

The *Reflector*

PUBLISHED BY THE BOSTON SECTION OF THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

NEREM ISSUE

NEREM - 63

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22 day - evening sessions



More than 450 Exhibits





with the hp 5245L Electronic Counter

The solid state hp 5245L Electronic Counter is an instrument that'll do your job today . . . and keep growing right along with you as your requirements increase. Plug-in versatility is the answer.

Three plug-ins available now . . . more to come. You can expand the usefulness of the 5245L simply by adding a plug-in, when—but not unless—you need it. As your requirements change, you can easily and economically change the 5245L to meet them.

The basic counter offers a maximum counting rate of 50 mc with 8-digit resolution, and a single plug-in extends that rate to 512 mc. Available soon will be a new plug-in extending the rate to 2500 mc. Other plug-ins include a video amplifier which increases 5245L sensitivity to 1 mv rms and a time interval unit which enables the counter to measure time interval 1 μ sec to 10⁸ sec.

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- Sample rate, independent of gate time, adjustable 0.1 to 5 sec
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- hp 5245L Electronic Counter, \$3250
- hp 5253B 512 MC Frequency Converter, \$500
- hp 5261A Video Amplifier, \$325
- hp 5262A Time Interval Unit, \$300

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

The Reflector

NOVEMBER 1963

Volume XII, No. 3

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AYN RAND AND THE ENGINEERS

RONALD E. SCOTT
 Chairman — Boston Section

THE gulf between the "two cultures" of literature and Technology is so great that it is bridged by few authors. Ayn Rand is one of these. In her novels, *The Fountainhead* and *Atlas Shrugged*, she has come remarkably close to describing the motivations and the joys of an engineer.

Her novels are a framework for the dissemination of her philosophy. She believes that a man should work for his own satisfaction and that egocentricity provides the motive power for all human progress. Her heroes are architects and engineers, businessmen and artists. They have in common an internal drive which leads them to create new and noble works.

Any engineer who has finally made something "work" knows the feeling of exaltation which occurs. It is personal and private and does not depend on the social significance of the device. The villains in Ayn Rand's novels are the parasites who live by manipulating people and buying favors. They may triumph over the creative workers,

as they do in the real world, but it is a Pyrrhic victory. Creativity does not come from slaves.

Ayn Rand's work has political implications. For generations, conservatism has been tagged as stationary, narrow-minded, unprogressive and selfish. Liberalism has managed to appear selfless, considerate and progressive. Creative people have been inevitably attracted to the liberal camp. Ayn Rand may have reversed this trend. She has identified conservatism with that egocentricity which is at the heart of creativity. She has damned liberalism as a cult of uniformity and mediocrity. In her view, Conservatism stands for an individual freedom which makes creativity possible, and Liberalism stands for a system of looting (taxing) which distributes the products of creativity to those who have not worked for them. The books of Ayn Rand are exciting, provocative and flattering to engineers. They are worth reading for the light which they shed on the contemporary American political scene.

COMING, Winter Lecture Series

PERT

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JANUARY 9, 16, 23, 30
 7:30pm



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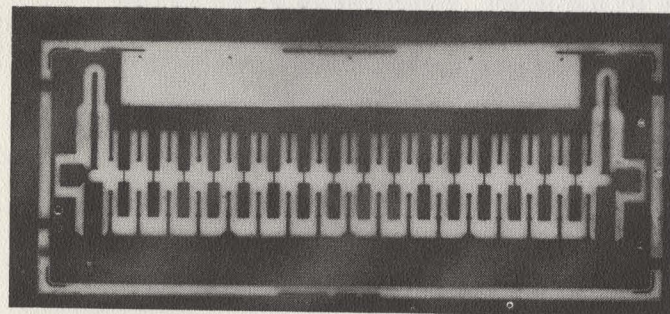
ASHLAND Motors	KENYON Transformers, Filters
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"That branch of physics which treats of the emission, behavior, and effects of electrons . . ." *

Research

"1. Careful search; a close searching. 2. Studious inquiry; usually, critical and exhaustive investigation or experimentation having for its aim the revision of accepted conclusions, in the light of newly discovered facts . . ." *

Engineering

"2. Applied science concerned with utilizing inorganic products of earth, properties of matter, sources of power in nature, and physical forces for supplying human needs . . ." *

Meeting

"1. Act of persons or things that meet; Meet . . . 6. To encounter; experience . . . v.i. 3. To come together for a common purpose; to assemble . . ." *

COMMONWEALTH ARMORY

and

SOMERSET HOTEL


BOSTON, MASS.

NOVEMBER 4, 5, & 6

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 Type 580A Series with a Type 82 Dual-Trace Unit

■ **DUAL-TRACE OPERATION** with 4 operating modes and independent controls for each channel—for individual attenuation, positioning, inversion, and ac or dc coupling as desired.

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■ **CALIBRATED SENSITIVITY** in 9 steps from 100 mv/cm to 50 v/cm, and in 10X Amplifier Mode, from 10 mv/cm to 5 v/cm, variable between steps.

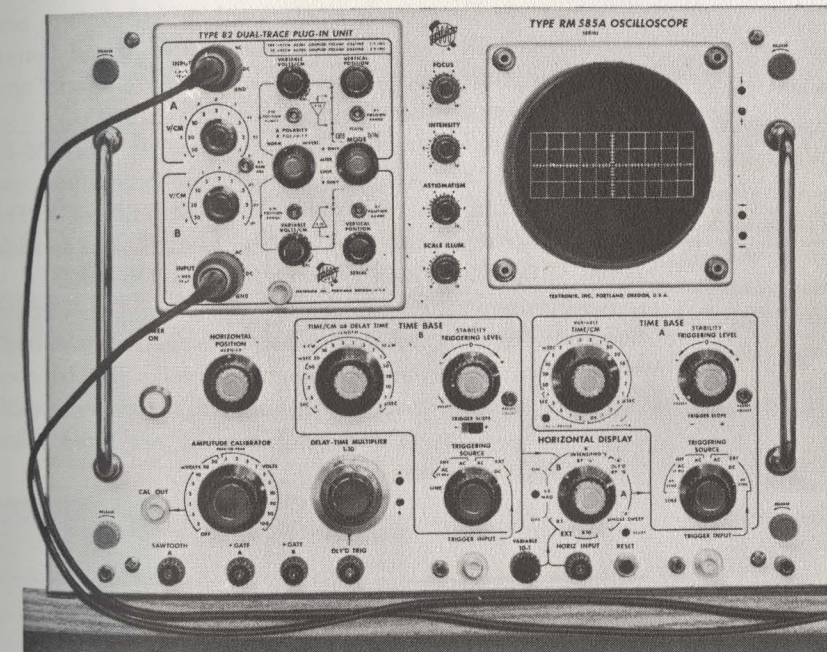
■ **INTERNAL AND EXTERNAL TRIGGERING** to 150 Mc.

■ **SWEEP RANGE** from 10 nsec/cm to 2 sec/cm.

■ **SUPPLIED SMALL SIZE PASSIVE PROBES** increase input R to 10 megohms and decrease input C to approximately 7 pf., with risetime (of probe, plug-in unit, oscilloscope) at over-all sensitivity of 100 mv/cm at approximately 4½ nsec.

PLUS

■ **COMPATIBILITY WITH 17 LETTER-SERIES PLUG-INS** to permit differential, multi-trace, sampling, other laboratory applications—when used with Type 81 adapter.



Type RM585A Oscilloscope, illus. . . \$1825

Type 585A Oscilloscope. \$1725

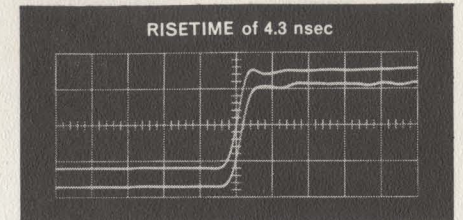
Types RM585A and 585A have 2 modes of calibrated sweep delay ranging from 1 µsec to 10 seconds.

Type 581A Oscilloscope. \$1425

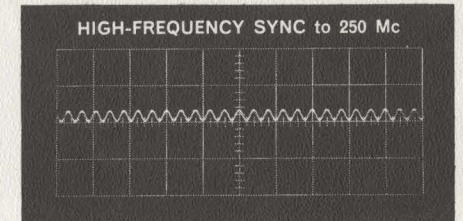
No sweep-delay capabilities . . . but other features similar to Type 585A Oscilloscope.

