EDITOR'S PROFILE of this issue

from a historical perspective …

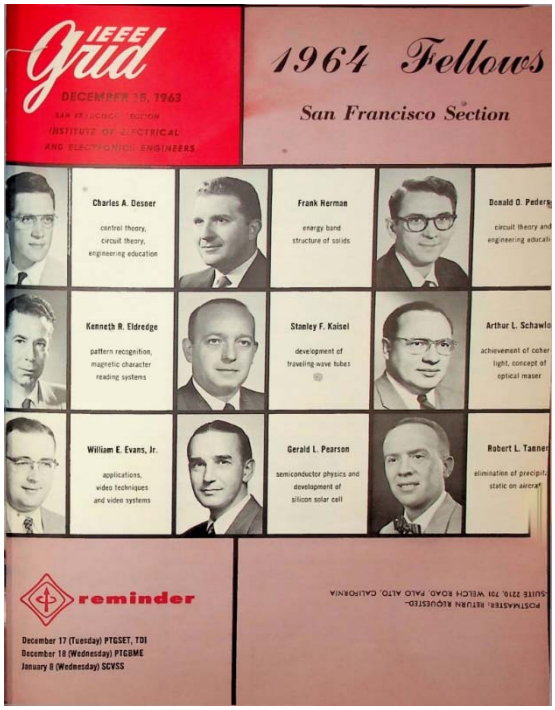
with Paul Wesling, SF Bay Area Council GRID editor (2004-2014)

December, 1963 (mid-month):

Cover: Nine of our Section's engineers have been elected to the grade of Fellow. Profiles are on page 3.

Page 3: Prof. Donald Pederson, of UC-Berkeley, is elected IEEE Fellow for his work in circuit theory and education. He had finished his PhD at Stanford, then worked at Bell Labs. The SPICE analog circuit simulator was developed at UC-Berkeley under his direction in the early 1970s; the birth of SPICE is now an IEEE Milestone. The IEEE Solid State Circuits Field Award is named for him.

Prof. Arthur Schawlow, of Stanford, is also elevated to Fellow, for his concept of the optical maser (laser) and coherent light; he receives the Nobel prize in 1981. He demonstrated the laser as a guest lecturer in my physics class.



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IEEE Grid
DECEMBER 15, 1963
SAN FRANCISCO SECTION
INSTITUTE OF ELECTRICAL
AND ELECTRONICS ENGINEERS

1964 Fellows

San Francisco Section

Charles A. Desoer

control theory,
circuit theory,
engineering education

Frank Herman

energy band
structure of solids

Donald O. Peders

circuit theory and
engineering educati

Kenneth R. Eldredge

pattern recognition,
magnetic character
reading systems

Stanley F. Kaisel

development of
traveling-wave tubes

Arthur L. Schawlo

achievement of coher
light, concept of
optical maser

William E. Evans, Jr.

applications,
video techniques
and video systems

Gerald L. Pearson

semiconductor physics and
development of
silicon solar cell

Robert L. Tanner

elimination of precipita
static on aircra

reminder

December 17 (Tuesday) PTGSET, TDI
December 18 (Wednesday) PTGBME
January 8 (Wednesday) SCVSS

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SECTION MEMBERS! To stay on mailing list when you move, send address change promptly to IEEE National Headquarters, Box A, Lenox Hill Station, New York 21, N.Y.

contents

cover

Among 118 members throughout the international structure of IEEE elevated to the grade of Fellow for 1964 by the board of directors at its meeting of October 30 were the nine prominent Section members pictured on the cover. For more on their citations and backgrounds, see page 3.

san francisco section officers

advertising

Bertolet Bellue

wescon news

'64 DIRECTORS ELECTED

Edward C. Bertolet was elected chairman of the Wescon board of directors for 1964 and S. H. "Penny" Bellue was named chairman of the executive committee in mid-November elections.

Bertolet, vice president of Behlman-Invar Electronics Corp., will chair an eight-man working board of electronics industry executives who volunteer their time to the Western Electronic Show and Convention. The 1964 board includes Bellue, Hugh P. Moore, and Ralph Lamm, all of Los

Moore Lamm

Angeles, and John Chartz, Edward W. Herold, John S. McCullough, and Phillip L. Gundy, all of the San Francisco area. McCullough and Gundy were elected to four-year terms. Herold and McCullough represent the San Francisco Section on the board.

