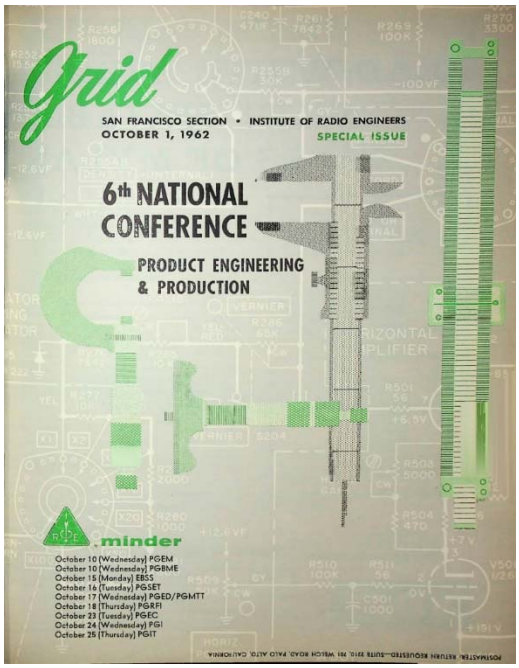
EDITOR'S PROFILE of this issue

from a historical perspective …

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



October, 1962:

Cover: The Sixth National Product Engineering and Production Conference, in S.F., inspired this cover. And yes, we used slide rules back in those days! Conference program coverage begins on page 7.

Page 7: Our IRE chapter on Product Engineering and Production, started by Charles (Bud) Eldon who'll go on to become Region 6 Director and IEEE president, organized and ran the third PGPEP Conference three years earlier, in San Mateo in 1959.

Page 8: Barnie Oliver, head of Hewlett Packard Research and Development, and who relayed Bill Hewlett's instructions to Bud to start this Group, is a luncheon speaker for the PGPEP Conference; a short bio and a photo are on page 12 (he was born in Santa Cruz). Bud Eldon himself is on the Group's national AdCom for 1962-63 (page 10). He is listed again on page 14 as chairing a session at the conference; his title is assistant to the vice president of operations at HP.

Grid

SAN FRANCISCO SECTION • INSTITUTE OF RADIO ENGINEERS
OCTOBER 1, 1962
SPECIAL ISSUE

6th NATIONAL CONFERENCE

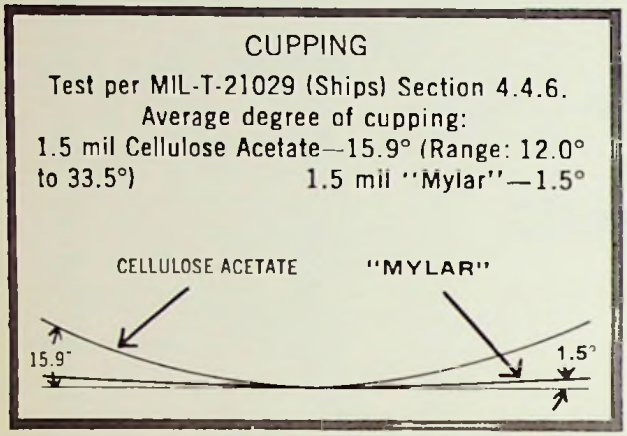
PRODUCT ENGINEERING & PRODUCTION

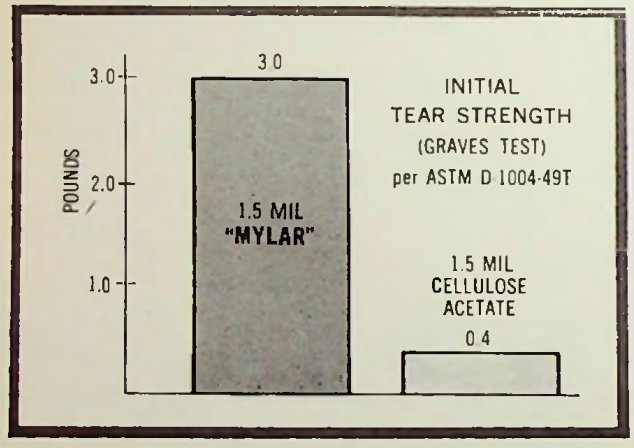
minder

October 10 (Wednesday) PGEM
October 10 (Wednesday) PGBME
October 15 (Monday) EBSS
October 16 (Tuesday) PGSET
October 17 (Wednesday) PGED/PGMTT
October 18 (Thursday) PGRFI
October 23 (Tuesday) PGEC
October 24 (Wednesday) PGI
October 25 (Thursday) PGIT

POSTMASTER: RETURN REQUESTED—SUITE 2210, 701 WELCH ROAD, PALO ALTO, CALIFORNIA

GUARD AGAINST READ/WRITE ERRORS WITH RELIABLE TAPES OF MYLAR®



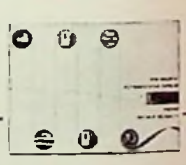


Unstable tape can cup or ruffle—cause read/write errors because the tape loses contact with the recording and playback heads. Dimensionally stable "Mylar"* polyester film base prevents tape cupping or ruffling. It does not shrink from dryness or swell from excess humidity, but maintains the original width and flatness of the tape.

"Mylar" is strong . . . has an ultimate break strength over 20,000 psi! Tapes of "Mylar" can resist edge nicks, stretching or breaking from sudden stops and starts. And since it contains no plasticizer to dry out, tapes of "Mylar" can be stored indefinitely without becoming brittle.

A stable tape assures accurate data acquisition—helps prevent costly read/write errors and loss of valuable test data. Tapes of "Mylar" have this stability. To be sure you'll get the best performance, insist on a base of "Mylar" on your next order for magnetic tape. Write for the free booklet on comparative test data. Du Pont Company, Film Dept., Wilmington 98, Delaware.

*"Mylar" is Du Pont's registered trademark for its brand of polyester film. Only Du Pont makes "Mylar".



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Film Department, Room #12, Wilmington 98, Delaware
Please send free, 12-page booklet of comparative test data to help me evaluate magnetic-tape reliability.

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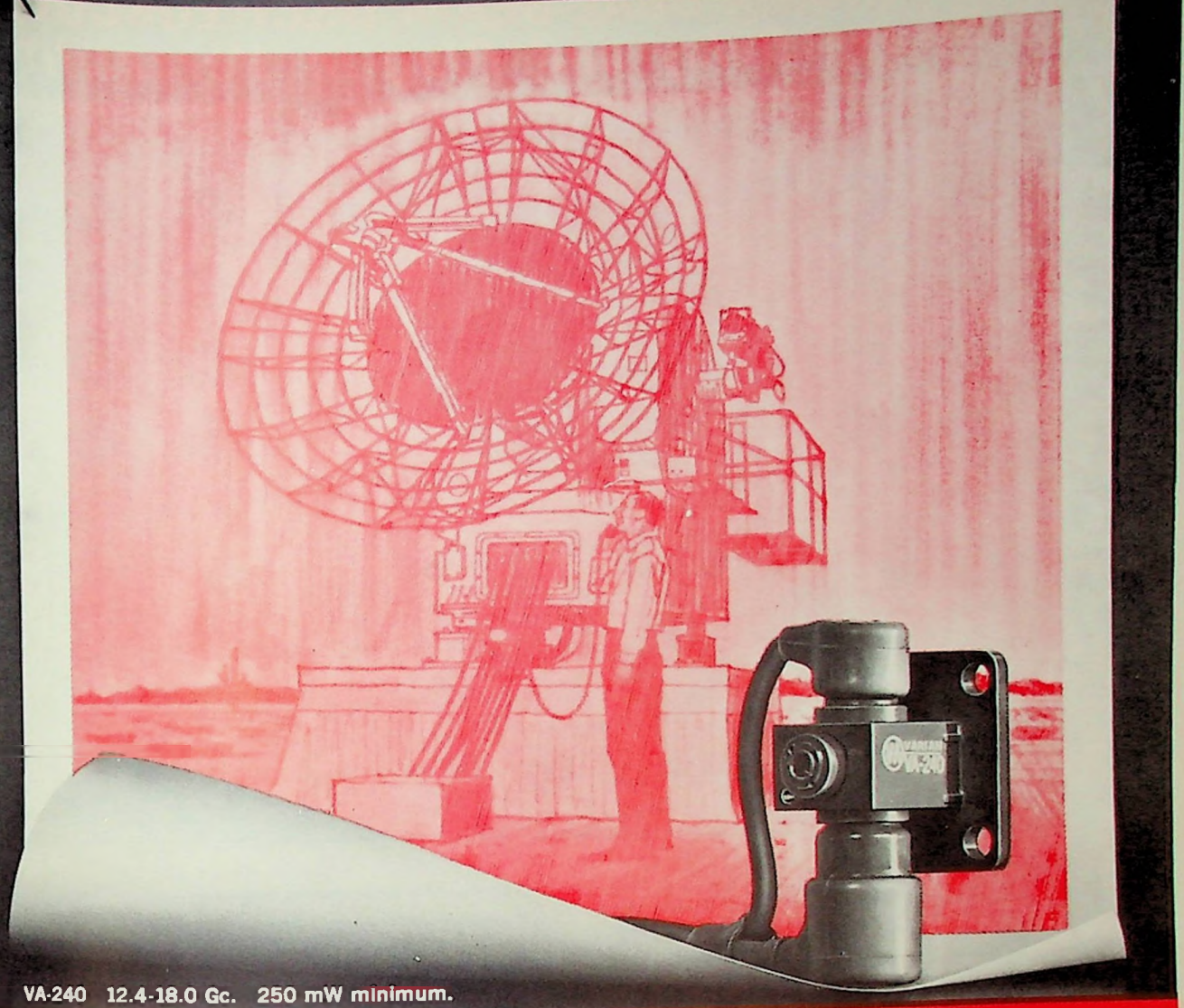


VA-240 12.4-18.0 Gc. 250 mW minimum.

from Varian: STABLE PUMP TUBES FOR PARAMETRIC AMPLIFIERS

Highly stable reflex klystrons by Varian can significantly improve your parametric amplifier system design. Tube types from 8.2 to 26.5 Gc are available for immediate delivery. From low-cost laboratory models to rugged 70 Gc tubes, all have Varian's inherent high quality of manufacture and performance.

Varian parametric amplifier pump tubes benefit from extensive research and testing for metals capable of contributing to precise control of temperature coefficients. For Varian pump tubes, this figure is less than 100 Kc per degree Centigrade. More than a dozen types of Varian reflex klystrons suitable for parametric pump use are operable in severe environments—20G shock, —55 to +85° C—and demonstrate excellent unattended long life characteristics. Improved optics in tube design provide maximum bandwidth. Power and frequency remain stable over a wide variety of environmental conditions.

