

# IEEE *Grid*

MARCH 1966

SAN FRANCISCO SECTION  
INSTITUTE OF ELECTRICAL  
AND  
ELECTRONICS ENGINEERS



## meeting reminder

Aerospace & Electronic Systems, Thursday, March 24;  
Tuesday, April 5; Thursday, May 26  
Audio & Electroacoustics, Thursday, March 24  
Automatic Control, Tuesday, March 15  
Circuit Theory, Wednesday, March 16  
Communication Technology, Wednesday, March 30; Wednesday, May 11  
Computer, Tuesday, March 29  
East Bay Subsection, Monday, March 28  
Electron Devices, Wednesday, March 9; Wednesday, April 13  
Engineering in Medicine & Biology, Tuesday, March 15  
Engineering Writing & Speech (Comtech/SCVSS), Wednesday, May 11  
Industry & General Applications (SCVSS), Wednesday, March 23  
Information Theory, Thursday, March 17  
Instrumentation & Measurement, Wednesday, March 9  
Microwave Theory & Techniques, Thursday, March 17  
Nuclear Science, Monday, March 21  
Reliability, Monday, March 14  
Santa Clara Valley Subsection (I&GA), Wednesday, March 23,  
(Comtech/EWS), Wednesday, May 11  
Student Paper Contest, IEEE Bay Area, Friday, April 1  
Vehicular Communications, Thursday, March 10



# Solve any CCTV problem with one of these seven basic systems from Cohu.



## High-fidelity color

1000 Series system includes the first CCTV camera with built-in references for correct registration and color balance. Compact, rugged, low-cost and easy-to-operate.



## Miniaturized

Series 2000 cameras feature 3" outside diameter cylindrical housings that will accommodate remote-controlled 4:1 zoom lens. Many lens options available, including 10:1 zoom. Operate on 10 or 20 megacycle bandwidths.



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Get top quality TV pictures from radiation environments up to a cumulative dosage of  $10^8$  roentgens and/or  $10^{12}$  neutrons/cm<sup>2</sup> with 3-inch diameter 2500 Series cameras. Readily de-contaminated.



## Airborne

3" or 6" diameter cameras weigh as little as 5 lbs. Unaffected by extremes of temperature, humidity, dynamic pressure, altitude, noise, vibration, shock or acceleration, within broad limits.



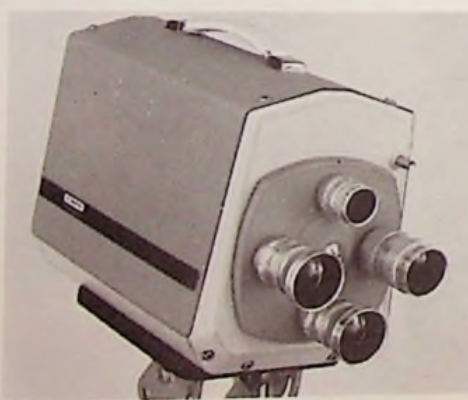
## Environment-resistant

3000 Series cameras provide continuous-duty operation in up to 100% humidity, at temperatures from  $-20^{\circ}\text{C}$ . to  $+60^{\circ}\text{C}$ ., ocean depths to 250 feet and altitudes out to deep space. Meet military explosion-proof specifications. Operate on 10 or 20 megacycle bandwidths.



## High-resolution self-contained

Modular-designed 3100 Series offers choice of plug-in sync generators for EIA 525 or 729, 873 or 945-line scan rates. Automatically compensates for light level variations to 10,000:1.



## Industrial self-contained

Complete with all camera control circuits, Model 20/20 cameras need only video cabling and any standard TV monitor to make a complete CCTV system. Highly versatile.

## Which one solves yours?

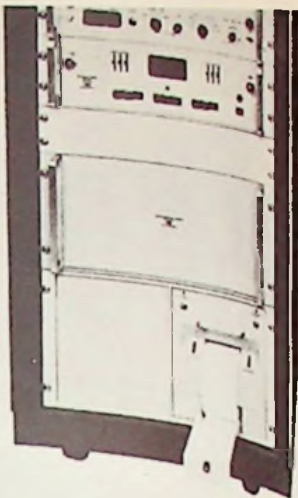
For details on the industry's most complete CCTV line—including monitors, accessories and video switching systems—contact Cohu or your nearest Cohu representative.

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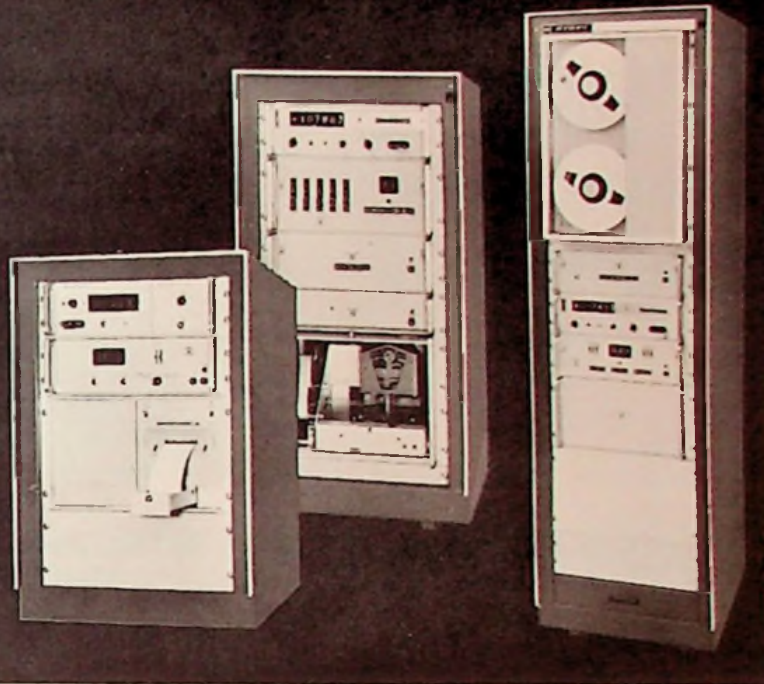
DY-2010C System in DY-2100 Cabinet

### APPLICATION

Dymec Data Acquisition Systems are designed to measure analog data derived from a number of sources, and to display and record this information in digital form. To present the recorded information in its most useful medium, systems are available with a choice of output medium, systems available. For direct reading by the operator, a readout on paper tape is provided. On the other hand, if the data is to be entered into a computer, it may be recorded on punched paper tape, punched cards, or digital magnetic tape, as appropriate.

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# Data Acquisition Requirements?



...Just turn to an hp Data Sheet!

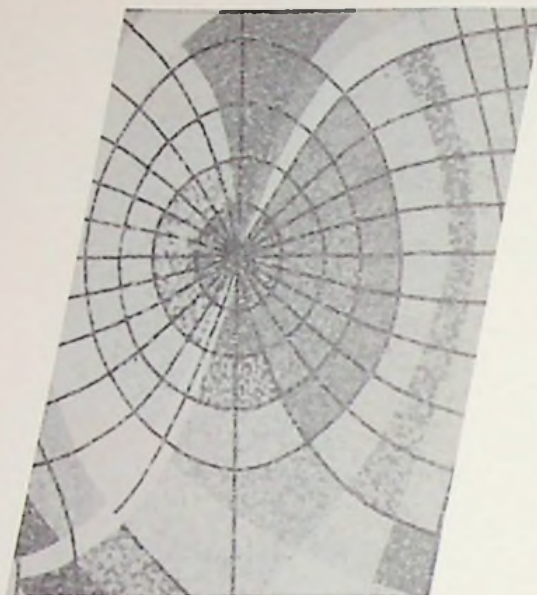
Feature	2013 Series (economy)	2010 Series (noise rejection)	2015 Series (speed, accuracy)	2017 Series (readout in engr. units)
Number of Input Channels	25 (2-wire) or 50 (1-wire) 2013 A-D 25 (3-wire) expandable to 100 2013 J-M	25 (3-wire) expandable to 100 2010A, B, E, H 200 (3-wire) or 100 (6-wire) 2010C, D, F, J	25 (3-wire) expandable to 100 2015A, B, E, H 200 (3-wire) or 100 (6-wire) 2015C, D, F, J	25 (3-wire) expandable to 100 2017A, B, E, H 200 (3-wire) or 100 (6-wire) 2017C, D, F, J
Noise Rejection	NMR 30 dB at 60 c/s (filter) ECMR	Inf. at 60 c/s (integrating)	Inf. at 60 c/s	20 db min. all freq. (integrating)
	At least 105 dB, all frequencies (floating)			
DC Voltage Range	10, 100, 1000 V. fs	0.1, 1, 10, 100, 1000 V. fs	1, 10, 100, 1000 V. fs	0.1, 1, 10, 100, 1000 V. fs
Resolution (mV/digit)	100 $\mu$ V 10 $\mu$ V with amplifier	1 $\mu$ V standard 0.1 $\mu$ V with amplifier	10 $\mu$ V	1 $\mu$ V standard 0.1 $\mu$ V with amplifier
Accuracy (% rdg.)	.05%	.015%	.005%	.015%
Max. Speed, Readings/Sec, DC Volts	1.7 (4 digits)	18 (3 digits) 7 (4 digits) 1 (5 digits)	12 (5 digits)	18 (3 digits) 7 (4 digits) 1 (5 digits)
Optional Measurement Capability	AC voltage, resistance, dc current	AC voltage, resistance (frequency is standard)	AC voltage, resistance	AC voltage, resistance (frequency is standard)
Programming		standard with DY-2901A; add DY-2911C or DY-2560A with DY-2911		
Types of Output Recording	Printed strip, typewriter, punched tape, cards	Printed paper strip, perforated tape, punched card (IBM 526) magnetic tape		
Price Range (Basic System)	\$4495 - \$6000	\$8310 - \$18,550	\$8160 - \$18,400	\$10,960 - \$21,200

Data subject to change without notice. Prices f.o.b. factory.