Bellue, director of corporate procurement of Packard Bell Electronics Corp., will direct the executive committee, composed of the four host city directors from southern California and Manager Don Larson, who carry principal responsibility for planning and execution of the 1964 show, sched-

(Continued on page 4)

Chartz Herold

MEETING CALENDAR

SANTA CLARA VALLEY SUBSECTION

8:00 P.M. • Wednesday, January 8, 1964

A field trip, reading, speech and hearing laboratories. Open to the public. Methods of improving reading, speech, and hearing for students, with the use of electronic equipment, will be discussed.

Prof. Paul Betten, San Jose State College

Place: Education Building, Room 100, San Jose State College
No dinner

TECHNICAL DIVISION

Industrial

8:00 P.M. • Tuesday, December 17

Experiences in Industrial Telemetry

Conrad Hoeppner, president, Industrial Electronics Corp.

Place: Main Conference Room, Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, California
No dinner

PROFESSIONAL TECHNICAL GROUP CHAPTERS

Bio-Medical Electronics

8:00 P.M. • Wednesday, December 18

Laser Coagulation of the Eye

Milton Flocks, M.D., associate clinical professor of surgery, Division of Ophthalmology, Stanford University

Place: Stanford University School of Medicine, Room M 112
Dinner: 6:00 P.M., Red Cottage Inn, 1706 El Camino Real, Menlo Park
Reservations: Con Rader, 326-1970, Ext. 327, by Dec. 17

Space Electronics and Telemetry

8:15 P.M. • Tuesday, December 17

Laser Communications

Dr. Burt McMurtry, Sylvania, Mountain View

Place: Lockheed, Bldg. 202, 3251 Hanover St., Palo Alto
Dinner: 6:15 P.M., Camino Bowl, 2025 El Camino Real, Mountain View
Reservations: Bob Light, 968-6211, Ext. 2748

events of interest

REGION 6 CONFERENCE

Combining the functions of the former IRE 7th Region Technical Conference and the AIEE Pacific General Meeting, the Region 6 Annual Conference in Salt Lake City, April 29, 30, May 1, will feature 20 technical sessions of five papers each. In addition, at least two sessions will be devoted to instrumentation, the conference being co-sponsored by the Instrument Society of America.

Papers are invited in the following and related fields:

Instrumentation—all areas of operation served by ISA.

Electrical power—systems, atomic reactors for power, communications for control, power for aircraft and space craft, energy conversion.

Electronics and communications—antennas, radio propagation, lasers, masers, radiometry, space measurements, information theory and coding, automatic controls, electron devices, semiconductor circuitry, circuit theory, high-speed data by wire, advances in telephone techniques, military electronics, satellite relays, communications systems, medical electronics, nuclear reactor instrumentation, audio, data processing, pattern recognition.

Abstracts of approximately 200 words are to be submitted by January 15 to the technical program chairman, Prof. Clayton Clark, EE Dept., Utah State University, Logan, Utah.

NINE SECTION MEMBERS ELEVATED TO FELLOW GRADE

Nine members of the San Francisco Section, featured on the cover of this issue, have been elevated to the grade of Fellow effective January 1, 1964, it was announced by Donald G. Fink, general manager.

They are Charles A. Desoer, Kenneth R. Eldredge, William E. Evans, Jr., Frank Herman, Stanley F. Kaisel, Gerald L. Pearson, Donald O. Pederson, Arthur L. Schawlow, and Robert L. Tanner. They will be honored at a section meeting early in 1964.

Charles A. Desoer, cited for contributions to control theory, circuit theory, and engineering education, is professor of electrical engineering at the University of California, Berkeley. A graduate of the University of Liege, Belgium, he also graduated from Massachusetts Institute of Technology in 1953 with the Sc.D. degree. He was a member of the technical staff of Bell Telephone Laboratory from 1953 to 1955 and supervisor in system development at that same organization from 1955 to 1958, when he joined the Berkeley faculty. He is the author of numerous papers and a book, "Linear System Theory—The State Space Approach" (with L. A. Zadeh).

