

# EDITOR'S PROFILE of this issue

*from a historical perspective ...*

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

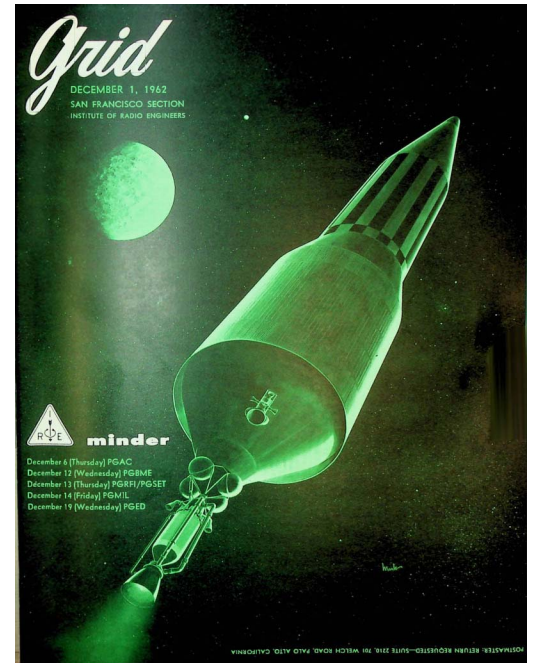
December, 1962:

Cover: An artist's concept of a nuclear propulsion unit – the NERVA nuclear engine; flight tests are scheduled for 1966-67.

Page 7: the predecessor to our Silicon Valley Engineering Council (SVEC) was the San Francisco Engineering Council (SFEC). SFEC has a focus on STEM education in high schools and conducting the annual Engineers Week events.

Page 7: So, was the the Soviet Union the inventor of radio? Did Popov beat Marconi? They claim they were, but Charles Susskind of UC-Berkeley details the literature that shows that this isn't true.

Page 10: How do our entrepreneurial startups get started? The Engineering Management chapter's speaker is Dean Watkins, of Watkins Johnson, talking about the process. W-J got angel investment in 1957 from an investment by the Kern County Land Company. It wanted to locate near a great university and offer stock options to its employees, and be quick about translating new ideas into useful products. It's revenue this year is twice what was predicted when it began.



Archive of available SF Bay Area GRID Magazines is at this location:

[https://ethw.org/IEEE\\_San\\_Francisco\\_Bay\\_Area\\_Council\\_History](https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History)

At time of scanning, the bound volumes are held by Paul Wesling. July, 2021 Contact p.wesling@ieee.org

# Grid

DECEMBER 1, 1962

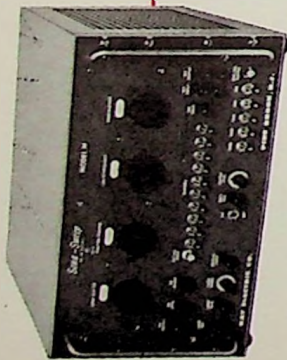
SAN FRANCISCO SECTION  
INSTITUTE OF RADIO ENGINEERS



**minder**

- December 6 (Thursday) PGAC
- December 12 (Wednesday) PGBME
- December 13 (Thursday) PGRFI/PGSET
- December 14 (Friday) PGMIL
- December 19 (Wednesday) PGED

*maker*



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and manual sweeps, or a calibrated c-w signal; sharp, "crystal," pulse type frequency markers and precision step attenuator.

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The Model M delivers a high level output of 5 volts rms into 600 ohms over the entire frequency range. The built-in, precision step attenuator provides up to 59 db of attenuation in discrete steps. An additional 6 db of variable attenuation is provided. Output is flat within  $\pm 0.5$  db.

**SPECIFICATIONS**

**Center Frequency Range:** 20 cps to 200 kc. Continuously variable.

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Markers designated for use at wide sweep (200 kc) are not applicable to other sweep widths. Specify whether for wide (200 kc) or narrow (less than 20 kc).

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### **Said Pierre de Fermat:**

*"The optical length of an actual ray between any two points is shorter than the optical length of any other curve which joins these points and which lies in a certain regular neighborhood of it."*

The continuing requirements of space exploration projects for larger and more accurate antennas have resulted in the construction of a number of enormous parabolic reflector antennas. Each costs many millions of dollars. This tremendous expense is due to the difficulty of maintaining reflector accuracy as the huge structures are moved and tilted, and as wind forces and temperature changes distort the surface.

Lockheed Missiles & Space Company's Electromagnetic organization is developing a far more economical and practical solution to the problem. A 120' reflector antenna working model now is being erected. Its shape is spherical instead of parabolic, and it is firmly mounted on the ground. *Only the feed is moved to change the beam angle.* This type of antenna design now is feasible, thanks to successful Lockheed research in spherical aberration correction. The concept should find applications in radar systems, satellite communication systems, and systems for data reception from deep space exploration probes.

Many comparable scientific break-throughs are being evolved at Lockheed because scientists and engineers find here the creative freedom needed to pursue and perfect original ideas. Lockheed Missiles & Space Company is located on the beautiful San Francisco Peninsula in Sunnyvale and Palo Alto. If you are interested in correlating your specialty to one of Lockheed's many challenging assignments, please write: Research & Development Staff, Dept. M-39C, 599 North Mathilda Avenue, Sunnyvale, California. Lockheed is an equal opportunity employer.

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### cover

Artist's concept shows RIFT (Reactor-In-Flight-Test) stage to be built by Lockheed for NASA to test the NERVA nuclear engine being developed by Aerojet-General Corp. First flight testing is scheduled for 1966-67 from Cape Canaveral, atop Advanced Saturn.

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## PROFESSIONAL GROUPS

### Automatic Control

8:00 P.M. • Thursday, December 6

"Drag-Free Satellites, Contractor Control in Rotating Reference Frames"

Speaker: Ben O. Lange, graduate study engineer/scientist, Lockheed

Place: Electrical Engineering 126, Stanford University, Stanford

Dinner: 6:30 P.M., Rickey's Hyatt House, 4219 El Camino, Palo Alto

Reservations: Mrs. Pauline Eckman, DA 1-3300, Ext. 268

### Bio-Medical Electronics

8:00 P.M. • Wednesday, December 12

"The Visual System of the Beetle"

Speaker: James Bliss, research engineer, Stanford Research Institute

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 December 12

### Electron Devices

8:00 P.M. • Wednesday, December 19

"Thermo-magnetic Cooling"

Speaker: Dr. Kermit F. Cuff, research scientist, Lockheed Research Labs

Place: Physics Lecture Hall, Room 100, Stanford University

Dinner: 6:30 P.M., Red Shack, 4085 El Camino Way, Palo Alto

Reservations: None required

### Military Electronics

7:00 P.M. • Friday, December 14

Christmas party, social only, amateur entertainment, wives and guests invited

Dinner: 7:00 P.M., Red Shack, 4085 El Camino Way, Palo Alto; choice of fish or meat course

Reservations: General Victor Conrad's office, DA 6-4000, Ext. 2212

### Radio Frequency Interference

8:00 P.M. • Thursday, December 13

(Joint meeting with PGSET)

"Error Detecting Codes for Computer Data Communications Systems"

Speaker: Dr. Fred B. Wood, communications subsystems, IBM, San Jose

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

Dinner: 6:15 P.M., El Camino Bowl, 2025 El Camino, Mountain View

Reservations: Tom Linders, RE 9-4321, Ext. 28394, by noon, Thursday, December 13

### Space Electronics & Telemetry

8:00 P.M. • Thursday, December 13

(Joint meeting with PGRFI, see above)

## wema news

### HEADS ARIZONA COUNCIL

Virden E. Scranton, assistant general manager of Motorola's semiconductor products division, Scottsdale, Arizona, was elected chairman of the Arizona Council of WEMA at the conclusion of an all-day seminar on PERT and value control in Phoenix.

John S. Rydz, executive vice president of Nuclear Corp. of America, was elected vice chairman, and Harold C. Olson, president of Microsecond Mechtronics, secretary-treasurer of the council.

A one-day PERT seminar for the Los Angeles Council has been scheduled December 11 at the Disneyland Hotel in Anaheim and will be led by James Halcomb. The WEMA Christ-

mas Capers will take place Saturday, December 8, in the Cabaña Motor Hotel, Palo Alto, including cocktails, dinner, and dancing, for \$18 a couple. For information and reservations for both events, call Al Beeson or Mrs. Norene Young, DA 4-4497.

## wescon news

### NEW ADDRESS AND TELEPHONE

The business office of WESCON in Los Angeles moved on November 19 to the Travelers Building (19th floor) at 3600 Wilshire Blvd., Los Angeles 5. The new telephone is 381-2871. Also moving to the same new headquarters were the Los Angeles sections of IRE and WEMA.

