EDITOR'S PROFILE of this issue

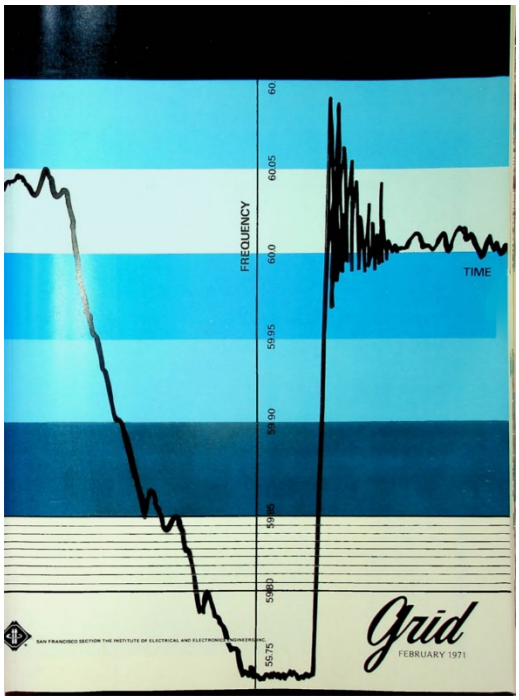
from a historical perspective …

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

February, 1971:

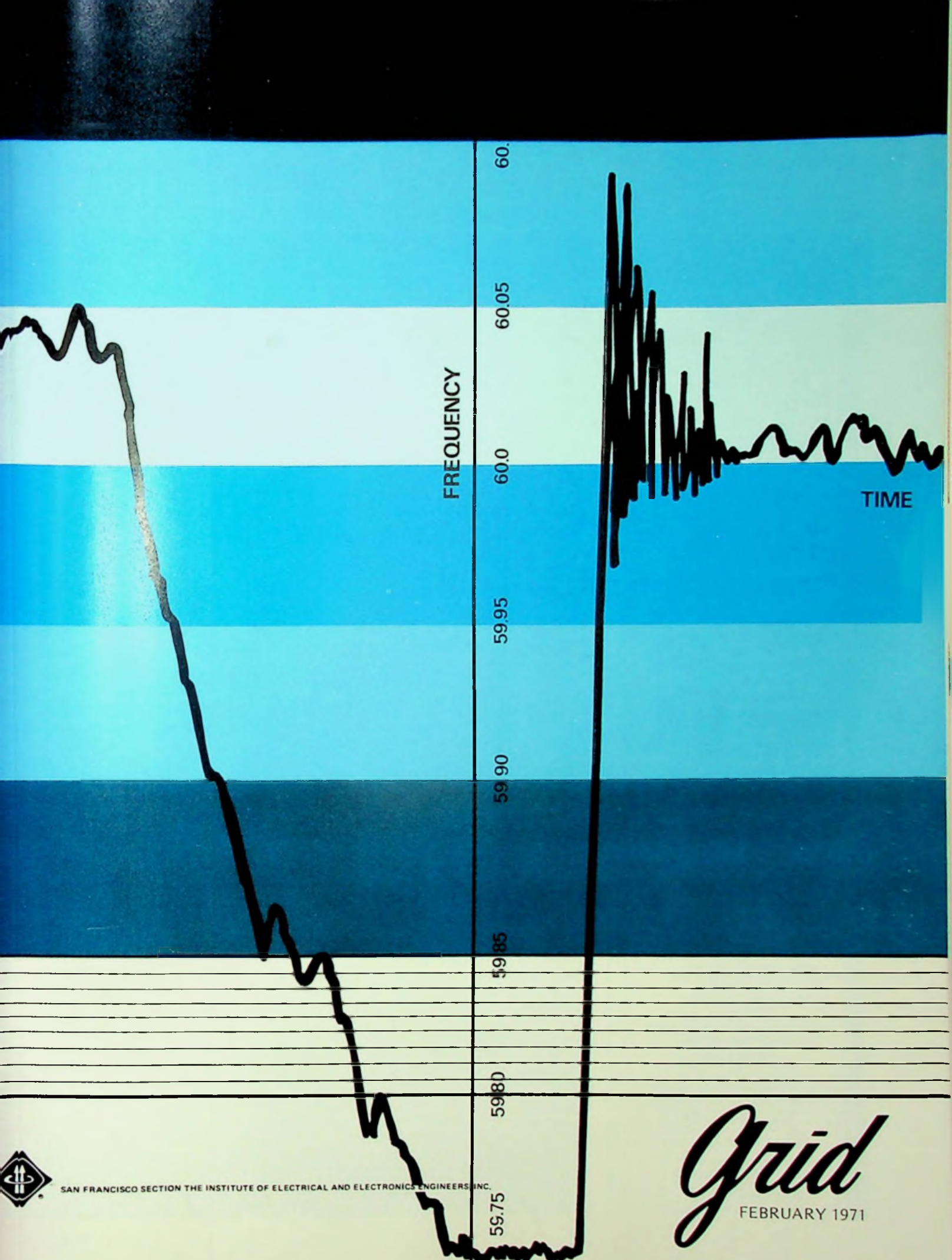
Cover: This graph shows analysis for stability control in a power system subject to disturbances. More on pages 5-8.

Page 10: SRI's "Shakey" intelligent robot is described by Bertram Raphael. A movie is shown of Shakey in operation. The Silicon Valley Technology History Committee put on a program commemorating this early robot: https://r6.ieee.org/sv-techhistory/?page_id=320



Archive of available SF Bay Area GRID Magazines is at this location:
https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History

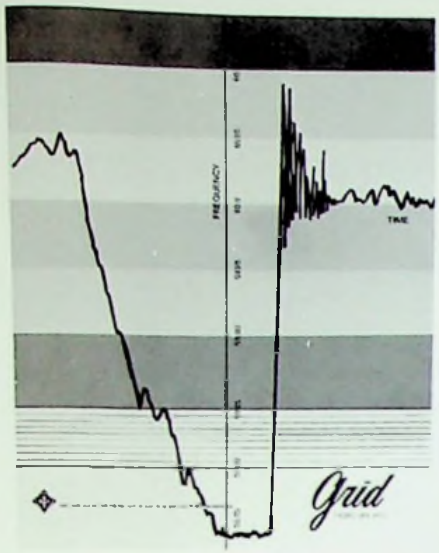
At time of scanning, the bound volumes are held by Paul Wesling. April, 2025 Contact p.wesling@ieee.org



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

Grid

FEBRUARY 1971



THE COVER

This month's issue of GRID features a special article submitted by The Power Group. The cover drawing shows stability control in interconnected power systems. The feature article, "A Brief Review of Generation Excitation Systems," and the cover material were submitted through Ron Thompson of PG&E. See pages 5, 6, 7 and 8.

Grid

volume 17
number 6

FEBRUARY 1971

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

Address all mail except address changes to
San Francisco Section Office, IEEE
Suite 2210, 701 Welch Road
Palo Alto, California 94304
Telephone: (415) 327-6622

Jean Helmke, Office Manager

Members send address changes promptly to
IEEE, 345 East 47th St., New York, N.Y. 10017
Telephone: (212) PL 2-6800

Advertising

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

Second Class postage paid at Palo Alto, Calif.
and at additional mailing offices

Subscriptions:

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

Art & Production

O'Neal Advertising, San Francisco

meeting

AEROSPACE & ELECTRONIC SYSTEMS
FEB. 18

Story on page 14

AUTOMATIC FAULT DETECTION AND ISOLATION IN AEROSPACE SYSTEMS. Ronald R. Crum, Staff Senior Engineer Specialist, Philco-Ford, Palo Alto.

FEB. 18, Thursday, 8:00 PM, Auditorium, Bldg. 56, Philco-Ford WDL, 3825 Fabian Way, Palo Alto. Dinner: 6:15 PM, Rickey's Hyatt House, 4219 El Camino, Palo Alto. Reservations: Pat Hoppe, 326-4350, ext. 6143 by Feb. 15th.

ANTENNAS & PROPAGATION
FEB. 17

Story on page 15

RADAR – A CASE STUDY IN SIMULTANEOUS INVENTION. Prof. Charles Susskind, U.C. Berkeley. A tour of the University Antenna Laboratory will follow the meeting.

FEB. 17, Wednesday, 8:00 PM, Room 277, Cory Hall, U.C. Berkeley. Cocktails 5:30 PM; dinner: 6:15 PM, Spenger's Fish Grotto, 1919-4th St., Berkeley. University Ave. exit off East Shore Freeway. No reservations.