Type 82 Dual-Trace Unit \$ 650

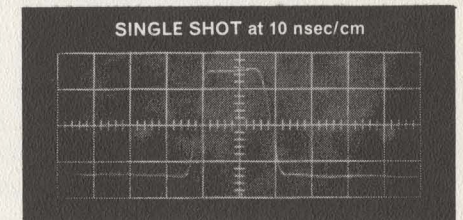
Type 86 Single-Trace Unit \$ 350



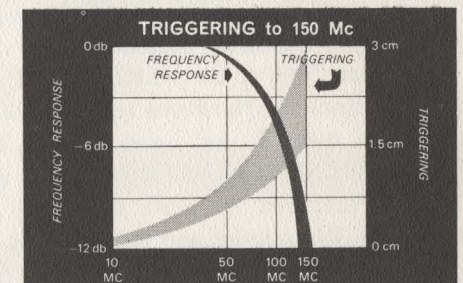
Dual-trace display of input and output pulses of a transistor amplifier at 10 nsec/cm—with lower trace delayed 1 nsec by amplifier under observation. Type 585A/82 combination can display time coincidence between input channels with no measurable difference at 10 nsec/cm.



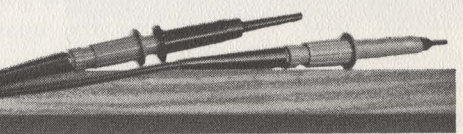
Display of a 250 Mc Sine Wave at 10 nsec/cm, using the H. F. Sync Mode. In this mode, the Type 585A/82 combination can display steady signals from 5 Mc to 250 Mc, with a fraction of a cm of displayed amplitude.



Display of a fast transient at 10 nsec/cm, using single-sweep operation and the Tektronix C-19 Camera. Single-sweep feature of the Type 585A/82 combination facilitates photographic recording of most one-shot phenomena.



Typical frequency response and internal triggering characteristics of Type 585A/82 combination—showing minimum number of cm necessary for triggering.



Type 81 Plug-In Adapter \$ 135

Adapter allows insertion of Tektronix letter-series plug-ins. Band-width (to 30 Mc) and Sensitivity depend upon plug-in used.

Oscilloscope Prices without plug-in units.

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NOVEMBER, 1963



Governor Peabody is shown with Dr. James E. Shepherd, NEREM-63 General Chairman, after inviting the Governor to attend NEREM.

PREPARATIONS for the annual Northeast Electronics Research and Engineering Meeting are proceeding at a very encouraging pace.

Long recognized as the "Hub City," it is particularly appropriate that NEREM be held in Boston (at the Commonwealth Armory and Somerset Hotel) since the Northeast region is the "Hub" of R & D.

The greater Boston area alone has more than thirty-four colleges and universities offering a variety and depth of graduates, professors and laboratories without peer in ANY area its size in the country. The "Hub City" and its Route 128 suburbs have the heaviest concentration of scientists, engineers and technical workers per 1000 population of anywhere in the free world.

More than 50% of the NEREM-63 Technical Program originates from the Northeast region, reflecting world-wide progress in research and development. The broad scope of the NEREM-63 Technical Program encompasses over 100 talks prepared by more than 130 authorities from universities, laboratories and industry and will be delivered during twenty-two day-evening sessions. Papers will cover such timely subjects as space electronics, instrumentation, energy conversion, biomedical electronics, microelectronics, technology, microwave measurements, plasmas, antennas, advanced radar, transistor circuitry, quantum electronics and underwater communications.

One of the highlights of the meeting will be an evening session on large-scale project management, when key representatives of government and industry will present a critical appraisal of four particularly significant programs: The Polaris Weapon System . . . NASA Space Effort . . . ComSat . . . and . . . Weapon System Management.

Post-deadline papers, reflecting recent research and development projects, may be included in the program and will be announced at the meeting.

Paying tribute to the magnitude of the conference in a proclamation declaring November 4-11 as Electronics Week in Massachusetts, Governor Endicott Peabody hailed

its growing impact on industry and the sciences. Once again, he stressed, engineers, scientists, technical personnel and members of industry will gather to re-evaluate and survey the advancements achieved during the year and the outlook for the future.

A complete report of the NEREM-63 Technical Program will be published in a letterpress edition of the NEREM RECORD—Volume V of a continuing series. Featuring over 200 pages of specially-prepared condensations and more than 550 drawings and photos, the book will include a complete cross-reference subject-author index.

All IEEE members will receive a copy of the NEREM RECORD when registering at the meeting. Non-IEEE registrants will be able to obtain copies of the NEREM RECORD at the meeting for \$2.00. Publication price of the NEREM-63 RECORD, after the meeting, will be \$7.50, and copies will be distributed by the Boston Section of the IEEE, 313 Washington Street, Newton, Mass. 02158.

The huge Commonwealth Armory will be completely filled with a multi-million dollar exhibit of the latest developments in electronic equipment, components and accessories. Every facet of the industry will be represented in all of the available 450 booths featuring displays and demonstrations.

A large specially-designed exhibit will also be shown by the military. Completely operational, it will feature new research and development activities of the Armed Forces, current applications and future possibilities. A special area in the Armory has been reserved for this exhibit.

The registration fee for IEEE members at NEREM-63 will be \$2.00, and all members will receive—without any additional charge—a copy of the NEREM RECORD. The non-member registration fee will also be \$2.00, but an additional \$2.00 charge will be made for the RECORD.

Registration will begin on Sunday, November 3, at the Somerset Hotel. From Monday, November 4, through Wednesday, November 6, registration desks will be open at both the Somerset Hotel and the Commonwealth Armory. Registration and exhibit hours are listed below for your convenience.

REGISTRATION HOURS

Somerset Hotel		Commonwealth Armory	
Sun., Nov. 3	3:00pm-9:00pm	Mon., Nov. 4	1:00pm-9:00pm
Mon., Nov. 4	9:00am-9:00pm	Tues., Nov. 5	9:30am-9:00pm
Tues., Nov. 5	9:00am-9:00pm	Wed., Nov. 6	9:30am-5:00pm
Wed., Nov. 6	9:00am-5:00pm		

EXHIBIT HOURS

Mon., Nov. 4	1:00pm-10:00pm
Tues., Nov. 5	10:00am-10:00pm
Wed., Nov. 6	10:00am-6:00pm

THE REFLECTOR



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Ripple .01% or 5 mv rms for standard model, .002% or 1 mv for "A" model
Electronic Short Circuit Protection
Price Range: \$50.00 to \$225.00

See pp 902 and 903 in EEM and page 307 in Electronics Buyers' Guide for more details.

DYNAGE

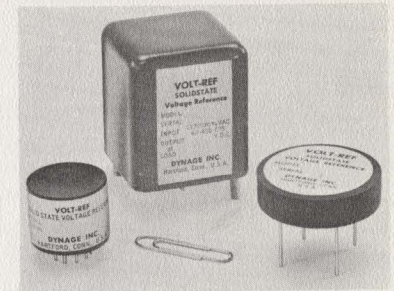
Nerem Booth S-13

BATTERY SUBSTITUTES



Model BS(TC)-2A supplies standard current to all laboratory DC potentiometers such as L&N K-3, Rubicon 2680, Gray 0304, and others. Price \$125.00
Model BS(TC)-1 replaces dry cells and standard cells in all strip chart recorders such as L&N Micromax, Speedomax G & H, M-H Electronik, and others. Price \$64.50

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Output nominal voltages of 6.2, 11.7, 17.9 vdc
Output currents of approximately 1 ma or 10 ma
Voltage regulation of .0025% or .001% for +10% input
Temperature Coefficient of +0.0005% / °C and .001% / °C
Input: 30 vdc, 3S vdc, 46 vdc, and 117 vdc (50-400 cps)
Long term stability: .005%
Packaging—printed circuit board mount, tube socket type or chassis mount
Price Range: \$55.00 to \$141.90

AUDIO PHASE METERS

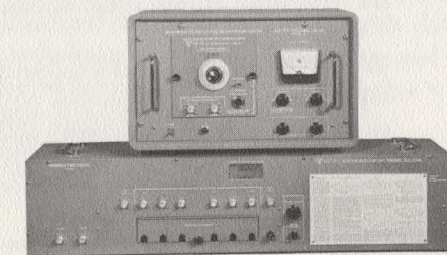


MODEL 524A
Frequency: 20 cps to 40+ cps
Accuracy: +0.1° rel.; +0.3° abs.
Inputs: 0.3v to 50v rms
Features: No amplitude adjustment
No frequency adjustment
No ambiguity at 0° or 360°
High resolution
Price: \$2165 ind. digital voltmeter