## Grid reporters

### EAST BAY SUBSECTION

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One of the many activities of the San Francisco Section is membership in the San Francisco Bay Area Engineering Council. The council, established in 1948, is an association made up at present of delegates from fourteen organizations representing professional engineers and scientists. At council meetings various problems or projects of common interest to the engineering profession are discussed and the reactions of the various societies explored.

The council and its members have long realized the unique importance of the secondary schools in the motivation and early development of potential engineers and scientists. Through its career counseling activities, it has developed and encouraged an aggressive program of education and vocational guidance in high schools and institutions of higher education, with a view toward acquainting all interested students with the scope, advantages, and responsibilities of a technical education. Career counseling has been a continuing program for a number of years and is now coordinated with Engineers Week for added emphasis.

The engineering profession has long sought to initiate a program by which it might gain public recognition of the merits of the profession. Engineers Week is such a program sponsored by the council.

One of the activities associated with the week is the scholarship program, under which the Bay Area is divided into ten zones. With the assistance of the various high schools in each zone, the outstanding mathematics and science students are interviewed by a panel of engineers and educators, and a zone winner is selected. The culmination of

the week is a banquet at which all zone winners are given an award and the top three are awarded scholarships. In addition, the banquet is addressed by a prominent engineer or educator.

Engineers Week is obviously an undertaking of considerable magnitude and merit. For this activity to function effectively, the participation of all engineering societies and their members is required. Toward this end the council has just received the approval of its member societies, permitting a new membership classification, that of "supporting member." Such membership will entitle the society so classified to have a delegate to the council, with voting privileges limited to matters directly relating to the conduct of the council's interest in the administration of Engineers Week. It is hoped that through this expanded council, more of the engineering fraternity will take an active part in Engineers Week.

Emerson said, "Progress is the activity of today and the assurance of tomorrow." So it is with the engineering council. Its success today will result in better public understanding and a continuing supply of enlightened engineering candidates for tomorrow. Let's all help!

HARRY H. SMITH  
SENIOR DELEGATE  
SAN FRANCISCO ENGINEERING  
COUNCIL

#### historical notes

##### POPOV, NYET/MARCONI, 51

There's more static than substance to Soviet claims for the invention of radio, Charles Süsskind, section vice chairman, writes in an article published in October.

Since 1945, Soviet authorities have trumpeted the claim that Russian physicist Aleksandr S. Popov beat Italian experimenter Guglielmo Marconi to the first successful transmission of radiotelegraphic signals.

The article by Dr. Süsskind, associate professor of electrical engineering at Berkeley, deflates the Soviet claims with the first thoroughly documented non-Soviet study of the early work of Popov and other pioneers in radio experiments. The article appears in the October issue of the PROCEEDINGS of IRE.

##### First Successful Demonstrations

It's very likely that Marconi made several successful demonstrations of radio transmission before Popov's first significant transmissions, Professor Süsskind points out.

And it's certain that Marconi was the first to publish a description of his experiments—the action generally accepted in scientific circles as establishing priority to a discovery or invention.

"It is not my intention to debunk Popov, a real pioneer of whom Russia may be justly proud," Dr. Süsskind writes.

"But the officious Soviet campaign to enlarge Popov's reputation out of proportion with his achievements must be deplored by any serious historian of technology who remains untouched by chauvinistic considerations."

Dr. Süsskind notes that Popov, Marconi, and several other European scientists experimented with electro-

(Continued on page 8)





Fred B. Wood

*meeting ahead*

**ERROR-DETECTING CODES**

Fred B. Wood, staff engineer, IBM ASDD laboratory, San Jose, will present before a joint meeting of PGRFI and PGSET, on December 13, a survey paper on the history and application of error-detecting codes for computer data communication systems.

The subject will be introduced by a nontechnical explanation of error-detection and error-correction processes, with some historical data on the mathematical concepts such as Galois fields and the electronic technology and computer programming upon which the practical use of codes are dependent. Then the techniques of choosing a code to match the error statistics will be reviewed, first using empirical error statistics and second using a noise model.

The engineer is usually confronted with meager error statistics. Techniques of graphically plotting whatever inadequate error data are available will be illustrated as a method of finding the confidence intervals on inadequate data and for determining what further data or error statistics would be useful.

Dr. Wood received the B.S., M.S., and Ph.D. in electrical engineering at the University of California and has been with IBM since 1952.

*meeting ahead*

**DRAG-FREE SATELLITES**

Ben O. Lange, speaker at the December 6 PGAC meeting, has chosen drag-free satellites as part of his doctoral thesis for the Ph.D. in electrical engineering at Stanford University, under sponsorship of the Lockheed graduate study program. He has an

M.A. in physics from Texas Christian University and has designed electronic instrumentation for satellite-borne radiometric equipment. At the Lockheed research laboratories he works in flight mechanics with the mechanical and mathematical sciences laboratory.

A drag-free satellite may be constructed by placing a free proof mass inside a satellite and by controlling the satellite to chase the proof mass which thus is shielded from drag. Spinning the satellite provides an example of the contactor control of a second-order plant with drag in a rotating reference frame. Solutions to the optimum control problem are found in minimum time, fuel, and error cost criteria. These solutions are compared with the results of linear switching. The effects of mechanization errors, finite thresholds, time delay, hysteresis, and wobble are considered.

A drag-free satellite would be used for geodetic measurements of gravitational harmonics, as a very sensitive drag indicator to measure orbital atmospheric density instantaneously, and to locate precisely aerodynamic perigee for exact reentry prediction. Spin is necessary because of attitude control impulse requirements due to position jet thrust vector misalignment.

---

**MORE HISTORICAL**

magnetic waves before 1896. But Popov did not publish a description of equipment specifically designed for the transmission and reception of radio messages until after Marconi's patent application on radiotelegraphy was published on June 2, 1896.

Among many contenders, Marconi has the best claim as the "inventor of radio" on the basis of this patent application, Dr. Süsskind writes.

**First Soviet Claim**

The Soviet claim of Popov's priority was originally based on his demonstration of May, 1895, when he repeated an experiment made by the Englishman Oliver Lodge in the previous year. The demonstration showed that an electric bell can be made to ring whenever an electric spark discharge occurs in the vicinity. Popov later applied this idea to a meteorological recorder of lightning discharges, which he called a "storm de-



Popov



Marconi

lector." And he wrote an article expressing the hope (as several others had before him) that such an apparatus might some day be used for the long-distance transmission of signals. But his article failed to describe his own use of his apparatus for this purpose.

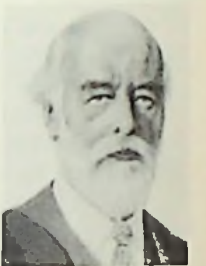
Soviet writers who have built up Popov as a national hero also point to an unpublished demonstration made in March of 1896 before the Russian Physical Society. Popov is said to have transmitted the words "Heinrich Hertz"—referring to the German physicist who proved in 1888 that electromagnetic waves are propagated through space.

**Unpublished Experiments**

If the Soviets wish to base their claim on unpublished experiments, contends Dr. Süsskind, they must also consider Marconi's achievements on the same basis. A month before Popov's alleged "Heinrich Hertz" dem-



Hertz



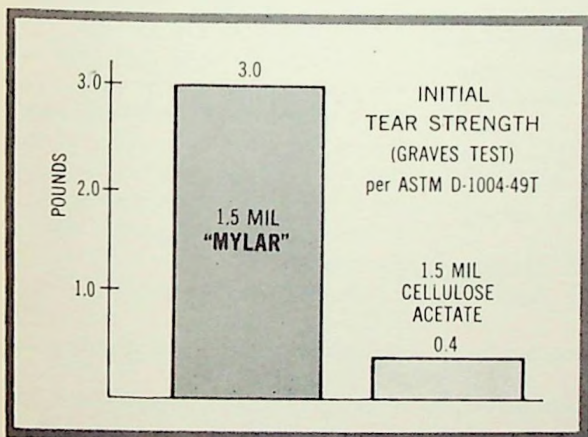
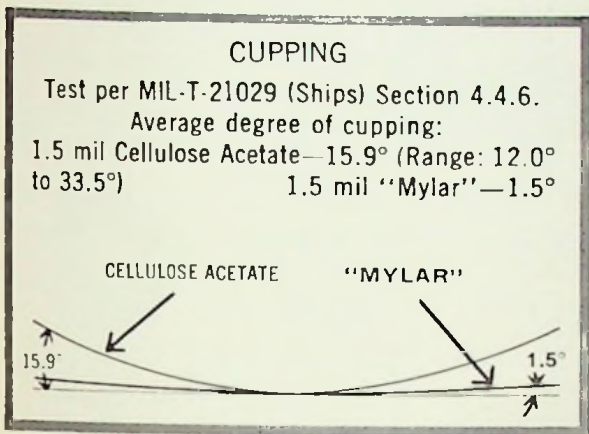
Lodge

onstration, Marconi traveled from Italy to exploit his radiotelegraph in Britain. He had already perfected his equipment to a point where such an expensive journey was justified. When he applied for his patent a few months later, he had more than a year of unpublished radio experimentation behind him.