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*the section*

**MEMBERSHIP**

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

W. F. Davison	J. B. Ghiringhelli
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T. B. Fryer	R. W. Mangum
J. H. Gard	C. Pavsidis

Following are the names of members who have recently entered our area, thereby becoming members of the San Francisco Section:

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program. Bring in  
at least one new  
member in '66.

Bring the benefits of IEEE membership to one of your engineering colleagues. Return the membership pledge card in the December issue and deliver the application form to a prospective member, following up to see that he completes and mails it with his check.

*cover*

Mike Vaccaro, deputy chief of bio-engineering at Marshall Space Flight Center, Huntsville, attired in an Apollo-style space suit, tests full-size mockup of the Lunar Mobile Laboratory (MOLAB) at the Lockheed Missiles and Space Co. in Sunnyvale. LMSC, under a contract with the Bendix Corp. for NASA, is designing a MOLAB life support cabin and its systems including crew displays and controls, and environmental control, for a two-week lunar exploratory tour. The Aerospace & Electronics Systems chapter will devote its March 24 meeting to space suits.

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meeting ahead

### POWER FOR TELEMETERING

W. R. Hampton, Farinon Electric, will address the March 10 meeting of the Vehicular Communications chapter.

Mr. Hampton will discuss design details of liquid petroleum gas-fired thermoelectric generators for powering remote telemetering equipment. The presentation will include a report of field operation experience obtained under environmental extremes found in typical California locations.

Mr. Hampton is vice-president of Hamrea Corp., a subsidiary of Farinon Electric. Previously he spent 15 years with Pacific Gas & Electric Co. in various capacities including project engineering of microwave systems.

meeting ahead

### FAILURE ANALYSIS

The Lockheed Space Systems Division has recently decided that a failure analysis laboratory is a mandatory requirement for supporting the Agena system. C. Ross Bumstead will describe the project at the March 14 meeting of the Reliability chapter.

The discussion will indicate why such a specific laboratory is necessary and what it is expected to accomplish. Some detail will be indicated on how the laboratory will operate and the types of equipment which will be required. A schedule for accomplishment of all phases of this facility will be discussed briefly as well as the various types of funding which are required for the design, fabrication, construction, and operation of such a laboratory. The method of controlling failure analysis within this division will be discussed and how this system fits into a complex failed equipment discrepancy report system and the method of reporting the results to the material review board for the proper corrective action will be described. In addition, a prototype piece of hardware will be displayed indicating a simplicity of hook-up to obtain electrical access to equipment and maximum versatility.

Mr. Bumstead received his BSEE from the University of Colorado and later attended both MIT and Bowdoin College. The majority of his Lockheed career has consisted of setting up and operating all types of laboratories including the environmental test labs at Sunnyvale and the Santa Cruz test base. The development of an exclusive failure analysis laboratory, having little precedence, required extensive test experience.

# Meeting Calendar

## MARCH 9, WEDNESDAY, 8:00 PM — Electron Devices Current status of plasma research

*Dr. Fred Crawford, Stanford Electronics Lab*

Place: PH 101, Stanford

Dinner: 6:00 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto

Reservations: Mrs. Beverly House, 326-4000, Ext. 2304

## MARCH 9, WEDNESDAY, 8:00 PM — Instrumentation & Measurement Precision temperature measurement using quartz thermometer

*Don Hammond and Al Benjaminson, Hewlett-Packard Co., Palo Alto*

Place: Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto

Dinner: 6:30 PM, L'Omelette, 4170 El Camino Real, Palo Alto

No reservations required

## MARCH 10, THURSDAY, 7:30 PM — Vehicular Communications Thermoelectric power converters for remote telemetering systems

*W. R. Hampton, Farinon Electric, San Carlos*

Place: SRI Conference Room B, 333 Ravenswood Ave., Menlo Park

No dinner

## MARCH 14, MONDAY, 8:00 PM — Reliability The development of a failure analysis laboratory

*C. Ross Bumstead, Lockheed, Sunnyvale*

Place: PH 101, Stanford University

No dinner

## MARCH 15, TUESDAY, 8:00 PM — Automatic Control Some control problems associated with the Stanford relativity experiment

*Benjamin O. Lange, assistant professor, Stanford University*

Place: Stanford University Room EE 128

No dinner

## MARCH 15, TUESDAY, 8:00 PM — Engineering in Medicine & Biology Mechanical impact: a model for auditory excitation and fatigue

*H. D. Crane, staff scientist, SRI*

Place: Stanford Medical School, Room M-112

Dinner: 6:30 PM, Red Cottage, Menlo Park

Reservations: Con Rader, 326-1970, Ext. 328 by noon, March 15

## MARCH 16, WEDNESDAY, 8:00 PM — Circuit Theory Some minor topics in network design

*H. I. Orchard, senior staff engineer, Lenkurt Electric Co.*

Place: SRI Bldg. 1, Conference Room B, 333 Ravenswood Ave., Menlo Park

Dinner: 6:30 PM, Red Cottage, Menlo Park

Reservations: Jan Mulvihill, 367-3169 by March 14

## MARCH 17, THURSDAY, 8:15 PM — Information Theory Trainable pattern classifying systems

*Dr. Nils J. Nilsson, head of artificial intelligence group, SRI*

Place: SRI Bldg. 1, Conference Room B, 333 Ravenswood Ave., Menlo Park

Dinner: 6:30 PM, Cote D'Azur, 3301 El Camino, Atherton

Reservations: Miss Shirley Jackson, 966-3865 by March 16

## MARCH 17, THURSDAY, 8:00 PM — Microwave Theory & Techniques Trends in the education of electrical engineers

*Panel discussion: Dr. Glen Wade Moderator; Dr. Richard W. Grow, Dr. Diogenes J. Angelakos, Dr. Alan Peterson, Dr. Max Weiss, Dr. Kenneth Mallory*

Place: Hewlett-Packard auditorium Room 1-A, 1501 Page Mill Rd., Palo Alto

Dinner: 6:30 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto

Reservations: Ruth Thor, SLAC, 854-3300, Ext. 711 by March 16



**MARCH 21, MONDAY, 8:00 PM**— Nuclear Science  
Radiation in space as a damaging environment to spacecraft  
materials and systems

*William E. Price, senior engineering specialist, Philco Corp. WDL, Palo Alto*

Place: Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto

Dinner: 6:30 PM at Rick's

Reservations: Mrs. D. Warner, 321-7801, Palo Alto; Mrs. Marie Garibaldi, 447-1100, Ext. 7821, Livermore, by March 18

**MARCH 23, WEDNESDAY, 7:30 PM**— Santa Clara Valley Subsection/  
I&GA

**Tour of IBM plant and talk**

**The photomicrography of the liquid crystal state**

*Marcel J. Vogel, IBM ASDD, Los Gatos*

Place: IBM plant cafeteria, Monterey & Cottle Rds., San Jose

Dinner: 6:30 PM, IBM Cafeteria

Ladies welcome—no reservations required

**MARCH 24, THURSDAY, 8:00 PM**— Aerospace & Electronic Systems  
Aerospace physiology in conjunction with space suits

*A. L. Hall, Ph.D., Lockheed, Sunnyvale*

Place: Lockheed Auditorium Bldg. 202, 3251 Hanover St., Palo Alto

No dinner

**March 24, THURSDAY, 8:15 PM**— Audio & Electroacoustics  
Standard test tapes—their manufacture and use to the new NAB  
standards

*Robert K. Morrison and K. McKnight, Ampex Corp.*

Place: SRI Conference Room B, Bldg. 1, 333 Ravenswood Ave., Menlo Park

Dinner: 6:15 PM, Red Cottage, Menlo Park

Reservations: Renda Blackler, 948-0571 by March 23

**MARCH 28, MONDAY, 7:30 PM**— East Bay Subsection  
Lasers and laser application

*Steven Schwarz, Ph.D., assistant professor of electrical engineering, UC, Berkeley*

Place: PG&E Oakland Service Center, 4801 Oakport Rd., Oakland

Dinner: 5:30 PM, Oakland Airport Inn, foot of Hegenberger Rd.