AD-YU ELECTRONICS

Nerem Booth S-14

HIGH FREQUENCY PHASE DETECTORS



MODEL 205B1
Frequency: 15 mc to 1500 mc
Accuracy: +.05° or 1% of dial
Inputs: 50 mv to 3 volts rms
Total Delay: 45 nanoseconds
Construction: Plug-in amplifiers
Features: Chopper stabilized detector
High resolution delay with motor
Price: \$2150 with 3 amplifiers

DELAY LINES—VARIABLE



MODEL 20A5
Total delay: 1.1 microseconds
Resolution: 10 nanoseconds
Accuracy: 1%
Impedance: 50 ohms
Price: \$285 or \$445

DELAY LINES—TAPPED



Total delay: 0.1 microseconds
Rise time: 3%
Feature: Up to 100 adjustable taps
Price: \$112 plus taps

Contact nearest E. E. Specialists Inc. office for complete catalogs or technical assistance or latest prices

TENTATIVE NEREM 63 SCHEDULE OF SESSIONS AND SPECIAL EVENTS

	COMMONWEALTH ARMORY		SOMERSET HOTEL			
	HOGAN HALL	MARRIOT HALL	LOUIS XIV Ballroom	PRINCESS Ballroom	REGENCY Ballroom	
MONDAY NOVEMBER 4	1:45-2:20 PM					
	2:30-5:00 PM	1 Microwave Measurements and Techniques	2 Instrumentation	3 Space Electronics	4 Plasmas	
	8:00 PM			5 Large Scale Project Management		
TUESDAY NOVEMBER 5	10:00 AM-12:30 PM	6 Antennas	7 Transistor Circuit Design-Status Report	8 Quantum Electronics Optical Sources	9 Automatic Control	10 Energy Conversion I
	2:30-5:00 PM	11 Antenna Feed Systems	12 Microwave and Solid State	Late Paper Session	13 Submarine Cable Communication Systems	14 Energy Conversion II
WEDNESDAY NOVEMBER 6	10:00 AM-12:30 PM	15 Biomedical Electronics	16 Microelectronics Technology	17 Quantum Electronics Modulation	18 Advanced Radar Technology	
	2:30-5:00 PM	19 Information Technology	20 Microelectronics Applications	21 Coherent Propagation	22 Radio Astronomy	
	6:00 PM	EXHIBITORS ALL INDUSTRY PARTY (CURTIS GUILD HALL)				

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2. Resolver zeroing adjustment
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4. Improved slow motion drive
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6. Optional clutch mechanism

The Test Stand consists of a Gurley Unisec projection-type Coincidence Reading System (absolute accuracy ± 2 seconds of arc), a precision graduated glass circle, a slow-motion drive assembly, and an adaptor plate on which the resolver can be mounted. Available in two models.



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One in a Series of Informative Advertisements on General Instrument's "Custom-Built" ICP's

Microcircuitry... WITHOUT INTERCOUPLING PROBLEMS!

**GI MULTICHIPS: The Advantages of Packaged Circuitry—
The HIGH-FREQUENCY PERFORMANCE of Discrete Components**

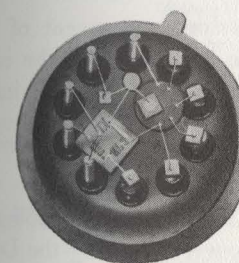
THE FAMILIAR "MONOLITHIC" or fully-integrated microcircuit has been—and, of course, still is—the ideal solution to many problems of reliability, miniaturization, switching time, performance and cost.

BUT, as we all know, the applicability of monolithic ICP's is far from universal. There are many circuits in which they are technically *not* suitable—not, at least, in the present state-of-the-art.

ONE OF THE MAJOR problems is parasitic *intercoupling* between component elements. Since all these elements share a single *common* substrate, some intercoupling is virtually inevitable...and can seriously limit high-frequency performance.

How to Have Your Cake—and Eat It, Too!

SUCH CONSIDERATIONS need not, of course, cause you to fall back on conventional circuitry or to abandon the very tangible advantages of ICP's. Increasingly, design engineers are relying on GI's highly developed technology of *multichip*, interface circuitry. General Instrument multi-



Typical example of multichip circuits: General Instrument NAND-Gate on TO-5 header

chip ICP's give you all the major advantages of monoliths in essentially the same degree...plus component *isolation* that closely approaches that of conventional, discrete elements on a conventional, much-bulkier circuit board. And many *other* advantages, as well!

GENERAL INSTRUMENT MULTICHIP components are batch-manufactured on individual wafers or substrates by the same techniques as we use for monolithic circuits—but each silicon wafer contains *identical* components, which are later diced apart and assembled into "custom-designed" multichip assemblies to your design. This means each substrate can be specifically

optimized for *one* component—resistor, capacitor, transistor, or other element. In a monolith, obviously, the common substrate must be a *compromise* between the parameter's ideal for one component, and those ideal for the others...and this, too, may limit the performance of each individual device, especially at extremely high frequencies.

...Plus Freedom of Design, at Low Cost!

EVEN WHERE "standard" circuitry is involved, however, many engineers sometimes prefer to design minor modifications in order to obtain performance which is not merely "adequate" but definitely superior in terms of some specific, overall objective. Here, again, it may well pay you to investigate General Instrument's facilities for interface microcircuitry. The multichip technique allows you to specify virtually any arrangement of components of any values obtainable by microcircuit techniques...at a total tooling-up cost, usually, of only a few hundred dollars compared with the thousands required for a fully integrated monolith created to your own specs.

When In Doubt—Call On Our Specialists!

NATURALLY, there are many borderline cases where it may be difficult to decide between a standardized, fully integrated monolith and a partially integrated, custom-built multichip. In such cases, we suggest you call on General Instrument's broad experience for advice. We manufacture *both* types, and are not biased in favor of either.

THIS ADVERTISEMENT, of course, barely scratches the surface of the subject of multichips. We have available considerable data on the subject—data you should find interesting and helpful. A note to Jerry Fishel at the address below will bring it to you by return mail.

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65 Gouverneur Street, Newark 4, New Jersey



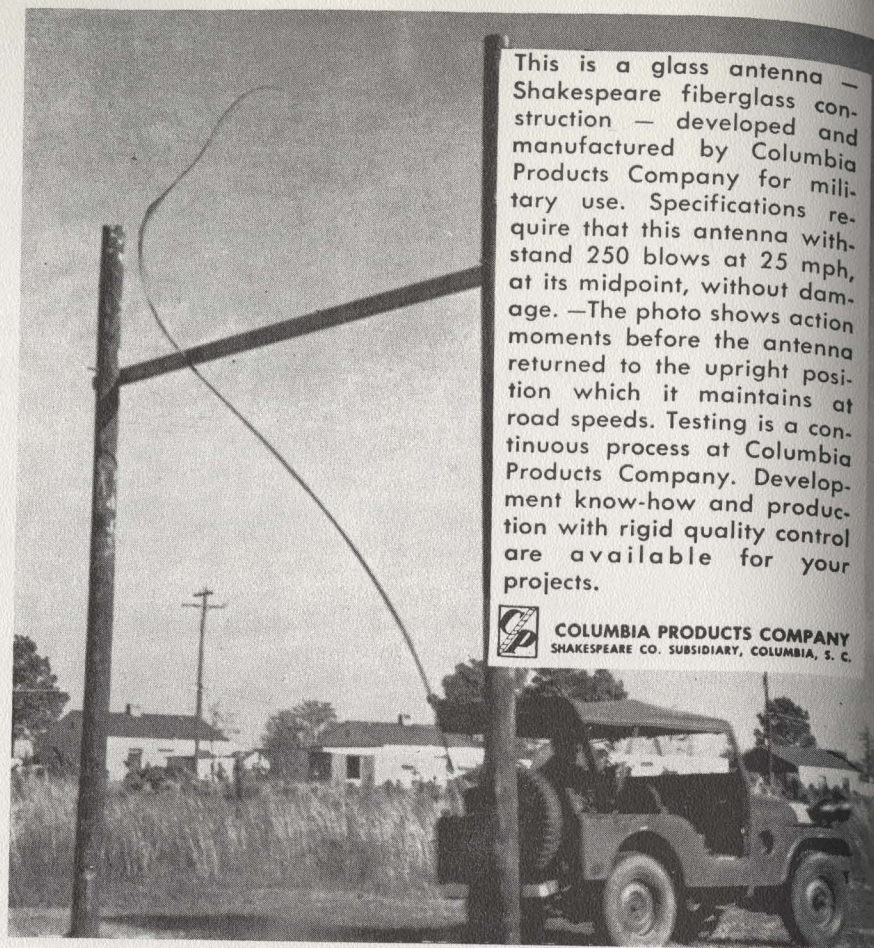
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This is a glass antenna — Shakespeare fiberglass construction — developed and manufactured by Columbia Products Company for military use. Specifications require that this antenna withstand 250 mph, at its midpoint, without damage. —The photo shows action moments before the antenna returned to the upright position which it maintains at road speeds. Testing is a continuous process at Columbia Products Company. Development know-how and production with rigid quality control are available for your projects.