Soviet authors have brought out countless articles, several books, and a film about Popov. Dr. Süsskind's study—the first thorough attempt to investigate these claims—will be pub-

*(Continued on page 10)*

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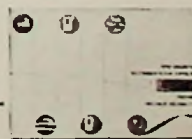
"Mylar" is strong . . . has an ultimate break strength over 20,000 psi! Tapes of "Mylar" can resist edge nicks, stretching or breaking from sudden stops and starts. And since it contains no plasticizer to dry out, tapes of "Mylar" can be stored indefinitely without becoming brittle.

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".



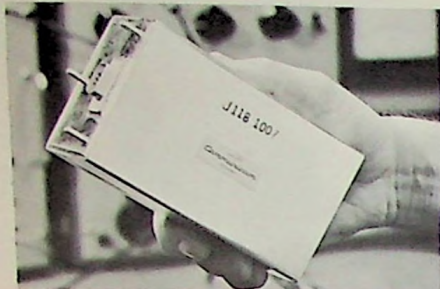
Better Things for Better Living . . . through Chemistry



E. I. du Pont de Nemours & Co. (Inc.)  
Film Department, Room #12, Wilmington 98, Delaware  
Please send free, 12-page booklet of comparative test data to help me evaluate magnetic-tape reliability.

Name \_\_\_\_\_ Position \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# COMMUNICATION SPECIALISTS



## COMPONENT PRODUCTION

Communicom supplies a wide variety of filters and networks using toroidal coils and ferrite pot-core coils. If your filter is not in stock, Communicom will design and manufacture to your specifications.

Small precision transformers, pot coils, and toroidal coils are also produced to your requirements. Careful assembly, impregnation, sealing, and testing with equipment calibrated from NBS standards assures highest quality for military or industrial applications.



## SYSTEM DEVELOPMENT

Communicom is now in expanded quarters in Palo Alto. Half of the plant is devoted to research and development and half to manufacturing.

Communicom specializes in the development of transmission systems, such as: data-multiplex, voice-multiplex, and related equipment for use on microwave or cable. Technical capabilities also include design of precision oscillators, discriminators, switching circuits, frequency multipliers, and the like.

**Communicom**

DIVISION OF CHASKIN-DIMMICK CORP.  
935 COMMERCIAL ST., PALO ALTO 2, CALIF.  
415-326-5740

## meeting review

### POLISHING ELECTRONIC CRYSTALS

At the September 25 meeting of PGPEP at Varian Associates in Palo Alto, Elmer W. Jensen, president of Geoscience Instrument Corporation of New York City, presented a very interesting talk on the materials, machines, and techniques involved in critical surface preparation work.

Mr. Jensen described an advanced facility for precision fabrication of exotic materials such as semiconductors, ceramics, crystals, glass, and metals. In addition to the machine shop, a precision optical laboratory is required as a laboratory that is half-metallurgical, half-mineralogical. In this operation, cleanliness is of the utmost importance. Two materials that require different polishing techniques are silicon and yttrium iron garnets.

In slicing silicon, a  $\frac{3}{8}$ "-diameter bar is mounted in a flask of plaster of paris and shellac. Cutting is accomplished at the rate of  $\frac{3}{4}$ " per minute, using a diamond blade rotating at 4500 rpm. The coolant is cool water, with Lysol as an additive. In the slicing operation the blade does not come in contact with the block.

Lapping of silicon is accomplished by the use of an alumina oxide abrasive. The type of abrasive particle, as well as the particle size, is important. Block-type crystals cause more damage to the strength of the silicon surface than the plate-type crystals of the same size. The additives used as suspension agents all contaminate the surface of the silicon and can cause staining, unless careful

*(Continued on page 12)*

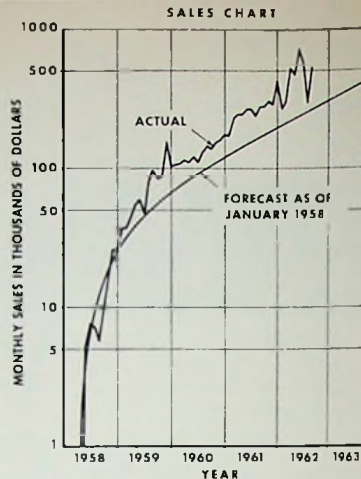
### MORE HISTORICAL

lished later in booklet form by San Francisco Press.

Chiding Soviet propagandists for their "manufactured" history, Dr. Süsskind concludes:

"The entire world has been impressed by the recent technical achievements of the Soviet peoples.

"As they near the front rank in the march of modern technology, they can well afford to abandon the unbecoming and recurrent protestation of priority characteristic of an earlier era, when . . . their leaders considered it necessary to carry over the personality cult from the political sphere to the field of modern invention."



*Prognosis very positive*

## meeting review

### ALL THE WAY WITH W-J

Dean Watkins, president of Watkins-Johnson, gave PGEM an unusually frank review of his company's founding, history, and policies at the October 10 meeting.

Dr. Watkins talked about the "early" days, beginning with the planning in 1957 with Dr. Johnson and the search for a financial angel (which turned out to be the Kern County Land Company). In January, 1958, the two entrepreneurs predicted the growth of sales, which at present are at an annual rate of about \$6 million, about double the prediction. The audience agreed to waive this gross error in planning!

The highlight in W-J planning was the prediction of the growing importance of high-level R&D skills in electronics, and the recognition of factors which attract the best engineering talent. These factors were:

- Professional standing of the key people
- Size of the company
- California location
- Location close to a great educational institution
- Good salaries plus profit participation
- Opportunity to get in on the ground floor

Their importance shows up right now in Watkins-Johnson's status as a national leader in R&D and production of microwave tubes, solid-state devices, and systems.

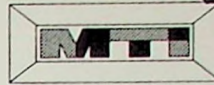
W-J system effort is relatively new and growing just about as predicted. The systems now being produced, of course, emphasize the company's line of microwave tubes and devices. They

*(Continued on page 12)*

# MORE SOLID STATE MICROWAVE DEVICES FROM

# MICROWAVE TECHNOLOGY INCORPORATED

TYPICAL  
HIGH PERFORMANCE DEVICES  
RECENTLY DEVELOPED —

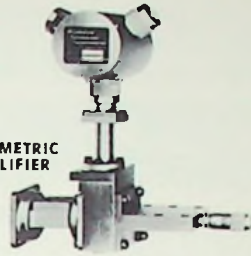


## MODEL L-501

Frequency: 1250 to 1350 mc  
Gain: 20 db  
Bandwidth: 20 mc.  
Noise Figure: 2.5 db

Simple Tuning —  
One Control for Frequency  
One Control for Gain

PARAMETRIC  
AMPLIFIER



## MODEL L-102S

Frequency: 1350 to 1450 mc  
Isolation: 20 db  
Insertion Loss: 0.3 db  
VSWR: 1.25

Features —  
Low Insertion Loss  
Low Drive Power

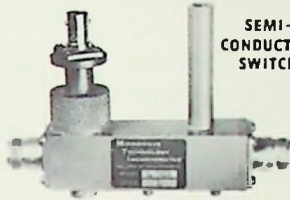
FERRITE  
CIRCULATOR  
SWITCH



## MODEL L-401

Frequency: 1250 to 1350 mc  
Isolation: 20 db  
Insertion Loss: 0.4 db  
Switching Time: 10 nano seconds  
Power Handling Capability —  
Greater than 5 Watt Average  
and 25 Watts Peak

SEMI-  
CONDUCTOR  
SWITCH



## MODEL L-153

Frequency: 1250 to 1350 mc  
Isolation: 20 db  
Insertion Loss: 0.7 db  
VSWR: 1.15

Features —  
Light Weight  
No External Magnets  
Magnetic Shielding

COAXIAL  
ISOLATOR



Similar Units are available at S, C and X Band



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perience as well as mechanical and gadgeteer-ing ability required. Position makes working knowledge of radiation and nuclear detection desirable, but not absolutely necessary.

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Tung-Sol lead-mounted silicon rectifiers in JEDEC "top hat" configuration provide designers with exceptional selectivity over a broad range of industry requirements—from general-purpose to high environmental, low-leakage applications. Operating temperature ranges of  $-65^{\circ}\text{C}$  to  $+165^{\circ}\text{C}$  makes Tung-Sol silicon rectifiers ideally suited to high ambient temperature applications. Write for consolidated data guide.

Why don't you get the benefit of Tung-Sol component knowledge and experience too? Tung-Sol components—whether transistors, tubes or silicon rectifiers—fill virtually every military, commercial and entertainment requirement with unexcelled dependability. For quick and efficient technical assistance in the application of all Tung-Sol components, contact:

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# TUNG-SOL®

ELECTRON TUBES • SEMICONDUCTORS

### HIGHLY SUCCESSFUL CONFERENCE

The sixth national conference on Product Engineering and Production, Jack Tar Hotel, November 1-2, attracted more than 300 engineers and production personnel to technical sessions and exhibits. The conference was sponsored by the San Francisco chapter of PGPEP. In addition to those attending from California, twelve other states were represented, including New York, Massachusetts, and New Jersey, with six participants each. Technical personnel from some 75 electronics and space companies, two universities, the Army, and the Navy took part.