AUTOMATIC CONTROL
FEB. 23

Story on page 15

COMPUTER MONITORING OF SURGICAL PATIENTS. Prof. Gene Franklin, Stanford Electronics Lab., Stanford. Dinner Topic: "Too Many Engineers."

FEB. 23, Tuesday, 8:00 PM, Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto. Dinner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. No reservations.

COMPUTER
FEB. 23

Story on page 9

NEW METHODS IN MEDICAL CARE. Dr. Joseph Terdiman, Medical Methods Research Dept. of Permanente Medical Group.

FEB. 23, Tuesday, 8:00 PM, Skilling Auditorium, Stanford University. Dinner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Reservations: Judie DeMetre, 321-3300, ext. 270 by Feb. 22nd.

ELECTROMAGNETIC COMPATIBILITY
FEB. 15

Story on page 11

RECENT ADVANCES IN EMI FILTER DESIGNS. Speaker to be announced.

FEB. 15, Monday, 8:00 PM, Hewlett-Packard, 5301 Stevens Creek Blvd., Santa Clara. Dinner: 6:30 PM, Custom House, Stevens Creek Blvd. near Wolfe Rd., Cupertino. Reservations: Don Clark, 321-3320 by noon, Feb. 15th.

ELECTRON DEVICES/ MICROWAVE THEORY & TECHNIQUES
FEB. 9

Story on page 9

SYMPOSIUM ON COMMERCIAL APPLICATIONS OF MICROWAVE DEVICES. Seven speakers will discuss what performance and cost are needed for commercial applications. Keynote speaker at the banquet will be Dr. M. M. Atalla, VP and Gen. Mgr., Fairchild Microwave and Optoelectronics Div. Topic: CAN THE MICROWAVE DEVICE INDUSTRY MEET THE CHALLENGE OF THE COMMERCIAL MARKET?

FEB. 9, Tuesday, 1:00 to 8:00 PM, International Bldg., SRI, Ravenswood Ave., Menlo Park. No-host cocktails and Banquet follow the sessions. Registration fee of $7.50 includes the sessions and the Banquet. Registration and fee must reach the Section office by Feb. 3. Attendance will be limited.

ENGINEERING MANAGEMENT
FEB. 10

Story on page 11

HAVE A WINNING STRATEGY? FIND OUT WITH COMPUTERIZED BUSINESS GAMES. Dr. Roger K. Summit, Lockheed M & S Co.

FEB. 10, Wednesday, 8:00 PM, China House, 1163 South Saratoga-Sunnyvale Rd., San Jose. Dinner: 6:30 PM, Reservations: Sue Mendell, 321-2300, ext. 3619 by Feb. 8th.

ENGINEERING IN MEDICINE & BIOLOGY
FEB. 9

Story on page 10

REFLECTIONS OF A HEART TRANSPLANT RECIPIENT. James Marshall.

FEB. 9, Tuesday, 8:00 PM, University of Calif. Med. Center, Medical Science Bldg., Room 664-S. Dinner: 6:00 PM, Cafe El Portal, 8th Ave. and Fulton St., S.F. Reservations: Harry Miller, 321-1200, ext. 6141 by 3 PM, Feb. 8th.

calendar

GOLDEN GATE SUBSECTION/SAN FRANCISCO SECTION EAST BAY and SANTA CLARA VALLEY SUBSECTIONS
"Mid March"

ANNUAL "OLD TIMERS NIGHT." C. W. Leihy, Past Consulting Editor of "Electrical West."

Engineers Club of San Francisco, 160 Sansome St. See March Grid for details.

INDUSTRIAL ELECTRONICS & CONTROL INSTRUMENTATION
FEB. 17

Story on page 12

POLLUTION AND THE ENVIRONMENT. Ladies and guests welcome. Carroll Maninger, Head, Electronics Engineering Research Div., Lawrence Radiation Lab., Livermore.

FEB. 17, Wednesday, 8:00 PM, University Room, Rickey's Hyatt House, 4219 El Camino, Palo Alto. No-host cocktails 6:15; dinner: 6:45 PM Reservations: Fran Casalino (408) 289-2365 by Feb. 17th.

INDUSTRY & GENERAL APPLICATIONS
FEB. 18

Story on page 12

INDUSTRIAL CONTROL FOR POST OFFICE MAIL HANDLING. Henry Hoge, Engineering Mgr., Wismer & Becker, Sacramento.

FEB. 18, Thursday, 8:00 PM, Marconi's Rest, 122 Battery St., San Francisco. Dinner: 6:30 PM. Reservations: W. E. Blinn, (415) 391-3230.

INFORMATION THEORY
FEB. 18

Story on page 13

INTERFERENCE REJECTION IN COMMUNICATION SYSTEMS. Dr. Richard C. Boonton, Jr., Manager, Electronic Information Systems, TRW, El Segundo

FEB. 18, Thursday, 8:30 PM, SRI, Bldg. 1, 333 Ravenswood Ave., Menlo Park. Dinner: 6:00 PM, Velvet Turtle, 325 Sharon Park Dr., Sharon Heights Shopping Center, Menlo Park. Reservations: Miss Geri Gibling, 326-6200, ext. 3881 by Feb. 17th.

RELIABILITY
FEB. 11

Story on page 15

THEORY & APPLICATIONS OF THE SCANNING ELECTRON MICROSCOPE. John Devaney, Senior Microscopy Engineer, Jet Propulsion Laboratory, Pasadena.

FEB. 11, Thursday, 7:30 PM, Lockheed Missiles & Space Co., Bldg. 104-PIC Room. See direction in story. No dinner. For meeting reservations call Phil Guillot, 742-7026 by Feb. 10th.

SANTA CLARA VALLEY SUBSECTION/ COMMUNICATION TECHNOLOGY
FEB. 8

Story on page 14

JOINT MEETING. THE AUTOMATED OPERATOR OR THE ELECTRONIC SWITCHING SYSTEM. Bruce Jamison, Pacific Telephone. Tour of the Electronic Switching System in Hayward. Attendance limited to 40 people.

FEB. 8, Monday, 8:00 PM, Pacific Telephone Co., 1129 "B" St., Hayward. No-host cocktails and dinner at 6:00 PM at the Doric Hayward Motor Hotel, Jackson and Foothill Blvd., Hayward. Reservatons: Mrs. Audrey Neal, 291-4837 or Mrs. Helen Stowe, 291-4667 by Feb. 5th.

SYSTEMS SCIENCE & CYBERNETICS
FEB. 16

Story on page 10

PROBLEMS IN THE DESIGN OF INTELLIGENT ROBOTS. Dr. Bertram Raphael, SRI, Menlo Park.

FEB. 16, Tuesday, 8:00 PM, SRI, 333 Ravenswood Ave., Menlo Park. Dinner: 6:00 PM, Stickney's, 1 Town & Country Village, El Camino & Embarcadero, Palo Alto. Reservations: Section office, 327-6622 by noon, Feb. 12th.

VEHICULAR TECHNOLOGY
FEB. 15

Speaker and subject will be announced by mailing to the VT membership.

FEB. 15, Monday, 8:00 PM, The Shadows Restaurant, 213-2nd Ave., San Mateo. Cocktails: 6:00 PM; dinner: 7:00 PM. Reservations: Section office, 327-6622.

1971-1972 SECTION NOMINEES


L. G. Fitzsimmons


Dawton W. Martin


Lawrence E. Jenkins


Charles A. Eldon


Ed Jackson


Stanley F. Kaisel

L. G. FITZSIMMONS FOR CHAIRMAN

Present Vice-Chairman, now Chief Engineer in San Jose for Central Counties Pacific Telephone. Graduated from University of California in 1940 with BSEE. Completed one-year Applied Communications course at Naval Postgraduate School, Annapolis. Eleven years with Bell Telephone Laboratories. Since 1951 with Pacific Telephone in various engineering, maintenance and staff assignments. Member of Tau Beta Pi, Eta Kappa Nu and American Society for Engineering Education. Fellow of the IEEE. Member of the Communication Technology group and on their National Awards Committee.

CHARLES A. ELDON FOR VICE-CHAIRMAN

Present Secretary, received a BS degree in Physics from Stanford University in 1948, and an MBA from Stanford in 1950. He joined Hewlett-Packard Company in 1951 and following a series of managerial assignments became production manager for the Microwave Division in 1957. In 1962 he became manager of corporate systems, and since 1967 served as systems and planning manager for the Frequency & Time Division until his recent appointment as Director of Operations (President of two operating subsidiaries) of Ness Industries. He is a Senior Member of IEEE, and in 1956 started the San Francisco Chapter of PEP. He subsequently served in all offices, and was national chairman from 1963 to 1965. From then until 1968 he was on the national administrative committee of PMP Group, which was created from a merger he guided between PEP and CP Groups.

