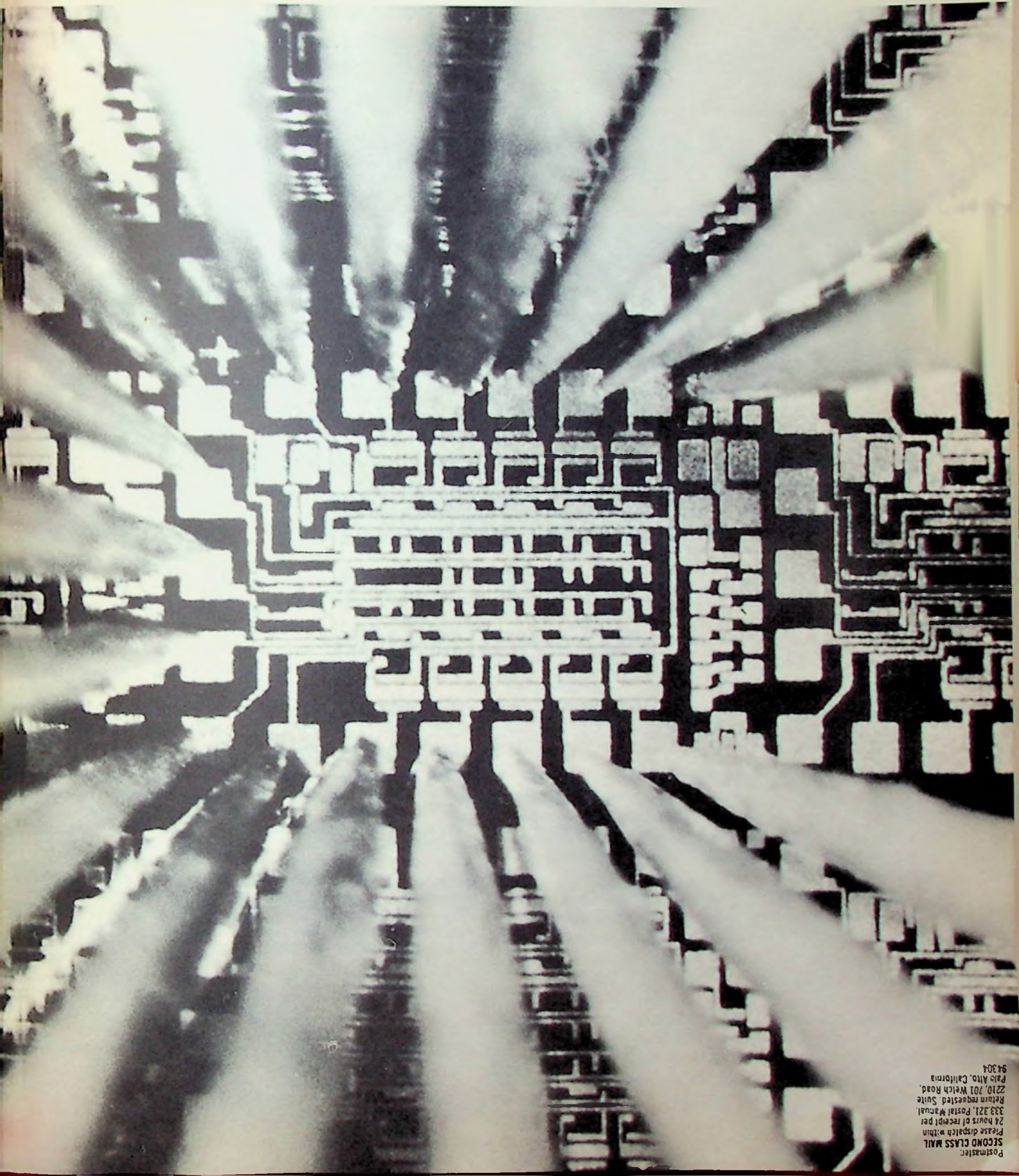
https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History

At time of scanning, the bound volumes are held by Paul Wesling. July, 2021 Contact p.wesling@ieee.org

IEEE *Grid*

SAN FRANCISCO SECTION • THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

MARCH 1968



Postmaster:
SECOND CLASS MAIL
Please dispatch within
24 hours of receipt per
333.321, Postal Manual.
Return requested. Suite
2210, 701 Welch Road,
Palo Alto, California
94304

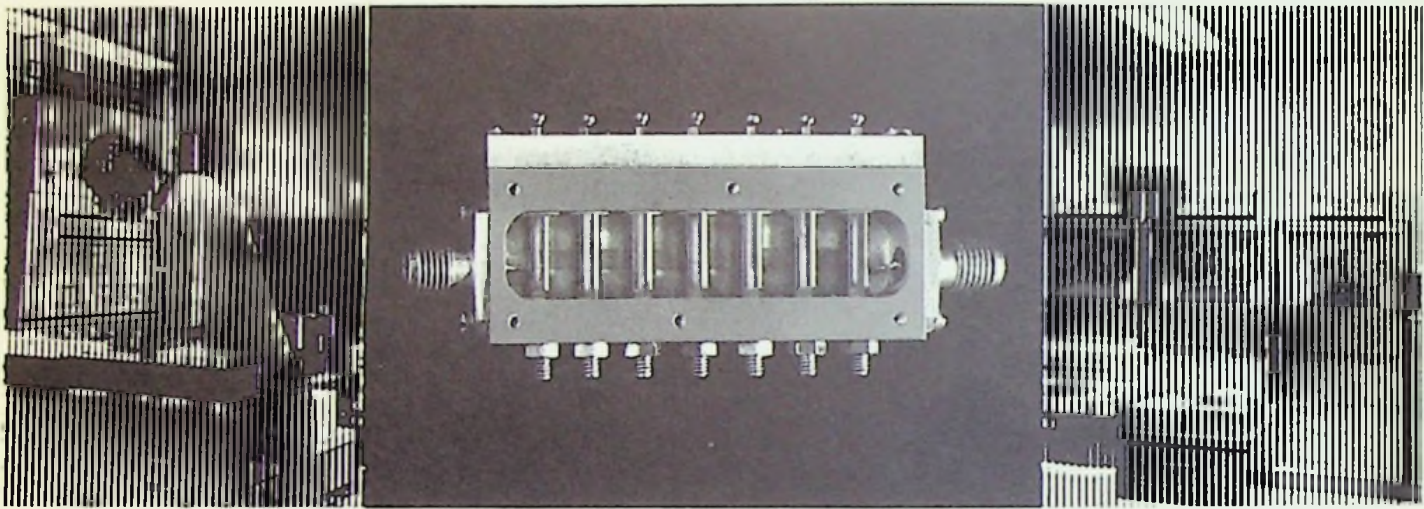
7 POLE COMB LINE FILTER 3730 - 4020

	C 0 1	C 1 2	C 2 3	C 3 4	C 4 5	C 5 6	C 6 7	C 7 8
	1.665	0.414	0.311	0.295	0.295	0.311	0.414	1.665
S/B	0.205	0.570	0.666	0.682	0.682	0.666	0.570	0.205

	C 0	C 1	C 2	C 3	C 4	C 5	C 6	C 7	C 8
	5.869	3.375	4.361	4.479	4.495	4.479	4.361	3.375	5.869
D/B	0.485	0.334	0.363	0.366	0.366	0.366	0.363	0.334	0.485

ELEMENT	LUMP CAP--PF
1	4.490040E-01
2	4.490040E-01
3	4.490040E-01
4	4.490040E-01
5	4.490040E-01
6	4.490040E-01
7	4.490040E-01

4 4 P S E N D O F J O B



The result of theory and application

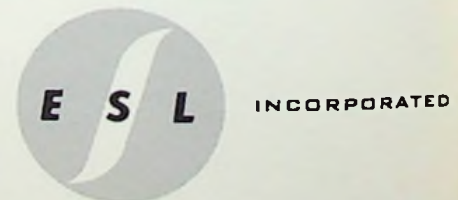
What's really worth conserving? Energy? Nature, offering no choice, insists on conserving it through numerous physical laws. With human energy, the situation is different. There is a choice, and the energy involved is time — the time of talented engineers and scientists.

For example, by choosing to provide the design engineer with modern, in-house computational support, we relieve him of six to eight hours of dull, repetitive calculation in the design of the modern microwave filter shown.* Moreover, filters like this can be realized in less than three days, as measured from determination of need to proven prototype.

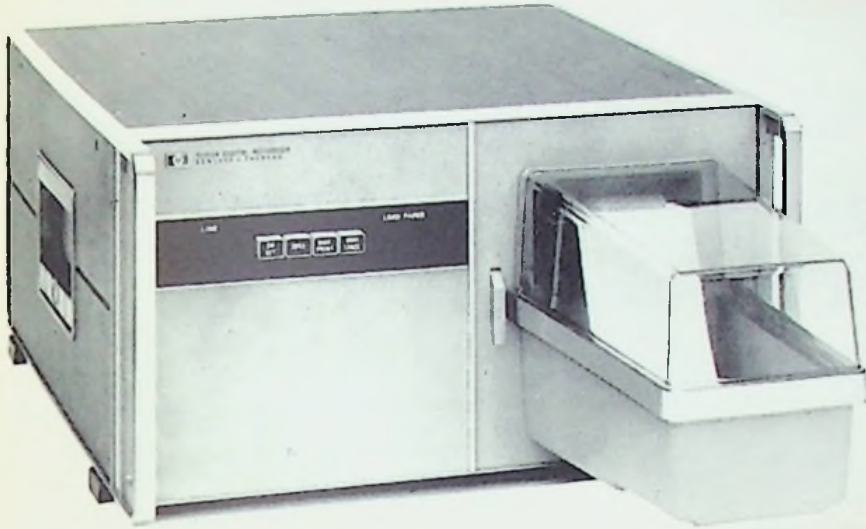
What's the design engineer doing with the time saved him? He's spending it on more stimulating technical problems, one of which concerns the next generation of microwave filters.

***Filter Description** Seven resonator comb-line filter, 0.1 db ripple design. Equal-ripple bandwidth 290 MHz centered at 3875 MHz. Passband insertion loss 0.6 db maximum. Stop-band rejection 60 db minimum 200 MHz from either pass-band edge. Volume 0.8 cu. in.; weight 1.3 oz.

Exceptional opportunities exist at ESL for Scientific Programmers, Microwave Engineers. U.S. Citizenship required. An equal opportunity employer. Direct inquiries to Electromagnetic Systems Laboratories, 495 Java Drive, Sunnyvale, California 94086, Phone (408) 734-2244.



The strong, silent one is now the faster, more compatible one.



You've heard the Hewlett-Packard 5050A Digital Recorder called the "strong, silent one." That's because of its high reliability and noise-sealing paper hopper.

Now, data storage options are available to increase the overall speed of your data system. Adding storage reduces data transfer time to less than 100 microseconds. The storage options are highly compatible with inputs from integrated circuits since inputs of less than 1.3 volts are required. You can order storage with your new 5050A, or add it to your present 5050A.

With or without a storage option, the 5050A retains all its original advantages. It accepts 4-line BCD data from one or two sources and prints 20 lines/second with rugged but

quiet operation. Photoelectric decoding eliminates rotating electrical contacts. An ink roller provides greater reliability than start-stop mechanisms common to inked ribbon systems. Pressure-sensitive paper is also optional. The 5050A can print up to 18 columns, and you don't need expensive circuit boards to change formats or codes. Here is silent, dependable, durable and highly economical printing.

Price: 5050A Digital Printer: \$1750 (plus \$35 per column for driving electronics). Option 50, storage for 20 columns, \$400; Option 51, storage for 10 columns, \$200 (when ordered with printer). Call or write 1101 Embarcadero Road, Palo Alto, California 94303, Tel. (415) 327-6500.

Brief Specifications

Print Cycle Time:
50 ms, asynchronous.

Data Transfer Time:
<0.1 ms with storage options;
50 ms without.

Reference Voltage: ± 50 V
max. with storage options;
 ± 150 V without.

Maximum Capacity: 18
columns, 16 characters each.

Data Input: Parallel entry,
BCD (1-2-2-4, 1-2-4-8 or
1-2-4-2); "1" must differ
from "0" by 1.3 V minimum
to 35 V maximum with
storage options; 4.5 V to
75 V without.

Hold-Off Signals: Both
polarities diode coupled,
simultaneously available (to
inhibit input data sources
while 5050A transfers data);
10 mA load max. ± 15 V
open circuit from 1 K source.

Print Command Required:
Positive or negative pulse.
2 to 20 V amplitude,
1 V/ μ s minimum rise time,
6 μ s or greater in width.
AC coupled; without storage,
4.5 to 20 V amplitude,
20 μ s minimum width.

HEWLETT  PACKARD

NEELY SALES REGION

electronics engineers

We are now offering you responsible assignments in a variety of nuclear research programs at our Livermore facility.

Our long-range programs include: industrial applications of nuclear explosives; radiation effects on the biosphere; development of controlled thermonuclear reactions; nuclear weapons for national defense; and reactors for power in space.

Some of the R & D projects being worked on by Electronics Engineers at LRL include:

Computer Technology

- Development of programs for computer-aided design
- Computer graphics
- Large time-shared computer systems
- Use of on-line computers in physics, chemistry and biomedical research

Systems Design and Development

- Laser systems
- Nanosecond data acquisition systems

Instrumentation

- Solid state and integrated circuit design
- Ultra-wideband oscillography
- Space research instrumentation

Nuclear Effects

- Information storage memory systems
- Detector development
- Large-scale digital and analog systems

For more information write to Mr. Dan McGee, Personnel Department.



P.O. Box 808 46-38
Livermore, California 94550

U. S. Citizenship Required

MEETING

AEROSPACE & ELECTRONIC SYSTEMS

Earth Horizon sensors. Richard Anderson, Lockheed M & S Co., Group Leader, Attitude Sensors.

