

# EDITOR'S PROFILE of this issue

*from a historical perspective ...*

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

September, 1966:

Cover: This 1919 photo shows a radio station in Oakland, designed by San Jose's Charles "Doc" Herrold, an early Stanford student. Herrold's first company (in S.F.) was destroyed in the 1906 earthquake and fire, so he moved it to San Jose. The inset is a drawing of Lee de Forest's audion, the first vacuum tube, for which he received a patent. I have two of these that were manufactured shortly after de Forest was at Federal Telegraph in Palo Alto.

Page 4: The Section and Chapter officers are listed.

Page 12: Highlights from the Perham Collection for the Foothill Electronics Museum are listed, including Cyril Elwell's founding of Federal Telegraph in Palo Alto, Lee de Forest's invention of the oscillator and amplifier circuits in Palo Alto, Leonard Fuller (Stanford's first EE PhD) using wire-line carrier-current modulation for power station control, the use of a discarded arc transmitter magnet in Palo Alto for Earnest Lawrence to make the 42" cyclotron (resulting in 6 Nobel Prizes by 1960), and more Bay Area history. I cover many of these events in my talk/video, "The Origins of Silicon Valley: Why and How It Happened Here" (on YouTube).

Page 15: Prof. Ronald Bracewell of Stanford explains how the new radio telescopes will work. "The Dish" on the hills behind the campus was used to study radio sources, including a mapping of our Sun. A good friend of mine completed his PhD under Bracewell, then went on to calculate orbital mechanics at Lockheed, including the L1 and L2 stable points, one of which was used for the James Webb Space Telescope.

Page 17: Hewlett Packard announces acquisition of property in Santa Clara, on Stevens Creek Blvd, for the start of a new division. It becomes Agilent, then Keysight.

Page 20: Donald Fink, IEEE's general manager, announces the start of a new journal on solid-state circuits.



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

[https://ethw.org/IEEE\\_San\\_Francisco\\_Bay\\_Area\\_Council\\_History](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

# Annual Directory Issue

SAN FRANCISCO SECTION • INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

# IEEE Grid

SEPTEMBER 1966



MIRACLES IN TRUST



FOOTHILL ELECTRONICS MUSEUM  
PERHAM FOUNDATION



## meeting reminder

Aerospace & Electronic Systems, Wednesday, September 21  
Automatic Control, Tuesday, October 18  
Communication Technology, Wednesday, September 21  
Computer, Tuesday, September 27  
Microwave Theory & Techniques, Wednesday, September 21  
Nuclear Science, Monday, September 19  
Parts, Materials & Packaging, Tuesday, September 27

MEMBERSHIP LISTEN TO THE NEWS WITH US! SEE US!  
—COURTESY OF THE IEEES—



The growth of world-wide demand for Varian products in commercial, military, and industrial markets is providing new career opportunities for engineers. The following positions are among those now available:

<p style="text-align: center;"><b>APPLICATION ENGINEERS</b></p> <p>Provide support to marketing functions in the chemical, electronic, and vacuum fields. Duties will include new equipment evaluation, analysis of customer requirements and samples, and direct support of field sales activities.</p>	<p style="text-align: center;"><b>QUALITY CONTROL ENGINEER</b></p> <p>BSEE with experience in, or ability to learn, the techniques of reliability analysis. Knowledge of production test methods and ability to specify or design production test electronic instrumentation.</p>	<p style="text-align: center;"><b>ELECTRICAL ENGINEER OR PHYSICIST</b></p> <p>Electrical Engineer or Physicist for product development in the field of Electron Paramagnetic Resonance. Requirements include MS and 3 years experience including instrument development or PhD. A specific knowledge of EPR and microwave and transistor circuits is desirable.</p>
<p style="text-align: center;"><b>MARKETING ENGINEERS</b></p> <p>B.S. Degree, 1 to 5 years' work experience, and a strong desire to sell in a scientifically oriented market. Positions are located in New York and St. Louis areas, to represent the leader in research, design and manufacture of NMR and EPR Spectrometers, Superconducting and Electromagnets.</p>	<p style="text-align: center;"><b>TUBE ENGINEERS</b></p> <p>Experience in design, development, or manufacture of klystrons, BWOs, or TWTs. Should be familiar with microwave techniques and vacuum tube engineering. Experience in systems and evaluation helpful.</p>	<p style="text-align: center;"><b>MANUFACTURING ENGINEERS</b></p> <p>To handle transfer of products from development into manufacturing. Prefer strong background in the electronics or instrumentation field. Experience in production processes and methods necessary.</p>

Many other technical and professional openings also exist and all inquiries will be welcomed. Successful candidates for these positions will work with technical staff members noted in the industry. Varian is one of the leading employers in Northern California, noted for its unique living, cultural, and educational environment.

For consideration of your qualifications, submit a resume in confidence to:

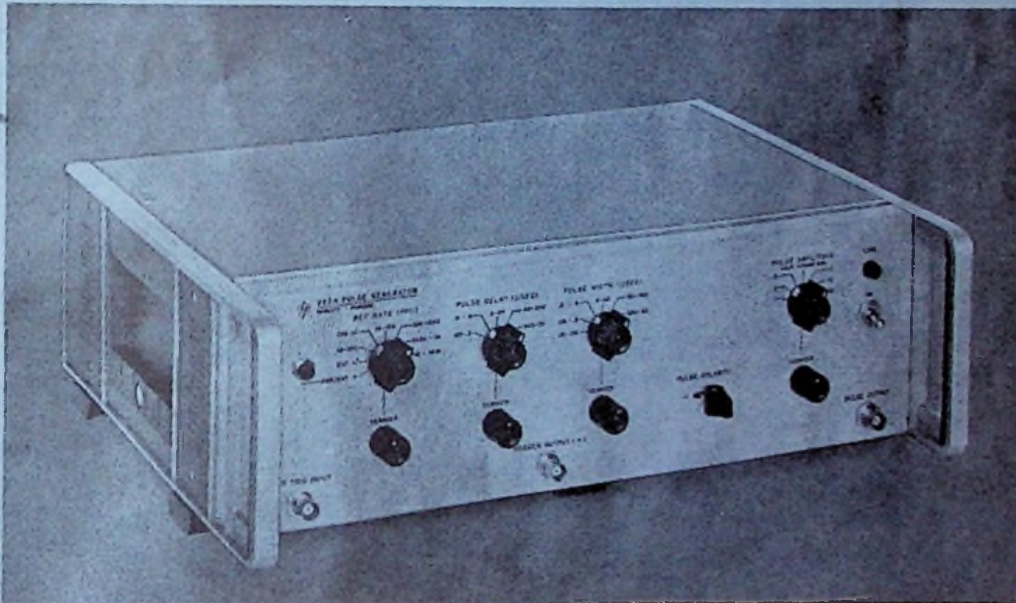
Technical Employment Manager



611 Hansen Way • Palo Alto, California

an equal opportunity employer

# WANTED!



## Post it

No matter what fugitive or maverick measurement you're tracking in the West, your Neely man holds the reward. Let him know your needs . . . and he can provide the solution. He represents the more than 1000 instruments and measuring systems available from Hewlett-Packard, and no measurement problem is too large . . . or too small . . . to get him working for you. In the West, he's a single, local call that can answer all your needs. Tell him what's Wanted,

and he'll help you find the best answer . . . in instrument performance and value.

North Hollywood—(213) 877-1282  
Palo Alto—(415) 327-6500  
Sacramento—(916) 482-1463  
San Diego—(714) 223-8103  
Scottsdale—(602) 945-7601  
Tucson—(602) 623-2564  
Albuquerque—(505) 255-5586  
Las Cruces—(505) 526-2486  
Seattle—(206) 454-3971  
Denver—(303) 771-3455  
Salt Lake City—(801) 486-8166

**HEWLETT  
PACKARD**  **NEELY**  
SALES DIVISION

# PRIME **GROWTH** OPPORTUNITIES IN SEMICONDUCTORS . . . AT UNION CARBIDE ELECTRONICS IN MOUNTAIN VIEW

Recent doubling of plant space to meet rapidly growing production schedules has created challenging job opportunities in many technical areas. There is an urgent immediate and continuing need for technical personnel qualified by education and experience for rewarding assignments in design, development and production of semiconductor devices, assemblies and integrated circuits.

## PRINCIPAL PRODUCTS

Bipolar Transistors    Dual Transistors  
Field Effect Transistors    Modular Amplifiers  
Integrated Circuits

## EMPLOYMENT OPPORTUNITIES

Materials Research    Production Planning  
New Product Development    Production Supervision  
Device Design    Product Evaluation  
Circuit Design    Quality Assurance  
Wafer Fabrication    Product Packaging  
Product Engineering    Specification Preparation

## APPLICANT QUALIFICATION

Degree in Electrical or Electronic Engineering, Physics, Chemical Engineering, Industrial Engineering. Related experience is desirable but not mandatory. Non-graduates with extensive related experience will be seriously considered.

**Act Now . . .**

Phone Mr. W. H. Fritz at (415) 961-3300 for further information and to arrange a personal interview, or write . . .

## UNION CARBIDE ELECTRONICS

365 Middlefield Road, Mountain View, California 94040

"An equal opportunity employer — M & F"

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

address all mail to  
IEEE, Suite 2210, 701 Welch Road  
Palo Alto, California 94304  
Telephone: (415) 327-6622

Members: send address change promptly to  
IEEE, 345 East 47th St., New York, N.Y. 10017  
Send copy of letter to Section Office

executive editor:  
JAMES D. WARNOCK

advertising director:  
ERNESTO A. MONTANO

editorial & advertising assistant:  
MRS. JEAN HELMKE

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

contents

- The Section-Membership—3, 20
- IEEE News—3, 20
- Section Directory, 1966-67—4, 6, 8
- Meetings Ahead—6, 8, 9, 11
- Remarks from the Chairs—9
- Program Schedule, 1966-67—10
- Meeting Calendar—10
- Bay Area—Cradle of Electronics—12, 14
- Electronics Museum—13
- Radio Astronomy News—15
- Grid Swings—17, 18
- Mfr./Rep. Index—19
- Advertisers Index—20
- Classified Advertising—20

san francisco  
section officers

Chairman: E. H. Hulse  
Vice-Chairman: Fred J. MacKenzie  
Secretary: J. E. Barkle  
Treasurer and  
Membership Chairman: John Damonté  
Dalmo Victor, 591-1414

Publications Advisor:  
David Kirby  
Hewlett-Packard, 326-7000

Executive Secretary:  
James D. Warnock,  
Section Office, Suite 2210, 701 Welch Road  
Palo Alto, California, 327-6622  
Second class postage paid at San Francisco

advertising

California & National: E. A. Montano, IEEE,  
701 Welch Rd., Palo Alto, Calif. (415) 327-6622  
East Coast: Cal Hart, Martin & Hart,  
25 W. 43rd St., New York, N.Y., LW 4-1290

the section

MEMBERSHIP

Following are the names of individuals who have been elected to current membership:

- |               |                  |
|---------------|------------------|
| F. G. Doell   | E. Munch         |
| A. K. Ganguly | W. Oldfield, Jr. |
| L. H. Heynick | A. G. Page       |
| R. S. Hirsch  | H. S. Payne      |
| J. C. Hubbs   | S. M. Pollock    |
| L. A. Jackson | J. E. Rauch      |

ieee news

INTERNATIONAL CONVENTION

Preliminary plans for the 1967 IEEE International Convention technical program have been formulated by the program committee. The plans include a number of innovations in organizing technical sessions. As initiated last year, the times for scheduling sessions, and the concentration of all technical sessions at the New York Hilton Hotel will be continued.

The annual convention and exhibition is the world's largest technical meeting of electrical and electronics engineers. The 1967 convention will be held March 20th through 24th at the New York Hilton Hotel and the Coliseum.

The technical program will continue to emphasize new technologies, new applications of existing technologies, and areas of current interest to the membership. The program will consist of group sessions on specific topics, interface sessions that link several groups and/or committees; as well as sessions on specific topics of such broad interest as to transcend groups and committees. Each proposed session will have a clearly identifiable theme.

The technical program committee has decided that there will be no general call for papers as in previous years. Instead, there will be a call for sessions and the committee will select those session topics which make the best program. Each sponsoring committee or group will select the papers and organize the accepted sessions.

October 1, 1966 has been set as the deadline for the receipt of papers to be considered for the 1967 technical program.

cover

Cover shows unidentified engineering pioneers at the Fruitvale station (Oakland) of the National Telephone and Telegraph Company, one of the stations founded by Dr. Charles D. Herrold and typical of the period. Dr. Herrold pioneered radio broadcasting in 1909, photo taken in 1914. For more on the history of "the cradle of electronics," the Bay Area, see page 12.

**BRILL**

OAKLAND • MOUNTAIN VIEW

has  
**LOTS**  
of  
**POTS**

**SINGLE TURN**

**3 TURN**

**5 TURN**

**10 TURN**

**PRECISION**

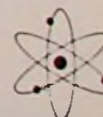
**POTENTIOMETERS**

By



**BOURNS**

**Stocked in  
depth for  
immediate  
off-the-shelf  
delivery**



**BRILL**  
**ELECTRONICS**

OAKLAND - 610 E. 10th St. Phone 834-5888  
MOUNTAIN VIEW - 1065 Terra Bella Phone 961-1500

**SAN FRANCISCO SECTION DIRECTORY  
1966-1967**

**SECTION OFFICERS**

Chairman: **E. H. Hulse**, Lawrence Radiation Lab, MT 170-C, P.O. Box 808, Livermore, 94550; 447-1100, ext. 8034.