COLUMBIA PRODUCTS COMPANY
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Gala NEREM Banquet to be Held

A GALA Banquet will be held in the Louis XIV Ballroom, Somerset Hotel, Tuesday, November 5. A taste-tempting sparkling champagne dinner will be served. The menu will include a refreshing sea food appetizer, luscious Rib Room roast beef with baked Idaho potato sonesta, and a delicious Italian dessert — zuppa anglesa.

Guest speakers will include Endicott Peabody, Governor of the Commonwealth of Massachusetts, and Ernst Weber, President of the Institute of Electrical and Electronics Engineers and the Polytechnic Institute of Brooklyn. George L. Haller, Vice President, Defense Products Division, General Electric Company, will deliver the featured address on The

Information Revolution: A searching assessment of the sweeping advancements that have emerged from the early days of the industrial revolution to the new dynamic information revolution destined to create startling changes in our way of life.

The social hour — an open house cocktail party — will be held before the annual Banquet — between 5:30 and 7:00pm — in the lounge immediately adjoining the Louis XIV Ballroom.

To ensure a choice table location at the Banquet, the advance reservation form on the bottom of this page should be completed and returned as soon as possible.

Advance Reservation Form — NEREM-63 BANQUET — November 5, 1963

Social Hour — 5:30 - 7:00pm, Dinner — 7:00pm

Please enter my NEREM-63 banquet reservation for

- person(s) @ \$10.00 per plate
- table(s) @ \$100.00 per table (12 persons per table)

My check for \$..... is enclosed.

Name _____

Address _____

Check, made out to the order of NEREM, should be mailed with this form to:

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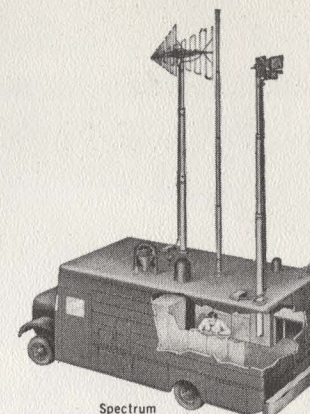
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Spectrum Surveillance System—mobile RFI monitoring facility for missile test range, 0.5 mc to 10.7 Gc, includes beacon checkout tester.

... in signal intercept, analysis, and measurements

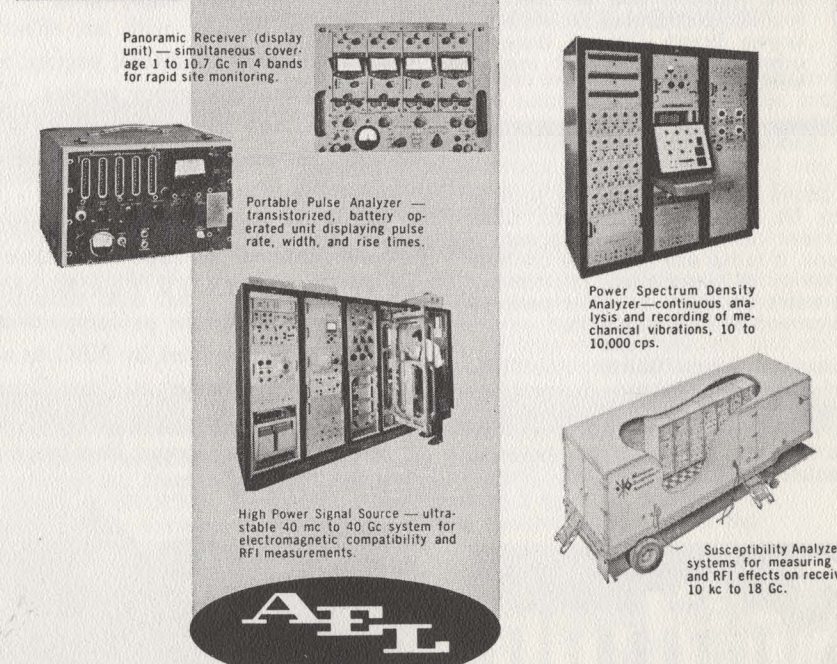
A rich background of experience covering test equipment, ECM and RFI techniques, data analysis, and microwave instrumentation has enabled AEL to make a wide variety of important developments in ... airborne, ground based, surface, and underwater systems.

Significant contributions to state-of-the-art have been made through theoretical and experimental studies to determine the vulnerability of equipment to ECM, and techniques to minimize interference effects on receivers.

The broad range of AEL's capabilities in this field is indicated by the following typical developments, and by the accompanying illustrations.

- Ultra-stable microwave signal generators
- Instantaneous direction finding equipment
- New applications for traveling wave tube amplifiers
- Low noise receivers for counter-measures operation and spectrum signature
- Missile checkout equipment
- Pulse analysis equipment
- Crystal video receivers for beacon checkout
- Swept panoramic receivers for site RFI evaluation

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Portable Pulse Analyzer — transistorized, battery operated unit displaying pulse rate, width, and rise times.

Power Spectrum Density Analyzer—continuous analysis and recording of mechanical vibrations, 10 to 10,000 cps.

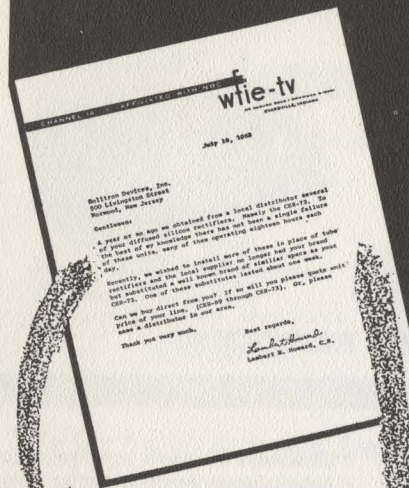
High Power Signal Source — ultra-stable 40 mc to 40 Gc system for electromagnetic compatibility and RFI measurements.

Susceptibility Analyzers—systems for measuring ECM and RFI effects on receivers, 10 kc to 18 Gc.



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The above letter was recently sent to us by Mr. Lambert B. Howard, Chief Engineer of WFIE-TV, Evansville, Indiana. It is but one more in a continuous series of unsolicited testimonials from users of highly reliable, performance-proved Solitron products.

Solitron produces Silicon Rectifiers, Solid-State Hi-Voltage Assemblies (Solidpaks®) and Noise Diodes (Sounvester®). Product specifications/applications data and price lists are available on request.

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NEREM-63 ALL-INDUSTRY PARTY

The ever-popular NEREM get-together All-Industry Party will once again be held on the final day of the meeting—Wednesday, November 6—6:00pm in the Curtis Guild Hall of the Commonwealth Armory. Admission tickets, which include two

"credits" may be purchased for only \$2.00 each during open hours at the Armory and Somerset Information Desks. Extra "credits," a block of THREE for \$2.00 may be purchased at the same time.

NEREM-63 Acknowledgements

NEREM's success in past years can be partly attributed to some company donating the use of equipment which could not be economically rented by the NEREM Committee. Three companies have lent equipment to NEREM-63.