March 28, Thurs. 8 PM, Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto. No dinner.

AUTOMATIC CONTROL

Story on page 6

Time-shared direct digital control and demonstration (reservations required). Dr. Gordon W. Markham, IBM

March 19, Tues. 8 PM, IBM, Monterey & Cottle Roads, San Jose. No dinner. Reservations for lecture: Dr. Robert Durbeck, 227-7100 ext. 2527 by Mar. 15.

AUTOMATIC CONTROL

Story on page 7

Considerations of computer requirements for digital control and digital filtering. Dr. Patrick E. Mantey, Systems Group, IBM Research Lab, San Jose.

April 16, Tues. 8 PM, University of Santa Clara Engineering Center, Room 551. Dinner: 6:30 Le Boeuf (old Luccas) across from the University. No reservations required. Order from menu.

CIRCUIT THEORY

Story on page 7

Modeling of integrated transistors. John G. Linvill, professor EE Dept., Stanford University.

March 13, Wed. 8 PM, Room 134 McCullough Bldg., Stanford. Dinner: 6 pm, Red Cottage, 1706 El Camino, Menlo Park. Reservations for dinner: Mrs. Stresner, 367-3112 by Mar. 12. Order from menu.

COMPUTER

Story on page 5

A building block approach to computer design. Prof. Wesley A. Clark, Jr., Washington Univ., St. Louis, Mo.

March 26, Tues. 8 PM, Room 134 McCullough Bldg., Stanford University. Dinner: 6:15 pm, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Reservations for dinner: Merrilee Ressel, 321-3300 ext. 451 by noon Mar. 25. Chef's special steak \$3.95, including tax and tip.

EAST BAY SUBSECTION

Story on page 10

Tour of General Motors Assembly Plant in Fremont

March 25, Mon. 7 PM, General Motors Assembly Division, 45500 Fremont Blvd., Fremont. No dinner. Reservations for tour: Oakland: Ruth Emerson 835-8500; San Francisco: Mary Vilter, 399-4974; San Jose: Linda Jarret: 291-4567 by Mar. 22.

ELECTROMAGNETIC COMPATIBILITY

Story on page 8

Power systems electromagnetic compatibility. William I. Emmons, supervising communications engineer, PG&E.

April 8, Mon. 8 PM, Hewlett-Packard Auditorium. Dinner: 6:00 pm, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Order from menu. Dinner reservations: A. R. Carlson, 326-7000 by noon April 8.

SCVS/SJ State College,

Engineering Career Guidance Talk, March 20

On Wednesday, March 20, 1968, the Santa Clara Valley Subsection will meet jointly with the San Jose State College Student Branch. Topic for the evening will be "Engineering Career Guidance."

Keynote talks will be given by Mr. L. G. FitzSimmons, Chief Engineer of Pacific Telephone in San Jose and by Dr. Edward W. Clemments, Director of Placement, San Jose State College. After the keynote talks, there will be an opportunity for Student Branch members and others to discuss various aspects of Engineering Careers with representatives from several industries in Santa Clara County.

The meeting will begin at 7:30 pm and will be held at the Engineering Lecture Hall, Room E-132 on the first floor of the Engineering Building at

San Jose State College. Easiest access to the meeting room is from the end of 8th Street.

Engineering students from all local universities and colleges are invited to attend, and representatives of local industries are also encouraged to attend, in order that employment opportunities can be described.

Just think . . . if it weren't for Edison, we would all be watching television by candlelight!

CALENDAR

MAGNETICS

Story on page 6

Domain walls in the orthoferrites. A. J. Kurtzig, Stanford University. Plant tour at 8:30 pm at IBM.

March 12, Tues. 7:30 PM, Auditorium Bldg. 010, IBM, Monterey & Cottle Roads, San Jose. Dinner: 6:30 pm, IBM Cafeteria. No reservations required.

NUCLEAR SCIENCE/ ENGINEERING IN MEDICINE & BIOLOGY

Biomedical application of accelerators. Dr. Cornelius Tobias, chairman, Division of Medical Physics, Donner Laboratory, Berkeley.

March 19, Tues. 8 PM, Spenger's Fish Grotto, 1919-4th St., Berkeley. Dinner: 6:45 pm — \$3.50. Dinner reservations: Dale Swadley, 837-5311 ext. 301 by Mar. 15.

POWER

Story on page 4

The impact of solid state on D-C transmission. Glenn D. Breuer, manager, high voltage D-C transmission, General Electric Co.

March 12, Tues. 7:30 PM, Engineers Club of San Francisco, Pine and Sansome Streets, San Francisco. Cocktails 5:30 pm; Dinner 6:30 pm. Dinner reservations: Engineers Club, 421-3184 by Mar. 11.

RELIABILITY

Story on page 8

Quantitative determination of self-test design for maintainability. John T. Decker, advanced development engineer, Sylvania Electronic Systems, Western Division.

March 21, Thurs. 8 PM, PH 101, Stanford University. Dinner: Stanford View Restaurant. Meet speaker at 6 pm; dinner at 6:45 pm. Order from menu. Reservations: Adeline Fako, Hal Caldwell, 966-3342, 966-3153 by Mar. 19. Choice of barbeque chicken or steak — \$3.00.

SAN FRANCISCO SECTION/SCV SUBSECTION

Story on page 3

Joint meeting. Annual Pioneers' Night. Ladies welcome. Theme: Pioneers in solid state electronics. Prof. Charles Susskind, moderator.

April 17, Wed. 8:30 PM, Crystal Room, Dinah's Shack, 4269 El Camino, Palo Alto. No host social hour 6:15 pm; smorgasbord buffet 7:30 pm. \$3.75 including tax and tip. For reservations call Section office.

SANTA CLARA VALLEY SUBSECTION

Story on page 2

Engineering career guidance/Careers in industry for engineers. L. G. Fitzsimmons, chief engineer, Pacific Telephone Co., San Jose and Dr. Edward W. Clements, Director of Placement, San Jose State College.

March 20, Wed. 7:30 PM, San Jose State College, Engineering Lecture Hall, Room E-132 on the first floor of the Engineering Building. Enter from the end of 8th Street. No dinner.

VEHICULAR TECHNOLOGY

Story on page 5

Review of FCC standards for vehicular communication. R. A. Isberg, consulting communications engineer, Berkeley.

March 18, Mon. 8 PM, Di Maggio's Restaurant, Fisherman's Wharf, San Francisco. \$4.50 incl. tax and tip. No host cocktails 6:00 pm; dinner 7:00 pm. Reservations: Joan Black, 349-3111 ext. 220 by noon Mar. 14.

Joint SF Section/SCVS Dinner Solid State Pioneers to be Honored

Theme of the joint San Francisco Section and Santa Clara Valley Subsection meeting to be held on Wednesday, April 17th, will be *Pioneers In Solid State Electronics*. We will be honoring our solid state pioneers new and old. A forum of Pioneers moderated by Professor Charles Susskind promises an interesting program.

The social hour preceding the dinner will provide the opportunity to renew old acquaintances and to reminisce. Wives are cordially invited. An added feature for the collectors in the group will be the awarding of prizes for: 1. The oldest solid state receiver shown. 2. The oldest solid state electron device.

A display of all entries will be featured during the social hour. Judges for the awards will be selected from

the pioneers on the panel and from the audience.

The joint meeting will be held on Wednesday, April 17 in the Crystal Room at Dinah's Shack in Palo Alto. There will be a no-host social hour beginning at 6:15 p.m. The smorgasbord buffet begins at 7:30 and the program at 8:30.

Reservations should be made prior to April 12. Call Section office.

On the cover

Probes test integrated circuit chip in Hewlett-Packard Frequency & Time Division's IC facility in Palo Alto, Calif. See story on page 17.

You Are Invited To Poly Royal

Each spring, California State Polytechnic College holds an event which displays the progress of the college and its students. This event is Poly Royal, which will be held on April 26 and 27 this year. The annual event is in its 36th year, and it is hoped that this will be the biggest and best yet. Last year, Poly Royal drew 60,000 visitors and an increase is expected this year.

Each of the nine departments in Cal Poly's School of Engineering displays senior thesis projects, and guided tours are held at various intervals to show our facilities and explain exhibits. Featured events include a student-built ice rink with professional figure skaters, a student designed and built monorail prototype, a variety of electronic devices, and demonstrations of aeronautical, environmental, electronic, mechanical, industrial, metallurgical, and electrical engineering interest. A new attraction this year will be a computer that "writes" songs.

IEEE
Grid

volume 14
number 7

MARCH 1968

Published monthly except July and August
by San Francisco Section,
Institute of Electrical and Electronics Engineers

EDITORIAL BOARD

J. E. Barkle, Bechtel Corp
John Damonte, LMSC
David Kirby, Hewlett-Packard Co.
Fred MacKenzie, SRI
O. O. Pederson, U. C. Berkeley

ADVERTISING MANAGER

Ernesto A. Montaño

Address all mail to

San Francisco Section Office, IEEE
Suite 2210, 701 Welch Road
Palo Alto, California 94304
Telephone (415) 327-6622
Mrs. Jean Helmke, Office Manager

1967-68 San Francisco Section Officers

Chairman: FRED J. MAC KENZIE
Vice-Chairman: J. E. BARKLE
Secretary: JOHN DAMONTE
Treasurer: DONALD O. PEDERSON
Membership Chairman: EINAR INGEBRETSEN,
LMSC, 742-0814

Members: send address change promptly to
IEEE, 345 East 47th St., New York, N.Y. 10017
(Telephone: (212) PL 2-6622)

Advertising:
E. A. Montaño, IEEE,
701 Welch Rd., Palo Alto, Calif. (415) 327-6622

Second class postage paid at Palo Alto

Typeset photographically at
ICONOTYPE in Santa Clara

Subscriptions:
\$4.00 (members), \$6.00 (others);
overseas, \$7.00 per annum

ENGINEERS and MANAGERS

B.S., M.S., Ph.D.

Urgent Requirements
by Our Clients in
Commercial Product
Areas for Experienced
Engineers to Staff
Key Positions in fields of

DATA ACQUISITION
SMALL COMPUTERS
PERIPHERAL EQUIPMT.
DISPLAY SYSTEMS
PROCESS CONTROLS
INSTRUMENTATION
MECHANISMS
FLUIDICS

for personal and
confidential referrals
to client management,
at no cost to you
please submit resume

ENGLERT and COMPANY

Management
Consultants

2555 Park Boulevard
Palo Alto, Calif.
(415) 326-7390

Power Group To Hear Breuer On New Developments In HVDC

Mr. Glenn D. Breuer, Manager of High Voltage D-C Transmission, will review recent developments in d-c valves and control, advantages of solid state apparatus and new application possibilities of HVDC at the Tuesday, March 12th meeting of the Power Chapter at the Engineers Club of San Francisco, at 7:30 pm.

While the technical feasibility of the d-c transmission was established in the early 1930's, implementation awaited the development of practical rectification equipment. To date there are at least seven d-c systems in commercial operation. Of local interest is the giant 750 KV d-c Pacific Intertie now under construction connecting the Columbia Power area to the Pacific Southwest. Mercury-arc rectifier valves have been used in all the HVDC systems to date, but many see the future belongs to solid state. New developments in the solid state art will be revealed in Mr. Breuer's talk.

Mr. Breuer is a graduate of the University of California in 1948, where he received his BS in EE and was a member of Tau Beta Pi and Eta Kappa Nu. He was first employed with the General Electric Company in the test engineering program in Pittsfield, Mass., and Schenectady, New York. Since 1950 when he joined the High Voltage Engineering Laboratory and later on the Electric Utility Engineering Operation he has held many positions dealing with AC and DC HV transmission, until last year when he was named manager of High Voltage DC Transmission Engineering in the Electric Utility Engineering Operation.

Mr. Breuer earned his masters in electrical engineering from Rensselaer Polytechnic Institute in 1954. He is also a graduate of G.E.'s Advanced Engineering Program. His IEEE activities include membership on: The Protective Devices Committee, The Trans-



mission Substation Subcommittee, the Working Group on overvoltage protection of DC systems, of which he is chairman, and two working groups on DC transmission under the Substation Committee and Transmission and Distribution Committee. Mr. Breuer has written several papers on DC Transmission subjects and serves also on CIGRE Committee No. 10 on high voltage transmission.

The session should prove to be most interesting to all and attendance is expected to continue to be good. It should be noted that there were 110 at the February meeting with a clear majority of those in attendance enjoying dinner.

Cocktails are at 5:30; dinner at 6:30; and the meeting at 7:30.

LOS ANGELES

CALIFORNIA

\$950

SINGLE

\$1150

DOUBLE



LOCATION — Unsurpassed FACILITIES — Unique

INCLUDES: FREE PARKING
(IN AND OUT PRIVILEGES)
FREE HEATED SWIMMING POOL
FREE TV

WESTWOOD MANOR HOTEL

IN THE PREFERRED L.A.
AREA, NEAR UCLA. BE-
TWEEN BEVERLY HILLS &
SANTA MONICA. 24
HOUR SWITCHBOARD —
LUXURIOUS, HOMELIKE
SINGLES, DOUBLES, AND
SUITES AT ADVERTISED
RATES — UNBELIEVE-
ABLE, BUT TRUE

WESTWOOD MANOR HOTEL
10527 Wilshire Boulevard
Los Angeles, Calif. 90024

A Building Block Approach to Computer Design

Professor Wesley A. Clark, Jr. of Washington University, St. Louis, Missouri, will discuss a building block approach to computer design at the March 26 meeting of the Computer Chapter. The speaker has been working with macromodules such as registers, adders, memories, control devices, etc. from which it is possible for the electronically naive to construct arbitrarily large and complex computers that work. Machines are assembled by plugging the modules into cells of a special frame which provides for communication between adjacent cells. Explicit data pathways and control structures are then made by plugging in standardized cables. All pieces of a system are therefore recoverable and systems can be easily reconfigured. Data modules process 12-bit word-segments: greater word lengths are obtained by interconnecting modules. Memory modules hold 4096 12-bit segments and can also be interconnected to form large arrays.