DALTON W. MARTIN FOR SECRETARY

Present Treasurer, received a BSEE from Stanford University in 1954 and an MSEE from Stanford in 1956. He was associated with Stanford Research Institute from 1953-1959 in the Radio Systems Laboratory, Low-Frequency Navigation Systems, and Direction Finding Systems. Mr. Martin was co-founder of VIDAR Corporation in 1960 and served as Vice President-Engineering from 1960-1968. He is presently Vice President-Manager, VICOM Division. Martin has been an IEEE member since 1955 and served as Technical Program Chairman for WESCON/69.

ED JACKSON FOR TREASURER

Served in U.S. Navy as an electronics technician in World War II and in the Korean War.

Between wars he attended school at Salinas Hartnell Junior College and the University of California at Berkeley.

He joined the Bell System in 1952 and is currently employed as a staff engineer heading a group responsible for coordinating all major projects in Central Counties area of Pacific Telephone and Telegraph Company.

Jackson joined IEEE in 1961 as a member and advanced to senior member in 1969.

He was active in East Bay Subsection for four years. After serving as chairman of the Subsection in 1969, he became active in the Section and is currently serving his second term as Group Chapter Coordinator.

LAWRENCE E. JENKINS FOR TREASURER

Mr. Jenkins graduated from the University of Utah with a BS and MS in Electrical Engineering. After a year with Douglas, he joined Lockheed Missiles & Space Company in 1958 as an attitude control analyst. He served successively as manager of Guidance and Controls, Vehicle Engineering, and Space Systems Technology. Presently he is the Assist. Chief Engineer in the Space Systems Div.

He was a student member of both AIEE and IRE and a member of the Automatic Control and Engineering Management Groups. He was active in re-establishing the local EM Chapter serving as Vice Chairman and the Chairman for the 1969-70 year. He recently received the Silver Knight of Management Award.

STANLEY F. KAISEL SECTION WESCON DIRECTOR

Dr. Stanley Kaisel is a consultant and is active as a director of several Bay Area electronic companies.

Until March, 1969, Dr. Kaisel was founder and president of Microwave Electronics, a Teledyne Company. He headed Microwave Electronics from its founding in 1959. He holds a BSEE from Washington University and an MA and Ph.D. in EE from Stanford.

Dr. Kaisel is the author of six technical papers and jointly holds two patents. He is a member of Tau Beta Pi, Sigma Xi and the American Management Association. He is a fellow of the IEEE, has served as a director of IEEE, as a trustee of the Western Electronic Education Fund, and as chairman of the San Francisco Section of the IRE. He is presently a director of the Western Electronic Show and Convention.

A brief review of generator excitation systems

The interconnection of power systems throughout the country has introduced certain new problems in the operation of these systems. One of these problems is that of dynamic stability. It has been observed that power swings may develop across an interconnected network when disturbances occur on a system which is part of the network. In many instances, these swings are of an oscillatory nature and eventually reach a sufficient magnitude to activate a relay and break the tie line between connected systems.

The dynamic stability problem required that utilities place more emphasis on control systems to compensate for reductions in stability margins. There are many reasons why system oscillations have increased.

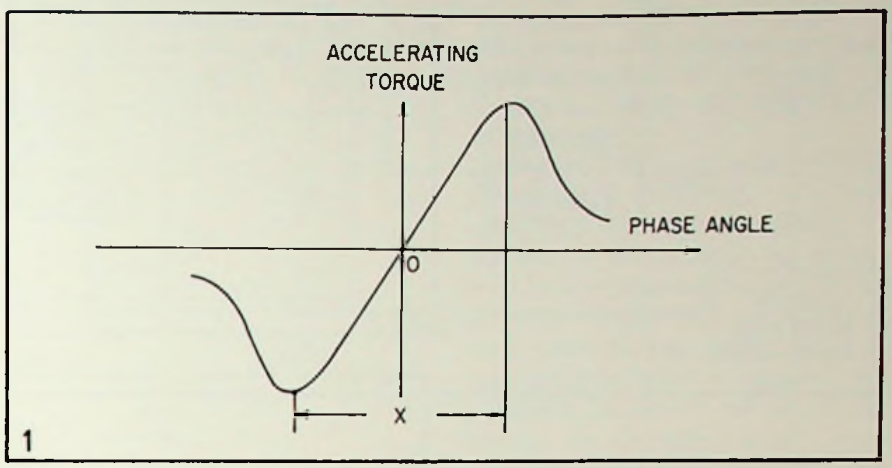
1. System designers have included large machine inertias and increased machine and line reactances which intensifies power swings and contributes to instability. This trend has enabled the system designer to achieve greater economies of scale but has hampered the system's stability.

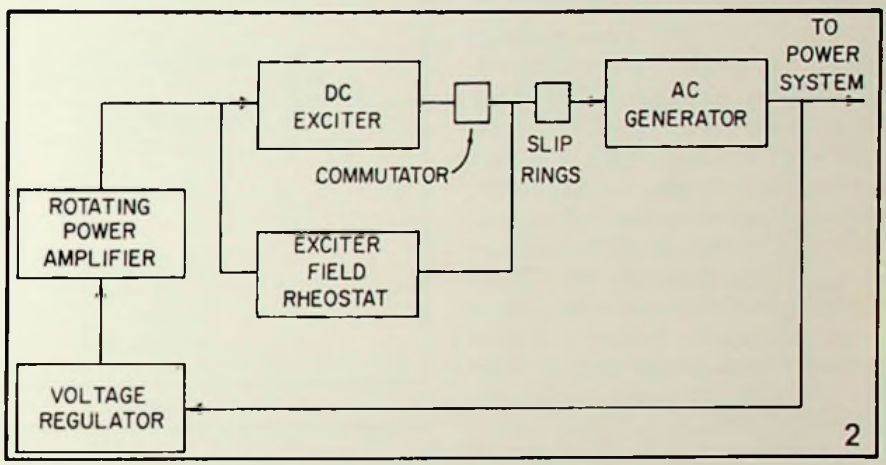
2. New generators have been located closer to fuel sites and often farther from the load areas.

3. Steam turbine generator characteristics have changed with direct cooling of stator and rotor conductors.

4. Higher transmission line voltages have generally meant higher transformer reactances and fewer parallel lines, causing increased instability.

Generally speaking, dynamic instability can occur when the rotor of a polyphase machine is not synchronized with the rotating field produced by the stator winding. The loss of synchronism causes currents to be induced in rotor circuits which react with stator currents to produce torques. These currents, and consequently the torques, are sensitive to the difference in speeds, that is, to phase angle. The phase angle-torque curve of Figure 1 indicates the familiar non-linear relationship. Rotor speed oscillations may be either positively or negatively damped. depending on the average phase angle and the magnitude of oscillation. Positive damping is shown in Region X of the curve of Figure 1, for a change in phase angle produces a change in rotor torque which tends to oppose the change in phase angle. The negative damping effect occurs outside Region X where a change in phase angle results in a change of torque which tends to change the phase angle further.





Oscillations of generator rotors following a power system disturbance are centered about zero phase angle unless synchronism is lost. These oscillations are normally positively damped, but there are a number of rotor circuits, including the field, the damper windings, and current paths in rotor iron; therefore, net damping is difficult to determine precisely.