Reservations: Mrs. Emerson, Oakland 835-8500; Mrs. Grey, Concord 685-4441; Miss Dhuyvetter, San Jose 291-4852 by March 25

**MARCH 29, TUESDAY, 7:45 PM**— Computer  
Promising avenues for computer research (panel)

*R. Rice, Chairman; L. C. Hobbs, T. Steel, K. Uncapher*

Place: Room ce-134, McCullough Bldg., Stanford University

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

Reservations: W. Sander, 321-7250, Ext. 257 by noon, March 28

**MARCH 30, WEDNESDAY, 7:30 PM**— Communication Technology  
Communication systems for the Bay Area Rapid Transit

*David Noton, engineer, Bechtel Corp.*

Place: PG&E Auditorium, 245 Market St., San Francisco

No host cocktails: 5:45 PM

Dinner: 6:00 PM, Harry's Fashion Restaurant, 22 Davis St. at Market, S.F.

Petite steak, \$4.50 including tip

Reservations: A. R. Dole, 399-4430; C. G. Griffith, 591-8461, Ext. 525 or Miss Wynne, 291-4039 by March 28

**APRIL 1, FRIDAY, 7:30 PM**— Student Paper Contest—IEEE Bay Area

Place: San Francisco State College, 1600 Holloway, San Francisco

Dinner: 6:00 PM at school Cafeteria

**APRIL 5, TUESDAY, 8:00 PM**— Aerospace & Electronic Systems  
Joint with AIAA, AAS and Chemical Engineering Society  
Supersonic transport (SST)

*Speakers from Lockheed and Boeing*

Place: Stanford Auditorium

Dinner: none

(Continued on page 6)

*meeting ahead*

**VOGEL'S CRYSTALS**

The photomicrography of the liquid crystal state will be the subject of a joint March 23 meeting of the Santa Clara Valley Subsection and Industry and General Applications chapter.

The photomicrographs in this exhibit show something familiar in a new way. They are the work of Marcel J. Vogel, staff chemist for the Los Gatos Laboratory of the advanced systems development division, who was singled out as one of IBM's outstanding inventors in 1962 and again in 1963.

Many awards, including the 1963 Watson Trophy for photography in IBM, San Jose, have come to Mr. Vogel. In the 1963 competition sponsored by the Biological Photographic Association, "Methyl Succinic Anhydride," he won first place and earned the Charles S. Foster Memorial Citation for exceptional achievement in photomicrography.

In this exhibit, Mr. Vogel draws chiefly on his studies of the liquid crystal state which occurs in some compounds during the transition from liquid to solid. He records critical phases of his experiments with an integrating camera and polarizing microscope (the Zeiss Ultraphot II). A sample may be examined as a melt or at room temperature; immediately after abrupt cooling, or long after it has cooled. It is viewed in polarized light, with or without phase contrast, and with bright or dark field illumination. It may be magnified as much as 2500X.

*region 6 news*

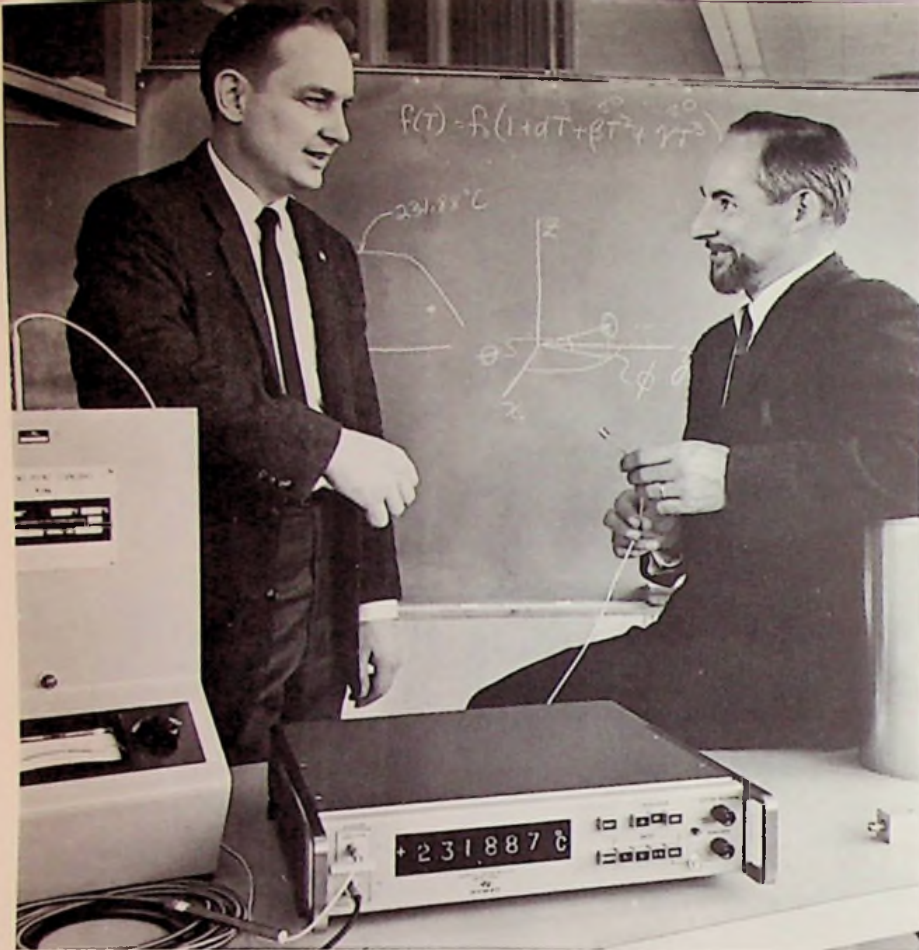
**STUDENT PAPER CONTEST**

The IEEE student paper contest for Northern California and the Bay Area will be held April 1 in the science building at San Francisco State College, beginning at 7:30 p.m., following a 6 p.m. dinner in the college cafeteria.

Participating will be representatives of student branches in the San Francisco and Sacramento Sections, who will compete for first, second and third prizes of \$50, \$30 and \$20 in graduate and undergraduate divisions. First prize winners will also be sent, with expenses paid, to compete in the Region 6 student paper contest in Tucson on April 26, during the annual regional conference. Winners of the regional conference will receive \$300 and be sent to New York to compete against other regional winners.

Section members are invited to attend. Dinner reservations may be made by calling Prof. Rene Marxheimer, S.F. State College, 584-2300, Ext. 706.





Don Hammond (left) and Al Benjaminson, speakers at the March 9 Instrumentation & Measurement chapter meeting, are shown with HP's new linear quartz thermometer (foreground) which uses quartz resonator as sensor to measure temperatures from  $-40^{\circ}\text{C}$  to  $+230^{\circ}\text{C}$  at resolutions up to  $.0001^{\circ}\text{C}$ . Thermometer can measure temperature at many-meter distances, and digitally-presented data can be recorded and processed by existing hardware. One calibration point of thermometer is established by freezing-point of tin ( $+231.88^{\circ}\text{C}$ ).

meeting ahead

### THERMOMETRY

Donald L. Hammond and Albert Benjaminson, Hewlett-Packard Co., Palo Alto, will discuss precision temperature measurement technique at the March 9 meeting of the Instrumentation and Measurement chapter.

Mr. Hammond will discuss the properties of quartz crystals as applied to thermometry. Particular emphasis will be placed on linearization of frequency-temperature characteristics, susceptibility to shock and response to transients in temperature.

A review of the use of platinum resistance thermometry and Quartz Thermometers in achieving accurate temperature measurements from near  $0^{\circ}\text{K}$  to  $500^{\circ}\text{K}$  will be given by Mr. Benjaminson.

Mr. Hammond is general manager of the physics research and development group, where he directs work on quantum electronics, electroacoustics and high vacuum devices. Mr. Benjaminson is engineering manager for transducer development of the Dymec division and was responsible for the quartz thermometer development.

meeting ahead

### RELATIVITY EXPERIMENT

Benjamin O. Lange, assistant professor, department of aeronautics and astronautics, Stanford University, will discuss control problems associated with the Stanford relativity experiment at the March 15 meeting of the Automatic Control chapter.

Stanford University is attempting to perform a gyro test of the theory of general relativity. Newtonian mechanics predict that a torque-free gyroscope in orbit about the earth would show no precession of its spin axis with respect to distant matter such as the "fixed" stars. General relativity, on the other hand, predicts a drift rate of approximately 7 seconds of arc per year. The Stanford gyroscope is designed to have a random drift rate of less than 0.01 seconds of arc per year and a readout system which can compare the direction of the spin-axis and the direction to a "fixed" star to this same accuracy. This degree of performance represents an improvement of roughly six orders of magnitude over conventional means. One system with this performance capability, known as "The Unsupported Gyroscope", is feasible because of the development of a special drag-free, zero-g satellite.