Vice Chairman: **Fred J. MacKenzie**, Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, 94025; 326-6200, ext. 2147.



*Hulse MacKenzie*

Secretary: **J. E. Barkle**, Bechtel Corp., P.O. Box 3965, San Francisco, 94119; 433-4567, ext. 3351.

Treasurer: **John B. Damonte**, Dalmo Victor Co., 1515 Industrial Way, Belmont, 94002; 591-1414.



*Barkle Damonte*

Executive Secretary/Editor: **James D. Warnock**, IEEE, San Francisco Section, 701 Welch Road, Palo Alto, 94304; 327-6622.

**EXECUTIVE COMMITTEE**

Those above and:

Section/WESCON Director: **Meyer Leifer**, Energy Systems Inc., 3180 Hanover St., Palo Alto, 94304; 326-1640.



*Warnock Leifer*

Section/WESCON Director: **John C. Beckett**, Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto, 94304; 326-7000.

Director-at-Large: **Arthur M. Hopkin**, Electrical Engineering Dept., University of California, Berkeley, 94720; 845-6000, ext. 3068.



*Beckett Hopkin*

Director-at-Large: **Charles H. Sedam**, Pacific Gas & Electric Co., 124 Beale St., San Francisco, 94105; 781-0474, ext. 2232.

Junior Past Chairman: **Jack L. Melchor**, -hp associates-, 620 Page Mill Road, Palo Alto, 94304; 321-8510.



*Sedam Melchor*

East Bay Subsection Chairman: **William H. Peterson**, Pacific Gas & Electric Co., 1625 Clay St., Oakland, 94612; 835-8500.

Santa Clara Valley Subsection: **Don McCauley**, Philco WDL, 3875 Fabian Way, Palo Alto, 94303; 326-4350, ext. 4757.



*Peterson McCauley*

Group Coordinator: **Robert H. Light**, Insul-8 Corp., 867 American Street, San Carlos, 94070; 591-9661.

Student Branch Coordinator: **Gordon T. Longerbeam**, Lawrence Radiation Lab, L-107, Room 5000, P.O. Box 808, Livermore, 94550; 447-1100, ext. 8048.



*Light Longerbeam*

**STANDING COMMITTEES**

Awards & Nominations Committee: **Jack L. Melchor**, -hp associates-, 620 Page Mill Road, Palo Alto, 94304; 321-8510.

Fellows Committee: **L. G. Fitzsimmons, Jr.**, Pacific Telephone, 111 No. Market St., San Jose, 95113; 291-4006.

Future Engineers Show: **Charles Eldon**, Hewlett-Packard Co. 1501 Page Mill Road, Palo Alto, 94304; 326-7000.



*Fitzsimmons Eldon*

Historical: **Earl Goddard**, 2522 Webster St., Palo Alto, 94301; 325-2522.

Membership: **John B. Damonte**, Dalmo Victor Co., 1515 Industrial Way, Belmont, 94002; 591-1414.

Professional Education: **J. E. Barkle**, Bechtel Corp., P.O. Box 3965, San Francisco, 94119; 433-4567, ext. 3351.

Program: **Fred J. MacKenzie**, Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, 94025; 326-6200, ext. 2147.

Publications Advisor & Public Relations: **David Kirby**, Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto, 94304; 326-7000.



*Goddard Kirby*

San Francisco Engineering Council: Delegate: **Leon C. Glahn**, Bechtel Corp., P.O. Box 3965, San Francisco, 94119; 433-4567, ext. 3587; Alternate: **William H. Peterson**, Pacific Gas & Electric Co., 1625 Clay St., Oakland, 94612; 834-1234.

Santa Clara Valley Engineers' Council: **Hugh C. Ross**, Delegate, 11915 Shadybrook Court, Saratoga, 95070; 253-1572.

Secondary Education: **Jack W. Savage**, Lawrence Radiation Lab, P.O. Box 808, Livermore, 94550; 447-1100, ext. 8116.



*Ross Savage*

**SUBSECTIONS**

(Chairmen: See Executive Committee.)

**EAST BAY:** Vice Chairman: **Richard L. Tremaine**, Electrical Equipment Sales Co., 1338 Reliez Valley Road, Lafayette, 94549; 939-2521; Secretary: **Ed Jackson**, Pacific Telephone, 111 North Market St., San Jose, 95113; 291-4900; Treasurer: **Theodore Hamm, Jr.**, Lawrence Radiation Lab, L-121, P.O. Box 808, Livermore, 94550; 447-1100, ext. 7027.

**SANTA CLARA VALLEY:** Vice Chairman: **Robert Membreno**, Rogers Engineering, 16 Beale St., San Francisco, 94105; 986-6546; Secretary-Treasurer: **Carl Hollstein**, IBM Corp., Monterey & Cottle Roads, San Jose, 95111; 736-0310.

(Continued on page 6)

# New Tektronix Type 556

## DC-to-50 MHz, dual-beam, sweep-delay oscilloscope

The Type 556 and rack-mount Type R556 use any combination of Tektronix letter or 1-series plug-ins

The UPPER BEAM can display a signal from either *left* or *right* plug-in; with either Time Base A, Time Base B, or external signals; triggered from a composite vertical signal, plug-in single channel signal (with 1A1 or 1A2), external, or line.

The LOWER BEAM can display a signal from the *right* plug-in; with either Time Base B or external signals; triggered from a composite vertical signal, plug-in single channel signal (with 1A1 or 1A2), external, or line.

*Independent Vertical Systems* use Type 1A1 or 1A2 Plug-In Units for 50 MHz operation; also accept any other 1-series or letter-series plug-ins.

*Independent Sweep Systems* provide 24 calibrated steps from 0.1  $\mu\text{s}/\text{cm}$  to 5  $\text{s}/\text{cm}$ ; the X10 Magnifier extends the fastest sweep rates to 10  $\text{ns}/\text{cm}$ .

*Calibrated Sweep Delay* extends continuously from 0.1 microsecond to 50 seconds.

*Single-Sweep Operation* enables one-shot displays of normal or *delayed* sweeps.

*Independent Triggering Systems* provide stable displays to beyond 50 MHz. Either input signal can be used to trigger either or both time-bases.

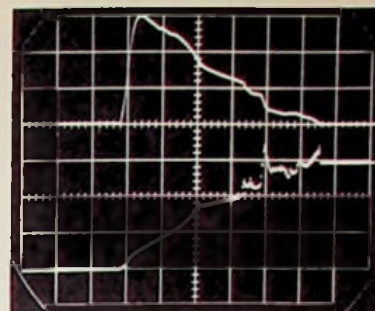
*New Dual-Beam CRT* (with illuminated internal graticule) provides "zero-parallax" viewing of small spot size and uniform focus over the 8 cm by 10 cm display area. Each beam has 6 cm vertical scan, with overlap scan of 4 cm.

*EMI (RFI) Suppression* — meets interference specifications of MIL-I-6181D over these frequency ranges: 150 kHz to 1 GHz — Radiated (with CRT mesh filter installed), and 150 kHz to 25 MHz — Conducted (power line).

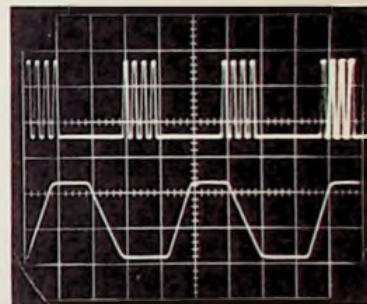
Size is 15" x 17" x 24".

Weight is  $\approx$  80 pounds, without plug-ins.

Power Requirement is 100-130 V or 200-260 V, 50-60 Hz  $\approx$  850 watts.



**Simultaneous Single-Shot Displays.** Current versus voltage display of a .75 ampere, fast-blow fuse during destructive overload. Both beams are driven by B Time-Base at 50  $\mu\text{s}/\text{cm}$  which is delayed by pre-triggered A Time-Base to provide base reference lines before and after the event. The upper beam shows the current waveform at 30 A/cm while the lower beam shows the corresponding voltage across the fuse at 100 V/cm.



**Single-Input Dual-Beam Displays.** Upper beam shows bursts of 2.5 MHz pulses on Time Base A with time variation between bursts. This shows up as increasing time-jitter between the first and successive bursts. The lower beam shows B Sweep (0.1  $\mu\text{s}/\text{cm}$ ) delayed by A Sweep and triggered on the second pulse of the last burst to provide a jitter-free expanded display of the A Sweep intensified zone. The use of only one probe and one plug-in input simplifies signal connection and provides minimum loading on the source.

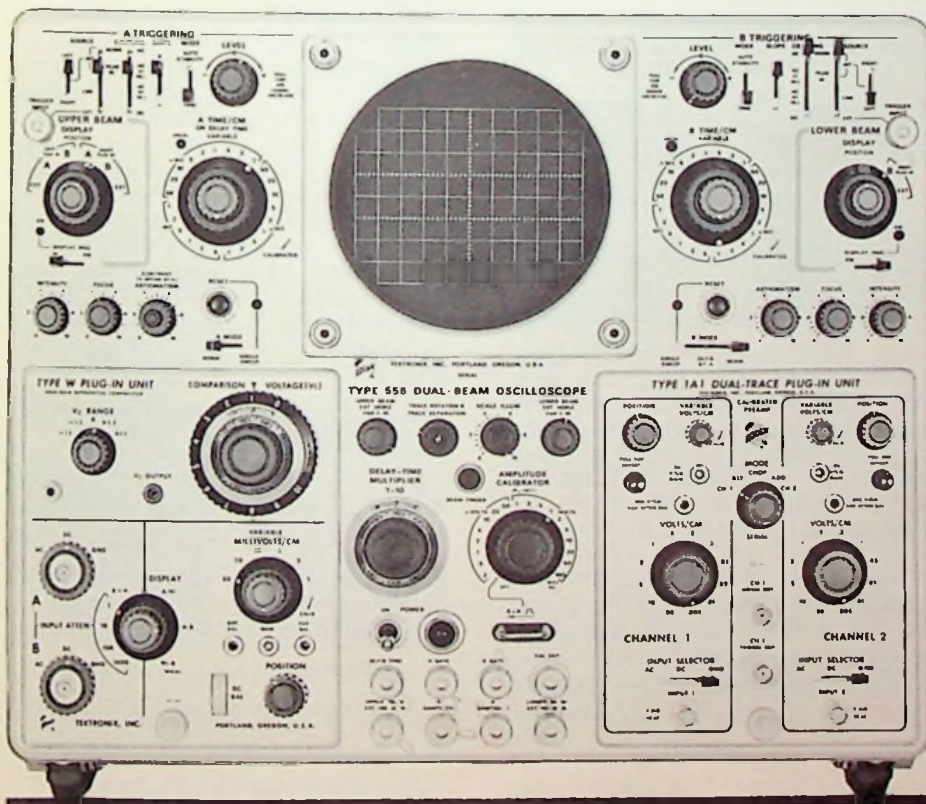
### Plug-ins illustrated

Type 1A1 Dual-Trace Unit . . . \$600 (Dual-Trace—50 mV/cm at DC-to-50 MHz, 5 mV/cm at DC-to-28 MHz. Single-Trace—500  $\mu\text{V}/\text{cm}$  at 2 Hz-to-15 MHz. 5 Display Modes—Channel 1, Channel 2, Alternate, Chopped, Added Algebraically. Front-panel signal output.)

Type W Differential Comparator Unit . . . \$575 (Conventional Preamplifier—50 mV/cm at DC-to-23 MHz to 1 mV/cm at DC-to-8 MHz. Decade Input Attenuator to X1000. Differential Input Preamplifier—CMRR of 20,000 to 1, DC-to-20 kHz. Max. Peak Input of  $\pm 15$  V, XI Attenuation. Calibrated Differential Comparator—Vc Supply of 0 to  $\pm 11$  V. Accuracy of  $\pm 0.15\%$  of output  $\pm 0.05\%$  FS.)

Type 556 Dual-Beam Oscilloscope . . . \$3150  
Rack Mount Type R556 Oscilloscope . . . \$3250

U.S. Sales Prices, f.o.b. Beaverton, Oregon



## Tektronix, Inc. SAN FRANCISCO FIELD OFFICES

3750 FABIAN WAY • PALO ALTO, CALIF. • Phone: 326-8500  
1709 MT. DIABLO BLVD. • WALNUT CREEK, CALIF. • Phone: 935-6101  
From Oakland, Berkeley, Richmond, Albany and San Leandro: 254-5353



## GROUP CHAPTERS

**AEROSPACE & ELECTRONIC SYSTEMS:** Chairman: Stephen H. Marx, Philco WDL, 3875 Fabian Way, Palo Alto, 94303; 326-4350, ext. 6048; Vice-Chairman: Ralph W. Franks, Lockheed Missiles & Space Co., Dept. 81-65, Bldg. 153, Sunnyvale 94088; 743-0525; Secretary: Kenneth H. Crandall, Jr., Lockheed Missiles & Space Co., Dept. 30-80, Bldg. 545, Sunnyvale, 94086; 742-3855; Treasurer: Joseph B. Shrock, United Technology Corp., 1050 E. Arques Avenue, Sunnyvale, 94086; 739-4880, ext. 2182.