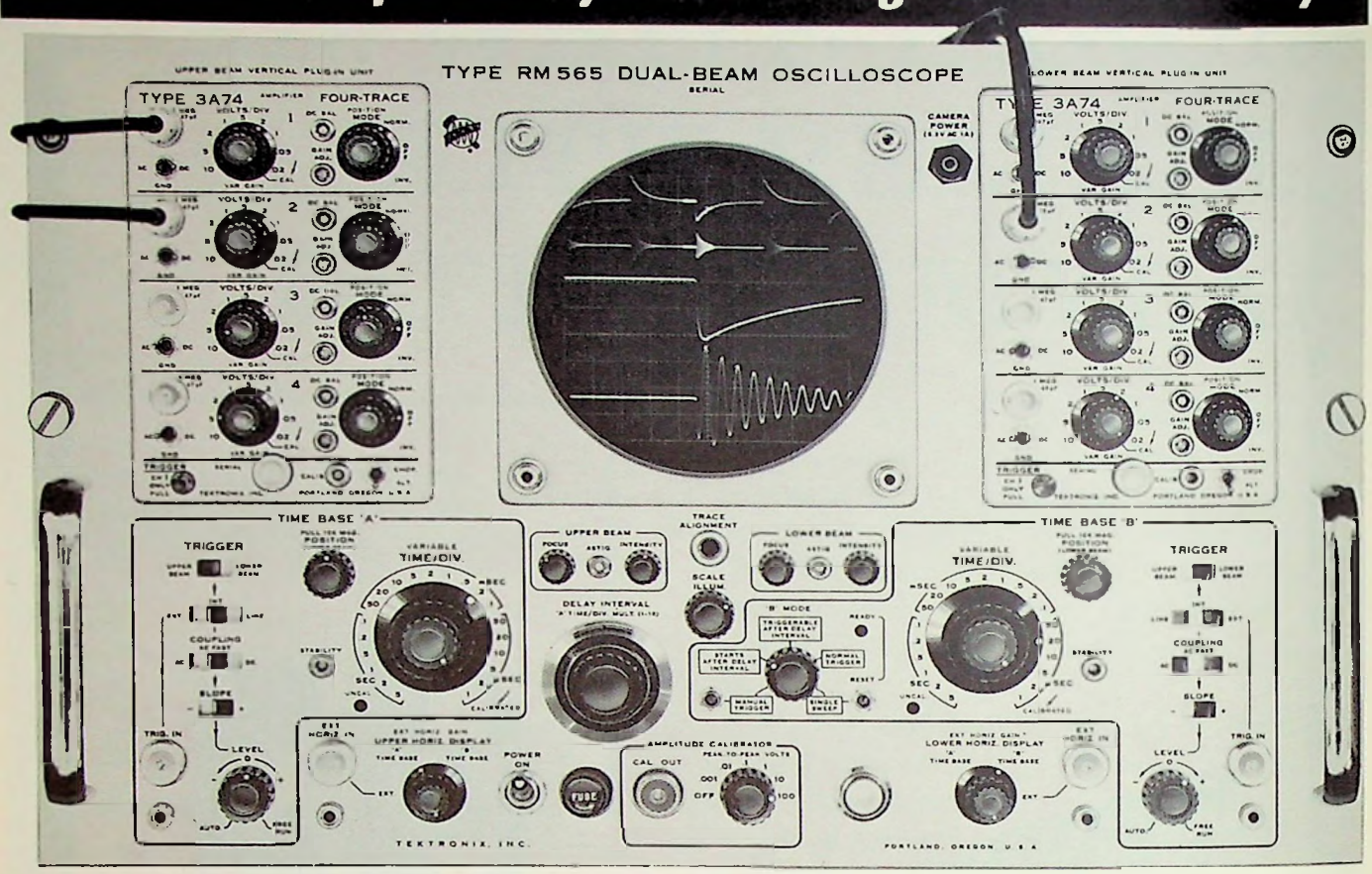
Tubes in the VA-240 series (see chart) are rugged, field trimmable, conduction-cooled. Other Varian tubes suitable for parametric amplifier application have similar features. Write Tube Division.

TUBE NO.	OPERATING FREQUENCY (Gc)	MINIMUM OUTPUT (mW)	MECH. TUNING RANGE (Mc)	ELECT. TUNING RANGE (Mc)	BEAM VOLTAGE (volts)
VA-240	12.4-18.0	250	50	40	750
VA-253	15.0-22.0	200	1000	40	750
VA-241	18.0-26.5	200	100	40	800
VA-254	18.0-26.5	150	1000	40	850

VARIAN associates
PALO ALTO 16, CALIFORNIA

Varian Subsidiaries: BOMAC LABORATORIES, INC. • S-F-D LABORATORIES, INC. • SEMICON ASSOCIATES, INC.
VARIAN ASSOCIATES OF CANADA, LTD. • SEMICON OF CALIFORNIA, INC. • VARIAN A.G. (SWITZERLAND)

NEW TEKTRONIX DUAL-BEAM OSCILLOSCOPE
with Sweep Delay and Plug-in Versatility



The waveform display represents four time-related functions—two trace-intensified by use of delayed sweep and two expanded presentations of these intensified portions.

Four additional traces are available from this oscilloscope/plug-in combination.

Sweep-delay characteristics include delay interval range of 1 μsec to 50 sec, calibrated and continuously adjustable—with 0.5% incremental accuracy and wide-range, jitter-free magnification.

PLUG-IN UNITS

AMPLIFIER UNITS TYPE	*PASSBAND (3-db down)*	*SENSITIVITY*	*PRICE*
2A60	dc—1 Mc.	50 mv/cm—50 v/cm 4 decade steps with variable control	$105
2A63—Differential (50:1 rejection ratio)	dc—300 kc.	1 mv/cm—20 v/cm 1-2-5 sequence with variable control	$150
3A1—Dual Trace (Identical Channels)	dc—10 Mc. (each channel) 6-cm linear scan.	10 mv/cm—10 v/cm 1-2-5 sequence with variable control.	$410
3A72—Dual Trace (Identical Channels)	dc—650 kc. (each channel)	10 mv/cm—20 v/cm 1-2-5 sequence with variable control.	$250
3A74—Four Trace (Identical Channels)	dc—2 Mc. (each channel)	20 mv/cm—10 v/cm 1-2-5 sequence with variable control.	$550
3A75—Wide Band	dc—4 Mc.	50 mv/cm—20 v/cm 1-2-5 sequence with variable control.	$175

2 Completely Independent Beams
2 Identical Independent Sweep Systems
2 Vertical Amplifier Compartments
Delayed-Sweep Operation
Single-Sweep Operation
Rear-Panel Output Connectors
Rack-Mount or Cabinet Model

Rack-Mount Model, illustrated.
(Mounts on tilt-lock, slide-out tracks to standard 19″ rack.)
Dimensions—12¼″ high by 19″ wide by 22″ deep.
Weight—67 pounds.
Type RM565 Oscilloscope (without plug-ins) $1500

Cabinet Model
Dimensions—13½″ high by 17″ wide by 23⅜″ deep.
Weight—62 pounds.
Type 565 Oscilloscope (without plug-ins) $1400

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

For more information on either model of this versatile new dual-beam oscilloscope, please call your Tektronix Field Engineer.

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volume 9, number 3

Grid

October 1, 1962

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contents

cover

Capturing the spirit of the 6th national conference on PEP, the art department of Hewlett-Packard has designed the cover for this special issue, for which the Grid is grateful.

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MEETING CALENDAR

EAST BAY SUBSECTION

8:00 P.M. • Monday, October 15

"The Synthesis of Electronic Bi-stable Circuits"
Speakers: Professor D. O. Pederson and R. S. Pepper
Tour of the new high-temperature plasma and semiconductor facilities of the electronic research labs of the University of California, Berkeley
Place: Room 277, Cory Hall, University of California Campus
Meet-the-Speakers Dinner: 6:30 P.M. (place to be announced)
Reservations and information: Berkeley, TH 3-2740, Ext. 5434; or Livermore, HI 7-1100, Ext. 8011

PROFESSIONAL GROUPS

Bio-Medical Electronics

8:00 P.M. • Wednesday, October 10

"Substitution for Lost Human Function; Sensory and Motor"
Speaker: Dr. Daniel J. Feldman, director, division of rehabilitation medicine
Place: Room M-112, Stanford Medical Center, Palo Alto
Dinner: 6:15 P.M., Red Cottage Restaurant, 1706 El Camino Real, Menlo Park
Reservations: Ken Gardiner, DA 6-6200, Ext. 2659, by noon of October 10

Electron Devices

8:00 P.M. • Wednesday, October 17

(Joint meeting with PGMTT)
"Quantum Noise in Optical Masers"
Speaker: Dr. William H. Louisell, Stanford University
Place: Physics Building, Stanford University

Electronic Computers

8:00 P.M. • Tuesday, October 23

"An Approach to General Pattern Recognition"
Speaker: Martin A. Fischler, Lockheed Missiles and Space Company
Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto
Dinner: 6:00 P.M., Red Shack, 4085 El Camino Way, Palo Alto
Reservations: None required

Engineering Management

8:00 P.M. • Wednesday, October 10

"Planning, Organization, and Development of W-J"
Speaker: Mr. Dean Watkins, Watkins-Johnson
Place: Watkins-Johnson Company, 3333 Hillview Avenue, Palo Alto

Information Theory

8:00 P.M. • Thursday, October 25

"Report on the Brussels International Symposium on Information Theory"
Speaker: Charles S. Weaver, project engineer, Philco, WDL
Place: Philco Auditorium, Building 56, 3825 Fabian Way, Palo Alto
Dinner: 6:00 P.M., Sakura Gardens, 2116 N. El Camino Real, Mountain View
Reservations: Mrs. Radl, YO 8-6211, Ext. 2460 or 2522

Instrumentation

Wednesday, October 24

"Time Domain Reflectometry"
Speaker: Bernard M. Oliver, Hewlett-Packard Company, Palo Alto
Dinner: To be announced
Meeting, time, and place: To be announced

Microwave Theory & Techniques

8:00 P.M. • Wednesday, October 17

(Joint meeting with PGED, see above)

Radio Frequency Interference

8:00 P.M. • Thursday, October 18

"The Frequency-Control Function on the Pacific Missile Range"
Speaker: Representative, Commander, Pacific Missile Range
Place: Auditorium, Building 202, Lockheed Missiles and Space Company

Space Electronics & Telemetry

8:15 P.M. • Tuesday, October 16

"Fuel Cells and Batteries for Space Applications"
Speakers: Dr. Morrin Eisenberg, Martin Klein Electrochimica Corp., Menlo Park
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto
Dinner: 6:30 P.M., Red Shack, 4085 El Camino Way, Palo Alto
Reservations: Tom Linders, RE 9-4321, Ext. 28394 or 28453

Grid reporters

EAST BAY SUBSECTION
N. K. (GENE) LITTLE, LAWRENCE RADIATION LABORATORY

PROFESSIONAL GROUPS:

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ANTENNAS AND PROPAGATION: ROLPH B. DYCE, STANFORD RESEARCH INSTITUTE

BROADCASTING: BEN WOLFE, KPIX-TV

BIO-MEDICAL ELECTRONICS: JAMES BLISS, STANFORD RESEARCH INSTITUTE

COMMUNICATIONS SYSTEMS: MAURICE H. KEBBY, LENKURT ELECTRIC COMPANY

CIRCUIT THEORY: R. E. KIESSLING, ITT LABORATORIES

ELECTRON DEVICES: MAHLON FISCHER, SYLVANIA, MICROWAVE DEVICE DIVISION

ELECTRONIC COMPUTERS: WILLIAM DAVIDOW, GENERAL ELECTRIC COMPUTER LABORATORY

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WELCOME TO PGPEP CONFERENCE 1962

Once again the San Francisco chapter of the Professional Group on Product Engineering and Production has the privilege of staging a national conference on the West Coast. The last time this chapter had this responsibility was in 1959, when the third national conference took place in San Mateo.

This year's national conference, the sixth, has the theme, "Product Engineering for the Sixties," indicating that this conference will look into the near future, whereas the previous conference, with the theme, "Production Techniques in Action," dealt with the state of the art at that time. The San Francisco chapter of the Professional Group on Product Engineering and Production extends a welcome to the sixth national conference, where you will find exhibits of interest along with papers being given on the theme subject.

This chapter is fortunate in being located in an area of unbelievable electronic growth and in drawing the talent of personnel connected with these many dynamic organizations. We are very appreciative of the cooperation that companies and individuals are giving the group to make the programs fit the need of members and nonmembers participating in the meetings and activities, and we are looking forward to seeing you at the national conference and the local meetings.