A number of interesting problems in control have arisen in connection with this project and will be discussed. A short sound film depicting the operation of a translational air-bearing simulator of the drag-free satellite will be shown.

## Meeting Calendar

(Continued)

**APRIL 13, WEDNESDAY, 8:00 PM — Electron Devices**  
Some recent developments in traveling-wave amplifier tubes and backward-wave oscillators

*Dr. William E. Waters, Varian Associates*

Place: PH 101, Stanford University

Dinner: 6:00 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto

Reservations: Mrs. Beverly House, 326-4000, Ext. 2304 by April 12

**MAY 11, WEDNESDAY, 8:00 PM — Communication Technology/SCVSS/EWS**

**Television for instruction**

*Glen Pensinger, technical director, instructional television center, San Jose State College*

Place: Educational Bldg., San Jose State College, San Jose, Calif.

Dinner: to be announced

**MAY 26, THURSDAY, 7:00 PM — Aerospace & Electronic Systems**  
**Tour of Paul Masson Vineyards**

Ladies welcome

Place: Paul Masson Vineyards

Dinner: 7:00 PM at the Vineyard

Reservations: Stephen Marx, 326-4350, Ext. 6048 by May 20



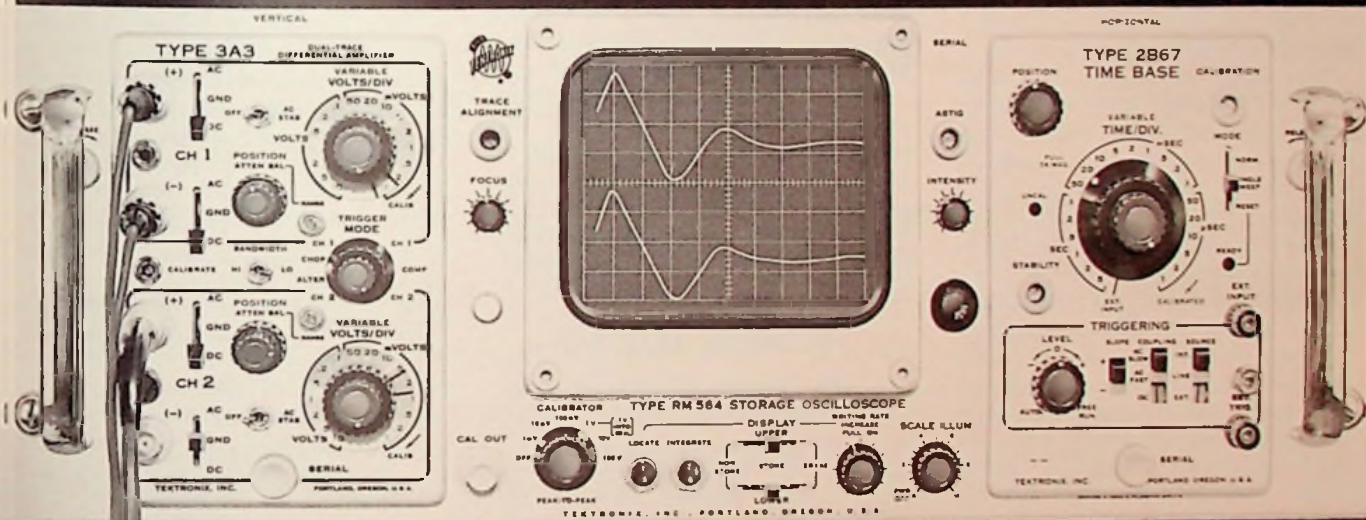
# Type RM564 general-purpose oscilloscope

with added feature of

# STORAGE

## SPLIT-SCREEN

permits simultaneous operation as a storage oscilloscope and as a conventional oscilloscope



■ **presents stored or conventional displays**—The Type RM564 presents full-screen stored displays or full-screen conventional displays. Or—with the split-screen—stored displays can be presented on either the upper or lower half of the crt with conventional displays on the other half.

■ **saves film**—The Type RM564 permits detailed waveform analysis and simplified waveform comparisons, in many instances, without resorting to photography. Just store and analyze—for periods up to one hour, with quick erase in less than one-fourth second.

■ **trace photography is easier and can cost less**—Stored displays can be recorded at one's convenience, without the need for high-speed lens or film.

■ **accepts combinations of 20 plug-in units**—The Type RM564 adapts easily to such applications as multi-trace, low level differential, sampling, spectrum analysis, others—including matched X-Y displays using the same type amplifier units in both the amplifier and time-base channels. Plug-in units offer capabilities from 100 $\mu$ V/cm sensitivity (3A3) and 10MHz passband (3A1, 3A6), to 0.5  $\mu$ sec/cm sweep rate (3B1, 3B3) and sweep-delay applications (3B1, 3B2, 3B3).

■ **saves space**—The Type RM564 occupies **only 7 inches** of standard rack height, yet has a full 8-cm by 10-cm display area.

■ **operates simply and reliably**—Although capable of many sophisticated measurements, the Type RM564 retains the operating convenience of a conventional oscilloscope.

Display shows ability of the Type RM564 to store single-shot events. Waveforms represent displacement of leaf springs due to imparted shocks given them during test. Split-Screen Facility—with independent storage and erase of upper and lower half of the crt—permits easy comparison of test waveforms to a reference display.

Type RM564 Oscilloscope . . . . .	\$960
Type 3A3 Dual-Trace Differential Amplifier Unit . . . . .	790
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18 other plug-in units available.	
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Oscilloscope prices without plug-in units	

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## AUDITORY MODEL

H. D. Crane, staff scientist, Stanford Research Institute, will discuss "mechanical impact: a model for auditory excitation and fatigue", at the March 15 meeting of the Engineering in Medicine & Biology chapter.

Quite good models exist for auditory mechanics from the outer ear to the excitation and response of the cochlear partition with its complex array of membranes and hair cells. The precision of the modeling breaks down, however, at the level of hair-cell excitation because of an incomplete picture of the mechanism of hair-cell stimulation.

An auditory model will be described in which hair-cell excitation is based on mechanical impact of the cochlear hairs against the tectorial membrane, and auditory fatigue is based on a relatively slow mechanical bending of the "silly putty" tectorial membrane. In this model the cochlear system is treated as a spatially distributed, mechanical, envelope-detection system.

This model evolved out of a study of novel, high-frequency mechanical impact devices which are useful for abstracting the envelope of a modulated wave and for generating subharmonic oscillations. The nature of these devices will be discussed as an introduction to the auditory model.

It will be shown how the model can explain a relatively wide range of auditory data such as pitch and threshold shifts with pure-tone fatigue, modulation of a steady, high-frequency tone by a simultaneous low-frequency tone, and rapid high-frequency cut-off in "tuning curves" recorded from single auditory fibers. The model leads to a reinterpretation of such features as pitch sharpening, missing fundamentals, and fatigue.



Crane

Crawford

meeting ahead

## EE EDUCATIONAL TRENDS

Trends in the education of electrical engineers will be considered by a panel at the March 17 meeting of the Microwave Theory & Techniques chapter.

Dr. Glen Wade, University of California at Santa Barbara, will serve as moderator. Other participants will be Dr. Richard Grow, University of Utah, Dr. Diogenes Angelakos, University of California at Berkeley, Dr. Alan Peterson, Stanford, Dr. Max Weiss, Aerospace Corp., El Segundo, and Dr. Kenneth Mallory, Stanford.

To be covered are curriculum changes taking place and recommended, the advantages to students of wider choice of courses and the effects on advisors, and changes in curriculum which will help universities better meet the needs of industry and research laboratories.

meeting ahead

## NETWORK DESIGN

At the March 16 meeting of the Circuit Theory chapter H. J. Orchard, senior staff engineer at Lenkurt Electric Co., Inc., will talk about a number of minor items of possible interest to the network designer.

Mr. Orchard joined the Post Office Research Laboratories in England in

## PLASMA DEVICES

Dr. F. W. Crawford, senior research associate at Stanford's Institute for Plasma Research, will present a status review of plasma devices at the March 9 meeting of the Electron Devices chapter.

A few years ago, considerable enthusiasm existed for realizing the potential of plasma devices for applications as widely differing as microwave amplifiers, phase-shifters and oscillators; power generation by thermonuclear fusion; MHD and thermionic energy conversion, and plasma propulsion of spacecraft. In some of these fields intense activity still continues, and progress is being made. In others, particularly the microwave device area, results are disappointing. This talk reviews the current status of plasma device development, and discusses the obstacles that have been encountered along the way.

Dr. Crawford has been at Stanford University since the end of 1959. He is responsible for a group of research associates and students working on plasma wave and diagnostic problems. He holds degrees in electrical engineering and mathematics from the Universities of London and Liverpool.