**ANTENNAS & PROPAGATION:** Chairman: Charles Phillips, Granger Associates, 1601 California Ave., Palo Alto, 94304; 321-4175; Vice Chairman: Claes Elfving, Sylvania Electric Products, Bldg. 4, P.O. Box 205, Mountain View, 94040; 966-9111; Secretary-Treasurer: Wilbert H. K. Chang, Dalmo Victor Co., 1515 Industrial Way, Belmont, 94002; 591-1414, ext. 234.



Marx

Phillips

**AUDIO & ELECTROACOUSTICS:** Chairman: Rudolph W. Buntenbach, Lawrence Radiation Lab, L-121, P.O. Box 808, Livermore 94550; 447-1100, ext. 8053; Vice Chairman: James G. Hussey, Electro Rents, 2239-G Middlefield Road, Mountain View, 94040; 961-5100; Secretary-Treasurer: James W. Daniels, B & K Instruments, Inc., One First St., Los Altos, 94022; 948-9519.

**AUTOMATIC CONTROL:** Acting Chairman and Vice Chairman: Lincoln D. Jones, Electrical Engineering Dept., San Jose State College, San Jose, 95114; 294-6414, ext. 2612; Secretary-Treasurer: Lloyd Bayley, Lockheed Missiles & Space Co., Dept. 55-33, Bldg. 153, Sunnyvale, 94088; 742-7552.



Buntenbach

Jones

**CIRCUIT THEORY:** Chairman: Robert W. Newcomb, Stanford University, ERL, Stanford, 94305; 321-3300, ext. 268; Vice Chairman: Maung Gyi, Ampex Corp., MS 3-54, 401 Broadway, Redwood City, 94063; 367-3624; Secretary-Treasurer: Dale Nielson, Signetics Corp., 811 E. Arques Ave., Sunnyvale, 94086; 739-7700.

## COMMUNICATION TECHNOLOGY:

Chairman: Robert S. Howland, Pacific Telephone, 111 North Market St., San Jose, 95113; 291-4039; Vice Chairman: C. G. Griffith, Lenkurt Electric Co., Inc., 1105 County Road, San Carlos, 94070; 591-8461, ext. 525; Secretary-Treasurer: E. E. Combs, Lynch Communications Systems, Inc., 695 Bryant St., San Francisco 94107; 397-1471.



Newcomb

Howland

**COMPUTER:** Chairman: Rex Rice, Fairchild Research Labs, 4001 Junipero Serra Blvd., Palo Alto, 94304; 321-7250, ext. 253; Vice Chairman: Howard Zeidler, Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, 94025; 326-6200, ext. 3284; Secretary-Treasurer: Andrew J. Nichols III, Lockheed Missiles & Space Co., Bldg. 201, Dept. 52-40, 3251 Hanover St., Palo Alto, 94304; 324-3311; ext. 45721.

**ELECTROMAGNETIC COMPATIBILITY:** Chairman: Victor M. Turesin, Lockheed Missiles & Space Co., Bldg. 181, Dept. 85-81, Sunnyvale 94088; 742-6827; Vice Chairman: Eric R. Isacson, Lockheed Missiles & Space Co., Bldg. 152, Dept. 62-23, Sunnyvale, 94088; 742-6472; Secretary-Treasurer: Leonard Lancaster, IBM Co., Monterey & Cottle Roads, Bldg. 15, Dept. 837, San Jose, 95111; 227-7100, ext. 3068.



Rice

Turesin

**ELECTRON DEVICES:** Chairman: Richard W. Soshea, hp associates, 620 Page Mill Road, Palo Alto, 94304; 321-8510, ext. 202; Vice Chairman: Daniel Dow, Varian Associates, 611 Hansen Way, Palo Alto, 94304; 326-4000, ext. 3141; Secretary: Donald K. Winslow, Hansen Labs, Stanford University, 94305; 327-7800; Treasurer: David Bates, Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, 94304; 326-8830.

**ENGINEERING MANAGEMENT:** Acting Chairman: Frank Wheeler, Hewlett-Packard Co., Dymec Div. 395 Page Mill Road, Palo Alto, 94304; 326-1755; ext. 444.



Soshea

Wheeler

**ENGINEERING IN MEDICINE & BIOLOGY:** Chairman: Noel P. Thompson, Palo Alto Research Foundation, 860 Bryant Ave., Palo Alto, 94301; 326-8120; Vice Chairman: J. W. Havstad, Dept. of Pharmacology, Stanford Medical Center, Palo Alto, 94304; 321-1200, ext. 5353; Secretary-Treasurer: Robert B. Altermatt, Ampex Corp., MS 2-3, 401 Broadway, Redwood City, 94063; 367-2758.

**INDUSTRY & GENERAL APPLICATIONS:** Chairman: J. R. Eliason, General Electric Co., 5000 Shellmound St., Emeryville, 94608; 654-7120; Vice Chairman: L. D. Kelly, General Electric Co., 235 Montgomery St., San Francisco, 94104; 434-2211; Secretary-Treasurer: W. H. Levers, Standard Oil Co., 555 Market St., San Francisco, 94105; 434-7700, ext. 3352.



Thompson

Eliason

**INFORMATION THEORY:** Chairman: James J. Spilker, Jr., Philco WDL, 3875 Fabian Way, Palo Alto, 94303; 326-4350, ext. 4101; Vice Chairman: D. J. Sakrison, Electrical Engineering Dept., University of California, Berkeley, 94720; 845-6000, ext. 3705; Secretary-Treasurer: T. M. Cover, Electrical Engineering Dept., Stanford University, 94305; 321-3300, ext. 6207.

**INSTRUMENTATION & MEASUREMENT:** Chairman: James G. Hussey, Electro Rents, 2239-G Middlefield Road, Mountain View, 94040; 961-5100; Vice Chairman: Kay Magleby, Hewlett-Packard Co. Dymec Div., 395 Page Mill Road, Palo Alto, 94304; 326-1755, ext. 378; Secretary: Fred Scholes, Beckman Instruments, 1117 California Ave., Palo Alto, 94304; 326-1970; Treasurer: William Milwitt, Pulse Engineering Inc., 560 Robert Ave., Santa Clara; 95050; 248-6040.



Spilker

Hussey

(Continued on page 8)

meeting ahead

## COMPUTER INSTRUCTION

Prof. Patrick Suppes, executive head, Dept. of Philosophy, and director, Institute for Math Studies in Social Sciences, Stanford University, will discuss computer-based instruction at the September 27 meeting of the Computer chapter in Room 111 of Polya Hall in the computer complex on the campus.

# Someone's life will change greatly as a result of reading this ad.

He will be a man who can make a significant contribution to the art of electronic measurement—in either design or production. Chances are he will be working for a large organization where his contribution is not accepted or—if accepted—not widely recognized. He will be looking for the opportunity to show his mettle and get the recognition he deserves. If you are such a man, read on:

For almost a generation, we (The John Fluke Mfg. Co., Inc.) have been one of the world's leaders in metrology. Recently, the demand for our quality instrumentation has created a number of unusually fine professional employment opportunities.

So if you want to join a medium size, well-respected company where your contribution stands out and your identity means something to everyone from the president on down, this is a grand opportunity. Our engineers work in a sophisticated technical environment with great personal freedom to pursue design problems as they see fit. We pick up the total tab on a company-sponsored graduate program for eligible personnel at the University of Washington (now widely regarded as one of the 10 best universities in the Nation).

But, though the job is the main thing, living in the Pacific Northwest shouldn't be ignored either. About 85% of our employees live on wooded acres within 10 minutes of the plant. You can buy twice the house in Seattle for the same dollars you spend in San Francisco or Los Angeles. And the taxes aren't too steep either (there is no state income tax).

Schools are good. The State of Washington ranks among the first three in literacy and number one

in terms of college graduates per thousand population. Art, theatre and music flourish in the great new Seattle Center, built for the World's Fair.

If the outdoors is your after hours bailiwick, Washington State offers great skiing (with short lift lines), the nation's best boating, outstanding hunting and fishing (sometimes, the other guy on the stream is five miles away), and fine hiking and climbing.

The company offers in addition to your salary (which is as good or better than anywhere else) profit sharing, medical insurance, and retirement benefits. So if all this excites you and you fit one of the job descriptions below, write our Engineering Manager, Mr. Ted Thomsen, in confidence. Interviews will be arranged in Los Angeles, San Francisco, or Seattle at your convenience. Please address Mr. Thomsen at P.O. Box 7428, Seattle, Washington.

**Design or Senior Engineers** with communication theory background and/or interest in digital circuits. Preferably an MSEE. Minimum experience, two years. Should be familiar with digital circuit design and frequency calibration techniques.

**Design or Senior Engineer** with minimum of one year's experience in feedback, digital and analog circuitry. Applicant

should be familiar with differential amplifiers, amplifier and feedback design, AC-DC converters, and state of the art measurement instruments. MSEE desired.

**Senior Applications Engineer** with experience in measurement or development work to provide support to field marketing and marketing research staff. BSEE with marketing knowledge desired.

**Electronic Package Design Engineer** with either BSEE or BSME. Applicant should be familiar with packaging methods in the MHz to 10 GHz region. Two to six years' experience with good mechanical design aptitude required.

**Industrial Engineer** with three years' experience in electronics or associated industry. Should possess a BSIE. A BSEE or BSME is acceptable if applicant has industrial experience. Candidate must have knowledge of methods, value, and process analyses, and work simplification.

**Senior Production Engineer** with four years' experience. Should be a mechanical engineer familiar with electronics or an electronic engineer familiar with mechanical engineering. Applicant must possess a BSME or BSEE. Must be able to carry new product from design to production.

An equal opportunity employer.



Box 7428, Seattle, Washington 98133 • Phone: (206) 776-1171 • TWX: (910) 449-2850

**MAGNETICS:** Chairman: **David Nitzan**, Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, 94025; 326-6200, ext. 2575; Vice Chairman: **Irving W. Wolf**, Ampex Corp., MS 3-55, 401 Broadway, Redwood City, 94063; 367-3103; Secretary: **Frank Olson**, Microwave Electronics, 3165 Porter Drive, Palo Alto, 94304; 321-1770, ext. 284; Treasurer: **Ray B. Yarbrough**, Electrical Engineering Dept., University of Santa Clara, Santa Clara, 95053; 296-3360, ext. 227.

**MICROWAVE THEORY & TECHNIQUES:** Chairman: **Howard C. Poulter**, Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto, 94304, 326-7000, ext. 2129; Vice Chairman: **Wes Matthews**, Sylvania EDL, 500 Evelyn Ave., Mountain View, 94040; 966-9111, ext. 2410; Secretary: **Dick Alvarez**, Stanford Linear Accelerator Center, Stanford, 94305; 854-3300, ext. 395; Treasurer: **David Adams**, Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, 94025, 326-6200, ext. 3903.



Nitzan

Poulter

**NUCLEAR SCIENCE:** Chairman: **Alexander J. Stripeika**, Lawrence Radiation Lab, L-121, P.O. Box 808, Livermore, 94550; 447-1100, ext. 7821; Vice Chairman: **Vernon L. Smith**, Stanford Linear Accelerator Center, Stanford, 94305; 854-3300, ext. 405; Secretary-Treasurer: **Don Toombs**, Aerojet, San Ramon, 94583; 837-5311, ext. 507; Program Chairman: **H. Van Ness**, Lawrence Radiation Lab, L-383, P.O. Box 808, Livermore, 94550, 447-1100, ext. 7036.

**PARTS, MATERIALS & PACKAGING:** Chairman: **John H. Hauser**, Lockheed Missiles & Space Co., Dept. 81-61, Bldg. 153, Sunnyvale 94088; 742-5167; Vice Chairman: **William G. Bougher**, Energy Systems, 3180 Hanover St., Palo Alto, 94304; 326-1640, ext. 259; Secretary-Treasurer: **Eric Edberg**, Varian Associates, 611 Hansen Way, Palo Alto, 94304; 326-4000, ext. 2478; Membership Chairman: **E. J. Stather**, Lockheed Missiles & Space Co., Dept. 84-58, Bldg. 540, Sunnyvale 94088; 742-1428.



Stripeika

Hauser

**POWER:** Chairman: **Roland K. Grannis**, K. M. Ryals Co., 9 First St., San Francisco, 94105; 982-8729; Vice Chairman: **Charles W. Dick**, Bechtel Corp., 101 California St. San Francisco, 94111; 433-4567, ext. 3204; Secretary-Treasurer: **Robert D. Junge**, Pacific Gas & Electric Co., 245 Market St., Room 1000, San Francisco, 94106; 781-4211, ext. 2683.

**RELIABILITY:** Chairman: **Kenneth E. Sladky**, Dalmo Victor Co., 1515 Industrial Way, Belmont, 94002; 591-1414, ext. 345; Vice Chairman: **Harold Caldwell**, Sylvania EDL, P.O. Box 188, Mountain View, 94040; 966-3029; Secretary-Treasurer: **Robert Welch**, Sylvania EDL, P.O. Box 188, Mountain View, 94040; 966-3342; Program Chairman: **William W. DeVille**, Philco WDL, 3875 Fabian Way, Palo Alto, 94303; 326-4350, ext. 6180.