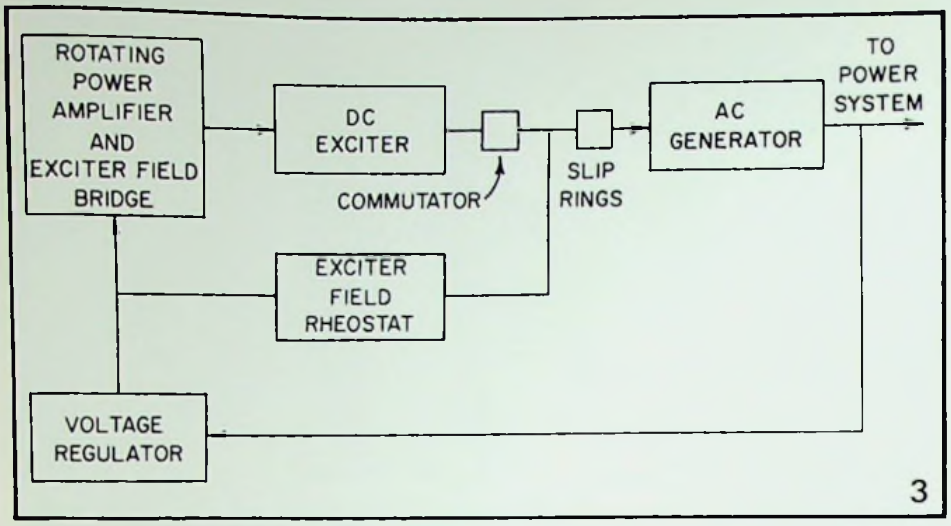
The general effect of the excitation system is to reduce the initial rotor swing angle by increasing the flux level in the machine during periods of low terminal voltage. When a fault occurs, increased flux causes a greater restoring torque which slows the machine more rapidly after the fault clears. Thus, an excitation system with a high exciter ceiling and a high speed of response to reach this ceiling will minimize the first swing. However, this action does not necessarily improve dynamic conditions following the first swing and, in fact, may often contribute negative damping.

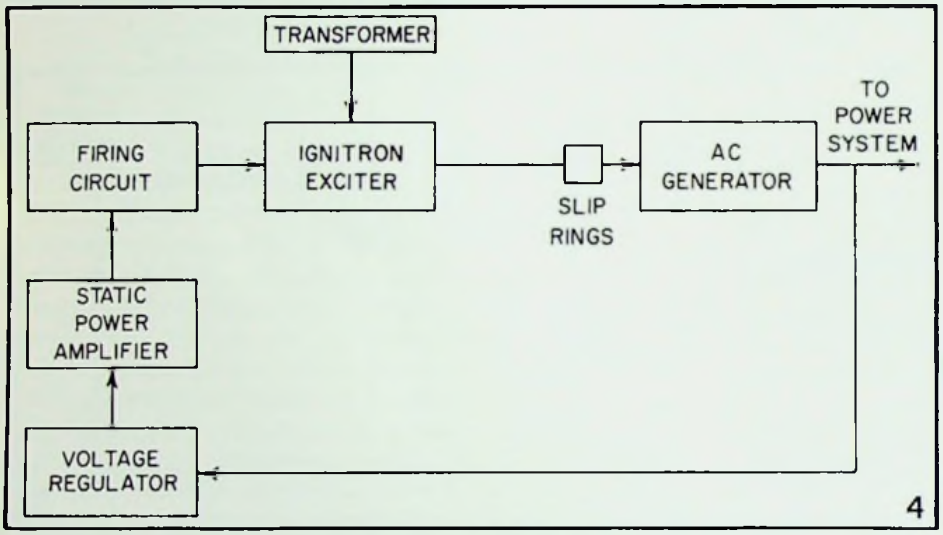
One of the first control systems to increase the stability of synchronous machines was a series braking resistor proposed in 1937 by R. C. Bergvall[1]. Since this initial application of an elementary control system, many significant contributions have been made to improve power system stability.

1948 – ROTATING POWER AMPLIFIER REGULATOR AND EXCITER SYSTEM – The rotating power amplifier controlled voltage regulator, Figure 2, was a major development in the ability of excitation systems to provide improvements in both transient and steady state stability[2]. In the 1960's, the field of the exciter was arranged in a bridge design (Figure 3) which utilized the power amplifier more efficiently,

[1]Bergvall, R. C. "Series Resistance Method of Increasing Transient Stability Limit," Transactions AIEE, Volume 50, 1931, pp 490-494.

[2]Concordia, C., "Steady-State Stability of Synchronous Machines as Affected by Angle-Regulator Characteristics," Transactions AIEE, Volume 67, pt. I. 1948, pp 687-690.





particularly if a high excitation system voltage response was necessary.

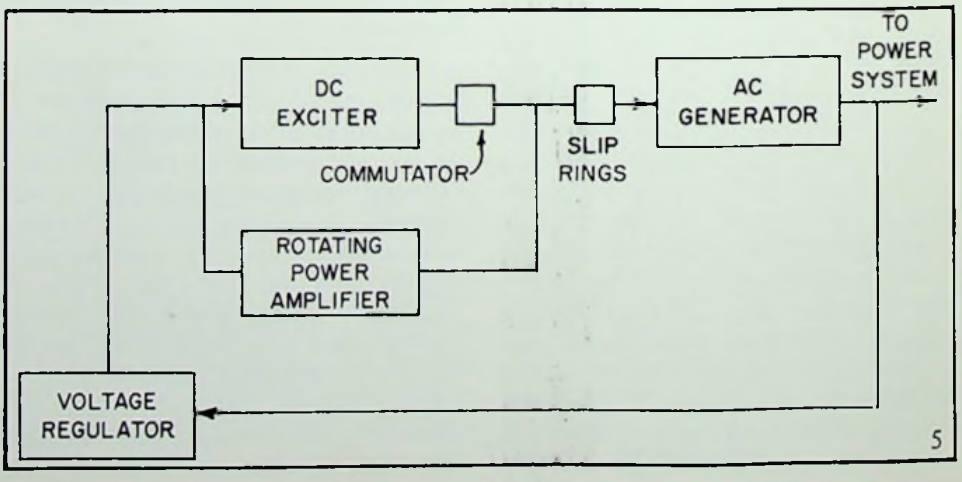
EARLY 1950's – THE ELECTRONIC EXCITER – The electronic exciter system (Figure 4) utilizing ignitrons was a major step which led to the retirement of the commutator exciter on new steam turbine generator installations. This system provided the fast voltage response of the rotating power amplifier exciter but with the added attraction of a static design. Ceiling voltage could be obtained in several cycles, providing the fastest voltage response capability of any system then in operation. Although applied to only a few steam turbine generators and to no hydro-generators in this country, the ignitron type electronic exciter was applied extensively in Canada on hydro generators. The fast voltage response was effective in increasing transient stability limits, and the small time constants of the regulator circuits and exciter provided an excellent base to extend steady state stability limits.

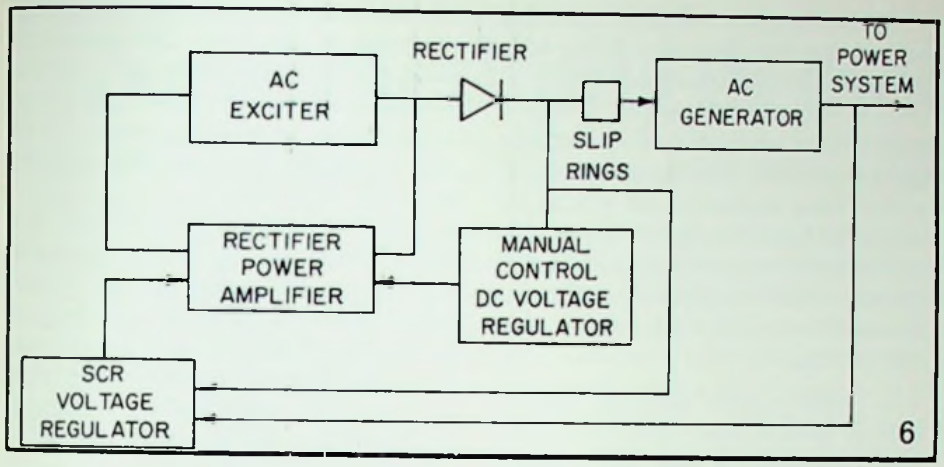
LATE 1950's – THE POWER AMPLIFIER MAIN EXCITER – The success of the rotating power amplifier exciter led to the development of an exciter with the characteristic of the power amplifier used in regulator circuits. The rotating amplifier exciter (Figure 5) was capable of providing an extremely fast voltage response with a relatively low level of control power. Ceiling voltage could be achieved in cycles rather than seconds. Although the characteristic of fast voltage response was to be utilized for applications demanding improvement in transient stability, the control circuit flexibility and lower loads permitted the consideration of special stabilizing networks to improve steady state stability.

