# 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**

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



## 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

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:

### APPLICATION ENGINEERS

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.

### QUALITY CONTROL ENGINEER

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.

### ELECTRICAL ENGINEER OR PHYSICIST

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.

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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.

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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.

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.

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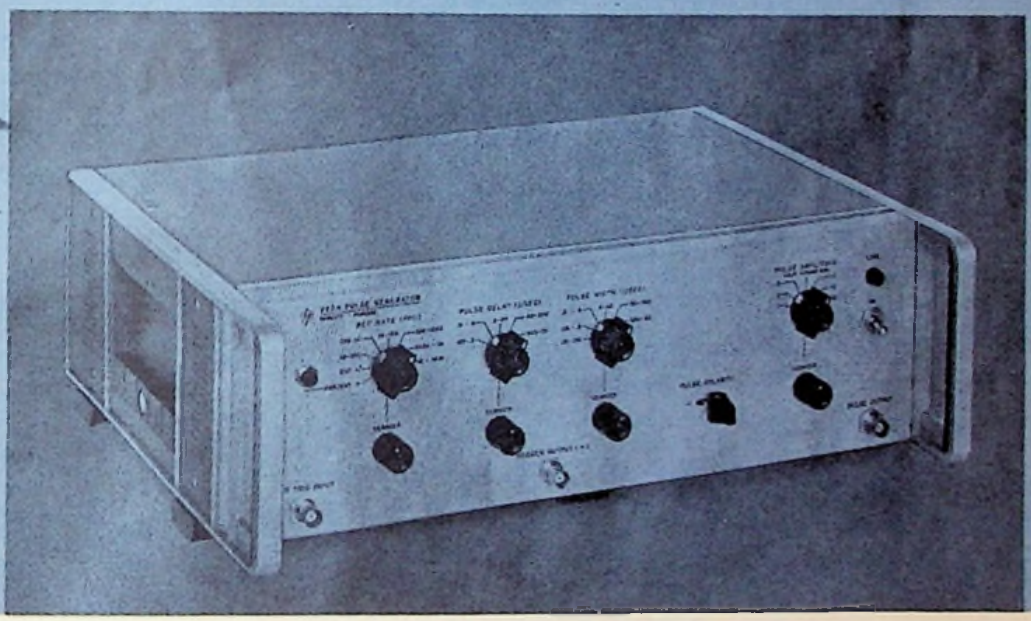

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| Device Design | Product Evaluation |
| Circuit Design | Quality Assurance |
| Wafer Fabrication | Product Packaging |
| Product Engineering | Specification Preparation |

### APPLICANT QUALIFICATION

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A. G. Page
H. S. Payne
S. M. Pollock
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.

## SAN FRANCISCO SECTION DIRECTORY 1966-1967

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*Sedam* *Melchor*

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*Peterson* *McCauley*

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*Light* *Longerbeam*

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*Ross* *Savage*

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*(Continued on page 6)*

# *New Tektronix Type 556*

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**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.

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*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 μs/cm to 5 s/cm; the X10 Magnifier extends the fastest sweep rates to 10 ns/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.

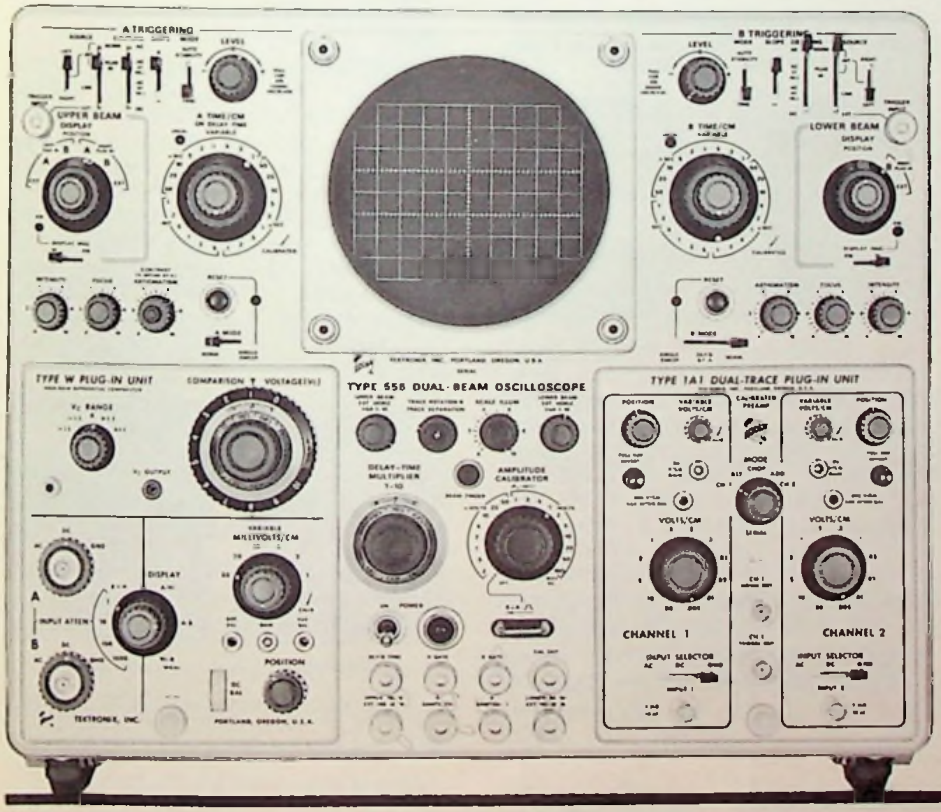
*New Dual-Beam CRT* (with illuminated internal graticule) provides "zero-parallax" viewing of small spot size and uniform focus over the 8 cm by 10 cm display area. Each beam has 6 cm vertical scan, with overlap scan of 4 cm by 10 cm.