Particular attention will be given to the problem of designing control structures. The control signals for a given process are routed along the cables of a control network whose topology is isomorphic to the flow diagram representing the process. The step from conception to realization can therefore be made directly, thereby eliminating many of the most vexing design problems.

Professor Clark was educated at USC and UC Berkeley and then spent a two year period with the reactor physics group at Hartford. He joined the MIT Digital Computer Lab and then the computer division of Lincoln Lab in 1951. In his 12 years there he was an associate group leader at Lincoln Lab, staff member of the



Research Lab of Electronics and lecturer in electrical engineering. He has been at Washington University since 1963 as a research professor of computer sciences and is the director of the University Computer Systems Lab which is actively engaged in the development of macromodular systems and their application to problems in biomedical research.

Dinner will be at 6:15 at Rick's Swiss Chalet in Palo Alto, with the meeting at 8 PM in Room 134, McCullough Bldg., Stanford University.

New Procedure

To make IEEE membership more readily available to the engineering community the Board of Directors has recently approved an amendment to the Bylaws reducing the number of references required on applications for admission or transfer to Member and Senior Member grades.

For the Member grade—3 references are required of either Fellow, Senior member or Member grade.

For the Senior Member grade—3 references are required of either Fellow or Senior Member grade.

For the grade of Associate, the number of references required continues to be only one, of either Member, Senior Member or Fellow grade.

Student membership privileges are now extended to any student enrolled in an institutional course of study related to IEEE fields of interest, provided he is carrying at least 30% of a normal full-time program.

WEMA's Eighth Annual Marketing Seminar

Electronic industry executives from throughout the United States will participate in a two-day marketing conference of the Western Electronic Manufacturers Association (WEMA) in San Francisco this Spring.

WEMA's Eighth Annual Marketing Seminar is expected to attract more than 150 electronic marketing men on April 29 and 30 to the Fairmont Hotel. Theme of the seminar is "Marketing for Growth."

Vehicular Technology to Review FCC Technical Standards

Al Isberg, consulting communications engineer, will review the latest FCC Rules and Regulations affecting vehicular communication at the March 18 meeting of the Vehicular Technology group at Di Maggio's, Fisherman's Wharf, S.F.

Of particular interest are the new FCC technical standards and propagation curves for establishing Radio Common Carrier base station service contours—the area in which a service is protected from cochannel interference.

These new standards were adopted last fall and are based upon the FCC report by Roger B. Carey entitled "Technical Factors Affecting the Assignment of Facilities in the Domestic Public Land Mobile Radio Service" which also will be reviewed.

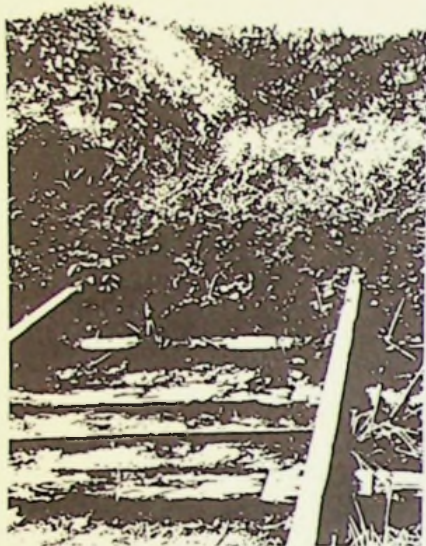
While the new rules apply to stations licensed in the Domestic Public Land Mobile Radio Service, an understanding of the new propagation curves and standards will be useful for

planning vehicular systems using frequencies between 35 and 460 mHz.

Al Isberg was formerly University wide Communications Engineer for the University of California. As a consulting communications engineer, he specializes on FCC and PUC applications and specifications for instructional, medical and business communication systems.

No-host cocktails begin at 6 p.m. Dinner is at 7, meeting at 8 p.m. See calendar for reservations.





Side-tracked?

If your career has been side-tracked then consider a switch to Memorex. Our standards are high, but so are the rewards . . . in creative freedom, salary, and opportunity. Current openings include:

PROJECT ENGINEER

(Recording) EE or Physics degree plus 5 years' experience. Must have knowledge of the processes of magnetic recording.

DEVELOPMENT ENGINEER

BSEE plus 2 years' experience with previous logic design experience preferred. Must be digital oriented.

ELECTRONIC ENGINEER

(Senior) Digital oriented with knowledge of production equipment. BSEE required with mechanical experience desired.

ELECTRONIC ENGINEER

(Solid State Circuit Design) To design solid state digital and analog circuits. BSEE with 2-5 years' experience.

Please send your resume to: Professional Employment Office, 1180 Shulman Avenue, Rm. 8 Santa Clara, California 95050. An Equal Opportunity Employer.

MEMOREX
CORPORATION

Regulation of Process Control Variables by Computer to Be Described to Automatic Controls Group, March 19

At the March 19 meeting of the Automatic Control chapter, Dr. Gordon W. Markham of the Control Systems Development Center of IBM, San Jose will give a description of a program to accomplish Time-Shared Direct Digital Control, followed by a demonstration of an IBM 1800 Control Computer controlling a small distillation column.

Present day process control computers have the capability and speed to handle the regulation of a large number of process variables such as flows, temperatures, pressures and levels with time available for various addition functions including off-line programs.

Such computers are being used in increasing numbers throughout the process industries.

In addition, a short plant tour will be conducted to view assembly and test operations associated with the 1800 Control Computer.

Dr. Gordon W. Markham is a program manager in the Control Systems Development Center. He holds a B.S. and an M.A. degree in Mechanical Sciences from the University of Cambridge, England. He received his Ph.D.

in Electrical Engineering from Yale University in 1959. He is a member of Sigma Xi, Instrument Society of America, and IEEE. Since 1960 he has worked in various process control groups in IBM Research, SDD and DP Divisions, Yorktown Heights, Camden, New Jersey, and San Jose, the joint IBM-DuPont Computer Control Project, the joint IBM-ESSO Research and Engineering Direct Digital Control Project. His present responsibilities include the IBM San Jose Pilot Plant and Direct Digital Control Programming.

The meeting will begin in room 209 in the IBM Education Center at the plant site on Monterey and Cottle Roads, San Jose at 8:00 pm. Reservations required, see calendar.

Domain Walls in the Orthoferrites Subject of Magnetics Meeting

Mr. Arjeh J. Kurtzig, Stanford University, will discuss domain walls in the orthoferrites at the March 12 meeting of the Magnetics Chapter. He will present the unusual results of work done in connection with his Ph.D. thesis. Mr. Kurtzig will describe a revolutionary magnetic technique of A. H. Bobeck, which is based on the use of domains in orthoferrites for two-dimensional shift register and logic operations. Pictures demonstrating the two-dimensional shift register operation will be shown.

In the thesis work, the simplest possible domain—wall configuration (planar, parallel, equally spaced domain walls) has been achieved. The planar walls have been controllably stretched by an applied magnetic field to increase the wall area and wall energy within the sample. The increase of wall area has been observed by the Bitter and Faraday techniques. Calculation of the work exerted by the applied and demagnetizing fields in forcing this increase of wall area has yielded an interesting new measure of domain—wall energy per unit area.

Mr. Kurtzig is a graduate of M.I.T. and expects to receive a Ph.D. degree from Stanford University on April 5, 1968. He has performed his dissertation under the direction of Dr. W. Shockley. Dr. Kurtzig is a member of Tau Beta Pi and Eta Kappa Nu. He has been an N.S.F. Graduate Fellow for three years.

Following the talk, the group will tour the IBM plant, where they will



have an opportunity to see computer equipment in various stages of assembly and checkout. Dinner will be available in the IBM Cafeteria at 6:30 pm prior to the meeting which is scheduled for 7:30 pm. The plant tour is to begin at 8:30 pm. No reservations are required.

Automatic Controls To Hear Patrick Mantey On Computer Requirements For Digital Control and Filtering

The Automatic Controls Chapter will meet on April 16 to hear Dr. Patrick E. Mantey discuss considerations of computer requirements for digital control and digital filtering.

Dr. Mantey is a member of the Systems Group of IBM Research Laboratory, San Jose. He is also a lecturer in Electrical Engineering at Stanford University where he received his Ph.D. in 1965. Prior to joining IBM in June, 1967, he was on the staff at Stanford University, where he taught graduate courses in automatic control. He also served as a consultant to Philco in problems related to the design of digital filters and special-purpose computers for space-craft applications. He is a member of IEEE and Sigma Xi, and the author of papers in the areas of sensitivity analysis and digital filtering.

The digital computer has found increasing application to problems of real-time control and filtering, for reasons of economy, flexibility and reliability. The design of digital controllers or filters may be carried out by classical methods or by the state-space methods of modern control theory. However, neither approach automatically incorporates an important aspect of digital computation: all signals, and all system parameters are represented by a finite word length—a chosen number of bits. This constraint leads to problems of round-off errors in calculations, and accuracy problems related to implementation of system parameters.

The first problem is often called quantization, and methods have been developed for determining the propagation of the effects of quantization of the input and internal states to the output. The problems related to parameter accuracies can be considered by applying techniques of sensitivity analysis. Sensitivity of system performance to parameter accuracy depends strongly on the choice of state variables implemented while preserving a given input/output relationship.

The computer requirements for a digital controller or filter are based on four factors: 1) sampling rate; 2) required storage; 3) arithmetic operations required; 4) word length required. Consideration must be given to each of these requirements in developing system realizations which reduce to computer requirements.

The meeting is called for Tuesday, April 16 at 8 pm at the University of Santa Clara Engineering Center, Room 551. Dinner is to be at 6:30 across the street at Le Boeuf (old Luccas).

Navy Contract For Applied Technology

Applied Technology, Palo Alto based division of Itek Corporation, today announced that it has been awarded a \$6,500,000 contract for electronic equipment for Navy aircraft.



Circuit Theory Chapter To Hear John Linvill on Modeling Integrated Transistors

Lumped models are presented which represent the physical processes of interest in transistors of integrated form. In particular, the processes of transport and storage of minority carriers in nonuniform regions are represented by models which utilize relative excess densities of minority carriers as the principal variables. Significant simplification results. The current transported across the section exhibits reciprocity when expressed in terms of these variables, leading to a model requiring fewer parameters. The parameters of the section are the reference currents and charges. The representation permits simple combination of storage and recombination effects on both sides of a junction into elements of the model appearing only on one side of the junction.

JOHN C. LINVILL is Head, Department of Electrical Engineering, Stanford University. He was born in Missouri in 1919. He received the A.B. in mathematics from William Jewell College, Liberty, Mo., in 1941, the B.S., M.S., and Sc.D. degrees in electrical engineering from the Massachusetts Institute of Technology, Cambridge, in 1943, 1945, and 1949, respectively.

From 1949 to 1951 he was Assistant Professor of Electrical Engineering at M.I.T. From 1951 to 1955 he was a member of the technical staff at the Bell Telephone Laboratories, Murray Hill, N.J., where he did research on transistor circuit problems in linear and pulse circuits. Since 1955 he has been with Stanford University, Stanford, California, where he is now Head of the Department of Electrical Engineering. His recent research is concerned with integrated circuits. Dr. Linvill is a member of Sigma Xi and Eta Kappa Nu, and a Fellow of IEEE.

The meeting will be held on Wednesday, March 13 at 8 pm in Room 134, McCullough Bldg. at Stanford University. Dinner is called for 6 pm at the Red Cottage. Reservations required, see calendar.



Many Nations Represented at "Engineering and Management Course"

Some 300 key managerial and engineering personnel from around the world will again participate in "Engineering and Management," University of California Extension's six-day course presenting effective ways of coordinating men, materials, machines and money, Monday, March 18, through Saturday, March 23, at UCLA.

No formal educational credits are required of the high level participants for admission to the program. Special attention will be given to the improvement of communication and to the understanding of human relationships. Concepts and techniques offered are applicable to both large and small organizations and to business, industry and government.

*You have friends
in high places*

*when you
fly United to the*

**IEEE
SHOW**

BLUE CARPET COACH

Exclusively yours on United —
coach with first class ideas.

**THE ONLY NON-STOP
TO NEWARK —**

The most convenient airport
to downtown Manhattan.

LEAVE SAN FRANCISCO
AT 8:30 AM, ARRIVE
NEWARK 4:20 PM

**WIDE SCREEN MOVIES
and STEREO
ENTERTAINMENT**

**CONVENIENT
DEPARTURES** from
San Francisco at 8:30 am,
9:00 am, 10:00 am, 12:00 noon,
3:30 pm, 10:15 pm.

"You should have seen how
I engineered this trip."

*fly
the
friendly skies
of
United.*

John Decker to Address Reliability Group On Self-Test Design For Maintainability

John Decker, who will address the Reliability chapter on March 21, is head of the Systems Availability/Maintainability section in the Reliability/Maintainability Engineering Department at the Sylvania Electronic Systems—Western Division.

He will discuss the practical aspects of using techniques such as failure modes effects/critically/probability analysis in determining and assessing self-test design requirements.

Specifically he will present the approach and analytical formats used when designing to meet quantitative malfunction detection and isolation requirements. The relationship of the self-test design requirements to flight line mean-time-to-repair (MTTR) vs. discard equipment design and identification of optimum high-reliability part selection will also be presented. Of special interest is the latter analysis of use of high-reliability parts selection as a function of cost and maintainability.