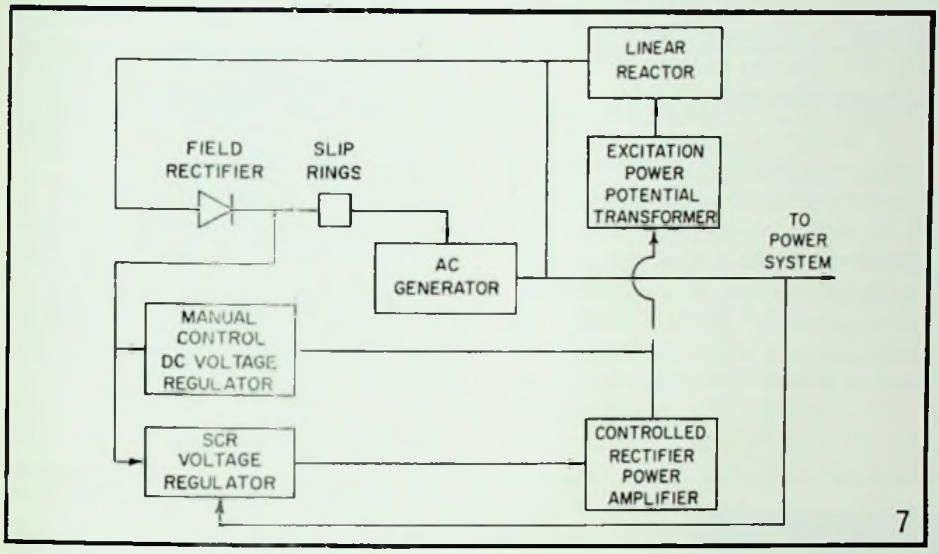
EARLY 1960's – THE ALTERNATOR-RECTIFIER-EXCITER SYSTEM – The alternator-rectifier-exciter system (Figure 6) consisting of an a-c generator and silicon diodes does not introduce major performance benefits. This system was primarily introduced to replace commutator-type machines. In performance, it resembles closely the commutator exciter and even utilizes the same power amplifier voltage regulator.

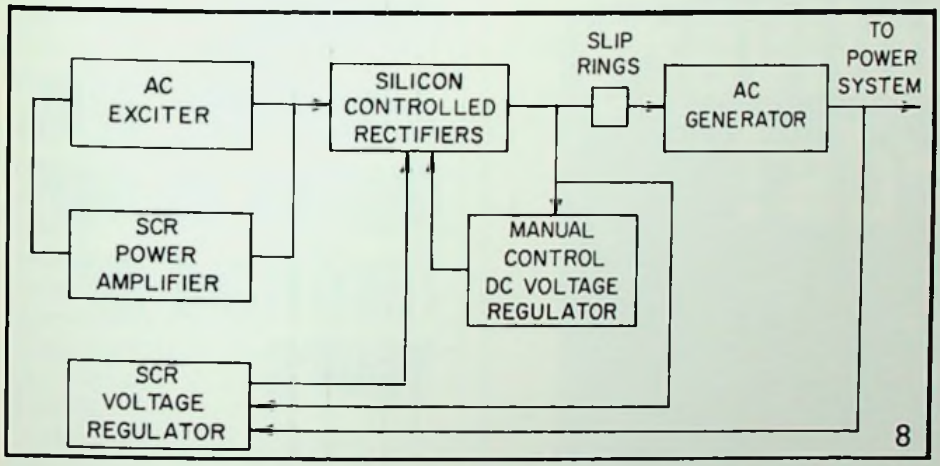
MIDDLE 1960's – THE STATIC EXCITATION SYSTEM WITH SPECIAL TRANSFORMERS – By utilizing both the generator current and voltage outputs and combining with silicon diodes, a new excitation system and concept evolved (Figure 7). Various voltage and current power transformer arrangements were introduced. The system was designed to operate using fault current as a means of producing a fast voltage response. This response is aided by the action of fast voltage regulators which provides characteristics which could effectively increase steady state stability limits.

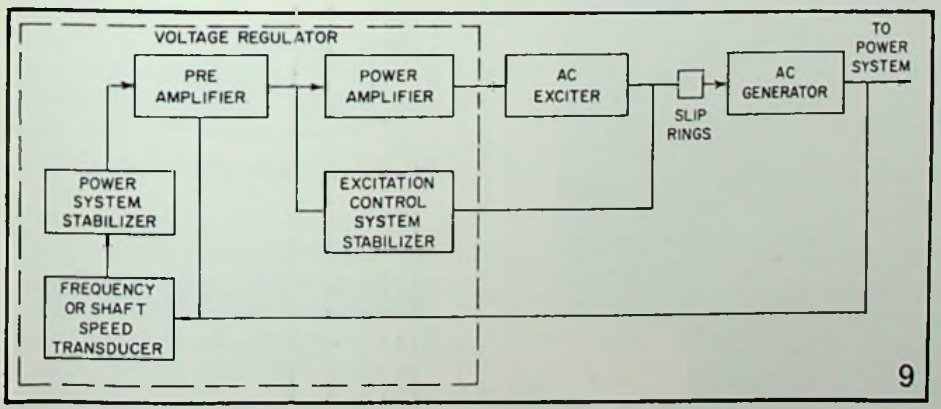
LATE 1960's – THE SILICON CONTROLLED RECTIFIER EXCITATION SYSTEM – By retaining the a-c alternator of the alternator-rectifier exciter system and replacing the diodes with silicon controlled rectifiers (Figure 8), a system with tremendous capabilities resulted. The static regulator and low control power requirements of the exciter provided extremely fast regulator ac-











tion. The voltage response of the system is, therefore, faster than that of the ignitron, electronic exciter. By controlling the exciter output voltage directly, rather than the exciter flux, an excitation system with essentially no time constants resulted allowing both the transient and steady state stability limits to be extended.

EARLY 1970's – POWER SYSTEM STABILIZER CONTROL – Power system stabilizer control incorporates a frequency or shaft speed sensor. It functions by supplementing the conventional voltage regulator with a frequency or shaft speed derived control signal so that excitation becomes regulated as a composite function of voltage and frequency. The controlled voltage may be caused to swing slightly above or below the selected average level in such direction and magnitude as to aid system damping and stability.

Basically, the function of a power system stabilizer is to produce a control response in phase with frequency deviations during system swings[3]. This is the phase relation needed to produce strong damping of system swings. When the frequency is momentarily higher than normal, the voltage is caused to be slightly higher than normal. Conversely, when the frequency swings momentarily below normal, the voltage is caused to swing slightly below normal.

The block diagram in Figure 9 indicates the basic information used by the control and illustrates the point of application of the control output to the voltage regulator. Signals proportional to frequency are developed from the transducers, and processed by lead-lag networks to obtain phase advances to compensate for excitation system lags. A driver stage then produces enough current to drive the power amplifiers in the voltage regulator.

As has been discussed, the inherent ability of an excitation system to improve system stability is enhanced as its fundamental time lag is reduced. In a conventional excitation system having a rotating exciter, the principal time lag occurs in the exciter itself by virtue of the time constant of its field. Newest developments in solid-state technology have made it possible to consider excitation systems which are capable of per-

[3]Schleif, F. R., H. D. Hunkins, E. E. Hatton, and W. B. Gish, "Control of Rotating Exciters For Power System Damping — Pilot Applications and Experience," IEEE Transactions Paper No. 69TP 155 PWR presented at IEEE Winter Power Meeting, New York, January 1969.

forming with no appreciable time lags in the exciter as well as in the regulator. Analytical investigations have shown that these excitation systems, combined with proper stabilizing signals, can provide striking improvements in the damping of generator oscillations[4]. By definition, this improved damping means improved stability limits as well as reduction in voltage oscillations throughout the power system.

Power system stabilizer controls have been added to many existing hydro and thermal units and are being specified as standard equipment on the majority of new units being placed in service. In the Western States Coordinating Council's (WSCC) control area (western third of the U.S.), 140 hydro and thermal units were equipped with power system stabilizer controls as of October 20, 1970. This represents approximately 50 per cent of all generating capacity in the WSCC area.

Although great strides have been made in the design of excitation systems to improve system stability, several aspects of control system operation have not been achieved.

1. The importance of static operation beyond the first frequency swing with adequate damping of subsequent oscillations is recognized[5], however, it is generally true that if first swing stability can be achieved, satisfactory performance of later swings can be assured by proper design of controls[6]. It remains for excitation systems to decrease the time lag in responding to an initial swing in order to provide improved damping and stability.

2. Power system stabilizer control systems obtain their feedback signal from a frequency or shaft speed sensor. Improved sensitivity control may be achieved by alternate means of measuring the phase lag introduced by a disturbance in the power system.