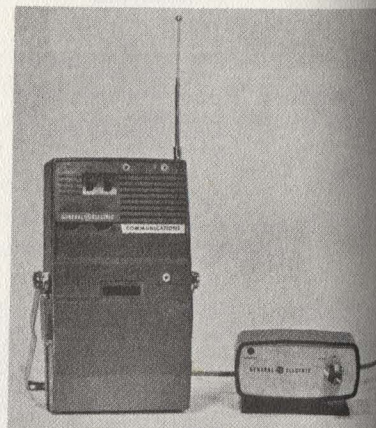
The National Cash Register Company has lent the NEREM Treasurer's Committee six Model 1944 (55-1B) IC electrically operated cash registers. Their dimensions are 22½" high, 19¼" wide, 15⅞" deep and a base 5⅜" high. (See picture). These registers have high registering capacity, initial keys which print on both the check and audit-strip to identify the operator, and Roman numeral keys which classify items or transactions and control totals. Audit Strip Cash Registers are an important item in controlling cash intake whether it be a large or small function.

Videonics Inc. has lent the Committee a closed-circuit TV paging system providing NEREM with an effective method of announcements, paging, and individualized emergency notices. This system will also cover the opening ceremonies, allowing people throughout the Armory to view the festivities.

Many of NEREM's announcements will be "canned" on tape via Videonics PI-3V Portable CCTV Tape Recorder. The picture shows the prototype of this model which was used by NBC to record on-location scenes at Cape Canaveral during the launching of MA-9 shot that put Gordon Cooper into space on May 15, 1963.



The General Electric Communications Products Department of Lynchburg, Virginia has lent NEREM-63 the latest in its line of shortwave communications equipment. Two of the latest model GE Tone Consoles will monitor messages between two Voice Commanders (see picture) and messages to twelve passive receivers called



Voice Directors. This versatile equipment enables the NEREM Committee to respond to any call more promptly.

The NEREM-63 Committee gratefully acknowledges the fine spirit of cooperation and sacrifice made by these organizations.

NEREM
BOOTH J15

New Ideas in PRECISION MEASUREMENTS

Talk to the men in the "ESI Blazers"—measurements specialists demonstrating the newest in matched instrumentation from the company that pioneered the system concept.

MODEL 791 RATIO MEASURING SYSTEM

Measures both in-phase and quadrature components of ac ratio. State-of-the-art calibration of dividers and comparison of resistors, inductors and capacitors. 7-place resolution.

MODEL 121 DOUBLE-RATIO RESISTANCE COMPARISON SYSTEM

One tenth ppm resolution. Circuit eliminates lead and contact resistance. No calculations necessary. Certified correction set on separate dials before making measurements. All switch contact resistance in the bridge suppressed by a factor of 100 or more.

MODEL 1071 AC RATIO MEASURING SYSTEM

Measures in-phase component of ac ratio and provides for quadrature balance. Highest accuracy calibration of both resistive and transformer dividers can be accomplished quickly and easily.

MODEL 721 DC RATIO MEASURING SYSTEM

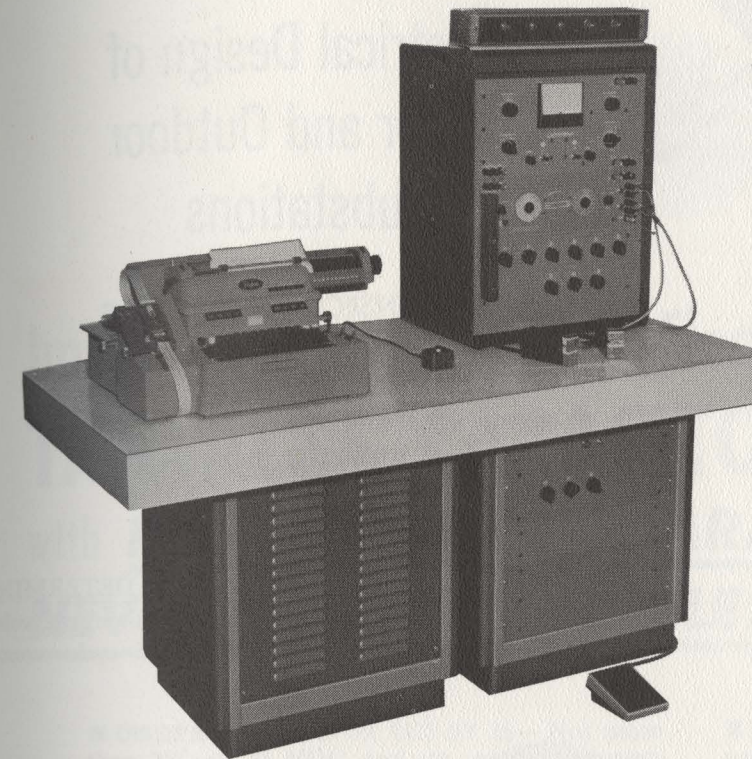
Compares unknown dividers to a part-per-million standard. Lead compensation and well-matched generator-detector give maximum flexibility and accuracy.

MODEL 701 CAPACITANCE MEASURING SYSTEM

Continuous one ppm per dial division resolution. Separate capacitance value and deviation dials provide maximum flexibility and convenience for capacitance comparison. Continuously tunable, self-tracking, line operated. Wide-voltage range generator and one microvolt detector provide more than enough sensitivity for fractional ppm comparison.

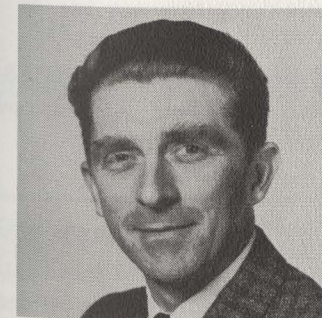
MODEL 209 MILLIOHM BRIDGE

Portable Kelvin Bridge for use in applications requiring high accuracy, low resistance, four-terminal measurements. Measures switch contact and connector resistances in the area of one milliohm and detects variations of resistance on the order of one microhm.



MODEL 242 RESISTANCE MEASURING SYSTEM with AUTOMATIC DATA LOGGER

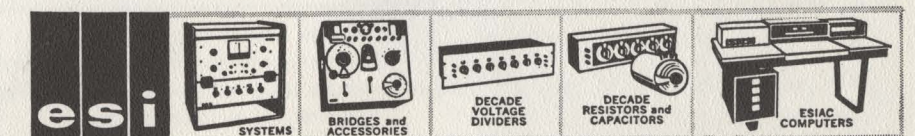
State-of-the-art resistance measurements automatically supplied as inputs to data logging systems. Ideal for detection of errors, failures or changes in resistive components and circuits. See it in operation as it automatically records as typed numbers and on punched tape the bridge reading of your sample ESI resistor.



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TWO FALL

LECTURE

SERIES

1. Phased Arrays

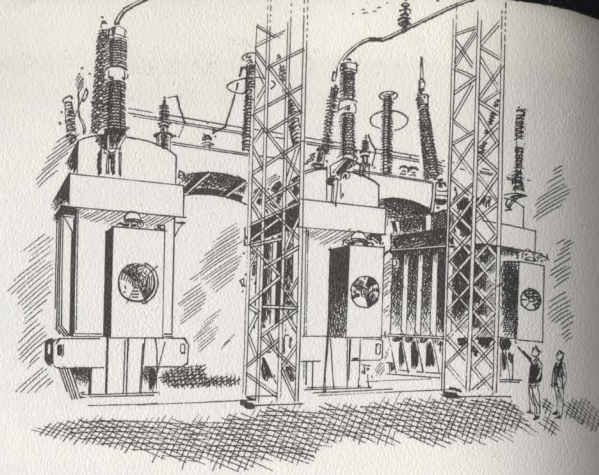
SEE PAGES 19, 20 & 21

2. Electrical
Design of Substations

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Electrical Design of Indoor and Outdoor Substations

FIVE CONSECUTIVE TUESDAYS

7:00 to 9:00pm

NEW ENGLAND POWER COMPANY HALL
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NOV
19

OVERALL FACTORS DETERMINING DESIGN—space requirements, voltage, outdoor, indoor, load cycle economies, transformer choice.

NOV
26

EQUIPMENT SELECTION AND SPECIFICATIONS—B.I.L. ratings, short circuit duty, transformer connections, neutrals, grounding, bus configuration.

DEC
3

PROTECTION—station shielding, lighting protection, insulation coordination, system protection, relaying, line protection.