OLOF LANDECK
CHAIRMAN, PGPEP
SAN FRANCISCO CHAPTER

A RACE TO EMPLOY NEW TECHNOLOGY

The many professional groups in the IRE fall into two general categories, those which deal with a specific technology or science in great depth and those which deal with a given subject or field of interest in a broad manner. The Professional Group on Product Engineering and Production is clearly one of the latter category, for the scope of its work is described as:

> "Technical progress in product engineering and the production of electronic equipment by collecting and disseminating information on theories, studies, practices, methods, materials, component-parts applications, techniques, processes, analysis and engineering for environment and reliability, and human engineering."

In industry today, there is a great rush. There are demands not only to produce the advanced materials and products to meet the performance requirements set by the scientists, but the engineers also must provide new tools and techniques to use these materials, so as to form or make the products.

Defense and space age needs have helped make the electronic industries not only the fastest growing, but an increasingly diverse industry. The transistor has replaced the vacuum tube, and even now both are being displaced by thin-film and molectronic circuits. Ultrasonic waves are used to provide energy both for cleaning and machining of metals. Solar cells are employed as source of power in isolated locations. Electron beams and beams of light are employed for joining or cutting materials. Much work must be done under high vacuums. Chemical treatment is used to etch metals to desired shapes.

Most of these processes and techniques have found their way into design and manufacturing on military or similar programs, but they are now also entering the commercial field. Progress in the latter area is somewhat slower because companies have to find a way to cut the costs of the materials and processes in order to employ them advantageously. PGPEP is expanding as the dynamic forum for the dissemination and exchange of information regarding not only the new materials, processes, equipment, and techniques, but also their use and application.

APPRECIATION

The San Francisco Section and the **Grid**, its official publication, acknowledge with appreciation the past contributions of Frank Haylock, founding editor of the publication. It is appreciation for his talent, skill, perseverance, and many other qualities which he brought to the inception of the magazine for the section and to its publication for the past eight years.

Under his guidance, the **Grid**, as a local IRE publication, has achieved national recognition. Its excellence of format, execution, and editorial coverage has become a guidepost for others.

On behalf of those who have worked with Frank Haylock, as well as all IRE section members, our warm thanks and best wishes are gratefully extended.

PETER LACY, CHAIRMAN
SAN FRANCISCO SECTION

Hardly any segment of American industry escapes the pressure of "constant change." The electronics industry in particular is experiencing this phenomenon in its effort to make the nation's goods. The trend is toward a still faster pace of innovation. The speed with which knowledge regarding new materials and techniques is applied to a company's products and production operations may well determine whether it can keep ahead of its competitors, grow in the years ahead, and achieve satisfactory profits. Success in all these areas is essential if a contribution is to be made to the community and society as a whole.

ARTHUR P. KROMER
GENERAL CHAIRMAN
PGPEP CONFERENCE

Responsible for planning and executing the sixth national conference on product engineering and production are these members of the committee. Left to right are W. Dale Fuller, Lockheed Missiles and Space Co., exhibits chairman; George F. Reyling, Varian Associates, program chairman; Vic B. Buell, Dymec Division of H-P, arrangements chairman; Hugh D. Kennedy, Granger Associates, finance chairman; Arthur P. Kromer, Varian Associates, general chairman; Olof Landeck, Electro Engineering Works, publicity chairman; and Harmon R. Traver, Hewlett-Packard Co., member of the publicity committee who coordinated material for the Grid.

pgpep conference

PGPEP: PURPOSE AND SCOPE

Many professional groups concern themselves with a particular segment of the electronics industry, such as computers, microwaves, communications, or electronic devices. While these groups are primarily concerned with design techniques and applications for their particular products, the Professional Group on Product Engineering and Production (PGPEP) is concerned with the production of all these devices and also their design as it pertains to their production and future environment. Thus, PGPEP is concerned with many products, the only limitation being that they be electronic, electromagnetic, or electromechanical in nature.

The main purpose of the PGPEP is to collect and distribute information that will promote technical progress in its chosen field. This field may be broken down into two separate but related areas.

Manufacturing

First, the group is concerned with all manufacturing processes and methods. Both automatic and manual means are included. Typical discussions might include hand tooling, brazing, automation, packaging, and thin-film deposition. Often the discussions are supplemented with a plant tour of the facilities in question.

Product Design

Secondly, PGPEP is concerned with product design. This should not be confused with circuit techniques. Rather, the group discusses product design as it may affect the product's producibility. This will include cost reduction and value engineering. For example, the basic trade-offs between weight, space, performance, reliability, cost, etc., would be considered.

pgpep conference

CHAPTER OFFICERS

Officers of the San Francisco chapter of PGPEP for 1962-63 are Olof Landeck of Electro Engineering Works, chairman; W. Dale Fuller of Lockheed Missiles and Space Company, vice chairman; Thomas E. Scatchard of the Berkeley Division of Beckman Instruments, Inc., secretary-treasurer; and Harmon R. Traver of the Hewlett-Packard Company, membership chairman. Under a rearrangement of officers' duties, Fuller will also serve as program chairman. The program committee will consist of the officers listed above and last year's PGPEP chairman, George F. Reyling of Varian Associates.

Human Engineering

Also, the group is interested in product design as it pertains to human engineering and the product's future environment. The former might include ease of operation, serviceability, and safety. The latter would encompass such subjects as vibration analysis, shock, heat transfer, and accelerated-life testing. The group believes that the practical aspects of designing described above must be integrated with the considerations of production techniques and manufacturing processes outlined earlier.

PGPEP approaches this broad scope of interest on three basic levels. The majority of activity centers around local meetings, panel discussions, and plant tours. The local PGPEP group, for example, held seven meetings last year which included three panel discussions. Four of the meetings included a plant tour. The next level includes symposiums where papers on special subjects are presented. The third and highest level of PGPEP activity centers around a national conference.

Conference

The Sixth National Conference of the Professional Group on Product Engineering and Production, in San Francisco, will include a number of technical papers, exhibits, and speakers. Anyone who is interested in the

(Continued on page 10)

pgpep conference

PRODUCT ENGINEERING

A total of 15 technical papers will be presented at the sixth national conference on product engineering and production at the Jack Tar Hotel in San Francisco, November 1 and 2, under sponsorship of the San Francisco chapter of PGPEP.

A luncheon on November 2 will feature a talk on "Communication with Other Intelligent Species," by Bernard M. Oliver, vice president for research and development of H-P.

Four technical sessions will cover components; processes and equipment for electronic production; electronic interconnection techniques; man-hardware relationships; and circuits packaging.

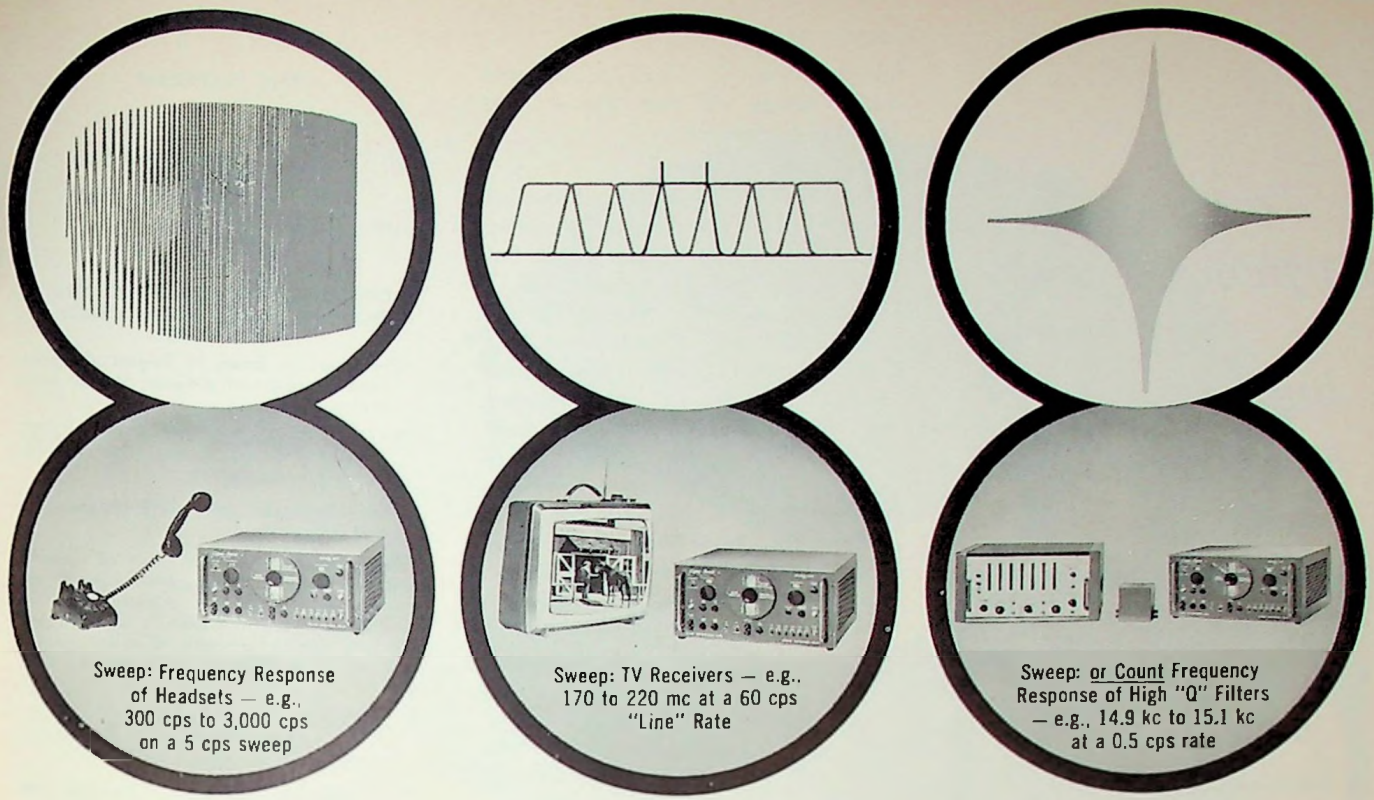
There will also be an additional luncheon on November 1 and exhibits of materials, parts, and equipment by a number of manufacturers.

For advance registration, including both luncheons and proceedings, mail $15.00 check payable to "1962 PGPEP Conference" to Hugh D. Kennedy, Granger Associates, 974 Commercial St., Palo Alto.

For exhibit information, write W. Dale Fuller, 1420 Hamilton Ave., Palo Alto.

For proceedings alone, send a $5.00 check to Kennedy.

The complete program follows in this special issue of **Grid.**



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50 CPS TO 220 MC IN 12 BANDS • WIDE RANGE OF SWEEP WIDTHS
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- Linear and logarithmic sweeps of 0.2 cps to 30 cps; or sweep locked to line frequency.
- Audio Sweep of 50 cps to 20,000 cps.
- 8 fixed, narrow-band video frequency sweeps for repetitive operations.
- Fundamental frequency 10 mc to 220 mc (widths to 30 mc plus).
- High-level output of 1 V rms into 70 ohms. AGC'd to ± 0.5 db over widest sweep.
- Manually-operated control for varying oscillator frequency.
- Fixed pulse-type markers or variable marker provision.

Price: $1295.00 F.O.B., Factory ($1425.00 F.A.S., New York).

The wide frequency range, extensive choice of sweep widths and repetition rates make the Kay *Ligna-Sweep* SKV a most useful sweeping oscillator.

For high frequency work, the unit provides 9 sweep bands, operating at fundamental frequencies for wide, stable sweeps from 10 to 220 mc. At the low end of the spectrum, an audio frequency sweep from 50 to 20,000 cps is provided. High order stability permits frequency sweeps to as low as 50 cps.