3. Excitation systems provide good voltage regulation at normal system frequency and assist in maintaining transient stability during disturbances. More studies are needed, however, to determine the response of control systems when operating at other than normal frequency and/or voltage for extended periods of time. The recent forced voltage reductions on the East Coast are examples of abnormal operating conditions, for decreases in frequency and/or voltage can cause increased output from the generator excitation system and impose increased loads on the generator and step-up transformer.

The brief review of excitation control systems covered in this paper indicates that many significant achievements have been made in control system development. With the increasing need for improved stability in interconnected systems, it is anticipated that many of the remaining control problems will be solved in the near future.

[4]Warchol, E. J., W. B. Gish, F. R. Schleif, J. R. Church, "Alinement and Modeling of Hanford Excitation Control for System Damping," Transactions Paper 70TP 562-PWR presented at IEEE Summer Power Meeting, Los Angeles, July 12-17, 1970.

[5]FP de Mello, D. N. Eward and M. Temoshok, "Stability of Synchronous Machines as Affected by Excitation Systems, Machine and System Parameters," Proc. American Power Conference, Volume 27, pp 1150-1157, 1969.

[6]FP de Mello and C. Concordia "Concepts of Synchronous Machine Stability as Affected by Excitation Control, "IEEE Transactions Power Apparatus and Systems, Volume PAS-88, pp 316-329, April 1969.

New methods in medical care

The Computer Group will hear Dr. Joseph Terdiman talk on "New Methods in Medical Care" when they meet at 8:00 PM on Tuesday, February 23, 1971, at Skilling Auditorium, Stanford.

Dr. Terdiman of the Medical Methods Research Department of Permanente Medical Group will review the "Multiphasic screening" program such as presently utilized in physical examinations conducted within the Kaiser Foundation Health Plan. Other projects under study by the Medical Methods Research group include Medical Information Systems related to computerized patient records; automatic pharmaceutical records, and on-line information.

Dr. Terdiman graduated from Cornell University with a BS in Physics and following this he attended medical school and received his MD degree, then did graduate work at the University of Illinois in Neurophysiology, and is presently completing his doctoral thesis.

A dinner at Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto will commence at 6:15. For reservations call Judie DeMetre at 321-3300, ext. 270.

Commercial applications of microwave devices

The promising commercial market for microwave devices has barely been exploited. Most existing microwave devices, having been designed for military equipment, are too complicated and too expensive for commercial use. Suitable low-cost commercial microwave devices can be developed, but the microwave device designer must know more of the requirements presented by commercial equipment.

As a first step toward the commercial microwave market, the Electron Device and Microwave Theory and Techniques Groups are jointly sponsoring a symposium on "Commercial Applications of Microwave Devices." The symposium speakers will be developers of various types of commercial electronic equipment. They will discuss what performance and cost are needed from microwave devices to make commercial applications a reality.

The symposium will be held in the International Building of Stanford Research Institute in Menlo Park on Tuesday, February 9, 1971, from 1:00 to 8:00 PM.

The symposium schedule includes technical sessions, a cocktail hour, and a banquet.

In the technical sessions, developers of commercial electronic equipment will describe their specific microwave device needs, such as:

1. What microwave devices are really needed?
2. What is the minimum performance that these devices must have?
3. What is the maximum acceptable cost for these devices?
4. What is the market potential of these devices?

The symposium speakers will be:

AIR TRAFFIC CONTROL
Dean Babcock, Stanford Research Institute
John Pratt, RCA Aviation Equipment Division
MICROWAVE HEATING AND COOKING
John Gerling, Genesys Systems
NON-DESTRUCTIVE TESTING
Robert Cribbs, Electro-Physics, Inc.
DIGITAL DATA TRANSMISSION
C. Louis Cuccia, Philco-Ford
SATELLITE COMMUNICATION
Robert Strauss, Comsat Corp.
MICROWAVE RELAY
David Fairley, Lenkurt Electric

The banquet will feature a keynote address by Dr. M. M. Atalla, Vice President and General Manager of Fairchild's Microwave and Optoelectronics Division on "Can the Microwave Device Industry Meet the Challenge of the Commercial Market?"

Fee for the symposium is $7.50, which includes the technical sessions and the banquet. Attendance will be limited, and registration before February 3, 1971 is required. Registrations, accompanied by the registration fee, should be sent to the IEEE Section Office, Suite 2210, 701 Welch Road, Palo Alto, California 94304.

COMMERCIAL APPLICATIONS OF MICROWAVE DEVICES
REGISTRATION FORM

(Should be received before February 3, 1971)

Mail to: IEEE San Francisco Section Office
Suite 2210
701 Welch Road
Palo Alto, California 94304

Enclosed is check in the amount of $..... to cover the registration fee.

Name: ..... (please print full name)

Home Address: ..... (Street)

..... (City and State) (Zip)

Business Address: ..... (Street)

..... (City and State) (Zip)

Position or Title: .....

Business Phone: .....

IEEE Affiliation (Check One)
Member Student Member Non-Member

IEEE Membership No.: .....

"Shakey" first generation robot

Dr. Bertram Raphael will discuss problems in the design of intelligent robots at the February 16 meeting of the Systems Science and Cybernetics Group. For several years, the Artificial Intelligence Group at the Stanford Research Institute has been developing an "intelligent robot" – a computer-controlled vehicle capable of performing non-repetitive tasks in a laboratory environment without human intervention. This work has focussed attention on three fundamental research areas:

(1) PROBLEM SOLVING. How can one define a task for a robot? What solutions are feasible? (2) PERCEPTION. What processing is necessary to make information about the real world, extracted by physical sensors, "meaningful" to a machine; (3) SYSTEM INTEGRATION. How can we coordinate the planning and execution phases of task accomplishment? What data structures are necessary?

This talk will describe the current status of continuing research in these areas. A film produced at SRI, "Shakey: A First Generation Robot," will be presented to demonstrate recent capabilities.

Dr. Bertram Raphael

Dr. Raphael received his Ph.D. in mathematics in 1964 from MIT, and has published more than a dozen papers in the field of artificial intelligence in technical journals and in the proceedings of national and international computer conferences. He joined SRI in 1965, and is, at present, manager of the Artificial Intelligence Group, Information Science Laboratory.

The talk, to be held at SRI at 8 PM, will be preceded by dinner at Stickney's, Town and Country Village, Palo Alto. See Calendar for reservation details.

Heart transplant recipient

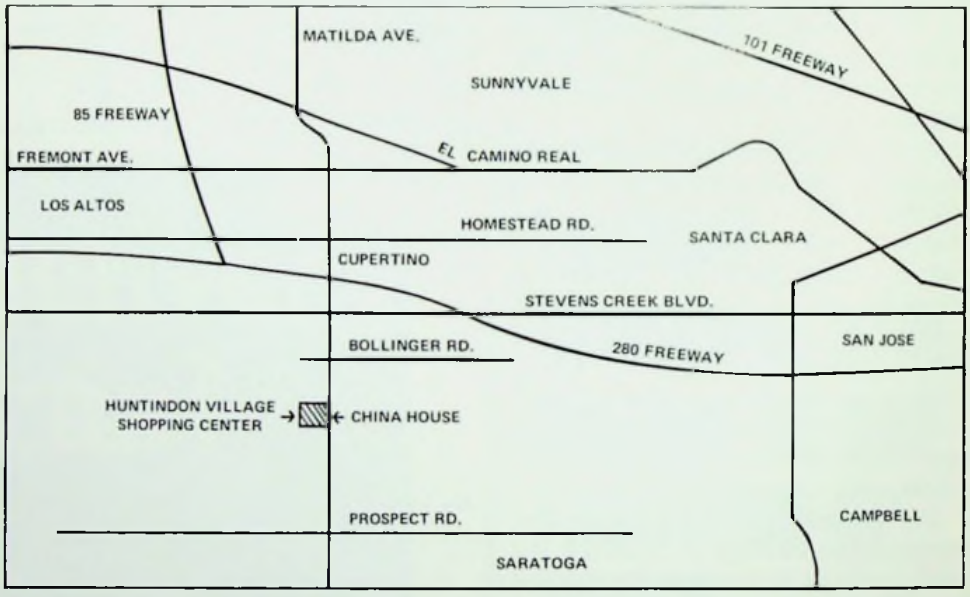
The medical and engineering complexitites involved in CARDIAC TRANSPLANTATION will be the highlights of Mr. James Marshall's presentation to the Group Chapter on Engineering in Medicine and Biology.