1947 where he was mainly concerned with network design and circuit theory. In 1961 he emigrated to the U.S. and joined Lenkurt Electric Co., Inc. in San Carlos; he is presently in charge of the networks and mathematics section in the advanced development department. He received the B. Sc. and M. Sc. degrees in mathematics from the University of London in 1946 and 1951 respectively.



Technical program committee of the 1966 International Symposium on Microwave Theory and Techniques, Palo Alto Cabana, May 16-18: (left to right) V. G. Price, SLAC, R. D. Hall, hp associates, S. Okwit, Airborne Instruments Lab, F. A. Olson, Microwave Electronics Corp., G. L. Matthaei, UC Santa Barbara, D. K. Adams, SRI, E. M. T. Jones,

TRG-West, D. B. Anderson, Autonetics, D. J. Angelakos, UC Santa Barbara, E. N. Torgow, Rantec, P. D. Lacy, Wiltron (chairman, steering committee), R. W. Beatty, Nat. Bur. of Standards, C. L. Cuccia, Philco, W. Culshaw, LMSC, M. Weiss, Aerospace, I. Kaufman, Arizona State University, L. Young, SRI (chairman, technical program committee).



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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.

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**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.

**Associate Engineer** with good scholastic record and BSEE. No experience necessary. Applicant should have an interest in analog and/or digital circuit design and knowledge of solid state circuitry.

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**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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slac news

## ACCELERATOR 80% COMPLETE

The entire 10,000 feet of the two-mile Stanford linear accelerator have been manufactured, 8,000 feet have been installed in the underground housing, and the original \$114 million authorized by Congress "still appears to be adequate for the machine's completion," project director Wolfgang K. H. Panofsky reports.

"The project is approximately 80 per cent complete," he notes in a report circulated to the university's board of trustees. "The full 10,000-foot electron beam will be activated for the first time next May, according to present schedule. About six months of 'shakedown' will ensue and full-scale experiments should begin before the end of 1966."

The accelerator construction is on schedule with plans announced in July 1962, when ground was broken.

Being built by Stanford under contract with the U. S. Atomic Energy Commission, the huge machine will accelerate electrons to energies of 10-20 Bev (billion electron volts). These

### SLAC ON DISPLAY

*Components and scale models of the accelerator will be shown at Stanford Museum through March 15 (10-5 weekdays, 1-5 Sat. and Sun.) in an exhibit entitled "Design for Nuclear Research" prepared by the SLAC staff and the department of art and architecture.*

*Target end of SLAC, where high-energy electrons will bombard atomic nuclei in massive concrete end stations on each side. Klystron gallery (center) stretches 10,000 feet back to the start of the accelerator, which lies buried 25 feet directly beneath in concrete tunnel. Stanford News Service Photo by Chuck Painter.*

will bombard atomic nuclei in high energy physics research, a study aimed at discovering the fundamental nature of matter.

Speaking of the project recently, AEC Chairman Glenn T. Seaborg said: "High energy physics is one of the leading intellectual developments of our age. It is not only very exciting, but experimentation in this field will probably lead to some of the most important, and perhaps then the most practical, developments of our age."

All originally planned SLAC buildings except the two end stations where experimental targets will be set up have been completed, Panofsky says. Building construction is under the direction of SLAC's joint-venture subcontractor, Aetron-Blume-Atkinson, while nearly all design and construction of the accelerator itself is being done by SLAC personnel.

Procurements awarded to industry for accelerator parts and equipment now total \$ 41,300,000. The SLAC staff stands at approximately 1,160. About 275 are senior staff or faculty members, scientists, and engineers. About 180 are temporary employees during construction.

Tests of the accelerator, 2,000 feet at a time, are under way, he reports. Tests with an actual electron beam in the first 666 feet (two sectors of the eventual 30) are continuing.

"The energy and beam quality observed during these tests fully agree with design expectations," Prof.

Panofsky comments.

SLAC's scientific policy committee, a 10-member group of scientists from high-energy physics research centers throughout the country, met in early October for the tenth time. The committee's task is to assure that the machine is available to all qualified scientists for the most productive experiments.

Although the two-mile accelerator will eventually run day and night and handle several experiments at once, anticipated demands are expected to far exceed its available time.

Interest in the project has grown steadily among the public and scientists alike. Over 31,000 people have seen or heard about SLAC through talks or tours. Over 10,000 have visited the site.

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meeting ahead

### LASER APPLICATIONS

Prof. Steven Schwarz, University of California at Berkeley, will discuss lasers and laser applications at the March 28 meeting of the East Bay Subsection.

Dr. Schwarz will demonstrate a helium-neon laser and describe present applications and long-range uses. A graduate of Harvard and Cal Tech, he engaged in full and part-time work from 1962-64 with Hughes Research Laboratories, where he worked with the group which discovered the Q-switched laser and the Raman laser. He has also worked on the application of high-power lasers to plasma diagnosis. He is presently working in quantum electronics.



Schwarz

Nilsson

meeting ahead

### TRAINABLE SYSTEMS

Nils J. Nilsson, head of the artificial intelligence group in the applied physics laboratory of Stanford Research Institute, will discuss trainable pattern classifying systems at the March 17 meeting of the Information Theory chapter. He has been active in pattern recognition research for the past four years and has recently published a book entitled *Learning Machines: Foundations of Trainable Pattern Classifying Systems* (McGraw-Hill, 1965). Dr. Nilsson has taught courses in pattern recognition at both Stanford University and the University of California.

Several prominent pattern recognition techniques will be examined and compared. These techniques include parametric and non-parametric statistical decision methods, adaptive or learning methods exploiting the knowledge gained from recent biological research. Emphasis will be given to those techniques currently under intensive study in the artificial intelligence group at Stanford Research Institute. Results of recent experiments applying these methods to the recognition of hand-printed characters will be presented. The talk will conclude with a discussion of outstanding unsolved problems in pattern recognition research and the directions being taken by present attempts to solve these problems.

march, 1966

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## **BSEE-Reliability test engineering:**

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## **BSME-Reliability and inspection:**

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# WESTERN ELECTRONIC SALES INCREASE 11% IN 1965, SIMILAR 1966 GAINS FORECAST

The west is again pacing U. S. electronics growth.

Sales of electronic companies in the western states increased 11% to \$4.3 billion in 1965 and will show a gain almost as great in 1966, according to a survey just completed by WEMA.

Western companies are forecasting 1966 sales of \$4.74 billion—nearly 26% of the nation's expected electronics output of \$18.25 billion—the WEMA survey reveals.

This could mean upwards of 20,000 new jobs in electronics in the west this year, said WEMA President Wendell B. Sell in announcing results of the survey at the association's annual congressional luncheon in Washington, D. C.

More than 50 senators and representatives from the 13 western states heard the optimistic report by Dr. Sell, who is president of Packard Bell Electronics

Arizona and the Los Angeles and San Francisco Bay areas of California.

Sales of companies in the San Francisco area topped \$1 billion for the first time in 1965 as output expanded 17% over the previous year. Employment has increased 6,000 the past 12 months to the current total of 55,500 in the Bay Area. A sales increase of 13% is forecast for this region in 1966.

Arizona continues to grow at the fastest rate. As employment jumped from 18,600 to 27,000 last year, sales boomed from \$325 million to \$425 million—a 30% increase resulting almost entirely from non-military business. Sales this year should top \$500 million and firmly entrench Arizona as the third largest electronics region in the West.

Well over half of the total electronic sales and employment in the west are still provided by the Los Angeles area,

added such nationally known companies as Hewlett-Packard, Ampex, Litton and IBM to its manufacturers' roster, is becoming an increasingly important factor in the western electronics picture, Dr. Sell said.

While detailed statistics for Colorado are not yet available, the burgeoning electronics complex around Denver is showing signs of rapid expansion, the WEMA president added.

Sales of firms in Colorado, New Mexico, Utah and Nevada totaled \$205 million in 1965 and should reach \$230 million in 1966, according to forecasts.

If you plan to move from the section area notify headquarters and your new section headquarters three weeks in advance to avoid missing important publications and meeting information.

## ELECTRONIC INDUSTRY EMPLOYMENT

	1964	1965
Los Angeles area	143,000	150,000
San Francisco Bay Area	49,500	55,500
Arizona	18,600	27,000
San Diego	10,800	11,500
Pacific Northwest	10,000	11,000
Balance of the West	11,200	12,300
<b>Western Totals</b>	<b>243,100</b>	<b>267,300</b>
<b>U. S. Totals</b>	<b>1,010,000</b>	<b>1,110,000</b>

## ELECTRONIC INDUSTRY SALES

(In millions of dollars)

	1964	1965	1966 (Estimated)
Los Angeles area	\$ 2,150	\$ 2,280	\$ 2,450
San Francisco Bay Area	860	1,005	1,135
Arizona	325	425	500
San Diego	175	195	210
Pacific Northwest	165	190	215
Balance of the West	185	205	230
<b>Western Totals</b>	<b>\$ 3,860</b>	<b>\$ 4,300</b>	<b>\$ 4,740</b>
<b>U. S. Totals</b>	<b>\$ 16,135</b>	<b>\$ 17,000</b>	<b>\$ 18,250</b>

Corp., Los Angeles.