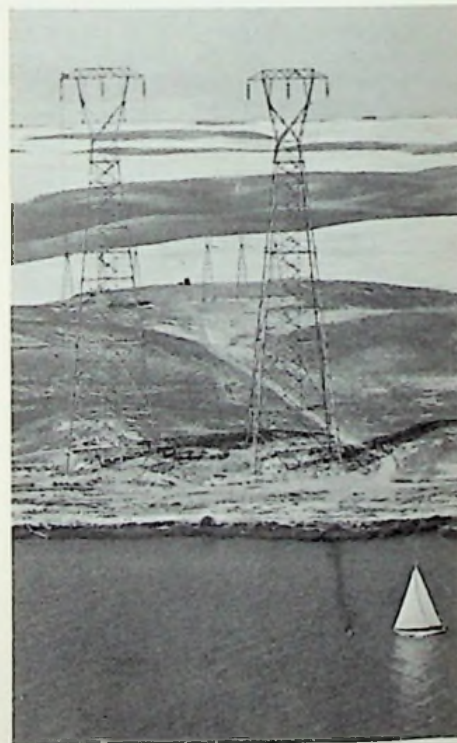
The meeting will be in Room Ph 101 at Stanford Univ. at 8 p.m. on Thursday, March 21. Meet the speaker at the Stanford View Restaurant at 6 p.m. Dinner at 6:45. Reservations required. See calendar.



Power System EMC - April 8

Representatives from the Pacific Gas and Electric Company, including William I. Emmons, Supervising Communications Engineer, will address the April 8 meeting of the Electromagnetic Compatibility Group Chapter on the subject of Power System EMC. They will present information on the newly constructed 500 kv transmission line and the peculiarities of its design with particular emphasis on minimizing the effects of electromagnetic radiation. They will also describe the work of his group in locating and identifying sources of radio interference which may arise on their lines or in customers' equipments, and in eliminating these effects. Since absorbing the work previously handled by the Radio Interference Division of the Northern California Electrical Bureau, this group has had many interesting experiences in running down noise sources. Further details of the meeting content will be included in the April issue of IEEE GRID, and in mailed announcements to EMC Group members.

Dinner is at 6:00 pm at Rick's Swiss Chalet. The meeting will be at the Hewlett-Packard Auditorium, 1501 Page Mill Road, Palo Alto, at 8:00 pm.



Sacramento river crossing

are you a capable weapon systems design engineer?



can you:

- Translate system functional requirements into subsystem/element specifications which will guide equipment designers?
- Monitor the equipment design process to assure progress toward defined system goals?
- Define and control intra-system and system/vehicle functional and physical interfaces?
- Assemble system elements into test configurations and get them into operational condition?
- Define and plan system test requirements, implementation and instrumentation?
- Conduct test programs in laboratory, test range and field environments?
- Analyze and interpret test results?

do you have:

- A broad range of technical interests?
- Above average technical knowledge and capability demonstrated by accomplishment?
- A minimum of four years of experience in weapon systems design or test?
- An accredited degree in Electrical, Mechanical or Aeronautical Engineering—or in Engineering Physics?
- U.S. citizenship?
- A need for a challenging job with commensurate prestige and salary?

If you can answer "yes" to the above questions, we sincerely believe that your long-range future is with us

HUGHES

HUGHES AIRCRAFT COMPANY
AEROSPACE DIVISIONS

We would appreciate hearing from you.
Please write:

Mr. Robert A. Martin
Head of Employment
Hughes Aerospace Divisions
11940 W. Jefferson Blvd.
Culver City, Calif. 90230

An equal opportunity employer

East Bay Subsection to Tour GM Plant

The East Bay Subsection will sponsor a tour of the General Motors Assembly Plant in Fremont on Monday, March 25. This tour is an extremely well-planned event and is a riding tour. Passengers will be transported on an elephant train through the plant. Four types of passenger vehicles and two trucks are assembled at this location and it is the largest plant of this type operated by General Motors.

Walk into the "Answer Room" of the new General Motors assembly plant here and you find people tending a battery of whirring and clicking machines, cards by the hundreds dropping into trays, a maze of wiring and scores of blinking red, white and green lights.

Channeled into this brightly-lighted area during each working day are hundreds of questions—usually in the form of figures, mathematical formulae or equations that are punched onto cards or tapes.

Electronic data processing units and related machines—61 pieces of equipment in all—turn out the answers as totals, lists, schedules, forecasts and a vast amount of other information that is used throughout the GM Fremont plant and offices.

Facts of all kinds pass through Data Processing—a carload of tires was received this morning; an employe's wife had twins last night (so change his

Income Tax Withholding exemptions); the Seattle Pontiac zone needs 114 more convertibles within 10 days, etc.

"Among the major areas in which the Data Processing facilities are particularly useful," Mr. Biggs said, "are general accounting, cost accounting, billing, purchasing, personnel (payrolls and insurance records), traffic (computation of freight and other shipping costs), material control, quality control, process engineering and specifications, car and truck scheduling, and vehicle shipment and distribution."

The tour will last one hour and will start promptly at 7 pm. Those who plan to attend should be at the main parking lot at 6:45 pm. The tour capacity is limited to 54 persons and reservations are required. Those who make reservations will be sent a map containing directions. For reservation information see meeting calendar.

January Computer Group Meeting Very Successful

The January meeting consisted of a joint meeting of the IEEE Computer Group and IEEE Instrumentation Group and was held at Stanford University, McCullough Hall on January 23 at 8:00 p.m.

Mr. Howard Zeidler, chairman of the local Computer Group, welcomed the combined groups and introduced the speaker, Dr. Kay B. Magleby, engineering manager of the Palo Alto division of Hewlett-Packard. Dr. Magleby discussed the application of on-line computers to instrumentation and data acquisition systems. Four different systems were described—logic module testing system, a computer data acquisition system, microwave network analysis and design system, and a gas chromatograph analysis system. Considerations such as instruction set, interface, and environment were covered.

The talk was interesting and informative, and featured a series of slides which pictured each of the four major systems as practical working hardware.

Well over 150 people attended the meeting.

SECOND ANNUAL IEEE COMPUTER GROUP CONFERENCE

International Hotel, Los Angeles
June 25 - 27, 1968

Maintainability Smash Hit In Boston

Maintainability and Reliability engineers were accused last week of failing to communicate properly with management and customers. The accusation was tossed out by some speakers which included a Three Star General, Lt. Gen. Bunker, Deputy Commanding General of Army Material Command during the 14th annual symposium on Reliability held at Boston.

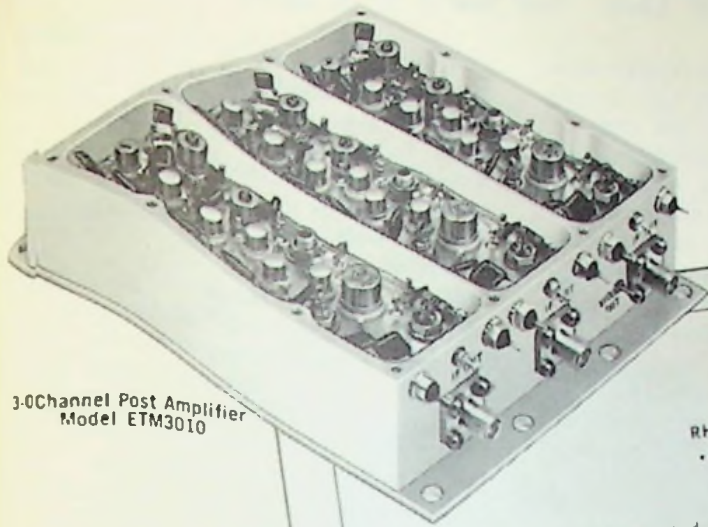
The sessions on Maintainability that were organized and chaired by Stan Houck, of Lockheed Missiles and Space Company, and the IEEE Chairman for Maintainability showed that lack of communication was not a problem with their people.

The three day symposium attracted nearly 1000 Reliability, Maintainability and other types of engineers and managers.

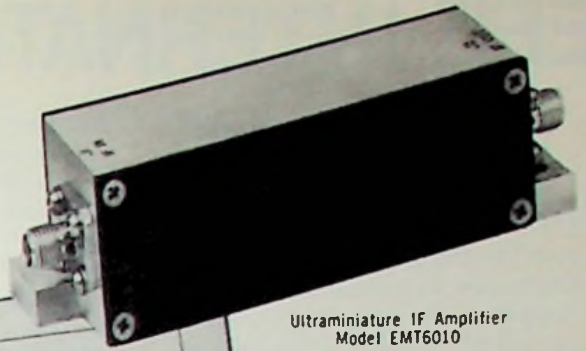
Maintainability engineering is a relatively new discipline. It addresses the characteristic of design and installation and is expressed as the probability that an item will be retained in, or restored to, a specified condition within a given period of time when the maintenance is performed in accordance with prescribed procedures and resources.



MOON INVADER! If it unexpectedly landed in your backyard you might be tempted to run to the phone and report an invasion from outer space. But this strange looking instrument, called a Lunar Surface Magnetometer is expected to be placed on the Moon by the Project Apollo astronauts before 1970. Conceived by the Space Sciences Division of Ames Research Center and designed and built by the Space & Re-entry Systems Division of Philco-Ford Corporation, Palo Alto, California, the magnetometer is a complex instrument. There are more than 4,000 separate electrical parts connected by 40,000 welds, some welds no bigger than the dot over this "i". Making final adjustments prior to shipping test models to NASA, is Clyde Ellis, Jr., project manager for the LSM program.



3-Channel Post Amplifier
Model ETM3010



Ultraminiature IF Amplifier
Model EMT6010

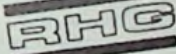
RHG SOLID STATE IF AMPLIFIERS
• RHG ELECTRONICS LABORATORY, INC. • BULLETIN NO. IFA103

RHG IF amplifiers have been industry standards for many years and offer the user quality MIL grade products at reasonable prices. A very wide selection of standard models is available from stock and is listed in this bulletin. RHG standard IF amplifiers use silicon semiconductor devices and provide high gain at center frequencies from 10 to 250 MHz. They are extremely stable and exhibit no tendency towards oscillation or regeneration. RHG solid state amplifiers will accommodate pulsed or CW signals and will perform satisfactorily over wide temperature extremes. Ultra-miniature models, high power units, and very wideband units are included in the standard line.



RHG IF AMPLIFIERS

- Featuring:
- MODEL ETM3010 — 3-Channel Post Amplifier
 - Gain Matched ± 1 db
 - Phase Matched $\pm 5^\circ$
 - (over 50 db AGC and -30 to $+70^\circ\text{C}$.)
 - MODEL EMT6010 — Ultraminiature IF Amplifier
 - Center Frequency 60 MHz
 - Bandwidth 10 MHz
 - Gain 75 db
 - Size 3 cubic inches



RHG ELECTRONICS LABORATORY, INC.

94 MILBAR BOULEVARD
FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

SEE
all solid state 2GHz
FM-TV RELAY LINK
in operation at
IEEE SHOW
Booths 3L07-3L08

RHG offers a wide selection of off-the-shelf, MIL grade, solid state IF amplifiers fully described in Bulletin IFA103. Utilizing the latest silicon semiconductors, ultra-miniature, high power, and very wideband units round out the standard line. Custom designs are also quickly and economically produced. The amplifiers accommodate pulsed and CW signals and are extremely stable. Priced from \$185.00

RHG provides the microwave engineer with a complete line of Microwave Receivers and Receiver Components (Catalog 67a), all solid state FM Microwave Relay Equipment (Catalog 67b), Mixer Preamplifiers (Bulletin MP-102), Solid State IF Amplifiers (Bulletin IFA-103), Logarithmic IF Amplifiers (Bulletin LA-101). Send for one or all of these catalogs or see EEM Section 3400 for comprehensive listing.



RHG ELECTRONICS LABORATORY, INC.

94 MILBAR BOULEVARD
FARMINGDALE, LONG ISLAND
NEW YORK 11735 (516) 694-3100

IEEE INTERNATIONAL CONVENTION

Over 50 technical sessions will cover a variety of topics

The technical program for the 1968 IEEE International Convention, sponsored by The Institute of Electrical and Electronics Engineers, Inc., has been completed. The program will consist of more than 50 technical sessions scheduled over a four-day period from March 18 through March 21. More than 200 papers are offered. All sessions will be held in New York City at both the New York Coliseum and the New York Hilton for the full four days.

Papers for the program were selected by the Technical Program Committee under the Chairmanship of Dr. E. W. Herold, RCA, Princeton, New Jersey.

The Annual IEEE International Convention and Exhibition is the world's largest technical meeting of electrical and electronics engineers. Its program consistently has drawn many thousands of engineers and scientists from throughout the world to discuss and learn about developments in the electrical and electronics field.

1968 marks the first major change in

the Convention Technical Program since its inception many years ago. Instead of an endeavor to solicit the most recent specialized developments, Sessions have now been invited which cover only the most important and the broadest topics. A particular emphasis was placed on filling the need of the average engineer to keep up with the art.

The Program Committee has organized the Sessions very carefully to meet one or more of the following three basic criteria: 1) the topics should be relatively new to the IEEE, 2) they should be interdisciplinary and extend beyond the interests of any one of the IEEE organized Groups, or 3) the subjects should be treated in tutorial or survey fashion, so as to be of value to someone not a specialist.

To reduce parallel Sessions, and to have larger meeting rooms, with better facilities, the total number of Sessions has been reduced. In the regular portion of the program, there were 80 Sessions in 1966, 72 in 1967, and this year there about 50. At the same time, many special features have been added, such

as a display-demonstration type Microwave Presentations at the Coliseum, two tutorial courses with textbooks and notes furnished to the registrants, a Workshop on presentation of papers, which includes a play, and a Film Theater with a special instructional feature of its own.

One traditional feature of past Conventions has been the Tuesday evening Highlight Session. This year, the topic selected is one of the most important in the future of electronics, namely how our industry can help to solve the world problems of depletion of resources, control of environment, and adaption to increased concentration of population. Fortunately, much of the technology developed for space exploration can be used, and this is the subject of the Tuesday night Session, "New Directions in Space."

There will be no published short abstracts of papers; in their place, there is a Convention Digest, in which the authors of papers in the regular Sessions present a much more detailed review, with pictures and figures.