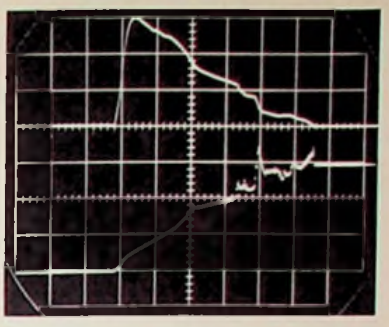
*EMI (RFI) Suppression* — meets interference specifications of MIL-I-6181D over these frequency ranges: 150 kHz to 1 GHz — Radiated (with CRT mesh filter installed), and 150 kHz to 25 MHz — Conducted (power line).

*Size* is 15" x 17" x 24".

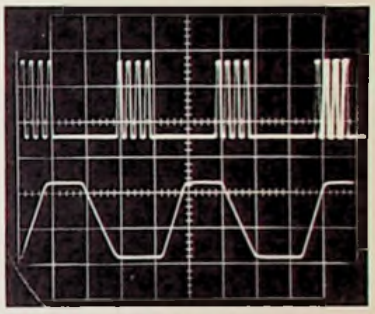
*Weight* is ≈ 80 pounds, without plug-ins.

*Power Requirement* is 100-130 V or 200-260 V, 50-60 Hz ≈ 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 μs/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 μs/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

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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 ±15 V, XI Attenuation. *Calibrated Differential Comparator*—Vc Supply of 0 to ±11 V. Accuracy of ±0.15% of output ±0.05% FS.)

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*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.

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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.

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*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.

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*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*

*remarks from the chairs*

## 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.

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

| | Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|---|
| SECOND | | Power | Instrumentation & Measurement | Industry & General Applications |
| THIRD | Nuclear Science | Automatic Control<br>Engineering in Medicine & Biology<br>Antennas & Propagation<br>Magnetics | Microwave Theory & Techniques<br>Communication Technology<br>Circuit Theory<br>Santa Clara Valley SS<br>Reliability | Vehicular Communications<br>Audio & Electroacoustics<br>Information Theory |
| FOURTH | East Bay SS | Computer<br>Engineering Management<br>Parts, Materials & Packaging | Electromagnetic Compatability<br>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. Rugge, 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, hydronamics, 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*

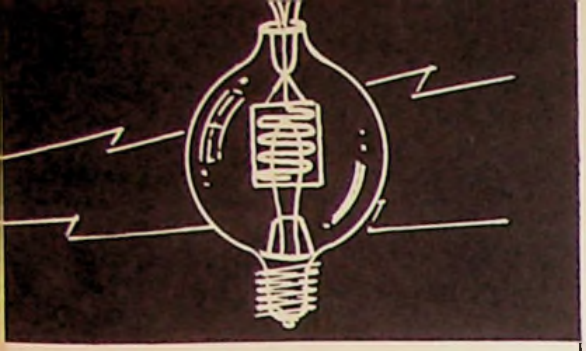
FOR THE SECTION AND YOUR GROUP CHAPTER

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

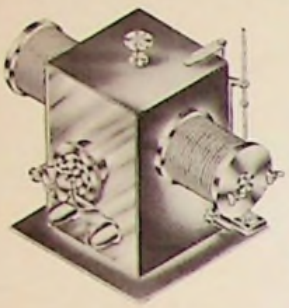
## SAN FRANCISCO BAY AREA — CRADLE OF ELECTRONICS

*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.

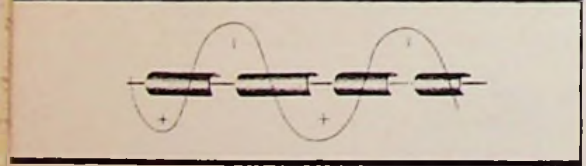

**1912** Founding of the Institute of Radio Engineers by the merger of the Society of Wireless Telegraph Engineers (Boston) and the Wireless Institute (New York).