Copies of the technical papers may be secured by sending a check for \$5.00, made out to "1962 PGPEP Conference," to Hugh D. Kennedy, Granger Associates, 974 Commercial, Palo Alto, California. The seventh national conference will be held in Boston during 1963, with C. W. Watt of the Raytheon Company as general chairman.

### MORE PGPEP

cleaning procedures after lapping are followed. One method is to wash the silicon with deionized water and keep immersed prior to a methyl alcohol rinse and nitrogen dry.

The main problem in polishing is the depth of scratches caused by previous operations. Excellent results in polishing have been obtained with the use of Pellon polishing cloths. Rough polish is performed at 100-150 rpm for 20 minutes, and fine polish at 200 rpm for 40 minutes. The use of too thin a slurry will give an orange-peel effect.

The machining of yttrium iron garnets requires different techniques than silicon. The garnet is like a precious stone in which the slightest pressure fractures the crystals. The garnet is mounted very carefully and cut by the outside diameter of a diamond wheel operating at 3500 rpm with a feed of 2 inches per minute.

In contrast to the machine lapping of silicon, lapping of garnets is usually accomplished by hand with fine emery paper.

C. F. CARLZEN

### BRUSSELS SYMPOSIUM REPORT

On October 25 in the Philco auditorium, Charles S. Weaver, project engineer in the communication sciences department of Philco WDL, reported to PGIT on the International Symposium on Information Theory in Brussels and on his subsequent trip with his wife behind the Iron Curtain.

Since the proceedings of the Brussels meeting have already been published as Volume IT-8, No. 5, IRE Transactions on Information Theory, Mr. Weaver commented only briefly on the three papers which he felt were of the greatest interest: "The Generation of Impulse-Equivalent Pulse Trains," D. A. Huffman; "The Threshold Effect in Modulation Systems That Expand Bandwidth," D. Slepian; and "Mathematical Analysis of Formal Structure in Music," W. Fuchs.

Mr. Weaver felt that parallel sessions over a three-day period would have been more desirable than the five days of single sessions.

Following the symposium, the speaker and his wife traveled by train from Vienna to Moscow, Moscow to Leningrad, by air back to Moscow, and thence to Khabarovsk in eastern Siberia, from which they traveled again by train to the Sea of Japan.

CHARLES H. DAWSON

### MORE PGEM

represent W-J's conviction that the small company, with top-level engineering talent, is in the best position to grasp new ideas quickly and translate them into useful products.

Expansion for its own sake is not a goal of W-J. Growth, says Dr. Watkins, will be tolerated provided per-share earnings can be increased.

W-J now has about 250 people. Thirty-three of these are on the technical staff, which includes 11 Ph.D.'s with 54 patents and 110 published journal articles to their credit. Dr. Watkins pointed out that while patent activity is certainly an intangible measure of the activity of a high-level professional staff, the patents themselves do not loom large; in his field the art changes so rapidly there is no time for patents to have an important effect.

LEONARD M. JEFFERS



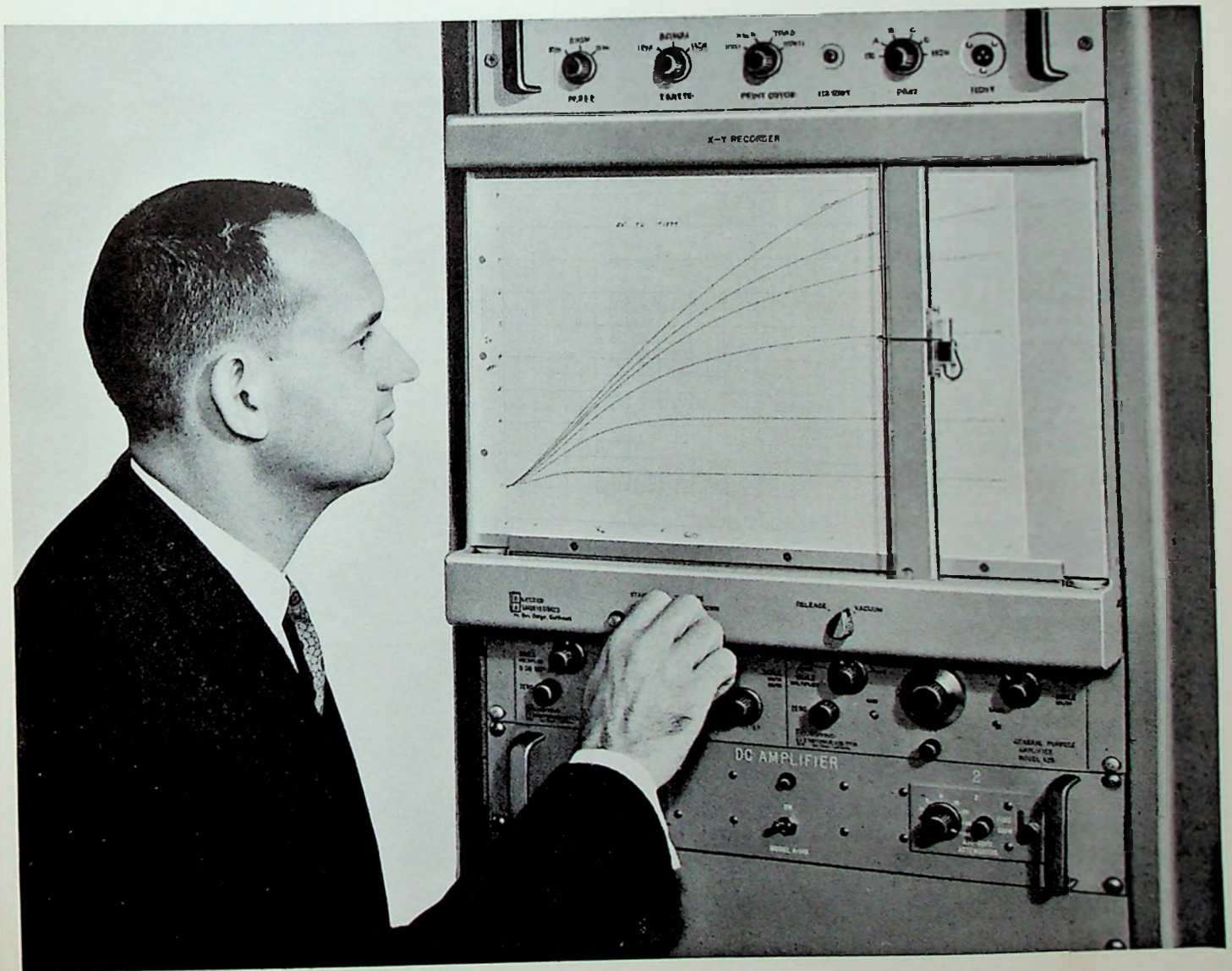
Side-by-side Comparison Proves the Superiority of

ELECTRO INSTRUMENTS' complete line of

Totally Transistorized

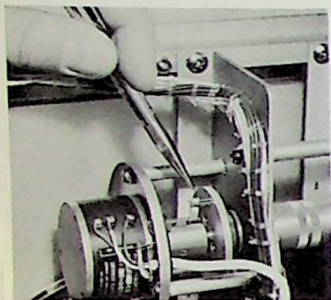
# X-Y RECORDERS

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

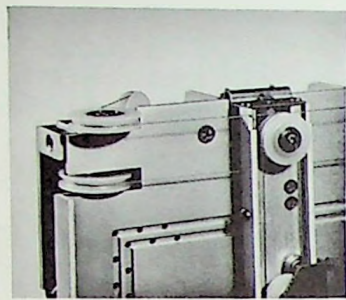


feature for feature, the world's most carefully designed and built

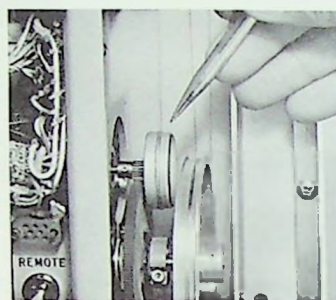
# X-Y RECORDERS



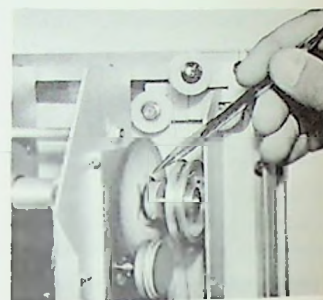
Improved floating coupling compensates for the usual null point "jitter," virtually eliminates potentiometer noise and winding damage.