Kenneth R. Eldredge, cited for contributions to pattern recognition and magnetic character reading systems, is staff scientist-engineering of Stanford Research Institute, Menlo Park. A graduate of Oregon State College, where he obtained the B.S. in electrical engineering and the M.S. in physics, he took his Ph.D. at Cambridge, England, in 1950. Formerly with Standard Oil of California and the London branch of the U.S. Office of Naval Research, he joined SRI in 1953 and shortly set up the control systems laboratory. The work initiated in this laboratory has expanded into the applied physics laboratory dealing with vacuum technology for producing extremely miniaturized electronic assemblies and to the basic work concerned with self-organizing types of computers. He is the author of numerous papers and holds many U.S. and foreign patents.

William E. Evans, Jr., cited for contributions to applications of video techniques and video systems, is manager of the data systems department of Granger Associates, Palo Alto. He received the B.S. in electrical engineering from the University of Louisville and the M.S. in the same field from Stanford University. Formerly with Bell Telephone Labs, Stanford University, McClatchy Broadcasting Co., Stanford Research Institute, and A. B. Dick Co., he was awarded the Academy of Motion Picture Arts and Sciences Technical "Oscar" in 1960 and the V. K. Zworykin Television Award of the IRE in 1963. He was elevated to Fellow in the Society of Motion Picture and Television Engineers in 1963. The author of several technical papers, he holds four U.S. patents.

Frank Herman, cited for contributions in the field of the energy band structure of solids, is senior consulting scientist for Lockheed Missiles and Space Co. research laboratories in Palo Alto. He attended Columbia College and the Columbia School of Engineering, and was awarded the B.S. and M.S. degrees in electrical engineering from the latter, receiving the Ph.D. in physics from Columbia University. Following experience with the U.S. Navy, Cooper Union, and RCA Laboratories, he joined Lockheed in 1962 and is scientific advisor to the director of research and coordinator of solid-state research activities in the electronic sciences laboratory. He is lecturer in applied physics at Stanford and the author of more than 25 scientific papers and review articles, his most recent publication being a book, "Atomic Structure Calculations," which he wrote in collaboration with Sherwood Skillman of RCA.

Stanley F. Kaisel, cited for contributions to the development of traveling-wave tubes, is president and technical director of Microwave Electronics Corporation, Palo Alto, and holds a B.S. in electrical engineering from Washington University and an M.A. and Ph.D. in the same field from Stanford. Following experience with Harvard University, Stanford, RCA Laboratories, Stanford Electronics Research Laboratory, and Litton Industries, he was a co-founder of Microwave Electronics Corp. He was chairman of the San Francisco Section of IRE in 1961-62. He is the author of a number of technical papers and holds several patents.

Gerald L. Pearson, cited for contributions to semiconductor physics and to the development of the silicon solar cell, is professor of electrical engineering at Stanford University, having retired in 1960 from Bell Telephone Laboratories after 31 years of service. He received the A.B. from Willamette University, the M.A. from Stanford, and an honorary Sc.D. from Willamette. At Bell he was concerned with noise in resistor, vacuum tubes, and carbon microphones, and later concentrated on the physics of semiconducting materials and was awarded 32 U.S. patents. From 1957 to 1960 he was in charge of a group specializing in applied physics of solids. At Stanford he is associated with the solid-state electronics laboratory, where he directs graduate students in investigations on the diffusion of impurities in compound semiconductors and other solid-state electronics research projects.

Donald O. Pederson, cited for contributions to circuit theory and engineering education, is professor of electrical engineering and director of the electronics research laboratory at the University of California. Awarded the B.S. from North Dakota Agricultural College and the M.S. and Ph.D. from Stanford, he was a research associate at the electronics research laboratory at Stanford and a member of the technical staff at Bell Telephone Laboratories. With research interests primarily in the field of electronic circuits, he is a member of the administrative committee and the publications committee of the PTG on Circuit Theory. He was awarded a John Simon Guggenheim fellowship in 1963.