For checking high-Q circuits and low-frequency response characteristics, either log or linear sweeps at variable rep rates down to 0.2 cps are available. This wide choice of sweep rates (continuous to 30 cycles, and fixed line lock) makes it easy to select that highest *rep rate* which gives both an *accurate response* display and easiest, brightest viewing on the scope screen. With the manual frequency control, the trace on the scope screen may be held and examined in detail, (counted precisely, measured on a VTVM) at any frequency point on the scope display.


Check Video Bandpass — e.g., 1 kc to 10 mc at 1 cps rate


Check Radar IF's — e.g., 25 to 35 mc at 30 cps


Check Audio Bandpass — e.g., 50 cps to 20 kc at 1 cps Log Sweep

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MORE PEP

latest advances in the production and design fields will find this a most valuable conference.

Nation-wide Committee

The PGPEP operates nation-wide with chapters in Boston, Los Angeles, New York City, Philadelphia, San Francisco, and Washington, D.C. The group functions through a national administrative committee consisting of the following members for 1962-63: D. B. Ehrenpreis, consulting engineer, New York; J. Eiselein, RCA, Camden, New Jersey; C. A. Eldon, Hewlett-Packard Company, Palo Alto; W. B. Ellwood, Bell Telephone Labs., New York; R. A. Gerhold, U.S. Army Signal Res. & Devel. Lab., Ft. Monmouth, New Jersey; A. R. Gray, Astronics of Florida, Inc., Orlando, Florida; H. D. Kennedy, Granger Associates, Palo Alto; A. P. Kromer, Varian Associates, Palo Alto; E. J. Lorenz, IBM, Poughkeepsie, New York; L. M. Matthews, Sperry Gyroscope Co., Great Neck, New York; G. F. Reyling, Varian Associates, Palo Alto; P. J. Riley, RCA, Cambridge, Ohio; R. L. Swiggett, Photocircuits, Inc., Glen Cove, New York; J. Trinkaus, Sperry Gyroscope Co., Great Neck, New York; and C. W. Watt, Jr., Raytheon Co., Lexington, Massachusetts. Officers for the current year are Trinkaus, chairman; Kennedy, vice chairman; and Matthews, secretary-treasurer.

RONALD K. CHURCH
SPECIAL CORRESPONDENT
PGPEP

pep conference

LOCAL PGPEP ACTIVE

Diversification is the key word to describe the San Francisco chapter of the PGPEP meetings for last year. The program topics ranged from discussion and inspection of a specific product or production technique to a discussion of the broad area of value analysis and cost reduction.

The first meeting held last September covered thin-film titanium circuits. W. Dale Fuller of Lockheed described a chemical fabrication process which contributes to economical production. These titanium circuits have high standards of reliability, reproducibility, and environmental range.

The October meeting featured a

(Continued on page 12)

pgpep conference

THE PROGRAM

Thursday, November 1

9:00-11:30 a.m. California Room

Welcome to Conference
Arthur P. Kromer, chairman

SESSION I

COMPONENTS, PROCESSES, AND EQUIPMENT FOR ELECTRONICS PRODUCTION

Chairman: Dr. Emery H. Rogers, vice president, instrument division, Varian Associates

1. VACUUM DEPOSITION TECHNIQUES FOR PRODUCING THIN-FILM INTEGRATED CIRCUITS

Russell D. Kraus, solid state systems division, Motorola, Inc.

The production of four types of vacuum-deposited films for integrated circuits will be discussed. The design philosophy behind the choice of basic methods, process controls, and production techniques to increase productivity and lower costs will be presented.

2. CHEMICAL PROCESSES AS MANUFACTURING TOOLS FOR THE ELECTRONIC INDUSTRY

L. B. Stearns, president, Chemical and Aerospace Products, Inc.

Chemical milling, a chemical process for metal removal, has come into general use as a method of weight reduction. Chemical blanking is used to produce close tolerance detail parts from thin or exotic metals. Preformed circuitry has been made possible by a combination of chemical processes, including chemical etching and polishing.

3. PRACTICAL ELECTRON BEAM APPLICATIONS FOR ELECTRONICS

F. R. Schollhammer, project engineer, Hamilton standard division, United Aircraft Corporation

Electron beams are used today for cutting, welding, drilling, and heat treating. This paper will emphasize recent applications, principally in the areas of cutting, drilling, and heat treating. Welding will also be touched on briefly. The practical point of view for the production engineer will be highlighted.

4. CONTROL OF AIRBORNE PARTICULATE CONTAMINATION

F. M. Allison, armament and flight control division of Autonetics (a division of North American Aviation, Inc.)

Sources of airborne particulate contamination will be discussed, with particular emphasis upon street clothing and protective garments worn by personnel in environmentally controlled areas. Microscopic and chemical analyses are used to demonstrate the common origin of the particulates. Proper selection of protective garments and control of the dewpoint help minimize the airborne dust.

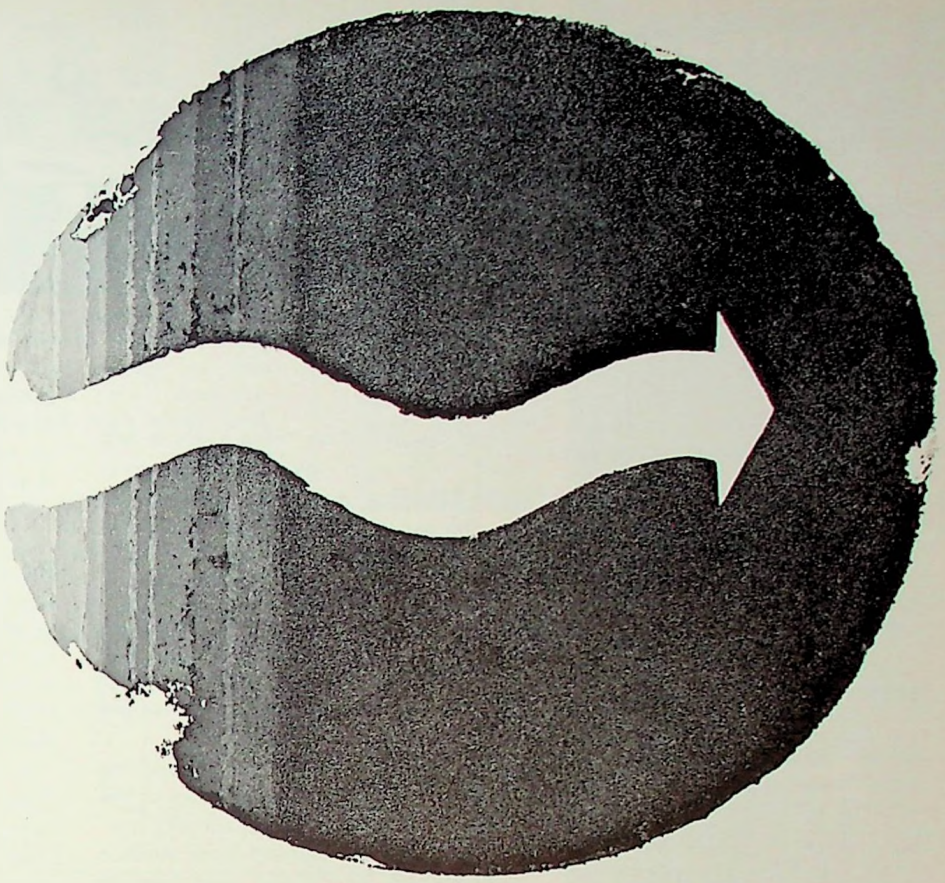
Questions from the audience will be answered by the authors, following each paper.

LUNCHEON

12:00-1:30 p.m. California Room

Speaker: To be announced.

(Continued on page 14)



Said Max Planck:

"The energy of a quantum is directly proportional to the frequency of vibration of its electromagnetic wave."

A new window in space is being opened by scientists at Lockheed Missiles & Space Company. While the visible spectrum of stars is observable from the earth, photons of several hundred to several thousand electron volts are filtered out by the atmosphere: Hence undetectible on the earth's surface.

Very hot stars may have coronas—as does our sun. Scientists speculate that, if it were possible to study that portion of the frequency range known as "soft" X-rays (which may emanate from the coronas of very hot stars), we might gain new insights into the evolution and constitution of the universe.

To initiate a search for celestial sources of "soft" X-rays, Lockheed (under NASA sponsorship) has developed and built photon counters to be carried aboard sounding rockets. Thus a survey of the night sky will be made for sources which emit photons in the 100-to-10,000 electron volt energy range.

Of interest to most engineers and scientists is the fact that this investigation was originated by a young Lockheed physicist. He realized that no serious attempt was being made to investigate those wave lengths just below the ultraviolet. Many similar developments have been evolved by Lockheed people who find here the creative freedom they need to pursue their own original ideas.

Lockheed Missiles & Space Company is located on the beautiful San Francisco Peninsula, in Sunnyvale and Palo Alto, California. We invite you to investigate your own career-potential with Lockheed. Write: Research & Development Staff, Dept. M-38, 599 North Mathilda Avenue, Sunnyvale, California. Lockheed is an equal opportunity employer.

LOCKHEED ***MISSILES & SPACE COMPANY***

A GROUP DIVISION OF LOCKHEED AIRCRAFT CORPORATION

SYSTEMS MANAGER FOR THE NAVY POLARIS FBM AND THE AGENA VEHICLE IN VARIOUS AIR FORCE SATELLITE PROGRAMS. OTHER CURRENT PROJECTS INCLUDE SUCH NASA PROGRAMS AS THE OGO, ECHO, NIMBUS, RANGER AND RIFT.

SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA • CAPE CANAVERAL, FLORIDA • HAWAII

Panelists from the November PGPEP meeting: Kenneth King, Cal Probst, Don Brown, and right, Harry Hall with the moderator and program chairman, T. E. Scatchard.
—Harmon R. Traver photo

MORE PGPEP

panel discussion on value analysis and cost reduction by representatives from four Bay Area companies. From the large attendance and the questions asked, it was evident that there was keen interest in this subject. Afterwards, we had the opportunity to inspect the biochemical and medical equipment production areas of the Beckman Spinco Division, where the meeting was held.

"Coatings and Finishes" provided the topic for a panel discussion at the November meeting. This subject covered the entire process from surface preparation and finish selection to application.

An automatic tape-controlled milling machine was described by Alan Watts of Hewlett-Packard and demonstrated at the January meeting. This machine automatically positions the work piece in three axes with relation to the spindle and selects the proper tool (mill, drill, reamer, etc.) at the command of a prepunched paper tape. Numerous advantages became apparent, some of the most significant being an 8-to-1 reduction in tooling costs and lead time and a 3.4-to-1 reduction in machining time.

In February the topic changed from that of a specific machine to the broad topic of "Testing Versus the State of the Art." Eric B. Edberg, manager of reliability and quality assurance for Varian Associates, described the effects of higher system cost, shorter life, and advances in the state of the art as they pertain to testing. Briefly, he advocated: (1) rapid feedback from the contractor; (2) semiautomatic test equipment; (3) continual calibration of the equipment; (4) improved environmental facilities; and (5) high-caliber personnel. The meeting concluded with a tour of the microwave tube testing areas of Varian Associates.

A panel discussion was held again in April to examine the packaging of parts and equipment for protection during storage and shipment. The discussion covered packaging small components and complete instruments.

(Continued on page 19)

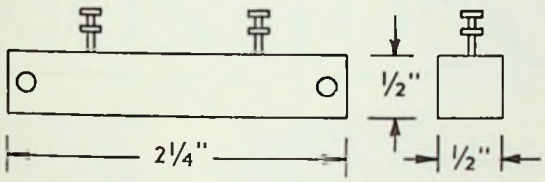
Panel on value analysis and cost reduction at October PGPEP meeting: seated, Steinberg, McMahon, Day, Brown; standing, Thomas E. Scatchard, program chairman.
—Harmon R. Traver photo

How Solitron solved it!