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

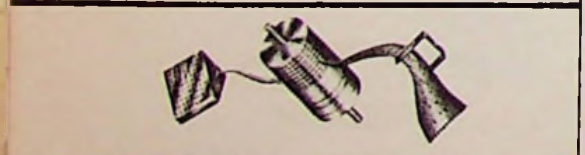
**1921** Pioneer L. F. Fuller linked major electric power substations in the Bay Area with hydroelectric power plants on the Pitt and Feather Rivers employing radio frequency carrier currents over the 220,000 volt power transmission lines. Techniques developed for such remote control were the forerunners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



*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-

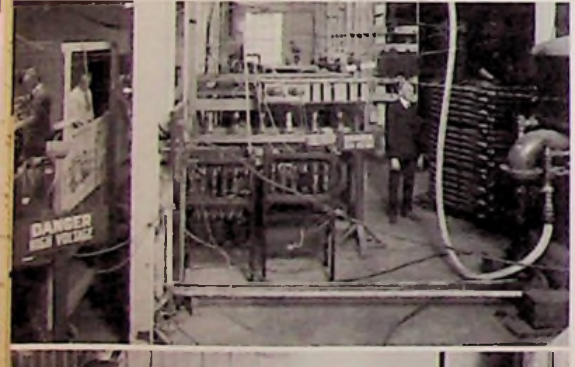
*(Continued on page 18)*

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.

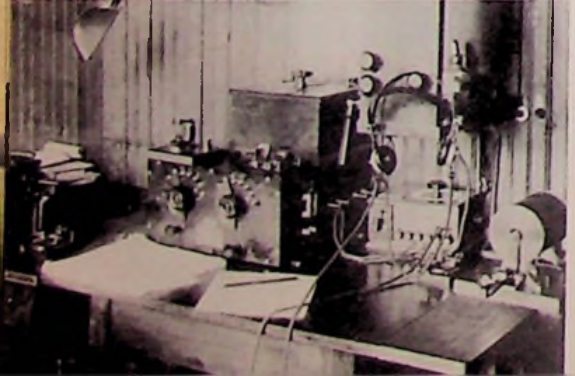
Location of the Poulsen Wireless Telephone and Telegraph Company at the corner of Emerson Street and Channing Avenue in Palo Alto, California. The shed in the back of the cottage became the first laboratory and factory of the Federal Telegraph Company and was the site of the invention of the de Forest 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.

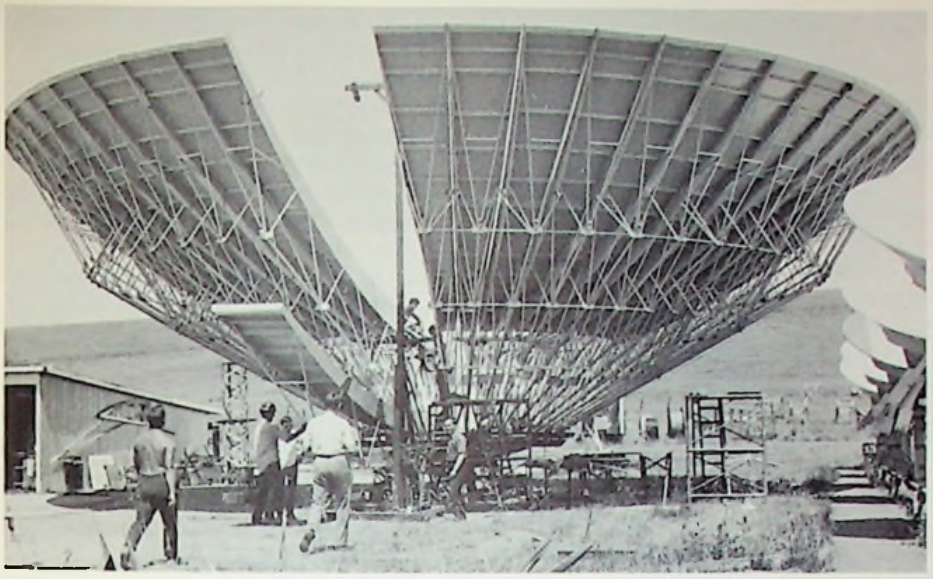


Engineering test area at the Federal Telegraph Company plant in Palo Alto, Calif.



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)*



*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.*

*m i t n e w s*

## 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)*

### 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 making 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.

## 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 Interconsal 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)*

## 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*

*Erdma*

## 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.

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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.

# Manufacturer / Representative Index

Abacus Div. Whittaker Corp. ..... Dietrich-Heffner Assoc.
Accutronics, Inc. ..... Frauman Associates
Acutech ..... Jay Stone & Assoc.
Applied Dynamics, Inc. ..... J. D. Kennedy Co.
Astro Communication Laboratory ..... Costello & Co.