Electronics employment in the west totals 267,300 today, compared to 243,100 a year ago, the WEMA official said. Employment had dropped in 1963 and 1964 when sales reached a temporary plateau, he explained.

Noting that all regions in the west are once more running ahead of the national electronics growth rate, Dr. Sell pointed out that the upswing is due primarily to commercial and other non-defense business rather than Viet Nam.

"The step-up in military buying is boosting sales for some companies, particularly those in microwave and other segments of the industry affected adversely by government cutbacks two years ago," Dr. Sell said.

"However, new technology and rapidly expanding use of electronics in consumer and industrial applications are the major forces behind the present industry expansion."

Pacing the west's growth today are

which is continuing to expand at the same rate as the national average.

Sales of Los Angeles area firms are expected to reach \$2.45 billion this year. That would be a 7.4% increase over the 1965 total of 2.28 billion. Employment climbed 7,000 to 150,000 last year as sales rose 6%.

San Diego and the Pacific Northwest, two areas hit particularly hard by military spending cuts two years ago, have both made good comebacks the WEMA survey reveals.

Electronics employment in San Diego has climbed to 11,500—just under the all-time peak—and sales of \$195 million in 1965 were the highest on record. A sales increase of 8% is forecast this year.

Companies in the Pacific Northwest are expecting to add \$25 million in sales this year, as they did in 1965, bringing total output for 1966 to \$215 million. Employment at electronic firms in the Portland and Seattle areas has climbed 10% the past year to 11,000.

Colorado, which in recent years has

The four largest chapters of the San Francisco Section are Aerospace & Electronic Systems (540), Computer (515), Electron Devices (484), and Microwave Theory & Techniques (429).

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meeting ahead

### SPACE TRAVEL HAZARDS

William E. Price, senior engineering specialist, Philco Corp. WDL, Palo Alto, will present a review of space radiation flux and distribution within the magnetic field of earth at the March 21 meeting of the Nuclear Science chapter. Curves showing distribution of protons between 0.1 and 5 Mev and above 30 Mev and electrons above 40 Kev and above 1.6 Mev will be given and also an argument in favor of low energy radiation testing of semi-conductor devices. Specific spacecraft failures due to radiation damage will be discussed. Radiation damage to materials and electronic devices with examples of choices which may be made to avoid radiation induced problems in systems exposed to space radiation will be covered. A display of samples of irradiated materials demonstrating visible damage will be discussed.

Mr. Price recently joined Philco after leaving NASA's Goddard Space Flight Center. In two years at Goddard he was responsible for the design of a complex radiation facility which is being built for simulation of space radiation on spacecraft. Prior to that Mr. Price worked five years at Lockheed Research Laboratories on radiation effects to spacecraft systems and dosimetry of laboratory and space radiation.



Price

Rice

meeting ahead

### COMPUTER RESEARCH

The March 29 meeting of the Computer chapter will feature a panel discussion on promising avenues for computer research as a repeat of one of the most popular sessions at the recent Fall Joint Computer Conference at Las Vegas. Rex Rice of Fairchild Semiconductor will be the chairman of the session, and the other panelists will be L. C. Hobbs of Hobbs Associates, T. B. Steel of System Development Corporation, and K. Uncapher of Rand Corporation.

The discussions will be based on projections that by 1970, monolithic circuit elements will be produced so efficiently that they will be available at costs of

(Continued on page 20)

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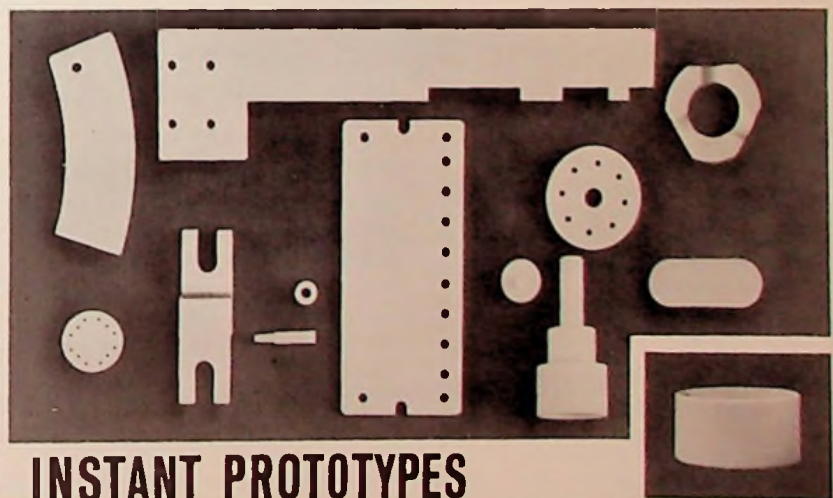
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wescon news

## 1966 PLANS ANNOUNCED

An attendance of 45,000 or more persons has been predicted for the 1966 Western Electronic Show and Convention, scheduled for Los Angeles August 23-26.

WESCON's 1966 executive committee has announced that exhibit applications materials for 1100 display booths are now in the hands of prospective exhibitors.

The huge electronic exhibition and conference will require all facilities of Los Angeles Memorial Sports Arena and Hollywood Park racetrack for product displays, and will utilize the Biltmore hotel for the four-day technical program.

WESCON's exhibitor prospectus, which carries an "eight-shows-in-one" theme, emphasizes the categorization of all exhibits by area of technical product interest. Two of the eight categories—packaging and production, and instrumentation, will be located at Hollywood Park. The remaining six, including circuit components, communication and detection, computers and data processing, audio-TV and automatic control, air and space control systems, and publishing, will be presented in the Sports Arena.

A new special event, the keynote luncheon, will be presented on opening day, replacing the former dinner-dance which was held later in the week. Other

construction design  
seminar

## ITC PROGRAM

A special electrical construction design course, conducted by the Industrial Training Corporation of San Francisco, is being offered for the fifth time to Bay Area professional personnel. The program will be held on Tuesday evenings from 7 PM to 9 PM over a period of 15 weeks. The first session will convene on Tuesday, March 15, 1966 on the premises of ITC at 205 Golden Gate Ave., San Francisco.

This seminar is a unique program, especially developed for the electrical construction industry, based on actual needs and practical experience. There is no other program in the Bay Area that deals directly with the practical problems that designers, draftsmen, and contractors meet in their daily work. The program has also proved extremely valuable for estimators, sales personnel and other persons who have a direct contact with the electrical construction industry.

Additional information about the seminar, enrollment forms and descriptive brochures can be obtained by writing or phoning Industrial Training Corporation, Engineering Division, 205 Golden Gate Ave., San Francisco, 626-6757.

wescon news

## EXHIBITORS' SEMINAR

WESCON will this year provide a forum for company exhibit managers to examine the methodology of successful product exhibiting. William J. Moreland, show director for 1966, announced that the volunteer exhibit committee will present an exhibit seminar at the Biltmore hotel in Los Angeles on April 1.

Under direction of Stephen Skilnyk (Bourns Inc.), chairman; and George Gramlich (Beckman Instruments) and Herb Becker (Herb Becker Co.), a program and "faculty" have been developed for the seminar, and invitations will be mailed to exhibit managers and marketing specialists. Attendance for the all-day session is expected to exceed 150, Skilnyk said.

Moreland noted that WESCON studies, together with comments from exhibitor company personnel had indicated that the opportunity for a comparison of ideas and experiences would be welcomed by responsible industry exhibit personnel.

major activities will include the distributor-manufacturer-representative conference, industrial design awards, Future Engineers show, all-industry cocktail party, and women's activities. The WEMA corporate luncheon will also be held during WESCON.

ieee news

## OCEAN ELECTRONICS

The IEEE Ocean Electronics Symposium, sponsored by the Hawaii Section, will take place at the new Ilikai Hotel convention hall in Honolulu, August 29-31, and will include four technical sessions, field trips to marine and oceanic facilities on Oahu, optional field trips to Kauai, Maui and Hawaii, and a complete ladies' program.

The symposium has been scheduled to follow WESCON (August 23-26) by only three days as a convenience to members wanting to attend both events.

The purpose of the meeting is to stimulate growth and further the state of the art in the field of ocean electrical and electronics engineering, including acoustics, communications, deep submergence, instrumentation, magnetics, man-in-the-sea, military ocean technology applications, mining and salvage application, and undersea cables. Two luncheons, a reception and banquet are scheduled. Proceedings will be published. Exhibits are not planned.