Actual case histories of significant advances in miniature high voltage silicon rectifier assemblies

Problem #3: A leading missile contractor required a miniature, high frequency voltage doubler for electrostatic gyro application. 5,000 volts DC output was required at an operating frequency of 265 KC; reverse leakage of the assembly had to be 1 microamp at 25°C. And the entire assembly had to withstand high shock and acceleration conditions.

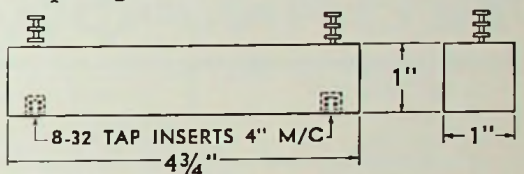
Solution: Solitron developed a doubler assembly measuring ¼" wide, ½" high and 2" long with 8,000 volts PIV per leg. The silicon diodes used in the assembly had switching characteristics of less than 0.5 μsec with reverse leakage of 1 microamp at rated voltage, 10 microamps at 100°C.



FILE #A521

Problem #4: The communications group of a well-known military equipment manufacturer found that the silicon rectifier bridge in a single sideband transceiver was acting as a fuse under load short conditions before circuit-breaker drop-out. They asked if we could supply a unit in the same size, which would not fail when subjected to 100 Amp surge currents.

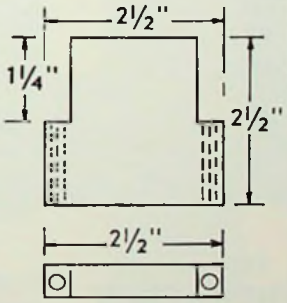
Solution: Solitron supplied a single phase full-wave bridge, each leg of which was rated at 6,000 PIV—2.5 Amps, in a package 1" x 4¾" x 1". Drop-out time of the breaker under worst-case conditions was 30ms; our unit can withstand a 200 Amp surge.



FILE #A522

Problem #5: We were asked to fulfill a requirement for a Charging Diode in an airborne radar modulator. Minimum space and weight was available for a 60KV PIV unit which had to meet extreme environmental specifications.

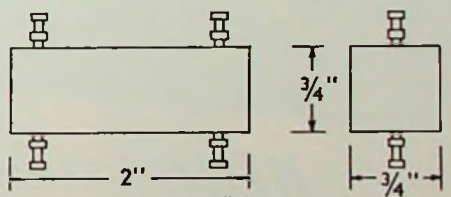
Solution: Solitron manufactured a miniature unit weighing 6 oz., using corona free material. It delivers 6 Amp peak charging current at 200 PRF and has a hold-off capability of 60KV.



FILE #A524

Problem #6: An electronics manufacturer, a pioneer in the field, had a requirement for a rectifier assembly for use in a satellite high voltage power supply. High reliability, small size and light weight were necessary.

Solution: Solitron designed and built an assembly with two 8,000V PIV, 1A legs in the same package, each leg closely matched for switching time. The requirements for operation at extremely high altitudes were met in a package weighing less than 2 oz.



FILE #A525

Above are just some examples of Solitron's wide success in solving high voltage solid state problems where others failed. Solitron can supply any high voltage assemblies in various configurations with fast delivery and free engineering services. The products described above are available from 1,600 to 100,000 volts per block.

Write today for free high voltage staff report.

Solitron
DEVICES, INC.
500 Livingston Street • Norwood, N. J.
PO 8-3770 • TWX-CLOS 863

MORE PROGRAM

SESSION II

2:00-4:30 p.m. California Room

ELECTRONIC INTERCONNECTION TECHNIQUES

Chairman: Dr. Stanley F. Kaisel, president, Microwave Electronics Corporation

1. ASSURED RELIABILITY IN SOLDERED CONNECTIONS

Dr. L. Pessel, defense electronics products, Radio Corporation of America

The reliability of soldering depends primarily upon solderability of the surface to be joined. An entirely new test for solderability is described which will permit raising this important characteristic to the highest possible level and provide a reliability aspect which is unique and, in some respects, unsurpassed in other connecting processes.

2. AN APPROACH TO MINIATURIZED WIRE WRAP

T. J. Fox and C. N. Patterson, data system division, International Business Machines Company

This paper constitutes a proposal to employ "wire wrap"® techniques to effect reliable electrical connections between random points on miniature electronic components. Topics emphasized are: the effects of miniaturization on connection philosophy, assurance of a high degree of reliability using basic quality-control methods, a major research experiment illustrating the feasibility of "wire wrap" and other techniques, still to be defined, that can increase the reliability and strength of wire wrapped connections.

3. SURVEY OF WELDING TECHNIQUES

Samuel A. Francis, vice president, The Sippican Corporation

The advantages, disadvantages, and typical equipment for each of the following techniques will be summarized: resistance welding; ac, dc, spike, pulse, percussion welding; ultrasonic welding; thermal compression bonding; electron-beam welding; and laser welding. Since resistance welding is being more widely used today, the following crucial production aspects of this technique will be discussed in detail, bearing in mind that the other techniques will have roughly similar requirements: materials control; weld schedule development; and equipment and operator certification.

Authors will serve as a panel for general discussion of the subject, following the presentation of the papers.

COCKTAIL PARTY

6:00-7:00 p.m. California Room

EXHIBITS

8:00 a.m.-8:30 p.m. Eldorado Room

Friday, November 2

SESSION III

9:00-11:30 a.m. California Room

MAN HARDWARE RELATIONSHIP

Chairman: Charles A. Eldon, assistant to the vice president of operations, Hewlett-Packard Company

1. MAINTAINABILITY DEMONSTRATION EQUIPMENT

Nick Buchaca, Western Development Laboratories, Philco Corporation

(Continued on page 20)

ELECTRO INSTRUMENTS, INC.
355 OLIVE STREET
SUNNYVALE, CALIFORNIA
PHONE 739-6917

BULLETIN SF1A-22

DIGITAL INSTRUMENTS

DC AMPLIFIERS

X-Y RECORDERS

DIGITAL SYSTEMS

MONITOR SCOPES

SHORT FORM CATALOG

1962

Electro Instruments, Inc.

DIGITAL INSTRUMENTS

ALL ELECTRONIC

(Price ranges: $4,000.00 to $8,000.00)

Eitronic series instruments with solid state logic switching. Totally transistorized AC and DC voltmeters, ratiometers and ohmmeters in either 4 or 5 digit models. All the inherent advantages of solid-state circuitry—speed, accuracy, reliability and silent operation. Automatic ranging and polarity indication. Electrical outputs for direct printer drive.

SPECIFICATIONS

	4 DIGIT MODELS	5 DIGIT MODELS
DC Voltage Range:	±.0001 to 999.9V	±0.0001 to 999.99V
DC Ratio Range:	±.0001 to 999.9	±0.0001 to 999.99
DC Accuracy:	±1 digit	±0.01% of reading or 1 digit
Average DC Balance Time:	50 msec.	50 msec.
AC Voltage Range:	.0001 to 999.9V	0.0001 to 0999.9V
AC Accuracy:	±0.1% of reading or 2 digits	±0.1% of reading or 2 digits
Average AC Balance Time:	1 sec.	1 sec.
Resistance Range:	.0001KΩ to 999.9KΩ	000.01Ω to 9.9999MΩ
Resistance Accuracy:	to ±.01% of reading	to ±.01% of reading
Average Resistance Balance Time:	200 msec.	200 msec.

ELECTROMECHANICAL

(Price ranges: $1,200.00 to $5.000.00)

Electromechanical AC and DC voltmeters, ratiometers and ohmmeters in either 4 or 5 digits. More than 10,000 now in field use. Solid state circuitry throughout. Higher accuracies, simpler operation, faster speeds and far greater reliability. Automatic ranging and polarity. Direct printer drive capabilities.

SPECIFICATIONS

	4 DIGIT MODELS	5 DIGIT MODELS
DC Voltage Range:	±.0001 to 999.9V	±0.0001 to 1100.0V
DC Ratio Range:	±.0001 to .9999	±.00001 to .99999
DC Accuracy:	±1 digit	±0.01% of reading or 1 digit
Average DC Balance Time:	1 sec.	2 sec.
AC Voltage Range:	.0001 to 999.9V	0.0001 to 0999.9V
AC Accuracy:	±0.1% of reading or 2 digits	±0.1% of reading or 2 digits
Average AC Balance Time:	3 sec.	3 sec.
Resistance Range:		000.01Ω to 9.9999MΩ
Resistance Accuracy:		to ±0.01% of reading
Average Resistance Balance Time:		2 sec.

X-Y and X-YY[1] RECORDERS

(Price ranges: $1,600.00 to $5,000.00)

Feature for feature, the world's most carefully designed and built recorders and accessories. Totally transistorized circuitry. Features plug-in signal amplifier modules in the 400 series instruments. Human engineered operating controls, unparalleled performance and reliability.

SPECIFICATIONS

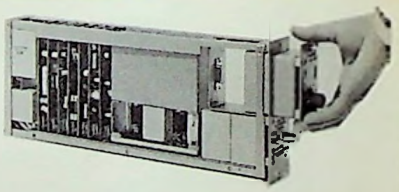
	300 SERIES	400 SERIES	500 SERIES
Slewing Speeds:	20"/sec.	30"/sec.	25"/sec.
Static Accuracy:	±0.15%	±0.15%	±0.15%
Input Sensitivity:	0.5mv/in. to 50v/in.	See Module Spec.	0.5 mv/in. to 100 v/in.
Input Impedance:	1 megohm	See Module Spec.	1 megohm
Time Base:	.02 to 1.0 in./sec.	See Module Spec.	.02 to 1.0 in./sec.
Reference:	mercury cells	See Module Spec.	Internal Zener diode.
Style:	table or rack mounting	Table or rack mount.	Table or rack mount.

	MODEL 420 PLUG-IN MODULE	MODEL 468 PLUG-IN MODULE
Static Accuracy:	±0.1%	±0.1%
Input Sensitivity:	0.5 mv/in. to 100 v/in.	0.5 mv/in. to 100 v/in.
Input Impedance:	1 to 4 megohms	1 to 4 megohms
Time Base:		0.02 to 2.0 in./sec.
Reference:	Zener diode	Zener diode

NOTE: Numerous other plug-in modules immediately available.

WIDEBAND DC AMPLIFIERS

(Price ranges: $850.00 to $1,500.00)



Totally transistorized DC amplifiers featuring plug-in attenuators to accommodate single-ended or differential inputs. Unmatched performance and versatility. High reliability, minimum size, no heat problems. NOTE: Specify basic amplifier and one plug-in attenuator when ordering

MODEL A-14 Basic Operational and Computer Control Amplifier—Includes basic amplifier specifications. Specify Model A-14GSP or A-14GDP plug-in attenuator.

MODEL A-15 Basic General Purpose Amplifier—Includes basic amplifier specifications. Specify Model A-15GSP or A-15GDP plug-in attenuator.

MODEL A-16 Basic True Differential General Purpose Amplifier—Includes basic amplifier specifications. Specify Model A-16GD plug-in attenuator.