DEC
10

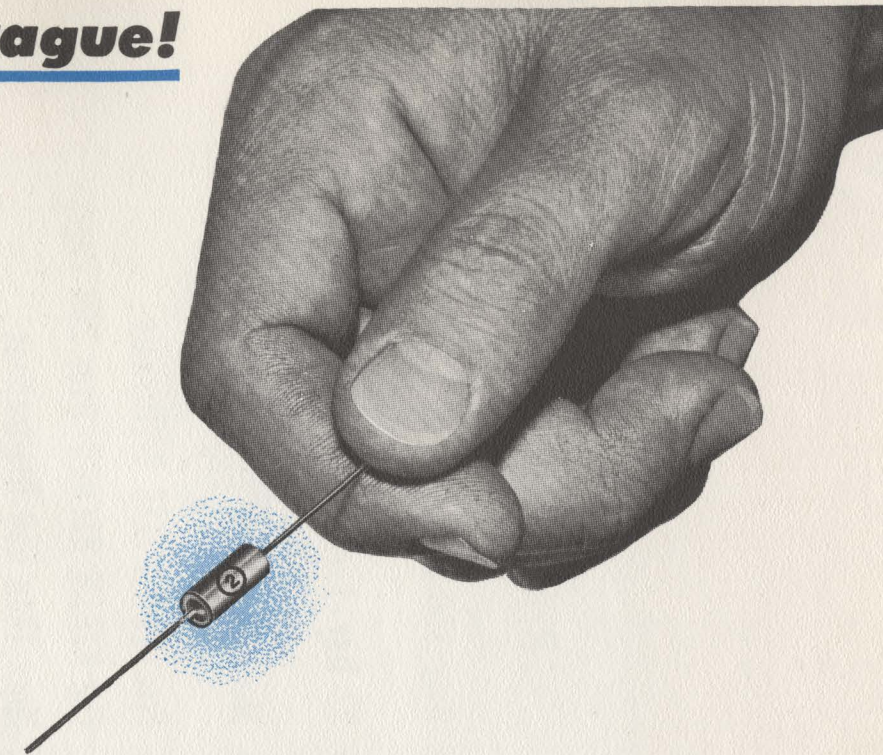
DISCONNECTING DEVICES—circuit breakers, load break switches, power fuses reclosers.

DEC
17

INSTRUMENT TRANSFORMERS—choice of accuracy and specifications, potential and current devices, burdens, capability. Installation and field tests of the completed substations.

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■ **DISSIPATION FACTOR CUT BY 1/2**—Not more than 3% at 20 VDC and up, permitting even higher a-c ripple currents!

■ **LOWER IMPEDANCE AT HIGH FREQUENCY**—With impedances in fractional ohmic values in the megacycle range, Type 150D admirably meets the stringent requirements of high-speed computers.

■ **LOWER LEAKAGE CURRENTS**—Previous limits have been dramatically reduced; in some instances by as much as a factor of three.

■ **INCREASED CAPACITANCE STABILITY**—Capacitance change with temperature is now less than 1/2 the previous guaranteed values. Capacitance change with life is almost insignificant.

■ **NEW HIGHER VOLTAGE RATINGS**—50, 60, 75 and 100 volt ratings are now available, with associated surge voltages higher than any presently offered in the industry.

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New end-seal design makes possible two tiny sizes (.085" dia. x .250" long, and .127" dia. x .375" long) for "cordwood" packaging to supplement standard-sized Type 150D ratings in case size "A".

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Popular ratings of Type 150D Capacitors are available for fast delivery from your Sprague Industrial Distributor

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NOVEMBER 4, 5, 6
Mon., Tues. and Wed.
Commonwealth Armory
Somerset Hotel

NEREM — '63
Northeast Electronics Research Engineering Meeting

NOVEMBER 9
Saturday, 9:30am
U. S. Coast Guard Station
Winter Island Road, Salem

LYNN SUBSECTION
INSPECTION TRIP TO U. S. COAST GUARD STATION

NOVEMBER 12
Tuesday, 8:00pm
MIT, Room 4-231

BIOMEDICAL ELECTRONICS - See page 22
A REAL-TIME HOSPITAL COMPUTER SYSTEM
Jordan J. Baruch, Bolt Beranek and Newman
Dinner - MIT Faculty Club - 6:00pm

NOVEMBER 12
Tuesday, 8:30pm
Pillar House, Newton

PRODUCT ENGINEERING AND PRODUCTION - See page 22
RECENT HUMAN FACTORS DEVELOPMENT AFFECTING ELECTRONICS PRODUCT DESIGN
Speakers: J. Keenan, Dunlap & Assoc.; J. A. Moody, Sylvania; P. Sampson, Tufts University
Dinner - Pillar House - 6:30pm

NOVEMBER 12
Tuesday, 7:30pm
MIT, Room 10-275

UTILITY SYSTEMS
E.H.V. — GENERAL STATUS REPORT
Meeting Chairman: R. S. Coleman,
Chas. T. Coleman, Inc.

NOVEMBER 13
Wednesday, 8:00pm
Raytheon Executive Offices
Lexington

MICROWAVE THEORY & TECHNIQUES - See page 24
LOW NOISE MICROWAVE RECEIVERS
Moderator: P. Penfield, MIT - Panel: C. Blake, Lincoln Lab; M. T. Lebenbaum, Applied Electronics; N. E. Chasek, International Microwave; P. Rizzi, Microwave Technology
Dinner - Raytheon Executive Offices - 6:30pm

NOVEMBER 14
Thursday, 8:00pm
Northrop-Nortronics
Marine Equipment Dept.
77 A St., Needham

AUTOMATIC CONTROL AND AEROSPACE AND NAVIGATIONAL ELECTRONICS - See page 25
HIGH ACCURACY CELESTIAL NAVIGATION SYSTEMS
D. C. Smith, A. Praznik, C. S. Brown
Northrop-Nortronics
Dinner - Northrop-Nortronics - 6:00pm

NOVEMBER 18
Monday, 7:00pm
Merrimack Valley Subsection

MERRIMACK VALLEY SUBSECTION - See page 26
SURVEY OF COMPUTER APPLICATIONS IN THE ELECTRIC POWER INDUSTRY

NOVEMBER 19
Tuesday, 8:00pm
General Electric Co.
40 Federal St., W. Lynn

LYNN SUBSECTION
FLUID AMPLIFIERS — THEIR STATUS AND SOME APPLICATIONS
J. N. Shinn, Advanced Technology Labs., G. E. Co.

NOVEMBER 20
Wednesday, 8:00pm
RCA, Burlington

MILITARY ELECTRONICS - See page 28
A NEW ELECTRONIC SYSTEM FOR TACTICAL AIR TRAFFIC CONTROL
R. E. Davis, RCA

NOVEMBER 20
Wednesday, 8:00pm
Sylvania Electronic Systems
100 First Ave., Waltham

ANTENNAS AND PROPAGATION - See page 29
NEAR-FIELD CHARACTERISTICS OF A LINEAR ARRAY
L. J. Ricardi, MIT Lincoln Lab.
TYPES OF ELECTROMAGNETIC BOUNDARY WAVES
F. J. Zucker, AFCL
Dinner - Charterhouse Motel, Rte. 128
Waltham - 6:00pm

If you are a member of the Boston Section and have NOT received the recent issues of THE REFLECTOR, please notify the Boston Office by mail or phone. Because of the merger there seems to be a list problem and we want to be sure that every member gets his subscription promptly.



See Pages
18, 19, 20 & 21
for details.

See Pages
18, 19, 20 & 21
for details.