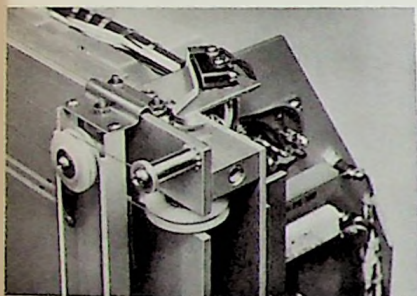
Simple cable drive on both axes assures instant, positive pen response. Cable is used only to position pen and carriage.



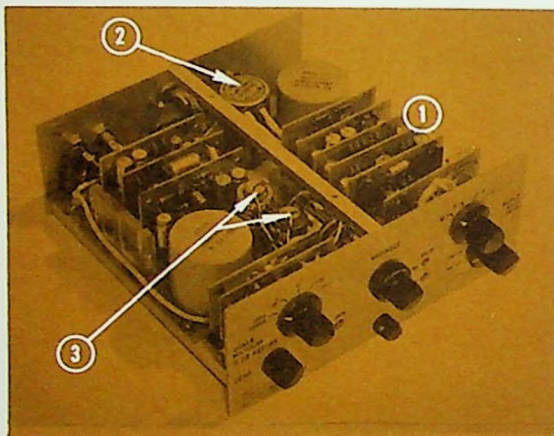
Inertial damping of servo motors permits higher gain with minimum velocity error. Utilizes oil-immersed flywheel.



Foolproof friction-type clutch prevents damage to carriage and pen assembly. May be operated continuously against the stops without damage.



Standby operation deactivates servo and eliminates pot end point wear, and facilitates paper loading.



1. Transistorized input circuit provides fixed input impedance of 1 megohm minimum contrasted to as low as 700 ohms on competitive 200,000-ohms-per-volt models.
2. Zener reference is temperature stabilized to .005% for months.
3. Miniature choppers virtually eliminate replacements for the life of the instrument.



Precision jig-aligned margins assure exact paper alignment; provide repeatability without discernible deviations.



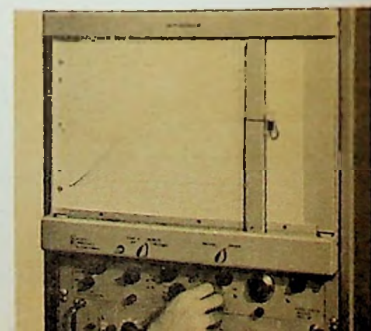
Centrifugal fan vacuum system securely holds 8½" x 11" or 11" x 17" paper; eliminates lubrication and maintenance of vacuum pumps.



Functional pen assembly. Visible reservoir stops dry runs. Non-integral pen lift reduces pen weight.

Direct rack mounting by removal from case.

**E**  
**I** = Reliability

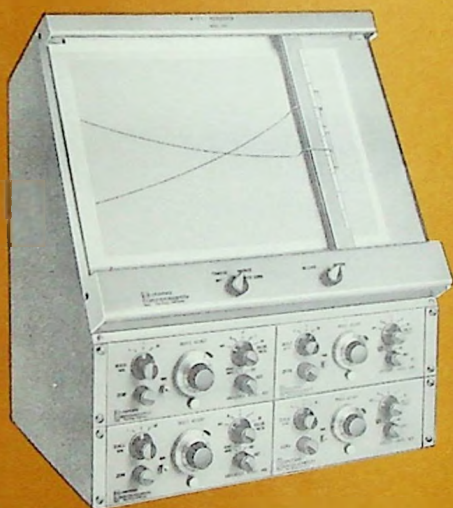




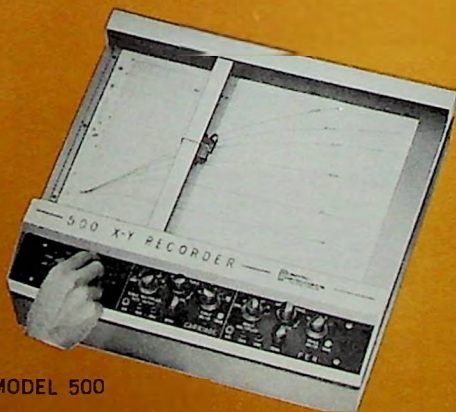
MODEL 300



MODEL 400



MODEL 480 X-YY\*



MODEL 500

## SERIES 300

**The world's first totally transistorized 8½" x 11" X-Y Recorder**

All of the performance capabilities found in the EI line of 11" x 17" instruments have been incorporated into the award winning Series 300 X-Y recorders. These instruments offer greater accuracy, higher speed, integral time base and increased reliability as virtues of the most advanced design available today. The Series 300 X-Y recorders fill the need for high performance, low priced 8½" x 11" plotting for either military or industrial applications. Use of all solid state circuitry, distinctive cabinetry and human engineering throughout unquestionably provides the finest in 8½" x 11" X-Y recorders.

## SERIES 400

**Totally transistorized, 11" x 17" X-Y and X-YY\* recorders with plug-in input function modules for maximum flexibility.**

The Series 400 recorders represent the first departure from conventional types of recording instruments. Their uncompromising design features and long term reliability coupled with unmatched flexibility have set the standard of comparison in X-Y recording. The unique use of either a single or dual pen recording bed in conjunction with a multiplicity of separate plug-in input modules eliminates obsolescence with changing requirements. Such basic needs as time base, computer input, curve following, true differential input and log conversion are readily available with a simple interchange of input modules. Add to this the total transistorization, conservatively rated circuits, zener diode references and exceptional mechanical ruggedness, and it is clear why the Series 400 X-Y and X-YY\* recorders have set the pace. Developed and proved by more than 7 years' experience.

## SERIES 500

**Newest in the complete line of 11" x 17" all-solid-state recorders... unparalleled performance and specifications... priced at only \$1975\***

The new Model 500 invites comparison alongside any competitive 11" x 17" X-Y recorder. It's the only way to point up the significant design advances provided in the 500 and not found in any competitive instrument. The same high standards of quality and performance have been given top design priority, second only to an economy price. The use of complete transistorization, coupled with such features as integral time base, high input impedance, distinctive cabinetry and all the other essential high performance features makes the Model 500 today's best X-Y recorder value. Each and every feature has been time and user tested on a line of recording instruments which has endured the test of years of rigorous field operation. The Model 500 is the economy complement to EI's complete line of recorders.

*\*f.o.b. San Diego, California.*



# X-Y RECORDERS

## general specifications

Input Impedance: 1 megohm to 4 megohms  
Input Ranges: .5mv/in. to 100v/in. in 20 steps plus vernier  
Inputs: Floating and isolated from each other  
Time Base: .02 to 2.0 in/sec  
Reference: Zener diode or mercury cells  
Accuracy: Static—to 0.1%  
Dynamic—to 0.15%  
Slewing Speed: to 30 in/sec  
Mounting: Cabinet or rack mount

## typical applications

- Data reduction
- Computer output
- Function generation
- Inspection and evaluation systems
- Point plotting
- Recording current, voltage, speed, torque, stress, strain, pressure
- Recording any two variables as a function of each other or time

## accessories and optional equipment

- Time base
- Computer input
- True differential input
- Curve follower
- Log converter
- Null detector
- Remote operation
- AC/DC converter
- Digital/analog converter
- Parallel entry manual keyboard
- Roll chart adaptor
- Event marker
- Character printer

For special features or equipment options not listed contact the factory.

*Prices and specifications subject to change without notice.*

*Specification sheets which give complete details on all Electro Instruments XY Recorders and input function modules for Series 400 Recorders are available. Please contact your nearest Electro Instruments office or write to:*



## **Electro Instruments, Inc.**

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CABLE ADDRESS: ELECTRO SANDIEGO

company offices: LOS ANGELES, CALIF.—2024 Montrose Avenue, Montrose, Calif., CHapman 5-6696 • SAN FRANCISCO, CALIF.—355 West Olive, Suite 214, Sunnyvale, Calif., REgent 9-6917 • SEATTLE, WASH.—EMerson 2-1500 • DENVER, COLO.—900 East Louisiana Avenue, 744-3606 • SALT LAKE CITY, UTAH—ELgin 9-1617 • ALBUQUERQUE, N.M.—2812 Garfield, S.E., Suite N, 242-8374 • DALLAS, TEXAS • CLEVELAND, OHIO—12160 Triskett Road, Winton 1-4663 • CHICAGO, ILL.—6110 West North Avenue, MErrimac 7-1911 • MILWAUKEE, WIS.—2450 West Wells, Division 2-2021 • DAYTON, OHIO—TROjan 8-6111 • HUNTSVILLE, ALA.—539-3902 • WALTHAM, MASS.—1062 Main Street, TWInbrook 4-3748 • DANBURY, CONN.—P.O. Box 65, Pioneer 3-7033 • NEW YORK CITY, N.Y.—P.O. Box 6, Halesite, Long Island—Suite 312, Cross Country Center, 6 Xavier Drive, Yonkers, JUdson 2-5934 • PLAINFIELD, N.J.—P.O. Box 574, JUdson 2-5934 (New York City) • PHILADELPHIA, PA.—724 Lancaster Avenue, Bryn Mawr, Pa., LAWrence 5-1472 • WASHINGTON, D.C.—2000 Florida Avenue NW, EXecutive 3-8093 • ORLANDO, FLA.—Midway 7-7880 • representatives: ST. PAUL, MINN.—Northport Engineering, Inc., 1729 Selby Avenue, Midway 6-2621 • Please direct all overseas inquiries to: ELECTRO INSTRUMENTS, Export Department, 8611 Balboa Avenue, San Diego 12, California, U. S. A.