Arthur L. Schawlow, cited for contributions to the achievement of coherent light and the concept of the optical maser, is professor of physics at Stanford and received the B.A., M.A., and Ph.D. from the University of Toronto. A postdoctoral fellow and research associate at Columbia University, he became a research physicist at Bell Telephone Laboratories, and was a visiting associate professor at Columbia University. His research has been in the fields of optical and microwave spectroscopy, nuclear quadrupole resonance, superconductivity, and optical masers. With C. H. Townes, he is co-author of a book, "Microwave Spectroscopy," and of the first paper describing optical masers. For this latter work, Schawlow and Townes have been awarded the Stuart Ballentine Medal of the Franklin Institute and the Thomas Young Medal and Prize of the Physical Society and the Institute of Physics.

Robert L. Tanner, cited for contributions leading to the elimination of precipitation static on aircraft, is general manager of TRG-West, Menlo Park, and vice president of TRG, Inc., Melville, Long Island, N.Y. He earned the B.S., M.S., and Ph.D. in electrical engineering from Stanford. He is the author or co-author of nearly 30 technical articles and holds a number of patents. He is a member of the papers

(Continued on page 6)

McCullough

Gundy

Larson

Bolton

MORE WESCON

uled for Los Angeles August 25-28, 1964. Working under the committee will be about 400 additional industry volunteer executives, who staff the 14 special committees of Wescon's show and convention activities.

In its annual meeting, the board also named James Bolton as assistant manager of Wescon under Larson. Bolton has carried out major financial and statistical responsibilities as a member of the Wescon staff for almost two years.

For the first time in its history, Wescon/64 will be a two-part show, with half of its 1,200-plus exhibits displayed in Los Angeles Memorial Sports Arena, and the other half on view at Hollywood Park. Absence of a single Southland convention facility that could house the nation's second largest technical convention prompted the division.

Both locations are air conditioned, equipped with restaurant facilities, and provide ample parking space. Both are convenient to the freeway system.

Moore, show director for 1964, is president of Technical Systems Inc., and Lamm, convention director for 1964, is an engineering executive of Bendix Pacific.

Chartz is vice president and general manager of Dalmo Victor, Belmont, and Herold is vice president of research, Varian Associates, Palo Alto. Gundy, executive vice president of Technical Systems Inc., is located in Palo Alto; McCullough is vice president and general manager of Electron Tube division of Litton Industries, San Carlos.

meeting ahead

LASERS IN COMMUNICATIONS

Dr. B. J. McMurtry, head of the optical device department in the Mountain View components laboratory of Sylvania's microwave device division, will discuss communication applications of lasers at the December 17 meeting of the PTG on Space Electronics and Telemetry chapter.

Dr. McMurtry received the B.A. and B.S. in electrical engineering from Rice University and the M.S. and Ph.D. in the same field from Stanford University. In mid-1961 he and Prof. A. E. Siegman of Stanford conducted the first conclusive optical heterodyne experiments involving microwave difference frequencies. His subsequent photomixing experiments produced time-resolved, high resolution spectroscopic information about the output of ruby optical masers.

A first step toward realizing the theoretical information-carrying capacity of laser beams is the development of techniques for broadband (and, hence, high-frequency) modulation and demodulation of light. This talk will include a discussion of the present status of such work.

Descriptions will be given of both AM and FM communications experiments involving microwave modulation frequencies. A discussion of some of the microwave-optical components involved, both proven and proposed, will be followed by the presentation of a meaningful basis of comparison among the various photodetectors now in use. The relative advantages of the different detectors under various operating conditions will be pointed out.

Comments will be made on the likely paths to be taken in future light communications work.

events of interest

IEEE PAPERS CALLS

January 1—Mining Industry Technical Conference, Wilson Lodge, Gelbay Park, Wheeling, W.Va., April 1. R. V. Bovenizer, Hanna Coal Co., Cadiz, Ohio.

January 15—Region 6 Annual Conference, Salt Lake City, Utah, April 29, 30, May 1. Region 6/ISA. Abstracts (200 words) to Prof. Clayton Clark, EE Dept., Utah State University, Logan, Utah.

WINTER POWER MEETING

The IEEE Winter Power Meeting will be held February 2-7 at the Statler-Hilton Hotel, New York City. The event takes over the 1964 date of the former AIEE Winter General Meeting and offers a week-long technical program on power apparatus and systems.