For further information, write: Robert R. Hill, chairman, IEEE Ocean Electronics Symposium, 1441 Kapiolani Blvd., Suite 1320, Honolulu, Hawaii, 96814.



## CALL FOR PARTICIPATION

A "call for participation" in the 1966 Western Electronic Show and Convention technical program has been issued to engineering educators and executives throughout the free world, it was announced by John J. Guarrera, WESCON director and 1966 convention director.

Guarrera reported that the technical program committee, headed by Dr. Samuel Sensiper (Space-General Corp.) and Robert Muchmore (TRW Systems), chairman and vice chairman, has completed publication of the call, and that it is in process of circulation to about 5000 persons directly and to many thousands more through media notices.

The call differs from the traditional invitation to technical authors to submit abstracts for consideration by a selection committee. Instead, it invites proposals for the organization of full technical sessions on specific technical topics. The format is very similar to the 1965 WESCON pattern, Dr. Sensiper noted.

He said that there will be 25-30 WESCON technical sessions in the 1966 program, all to be held in meeting rooms of the Biltmore hotel during WESCON week, August 23-26. The program will be made up of "contributed sessions," proposed and organized by a single group on a single subject, but presenting authors from different organizations, and "invited sessions" made up of speakers specifically invited by the technical program committee to explore a particular subject of technical interest. Dr. Sensiper also noted that the science film theater, in which engineering and other technical motion pictures will be presented on a continuing daily schedule, will also be a part of the technical program presentation.

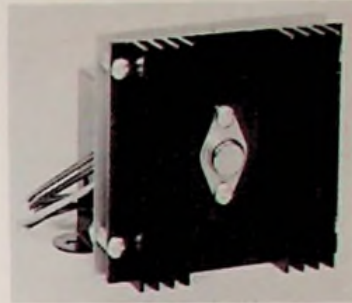
Deadline for submission of letters-of-intent to submit a session proposal is March 10, Dr. Sensiper said, and fully developed session proposals will be due April 15.

Guarrera also announced that plans are now complete for presentation of three concurrent technical symposia. Each will last two days (August 22 and 23), and is being organized by a sponsoring group or technical society. The 7th International Electronic Circuit Packaging Symposium will be presented cooperatively by WESCON, EDN, and the University of Southern California on the USC campus; the IEEE Group on Electron Devices will hold a two-day tutorial symposium at the Statler-Hilton hotel; and the Society of American Value Engineers will present a two-day technical meeting at the Ambassador hotel.

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## SECTION IEEE PARTICIPANTS

Twenty members of the San Francisco Section will take part in the technical program of the IEEE International Convention and Exhibition, New York, March 21-25.

The participants, their session numbers and subjects:

P. D. Dodd, F. B. Wood, IBM, Los Gatos; 5. Transmitted signal design.

D. C. Allais, IBM, Los Gatos; 13. Received signal processing.

E. G. Chilton, Stanford Research Institute, Menlo Park; 21. Transportation.

T. Moreno, Varian Associates, Palo Alto; 34. Electron tubes.

H. J. Shaw, D. K. Winslow, Stanford University; 37. Recent advances in microwave theory and techniques.

W. R. Vincent, Stanford Research Institute, Menlo Park; 40. Present status and future utilization of advanced technology in high frequency systems engineering.

M. M. Atalla, Hewlett-Packard Co., Palo Alto; 42. Solid state devices and integrated circuits.

H. M. Weil, F. S. Coale, Melabs, Palo Alto; 45. Microwave Integrated circuits.

Dean Joseph Pettit, Stanford University; 53. Goals of engineering education.

R. C. Dawer, Lockheed Missiles & Space Co., Sunnyvale; 60. Electronic, ionic and cryogenic components.

C. A. Desoer, K. K. Wong, University of California, Berkeley; 70. Circuit theory II—network analysis and synthesis.

D. D. Siljak, University of Santa Clara; 74. Linear systems and applications.

L. A. Zadeh, University of California, Berkeley; 75. Computer and information sciences in electrical engineering education and the IEEE.

F. M. Dukat, Raytheon Co., Mountain View; 76. Audio & electroacoustics.

W. G. Howard, Jr., University of California, Berkeley; 80. Circuit theory III—special structures.

B. M. Oliver, Hewlett-Packard Co., Palo Alto and junior past president of IEEE, will take part in a special symposium on Tuesday evening, March 23 at 8 p. m. in the grand ballroom of the Hilton: "After Apollo—What?", along with a distinguished panel.

John V. N. Granger, Granger Associates, Palo Alto, is vice chairman of the technical program committee.

Twenty-two of the 31 IEEE Groups have active chapters in the San Francisco Section.

## ANNUAL CONFERENCE

The 1966 annual conference of Region 6 will be held April 26-28 at the Pioneer International Hotel, Tucson, co-hosted by the Tucson and Fort Huachuca Sections with the theme "Future Engineering for Earth and Space."

The three-day meeting will feature 125 technical papers and an exceptional group of invited luncheon and dinner speakers, including Dr. Richard Bellmen, University of Southern California; Dean W. L. Everitt, University of Illinois; Maj. Gen. David P. Gibbs, USA; and Dr. W. G. Shepherd, president, IEEE.

Two sessions on military electronics (electromagnetic compatibility) will be held at the U. S. Army electronic proving grounds at Ft. Huachuca, southeast of Tucson, all other sessions being in the hotel. Technical tours will include the proving grounds, a Titan ICBM installation, and Tucson Gas & Electric Co.

Supplementing the technical program will be the Region 6 student paper contest and a full program for the ladies. No exhibits are planned.

Pre-registration fees for members and non-members through April 20 are \$4 and \$5. Registration fees at Tucson will be \$6 for members and \$7 for non-members.

For advance registration forms or paper abstracts, write: IEEE Region 6 Conference, P.O. Box 12826, Tucson, Ariz. 85711.

Technical sessions and chairmen: circuit theory (I), M. E. Van Valkenburg; hybrid analog computers, G. A. Korn; reliability, I. Bazovsky; nuclear generation of power, N. Hilberry; circuit theory (II), B. R. Myers; computer organization, H. G. Kolsky; communication systems, J. C. Hancock; high voltage DC transmission, E. W. Kimbark; system theory, A. V. Balakrishnan; solid state and gaseous plasmas, S. J. Buchsbaum; engineering education, S. S. Shamis;

Information theory, N. Abramson; biomedical engineering, F. S. Grodins; rotating machinery, E. C. Guilford; military electronics (I), L. E. Killion; military electronics (II), J. J. Lamb; automatic control, J. A. Aseltine; integrated circuits, D. O. Pederson; electromagnetics, L. Felsen; basic sciences, A. Papoulis; optimal control, G. Leitmann; solid state device technology, I. A. Lesk; propagation of pulses, J. R. Wait; atmospheric electricity, M. Brook.

**HELP** THE SECTION GROW  
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**IT IS REPORTED:**

General Electric's atomic power equipment dept., Sunnyvale, has signed a \$79 million contract with Commonwealth Edison of Chicago for a new atomic power reactor for the Dresden power station, Morris, Ill., bringing capacity to 1.8 million kilowatts, a world's record.

Eimac Division of Varian Associates has received three government contracts totalling \$511,000 to supply electron tubes to the defense electronics supply center at Dayton, Ohio.

Robert G. Moore has been appointed systems application engineer for Ultek Corp., Palo Alto, was formerly national sales manager for Photomation, Illinc.

Itek Corp. will request stockholder approval of the purchase of Pennsylvania Optical Co., Reading, Pa., for \$9 million.

Prof. Glenn H. Keitel has been named acting chairman of the San Jose State College electrical engineering dept., succeeding Prof. James C. Mace, who has returned to full-time teaching.

Richard MacMillan has been named chief engineer for Kaiser Aerospace & Electronics, Phoenix.



Linvill

Rollnick

Prof. John G. Linvill, electrical engineering dept., Stanford, has been awarded an honorary doctoral degree of applied science by Belgium's University of Louvain.

William D. Rollnick has been appointed to the new post of vice-president of finance and administration at Data Technology Corp., Mountain View. He was formerly assistant secretary and military marketing manager at Fairchild Hiller Corp.

Dr. Charles E. Enderby has been named director of research and development of Electro Optics Associates, Palo Alto, was formerly a senior scientist at the General Electric microwave laboratory, Palo Alto, responsible for high power traveling-wave tube design and optical modulation, detection and system programs.

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## MORE SWINGS

**Quantic Industries, Inc.**, San Carlos, has been awarded a \$200,000 Air Force contract to develop a new horizon sensor for the primary reference systems of an earth-orbiting satellite.

**Pacific Plantronics**, Santa Cruz, manufacturer of lightweight telephone headsets, announced sales of \$751,309 and earnings of \$64,390 for the first half of the fiscal year ending November 30.

**Dalmo Victor**, Belmont, a division of Textron Corp., has been awarded a \$1.4 million Air Force contract to develop and manufacture an automatic, tape-controlled test system for checking out wiring in fighter aircraft.