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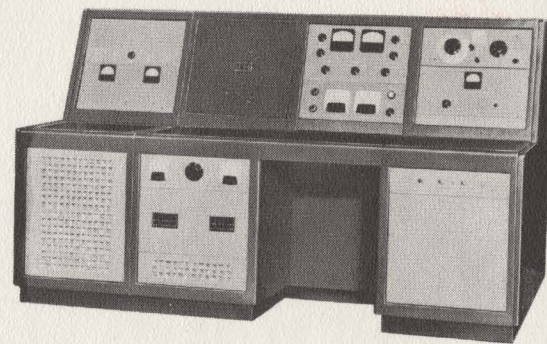
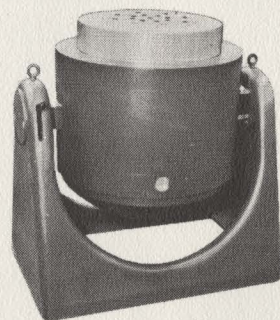
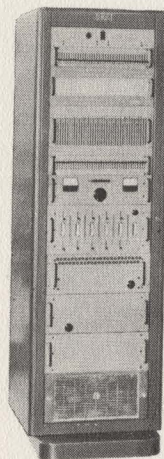
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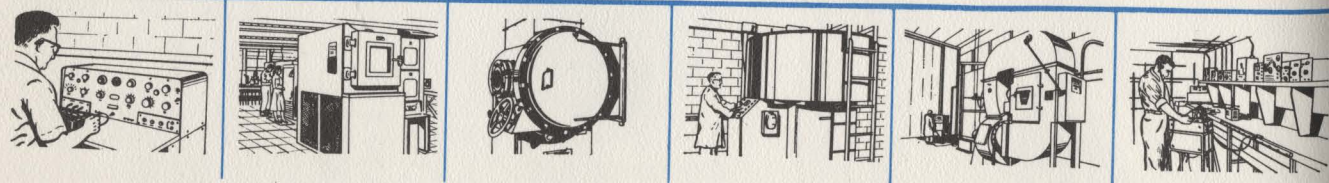
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PHASED ARRAY LECTURE SERIES

TUESDAY, NOV. 26, 8:00pm

Large Array Antennas

ANY system using array techniques is first and foremost an electronic antenna; it is the achievement of satisfactory antenna performance which largely dictates the peculiar requirements on such array components as phase shifters, receivers and transmitters. Consequently, it is *desirable* for the components engineer and *necessary* for the systems engineer to have a working knowledge of the principles of large array antennas. This presentation is directed toward providing some of that knowledge.

Three major areas of array antenna theory and practice will be covered:

- (1) The theory of ideal (error-free) large arrays of isotropic radiators;
- (2) The extent to which arrays of real radiators may be expected to depart from the ideal and means for controlling the departure;
- (3) Configurations for physically realizing ("feeding") large array antennas for electronic scanning of single beams and the generation of large numbers of multiple beams.

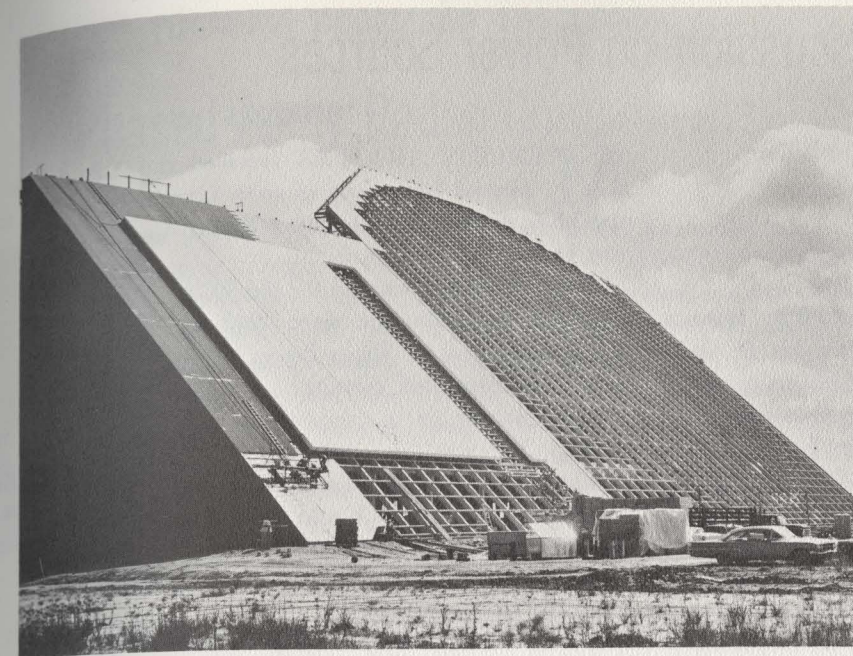
Emphasis will be on providing results and "rules of thumb" useful for systems and components designers, indicating those areas, both theoretical and practical, that are not well understood.

John L. Allen received the B.S. degree in Engineering Science from the Pennsylvania State University in 1958 and the S.M. degree in Electrical Engineering from MIT in 1962.

He is currently at Lincoln Laboratory where he is now Group Leader of the Array Radars Group. His primary interests are in the fields of array antennas and radar systems design.



J. L. ALLEN
MIT Lincoln Lab



Under construction at the Eglin Air Force Base, Florida is the AN/FPS-85 Space Track Radar site. This phased array radar project under contract from Rome Air Development Center to Bendix Radio Division at Baltimore, Maryland is capable of detecting and tracking man-made satellites orbiting the earth up to several thousands of miles.

TUESDAY, NOVEMBER 19, 8:00pm

Array Systems

ARRAY antennas offer some hope to the desperate radar system designer making his last stand against the skyrocketing missile and space threats. In contrast to lens/reflector antennas, the array's electronic scan permits him efficient and intelligent search of a non-uniform threat volume, matching his search rate to the range, clutter and jamming conditions at each point. Electronic scan also permits efficient tracking of multiple targets, or the performance of multiple precise measurements for target identification. Where speed of light limits the search, track, or identification rates for a multi-target threat, the array can generate multiple independent beams for parallel search. Peak and average power limitations of the single-feed dish may be extended by orders of magnitude in the array, since the power may be generated across the full aperture rather than in the point feed. In effect, the array radar is a *relatively* economical way of implementing a large number of conventional radars, all peering

out the same window (which may be hardened against nuclear attack).

Fundamental radar requirements for search, track, and identification will be reviewed, and the compatibility of various array approaches with these requirements discussed.

Mr. Howells received his BSEE from Syracuse University in 1942 and his MSEE from the University of Maine in 1949. From 1942 to 1947 Mr. Howells was with the High Frequency Section of General Engineering Lab., G-E, Schenectady and worked on the development of CRT test equipment, FM & TV station monitors, Armstrong FM Radar and storage tubes. From 1947 to 1950 he did graduate work and was a staff member of the University of Maine. Mr. Howells joined G-E in Syracuse in 1950 and has been associated with the Electronics Lab. and Advanced Development Section, HM ED, and is currently working as a consultant at the Syracuse University Research Corp.

TUESDAY, DECEMBER 3, 8:00pm

Panel Discussion on Power Sources

TETRODES

MERLE V. HOOVER received the A.B. degree in physics from Susquehanna University in 1941 and the M.A. degree from George Washington University in 1946.



M. V. HOOVER
RCA

Mr. Hoover has worked for the RCA Electron Tube Division since 1948 on the development of Super-Power tubes and their associated circuits.

Mr. Hoover is a member of the IEEE. He was awarded the Navy Distinguished Service Award for circuit developments during World War II. He holds thirteen U. S. patents in the electronics field.

BACKWARD WAVE CROSSFIELD TUBE

DR. SCHARFMAN received his B.S.E.E. Degree from New York University in 1947, the M.S.E.E. Degree from Northwestern University in 1948, and his D.S.E.E. Degree from Johns Hopkins University, Baltimore, Maryland, in 1954.



H. SCHARFMAN
Raytheon Co.

He has been associated with the Boeing Airplane Company, Seattle, Washington and the Johns Hopkins University Radiation Laboratory. He is at present Manager of Engineering for the Microwave and Power Tube Division at Spencer Laboratory, Burlington, Mass.

Dr. Scharfman has worked in all phases of ferrite devices and materials and holds a number of patents in these fields. He has presented many papers on these subjects.

FORWARD WAVE CROSSFIELD TUBE

JOSEPH A. SALOOM received his B.S.E.E., M.S.E.E. and Ph.D.E.E. from the University of Illinois in 1948, 1949 and 1951, respectively. Dr. Saloom's past interests have been in ... the gaseous plasmas in electron tubes, the formation and maintenance of electron beams, the final development of reflex klystrons and magnetrons, and in pilot line production of microwave tubes and application of same. He has been president of S-F-D Laboratories since its formation in 1959; in March, 1963, Dr. Saloom was appointed General Manager of the Bomac Division of Varian Associates.



J. SALOOM
SFE

MODERATOR

GORDON L. GUERNSEY received his B.A. from the University of Buffalo in 1943 and his Ph.D. in Physics from the University of Rochester in 1952. Dr. Guernsey is currently at MIT Lincoln Laboratory where he has contributed to the development of coherent MTI radar transmitters, was one of the authors of a decorrelation technique for radar clutter rejection, and has been concerned with research and development of high power microwave amplifiers, particularly klystrons. Dr. Guernsey has served as an AF associate member of the DOD, AGED, Working Group on Microwave Devices (previously Tubes) since 1955 and as Associate Group Leader of the Radar Transmitter Group at Lincoln since 1959.