ABBREVIATED SCHEDULE—A Week at a Glance

The following schedules were prepared with information on file at IEEE Headquarters as of January 2, 1968. Detailed information, including a summary of the Technical Sessions, Titles, and Authors of papers will be published in the Advance Program, which will be

available on or about February 1. In addition to the Technical Sessions and traditional Convention activities, many other meetings and events will be scheduled during the period. A schedule of these meetings will be made available at the Convention. Information on special receptions, luncheons, tours, etc., will also be publicized in the Advance Program.

MONDAY MARCH 18	Exhibition New York Coliseum 10:00 A.M. to 8:00 P.M.	Technical Sessions N.Y. Hilton 10:00 A.M. to 12:30 P.M. 2:00 P.M. to 4:30 P.M.	Tutorial Sessions N.Y. Hilton East & West Ballrooms Special Reg. 8:00 A.M. to 10:00 A.M.	Workshop: How To Present A Technical Talk N.Y. Hilton Sutton South 8:30 A.M. to 10:00 A.M. Organized by the Group on Engineering Writing & Speech	Special Microwave Presentations N.Y. Coliseum Microwave Hall (So. America Rm.) 10:30 A.M. to 5:00 P.M. Organized by the Group on Micro- wave Theory and Techniques	Film Theater* and Compressed Speech** N.Y. Coliseum United Nations Room 10:30 A.M. to 8:00 P.M. *Organized by the Group on Education **Organized by the Group on Engineering Writing & Speech	Cocktail Party N.Y. Hilton East Ballroom 5:30 P.M. to 7:30 P.M.
TUESDAY MARCH 19	↓	↓	↓	↓	↓	↓	Special Highlight Evening Symposium N.Y. Hilton Grand Ballroom 8:00 P.M.
WEDNESDAY MARCH 20	↓	↓	↓	↓	↓	↓	Convention Banquet N.Y. Hilton Grand Ballroom 7:15 P.M.
THURSDAY MARCH 21	↓	↓	↓	↓	↓	↓	↓

OTHER EVENTS—While many of these meetings are not officially connected with the Convention, they are included here should you wish to include them in your plans. The majority are by special registration or invitation and attendance is limited.

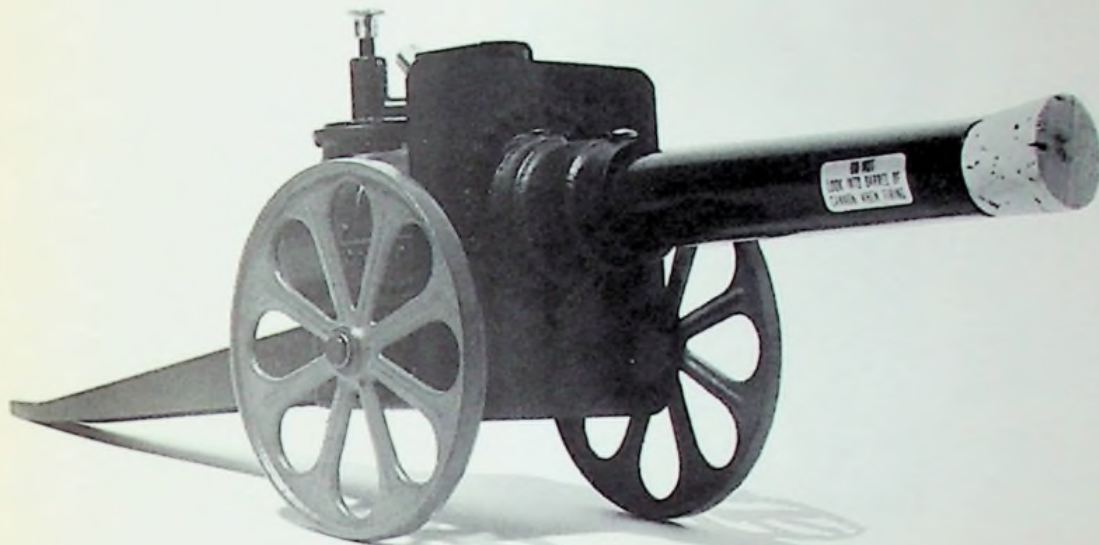
Student Convocation—March 18-21, New York Hilton Hotel. Special invitation only. **Workshop—Learning Systems**—organized by G-AC and G-SSC. Uptown Campus, City College, New York, March 22. Free bus transportation from and to New York Hilton.

Section Forum—March 18, 2:30-5:00 p.m.

Life Member Colloquium—March 20, 10:00 a.m.-12 Noon

G-AES Luncheon—Warwick Hotel—March 19, at 12 Noon. Speaker: James C. Elms, Director, NASA, ERC. Tickets \$7.50 each.

Thick Film Integrated Technology Workshop—March 22, 10:00 a.m. to 4:00 p.m., New York Hilton. Limited Advance Registration \$30. Reservations: E. Hickey, Jr., 1 Decker Square, Balacynwyd, Pa.



security systems organization

Conceive, develop, design and produce systems using electromagnetic, infrared, acoustic, seismic, optical, magnetic and other technologies to provide detection of perimeter or volume intrusions for military, government and industrial installations.

Detection and reporting movement or location of men or equipment in combat situations. Security devices and techniques to assume acoustical or visual security for rooms or buildings.

All levels of engineers are needed, BSEE required with MSEE preferred. Prefer two or more years applicable experience.

SSO Systems Engineering Analytical and experimental evaluation of new techniques and concepts/perform signal analysis, using data processing and information display techniques; translate system operational requirements into equipment specifications / write systems specifications. Plan and execute system evaluation tests.

SSO Equipment Engineering Apply various kinds of sensors to security detection systems. They will perform design, development and worst-case analysis of solid state circuitry. Will perform tests and evaluations, and will analyze test data to determine system effectiveness, sensitivity and weaknesses.

Some will be involved in design and development of solid state low power transmitters and receivers for alarm data transmission, and in design and development of the transmitter and receiver portions of low power radar equipments.

SSO Product Engineering Perform electrical and mechanical design to transform engineering models or engineering data into producible militarized products which are fully documented and which comply with specifications. Based on specifications and data from development engineers, they will redesign, package and document devices and systems for military applications. Will direct the procurement, fabrication, assembly and test of equipment which is to be delivered, insuring that it complies with specifications and engineering data.

EXPANDED FACILITIES

New facilities of our Security Systems Organization has now relocated to 475 Ellis St., Mountain View. Your inquiry should be addressed to Mr. C. M. Davis or he may be reached at (415) 966-3141. Sylvania is an equal opportunity employer.

SYLVANIA
A SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS

162 Attended Com-Tech Symposium on January 17

On January 17, the San Francisco chapter of the Communications Technology group conducted a one-day symposium on digital data communications. The symposium was held in the ballroom of the San Francisco Hilton hotel and drew a total of 162 engineers from the Bay Area and Los Angeles.

The symposium consisted of four invited papers: 1.) Techniques in High-Speed Digital Data Transmission by Adam Lender, Lenkurt Electric Co.; 2.) Adaptive Equalization by R. W. Lucky, Bell Telephone Laboratories; 3.) Convolutional Coding for Burst Channels by A. Kohlenberg, Codex Corporation; 4.) Designing Multiple Computer Communications Systems by E. T. Eisel, IBM Corporation.

January EMC Meeting On EMI Specifications Successful

The January meeting of the EMC group was addressed by Carl B. Pearlston, Jr., Staff Engineer of the Electronics Division, Aerospace Corporation, in a paper entitled "An Historical Analysis of EMI Specification Limits".

Within the past few years, there has been a great deal of activity in the generation of new interference specifications which, to a certain extent, have made a sharp break with their predecessors. This trend was started by Mil-Standard-826 in 1964 (and its subsequent revision in 1966) and by the issuance of the proposed Military Standards 461 and 462. In studying these specifications, one notices that the changes are not merely ones of organization and method of testing, but that changes have been made in the test limits themselves. Such changes in limits naturally prompt the question as to why the changes were made, which in turn, leads to the question of how the original and present interference limits were generated. Accordingly, a study was initiated to compare the various service interference limits, determine the degree of commonality between these limits, and see if a criterion of reasonableness might be established to evaluate particular interference limits.

The full text is available from the author at Aerospace Corporation, El Segundo, California.

GROUP MEMBERSHIP

IEEE Groups offer the individual member the advantages of a small society in his specialized field within the comprehensive IEEE organization. Over 30 separate groups are now available, covering practically every specialized interest within the electrical and electronics areas.

Hubert Heffner Elected To IEEE 1968 Board

Dr. Heffner was elected to the board as IEEE Director-at-large in late 1967, and assumed his duties as of January first. He is Professor of Applied Physics and Electrical Engineering, Division of Applied Physics, W. W. Hansen Laboratories, Stanford University.



His degrees were earned at Stanford as follows: B.S. Physics 1947; E.E. 1949, Ph.D. Electrical Engineering 1952. From 1952 to 1954, he was on the research staff of Bell Telephone Laboratories. 1949-51 Atomic Energy Commission Fellow, and IRE Fellow—1961.

AIAA Conference April 8-10 In San Francisco

The second AIAA Communications Satellite Systems Conference will be held at the St. Francis hotel in San Francisco on April 8-10, 1968.

The conference is supported by the San Francisco chapter on Aerospace and Electronic Systems. The chairman is Dr. Spence Spaulding, RCA, Princeton, N. J. For local information contact Steve Marx, Philco WDL, 3825 Fabian Way, Palo Alto. Ph. 326-4350 (6048).

Thomas Kailath Honored With Paper of the Year Award

Dr. Thomas Kailath, Associate Professor of Electrical Engineering at Stanford University, was presented with the Information Theory Paper of the Year award at the local Information Theory Group meeting on January 18th. Professor Kailath shared this award with Dr. Peter Schalkwijk for their paper, *A Coding Scheme for Additive Noise Channels with Feedback—Part I: No Bandwidth Constraint*, which was presented at the International Symposium on Information Theory at UCLA in 1966.



American Society For Quality Control 22nd Annual Conference May 3-5

A wide variety of equipment and services which help to control the quality of industrial products will be on display at the 22nd Annual Technical Conference and Exhibit to be held by the American Society for Quality Control May 3-5, 1968 at the Sheraton Hotel in Philadelphia.

New Book "Space-Charge Flow"

A new book on "Space-Charge Flow" (496 pp., \$22.50) published by McGraw-Hill Book Co. has been co-authored by Stanford Prof. Gordon S. Kino of the Electrical Engineering Department. His co-authors are Dr. Peter T. Kirstein of the University of London and Dr. William E. Waters of the Philco-Ford Corp.

The book presents a comprehensive summary of the most important features of the theory of electron guns and focusing systems. Prof. Kino, a specialist in plasmas and a theorist in the fields of electron and ion guns and focusing systems, is now working in the solid state field.

Northern California's finest microwave instrumentation, components and materials

COUNTIS Industries
Microwave Ferrites

FILMOHM Corporation
Microwave Resistors/Thin Film Components/Bolometers and Thermistors

GOMBOS Microwaves, Inc.
Microwave Filters/Cavity Oscillators/Waveguide Components

MICRO-POWER Inc.
Microwave Sweep Oscillators/Power Supplies for Microwave Tubes

MICRO-TEL Corporation
Wide Range Receivers/Remote Control Attenuators/Micro Signal Sources

OMNI SPECTRA Inc.
OSM® Min. Coaxial Components & Inst's./OSM® & OSSM Min. Coaxial Connectors/S.S. Oscillators

RODCO
RF Coaxial Assemblies

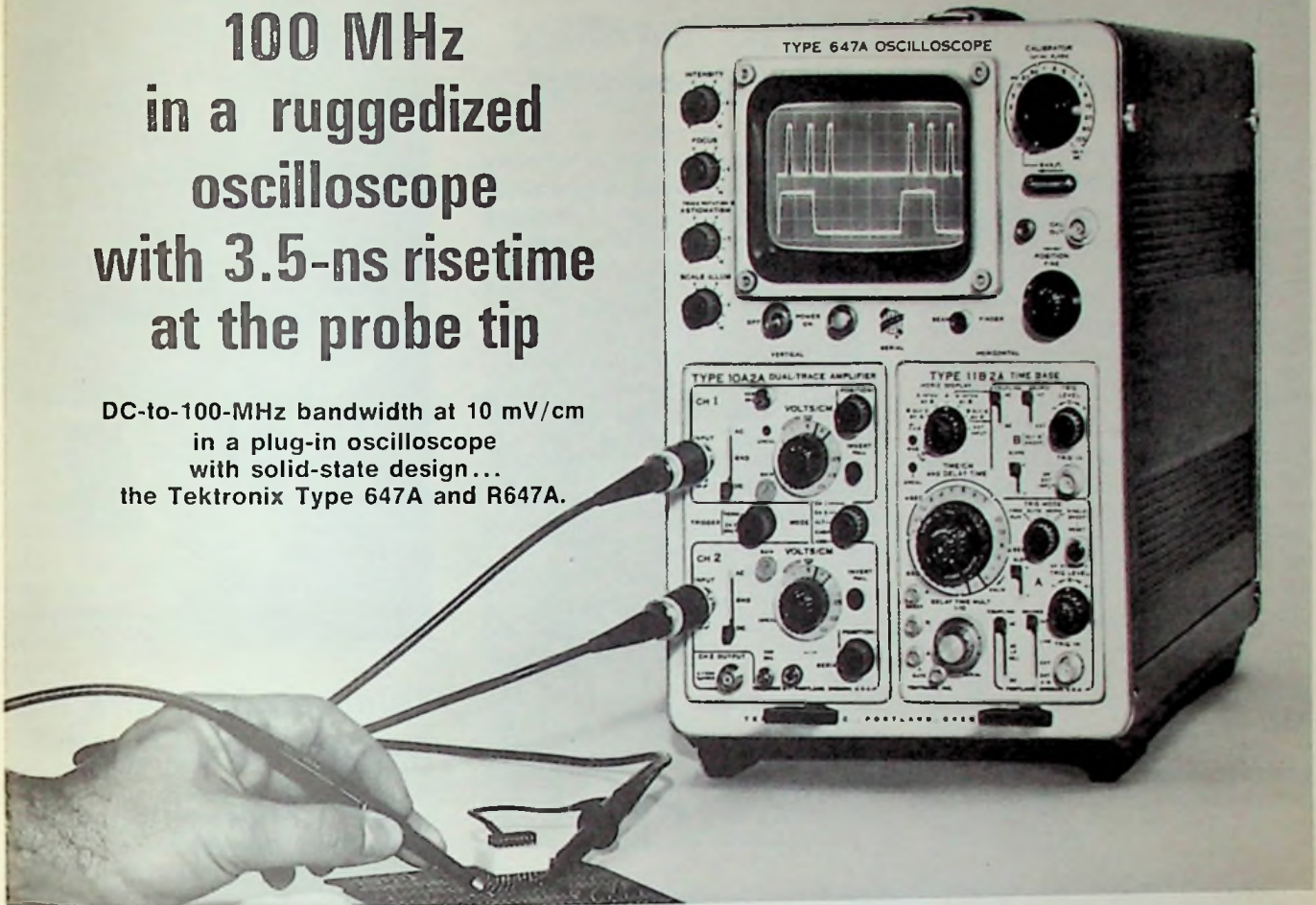
ROYAL
Microwave Devices Waveguide Switches/Waveguide Terminations/Pressure Windows

WALTRONIC Sales
Distributors for Filmohm/Omni-Spectra/Torque Controls/Uniform Tube

WALTER ASSOCIATES, Inc./P.O. Box AN/Los Altos, Calif. 94022/(415) 941-3141

100 MHz in a ruggedized oscilloscope with 3.5-ns risetime at the probe tip

DC-to-100-MHz bandwidth at 10 mV/cm
in a plug-in oscilloscope
with solid-state design...
the Tektronix Type 647A and R647A.