**CIRCUIT SYNTHESIS**

At the East Bay Subsection meeting of October 15, in Cory Hall on the UC campus, Professor D. O. Pederson gave an interesting lecture on the "Synthesis of Electronic Bistable Circuits." A synthesis had to be made, for there was no catalog of bistable circuits.

Purpose of this investigation is to build the most optimum integrated circuit using slabs of semiconductor material. The price of integrated circuits is about the same as for lumped circuits. Reliability of integrated circuits, at this time, is about equal to lumped circuits, but shows promise of being one or two orders of magnitude better in the future.

Professor Pederson illustrated that by taking a 3-port network with one sensing resistor, one control resistor, a load resistor, a source, and a source resistance, there were 114 possible combinations of bistable circuits. This number is reduced to 12 if only unipolar and bipolar devices are used (i.e., device is not potentially bistable by itself). If polarity restrictions are placed, this leads to only two possible combinations.

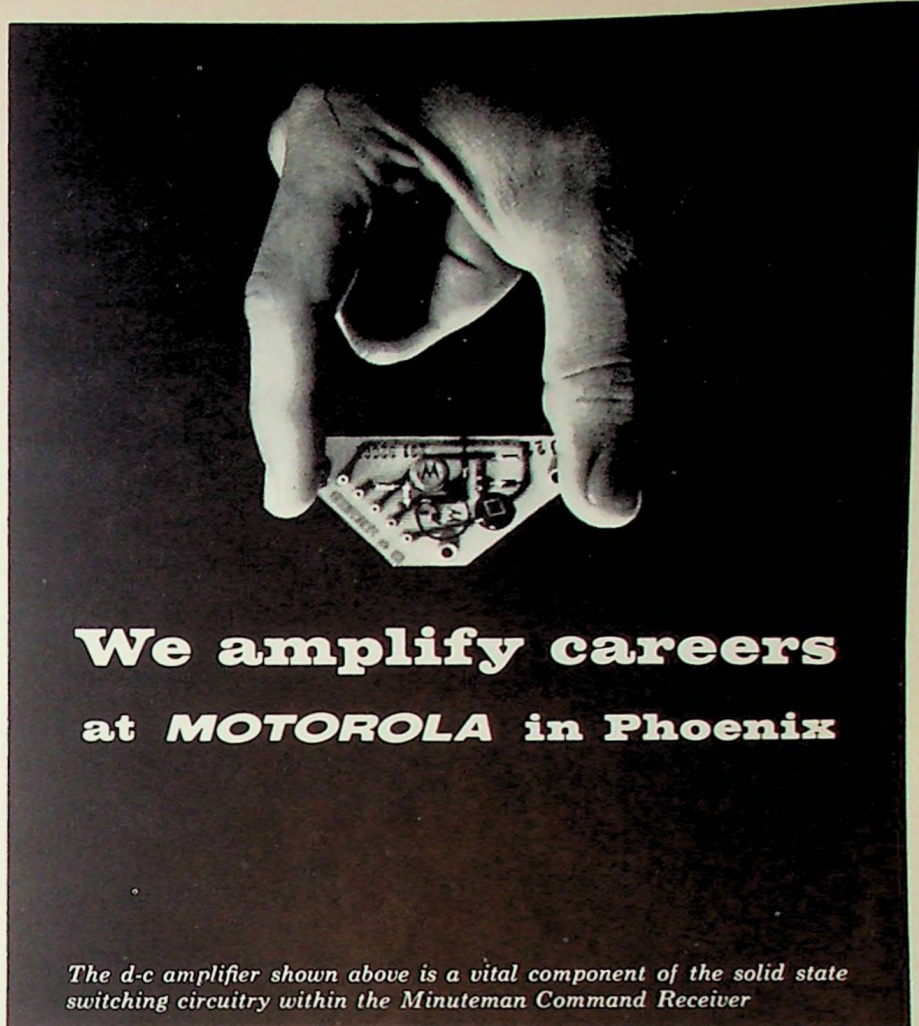
From these two can be developed all possible combinations:

1. Schmitt triggers
2. PNP switches
3. Eccles-Jordan circuits
4. Bipolar plus unipolar
5. Unipolar plus unipolar

The last two show great promise, because they take advantage of the inherent properties of the semiconductor.

Professor R. S. Pepper conducted a tour of the new semiconductor lab at Cory Hall. Mrs. Ruth Talcott is in charge. Two diffusion furnaces are on order. One will be used for P-type Si and the other for N-type. They hope to do GaAs and Ge in about a year. No crystal pulling will be done. One room has been reserved for epitaxial investigations. Work is also being done on photo-resistive material. Work on thin-film active devices is being done on vacuum furnaces. Professor Pepper stated that there were 17 graduate students (about one-half M.S. and one-half Ph.D. candidates) working in this lab. One is working on the synthesis of

*(Continued on page 19)*



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at MOTOROLA in Phoenix**

*The d-c amplifier shown above is a vital component of the solid state switching circuitry within the Minuteman Command Receiver*

Engineers discover, after joining the Military Electronics Division of Motorola in Phoenix, that they have a new-found enthusiasm for their work and a fresh sense of accomplishment. That's because all professional personnel are individually selected and then assigned to challenging state-of-the-art projects which fully utilize their training, experience, and creativity. We can thus provide greater career opportunities for our engineers and also broaden Motorola's capabilities as a leader in the field of advanced military electronics.

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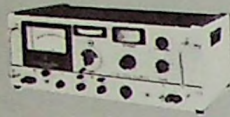
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## precision ac measurement & checkout instruments



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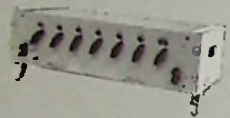


**MODEL VM-301**

**BROADBAND PHASE ANGLE VOLTMETER**

Use: Measures both phase angle and magnitude of complex AC signals and their vector components with respect to reference voltage. Ideal for amplifier and network design, vibration analysis, phase sensitive null detection in production and laboratory, telemetry system analysis, and bio-medical research.

Specs: Phase measurements from 10cps to 100kc. 1mv to 300v voltage range in 12 ranges. 0.2° accuracy from 0 to 360°. 2 microvolts null sensitivity.



**MODEL RB-504T INVERTING RATIO BOX**

Use: For precision calibration of resolvers and synchros where minimum loading, high accuracy and low phase shift are essential. Can be used with the Model VM-301 for rapid direct reading of nulls, phase shift angles and quadrature voltages.

Specs: Ratios from +1.111110 to -1.111110. 3ppm isolated, 1ppm direct accuracy at 400cps. 50cps to 3kc frequency range.

**TSI** has complete data on the above instruments, also a condensed catalog covering North Atlantic's instrument servos, phase angle voltmeters, ratio boxes, AC to DC converters, and related instruments. This data and expert applications assistance from TSI Engineers are yours for the asking. Call TSI for service. No obligation, of course.



# TSI

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## meeting review

### JUST THE FACTS, MAN

Clarity and conciseness in a technical proposal win favor with a proposal reviewing team; bulk and expensive production lose favor. This was the central theme of the talk given to the October meeting of PGEWS by Harold Hornby, chief of systems, mission analysis group, NASA Ames Research Center. A good portion of Mr. Hornby's time is spent in reviewing and evaluating technical proposals.

Each technical proposal must be read and evaluated in a very short time, sometimes in less than an hour or two. For this reason, brevity is very important. Mr. Hornby pointed out that brevity leads to clarity which in turn leads to quality in a technical proposal. A good rule of thumb to use is that a technical proposal should contain between four and ten pages for each one page of the work statement accompanying the request for proposal. If you insist in supplying voluminous mathematical analysis, lengthy and numerous biographies, etc., make them appendices to the proposal. They probably will not be read anyway and would detract from the main body of the proposal.

Expensive production of the proposal itself creates an adverse reaction in the reviewer. Mr. Hornby advised that fancy covers, superfluous elaborate illustrations, costly publication methods, all be discarded. The proposal evaluator realizes that all the money given over to producing a glamorous document must be regained either in the costing of this project proposed or another.

Another irritating quality of many unaccepted proposals is unconventional prose style. To preclude such a quality, Mr. Hornby strongly recommended that, after all the words have been generated by the scientific and engineering personnel, a professional technical writer be given the task of boiling the manuscript down to its meat and of presenting the meat in clear, concise, conventional wording.