Beckman/Systems Division ..... V. T. Rupp Co.
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Canoga Corporation ..... Jay Stone & Assoc.
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Ceramaseal, Inc. ..... Wadsworth-Pacific Mfg. Assoc.
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Data Technology Corp. ..... T. Louis Snitzer Co.
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Digitronics Corp. ..... Components Sales Calif.
Dynamic System Electronics Corp. ..... King Engineering

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Electro Optics Associates ..... O'Halloran Assoc.
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Metex Electronics, Inc. ..... Frauman Associates
Metron Instrument Co. ..... Components Sales Calif.
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**Data Associates**
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Mountain View; 961-8760

**Dietrich-Heffner Associates**
22555 Park Blvd.,
Palo Alto; 321-4321

**Dynamic Associates**
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Burlingame; 344-2521

**Frauman Associates**
P. O. Box 357,
Menlo Park; 322-8461

**Geist Co., W. K.**
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968-1608, 253-5433

**Kennedy Co., J.D.**
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(415) 327-0413

**King Engineering Co., Inc.**
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San Mateo; 342-9645

**L & M Engineering**
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Santa Clara; 243-6661

**Nickerson-Gray & Assoc., Inc.**
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Palo Alto; 326-0152

**O'Halloran Associates**
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Palo Alto; 326-1493

**Rupp Co., V. T.**
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Los Altos; 948-1483

**Snitzer Co., T. Louis**
1020 Corporation Way,
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**Stone & Assoc., Jay**
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Los Altos; 948-4563

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Los Altos; 941-3141

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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



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

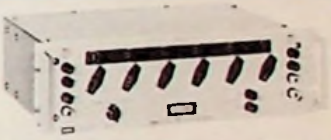
**POSITION WANTED**

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**

# 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°.



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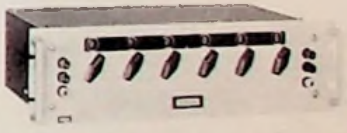

**Decade Synchro Bridge or Resolver Bridge.** Either model available with dial-type readout. Other models provide digital angular readout with Nixie tubes. 2 seconds-of-arc accuracy. Resolution: .001° or .0001°.

**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.

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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.

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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.

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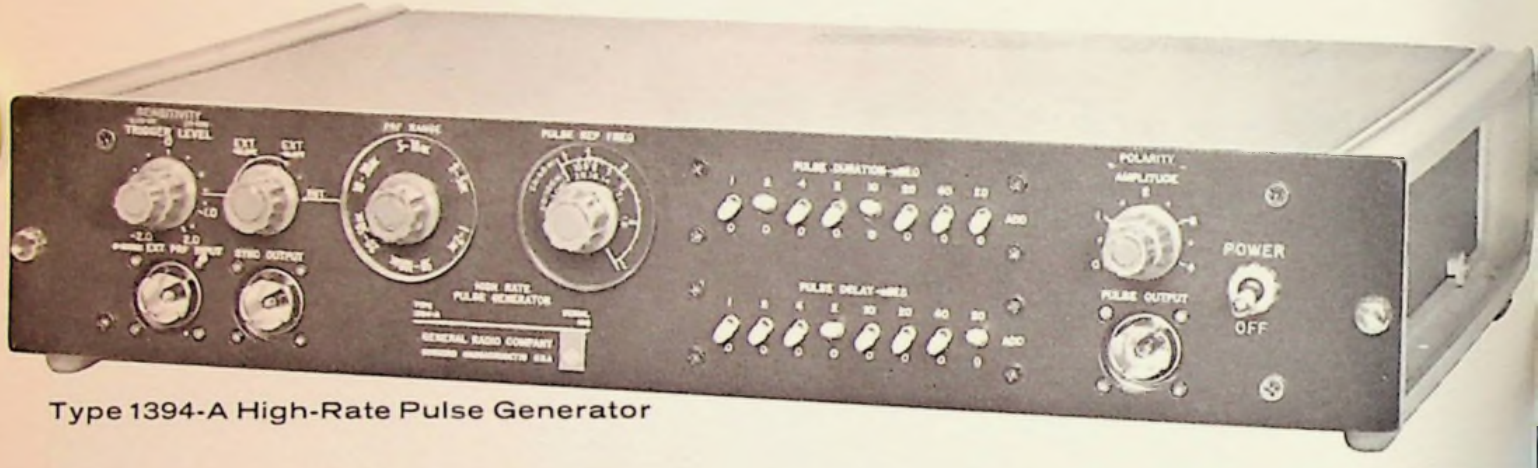


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1. High repetition rate.
2. Fast rise and fall times.
3. Sufficient voltage to switch circuits.

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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.

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**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**
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