Type 10A2A Dual Trace Amplifier. The risetime and bandwidth are specified where you use it — at the probe tip. The vertical system performance with or without the miniature P6047 10X Attenuator Probe is DC-to-100 MHz bandwidth with 3.5-ns risetime at ambient temperatures of 0° C to +40° C (+32° F to +104° F). Bandwidth is DC-to-90 MHz with 4.1-ns risetime over its entire operating range, —30° C to +65° C. The calibrated vertical deflection range (without probe) is from 10 mV/cm to 20 V/cm.

Bright Displays. The Tektronix CRT provides bright displays with its advanced design and 14-kV accelerating potential. It has a 6-by-10 cm viewing area and a no-parallax, illuminated, internal graticule.

Type 11B2A Delayed Sweep Time Base. The Type 11B2A triggers to above 100 MHz internally and provides a calibrated delayed sweep. Calibrated sweep range is from 100 ns/cm to 5 s/cm, extending to 10 ns/cm on both normal and delayed sweeps with X10 magnification. Calibrated sweep delay is from 1 μ s to 50 s and the plug-in also provides single sweep operation.

Rugged Environmental Capabilities. These instruments are capable of accurate measurements in severe environments and offer an extra margin of dependability and even greater accuracy in normal environments. Temperature: Operating —30° C to +65° C. Non-Operating —55° C to +75° C. Shock: Non-Operating 20 G's max, 2 shocks, each direction, along each of the 3 major axes. Vibration: Operating or Non-Operating 0.025" p-to-p, 10-55-10 Hz, (4 G's) 1 min cycles, 15 min each major axis. Humidity: Non-Operating meets MIL-STD-202B, Method 106A, except freezing and vibration, through 5 cycles (120 hours). Altitude: Operating 15,000 ft. Non-Operating 50,000 ft.

Type R647A Rack Mount. The same DC-to-100 MHz performance also is available in a 7-inch-high rack mount oscilloscope, the Type R647A. Additional plug-ins include the Type 10A1 Differential Amplifier and the Type 11B1 Time Base.

Type 647A Oscilloscope (includes 2-P6047 Probes)	\$1550
Type R647A Oscilloscope (includes 2-P6047 Probes)	\$1675
Type 11B2A Time Base	\$ 885
Type 10A2A Dual Trace Amplifier	\$ 805

U. S. Sales Prices FOB Beaverton, Oregon

For a demonstration, contact your nearby Tektronix field engineer or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.



Tektronix, Inc. SAN FRANCISCO FIELD OFFICES

1709 MT. DIABLO BLVD. • WALNUT CREEK, CALIFORNIA 94596 • Phone: 935-6101
FROM OAKLAND, BERKELEY, RICHMOND, ALBANY AND SAN LEANDRO: 254-5353
3750 FABIAN WAY • PALO ALTO, CALIFORNIA 94303 • Phone: 326-8500

World Experts To Probe Progress And Future Of Transportation In April IEEE Proceedings

Over thirty transportation experts from throughout the world are contributing specially prepared articles on the current status and future needs in land, sea, and air transportation for the April 1968 issue of the *Proceedings of the IEEE*.

This special issue on transportation will emphasize the overall systems approach to this important and burgeoning socio-technical problem rather than just the narrower electrical engineering approach.

The issue will be divided into three parts. The first part will delve into the socio-political-economic treatment of present and projected transportation needs. Articles are included on society in the year 2000, on the megalopolis, on national transportation goals, and on studies now in progress of the Great Lakes and San Francisco Bay areas.

The second part will be concerned with the systems engineering aspects of transportation. Some of the subjects covered are propulsion, suspension and guideways, communications and control, tomorrow's sea transportation,

traffic flow theory, and automated ground transportation systems.

The third part of the issue will describe a variety of specific transportation subsystems and components. Among the many subjects treated are air and highway traffic control, the SST and VTOL concepts, containerized ships, computerized lofting, the Tokaido Line, the Bertin Aerotrain, surface-effect ships, and off-highway vehicles.

Copies of this issue of the *Proceedings of the IEEE* may be ordered from the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, N.Y. 10017. The price per copy is \$2.00 for members of the Institute and \$4.00 for non-members (add 50c outside U.S. and Canada). Receipt of an order by March 15, 1968, will ensure that a copy can be supplied.



Teletype Network for Mathematics Drill

Major expansion of the teletype network which provides mathematics drill and practice from a Stanford computer to schools in the Eastern and Southern U.S. is well under way.

Starting this week, 30 teletype machines went into operation at Breckenridge School, Morehead State College, Kentucky.

Second through sixth graders at Breckenridge, which is the demonstration school at Morehead State College, will practice daily at the machines.

Their practice began last spring when 26 machines were placed in operation. The machines are "multiplexed" into two PDP-8 table-top computers, one at Morehead, the other at Stanford's Computation Center. These in turn are linked to the main control, a PDP-1 computer at Stanford's Institute for the Study of Mathematics in the Social Sciences (IMSSS) directed by Dr. Patrick Suppes, pioneer in the field of computer-assisted instruction (CAI).

The larger network was an outgrowth of a smaller one established about four years ago among various Peninsula school districts. In the past year, this local network had increased to 29 terminals: Redwood City, 7; Cupertino, 4; Menlo Park, 4; Palo Alto, 11; East Palo Alto, 1; and San Jose, 2.

The most recent addition is at a Job Corps school in Clinton, Iowa. It is estimated by Dr. Suppes that 3,000 youngsters have been given more than 100,000 lessons within the past year.



LOST YOUR FIRE?

When was the last time you were offered a real challenge? Solved a problem your own way, got a raise or even a pat on the back, or had the satisfaction of seeing your own ideas put into practice?

If you are looking for these things in a professional environment...we ought to talk. Wouldn't you say?

SYSTEMS ENGINEERING. Military data systems and communications systems. BS or MS, 4-7 years experience.

TECHNICAL LEADER. Microelectronics applied research in metallurgical and physical problems of the design and fabrication of multiple circuit monolithic chip systems. MSME or Physics.

LOGIC DESIGN. Digital display and information processing equipment; BSEE; 4-5 years experience.

OPERATIONS RESEARCH. Studies of communications and control systems, war gaming, systems modeling. BS degree plus 5-15 years experience.

SOFTWARE DEVELOPMENT. To develop complex programming systems & systems analysis. Machine language, FAP and MAP. 1-3 years experience.

ANTENNA & MICROWAVE ENGINEER. To develop sophisticated microwave and antenna hardware. 2-5 years experience.

LEADER-DISPLAY SYSTEMS. To lead digital computer driven display system applications efforts. 5-10 years experience.

MATERIAL & PROCESS ENGINEER. To assist design engineers in selection of materials and processing. 1-4 years experience.

Call or write Thomas Householder, DI 6-6000, Ext. 251



THE BUNKER-RAMO CORPORATION

DEFENSE SYSTEMS DIVISION

8433 FALLBROOK AVENUE • CANOGA PARK, CALIF. 91304

An Equal Opportunity Employer

Implementing Integrated Circuits in HP Instrumentation

The development of integrated circuits (ICs) represents a technological advance of far-reaching impact to electronics.

ICs are complete electrical circuits on thin silicon "chips" about 1/16-inch square, miniaturized versions of circuitry that previously required many individual components. Use of ICs often enables engineers to design instruments and systems that provide greater reliability, economy, versatility and compactness.

To maintain Hewlett-Packard's high standards of quality and performance, and to retain circuit design flexibility, the company chooses to make many of the ICs it uses.

The key operation involves an automatic step-and-repeat camera designed and built by HP. The camera, which uses a laser beam for positioning to an accuracy of 12-millionths of an inch, makes final reductions of photomasks used in integrated circuit manufacture.

IC Technology

In setting up the IC technology, care was taken to rely on established processes with a known history of reproducibility and reliability. The logical choice in this respect was oxide-passivated silicon monolithic bipolar IC technology. This technology gives the instrument designer wide latitude as to circuit power, speed and function. Also, established techniques were used for packaging, such as TO-5 metal cans and dual in-line plastic packages.

Developmental circuits as well as production circuits are produced in the regular production manner, making turn-around time for the circuit short and unit cost of the first circuits not much above that of subsequent batches. In addition, developmental circuits may be expected to have the same reliability as production circuits.

Designer Transition

One of the most difficult steps for the designer making the transition from designing with discrete components to designing ICs has been found to occur after he has a working breadboard of his desired circuit, and is ready to venture into the technology associated with making ICs. Up to this point the steps and design methods have been relatively familiar. At this point, however, the designer is faced with an unfamiliar array of materials, processes and devices. He must learn a new set of rules and techniques before he can translate his breadboard circuit into a usable set of IC mask drawings.

This post-breadboard stage is the point at which the IC staff may render

some of its most valuable services, both as to technology and in generating confidence in the designer to continue.

Other Problems

It is important that the IC designer be aware of the numerous parasitics possible in a complex IC. Circuits have consisted of up to 100 components, and the interactions can be many. The problems of parasitic capacitance, inductance and resistance are usually well understood, but unwanted diode and transistor effects may be overlooked.

On the other hand it has been found that the designer has relatively little difficulty in devising his circuits so that they comply with the basic restrictions imposed by IC technology. Designers have not, for example, found difficulty in designing with a limited range of components or in adapting these designs to the wider parameter tolerances. In other instances more radical changes in philosophy are involved such that many transistors may be used to avoid a single capacitor or that the cost of any component is ultimately determined by the space it occupies on the silicon wafer. However, once he understands these new rules, the designer may have considerably more flexibility in his approach to the circuit design than before.

In some critical areas the circuit designer has had no choice but to rely

on the experienced IC staff. Such factors as optimum chip size, component geometry and diffusion parameters for the best compromise between performance and yield have to be constantly re-evaluated against changes in the rapidly-expanding technology, and made known to the circuit designers.

Help Anyone?

CAMPOLINDO HIGH SCHOOL
300 Moraga Road, Moraga, Calif.

October 5, 1967

Dear Sirs:

I am a physics instructor, some of whose students want to build a functioning laser. We have very little money, but lots of enthusiasm and know how. With a similar group of students the research in Physical Status Solidi was performed. Naturally, all work would be performed under my direct control and supervision.

If you have any obsolete, incomplete, left over, or unwanted lasers that you could donate to our class, we would really appreciate and use them.

Sincerely,

Tony deBellis



Electronics Engineers

Lockheed Missiles & Space Company is one of the largest electronics firms in the San Francisco bay area. Openings exist in a broad range of specialties and skills. Lockheed, in Sunnyvale, is deeply involved in many exciting, long-range programs in space, on land, and undersea. Such programs as Poseidon, Agena, Polaris, Deep Submergence Rescue Vehicle and advanced land vehicle systems; requiring people in all disciplines, at all levels. And, never before have benefits been more attractive. For more complete information, you are invited to write Mr. R. C. Birdsall, Professional Employment Manager, Post Office Box 504, Sunnyvale, California 94088. **LOCKHEED** MISSILES & SPACE COMPANY
A GROUP DIVISION OF LOCKHEED AIRCRAFT CORPORATION
Lockheed is an equal opportunity employer.

WESCON Packaging Symposium Call For Papers

There has been an official call for papers for the IEC Packaging Symposium to be presented by WESCON in Los Angeles Monday and Tuesday, August 19 and 20, 1968. Abstracts of from 200 to 500 words are invited for submission.

Full papers will be invited on the basis of judgment of abstracts by the Papers Selection Committee.

Papers covering a wide range of specialties within the electronic packaging field are sought. Suggested areas of interest are:

Advanced and micro interconnection systems; LSI/Hybrid—first and second level packaging; Computer-aided design—photo master to documentation and check-out; Thermal and vibration studies—considerations and actual; Semi-automated and automated tooling for packaging; Systems packaging concepts (total concept); New materials/concepts/processes; Unique packaging applications—space, under water, power supplies.