Mr. Hornby said that he would be the first to admit that work statements are too often themselves inadequate or even impossible. If the requesters knew enough to write a perfect work statement, they wouldn't be needing to request the services to

be proposed. In preparing the proposal, the work statement should not be followed slavishly. The ideal situation is for the proposer to study the work statement, divine its motive, and then to respond to the motive, taking incidental exception to the parts of the work statement which lead away from the desired goal.

The proposal must show a complete understanding of the work statement and then must properly respond with what the requester needs to know. What the requester most wants to know is the quality of the proposer's management, leadership, and corporate support.

The meeting was a joint one with the Golden Gate Chapter of the Society of Technical Writers and Publishers.

DOUGLAS W.M. DUPEN

### The Generation of a "PROPOSAL FOR RESEARCH" by a Stochastic Process

About 100 different individuals associated with a particular research community contributed to the writing of the last 175 out of the 179 words in the "Proposal for Research" that appears below. The contributors included administrators, engineers, secretaries, technicians, technical editors, mathematicians, physicists, chemists, contract negotiators, librarians, and a few spouses of these persons. The rules for the proposal writing were simple. At the top of a piece of paper was written the four-word title: "A Proposal for Research." Also shown to the first contributor were the first four words of the first paragraph: "This proposal is for . . ." He (or she) was asked to add one word only to the preceding four words with the admonition that, within the context he (or she) had in mind, the five-word string that resulted should make sense and should also be persuasive in our quest to obtain a contract for research. Besides adding a word, the contributor had the option of adding a punctuation mark at the end of the previous four-word string he (or she) was allowed to see. As may be seen in the text, the first contributor did not insert punctuation, and added the word "development." The second contributor was shown the last four-word string, "proposal for development," and added the word "of." This process was repeated for a total of 175 times; some persons contributed twice. Below is the result.

### A PROPOSAL FOR RESEARCH

"This proposal is for development of laundry machines. The operation

is involved; now it works on different particles of the air. In consideration of which, this implies validity. Therefore, it negates the primary function completely obviates disorder. However, problems utilizing space vehicles fall between the signals; however, many in orbit convolute. Unfortunately, calculations disrupt many studies relating entropy indicate that biologically, they assume irrelevant proportions of concentrated sulphuric acid. Dry runs have continued to exhaustion. Fortunately, this situation ameliorates exponentially corroborating mathematical equations. Therefore, Norbert Weiner expostulates that we react with haste to buy it before. Nonetheless, after careful consideration, we propose, should inevitably confirm or deny allegations concerning the electromagnetic research in the field of bionics. Electronics should not constrain further efforts to develop suitable large-scale machines designed lately. Furthermore, these extremely interesting artifacts cannot generate copious amounts, providing for increasing entropy to substantiate failure of the program. Unilateral circuits computed by squaring matrices to propagate a series of disciplines providing the required source satisfies demands. However, constant thirst for knowledge characterizes desire anthropomorphic-all. Parenthetically, human attributes . . ."

*If any reader's reaction to this 'Proposal for Research' includes such comments as: "I can think of at least one agency that would agree to support the work proposed" or "This proposal is better than many I've seen" or comments in a similar vein, then he (or she) will be echoing the reactions of almost all the persons who contributed to the writing of this "proposal."*

LOUIS FEIN

Reference: J. R. Pierce, Symbols, Signals, and Noise, New York, Harper and Brothers, 1961. 261 ff.

#### MORE EBSS

monostable circuits, another on semiconductor oscillator circuits, investigating the basic semiconductor properties such as carrier concentration, lifetimes, etc. (not treating the oscillator circuit as a lumped L, C, and R).

N. K. LITTLE

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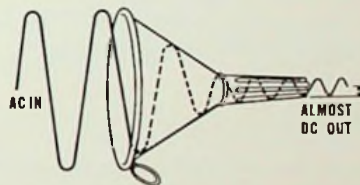
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**Microwave**

Will specialize in microwave and RF system design portions of the telemetry, tracking, and control systems; emphasis being placed on the transmitting, receiving, tracking, and control functions related to total system operation. Must keep abreast of the state-of-the-art advances and be able to apply new techniques to current system requirements. Short-term feasibility studies as required. Advanced E.E. degree required.

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**IT IS REPORTED:**

Dr. James L. Palmer has been appointed manager of the tube division at Huggins Laboratories, Sunnyvale, after serving as director of research since 1961. In his new position he will be in charge of planning, administration, and technical direction of all R&D and manufacturing activities, including projects dealing with refinement of focusing methods, PPM low-noise TWTs, PM-focused backward wave oscillators, and increase of gain and power output.

Manfred Wildmann, an authority on gyroscope technology, has been named manager of the Ampex Corp. mechanics and gas bearing group. In this newly created post Wildmann will be responsible for research on tape handling and guidance techniques for magnetic tape recorders.

John C. Mallinson has been named a senior physicist at the magnetic tape laboratory of Ampex Corp., Redwood City.

Melvin Cohen is head of a single planning and marketing staff recently consolidated out of four activities at United Technology Corp. Morris M. Arnold has been named to head marketing under the new arrangement and will be responsible for five field offices, applications engineering, and market and resources analysis and planning.

Dr. H. M. Truby has joined the speech synthesis project of the communications science department in IBM's research laboratory at San Jose. From 1955 to 1960 he was associated with the speech transmission laboratory of the Royal Institute of Technology in Stockholm. He has also been a full-time consultant to the National Institute of Health, also doing research in medical sonics.

Advanced Technology Laboratories, a division of American-Standard, Mountain View, has augmented its instrument product line to include Norwood Transducers of Detroit, and Rochester Instruments of Monrovia, Calif. Both formerly were part of American-Standard Controls Division.

**PAPERS CALLS**

**Dec. 31:** 500-word abstract for the 1963 Nat'l Electronic Packaging & Production Conf., June 4-6, 1963, New York Hilton, New York City. Tech. Prog. Committee, Nat'l Electronic Packaging & Production Conf., 222 West Adams St., Chicago.

**Feb. 1:** 300-word abstract for Annual Symposium on Human Factors in Electronics, May 2-3, Marriott-Twin Bridges Motor Hotel, Washington, D.C., Prog. chairman: Rube Chernikoff, U.S. Naval Research Lab., Code 5124, Washington 25, D.C.

**Jan. 15:** 300-word abstract for the 15th Annual SWIRECO, Apr. 17-19, 1963, Dallas, Texas. Prog. chairman: Al Mitchell, Graduate Res. Center of the Southwest, P.O. Box 8478, Dallas 5.

**July 1:** 500-word abstract for 1963 Internat'l Solid-State Circuits Conf., Feb. 20-22, Univ. of Pennsylvania & Sheraton Hotel, Philadelphia, Pa. Program chairman: Michael Inhat, AVCO Corp., 201 Lowell St., Wilmington, Mass.



Kaufman

Bender

Jack Kaufman was recently sworn in as consultant to Dr. Irvin C. Stewart, Office of Emergency Planning, personal advisor to President Kennedy on telecommunications. Kaufman's interest will be connected primarily with the satellite communication system. Executive vice president of Globe Wireless System for 18 years and president of Heintz & Kaufman, Ltd., for 20 years, he was also a founder of Lewis and Kaufman, Ltd., electron-tube manufacturer, and active in the formation of WEMA.

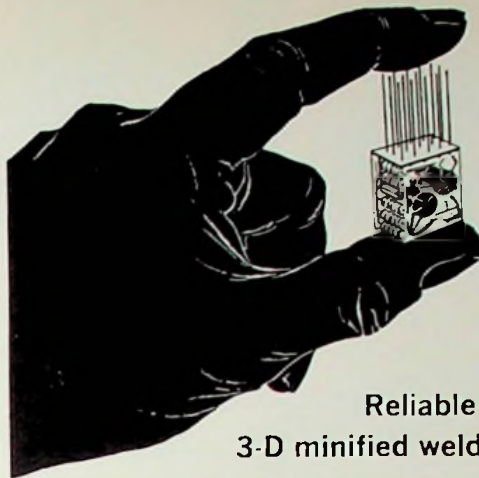
Daniel W. Bender has been named manager of the San Francisco district marketing office of General Precision's Librascope division, to coordinate marketing activities in northern California, the Pacific Northwest, and Colorado. He was marketing manager for Alto Scientific Co., Inc., Palo Alto.

Robert W. Berg will manage the new Washington engineering office of Granger Associates, providing technical liaison with government agencies and Eastern customers.

Harold Hogg and James Tangney have joined Microwave Electronics Corp., Palo Alto, as senior research engineer and senior development engineer, respectively.

Dr. Burton J. McMurtry is head of the newly formed optical devices group at Sylvania's microwave device division, which is engaged in research and development work on microwave photomixers and detectors, and microwave light modulators.