Grannis

Sladky

**VEHICULAR COMMUNICATIONS:** Chairman: **Guy V. Wood**, U.S. Forest Service, 630 Sansome St., Room 641, San Francisco, 94111; 556-3715; Vice Chairman: **Herbert M. Watson**, Watson Communications Engineering, 10533 San Pablo Ave., Richmond, 94608; 524-2484; Secretary-Treasurer: **Herbert Vanderbeck**, Kaar Electronics Corp., 2250 Charleston Road, Mountain View, 94040; 961-8220.



Wood

#### CHANGE OF ADDRESS

If you plan to change your address, notify headquarters and the section office at least three weeks in advance of the effective date.

*meeting ahead*

#### PRINTED CIRCUIT BOARDS

Don Higgins, production manager, Paeco Div., Hewlett-Packard Co., will speak to members of the Parts, Material & Packaging chapter at its September 27 meeting in the division's new facility at 3215 Porter Drive, Stanford Industrial Park, Palo Alto.

A discussion of the processes involved in the making of single, double-sided, and multi-layer boards will be followed by a tour of production facilities.

#### STUDENT BRANCH COUNSELORS

Fresno State College, Fresno, 93726, (209) 222-5161

Counselor: **James H. Smith**

Heald Engineering College, 1215 Van Ness Ave., San Francisco, 94109; 673-5500

Counselor: **Roy O. Hurd**



Smith

Hurd

San Francisco State College, 1600 Holloway Ave., San Francisco, 94132; 469-1529

Counselor: **Byron E. Thinger**

San Jose State College, San Jose, 95114; 294-6414, ext. 2019

Counselor: **Ed C. Glover**



Thinger

Glover

Stanford University, Stanford 94305; 321-3300, ext. 4025

Counselor: **Ralph Smith**

University of California, Berkeley, 94720; 845-6000, ext. 2664

Counselor: **Richard M. White**



Smith

White

University of Santa Clara, Santa Clara, 95053; 296-3360, ext 227

Counselor: **R. B. Yarbrough**

U.S. Naval Postgraduate School, Monterey 93940; (408) 372-7171, ext. 513

Counselor: **John M. Bouldry**



Yarbrough

Bouldry

#### 4 REQUESTS OF CHAIRMAN

It is a pleasure to address all of the members of what is now the largest single section of the IEEE. I am looking forward to a very successful operating year and would like to ask for your assistance and consideration in the following areas:

- Will each of you please review your professional group interests, since all San Francisco programs are built around group chapter meetings, of which we had 100 last year. Institute activities are an important part of your professional life, and I hope that each of you will join one or more groups of your choice.
- We need a higher percentage of the electrical engineering profession enrolled as members in the IEEE. The recent change in dues will make the Institute more nearly self-supporting, but additional members would certainly help also. Any assistance you can give our membership committee will indirectly benefit all of our members.
- I would like to ask all of you to encourage our student members to attend Section and Group Chapter meetings in order to improve the communication between our practicing engineers and the students in our eight student branches. These young men, who are the future of IEEE, must be encouraged to continue as active members after graduation for the furtherance of the purposes of the Institute.
- Any suggestions you may have concerning the operation of Section affairs will certainly be welcome and can be addressed to the Section Office.

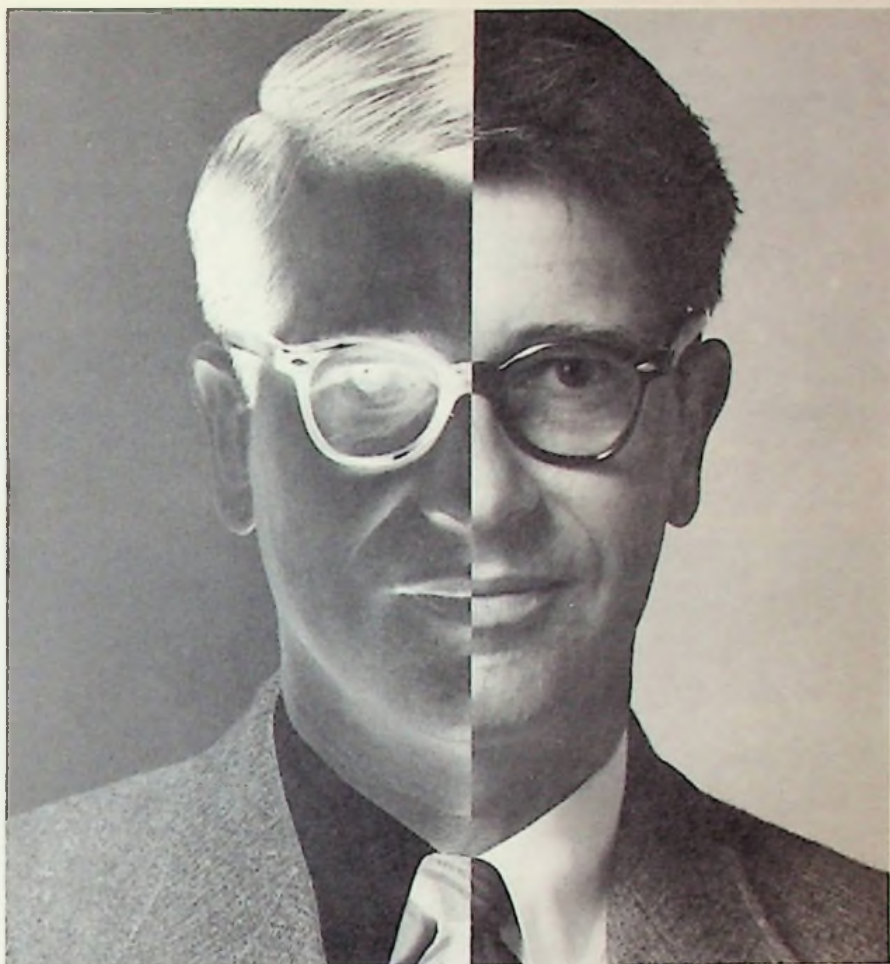
E. H. Hulse  
Chairman  
San Francisco Section

meeting ahead

#### ANTENNA FARM TOUR

The Microwave Theory & Techniques and Aerospace & Electronics Systems chapters will sponsor a tour of the Stanford antenna site facilities on September 21, participants to gather at 7 p.m. on the northern corner of Junipero Serra Blvd. and Page Mill Road, the latter an extension of Oregon Ave., Palo Alto, which begins at Bayshore.

# Friden



## What is a Specialist/Generalist?

(are you one?)

A specialist is a fellow who works within the limitations of a specific problem or field of interest. He seldom gets involved in the "big picture". (Perhaps that's you now.)

A generalist is closer to the overall job. He sees how the work of many specialists fits together. But he often misses out on the thrill of being an expert in something specific.

At Friden R&D these two functions are combined.

Because research teams are relatively small, you *do* get involved with the project as a whole, in addition to your specialized work.

That's why we call you a "Specialist/Generalist".

Today, Friden is looking for more Specialists/Generalists for R&D openings in the San Francisco Bay Area. We've been making news with exciting new products in office automation: computers, electronic billing machines, electronic calculators,

data collection and transmission equipment.

R&D is supporting this development program with work in these areas:

- low-cost, general purpose digital computers
- sophisticated electronic calculators (wired sub-routine computers for minimum cost)
- low-cost electro-mechanical mass memories
- the application of latest breakthroughs in integrated circuits, computerized designs, and thin film technology
- low-cost displays

If you're an electronic or mechanical engineer, or have a background applicable to the development of small business machines, call David Abbot collect: (415) 357-6800. Or write to him at Friden, Inc., San Leandro, Calif.



\*A TRADEMARK OF FRIDEN, INC.

**SUBSECTION AND CHAPTER PROGRAM SCHEDULE**  
San Francisco Section, 1966-67

	Monday	Tuesday	Wednesday	Thursday
<b>SECOND</b>		Power	Instrumentation & Measurement	Industry & General Applications
<b>THIRD</b>	Nuclear Science	Automatic Control Engineering in Medicine & Biology Antennas & Propagation Magnetics	Microwave Theory & Techniques Communication Technology Circuit Theory Santa Clara Valley SS Reliability	Vehicular Communications Audio & Electroacoustics Information Theory
<b>FOURTH</b>	East Bay SS	Computer Engineering Management Parts, Materials & Packaging	Electromagnetic Compatibility Electron Devices	Aerospace & Electronic Systems

**SEPTEMBER 19, MONDAY, 8:00 PM — Nuclear Science**  
**Pulsed power research and application to nuclear science**

*Dr. Franklin C. Ford, director of research, Physics International Co.*

Place: 2700 Merced St., San Leandro

No dinner

**SEPTEMBER 21, WEDNESDAY, 6:45 PM — Communication**  
**Technology**

**Social event and entertainment (tentative) by the "Strafilcher String Trio".**

*Dr. Ephriam Engleman, Chalmers Smith, attorney, and Craig Vittetoe, teacher and writer*

Place: Paul Masson Mountain Winery, Saratoga

Dinner: 7:45 PM, on the patio of the Paul Masson Winery

Reservations: Robert Howland, (408) 291-4039; George Griffith, (415) 591-8461 x 525; Ed Combs, (415) 397-1471 by September 20. Price: \$5.00 payable in advance. Note: reservations are limited to 100 persons

**SEPTEMBER 21, WEDNESDAY, 7:00 PM — Microwave Theory & Techniques/Aerospace & Electronic Systems**  
**Tour of Stanford antenna site facilities**

Place: Meet at north corner of Junipero Serra Blvd. & Page Mill Road

No dinner

**SEPTEMBER 27, TUESDAY, 8:00 PM — Computer**  
**Computer based instruction**

*Prof. Patrick Suppes, Stanford University*

Place: Room 111, Polya Hall (in computer complex)

Dinner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto

Reservations: Mrs. Chris Hensen, 324-3311 x 45034 by noon Sept. 26

**SEPTEMBER 27, TUESDAY, 8:00 PM — Parts, Materials & Packaging**  
**Products of printed circuit boards**

*Don Higgins, product manager, Paeco Div., Hewlett-Packard Co.*

A tour of Paeco follows the discussion

Place: 3215 Porter Drive, Palo Alto

No dinner

**OCTOBER 18, TUESDAY, 8:00 PM — Automatic Control**  
**Design of piecewise linear switching functions for relay control systems**

*Dr. Gene F. Franklin, professor of electrical engineering, Stanford*

Place: University of Santa Clara, Engineering Center, Room 551

Dinner: 6:30 PM, Lucca Restaurant, Santa Clara

No reservations required

Above is the schedule of meeting nights agreed upon at the August 2 program coordination meeting. In the event that a group finds it necessary to meet on a night other than that specified because of holidays, speaker availability or other causes, it is important that the Section office be notified immediately for the purposes of coordination and possible re-scheduling of other meetings to avoid conflicts.

The minimum number of meetings required per calendar year for chapters is two; for subsections it is five. Since the Section has more chapters than any other and competition for meeting nights is heavy, a long-standing policy of the Section has been to encourage meetings of high caliber and interest, even if the annual number is only at the minimum or slightly above, rather than the greatest possible number of meetings during the ten-month operating year (September through June). Chapters should consult with others assigned the same night to stagger their meetings by months and avoid conflicts. Appropriate joint meetings should also be arranged whenever possible.

Most Section meetings (five during the operating year) will be joint with sub-sections or chapters. When not joint, they will be scheduled during the first week of the month whenever possible to avoid conflicts. Contact Program Chairman Fred MacKenzie or Group Coordinator Bob Light (see directory) to arrange joint meetings with the Section.

The closing date for all meeting background material—calendar notice on standard form, speaker's biog, abstract and photograph—is the 15th of the preceding month.

meeting ahead

### PULSED POWER RESEARCH

Dr. Franklin C. Ford, director of research, Physics International Co., will discuss pulsed power research and its application to nuclear science at the September 19 meeting of the Nuclear Science chapter at the firm's headquarters, 2700 Merced St., San Leandro.

Drs. William T. Link and Henry F. Ruge, both Physics International staff members, will assist in conducting the tour and describing various aspects of the facility and of company activities.

Physics International specializes in a variety of complex and exotic areas of research in nuclear weapons effects, radiation simulation and effects, hydrodynamics, pulsed power systems, and plasma physics. Their simulation capabilities include such sources as 50,000 R gamma sources at 5 MeV in a 40 nanosecond pulse, 6 MeV 50,000 ampere electron beams, neutron pulses at rates up to  $10^{19}$  neutrons per second, and high power electromagnetic fields for EMP studies.

meeting ahead

### WINERY MEETING

Dinner and entertainment at the Paul Masson Mountain Winery, Saratoga, are planned on September 21 by the Communication Technology chapter. A preview of program plans for the year will be given. Reservations, at \$5, are limited to 100, and may be made by calling the members listed in the meeting calendar.

meeting ahead

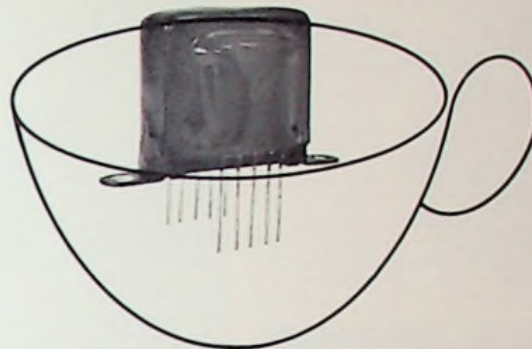
### LINEAR SWITCHING FUNCTION

Prof. Gene F. Franklin, Dept. of Electrical Engineering, Stanford University, will discuss the design of piecewise linear switching functions for relay control systems at the October 18 meeting of the Automatic Control chapter. The meeting will be held in the University of Santa Clara engineering center.