It sets the stage for the IEEE International Convention of March, 1964, provides a regular annual forum on power systems subjects, and brings new unity to technical activities of the Power division.

Additional information may be obtained from Edward C. Day, assistant staff secretary, IEEE, Box A, Lenox Hill Station, New York 21, N.Y.

Power-oriented section members are reminded that a completed subscription order form for **Power Apparatus and Systems** automatically makes them members of the San Francisco chapter of the Professional Technical Group on Power now being formed. If they have not yet completed the order form recently mailed, they are urged to do so and mail it with a check for $6.00 to the section office. Additional forms and explanatory news letters are available from the office.

COMPUTERS IN ECG WORK

The November PTG on Bio-Medical Electronics chapter meeting featured Dr. J. Von der Groeben of Stanford, who discussed automatic recognition of ECG abnormalities. Dr. Von der Groeben is the author of a number of papers on ECG diagnosis with the aid of computers. His talk was a summary of this continuing work.

Dr. Von der Groeben indicated that about 20 million depolarizing cells contribute to each heart contraction. The electrical activity associated with this contraction can be recorded at the body surface with suitable electrodes, leads, and amplifiers. The exact placement of each electrode has become standardized over the years, and for clinical work is universally accepted. The usual methods of presenting ECG were discussed and the limitations of each pointed out. The amplitude vs. time recording and the vector electrocardiogram are the most often used methods, but an orthogonal 3-lead system has certain advantages. Dr. Von der Groeben and associates have chosen a lead system which allows the electrical potentials associated with the heartbeat to be accurately represented as a vector quantity in space. This vector quantity is represented graphically as a linear time function of its spherical coordinates.

Dr. Von der Groeben said that expressing the 3-lead potential as a single time-varying vector quantity in space has certain theoretical advantages. It allows an exact quantitative description of the information as a single directed magnitude. This aids analysis.

To prepare the data for the computer, the 3 vector leads X, Y, and Z were recorded on film at 6 inch/sec.—using the Helm lead system. The amplitudes were converted to digital data on punch cards. Readings of the analog signal were taken every 5 msec. throughout ventricular activation, i.e., the QRS complex. The QRS complex lasts about 80 msec. The rectangular coordinates were then converted to polar coordinates called **alpha, tilt,** and **spatial magnitude.** These coordinates are best described by imagining you are facing a man who has a vector which originates at his heart—which is at the center of his chest. Assume the vector points toward his left arm and downward and slightly forward—toward you. The downward angle is **alpha,** the forward angle is **tilt,** and the length of the vector is **spatial magnitude.**

Three graphs can now be constructed—each having an abscissa of time in milliseconds. The coordinates are **alpha** in degrees, **tilt** in degrees, and **spatial magnitude** in millivolts.

Dr. Von der Groeben and associates calculated the spatial frequency distribution of the heart vector for a group of 154 normal adults. These normals were subdivided into six divisions according to age and sex. Graphs were constructed for each subgroup with a shaded area indicating normal scatter of ± 2 standard deviations.

The plot of **alpha, tilt,** and **spatial magnitude** of the abnormal can be plotted on these graphs, and deviations from the shaded areas are clearly seen.

Dr. Von der Groeben indicated that additional equipment is being purchased so that the process can be completely automatic. He said that time function display enables easy discernment of characteristic abnormalities.

CON RADER

MORE FELLOWS

review committees of **Proceedings of the IEEE** and **Transactions of PTGAP,** and was formerly a member of the Air Force design review committee for the RBGG-C electronic countermeasures system G.

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WESTERN ELECTRIC, Defense Project Division, Benton Newnum (left): MOORE ASSOCIATES, INC., Chief Scientist, Laurence Moore.

PHILCO CORPORATION, Sierra Electronic Division, Joseph R. Lewis (left); STANFORD LINEAR ACCELERATOR CENTER, Stanford University, Richard Borghi.

the section

MEMBERSHIP COMMITTEE MEMBERS

Shown above are four of the nearly 90 section members serving on the membership committee located strategically in nearly 75 northern California firms to handle application and upgrading inquiries.