SPECIFICATIONS

BASIC AMPLIFIER
DC Linearity: to 0.01%
DC Output Impedance: less than 80 milliohms
Output Capability: ±10V to ±100 MA
Capacitive Output Load: to 0.25 μfd

A-14GSP ATTENUATOR
Gain: 1 to 100 with vernier between steps
Input Impedance: 100 meg
Drift: to 2μv
Noise (referred to input): to 5μv P/P
Frequency Response: to 10KC
Common Mode Rejection:
Operation: Single-ended floating

A-14GDP ATTENUATOR
1 to 100 with vernier between steps
100 K
to 4μv
to 50μv RMS
to 10KC
to 100 db
balanced differential

A-15GSP ATTENUATOR
Gain: 10 to 1000 with vernier between steps
Input Impedance: 100 meg.
Drift: to 2 μv
Noise (referred to input): to 1 μv P/P
Frequency Response: to 10 KC
Common Mode Rejection:
Operation: single-ended floating

A-15GDP ATTENUATOR
10 to 1000 with vernier between steps
10 K
to 4 μv
to 7 μv RMS
to 10 KC
to 100 db
balanced differential

A-16GD ATTENUATOR
Gain: 10 to 1000
Input Impedance: 100 megohms
Drift: to 2 μv
Noise (referred to input): to 5 μv RMS
Freq. Response: to 10KC
Common Mode Rejection: to 160 db
Operation: true differential

NOTE: Numerous other plug-in attenuators available.

4 DIGIT MODELS

EITRONIC 848 DC Voltmeter/Ratiometer — Includes all 4 digit DC specifications.

EITRONIC 850 DC Voltmeter/Ratiometer/AC Voltmeter — Includes all 4 digit AC and DC specifications.

EITRONIC 851 DC Voltmeter/Ratiometer/AC Voltmeter/Ohmmeter — Includes all 4 digit AC, DC and resistance specifications.

5 DIGIT MODELS

EITRONIC 880 DC Voltmeter/Ratiometer — Includes all 5 digit DC specifications.

EITRONIC 881 DC Voltmeter/Ohmmeter — Includes all 5 digit DC and resistance specifications.

EITRONIC 882 DC Voltmeter/Ratiometer/AC Voltmeter — Includes all 5 digit AC and DC specifications.

EITRONIC 883 DC Voltmeter/Ratiometer/AC Voltmeter Ohmmeter — Includes all 5 digit AC, DC and resistance specifications.

4 DIGIT MODELS

MODEL 4010 Budget Priced Portable DC Voltmeter — Includes all 4 digit DC voltage specifications only, but with ±0.001V minimum sensitivity. Specify Model 4000 for rack mounting.

MODEL 3410A DC Voltmeter/Ratiometer/AC Voltmeter — Includes all 4 digit AC and DC specifications. Specify Model 3400A for DC and DC ratios only.

MODEL 3510A DC Voltmeter/Ratiometer/AC Voltmeter — Includes all 5 digit AC and DC specifications. Specify Model 3500A for DC and DC ratios only.

5 DIGIT MODELS

MODEL 3500CR DC Ratiometer — Includes all 5 digit DC ratio specifications only, but with manual rather than automatic polarity.

MODEL 3500A0 Ohmmeter — Includes all 5 digit resistance specifications.

MODEL 300T 8½" x 11" X-Y Recorder — Includes all 300 series specifications. Specify Model 300 if time base not required. Specify Model 300RA or Model 300TRA for rack mounting.

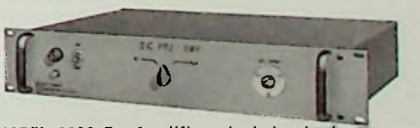
MODEL 400 11" x 17" Basic X-Y Recorder Assembly — Includes table mount cabinet and mechanical recording assembly only. Specify one plug-in module for each axis. Specify Model 401 for rack mounting only.

MODEL 480 11" x 17" Basic X-YY' Recorder Assembly — Includes table mount cabinet and mechanical recording assembly only. Provides two independent Y axes. Specify one plug-in module for each axis. Specify Model 481 for rack mount only.

MODEL 500 11" x 17" Budget Priced X-Y Recorder — Includes all 500 series specifications.

DC PRE-AMPLIFIERS *(Price ranges: $1,000.00 to $1,100.00)*

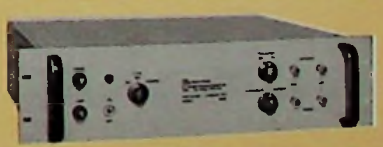
Totally transistorized pre-amplifiers to operate in conjunction with digital instruments and X-Y recorders. Single-ended floating input and output. 100 megohm input impedance. ±0.01% gain accuracy. Drift to 2μv/°C. 0 to 1 volt input. ±10 volt output.

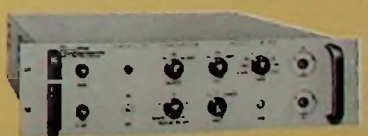


MODEL 3020 Pre-Amplifier — Includes basic pre-amplifier specifications and fixed gains of 1 and 10. Specify Model 3020Q for fixed gains of 1, 10 and 100.

SPECIAL PURPOSE INSTRUMENTS

Totally solid state, special purpose instruments for measurement of capacitance, dissipation factor and impedance deviation. A truly new approach to high speed measurement of these parameters in conjunction with production checkout, receiving inspection and quality assurance programs. Measurement times reduced by as much as 75% over conventional techniques. Request Bulletin No. C3.19 for complete Model 6150 Capacitance to DC Converter specifications. Request Bulletin No. C4.19 for complete Model 6100 Impedance Comparator specifications.



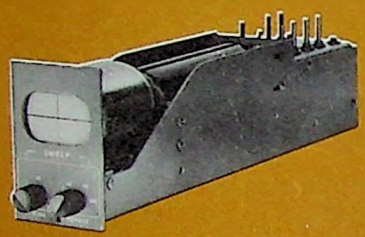


MONITOR OSCILLOSCOPES

(Price ranges: $950.00 to $3,300.00)

Compact high performance, solid state, plug-in scopes for monitoring multichannel magnetic tape data, verification of telemetering or control systems phenomena, viewing medical instrumentation parameters and a host of similar multidata monitoring problems. A single scope bay will accommodate from 1 to 7 individual plug-in scopes with the one common power supply being located in the rack adaptor.

MODEL 260 Oscilloscope Bay—Includes 7 Model 260M plug-in scopes and 1 Model 260R rack mount with common power supply and slide rails. Mounts in 3¼" x 19" x 16" of rack space.



MODEL 260M Plug-In Scope—2" flat faced CRT; frequency response DC to 1 megacycle; sensitivity 0.25 to 2.5 volts rms/in. of deflection; input impedance 100K ohms; sweep rates 10 cps to 10 KC; triggered or free running operation.

INPUT SCANNERS

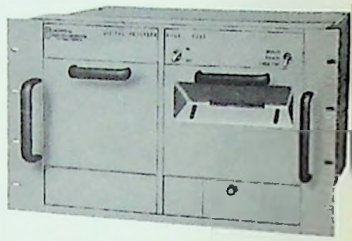
MODEL 760-120—120 Point Crossbar Scanner—Input capability 120 points 1-wire scan to 20 points 4 to 6-wire scan; input voltage range 10 μv to 1000 v AC or DC; scanning speed to 50 crosspoints per second; MODEL 755-600 available for 600 point scan; MODEL 760-60 available for 60 point scan.

CONTROL MODULES

800 SERIES Output Control Modules—Accepts the BCD output of EI 800 series digital instruments and places this data in proper format for entry into typewriters, card punches, high speed paper tape punches or digital printers.

3000 SERIES Output Control Modules—Accepts the 10-line decimal output of EI 3000 series digital instruments and places this data in proper format for entry into typewriters, card punches or high speed paper tape punches or digital printers.

DIGITAL PRINTERS



MODEL 9053 Digital Printer—Input 10-line decimal; output in the form of 11 columns of information printed on a 3" wide paper tape; speed 5 lines per second, maximum. For use with all EI 800 and 3000 series digital instruments except 3000 series instruments requiring an input scanner.

DIGITAL LIMIT COMPARATORS

7000 SERIES Limit Comparators—Operates with all EI 800 and 3000 series digital instruments. Provides totally transistorized digital circuitry for error-free comparison. Can be provided with manual or externally programmed upper and lower limits, polarity and range.

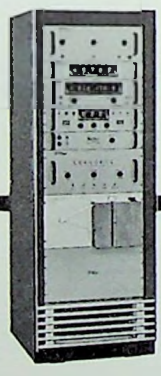
DIGITAL CLOCKS

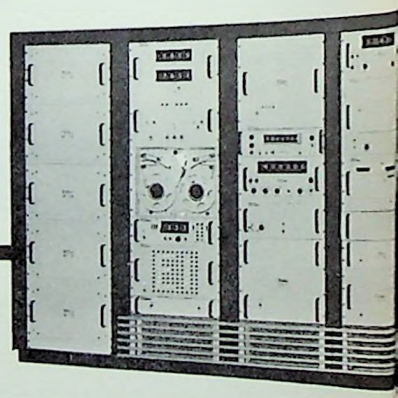
MODEL 956 Internal Time Base Clock—Provides 12 or 24 hour display of time with BCD output for programming or driving external devices. Time base is derived from internal crystal oscillator with totally solid state divider networks to achieve the various time periods.

MODEL 957 Line Frequency Clock—Specifications same as Model 956, but time base derived from 60 cycle line frequency.

DIGITAL SYSTEMS

In addition to the standard instrument line, EI manufactures a wide variety of input scanners, output control units and digital clocks. These items, in conjunction with standard and special digital instruments, may be combined to achieve simple data logging or highly complex multifunction systems. Programming, data storage and high speed outputs for various recording devices may also be incorporated as required. Fully 20% of EI's total engineering staff is devoted exclusively to the design and production of digital systems.





TYPICAL SYSTEMS

MODEL 10003 Digital Capacitance System—Measures both capacitance and dissipation factor and prints the information on a digital printer. Specifications based upon Model 6150 capacitance converter.

MODEL 10007 High Speed Data Acquisition System—Measures DC voltages from up to 120 inputs and records the information on punched tape at the rate of 3 channels per second.

MODEL EI-S2156 System Tester—A tape programmed system capable of measuring DC voltages, DC ratios, AC voltages, AC ratios, ohms and frequency. Digital programmed limits are determined and all output information is recorded on high speed punched paper tape and a digital printer.

NOTE: Specifications subject to change without notice.

Electro Instruments, Inc.
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MORE PGPEP

Added engineering effort in this area should mean not only better protection but also lower costs. The latter should be accomplished by a reduction in material, weight, labor, and volume. Several new techniques and materials were discussed, such as skin packaging, polyethylene, floater packs, and expanded polystyrene foam.

The final PGPEP meeting of the year featured a discussion of brazing problems encountered in vacuum tube manufacturing, by David K. Davis of Varian Associates. The discussion centered around the diffusion between base metals and the brazing alloy. After the talk the group toured the Western Gold and Platinum Company, which manufactures brazing alloys and various crucibles, boats, and special fixtures for brazing and heat-treating applications.

Through these various meetings, panel discussions, and plant tours, the PGPEP has worked toward its goal of advancing the state of the art in product engineering and production.

RONALD K. CHURCH
SPECIAL CORRESPONDENT
PGPEP

MORE PROGRAM

An electronic maintainability demonstration equipment will be described which permits the simulation of maintainability of a particular system design by setting up a "test vehicle." Signals and wave forms characteristic of the system being simulated can be programmed into the signal paths of the data-flow configuration. Malfunction indications are thus obtained as they would appear in the actual system. It is possible to determine the relative ease, rapidity, accuracy, and economy of malfunction detection, localization, correction, adjustment, and checkout to keep a product in satisfactory operating condition.

2. A PRACTICAL CONCEPT TO MAINTAIN PRODUCT RELIABILITY THROUGH INTEGRATED IN-PLANT PACKAGING AND HANDLING

Bronson B. Baker, manager of packaging, handling engineering, and conservation, Lockheed Missiles & Space Co.