Deadline for abstracts is March 15.

Abstracts are to be mailed to: Papers Selection Committee, c/o WESCON, 3600 Wilshire Boulevard, Los Angeles, California 90005.

WEMA Spring Marketing Seminar April 29-30

Electronic industry executives from throughout the United States will participate in a two-day marketing conference of the Western Electronic Manufacturers Association (WEMA) in San Francisco April 29 and 30.

WEMA's Eighth Annual Marketing Seminar is expected to attract more than 150 electronic marketing men to the Fairmont Hotel. Theme of the seminar is "Marketing for Growth."

ENGINEER AT TOP OF WAGE SCALE, SURVEY INDICATES

Starting salaries for engineers are on the average \$100 a month higher than for holders of bachelor's degrees in the social sciences and humanities, a survey of 1967 UCLA graduates shows.

The average engineer with a brand new bachelor of science degree drew an initial monthly pay check of \$735, up 5% from last year. Median salaries for holders of degrees in the physical and life sciences and in mathematics were only slightly less.

Kaisel, Dyke named to WEEF posts

Stanley F. Kaisel, president of the Microwave Division of Teledyne, Inc., and IEEE Sixth Region Director, has been named chairman of the board of trustees of the Western Electronic Education Fund (WEEF).



Stanley F. Kaisel

W. P. Dyke, president, Field Emission Corporation, McMinnville, Ore., was appointed to the board, succeeding Howard Vollum, president of Tektronix, Beaverton, Ore., who has completed his four-year turn as a WEEF trustee.


Other WEEF trustees are Burgess Dempster, Electronic Engineering, Santa Ana, Calif., and R. C. Mercure, Ball Brothers Research, Boulder, Colo.



NEW YORK IS A TWA CITY!

Daily non-stops between San Francisco and New York at 9 am, 10 am, 12 noon, 1 pm and 10:40 pm.
Your choice of five entrees individually cooked in our "crazy little ovens".
Wide screen color movies and eight channels of stereo entertainment.
No other airline pampers you the way TWA does!

So make your reservations for the IEEE Show by calling
TWA's "Convention-Air" desk at 626-2410.
Or call your travel agent.

up up and away 

Manufacturer / Representative Index

3-D Data Systems	W. K. Geist Co.	IKL, Inc.	Components Sales Calif.
3-D Systems, Inc.	Frauman Associates	Inland Testing Laboratories	W. K. Geist Co.
3-Electronics	W. K. Geist Co.	Instrumentation Technology Corporation	Components Sales Calif.
3-Systems Company	W. K. Geist Co.	Intercontinental Instruments Inc.	T. Louis Snitzer
3-Field Dynamics, Inc.	J. D. Kennedy Co.	Keppo, Inc.	V. T. Rupp Co.
3-Field Microwave Laboratories	Jay Stone	Krohn-Hite Corporation	L & M Engineering, Inc.
3-Field Laboratories, Inc.	T. Louis Snitzer Co.	Logic Systems, Inc.	W. K. Geist Co.
3-Field Electric Co.	Abbott Engineering Co.	The London Company	W. K. Geist Co.
3-Field Electronics Corp.	O'Halloran Assoc.	McLean Engineering Labs	T. Louis Snitzer Co.
3-Field Information Tech.	T. Louis Snitzer Co.	Micro Instrument Co.	Jay Stone & Assoc.
3-Field Corporation	Jay Stone & Assoc.	Micro-Power Inc.	Walter Associates
3-Field Electronics Corp.	V. T. Rupp Co.	Micro-Tel Corp.	Walter Associates
3-Field Electronics		Microlab-FXR Div. of Microlab	L & M Engineering
3-Field Instruments	T. Louis Snitzer Co.	Microwave Electronics Corp.	Jay Stone & Assoc.
3-Field Electrical Products Corp.	Abbott Engineering Co.	Millitest Corp.	Bill Coe & Assoc.
3-Field Electronics Div.		Narda Microwave Corp.	O'Halloran Assoc.
3-Field Industries, Inc.	Abbott Engineering Co.	NH Research, Inc.	W. K. Geist Co.
3-Field Instruments	V. T. Rupp Co.	Norelco/Philips Electronic Instruments	V. T. Rupp Co.
3-Field Instruments Corp.	Bill Coe & Assoc.	Nuclear Corporation of America	Jay Stone & Assoc.
3-Field Labs	V. T. Rupp Co.	Omni Spectra Inc.	Walter Associates
3-Field Test Corporation	King Engineering	Optical Electronics, Inc.	W. K. Geist Co.
3-Field Industries	Walter Associates	Optimax Corp.	W. K. Geist Co.
3-Field Materials, Inc.	Jay Stone & Assoc.	Ostronics, Inc.	W. K. Geist Co.
3-Field Electronics, Inc.	Data Associates	PRD Electronics	T. Louis Snitzer Co.
3-Field Technology Corp.	T. Louis Snitzer Co.	Peninsula Microwave Labs, Inc.	Jay Stone & Assoc.
3-Field, Inc.	Jay Stone & Associates	Polarad Electronic Instruments	T. Louis Snitzer
3-Field Recorders, Inc.	Components Sales Calif.	Precision Mechanisms Corp.	Components Sales
3-Field, Inc.	L & M Engineering, Inc.	Princeton Applied Research	O'Halloran Assoc.
3-Field Electronics Corp.	Components Sales Calif.	Quan-Tech Labs	Jay Stone & Assoc.
3-Field Scientific	Jay Stone & Associates	Rayonic Corporation	Abbott Engineering Co.
3-Field System Electronics Corp.	King Engineering	Rodda Company	Walter Associates
3-D RP.	W. K. Geist Co.	Royal Microwave Devices	Walter Associates
3-D Laboratories	L & M Engineering, Inc.	Roytron Division, Litton Indus.	Costello
3-D Electronics	T. Louis Snitzer Co.	Russell & Stoll Products	Far West Industrial Sales
3-D Associates, Inc.	O'Halloran Assoc.	Scott, Inc., H. H.	W. K. Geist Co.
3-D Electronic Engineering Co.	Data Associates	Sierra Electronic Div., Philco	T. Louis Snitzer Co.
3-D Products Labs, Inc.	King Engineering	Taylor-made Laboratories	Data Associates
3-D Corp.	V. T. Rupp Co.	Telonic Instruments & Eng.	T. Louis Snitzer Co.
3-D, Inc.	V. T. Rupp Co.	Test Equipment Corp.	W. K. Geist Co.
3-D Borg-Warner Corp.	T. Louis Snitzer Co.	TRF, Inc.	W. K. Geist Co.
3-D GEACOM Div., Whittaker Corp.	O'Halloran Assoc.	TRW Instruments	V. T. Rupp Co.
3-D Laboratory, Inc.	W. K. Geist Co.	Wagner Digital Electronics	W. K. Geist Co.
3-D M. Engineering	Jay Stone & Assoc.	Waltronic Sales	Walter Associates
3-D Products	Far West Industrial Sales	Watkins-Johnson Co.	L & M Engineering
3-D Corp.	Walter Associates	Waveforms, Inc.	W. K. Geist Co.
3-D Systems, Inc.	King Engineering	Wayne Kerr Corporation	W. K. Geist Co.
3-D Mfg. & Rsch. Corp.	W. K. Geist Co.	Waysch Engineering, Inc.	Jay Stone & Assoc.
3-D Microwave	Walter Assoc.	Wiltron Co.	O'Halloran Assoc.
3-D Instruments	T. Louis Snitzer Co.		
3-D Standards, Inc.	T. Louis Snitzer Co.		
3-D Instrument			
3-D Bausch & Lomb	V. T. Rupp Co.		

We did it ... we're sorry!

In the February issue, Grid stated incorrectly that Jeremy K. Schloss was a nominee for Section/WESCON Director. This should have read Director-at-large. Jeremy K. Schloss has been nominated to replace Professor Hopkin whose term expires June 30, 1968.



Jeremy K. Schloss



A. W. Hopkin



John C. Beckett



E. W. Pappenfus

John C. Beckett, Hewlett-Packard Co., and E. W. Pappenfus, Granger Associates, are present Section/WESCON Directors. Professor A. W. Hopkin, University of California at Berkeley, is at present Director-at-large.

Representative Directory

Abbott Engineering Co. 22600 El Camino Real Palo Alto; 327-0830	O'Halloran Associates 3921 E. Bayshore, Palo Alto; 326-1493	Willard Nott & Co. 1485 Bayshore Blvd. San Francisco; 587-2091
Bill Coe & Assoc. P.O. Box 1383 San Carlos; 593-6057	Rupp Co., V. T. 1182 Los Altos Avenue, Los Altos; 948-1483	Snitzer Co., T. Louis 1020 Corporation Way, Palo Alto; 968-8304
Components Sales California 23580 Fabian Way Palo Alto; 326-5317	King Engineering Co., Inc. 525 Grant Street San Mateo; 342-9645	Stone & Assoc., Jay 140 Main Street, Los Altos; 948-4563
Far West Industrial Sales P.O. Box 11134 Palo Alto; 321-3943	L & M Engineering 2620 The Alameda Santa Clara; 243-6661	Geist Co., W. K. Box 746, Cupertino; 968-1608, 253-5433
	Walter Associates 175 S. San Antonio Road, P.O. Box AN Los Altos; 941-3141	

WESGO

Your local
manufacturer
of
**GOLD, SILVER,
PLATINUM**
and alloys thereof
IN ALL FORMS

ALUMINA CERAMICS

rapid delivery in
prototype quantities

BRAZING ALLOYS

For service call
593-3121

WESTERN GOLD & PLATINUM

Belmont, California

**ELECTRONICS TRANSFORMERS
STANDARDS PUBLICATIONS
NOW AVAILABLE**
from
**THE INSTITUTE
OF ELECTRICAL
AND ELECTRONICS
ENGINEERS, INC.**
345 East 47 Street
New York, N.Y. 10017

Standard for Low Power Wide-Band Transformers, I.E.E.E. No. 111, August 1964 -Price, Non-Members \$3.00, Members \$1.50.

Proposed Standard for High Power Wide-Band Transformers, I.E.E.E. No. 264, December 1965 -Price, Non-Members \$3.00, Members \$1.50.

Proposed Test Procedure for the Evaluation of Insulating Systems for Electronics Power Transformers, I.E.E.E. No. 266, May 1966 -Price, Non-Members \$3.00, Members \$1.50.

Proposed Standard Letter and Graphic Symbols for Electronics Transformers, I.E.E.E. No. 276, January 1967 -Price, Non-Members \$4.00, Members \$2.00.

Proposed Standard for Computer Type (Square Loop) Pulse Transformers, I.E.E.E. No. 272, February 1967 -Price, Non-Members \$4.00, Members \$2.00.

I.E.E.E. Transformer and Inductor Bibliography, Publication No. 21 S 89, June 1967 -Price, Non-Members \$6.00, Members \$3.00.

**SCIENTIFIC INSTRUMENTS
DEPARTMENT OF
EAI**

**Electronic Engineering
Group Supervisor
Senior Electronic Design
Engineers
Senior Project Engineers**

Join a group involved in commercial development of analytic instruments. We have a small company atmosphere with large company stature.

Excellent opportunities for superior technical personnel to work with a fast growing scientific instrument activity. Positions available require BSEE, MSEE or Ph.D., with experience in the design and development of analytic instruments including mass spectrometers and/or design of solid state circuits, RF circuits and ion optic systems. Salary is commensurate with experience and capability.

Send your resume in confidence to, or call, Mrs. P. Barringer to arrange an interview.

ELECTRONIC ASSOCIATES, INC.
Scientific Instruments
4151 Middlefield Road
Palo Alto, California 94303
(415) 321-7801

**New Exhibit Building In Los Angeles
(For WESCON in '70?)**

The final leases and contracts have been signed by the City of Los Angeles and the Exhibition Authority Commission for the immediate construction of a new Auditorium and Convention Center. To be located at the northeast intersection of the Harbor and Santa Monica Freeways in downtown Los Angeles, the building will be situated on a 31.5 acre site which is less than a mile from the major downtown hotels. It will have a total exhibit space of about 250,000 square feet. Sixteen meeting rooms on the second floor will accommodate from 50 to 1600 at one time.

Membership

The San Francisco Section welcomes the following new members:

<i>J. C. Alden</i>	<i>K. T. Matsuoka</i>
<i>T. A. Barrett</i>	<i>R. B. McPherson</i>
<i>G. H. Blomgren</i>	<i>D. B. Mitchell</i>
<i>K. W. Cocksedge</i>	<i>J. R. Morrison</i>
<i>T. F. Curry</i>	<i>P. M. Oliver</i>
<i>J. L. Fickes</i>	<i>K. Patel</i>
<i>P. E. Galonis</i>	<i>D. R. Reddy</i>
<i>W. Gourlay, Jr.</i>	<i>B. H. Schleifer</i>
<i>P. Jirasook</i>	<i>L. C. Smits</i>
<i>M. H. Kim</i>	<i>P. A. Szege</i>
<i>R. D. Lee</i>	<i>L. C. Wang</i>
<i>R. A. Wilson, Jr.</i>	

The San Francisco Section congratulates these members recently advanced to the grade of Senior Member.