*Share the responsibility*

FOR THE SECTION  
AND YOUR GROUP  
CHAPTER

Take part in the membership pledge program. Bring in at least one new member in '66.

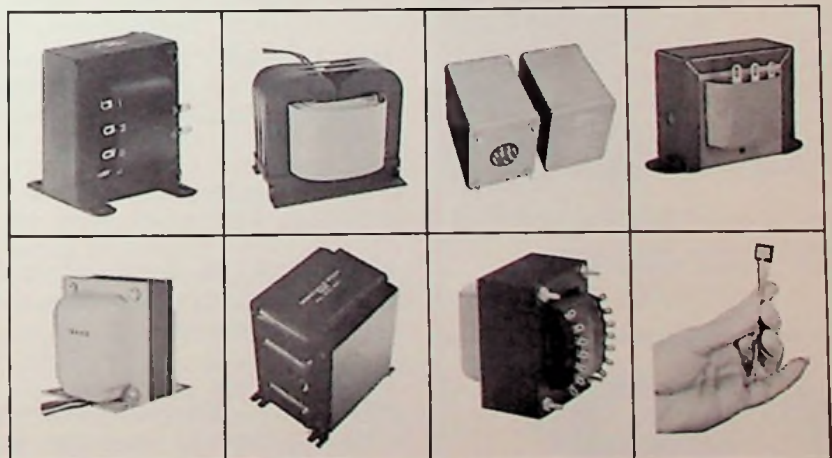


## Instant transformers

It's easier said than done. The problem arises because it's easier to make instant promises than to make instant transformers. The trick is to go to someone who is good at making both.

Tranex, for example. Not that we have some magic formula unavailable to other manufacturers; but we do have specially-developed tooling for quickly customizing a design without the

time and expense usually associated with special transformers. Shown below are just a few of the custom transformers we've made. Each was originally designed and manufactured for a customer who couldn't find what he wanted on the shelf. Can we tell you more? Drop us a note today at 1599 Stierlin Road, Mountain View, California. Or call us at (415) 968-9292.



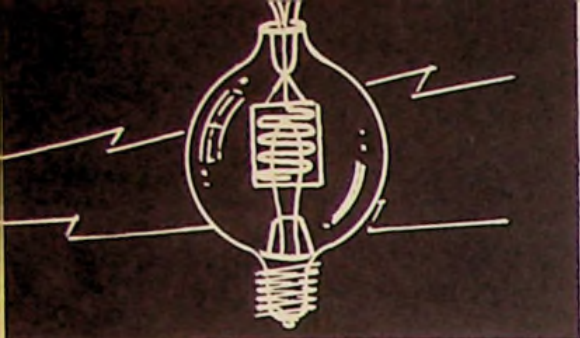
**TRANEX**

prototype and specialty production transformers • quality and quantity • milliwatt to 10 KVA

SAN FRANCISCO BAY AREA — CRADLE OF ELECTRONICS

The Grid is indebted to Earl Goddard, chairman, historical committee, San Francisco Section, past chairman of the section, and member of the board of directors of the Perham Foundation, for the following pictorial history, to be continued in the October issue.

The dates shown and the events illustrated occurred in the San Francisco Bay area. They attest to the significant contributions that have been made to the birth and growth of radio and electronics in this area.



**1906** The full potential of Dr. Lee de Forrest's invention of the triode vacuum tube was not achieved until 1912 when its amplifying and oscillating characteristics were discovered in Palo Alto.



**1909** Although partially successful experiments in 1908 by C. F. Elwell were the first radiotelephone signals, it was not until late in 1909 that wireless using the Poulsen arc proved the efficacy of continuous waves for radio telephony.



**1912** Founding of the Institute of Radio Engineers by the merger of the Society of Wireless Telegraph Engineers (Boston) and the Wireless Institute (New York).

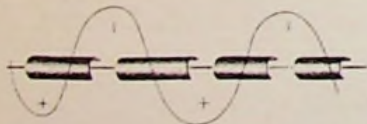
**1916** Founding of the San Francisco Section of the Institute of Radio Engineers.

**1921** Pioneer L. F. Fuller linked major electric power substations in the Bay Area with hydroelectric power plants on the Pitt and Feather Rivers employing radio frequency carrier currents over the 220,000 volt power transmission lines. Techniques developed for such remote control were the forerunners of present telemetry and space communications.



**1931** University of California Nobel Prize winner Dr. E. O. Lawrence constructed one of his first atom-smashing cyclotrons from Federal Telegraph Company 1000 KW arc converter.

**1937** Application of velocity modulation of the electron beam by Russell and Sigurd Varian and W. W. Hansen at Stanford University made possible the first Klystron amplifier of microwave frequencies.



**1947** Drs. W. W. Hansen and E. L. Ginzton of Stanford University developed a twelve foot long linear accelerator forerunner of today's two mile long accelerator of "Project M".



**1955** ERMA, Electronic Recording Machine Accounting, computer system for modern banking. Developed at Stanford Research Institute, produced by the General Electric Company for the Bank of America.



**1960** Courier Communications Satellite used in the transmission of teletype, voice, or facsimile signals. Launched October 4, 1960.

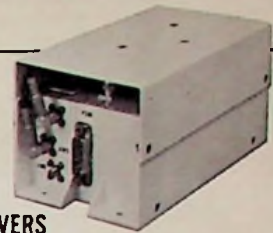
**1963** Merger of the Institute of Radio Engineers and The American Institute of Electrical Engineers to form present society, Institute of Electrical and Electronics Engineers.

(Continued on page 14)



Foothill College President and District Superintendent Calvin Flint (left) looks on as James F. Riley (right), president of Signetics Corporation, presents a \$10,000 check to Ralph M. Heintz, Jr., president of the Perham Foundation. The money was given by the Corning Glass Works Foundation to aid in the construction of the Foothill Electronics Museum on the campus at Foothill College in Los Altos Hills. Signetics is a division of Corning Glass Works, Corning, New York.

## Product: CHALLENGE!



### RECEIVERS L AND S BAND

Frequency:	1435-1535 Mc and 2200-2300 Mc
Frequency Stability:	±0.0005%
Sensitivity:	4 $\mu$ v at 6 db $\frac{S+N}{N}$ ratio (2 $\mu$ v with preamplifier module)
Interference Control:	MIL-I-26600
Power Supply:	115 vac, 400 cps, or 28 vdc
Temperature:	-55°C to +72°C (operating)
Size:	7.50" x 2.50" x 4.0"

## Company: PROGRESSIVE!

RS ELECTRONICS CORPORATION is engaged in the design and manufacture of airborne RF equipment. Our field of activity covers transmitters, receivers and decoders for command and telemetry; associated test equipment; as well as IF amplifiers. With the forthcoming move of telemetry to the UHF bands, our engineers are faced with new and unusual assignments. The miniaturized airborne receiver shown above is a recently completed design. Other jobs in this area are waiting to be done.

We would like to add two senior engineers to our staff. In a small company, they will be exposed to a wide range of responsibilities. They will manage projects, they will do design work, they will be in touch with management and customers. They will be compensated accordingly. If you are that flexible, please mail your resume or contact our Engineering Manager, Mr. John Isabeau, at 795 Kifer Road, Sunnyvale, California.

Telephone  
(408) 739-3230

Or Write



## RS ELECTRONICS

Corporation

795 Kifer Road  
Sunnyvale, California 94086

an equal opportunity employer

### historical notes

#### \$10,000 SIGNETICS GRANT

The building fund for the Foothill Electronics Museum increased by \$10,000 recently with the receipt of a grant from Corning Glass Works Foundation on behalf of Signetics Corporation of Sunnyvale, a division of Corning Glass Works.

The announcement was made jointly by James F. Riley, president of Signetics, and Ralph M. Heintz, Jr., president of the Perham Foundation, which is raising \$225,000 to build and equip the museum. Construction is slated to begin later this year on the campus of Foothill College in Los Altos Hills. The total of cash and pledges received in the drive stands now at \$164,500 according to Heintz.

In making the presentation to Heintz, Riley said "Both Corning Glass Works Foundation and Signetics Corporation are delighted to be able to help in this worthy project. We feel that the Foothill Electronics Museum will have a significant effect on education at all levels in the field of electronics."

Plans have already been formulated with the Santa Clara County school system to include a visit to the museum in the curriculum of all elementary school children. The facility will also complement the college's courses in elec-

(Continued on page 18)

## 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 and literature on "Things to Do and See in L.A."

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





Photograph of the late Dr. Lee de Forest shown holding one of the first "Audion" tubes he invented in 1906. In 1912 it was found that these three-electrode tubes could amplify a signal as well as oscillate. It is this discovery that is credited with launching present-day radio communications systems. Many of these early electronic tubes will be seen in the Perham Electronics Collection at the Foothill Electronic Museum.



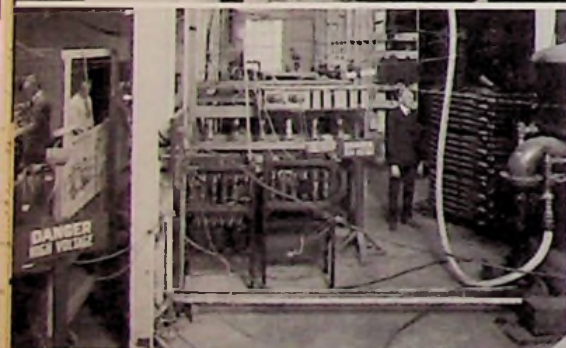
Location of the Poulsen Wireless Telephone and Telegraph Company at the corner of Emerson Street and Channing Avenue in Palo Alto, California. The shed in the back of the cottage became the first laboratory and factory of the Federal Telegraph Company and was the site of the invention of the de Forest triode as an amplifier and discovery of its use as an oscillator for generation of radio frequencies.



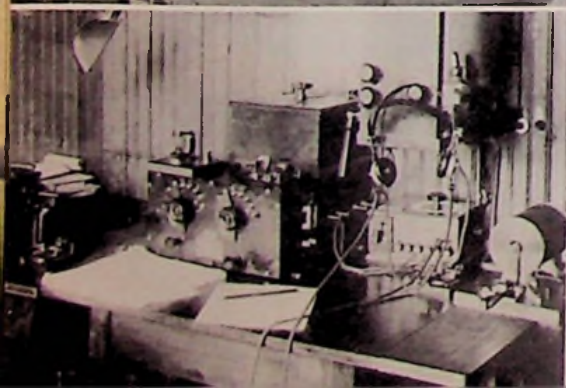
Production line of early vacuum tube transmitters of the Federal Telegraph Company at Palo Alto, Calif. Period mid-1920's.



The first complete arc transmitter and receiver built by the Federal Telegraph Company. The microphone for radiotelephone with multiple buttons to handle the heavy antenna currents may be seen in the center of the panel. Douglas Perham for whom the Perham Foundation is named is at the left. Peter Jensen on the right together with Albertus, center, and Edwin Pridham left the Federal Company to develop the moving coil loudspeaker which was shown at the 1915 San Francisco Exposition. The Magnavox Company produced these loudspeakers for the industry. Jensen later established the company which manufactures the loudspeakers bearing his name.



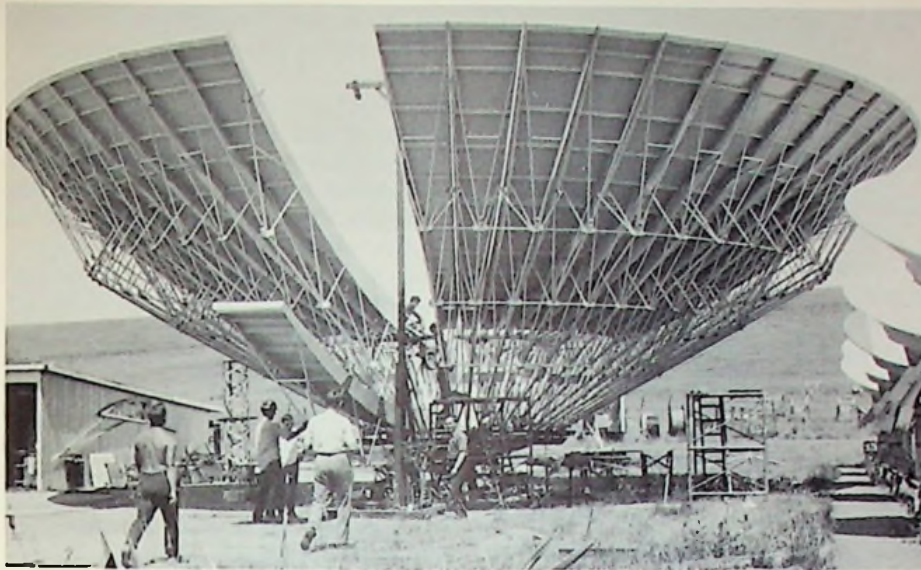
Engineering test area at the Federal Telegraph Company plant in Palo Alto, Calif.