Allan E. Lee, manager, electronics industry economics group, Stanford Research Institute, has been elected president-elect-secretary of the Instrument Society of America at its New York annual meeting.



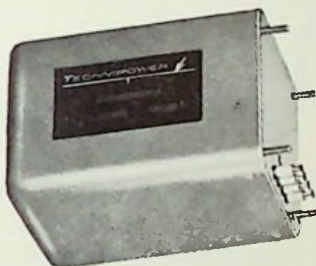
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Keyes

Becker

John A. Keyes heads the new spacecraft system marketing department, and Edmund L. Becker the space systems support marketing department, at Philco Corp. WDL, established to strengthen marketing activities.

L. G. Crawford and G. E. Hall have been appointed industrial sales manager and distributor sales manager, respectively, of the J. W. Miller Co.

Walter J. Farrell has been advanced to the new position of operations administrator at Granger Associates, with responsibility for scheduling and coordinating the control activities of operations departments.



Bialek

Ballasch

Fred Bialek has been appointed manager of Fairchild Semiconductor's diode plant in San Rafael, succeeding David Beadling, recently named to the new post of director of planning.

Joseph Ballasch heads a new service department at the T. Louis Snitzer Co., the facility now equipped to repair and calibrate equipment and instruments sold by the company.

George Voronoff, senior microwave design engineer at Dalmo Victor, presented a paper on one of his inventions, in Boston on November 5 at NEREM of IRE. He discussed the theory and design of an h-guide antenna which he developed at Dalmo Victor as a member of the advanced antenna research group.



Gregory

Dow

Earl Gregory has been named Minuteman program manager for Raytheon Company's semiconductor division and will coordinate all aspects relating to Raytheon's performance in the program, including sales of transistors and diodes for the USAF solid-fuel, hardened-site ICBM.

Dr. Daniel G. Dow has been named manager of tube research at Varian Associates, Palo Alto, responsible for all basic research in microwave tubes and devices. Tube development, as well as certain applied research activities, will continue under the direction of Dr. Richard Nelson. Both will report to Dr. Theodore Moreno, vice president, tube division.

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Greenberg

Jacobson

Dr. Sidney A. Greenberg has been named staff scientist at Ampex Corp.'s magnetic tape laboratory, Redwood City. Morton Jay Jacobson has been named research chemist in the laboratory.

Electron Tube Division of EMI/US is now represented in California, Arizona, and Nevada by O'Halloran Associates for the complete line of microwave tubes and photomultiplier tubes.

Omni Spectra, Inc., Detroit, will be represented in Southern California by Western Electronic Associates, Sherman Oaks, and in Northern California by Walter Associates, Menlo Park.

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<p><b>American Wireless</b> 22 Devonshire Blvd., San Carlos; 591-6260</p>	<p><b>Cain &amp; Company</b> 175 So. San Antonio Road, Los Altos; 968-0995 or 948-9350</p>	<p><b>Dynamic Associates</b> 1011-D Industrial Way, Burlingame; 344-1246</p>	<p><b>Logan &amp; Associates, Jack</b> 801 Mahler Road, Burlingame; OX 7-6100</p>
<p><b>Artwel Electric, Inc.</b> 1485 Bayshore Blvd., San Francisco; JU 6-4074</p>	<p><b>Compar San Francisco</b> 120 Santa Margarita Menlo Park; DA 6-1760</p>	<p><b>Geist Co., W. K.</b> Box 643, Cupertino, Calif.; YO 8-1608, AL 3-5433</p>	<p><b>Long &amp; Associates, Inc.</b> 505 Middlefield, Redwood City; EM 9-3324</p>
<p><b>Ault Associates</b> 120 Santa Margarita, Menlo Park; DA 6-1760</p>	<p><b>Components Sales California, Inc.</b> Palo Alto; DA 6-5317</p>	<p><b>Heaton Co., James S.</b> 413 Lathrop St., Redwood City; EM 9-4671</p>	<p><b>Magnetics, Inc.</b> 1826 Industrial Way, Redwood City; EM 6-1210</p>
<p><b>Belsco</b> Box 907, Palo Alto; DA 1-8501</p>	<p><b>Costello &amp; Company</b> 535 Middlefield Road, Palo Alto; DA 1-3745</p>	<p><b>Instruments for Measurements</b> 251 So. Murphy Ave., Sunnyvale; RE 6-8680</p>	<p><b>Maier Co., Tom G.</b> Suite 276, 375 S. Mayfair Ave., Daly City; PL 5-5566</p>
<p><b>Birnbaum Sales Company, Inc.</b> 626 Jefferson Ave., Redwood City; EM 8-7757</p>			<p><b>McCarthy Associates</b> 1011-E Industrial Way, Burlingame; 342-8901</p>

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## the section

### MEMBERSHIP

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

#### Member

R. J. Espinosa

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

J. C. Shiu  
G. T. Uber

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

H. C. Alberts	R. H. Katzive
G. R. Bea	J. R. Kerr
K. G. Beaman	R. J. Klinke
C. H. Berg	E. B. Kopp
G. H. Blount	R. C. Kreps
J. M. Bonsall	L. H. LaForge, Jr.
P. A. Brikford	R. T. Lockie
H. A. Brinkman	P. E. Martin
D. A. Brown	W. F. McGee, Jr.
C. N. Burrous	R. E. McKean
F. C. Cameron	A. L. Millhollon
D. J. Chesarek	A. I. Morrison
W. P. Cleveland, Jr.	C. H. Much
J. Coggsball	C. E. Mullett
W. C. Coombs	B. F. Newland
J. C. Cummings	R. G. Newman
J. E. Daniels	O. W. Perkins
R. Disman	F. W. Poole, Jr.
R. P. Dolan	R. Price
C. A. Eldon	J. W. Puopolo
J. H. Friedrich	J. O. Riggs
P. A. Froess	W. A. Ross
A. Galopin	E. S. Seeley
G. L. Gaskell	T. C. Simonen
J. G. Giacobino	F. L. Smith III
L. I. Haigler	C. W. Soules
A. S. Halsted	D. P. Strandberg
J. D. Harr	P. L. Sursi
Jeremiah F. Hayes	E. E. Ungstrup
R. S. Heard	R. J. Vincent
J. P. Hernandez	W. K. Wagner
C. D. Herold, Jr.	M. B. Wittry
A. A. Hubinger	J. A. Wulfmeyer
F. J. Hughes	A. A. Wulkan
	J. C. Wurr

### student news

#### HEALD STUDENT BRANCH

Newly elected officers of the IRE student branch at Heald Engineering College, San Francisco, are: Coleman Daniel, chairman; Fred Mills, vice chairman; Donald Thompson, secretary; Floyd Peterson, treasurer; and Ron Wohlers, membership chairman. Roy O. Hurd is IRE student advisor at the college.

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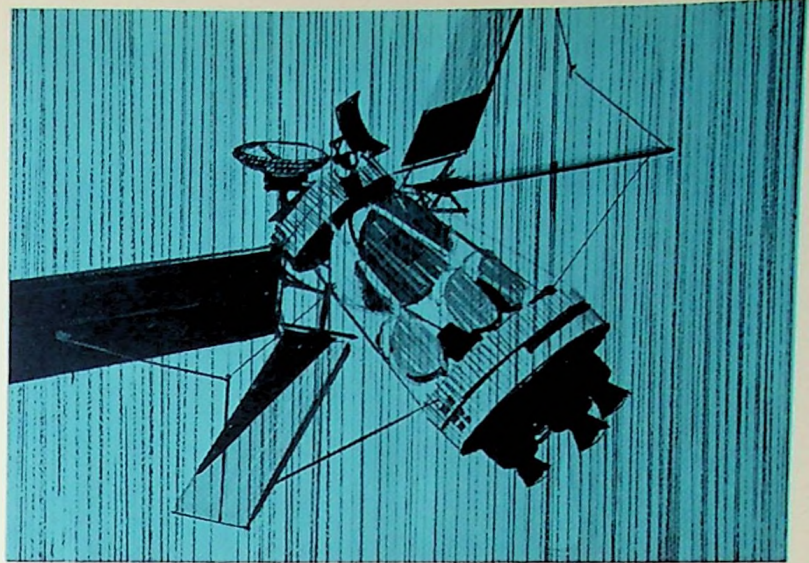
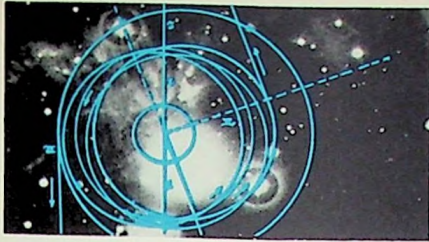
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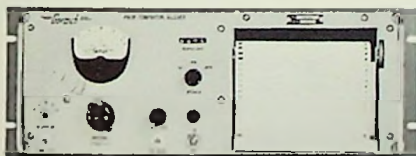
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