C. G. Griffith *G. T. Longerbeam*

ADVERTISER/AGENCY INDEX

Applied Technology, Inc.	Inside Back Cover
(John Nelson Agency)	
Bel Air Sands Motor Hotel	20
Bunker-Ramo Corporation	16
(Diener & Dorskind Inc.)	
ESL Inc.	Inside Front Cover
(Sobel Advertising)	
Electronic Associates Inc.	20
Englert and Company	4
Hughes Aircraft Co.	9
(Foote, Cone & Belding)	
Lawrence Radiation Laboratory	2
(Hal Lawrence Inc.)	
Lockheed Missiles & Space Co.	17
(McCann-Erickson, Inc.)	
Memorex Corporation	6
(Hal Lawrence Inc.)	
Neely Sales Div. HP Co.	1
(Lennen & Newell, Inc.)	
RHG Electronics Laboratory	11
(Samuel H. Goldstein)	
Sylvania	13
(Hal Lawrence Inc.)	
Tektronix, Inc.	15
(Hugh Dwight Advertising)	
Trans World Airlines	18
United Air Lines	8
Walter Associates	14
(Stadler/Cowman Advertising)	
Wanlass Electric Co.	Back Cover
Leland Olover Co., Inc.)	
Western Gold & Platinum Co.	19
(Hal Lawrence Inc.)	
Westwood Manor	4

**BEFORE MAKING
HOTEL RESERVATIONS IN
Los Angeles**

USE THIS COUPON

BEL-AIR SANDS
11461 Sunset Boulevard
Los Angeles 49, California
Please send me color brochure

NAME _____
ADDRESS _____
CITY _____ STATE _____

To Get Complete Information on the

BEL-AIR Sands Resort Motor Hotel

Near U. C. L. A., adjacent to Beverly Hills, Westwood and Brentwood areas, the Bel Air Sands is set in a tropical garden with a magnificent view from 8 acres of mountain side privacy. Minutes from Famous Restaurant Row, Movie, Radio and TV Centers. Just 15 minutes from L. A. Airport.
★ 2 Olympic-size Heated Swimming Pools. Wading Pool ★ Poolside Dining
★ Free TV ★ Beauty Shop ★ PRIVATE PATIOS ★ EXCELLENT FOOD

FREE GARAGE PARKING
BEL-AIR SANDS
11461 Sunset Blvd. Los Angeles 49, Calif.
Phone GRanite 6-1241 - TWX WLA 6-657

Classified Advertising

CLASSIFIED ADVERTISING RATES

Members: \$15 for 1st col.-inch, \$10 for 2nd, \$5 for each additional. Non-members: \$20 for 1st col.-inch, \$15 for 2nd, \$10 for each additional. 10% frequency discount for 10 consecutive ads. None to exceed total of 4 col.-inches. Non-commissionable. Deadline 1st of month preceding month of publication. Write or call: Ernesto A. Montano, IEEE Grid, Suite 2210, 701 Welch Rd., Palo Alto, Telephone (415) 327-6622.

SERVICES

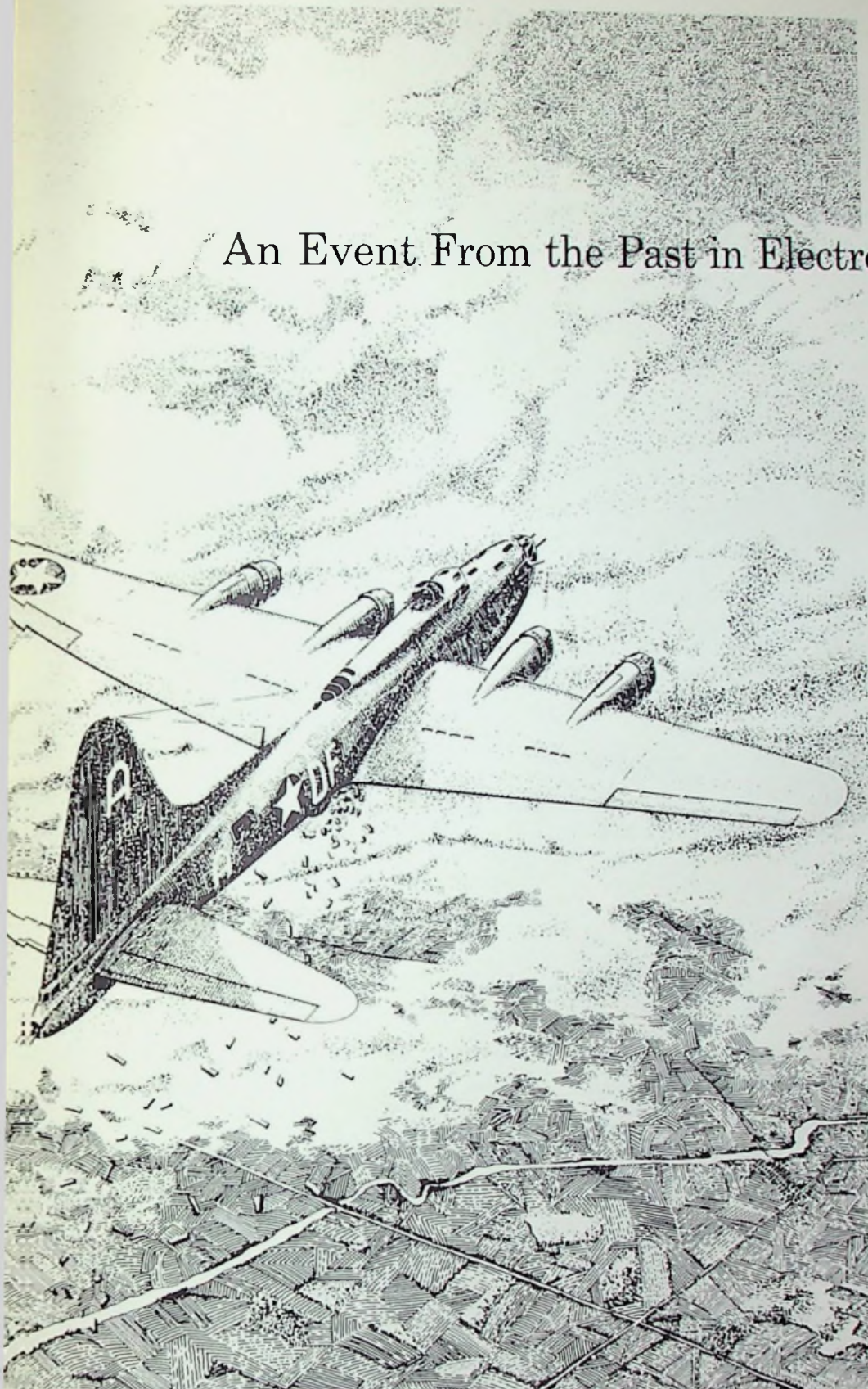
PHOTOGRAPHIC TYPESETTING
... and the many lithographic-preparatory services we can provide, such as seen throughout Grid, may be just the answer to your problems.
ICONOTYPE
Santa Clara, California • 296-6915

POSITIONS AVAILABLE

**ELECTRICAL
ENGINEER
CITY OF PALO ALTO**

BSEE—power option desirable—prefer experience in power distribution, substation design, or industrial power analysis. U.S. citizen. Salary \$750-\$1,138 per month.
Apply: City of Palo Alto Personnel Office, by mail—1313 Newell Rd., or in person—445 Sherman Ave., Palo Alto, Calif. An Equal Opportunity Employer.

An Event From the Past in Electronic Countermeasures



Aluminum foil strips dropped in advance of air raids had a devastating effect on German radar in World War II. In some instances bomber losses from missions were reduced from an expected 5% to less than 2%.

We're making history today at Applied Technology as a quick-reaction developer and manufacturer of electronic warfare equipment. ATI's record for achievement and growth is an industry success story. If you would like to be part of tomorrow's achievements, call the GROWING ONE. ATI is conducting a special talent search for electronic engineers, designers and technicians with Ability... Talent ... Imagination.

For technical interview appointment ask for:

Mr. Lawrence Peckler
Professional Employment Representative

or

Mr. Richard Denzler
Employment Manager

Write or call for a free copy of this drawing

APPLIED TECHNOLOGY

A Division of
Itek Corporation

101 HILLVIEW AVE. • STANFORD INDUSTRIAL PARK • PALO ALTO • CALIFORNIA



Call Collect

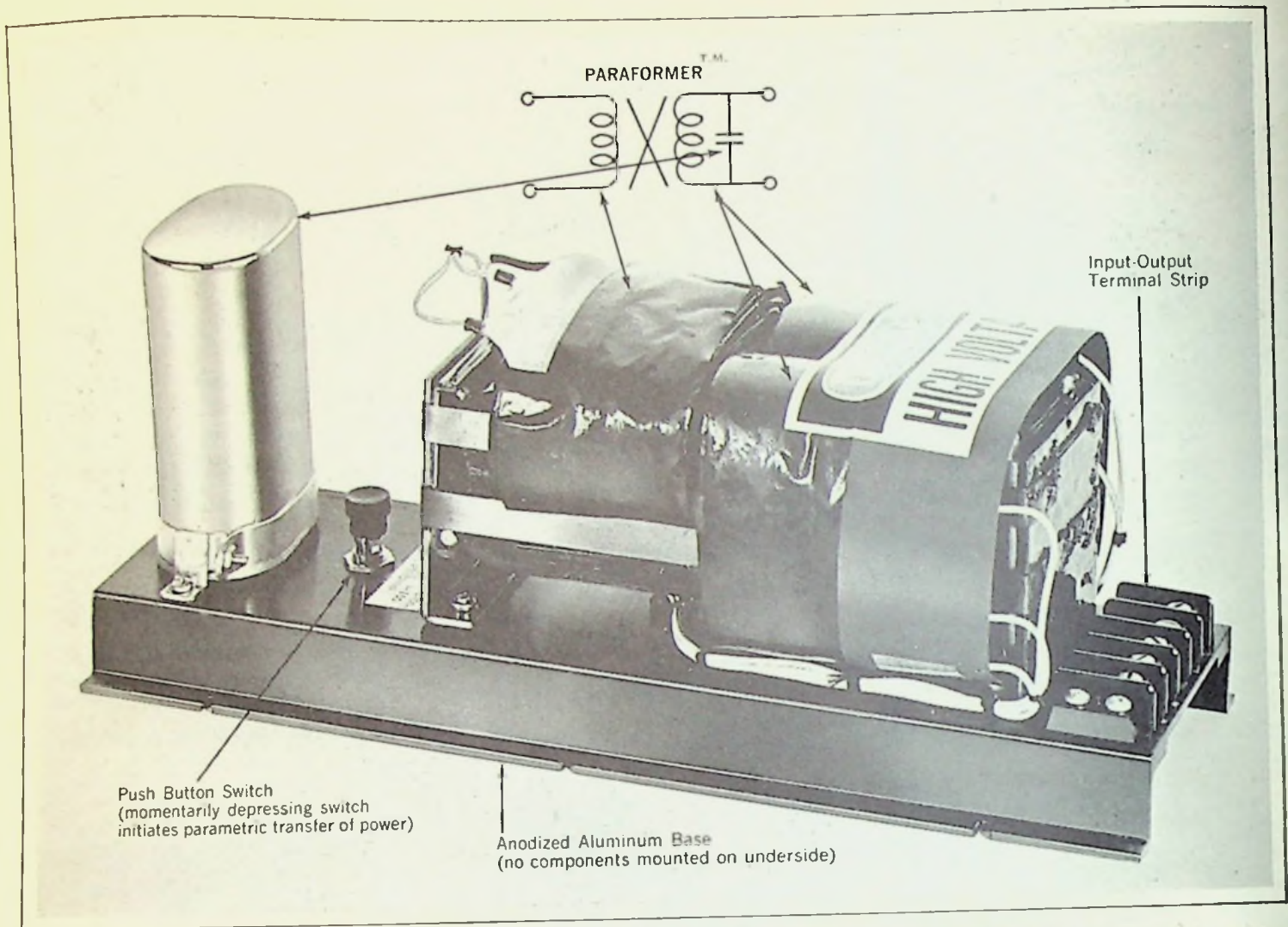
(7:30 a.m. to 5:30 p.m.)
(415) 321-5135

An Equal Opportunity Employer

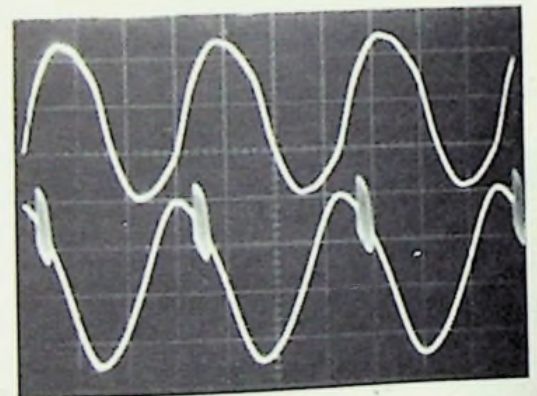
ELECTRONIC WARFARE SYSTEMS • MICROWAVE COMPONENTS • SPECIAL COMMUNICATIONS • AIRCRAFT MODIFICATION

Model PEC-150 PARAXTM AC POWER CONDITIONER

150 VA Regulated, Transient Free



Input Voltage (60 Hz)	50-150VAC (Input voltage range dependent upon load current)
Output Voltage (60 Hz)	117VAC
Output Capacity	150VA
Noise Attenuation	Over 50 db (200 Hz - 1MHz)
Line Regulation ($\pm 10\%$)	$\pm 0.25\%$
Load Regulation (0-FL)	$\pm 1.5\%$
Size	5 $\frac{1}{2}$ " H x 4 $\frac{5}{8}$ " W x 14 $\frac{1}{8}$ " L
Weight	21 #
Price	\$175.00 (Optional 19" rack mounted version —\$190.00)



High Frequency Noise. Upper Trace—Paraformer Output. Lower Trace—60 Hz. Input to Paraformer. Vertical Scale—100 volts/cm. Here a high frequency oscillation has been superimposed on the 60 Hz. input voltage waveform. Note that this high frequency noise is not transmitted to the output. Similar tests with ferroresonant transformers showed that such noises are readily transmitted to the output.

See this and other exciting new products utilizing the PARAX principle at the IEEE Show in New York, March 18-21. Booth 2J24

WANLASS ELECTRIC COMPANY

A subsidiary of American Bosch Arma Corporation
2175 South Grand Avenue, Santa Ana, California
Phone: (714) 546-8990