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

R. C. Carll
O. M. Gador
G. K. Haley
D. R. Harrison
D. W. Jaynes
D. E. Knepper
J. C. Kufis
S. C. Lam
R. G. Landrum
F. A. Myers
B. L. Smith
E. A. Strickert
C. W. Townsend
I. C. Uhl
J. R. Wright
K. A. Zemann

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

R. Albon, Jr.
J. R. Bailey, Jr.
M. L. Barton
T. A. Beck
J. A. Beghin
D. S. Bennet
J. S. Blakemore
F. H. Bower
W. M. Breen
C. J. Brown
J. H. Carroll
R. G. Chapin
N. R. Clark
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J. R. Crowley
J. A. D'Urso
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Burlingame; 342-8901

McDonald Associates
716 Wilshire Blvd.,
Santa Monica; 394-6610

Moxon Electronics
15 - 41st Avenue,
San Mateo; 345-7961

O'Halloran Associates
3921 E. Bayshore,
Palo Alto; 326-1493

Peninsula Associates
1345 Hancock Street,
Redwood City; 344-2521

MANUFACTURER / REPRESENTATIVE INDEX

Landis & Gyr, Inc. ..... Recht Assoc.
Laser Systems/Lear Siegler, Inc. (Trion) ..... Walter
Lavole Laboratories, Inc. ..... McCarthy Assoc.
Laboratory For Electronics ..... O'Halloran Assoc.
Lind Instruments, Inc. ..... The Thorson Co.
Lindgren & Associates, Erik A. ..... White & Co.
Lowell Instrument Laboratories ..... W. K. Geist Co.

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Marconi Instruments ..... Moxon Electronics
Maser Optics, Inc., Trident Div. ..... Peninsula Assoc.
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McLean Syntorque Corporation ..... T. Louis Snitzer Co.
Measurements, McGraw-Edison Div. ..... O'Halloran Assoc.
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Metex Electronics Corp. ..... Perlmuth Electronics
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Metron Instrument Co. ..... Components Sales Calif.
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Polarad Electronics ..... T. Louis Snitzer Co.
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Precision Mechanisms Corp. ..... Components Sales

Quan-Tech Labs ..... Jay Stone & Assoc.

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RHG Electronics Laboratory ..... Walter Assoc.
Rohde & Schwarz Sales Co. ..... W. K. Geist Co.
Rowan Controller Co. ..... Artwel Electric
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Sangamo Electric Co.— Electronic Systems Div. ..... Perlmuth Electronics
Scientific Data Systems ..... West Eleven
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Wyle Labs/Mfg. Div. ..... West Eleven

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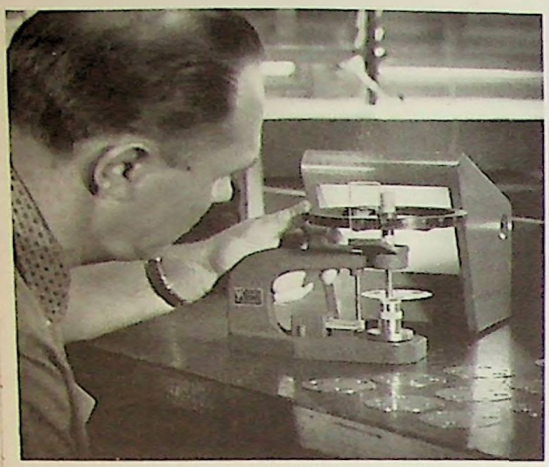
Wright Engineering
126 - 25th Ave.,
San Mateo; 345-3157

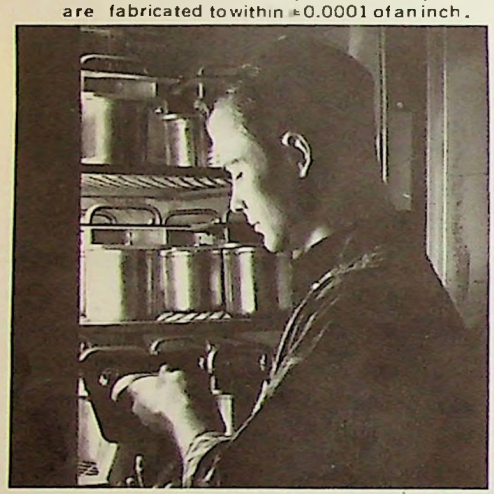
the Making of a Standard



Plates for the 1404 Reference Standard Capacitor are made of low-temperature-coefficient Invar alloy, precision lapped and checked on a light-wave micrometer for flatness. Each plate must be absolutely flat. To insure this, the plates are first heated and stress relieved at high temperature in a neutral atmosphere. Following this annealing process, the plates are hyperlapped to a thickness that is held to better than ±0.00025 of an inch. In addition, special Invar spacers are fabricated to within ±0.0001 of an inch.