A practical concept in the application of industrial engineering to solve the problem of protective packaging and handling for high-reliability parts will be discussed. Cradle-to-the-grave protective packaging and material-handling systems cover every segment of the material flow—from raw materials to consumption. This assumes that the delivered product will meet the rigid performance parameters imposed by the space age.

3. HANDLING OF SEMICONDUCTOR AND OTHER COMPONENTS FOR AUTOMATIC TESTING

Ralph W. Schwarze, chief engineer, Advance Automation Associates

Simplification and improvements in handling of parts for automatic testing will be discussed. Automation achieves lower costs and/or improved quality. Automation fundamentals often overlooked in parts handling include orienting the part once and keeping it oriented, performing a number of tasks at one position, and using the systems approach to total problem. Case studies will be presented along with suggestions and recommendations for the most effective parts handling.

4. INDUSTRIAL AUDIO-VISUAL APPLICATIONS

Jack M. Duer, application engineer, Nortronics, a division of Northrop Corporation

The benefits of using the audio-visual method of giving assembly instructions will be discussed. A significant reduction in assembly time, coupled with a decrease in rejection rates, has been achieved. Manufacturing engineering personnel have experienced little difficulty in adopting A-V for use in presenting instructions in a semi-automatic manner. A-V production, while not an untried system, will, in the next few years, experience many refinements and countless new applications.

Questions from the audience will be answered by the authors, following each paper.

LUNCHEON

12:00-1:30 p.m. California Room

Speaker: Dr. Bernard M. Oliver, vice president for research and development, Hewlett-Packard Company

Subject: "Communication With Other Intelligent Species"

(Continued on page 21)

MORE PROGRAM

SESSION IV

2:00-4:30 p.m. California Room

CIRCUIT PACKAGING

Chairman: Duncan N. MacDonald, director of engineering, electro-data division, Burroughs Corporation

1. APPLICATION OF DOT COMPONENTS TO A MINIATURIZED CIRCUIT

J. R. Goodykoontz, Space Technology Laboratories, Inc.

Dot or pellet component parts permit a highly desirable uniformity of body and lead geometry of electronic parts. A digital telemetry unit is described that uses 1200 parts disposed on six 3" x 6" x .030" cards with interconnections made at one edge by flexible leads. This permits the cards to be fanned out like the pages of a book for inspection or parts replacement without disconnecting any section of the circuit. When in operation the cards are stacked with spacers, compressed and held rigid with endplates to yield a prestressed structure virtually immune to shock and vibration.

2. CIRCUIT PACKAGING DESIGN CONSIDERATIONS USING CONVENTIONAL COMPONENTS

Donald A. Grassi, manager, Product Design Department, missile and space division, Raytheon Company

A summary of package design considerations and solutions to problems of process control encountered in the use of conventional components in welded compact assemblies will be presented. The advantages of the use of such components and experience with their use in reliable systems will also be covered.

3. ELEPHANTINE ELECTRONICS

R. L. Blessing, senior project engineer, and A. M. Poiré, production project engineer, Radiation at Stanford

The new and unique problems in production engineering presented by very high voltage-high power electronic equipment will be discussed. Components performing the same functions as in conventional power supplies deviate tremendously in size from the norm. The power transformer may occupy the same space as a week-end cabin, and the filter capacitors may be as large as a railroad car. The packaging, integration, and manufacturing of a typical system, including operational, safety, and maintenance considerations, will be described.

4. PRODUCTION TECHNIQUES FOR INTEGRATED ELECTRONICS

W. Dale Fuller, senior member of research for microsystems electronics, Lockheed Missiles & Space Co.

Integrated electronic components made by using thin-film and semiconductor techniques have an important part in the design and fabrication of physically smaller, more reliable electronic systems. The general processes of materials preparation, metallizing, circuit pattern formation, materials modification, pattern modification, lead attachment, and protection will be presented for both thin-film and semiconductor integrated components. Comparative evaluation indicates that a combination of the two technologies will be used to meet the requirements of the sixties.

Authors will serve as a panel for general discussion of the subject, following the presentation of the papers.

EXHIBITS

8:00-5:30 p.m. Eldorado Room

pgpep luncheon speaker

DR. BERNARD M. OLIVER

Dr. Bernard M. Oliver was born in 1916 in Santa Cruz, California. He received his Bachelor's degree in electrical engineering from Stanford University in 1935 and his Master's degree in 1936 from California Institute of Technology. Following a year of study in Germany under an exchange scholarship, he returned to the institute and received his Ph.D. degree in 1939. From 1939 to 1952 he was employed at the Bell Telephone Laboratories in television research and radar development. He joined the staff of the Hewlett-Packard Company in 1952 and at present is vice president, research and development. Dr. Oliver is a Fellow in the Institute of Radio Engineers, and is a member of the board of the Palo Alto Unified School District.

PAPERS CALLS

Nov. 1: 300-500-word summary of the paper and a 35-word abstract for the International Solid State Circuit Conference. Sheraton Hotel and Univ. of Pennsylvania, Philadelphia, Pa. Summary and abstract should be forwarded on or before Nov. 1, 1962, to the Program Committee secretary: A. K. Rapp, Philco Scientific Laboratory, Blue Bell, Pa.

Nov. 1: 200-word abstract (approx.) for the 1963 Intermag Conference. Sponsor: IRE-AIEE. Dr. J. J. Suozzi, Technical Program Chairman, Bell Telephone Labs., Inc., Whippany, N.J.

Jan. 5, 1963: 100-word abstract and 1000-word summary for 1963 PGMTT National Symposium, Miramar Hotel, Santa Monica, Calif. Address all material to: Dr. Irving Kaufman, chairman, Technical Program Committee, Space Technology Lab., Inc., 1 Space Park, Redondo Beach.

Hewitt D. Crane

seventh region news

CRANE HONORED

Dr. Hewitt D. Crane, a major contributor in the field of logic systems for computers, was named during WESCON as winner of the annual achievement award presented by the Seventh Region of the IRE.

Dr. Crane, a senior research engineer at Stanford Research Institute, is recognized as an originator of the so-called "MAD" (multi-aperture devices) technique of design in computer memories and logic systems. He is also the inventor of the neuristor, a new kind of logic element.

IRE's citation of achievement reads, "For pioneering research in the field of computer techniques, particularly in areas of all-magnetic digital logic and neuristor logic."

Dr. Crane's career has included work at the Institute for Advanced Study, the David Sarnoff Research Center, and Stanford University. He joined SRI in 1956, and was instrumental in the development of the logic system for ERMA, a large-scale data-processing system now commercially operative.

Dr. Crane received his doctorate in electrical engineering at Stanford in 1960. He completed earlier study at Columbia and New York University and graduate work at Princeton.

He is the author of 23 technical papers and is co-author of a book on magnetic networks which will be completed this year. He holds more than 20 patents.

Starr *Chapman*

McGrath *Dolin*

grid swings

IT IS REPORTED

San Francisco Bay Area will be the prime growth area in the electronics industry for 1960-80, will outstrip all others in the next decade, sales here having increased 50.5 percent from 1959 to 1962, **Dynamic Associates** pointed out in announcing formation of its new firm specializing in area-centered instrument manufacturer representation and headquartering in Burlingame.

President is **Robert P. McGrath**, formerly with McCarthy Associates and a specialist in electronic standards. Vice president, finance, is **Louis Starr**, formerly with Moxon Electronics and a specialist in data and digital systems. Vice presidents are **Joel Dolin**, formerly with McCarthy and a specialist in nuclear electronic instrumentation, and **Norman Chapman**, former field engineer with Moxon and a specialist in RF and microwave engineering and instrumentation.

Communicom, a division of Chaskin-Dimmick Corp., has announced the appointment as communications project engineer of **Tom Cook**, previously project manager and operations manager of ITT-Kellogg Communications Laboratory, Palo Alto.

Royal C. Bosshard, former sales engineer with Raytheon, McCarthy, and Ault Associates, has been named to the staff of O'Halloran Associates in its Palo Alto branch.

John L. Selover has been appointed advertising manager for the vacuum products division of **Varian Associates** and will direct all product advertising for the division.

Lieut. Col. Frederick J. Johnston, Signal Corps, has assumed command of the U.S. Army Signal Electronic Research Unit (USA-SERU) located at the electronic defense laboratories of Sylvania Electric Products, Inc., Mountain View.

Ray C. Snider has been added to the sales department at **Huggins Laboratories, Inc.**, Sunnyvale, after previous experience with O'Halloran & Associates, RCA, and Garrett Corp.

Granger Associates has added three more engineers to its staff—**Ray M. Johnson**, in the company's antenna section; **Jenkin Leong**, in systems research; and **Paul D. Hopper**, in the operations test group.

grid returns

LETTERS TO THE EDITOR

Los Angeles

Editor, the **Grid**:

I would like to take this opportunity to thank you, the IRE section manager, and the advertising manager for the excellent manner in which you and your staff have combined technical, professional, and advertising information in the San Francisco **Grid**.

From time to time, Genistron has advertised in the **Grid** and our current plans include additional advertising in the **Grid**.

We are particularly appreciative of the directory in each issue which lists the Manufacturer/Representative Index and the representatives' name, address, and telephone number. Advertising in a periodical such as yours enables any interested engineer to become immediately familiar with the name and address of our representative in your area. This has been to our benefit many times and I think that it is only fair that we express our appreciation for this policy.

Fred J. Nichols
President
Genistron, Inc.

events of interest

Oct. 8-10—**National Electronics Conference.** McCormick Pl., Chicago, Ill. Exhibits: Natl. Elec. Conf., 228 N. La Salle, Chicago, Ill. Program: Dr. Thos. W. Butler, Jr., E.E. Dept., Univ. of Mich., Ann Arbor, Mich. Proceedings: Contact NEC Office—$6.

Oct. 12-13—**7th Annual Electronics Symposium.** Greensboro Coliseum, Greensboro, N.C. Exhibits: M. Baran, Western Electric Co., 2300 Reynolds Rd., Winston Salem, N.C. Program: H. W. Augustadt, 2818 Regency Dr., Winston-Salem, N.C.

Oct. 15-17—**URSI-IRE Fall Meeting.** Ottawa, Canada. Program: Dr. J. H. Chapman, Def Res Telecom Est—Shirley Bay, Ottawa, Canada.

Oct. 15-18—**Symp. on Space Phenomena and Measurement.** Statler-Hilton, Detroit, Mich. Exhibits: J. B. Bullock, Univ. of Mich., Ann Arbor, Mich. Program: Michael Ihnat, Avco Corp., 201 Lowell St., Wilmington, Mass. IRE TRANSACTIONS on Nuclear Science after Conference.

Oct. 22-24—**ECCANE (East Coast Conf. on Aerospace and Navigational Electronics).** Emerson Hotel, Baltimore, Md. Program: Wm. C. Vergara, Dept. 466-2, Bendix Radio, Towson, Md. Proceedings: $5. Post Conf. from Melvin Hastings, Westinghouse, P.O. Box 746, Balt. 3, Md.

Oct. 25-27—**1962 Electron Devices Meeting.** Sheraton Park Hotel, Wash., D.C. Program: J. Earl Thomas, Jr., IBM Corp., Components Lab., Dept. 677, P.O. Box 110, Poughkeepsie, N.Y.

Oct. 30-31—**Conf. on Spaceborne Computer Engineering.** Disneyland Hotel, Anaheim, Calif. Program: R. Kudlich, AC Spark Plug, 950 N. Sepulveda Blvd., El Segundo, Calif. Proceedings: Available at Conference.