Early wireless telegraphy station of the Marconi Company, typical of those used in inter-island traffic in the Hawaiian Islands about 1901 and on the West Coast soon after. Note the crystal detectors with adjustable cat whiskers mounted on small shelves over the tuning controls of the center unit. Almost a half century later the use of semiconductor materials by Drs. Schockley, Bardeen and Brattain in the development of transistors produced a breakthrough of significance comparable to the de Forest "Audion".

*(To be continued in October)*

September, 1966



Final slice of a new pie-shaped dish antenna, the first of five which will make up the super-sensitive radio telescope being built on Stanford's "antenna farm," is raised into place by engineers of the University's Radio Astronomy Institute. The 60-foot dishes will be placed on steerable mounts to enable them to search the skies for radio stars.

MIT NEWS

### NEW DISH UNVEILED AT STANFORD FARM

The first of five dish-shaped antennas, an array that will combine greater sensitivity and higher resolution (sharp focus) than any radio telescope of its type now existing, was unwrapped recently at Stanford University by Prof.

Ronald N. Bracewell.

The radio astronomer showed the parabolic, 60-foot diameter antenna to industry and government scientists attending an annual electronics research *(Continued on page 16)*

## In the face of rising costs, these new power modules bring the cost per watt of 0.05% regulated DC to an all-time low!

MC-65 SERIES is a new line of all-silicon AC-DC power modules — specifically designed to give you more watts per dollar. A wide range of different voltage and current models is available. So, if you're interested in better power supplies at budget prices — and who isn't — write for information on these new Technipower modules today!

- 314 models, outputs 3 to 152VDC, up to 750 watts.
- Regulation  $\pm 0.05\%$ .
- Temperature coefficient  $0.015\%/^{\circ}\text{C}$  typical.
- Ripple 2mV RMS.
- Temperature rating 65 C.
- Not damaged by output shorts or overloads.
- No turn-on/turn-off overshoot.
- Designed to meet MIL specifications.



Portrait of a Hero

Your inquiry will also bring you a copy of the latest Technipower catalog, giving complete data and prices for more than 4000 power modules and lab supplies.



# TECHNIPOWER

A BENRUS SUBSIDIARY

18 Marshall Street, Norwalk, Connecticut 06856

Represented by Dietrich-Hefner Assocs., 2555 Park Blvd., Palo Alto. 415-DA1-4321

## 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

## ENGINEERING MARKETING MANUFACTURING

in fields of

COMPUTERS  
COMMUNICATIONS  
INSTRUMENTATION  
SEMICONDUCTORS  
MICROWAVE DEVICES

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



## THE CALIFORNIA INVESTOR

By **STANLEY J. WEISS**

President, Intercontinental Properties.

Investing in raw land is not a get-rich-quick overnight proposition; it never has been and never will be.

There are three qualifications for earning money in undeveloped land:

1. Money—it requires some, but not too much, usually 20% to 25% of the purchase price.

2. A Sophisticated Imagination; by that I mean the ability to look at what today is and imagine what it will look like tomorrow (tomorrow being 3-5-10 years from now) as a finished subdivision, complete with homes, trees, etc.

3. Intestinal Fortitude: This means the "guts" to put your money on the line and wait patiently for time to work in your favor, and further, to stand up to the "slings and arrows" of outrageous insults from "know-it-all" friends who are always long on advice but short on cash.

If you have the above qualifications you are then ready for the following steps:

1. Determine the amount of money you have available for down payment.

2. The amount of money you can comfortably afford to save (in the form of monthly payments) each month.

3. Contact a qualified real estate investment firm and tell them you want to discuss an investment in undeveloped acreage.

### WE RECOMMEND

40 acres, San Diego County, in the path of progress and developing area at \$1,000 per acre. Twenty percent (20%) down, no payments on First Trust Deed for one year, interest only for ten years on Second Trust Deed. Property nearby is selling for \$1,500-\$1,800 per acre.

For additional recommendations see "THIS MONTH'S BEST INVESTMENTS" elsewhere on this page.



**INTERCONTINENTAL PROPERTIES**

**BAY AREA INFORMATION: 327-6623**

9021 Melrose Avenue  
Los Angeles 69, Calif.  
Phone: TR 8-3344

### MORE ON BIG DISH

review conference. The five-element radio telescope should be finished in two or three years, he said, and will be used for X-band (3 cm. waves) studies of celestial radio sources from the university's "antenna farm" behind the campus.

Strategic spacing of the five antenna elements in a 675-foot row will squeeze the telescope's fan-shaped observing "beam" down to a mere one-third of one minute of a degree.

This will be three times sharper than the one-minute fan beams so far achieved by multi-element solar radio telescopes at Stanford and elsewhere. It will be six times sharper than the two-minute, pencil-shaped beams of the best giant radio telescopes.

The 15,000-square-foot aluminum surface of the five combined dishes also will soak up more of the weak radio signals from celestial sources than is possible with the smaller dishes of the multi-element telescopes. This, plus new signal amplifiers used with each dish, will increase the new telescope's sensitivity about 30 times over the multi-element solar arrays, designed for receiving the sun's much stronger radio emissions.

The "lobes" of the beam fanning out on each side will widen it to a 10-minute arc in this dimension. By mak-

ing successive fan-beam scannings of a radio source, however, the radio astronomers plan to use computers to reduce their multiple observations to one equivalent, pencil-shaped observation.

The problem can be likened to viewing the stars through a narrow slit, Prof. Bracewell explained. The slit can be narrowed by judicious placement of more antennas in the row, but its length can't be shortened so simply.

The narrow fan-beam should enable the new telescope to observe about 75 of the known "quasars" and other newly discovered, powerful radio-emitting stars with greater precision and effectiveness, he said. These radio sources range up to about one degree in width, and when observed with wider beams they appear very fuzzily.

Radio telescopes observe electromagnetic radio waves from the stars just as big optical telescopes see visible electromagnetic waves, or light, from the stars. Although X-rays and other kinds of electromagnetic radiation are emitted by the stars, only the radio and light waves can penetrate the earth's atmosphere.

The radio astronomy group undertook its own development and construction of the telescope for reasons of economy, Prof. Bracewell said. If commercially produced it would cost about four times as much, he estimates, or around \$3 million.

### THIS MONTH'S BEST LAND INVESTMENTS

SD 0214 30 Acres near Whispering Palms. \$3250/Acre. Low downpayment. 2 years interest only.  
AV 0216 70 Acres Commercial & Manufacturing Potential. \$80,000—Low downpayment & prepaid interest.  
R 0217 130 Acres. Part producing citrus. Key commercial corners. Tax advantages from Grove & Interest only. \$5000/Acre.  
V 0218 40 Acres. Hungry Valley gateway to Pyramid Lake. Low down. Interest only.  
**MAIL COUPON TO:** Intercontinental Properties, 9021 Melrose Ave. Los Angeles 69, California



**BAY AREA INFORMATION: 327-6623**

**INTERCONTINENTAL PROPERTIES 9021 Melrose Ave./Los Angeles/Calif. 90069 Phone: TRemont 8-3344**

- ( ) Please send me information about Listing No. \_\_\_\_\_ above.
- ( ) I am interested in other acreage. Please have your representative phone me for an appointment.
- ( ) I would like you to sell my property.

NAME \_\_\_\_\_ PHONE \_\_\_\_\_  
ADDRESS \_\_\_\_\_ CITY & STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_

"Profits through Service to both Buyer & Seller"

## LET US OSCILLOSCOPE YOUR ESTATE . . .



**WEN BROWN, C.L.U.**

MBA Stanford  
1966 Member Million  
Dollar Round Table

That's right!! . . . Bring in your insurance policies and investment portfolio and some day we will put them on tape, run them across a printed circuit, sit back and view the screen for flaws and imperfections. Until then however, we can ease tax burdens, create trusts and insure incomes through personal estate and financial planning. No printed circuits . . . just years of qualified professional service in the most important field of all—YOUR ESTATE. May we "scope" your portfolio for imperfections? No fee, of course.

### WEN BROWN ASSOCIATES

**INSURANCE AND FINANCIAL PLANNING**  
701 Welch Road, Suite 2220, Palo Alto, California  
327-7277 or 326-1554

IT IS REPORTED:

Michael T. Artam has joined Industrial Training Corp., San Francisco, to manage ITC Engineers, a consulting office, and serve as dean of engineering for ITC Technical College.

Walter H. Kohl, former Los Altos consulting engineer, has joined the senior staff of the NASA microwave radiation laboratory at Cambridge, Mass.

Richard I. Tanaka has been elected vice president of California Computer Products, Inc., Anaheim.

Melvin G. Snyder has been named computer programs manager for Fairchild Semiconductor, Mountain View.

Bertil Lindberg has joined Mentor International, San Francisco-based electronics consulting firm, as a senior consultant.

Donald J. Murphy has been named vice-president-operations of Applied Technology, Inc., Palo Alto.

Jack Carlson has been named northwestern regional manager of Intercon-sal Associates, Inc., Palo Alto.



Granger

Palmer

John V. N. Granger has been appointed to the board of directors of Pacific Plantronics, Santa Cruz.

Robert N. Palmer has been named manager of the microwave division of EIMAC Division of Varian, San Carlos.

Charles Elkind has been promoted to southern California manager of the Western Electronic Manufacturers Assn, having joined the staff as communications manager early this year.

Loren Belcher has been promoted to Apollo program manager at Dalmo Victor, Belmont, responsible for development of the communications antenna system.

Hewlett-Packard Co. has announced plans to acquire a 55-acre plant site in Santa Clara for the development of a major engineering - manufacturing facility.

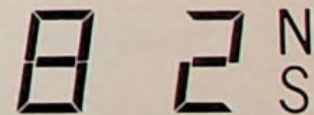
(Continued on page 18)



# New Brilliance and Clarity in a Digital Read-Out!

More than a dozen outstanding features demonstrate that the Tung-Sol DT1511 is the most thoroughly engineered read-out of its type. Its physical and electrical characteristics combine to produce a read-out of unequalled legibility. DT1511 provides all those features most desired for brilliant display, thorough reliability and universal application.

Bulletin T430 contains completely detailed information. Write for a free copy. There is no obligation.



**Brilliance.** Incandescent lamps provide clear, white characters with a minimum brilliance of 500 foot-lamberts at 4.0 volts.

**Clarity.** Seven-segmented characters have high contrast between "on" and "off" segments, for unequalled clarity.

Your Tung-Sol representative:

ED DAVENPORT

Menlo Park, Calif. 322-4671

## TUNG-SOL\*

\*Registered trademark of Tung-Sol Electric Inc.

# RELIABILITY ENGINEERS

### BSEE or BSME-Reliability design review:

Experienced with small electrical components and semiconductors. Prepare procurement, test and design specifications.

### BSEE-Reliability analysis:

Experienced in circuit design and analysis. Perform detailed reliability analyses of complex electronic parts and circuits and recommend improvements in design reliability.

### BSEE-Reliability test engineering:

Prepare test procedures for electrical and electronic packages and coordinate procedures with test laboratories, conduct proofing of test procedures and test equipment.

### BSME-Reliability and inspection:

Perform mechanical and structural reliability analyses. Provide for inspection planning and review prints to determine inspection attributes. Experience in metallurgy and NDT helpful.

### Non-destructive testing:

Background in electronics and applied physics plus knowledge of instrumentation related to the use of X-rays, sound waves, electrical fields and optics.

Write Mr. K. R. Kiddoo, Professional Placement Manager, Lockheed Missiles & Space Company, P.O. Box 504, Sunnyvale, California. An equal opportunity employer.

## LOCKHEED

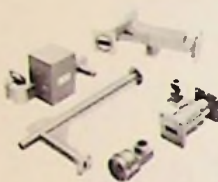
MISSILES & SPACE COMPANY

A GROUP DIVISION OF LOCKHEED AIRCRAFT CORPORATION



For Microwave problems...

...the Eggheads love us

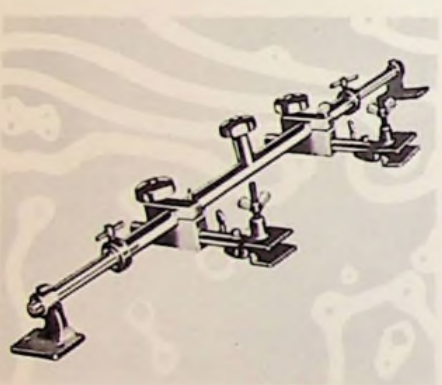


Solving MICROWAVE problems is our business. When the scientists who are pushing the state-of-the-art in systems design come to us for sticky MICROWAVE requirements, we meet the challenge - and they keep coming back. We also produce a broad line of standard PRECISION MICROWAVE COMPONENTS.

Write for Complete Data today!

DESIGNERS & MANUFACTURERS OF MICROWAVE COMPONENTS & SYSTEMS  
 5000 SO MOUNTAIN AVE • MENLO PARK, CALIF. • (415) 357-3285

**mcs**  
 CORPORATION



## Printed Circuit Registration ... In Seconds!

new **"REG-STR-RITE"**  
 screen carriage

Reduces set up time to seconds! Precision silk screen printing registration for critical electronic circuits.