James Marshall, age 49, self-employed interior decorator and father of 4 daughters, received a transplanted heart in January of 1970 from Stanford University Medical Center. He was discharged from the hospital in March 1970 and has been leading a full, active and enthusiastic life. He enjoys golf, tennis, jogging, cycling and participates actively in a medical research program at Stanford University. One year following surgery, Mr. Marshall will share his experiences with the engineering profession.

Mr. Marshall will entertain questions from the audience and hopes to emphasize areas in which the engineer can assist the physician and hospitals in providing improved health care delivery.

James Marshall

The meeting will be held in room 664-S of the Medical Sciences Building, at the University of California Medical Center, 3rd Ave. and Parnassus, in San Francisco at 8:00 PM. A pre-meeting dinner will be held at the Cafe El Portal, 8th Ave. and Fulton St. in San Francisco at 6:00 PM, where Mr. and Mrs. Marshall will be guests. See Calendar. Members and guests are welcome to both the dinner and meeting.



Region Six Conference held in Sacramento

The IEEE Region 6 Conference will be held at the Woodlake Inn in Sacramento, California, on May 11, 12, and 13, 1971. Mr. E. J. Terhaar, Conference Chairman, reports the conference theme, "Engineering for Conservation of Mankind," has generated numerous papers on subjects such as noise pollution, computers, power systems, space technology, microwaves, telemetry systems, biomedical electronics, etc.

In addition to an excellent technical program, field trips are scheduled to Sacramento Municipal Utility District's Rancho Seco Nuclear Plant and the World Wide Communication and Computer Switching Network at McClellan Field. A full program for the wives has also been scheduled.

Attending this 1971 IEEE Region 6 Conference will be rewarding for any IEEE Member. Mark your calendar now for May 11, 12, and 13, 1971, at the Woodlake Inn, Sacramento, California. Inquiries for program and registration data should be directed to Mr. E. J. Terhaar, Conference Chairman, 5615 Seward Ct., Sacramento, California, 95819.

Latest EMI filter designs

The Electromagnetic Compatibility Group will meet at 8:00 PM on Monday, February 15, 1971, at the Santa Clara Hewlett-Packard plant, 5301 Stevens Creek Blvd. The topic of the meeting will be "Recent Advances in EMI Filter Design."

The technical presentation will concern the design, fabrication and application of subminiature ceramic chip EMI filters. The latest techniques in the manufacture of AC and DC circuit filters will be discussed including design potentialities and limitations and hints on writing filter design specifications.

A dinner at the Custom House restaurant, Stevens Creek Blvd. near Wolfe Road, Cupertino will begin at 6:30 PM. Call Don Clark at 321-3320 for reservations no later than noon on February 15.

Computerized business games

The February 10 meeting of the Engineering Management group will feature Dr. Roger K. Summit, Senior Member of the Research Laboratory, Lockheed Missiles & Space Company, who will discuss the application and payoff of computerized business games.

Dr. Summit developed the Aerospace Business Environment Simulator computer program for which he has received a special award. The program is now licensed to IBM.

Because it is possible to induce recessions into the gaming experience, players' reactions to this situation, as well as observed results, are pertinent to the current aerospace outlook. Companies that survived assumed quite different postures from those that failed.

Dr. Summit, a Stanford Business School graduate, directs several research projects for LMSC under contract with NASA, AEC, Office of Education and DOD. Dr. Summit has been a special Consultant to IBM in management and development and to the Industrial College of the Armed Forces. He has been an assistant Professor of Management at San Jose State College. He has several publications and numerous papers treating on-line retrieval systems and aerospace business models — also the subject of his thesis.

The cost is $5.00 per person including tax and tip. See calendar for dinner reservation information.

Pollution and environment

The ability to measure and analyze the quality of our environment has become very important in this age of ecology. On February 17, 1971, the Industrial Electronics and Control Instrumentation Group will hear Mr. Carroll Maninger discuss this topic.

Existing techniques and methods of measurement involve wet chemistry as their foundation. New approaches are based on various forms of Spectroscopy. An overview of the whole field and how existing techniques are written into the laws will be presented by Mr. Maninger.

Carroll Maninger

Mr. Maninger is Head of the Electronics Engineering Research Division at the Lawrence Radiation Laboratory in Livermore. He is also Chairman of the Radiation Lab Air Pollution Committee. Mr. Maninger received his BS and did graduate work at the California Institute of Technology. He became involved with environmental measurements while Director of Physical Research and Development for Vitro Corporation from 1948 to 1953. See calendar for details.

Industrial control for P.O.

Mr. Henry Hoge, Engineering Manager at Wismer and Becker in Sacramento, will be the speaker at the IGA meeting of February 18th at Marconi's Restaurant in San Francisco.

Mr. Hoge has been with Wismer and Becker, an Engineering and Construction firm, since 1961, in charge of various turnkey projects including many which have used process computer control. He is a graduate of the University of Washington in Electrical Engineering, and in the Bay Area, has previously been associated with Bechtel and Pacific Electric Manufacturing Co.

The United States Post Office Department has a multi-year program of some 250-million-dollar magnitude for the mechanization of mail handling. A key or integral part of this mail handling is computer controlled sorting machines. Mr. Hoge will discuss the electrical aspects, design, application and installation of these high speed computer controlled mail sorting systems.

Interference rejection in communication systems

The Information Theory Group will meet at 8:30 PM Thursday, February 18, 1971, at SRI, to hear Dr. Richard Booton, Jr. speak on "Interference Rejection in Communication Systems."

Dr. Booton received his BS in Electrical Engineering and his MS in Mathematics from Texas A&M; his ScD in Electrical Engineering from the Massachusetts Institute of Technology. He has had 22 years of experience in the design and development of guidance and communication systems. Current responsibilities include overall management direction of TRW's Communication, Electronic Data Systems and Electronic Warfare Product Lines. Dr. Booton is a member of IEEE. He received the Browder J. Thompson Award from the IRE in 1953 and was awarded the grade of Fellow in the IEEE in 1969.

Frequently, additive white Gaussian noise is not an adequate model for a real communication channel. Interference of a deterministic or non-Gaussian character is often encountered in practice. The impact of this interference is to significantly degrade the performance of the receiver which, in general, has been designed for operation in a Gaussian noise environment.

Receiver performance can be improved by linear and/or nonlinear operations based on knowledge of the characteristics of the interference. For example, it is possible to remove AM interference from an FM signal. This example will be developed in the talk as an example of a general mathematical formulation of the interference problem. An application to the rejection of telemetry interference in the Apollo TV system will also be presented. See Calendar.

NEW MEMBERS

The Section welcomes these new members:

D. L. Bartels	G. J. Latus, Jr.
M. P. Beere	L. Lew
M. H. Chandler	E. Mills
R. G. Eloy	A. J. Saffir
G. Gabor	A. C. Siddal
C. K. Ha	F. Silberman
J. T. Jacobs	W. V. Stamirowake
P. P. Kristensen	C. H. Sun
J. S. Larson	

Automatic fault detection & isolation techniques

Ronland R. Crum, Staff Senior Engineering Specialist at Philco-Ford will address the meeting of the Aerospace and Electronics Group when they meet at 8:00 PM on Thursday, February 18, 1971, in the Auditorium of Bldg. 56, Philco-Ford, 3825 Fabian Way, Palo Alto. Mr. Crum will speak on "Automatic Fault Detection and Isolation in Aerospace Systems."

This discussion will address automatic fault detection and isolation techniques as applied to the ground support systems of the Satellite Control Facility to obtain the required system effectivity.

Ronland Crum has extensive experience in digital systems. He has been responsible for a major part of the Advanced Data Systems development, and for the development and design of a wide variety of data handling devices for interfacing computers to communication command and control systems. Mr. Crum majored in Mathematics at California Polytechnic College and has been with Philco-Ford for over six years.

A dinner at Rickey's Hyatt House, El Camino Real, Palo Alto, will precede the meeting at 6:15 PM. For reservations, call Pat Hoppe, 326-4350, ext. 6143 by February 15. See Calendar for details.