Nov. 4-7—**15th Annual Conference on Engineering in Biology and Medicine.** Conrad Hilton Hotel, Chicago, Ill. Exhibits: Professional Associates Inc., 6520 Clayton Rd., St. Louis 17, Mo. Program: D. A. Holaday, P.O. Box 1475, Evanston, Ill. Digest: $5. Order from IRE Headquarters after Conference.

Nov. 12-14—**Radio Fall Meeting.** King Edward Hotel, Toronto, Ont., Canada. Program: Virgil M. Graham, EIA Eng. Dept., 11 East 42nd St., New York 36, N.Y.

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Stone & Associates, Jay
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Strassner Company, Richard A.
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WH 8-3334

Striker Company, John E.
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Thompson Associates, R. W.
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Vaughan Co., G. H.
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DA 1-1347

Walter Associates
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Western Electronic Associates
485 Ramona Street,
Palo Alto, DA 5-4569

Whychell Company, T.
580 Spargur Drive,
Los Altos; 948-0355

MEMBERSHIP

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

L. B. Bayley
S. M. Becker
F. J. Boudreaux
P. Brissenden
P. Chaba
D. W. Chamberlin
C. J. Chapin
C. K. Clark
W. Y. Cole
A. W. Dana
W. E. Devereaux
D. M. Dible
R. O. Duda
K. L. Dumas
J. A. Eikelman, Jr.
R. E. L. Farmer
R. Frank
E. Fthenakis
G. L. Gaskell
R. B. Gelinas
L. W. Grace
R. C. Hedlund
L. D. Humpherys
R. M. Ito
J. C. Jackson
J. B. Kennedy
S. Kobayashi
J. L. Le Call
C. A. Lewis
R. S. Lim
B. E. Lipschuetz
R. V. Locke, Jr.
L. T. Maino, Jr.
J. D. Malone
J. A. McComb
O. E. McNiel
M. H. Miller
D. J. Pauken
J. R. Pettit
R. T. Pohlman
H. C. Rocklitz
G. J. Rubissow
B. Schenker
L. R. Schultz
C. A. Shank
E. J. Skiko
E. Swarthe
R. H. Terlet
P. A. Wardell
M. R. Weatherly
R. D. Williams
D. A. Wolf
K. H. Wong

M. C. Ebert
E. H. Edwards
Z. D. Farkas
D. E. Fisk
H. W. Frerking
W. L. Gann
J. Y. Gilkey
W. G. Hardman
J. J. Heinemann
M. E. Hollar
J. E. Judd
C. M. Kellett, Jr.
D. E. Killen
J. K. La Galante
R. J. Larsen
J. D. Larson
W. Lee
D. R. McNeal
R. B. Mulock
B. A. Nemer
J. K. Omura
J. R. Peoples
P. Polgar
F. G. Rea
R. F. Reinke
R. M. Richardson
J. A. Ross
L. D. Rupel
D. R. Rush
B. G. Ryland
D. E. Snider, Jr.
W. C. Stafford
J. E. Stuehler
R. M. Toda
J. Van Sandwyk
L. M. Warren
W. W. Whisler
W. C. Wiedemann
T. F. Wieskamp
F. G. Willey
R. S. Woodbury, Jr.
W. L. Young

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

R. S. Bucy
W. W. Morrow
A. S. Nolan
R. F. Schneider
L. E. Zulaica

Following are the names of members who have recently been transferred to a higher grade of membership as noted:

SENIOR MEMBER

H. W. Frerking

MEMBER

F. De Mendonca
V. V. Pazemenas

ASSOCIATE

R. B. Rosenquist

INDEX TO ADVERTISERS

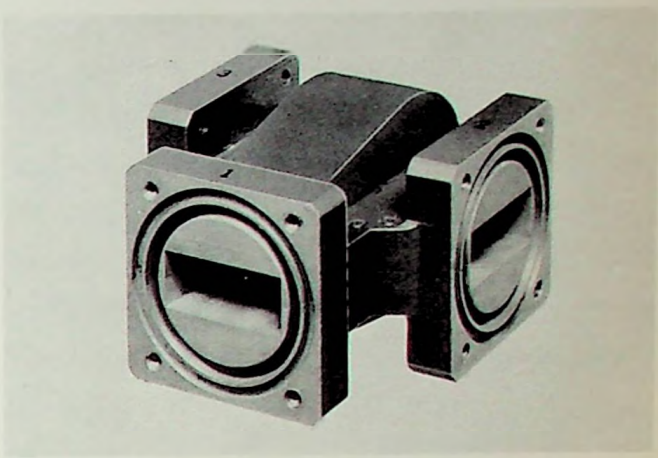
CASWELL

Nulli Secundus

Microwave Component Specialists

WAVEGUIDE Y-T CIRCULATORS

3 PORT CIRCULATOR

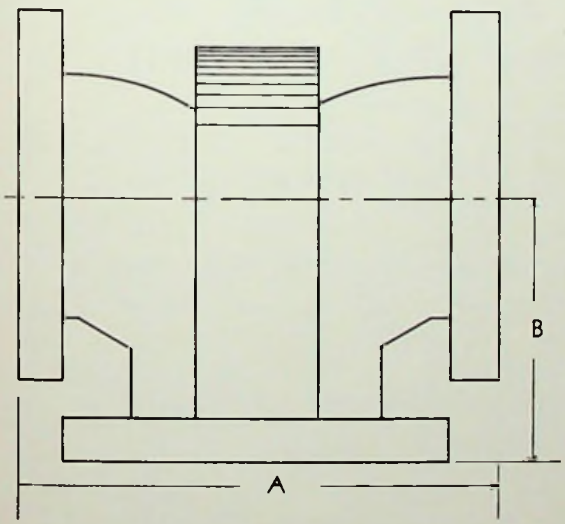


FEATURES:

- ★ Isolation to insertion loss ratio typically 150:1.
- ★ Nominal 20% bandwidths.
- ★ Compact, convenient, light weight.
- ★ Temperature insensititive: —15° C to +55° C.
- ★ Average power 10 watts.
- ★ Switching circulators available upon special order.

Frequency Gc	Model No.	Isolation Min.—DB	Insertion Loss— Max. DB	VSWR	Mating Flange	Average Power Watts	Dimensions A	Dimensions B	Wt.
15.0 - 18.0	KU-120-B	20	0.3	1.20	UG419/U	10W	1.75"	1.032"	12 oz.
12.4 - 15.0	KU-120-A	20	0.3	1.20	UG419/U	10W	1.75"	1.032"	12 oz.
10.0 - 12.4	X-120-C	20	0.3	1.20	UG135/U	10W	2.50"	1.438"	14 oz.
8.2 - 10.0	X-120-B*	20	0.3	1.20	UG135/U	10W	2.50"	1.438"	14 oz.
8.2 - 10.0	X-122-A*	20	0.3	1.20	UG135/U	50W	2.50"	1.438"	14 oz.
7.05 - 8.5	W-120-D*	20	0.3	1.20	UG138/U	10W	3.00"	1.988"	14 oz.
5.92 - 7.13	C-120-D	20	0.3	1.20	UG344/U	15W	3.90"	2.300"	23 oz.
5.92 - 7.13	C-120-E*	20	0.3	1.20	CMR 137	15W	3.25"	1.856"	23 oz.

* Normally available from stock.



DESCRIPTION:

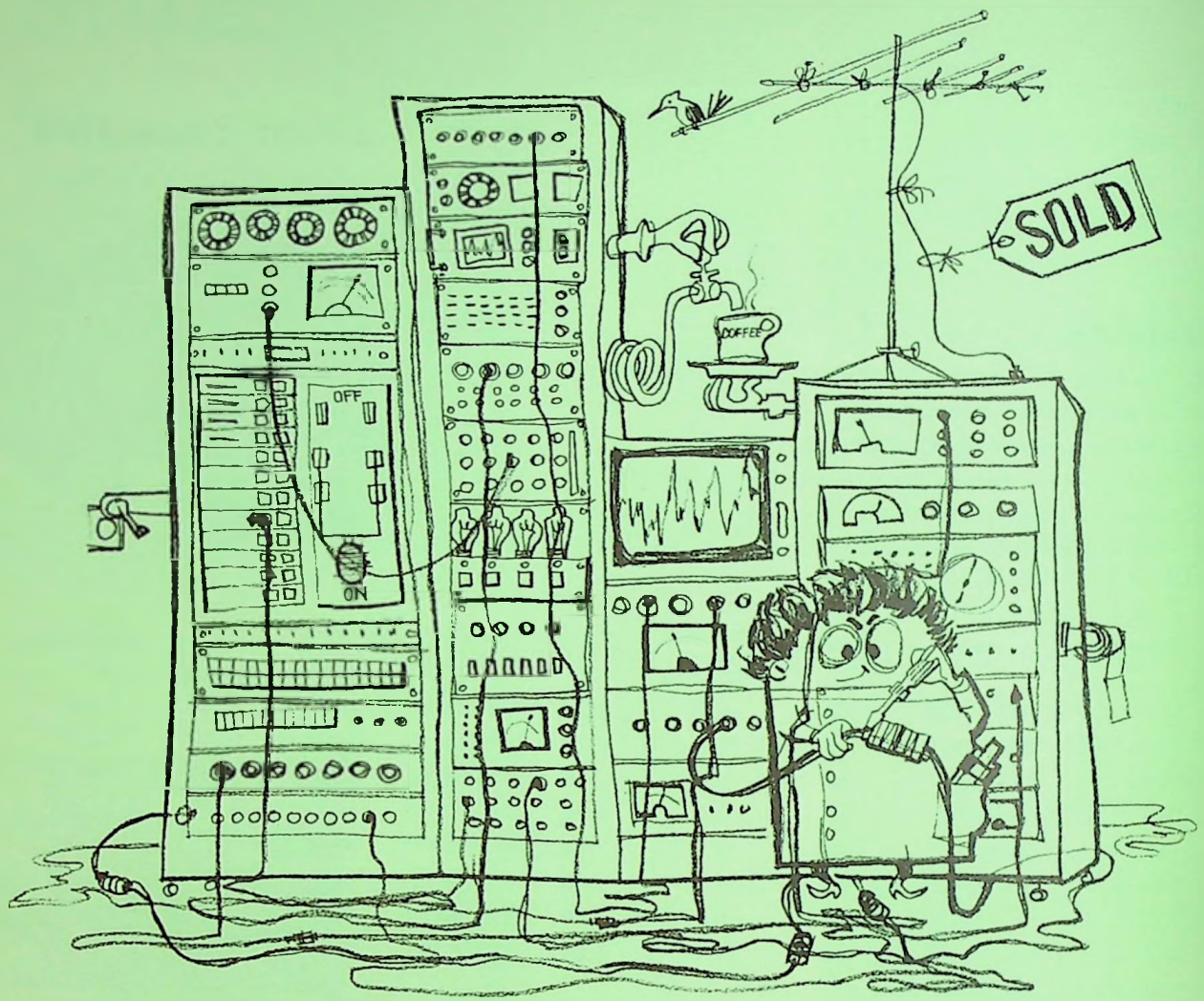
The Y-T circulator is a three port circulator with ferrite located at the symetric junction of three waveguides. A bend is incorporated in two of the arms so that the output flanges form a "tee". This arrangement gives the outstanding performance of the "wye" junction, with the convenience of a "tee" junction. Encapsulated magnets provide the required magnetic field.

APPLICATIONS:

A circulator is useful for duplexing, channel branching, and when terminated with a load, as a high performance isolator. The use of circulators with masers and parametric amplifiers permits introducing the input signal and removing the amplified signal from the same port. Due to the low insertion loss the noise temperature is low.

R. W. THOMPSON ASSOC., INC.

4135 EL CAMINO WAY, PALO ALTO, CALIFORNIA · DAvenport 1-6383



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