Carefully engineered... round registration knobs provide complete control with simplicity and ease. Write for brochure and price sheet.

**NAZ-DAR**  
**INTERNATIONAL**  
 COMPANY  
 1087 N. NORTH BRANCH STREET  
 CHICAGO, ILLINOIS 60622

### MORE ELECTRONICS MUSEUM

tronics, and its archives will be made available on microfilm to all colleges and universities in the country.

Heintz pointed out that the Foothill Electronics Museum will be both contemporary and historical. Plans call for exhibits which will trace current developments back to the original inventions and devices in the fields of medicine, communications and instrumentation. The basis upon which the museum was conceived is the Perham Collection of over 2000 electronic devices and artifacts dating back to the turn of the century. This collection was recently deeded to Foothill College by the Perham Foundation.

The money to build the museum will also be given by the Perham Foundation to the college which will construct the buildings on a hill surrounding the observatory. The museum will become the center of the space-science complex at the college which now includes the observatory, planetarium, and the Project OSCAR satellite tracking station. Once built, the college will maintain and administer the museum as a part of the community services program under the direction of Dr. Rowland K. Chase, the newly appointed director.



Starr

Seidman

Erdman

### MORE SWINGS

David A. Starr, Jr., has joined RO Associates, San Carlos, as vice president and chief engineer.

Herbert A. Seidman has been appointed manager, product planning and analysis, for the newly-established ground instrumentation operations at Philco WDL, Palo Alto.

Robert L. Erdman has been appointed to the newly-created position of Memorex Product Manager, computer products, at the Santa Clara headquarters.

Jack Doscher of Los Altos is handling the fund raising drive for the college. Other major contributors to date have been Hewlett-Packard, Varian, Lockheed, Philco and Ampex.

## How to get complete product data on Tektronix

...EEM's your best bet! Refer to their catalog in the 1966



**UNITED TECHNICAL PUBLICATIONS**

Subsidiary of Cox Broadcasting Corporation

645 Stewart Ave., Garden City, N. Y. 11530

# Manufacturer / Representative Index

<b>Albacus Div. Whittaker Corp.</b> .....	Dietrich-Heffner Assoc.	<b>Magnetic Shield Division,</b>	
<b>Anacronics, Inc.</b> .....	Frauman Associates	<b>Perfection Mica</b> .....	Frauman Associates
<b>Anerlech</b> .....	Jay Stone & Assoc.	<b>McLean Engineering Labs</b> .....	T. Louis Snitzer Co.
<b>Applied Dynamics, Inc.</b> .....	J. D. Kennedy Co.	<b>Metex Electronics, Inc.</b> .....	Frauman Associates
<b>Astro Communication Laboratory</b> .....	Costello & Co.	<b>Metron Instrument Co.</b> .....	Components Sales Calif.
<b>Baeckman/Systems Division</b> .....	V. T. Rupp Co.	<b>Micro Instrument Co.</b> .....	Jay Stone & Assoc.
<b>Beehman/Invar Electronics</b> .....	T. Louis Snitzer Co.	<b>Micro-Power Inc.</b> .....	Walter Associates
<b>Boenrus Built-Instruments</b> .....	Dietrich-Heffner Assoc.	<b>Micro-Tel Corp.</b> .....	Walter Associates
<b>Brand-Rex Div. of</b>		<b>Microlab-FXR Div. of Microlab</b> .....	L & M Engineering
<b>American Enka Corp.</b> .....	L & M Engineering	<b>Microwave Electronics Corp.</b> .....	Jay Stone & Assoc.
<b>Bryant Computer Products</b> .....	Costello & Co.	<b>Millitest Corp.</b> .....	Components Sales Calif.
<b>Burn-Brown Research Corp.</b> .....	W. K. Geist Co.	<b>Motorola, Inc.,</b>	
		<b>Communications Div.</b> .....	Frauman Associates
<b>Cambridge Scientific Industries, Inc.</b> .....	Dietrich-Heffner Assoc.	<b>Nanosecond Systems</b> .....	V. T. Rupp Co.
<b>Caznoga Corporation</b> .....	Jay Stone & Assoc.	<b>NH Research, Inc.</b> .....	W. K. Geist Co.
<b>Cesary Electronics &amp; Instruments</b> .....	V. T. Rupp Co.	<b>The Nortronics Co.</b> .....	Nickerson-Gray & Assoc.
<b>Ceramagnetics, Inc.</b> .....	Wadsworth-Pacific Mfg. Assoc.	<b>OmniSpectra Inc.</b> .....	Walter Associates
<b>Ceramaseal, Inc.</b> .....	Wadsworth-Pacific Mfg. Assoc.	<b>Pastoriza Electronics</b> .....	W. K. Geist Co.
<b>CoElectron Corporation</b> .....	Costello & Co.	<b>PRD Electronics</b> .....	T. Louis Snitzer Co.
<b>Computer Instruments Corp.</b> .....	Bill Coe & Assoc.	<b>Pacific Measurements</b> .....	V. T. Rupp Co.
<b>Computer Test Corporation</b> .....	King Engineering	<b>Polarad Electronic Instruments</b> .....	T. Louis Snitzer
<b>Coorning Electronic Devices</b> .....	Costello & Co.	<b>Precision Mechanisms Corp.</b> .....	Components Sales
<b>Custom Materials, Inc.</b> .....	Jay Stone & Assoc.	<b>Quan-Tech Labs</b> .....	Jay Stone & Assoc.
<b>Cylbetronics, Inc.</b> .....	Data Associates	<b>Ram Electronics, Inc.</b> .....	Jay Stone & Assoc.
<b>Data Instruments</b> .....	W. K. Geist Co.	<b>Reeves-Hoffman Div. of</b>	
<b>Data Technology Corp.</b> .....	T. Louis Snitzer Co.	<b>Dynamics Corp. of America</b> .....	L & M Engineering
<b>Dielectric Products Eng. Co.</b> .....	Jay Stone & Assoc.	<b>Remanco Inc.</b> .....	Jay Stone & Assoc.
<b>Digital Devices, Inc.</b> .....	Costello & Co.	<b>Rixon Electronics, Inc.</b> .....	Costello & Co.
<b>Digitronics Corp.</b> .....	Components Sales Calif.	<b>Rohde &amp; Schwarz Sales Co.</b> .....	V. T. Rupp Co.
<b>Dynamic System Electronics Corp.</b> .....	King Engineering	<b>Roytron Division, Litton Indus.</b> .....	Costello
<b>Eldorado Electronics</b> .....	T. Louis Snitzer Co.	<b>Schauer Mfg. Corp.</b> .....	Nickerson-Gray & Assoc.
<b>Electronic Engineering Co.</b> .....	Data Associates	<b>Scott, Inc., H. H.</b> .....	W. K. Geist Co.
<b>Electro Optics Associates</b> .....	O'Halloran Assoc.	<b>Sierra Electronic Div., Philco</b> .....	T. Louis Snitzer Co.
<b>Electro Products Labs, Inc.</b> .....	King Engineering	<b>Singer/Metrics/Gertsch</b> .....	Dynamic Associates
<b>Electro Switch Corp.</b> .....	Willard Nott & Co.	<b>Sony Corp., Ind. Prod.</b> .....	V. T. Rupp Co.
<b>Elegence, Inc.</b> .....	V. T. Rupp Co.	<b>Taylor-made Laboratories</b> .....	Data Associates
<b>Emcor-Borg-Warner Corp.</b> .....	T. Louis Snitzer Co.	<b>Technipower, Inc.</b> .....	Dietrich-Heffner Assoc.
<b>Eppley Laboratory, Inc.</b> .....	W. K. Geist Co.	<b>Telonic Industries &amp; Eng.</b> .....	T. Louis Snitzer Co.
<b>Falibri-Tek, Inc.</b> .....	Costello & Co.	<b>Texas Instruments, Ind. Prod.</b> .....	V. T. Rupp Co.
<b>Famrand Controls, Inc.</b> .....	W. K. Geist Co.	<b>T R W Instruments</b> .....	V. T. Rupp Co.
<b>Filmohm Corp.</b> .....	Walter Associates	<b>Transformer Engineers</b> .....	Nickerson-Gray & Assoc.
<b>GTTI Components</b> .....	Wadsworth Pacific Mfg. Assoc.	<b>Trush Co. (Stettner)</b> .....	Nickerson-Gray & Assoc.
<b>General Computers</b> .....	V. T. Rupp Co.	<b>Trymetrics Corp.</b> .....	T. Louis Snitzer Co.
<b>General Resistance, Inc.</b> .....	W. K. Geist Co.	<b>Union Carbide Electronics</b> .....	Jay Stone & Assoc.
<b>Gemisco Systems, Inc.</b> .....	King Engineering	<b>United Precision</b>	
<b>Glow-Lite Corp.</b> .....	Wadsworth-Pacific Mfg. Assoc.	<b>Plastics, Inc.</b> .....	Wadsworth-Pacific Mfg. Assoc.
<b>Gombos Microwave</b> .....	Walter Assoc.	<b>Universal Volttronics Corp.</b> .....	Dietrich-Heffner Assoc.
<b>Grayhill, Inc.</b> .....	Nickerson-Gray & Assoc.	<b>Uptime Corporation</b> .....	Costello & Co.
<b>Griffith/Hallmark</b> .....	T. Louis Snitzer Co.	<b>U. S. Capacitor Corp.</b> .....	Nickerson-Gray & Assoc.
<b>Hallmark Standards, Inc.</b> .....	T. Louis Snitzer Co.	<b>Vero Corporation</b> .....	Wadsworth-Pacific Mfg. Assoc.
<b>Holt Instruments Laboratories</b> .....	W. K. Geist Co.	<b>Wang Laboratories</b> .....	Frauman Associates
<b>Houston Omnigraphic Corp.</b> .....	V. T. Rupp Co.	<b>Warren Components</b> .....	Wadsworth-Pacific Mfg. Assoc.
<b>Howard Industries</b> .....	Nickerson-Gray & Assoc.	<b>Watkins-Johnson Co.</b> .....	L & M Engineering
<b>Island Testing Laboratories</b> .....	W. K. Geist Co.	<b>Waveforms, Inc.</b> .....	W. K. Geist Co.
<b>Intercontinental Instruments Inc.</b> .....	T. Louis Snitzer	<b>Weinschel Engineering, Inc.</b> .....	Jay Stone & Assoc.
<b>Ispoco, Inc.</b> .....	V. T. Rupp Co.	<b>Wilttron Co.</b> .....	O'Halloran Assoc.
<b>Iambda Electronics Corp.</b> .....	Jay Stone	<b>Wyle Laboratories</b> .....	V. T. Rupp Co.
<b>Lockheed Electronics Co.</b> .....	Data Associates		

# explode

...the theory that a challenging career has to include challenging living conditions. United Control, the fastest growing aerospace electronics corporation in the Pacific Northwest, has career opportunities open now. Men who join us will have a chance to contribute to advanced projects of major importance to the aircraft and space industry. They



will be members of a young, vigorous organization that is already leading the way in its field. They'll work with some of the brightest minds in the aerospace industry. And, if you're one of them, you'll enjoy living in one of the world's most beautiful regions. Drive 20 minutes to the cosmopolitan bustle and cultural attractions of Seattle. Drive 40 minutes to snow-capped peaks and mountain wilderness. Golf year 'round, cruise on hundreds of miles of sheltered waters, enjoy clean air ...space...a home with a view. For full details on careers at United Control, send your resume to Mr. D. G. Vawter, Employment Manager.



## UNITED CONTROL

UNITED CONTROL CORP. / REDMOND, WN. 98052

## Representative Directory

<b>Hill Coe &amp; Assoc.</b> P.O. Box 1383 San Carlos; 593-6057	<b>Dynamic Associates</b> 1011 Industrial Way, Burlingame; 344-2521	<b>L &amp; M Engineering</b> 2620 The Alameda Santa Clara; 243-6661	<b>Stone &amp; Assoc., Jay</b> 140 Main Street, Los Altos; 948-4563
<b>Components Sales California</b> Palo Alto; 326-5317	<b>Frauman Associates</b> P. O. Box 357, Menlo Park; 322-8461	<b>Nickerson-Gray &amp; Assoc., Inc.</b> P. O. Box 11295 Palo Alto; 326-0152	<b>Walter Associates</b> 175 S. San Antonio Road, Los Altos; 941-3141
<b>Costello &amp; Company</b> 5335 Middlefield Road, Palo Alto, DA 1-3745	<b>Geist Co., W. K.</b> Box 746, Cupertino; 968-1608, 253-5433	<b>O'Halloran Associates</b> 3921 E. Bayshore, Palo Alto; 326-1493	<b>Wadsworth-Pacific Mfg. Assoc., Inc.</b> 71 Parker Avenue, Atherton; 321-3619
<b>Data Associates</b> 11160 Terra Bella Avenue Mountain View; 961-8760	<b>Kennedy Co., J.D.</b> 770 Welch Road, Palo Alto; (415) 327-0413	<b>Rupp Co., V. T.</b> 1182 Los Altos Avenue, Los Altos; 948-1483	<b>Willard Nott &amp; Co.</b> 1485 Bayshore Blvd. San Francisco; 587-2091
<b>Dietrich-Heffner Associates</b> 22555 Park Blvd., Palo Alto; 321-4321	<b>King Engineering Co., Inc.</b> 525 Grant Street San Mateo; 342-9645	<b>Snitzer Co., T. Louis</b> 1020 Corporation Way, Palo Alto; 968-8304	

# ENGINEERS

(B.S., M.S., & Ph.D.)