**Elmar Electronics, Inc.**, 21 year-old distributor of electronics parts, has completed moving its headquarters from Oakland to a new \$650,000, 40,000 square foot building at 2288 Charleston Road, Mountain View, including its former Palo Alto division, Pencor, now merged into Elmar. Sales of \$8.2 million and net income of \$411,696 were reported for the fiscal year ending October 31. There are 88 employees in Mountain View and 22 at the Oakland facility, now operated as a branch store.

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**Frank J. Gallagher** has been appointed manufacturing manager for connector products for Microdot, Inc., South Pasadena.

**Samuel Levine**, divisional vice-president, systems engineering, business and industry division of Bunker-Ramo Corp., has been elected vice-chairman of the Computer Group, IEEE.

**Andrew J. Unetic**, executive vice-president, Kinetics, Inc., Solana Beach, has been elected chairman of the San Diego Council of WEMA.

**Prof. Edward A. Feigenbaum** has been named director of the Stanford Computation Center, one of the largest university computer installations in the nation. Prof. George E. Forsythe, head of the computer science dept. who previously served as director of the center, will now devote full time to the rapidly growing department.

**Lockheed Missiles and Space Co.**, Sunnyvale, has received a \$1.5 million two-year development contract for SPARCS (Solar Pointing Aerobee Rocket Control System) from NASA, the proposal to link a sun sensor to gas jets activated if the rocket started to veer away from the sun.

**Prof. Edward W. Ernst**, dept. of electrical engineering, University of Illinois, Urbana, has been elected chairman of the National Electronics Conference board of trustees and the NEC board of directors.

**Varian Associates**, Palo Alto, has reported the best quarter in its history with sales of \$28.1 million and net income of \$1.5 million, reflecting the acquisition of Eitel-McCullough, Inc., San Carlos, and Wilkens Instrument, Walnut Creek, now known as Varian Aerograph.

**Eugene C. Meister** has joined Electro-Optical Systems, Inc., Pasadena, as a senior member of the corporate marketing staff.

**Patrick J. Schmitz** has been named manufacturing manager of Signetics Corp., Sunnyvale, was formerly product manager of Globe-Union Corp., Milwaukee, manufacturing manager of Continental Device Corp., and operations manager of Transitron.



# Manufacturer / Representative Index

Abacus Div. Whittaker Corp. ....	Dietrich-Heffner Assoc.	Elgenco, Inc. ....	V. T. Rupp Co.	N-H Microwave .....	SMA/WEST
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American Electronic Labs .....	SMA-WEST	GT I Components .....	Wadsworth Pacific Mfg. Assoc.	Quan-Tech Labs .....	Jay Stone & Assoc.
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<b>S</b> Stone & Assoc., Jay 140 Main Street, Los Altos; 948-4563	<b>W</b> adsworth-Pacific Mfg. Assoc., Inc. 71 Parker Avenue, Atherton; 321-3619	<b>C</b> ostello & Company 535 Middlefield Road, Palo Alto; DA 1-3745	<b>F</b> rauman Associates P. O. Box 357 Menlo Park; 322-8461	<b>R</b> upp Co., V. T. 1182 Los Altos Avenue, Los Altos; 948-1483
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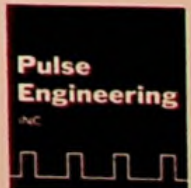
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ted to time-shared, on-line facilities for use by the individual will be explored. Other vital factors such as simplification of software, and improvement of the man-machine interface through development of better input/output concepts and hardware will also be discussed.

During the first part of the meeting, the panelists will present their views of data processing of the year 1970. Audience participation will be invited during the latter part of the meeting.

The meeting will be held at 7:45 pm in Room ee-134 of the McCullough Building on the Stanford campus. This building is located on Lomita Drive opposite the west side of the main Quad, to the south of the (round) Physics Lecture Hall (toward the foothills). Entrance to the building will be via the door opening to the covered walk between the building and the lecture hall.

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



## 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.

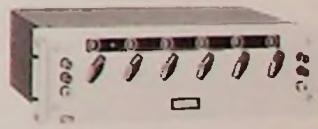
There is a *Gertsch* Synchro Bridge, Resolver Bridge, or combination unit, to meet all requirements. In addition to the models pictured, there are Rotary Solenoid and Relay (programmable) models. Associated instruments, including phase angle voltmeters, dividing heads, and null indicators, are also available.

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

◀ 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.

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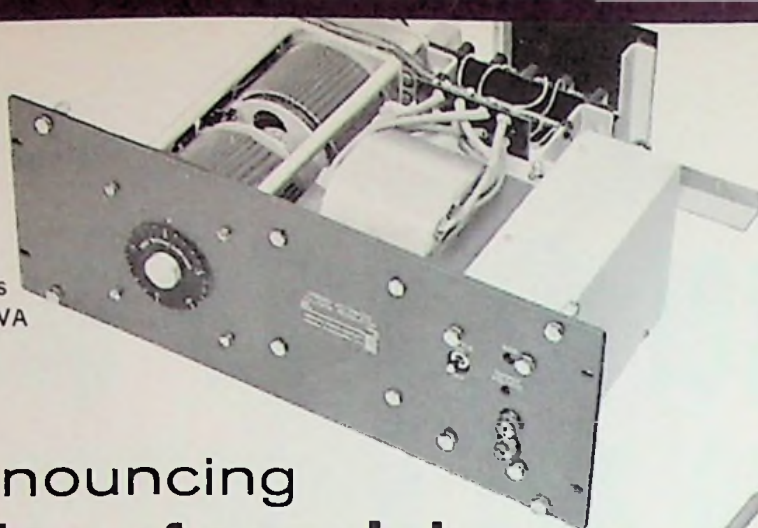
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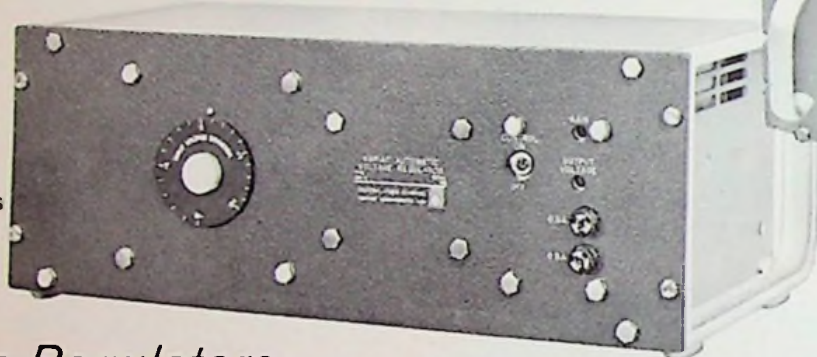
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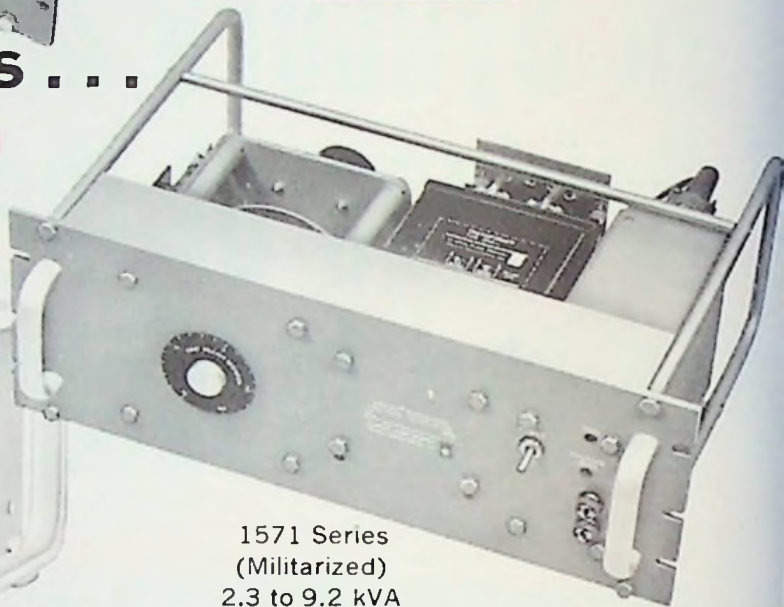
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**designed to meet today's stringent demands  
for better line-voltage control**

1581 Series  
2.3 to 9.2  
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### *These Regulators:*

. . . Hold line voltage constant to  $\pm\frac{1}{4}\%$  despite  $\pm 10\%$  input variations . . . models are also available to hold  $\pm 20\%$  variations to  $\pm\frac{1}{2}\%$ .

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. . . in electroplating applications, deposition rate drops 10% to 20%?

. . . ultrasonic-cleaner and induction-heater output is down at least 20%?

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. . . incandescent lamps must be replaced 2½ times as often as lamps operating at the correct voltage?

. . . cathode-type tubes fail at about ¼ normal life?

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