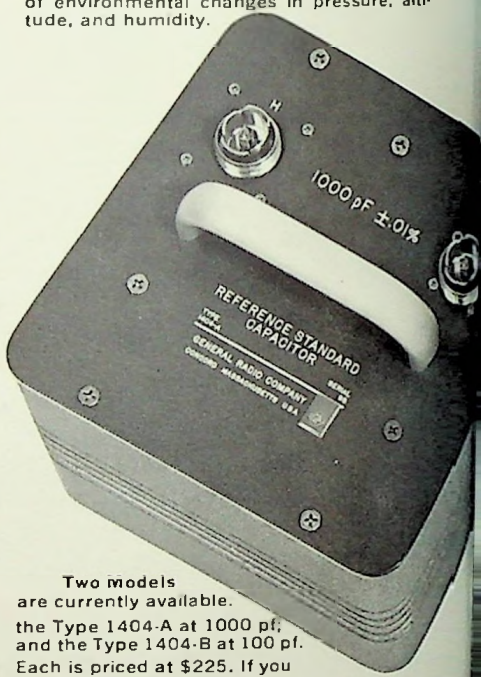
The capacitor is carefully assembled from parts that are one-hundred-percent inspected. The stacks of lapped Invar plates are mounted on six Invar posts separated by six Invar spacers and mounted on a thick Invar baseplate. By using one low-temperature-coefficient material throughout, the capacitor's final value is made more reproducible, since differential drift caused by use of dissimilar metals is eliminated. Temperature coefficient of the unit is that of Invar, or about +2 ppm/°C.

Following inspection and measurement, the capacitor is mounted in a hermetically-sealed heavy brass enclosure. All connections are made through glass-to-metal seals. The unit is then evacuated, purged to remove water vapor, refilled with high-purity, dry nitrogen gas and sealed. Sealing in an invariant atmosphere insures that both capacitance and dissipation factor will be virtually independent of environmental changes in pressure, altitude, and humidity.



After assembly and sealing, each capacitor is subjected to a number of hot and cold cycles of temperature to stabilize the structure and to determine temperature coefficient and magnitude of hysteresis. Test procedure requires heating the unit to 150° F — measuring; cooling to room temperature — remeasuring; cooling to 0° F — measuring; reheating to return the capacitor to its value prior to heating, and remeasuring to determine the retraceability of the cycle. Test limits are ±5 ppm on retraceability; capacitance change must not exceed 20 ppm for these hot and cold cycles. Typical change from hysteresis is less than 10 ppm.

The capacitor is adjusted with a trimmer to bring it close to nominal value. This is done with a precision of better than ±1 ppm. Adjustment is made at a temperature of 23° ± 1°C and frequency of 1000 cps to a value of 5 ppm above nominal with respect to reference standards whose values are traceable to NBS standards. The adjustment above nominal (e.g. 1000.005 pf) is made because it is more convenient to use than a standard adjusted to below nominal value (e.g. 999.995 pf).



Two models are currently available. the Type 1404-A at 1000 pf, and the Type 1404-B at 100 pf. Each is priced at $225. If you would like more information, please write. General Radio also manufactures a complete line of R-L-C standards.

Type 1404 Reference Standard Capacitors show very little change with orientation. Typical change is less than 5 ppm as the capacitor is turned in all possible directions. These capacitors are relatively free from microphonics. They do not have to be coddled. Sample units have been through 50g shock for 11 milliseconds and have shown capacitance changes of less than 50 ppm. Drift rate is well below 20 ppm per year. Losses are very low — almost immeasurable. Dissipation factor is less than 10 ppm at 1 kc.

Write for Complete Information

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS

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