Senior level openings available for persons with advanced degrees in Electrical Engineering or Physics, preferably with several years experience in one or more of the fields listed below:

- Optical systems
- Lasers, gaseous and solid-state
- Signal processing systems
- Noise in lasers, detectors

A demonstrated capability for organizing and leading group research and development, and/or a strong background in individual experimentation is highly desirable.

Openings also exist for electronic circuit solid-state engineers with B.S. and M.S. degrees. 1-3 years experience in the following solid-state circuit areas is desirable:

- Receivers
- Transmitters
- Audio-video

Applicants should be able to demonstrate project level ability.

U. S. citizenship required for all positions.

Send resume to:

A. Carollo  
Zenith Radio Research Corp.  
4040 Campbell Avenue  
Menlo Park, California

An equal opportunity employer



Bourne

Brenner

the section

## MEMBERSHIP

The following members have recently been transferred to the grade of Senior Member:

C. P. Bourne      W. E. Price  
B. M. Brenner    R. A. Short



Price

Short

ieee news

## NEW JOURNAL

A new IEEE journal on solid-state circuits will appear quarterly beginning in September, according to Donald G. Fink, general manager of the institute. The new journal will be the central IEEE publication on solid-state circuits. It will emphasize a broad coverage of the technical area extending from devices to systems.

The journal, initiated through the IEEE Group on Circuit Theory, in cooperation with Electron Devices, Microwave Theory and Techniques, and the Computer Group, represents a new era of inter-group cooperation to bring to IEEE members, under one cover, a new and stronger level of reporting of an area heretofore not served comprehensively by a single journal.

## ADVERTISERS INDEX

Baran Associates .....	20
Bel Air Sands Motor Hotel .....	13
Brill Electronics .....	3
Brown, Wen .....	16
Christie Electric Corp. ....	20
Englert and Company .....	15
Fluke Mfg. Co. ....	7
Friden, Inc. ....	9
General Radio Co. ....	Cover 4
ITC Technical College .....	20
International Properties .....	16
Lockheed Missiles & Space Co. ....	17
MCS Corp. ....	18
NAZ-DAR Company .....	18
Neely Sales Div. HP Co. ....	1
RS Electronics .....	13
Singer Co.—Metrics Div. ....	
Gertsch Instruments .....	Cover 3
Technipower, Inc. ....	15
Tektronix, Inc. ....	5
Tung-Sol Electric Inc. ....	17
Tranex .....	11
Union Carbide Electronics .....	2
United Control Corp. ....	19
United Technical Publications .....	18
Varian Associates .....	Cover 2
Zenith Radio Research Corp. ....	20

# 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 15th of month. Write or call: Ernesto A. Montano, IEEE Grid, Suite 2210, 701 Welch Rd., Palo Alto, Telephone (415) 327-6622.

## POSITION WANTED

Engineering/management. Age 27. M.S.E.E., M.B.A. Calif. registered professional engineer. Experience: 14 months instrumentation, 20 months design of nuclear radiation resistant circuits and systems, 20 months design of logic circuits and digital systems. Desires position of responsibility. Resume sent on request. Reply to Box W, IEEE Grid.

## PRODUCTS

### PHASE METERS

0.001 cps to 18 kmc

### DELAY LINES

### PRE-AMPLIFIERS-FILTERS

### AD-YU ELECTRONICS INC.

249 TERHUNE AVE., PASSAIC, N. J.

Sales Rep.: CARL A. STONE ASSOCIATES, INC.  
800 North San Antonio Road, Palo Alto, California

(415) 321-2724

## SPECIAL SEMINAR

### SHORT CIRCUIT CALCULATION AND RELAY COORDINATION

Starts September 22  
Seven Meetings

Presented By:

Mr. Moon Yuen, Senior Supervising Engineer, Bechtel Corporation  
Descriptive Brochure  
ITC Seminars and Courses  
626-6757

### Industrial Training Corporation

160 South Van Ness Avenue  
San Francisco, California

## DEPENDABILITY . . .

That means you can count on us to supply competent, technical talent at a reasonable price. We really do what we promise.



Personnel available to work on your premises or in our design office

### BARAN & ASSOCIATES

1155 CRANE  
MENLO PARK, CALIF.  
324-1615

"We are the job shop"

## AUTOMATIC TESTER FOR BOTH NICKEL-CADMIUM AND LEAD-ACID BATTERIES



- FULLY PROGRAMMED—automatic turn-off or charger activation
- AUTOMATIC READ-OUT—displays ampere-hours
- UNIVERSAL—12 and 24 volts, 3 to 100 ampere-hours
- PORTABLE—only 11½ pounds
- SELF-POWERED—no a-c required

### CHRISTIE ELECTRIC CORP.

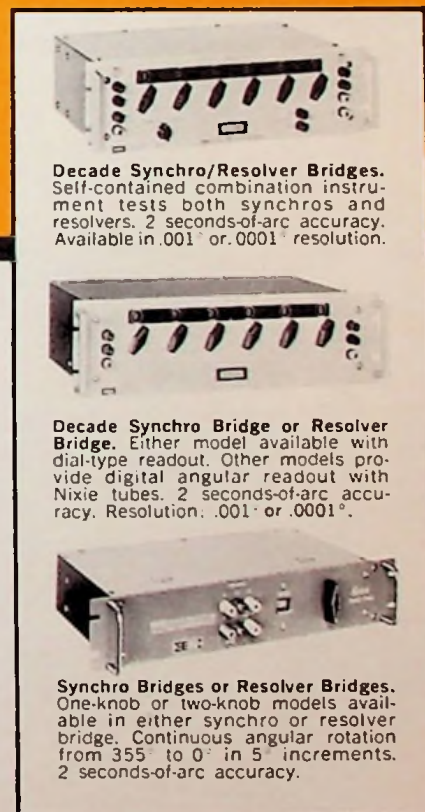
Since 1929

3416 W. 67th St., Los Angeles, Calif. 90043

# You can get *Gertsch*\* quality in Synchro and Resolver Bridges at the lowest prices in the industry



◁ Decade Error Bridges. Three models available, all with built-in phase angle null indicator: Synchro Bridge, Resolver Bridge, and the new combination Synchro and Resolver Bridge. 2 seconds-of-arc accuracy. Optional resolution of .001° or .0001°.



Decade Synchro/Resolver Bridges. Self-contained combination instrument tests both synchros and resolvers. 2 seconds-of-arc accuracy. Available in .001° or .0001° resolution.

Decade Synchro Bridge or Resolver Bridge. Either model available with dial-type readout. Other models provide digital angular readout with Nixie tubes. 2 seconds-of-arc accuracy. Resolution: .001° or .0001°.

Synchro Bridges or Resolver Bridges. One-knob or two-knob models available in either synchro or resolver bridge. Continuous angular rotation from 355° to 0° in 5° increments. 2 seconds-of-arc accuracy.

## High quality—a *Gertsch* tradition!

Gertsch bridges employ the time-proven design techniques developed for *Gertsch RatioTran*\* precision voltage dividers. High input impedance, low output impedance, very low phase shift, and accuracy within 2 seconds-of-arc, are all inherent characteristics of these unique techniques.

## Minimum maintenance.

All units are ruggedly constructed for long, trouble-free operation. Periodic re-calibration and maintenance checks

are practically eliminated since *Gertsch* bridges are essentially ageless devices.

## More models to choose from.

There is a *Gertsch* Synchro Bridge, Resolver Bridge, or combination unit, to meet all requirements. In addition to the models pictured, there are Rotary Solenoid and Relay (programmable) models. Associated instruments, including phase angle voltmeters, dividing heads, and null indicators, are also available.

For complete information, request *Catalog 11*—a valuable reference source for engineers.

Ask your Metrics Sales Representative about the new Singer Time Pay and Lease Programs—

# SINGER INSTRUMENTATION

PANORAMIC • SENSITIVE RESEARCH • EMPIRE • GERTSCH



THE SINGER COMPANY  
METRICS DIVISION  
3211 South La Cienega Boulevard  
Los Angeles, California 90016  
Phone (213) 870-2761

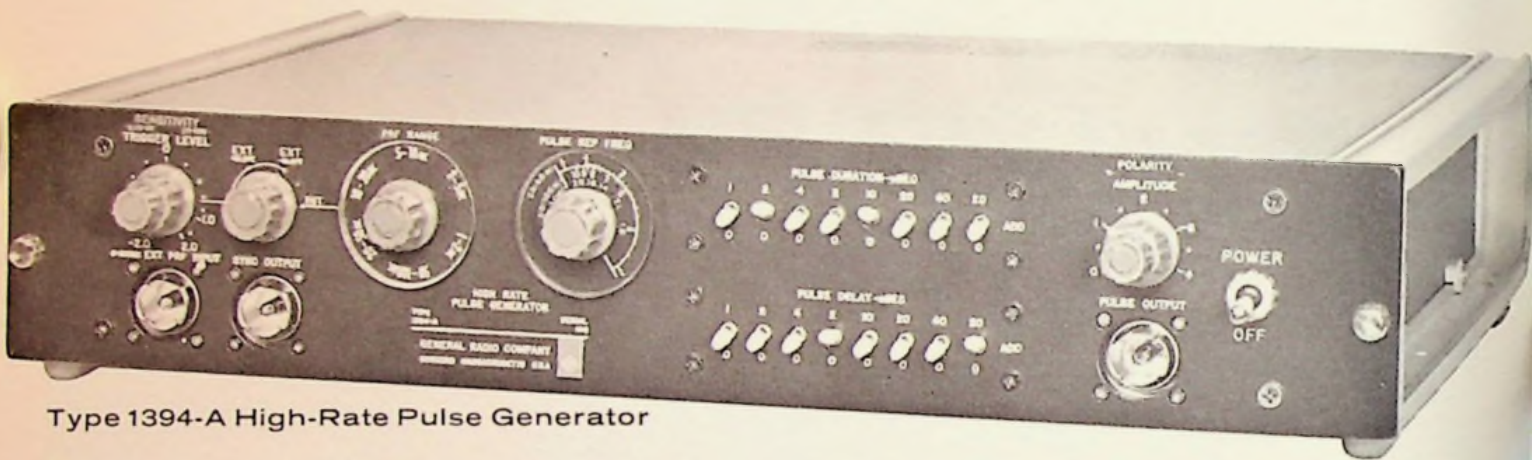




# A NEW 100-MHz Pulse Generator...

for only  
**\$995**  
in U.S.A.

- 1 to 100 MHz generated internally; dc to 100 MHz, externally.
- 2-ns rise and fall times.
- Calibrated output, 0 to 4 volts into 50  $\Omega$  in 1/2-volt steps.
- Duty ratios up to 96%.
- Output-pulse duration variable from 4 to 99 ns in 1-ns steps.
- Trigger-level and slope controls for use with external triggering.



**Type 1394-A High-Rate Pulse Generator**

The development and testing of today's high-frequency digital circuitry call for a pulse generator whose output pulses have:

1. High repetition rate.
2. Fast rise and fall times.
3. Sufficient voltage to switch circuits.

GR's new pulse generator meets these requirements, and it has many other useful features for testing high-speed computers, radar systems, digital-communication systems, and other sophisticated equipment. It has, for instance, calibrated controls for pulse duration, delay, amplitude, and repetition frequency, and pulses of either polarity are available at the output. The fast-rise-time capability of the 1394-A makes it also well suited for the study of component characteristics, such as semiconductor switching speed and pulse-transformer rise time. Add to these features a price that is substantially less than that of comparable instruments and you have a pulse generator that has an unusually high performance/price index.

An accessory unit, the Type 1394-P1 Pulse-Offset Control, is available for applications requiring a dc-coupled output. This unit fixes the base line of the output pulses to any reference voltage from -2 to +2 volts and is continuously adjustable. Price: \$255 in USA.

## Other Pulse Instruments

### Type 1217-C Unit Pulse Generator

... high performance at minimum cost, prf up to 1.2 MHz. Price: \$275 in USA.

### Type 1398-A Pulse Generator

... rise and fall times less than 5 ns, 60-V output pulses, prf up to 1.2 MHz. Price: \$595 in USA.

### Type 1395-A Modular Pulse Generator

... produces practically any pulse shape or train you may want, five different modules available, main frame accommodates up to 7 modules. Price: Main Frame, \$575; Modules, \$160 to \$400 in USA.

### Type 1397-A Pulse Amplifier

... linear amplifier with 1.2-ampere output for use with Types 1217-C and 1398-A or any other pulse generator with negative output pulses. Price: \$495 in USA.

*Write for complete information*

**SAN FRANCISCO OFFICE**  
626 San Antonio Road, Mountain View, California 94040  
Tel: 415 948-8233 TWX: 910 370-7459

# GENERAL RADIO

WEST CONCORD, MASSACHUSETTS