Ronland R. Crum

Classified Advertising

CLASSIFIED ADVERTISING RATES

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

SITUATION WANTED

Ph.D. in physics, minors in math and EE. 21 years experience, 29 publications, 10 U.S. patents, broadly based with work and publications relating to semiconductor purification, transistor fabrication, electron optics, sputtering, thermionic emission, cryogenics, IR sensors, reliability physics — theory and failure mechanisms, computer programming, transient analysis of non-linear systems, electromigration, fatigue fracture, proposal preparation and teaching. Salary — open. Telephone (415) 941-6699

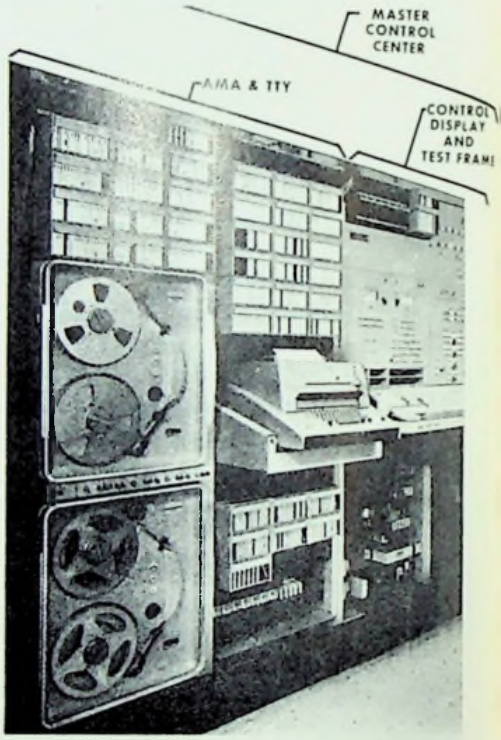
Joint meeting features ESS

"The Automated Operator or Electronic Switching System" will be the subject of a meeting of the Santa Clara Valley Subsection and the Communications Technology Group on February 8 at PT&T in Hayward. The meeting will consist of a presentation by Mr. Bruce Jamison of Pacific Telephone and a tour of the Electronic Switching System in Hayward.

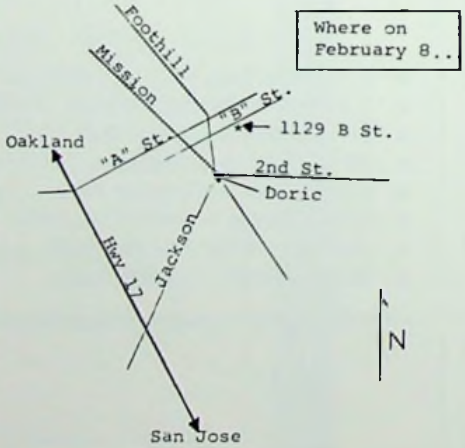
Mr. Jamison will discuss the Electronic Switching Systems (ESS) now being installed within the Bell System. He will include 1) a description of the call processing equipment and the switching network and their interaction, 2) the stored programs, 3) the determination of switching capacities, and 4) examples of the capabilities of the ESS.

Mr. Jamison attended U.C. Berkeley where he received his B.A. degree in Economics in 1963 and his M.A. in 1964. He served in the Navy as Operations Officer aboard a Minesweeper from 1964 to 1966. He joined Pacific Telephone after his release from active duty and has worked in a Traffic Toll Operating District and the office of the Chief Economist. Currently he is a Senior Engineer in the Engineering Division of the Traffic Department in San Jose.

See Calendar for dinner and meeting details.



This is a portion of the ESS Machine that will be discussed and seen at the meeting on Feb. 8, 1971.



Radar invented simultaneously

The February 17th meeting of the Group on Antennas and Propagation will be held on the Berkeley Campus of the University of California. The Group is honored to have as its speaker Professor Charles Susskind of the University faculty.

Professor Susskind, whose interest in the historical aspects of technology is well known, will present a talk entitled "Radar – A Case Study in Simultaneous Invention." The talk will cover a classic example of simultaneous invention, in that radar was invented nearly simultaneously in at least six different countries, yet independently due to military secrecy.

Professor Susskind was born in Czechoslovakia and educated in that country and in England. He served as a radar technician in the U.S.A.A.F. during World War II and after his discharge attended Caltech (B.S. '48) and Yale (M.Eng. '49, Ph.D. '51). From 1951 to 1955 he was a research associate and lecturer at Stanford University, specializing in microwave engineering and electron optics. After joining the faculty of the University of California at Berkeley in 1955, his interests turned more and more to bioengineering, and the history of technology and the effects of technology on society. In addition to the historical articles by which he is known to IEEE SPECTRUM readers, he has written papers and reviews for the journals of such professional associations as the Society for the History of Technology (of which he is a charter member) and the History of Science Society (ISIS).

Charles Susskind

The meeting will be held on Wednesday, February 17th, at 8 PM in Room 277, Cory Hall, U.C., Berkeley. There will be a tour of the University Antenna Laboratory following the meeting. Meet-the-Speaker Dinner at Spenger's Fish Grotto, 1919-4th St., Berkeley. Take University Avenue Exit off the East Shore Freeway. Cocktails 5:30, Dinner 6:15 PM. No reservations required.

Two Topics for automatic control program

The Automatic Control Group will meet for dinner at 6:15 on Tuesday, February 23, 1971, at Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. The speaker, Prof. Gene Franklin, will talk on two subjects. At the dinner, the topic will be "Too Many Engineers." The topic at the 8:00 meeting will be "Computer Monitoring of Surgical Patients." Lockheed Auditorium, Bldg. 202, 3251 Hanover Street, Palo Alto, is the meeting place.

"Too Many Engineers?" The unemployment of engineers and the adverse contributions of high technology to our environment have caused some serious challenges to engineering as a profession and raised many questions of importance to those engaged in educating new engineers. Professor Franklin will be interested in participating in a discussion of these topics with those who attend the dinner to explore what role a professional organization such as the IEEE can play in the resolution of these problems.

A project being implemented at Stanford University Hospital to demonstrate the use of modern instrumentation and information processing to aid the anesthesiologist will be described. The aim of the project is to take external (non-invasive) measurements such as ECG, EEG, and cuff blood pressure and to return to the operating room signals on which decisions such as control of anesthetic agents and other drugs can be based. The basic information processing is done in a medium-sized computer (XDS Sigma 5) and the processed information is returned to the operating room as standard TV video.

Gene Franklin

Dr. Franklin is a professor of Electrical Engineering at Stanford University. He received his BEE at Georgia Institute of Technology, his SM at Massachusetts Institute of Technology and his D.Eng. Sci., at Columbia University. Dr. Franklin is a member of IEEE.

SEM theory and applications

The Scanning Electron Microscope, or SEM as it is commonly known, is assuming its rightful position as one of the most powerful and comprehensive evaluation tools currently available to the technical world.

Mr. John Devaney, Senior Engineer in charge of Scanning Electron Microscopy at the Jet Propulsion Laboratory, will address the IEEE Reliability Group on Thursday, February 11, 1971, at 7:30 PM at Lockheed's Bldg. 104. The title of his talk is "Theory and Applications of the Scanning Electron Microscope."

Non-IEEE members are welcome at this meeting. An interest in SEMs is all that is required for attendance.

Mr. Devaney will discuss the basic operation of the SEM and its capabilities in comparison with other optical and electronic techniques. Slides and movies will be used to show application of the SEM to semiconductor analyses.

Mr. Devaney has a BS in Physics from Texas Institute of Technology. He is recognized in Microscopy as an authority on SEM's and has had considerable experience in industry in related analysis technology. He has authored numerous papers on the general subject of Scanning Electronic Microscopy and has lectured before many groups on both theory and specific applications of SEMs.

Here are the directions on how to get to the meeting at Lockheed-Sunnyvale:

Heading North on Mathilda take 2nd turnoff left after passing under Mt. View-Alviso Road (Route 237); (Building 104 is on the corner of this Frontage Road and Lockheed Way). Turn right on Lockheed Way and park past Building 104 and use 104 Lobby entrance facing Lockheed Way.

Please call Phil Guillot on 742-7026 or Howard Frank, 742-7756, by February 10th if you plan to attend.

"Thank you for calling Hewlett-Packard."

Computer software . . .	Yes sir, I'll connect you with our Data Products Staff Engineer.
Microwave applications . . .	Yes sir, I'll connect you with an Instrumentation Staff Engineer.
Intensive care patient monitoring equipment . . .	I'll connect you with a Medical Staff Engineer.
Chromatography . . .	Yes sir, I'll connect you with our Analytical Staff Engineer.
Calculator programming assistance . . .	I'll connect you with our Calculator Staff Engineer.
Voltmeters . . .	Yes sir, I'll connect you with an Instrumentation Staff Engineer.

Whatever your requirements for scientific or medical electronic instrumentation, Neely is your source of immediate, responsive, and competent service. Just pick up the phone; dial; and listen for the *Thank you for calling Hewlett-Packard.*

HEWLETT hp PACKARD

NEELY SALES REGION