G. L. GUERNSEY
MIT Lincoln Lab

TRAVELING WAVE TUBE

OTHOMAS PURL received his B.S. Degree in General Engineering at the University of Illinois, 1948; B.S.E.E., 1951; M.S.E.E., 1952; and Ph.D., 1955; University of Illinois.



O. T. PURL
Watkins-Johnson

Dr. Purl is currently Manager, Tube Research and Development Department at Watkins-Johnson Company and is responsible for high-power tubes, medium-power space and satellite tubes, and ultra-low noise traveling-wave tubes. At Watkins-Johnson he has been engaged in research and development on high-power traveling-wave tubes and in research on high perveance high convergence electron guns.

Formerly, he headed the Traveling-wave Tube Section at Hughes, was Research Associate at the University of Illinois and engaged in development of high-power resonant microwave amplifier tubes.

He is a member of the Institute of Electrical and Electronics Engineers, Sigma Xi, RESA, Eta Kappa Nu, Phi Kappa Phi, and Sigma Tau.

TUESDAY, DECEMBER 10, 8:00pm

Phased Array Radar Components

THE advent of phased array technology is bringing changes to the component field.



K. MOLZ
Bendix

Requirements for high performance, small size and low cost, are encountered in all phased arrays because of the high redundancy in this type of system. Discussed in this paper will be various low noise receiver techniques, and several approaches to phase shift devices. Also, components suitable to the transmitter module will be covered. Certain miscellaneous components, such as fuses and RF terminations, for example, will be covered. Problems on signal processing and computer control of phased

array systems will be mentioned.

Mr. Molz is currently the Program Manager for the Space Track Radar Project FPS-85 at Bendix. He previously held the position of Assistant Director of Engineering where he was responsible for management of all Radio Division Government Products engineering functions including research, development, design, production liaison, and field follow-up. Major systems programs under his cognizance to which he has devoted considerable attention include the AN/FPS-46 (XW-1) Electronically Steerable Array Radar and the Space Track radar.

Mr. Molz has also served as chief Engineer of the Air Traffic Control Radar Department and as Engineering Project Manager for the AN/FPN-34 ATC radar program.

TUESDAY, DEC. 17

8:00pm

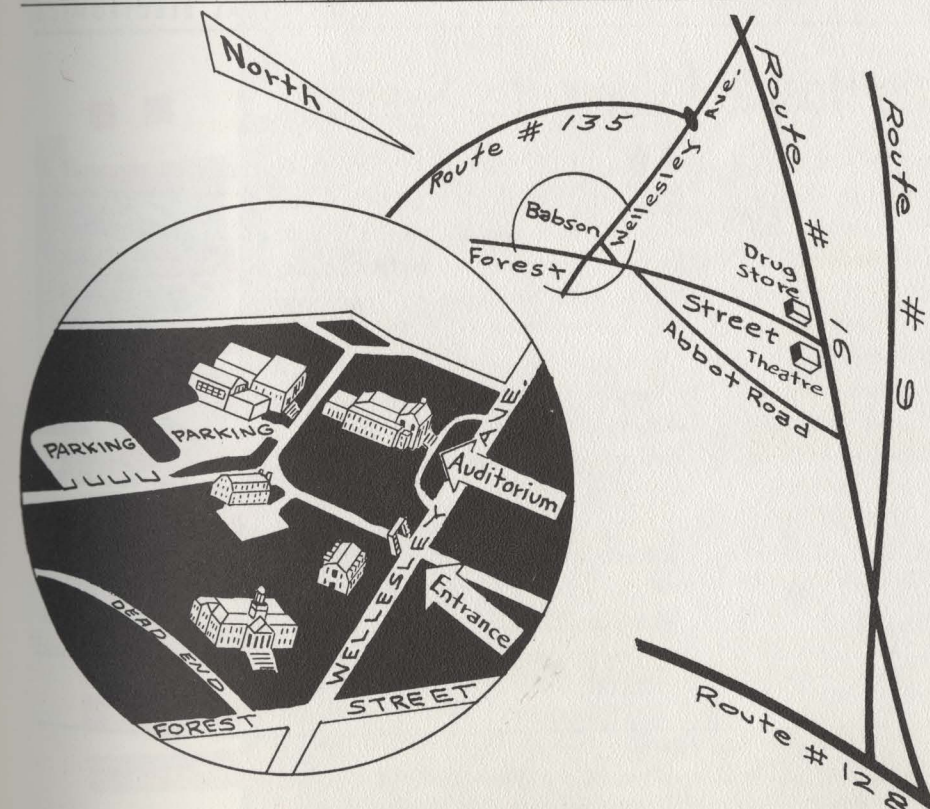
The Role of Phased Arrays in Military Systems

DR. Samuel J. Rabinowitz is currently the Deputy Director for Ballistic Missile Defense, Advanced Research Projects Agency. He will discuss the role of the phased array in military systems. The unique features of the phased array such as great beam steering agility, its capability of forming multiple beams, its suitability for use in automatic control systems will be reviewed and potential applications discussed.



S. J. RABINOWITZ
ARPA

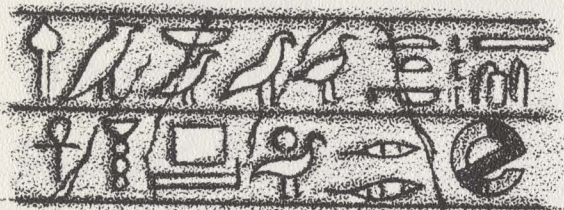
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SPEAKERS

James Keenan, Senior Psychologist, Dunlap & Associates, Stanford, Conn.

John A. Moody, Senior Engineering Specialist, Sylvania Electronics Systems, ESD.

Philip Sampson, Associate Professor of Psychology, Tufts University.

TUESDAY, NOVEMBER 12

Dinner — 6:30pm — Pillar House — Newton

Meeting — 8:30pm — Pillar House — Reservations must be made with Miss Whitcher before November 8 by phoning 527-5151

Cost of dinner \$3.60

A Real-Time Hospital Computer System

DR. BARUCH's talk will be a progress report on a computer system study which he is currently directing. This project, which is supported by the National Institutes of Health and the American Hospital Association, is aimed at examining the many roles that could be played by a real-time computer system in a modern acute teaching hospital. Rather than segregating the activities of information storage and retrieval, real-time communications, an interpretive communications system capable of integrating these various functions. The construction of such a system entails problems of hardware, software, training, and personnel relations, but offers promise of a powerful tool. Dr. Baruch will review the factors involved in each of these problem areas and will discuss these with regard to the attainment of the comprehensive system goals.

Dr. Baruch holds his B.S. (1947), M.S. (1948) and his

Sc.D. (1950) from MIT. He is currently on the staff of Bolt Beranek and Newman Inc., working as a supervisory engineer and directing programs in electronics, servomechanisms, bio-medical engineering, and systems research. Projects under his supervision have included a high intensity acoustic facility, a cardiac surgery console, a Colorimeter for blood analysis and automation of a clinical pathology. Prior to joining the Bolt Beranek and Newman staff, he was an Assistant Professor in Electrical Engineering at MIT. He is a member, American Association for the Advancement of Science; member, American Hospital Association; fellow, New York Academy of Science; fellow, American Academy of Arts and Sciences.



J. J. BARUCH
Bolt, Beranek & Newman

TUESDAY, NOVEMBER 12

Dinner — 6:00pm — MIT Faculty Club — Sloan Building, Cambridge

Meeting — 8:00pm — MIT Room 4-231

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A major advance in weight reduction, this 37-pound command pack can be carried by a single parachutist or dropped into a forward area to do the same job which formerly required approximately 300 pounds of equipment. It provides the full flexibility of 8 communication channels in the high frequency, very high frequency, and ultra-high frequency bands. With it, a forward observer or forward air controller can communicate with ground forces up to 25 miles, aircraft up to 100 miles and base stations up to 500 miles away. And each of the four transceiver units can be removed and operated independently as each has a self-contained rechargeable battery. Yet, in spite of the versatility of this command package, it was designed and produced in just 120 days.

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Low Noise Microwave Receivers

PANEL DISCUSSION

THE performance of various currently available low-noise devices, including parametric amplifiers, tunnel diodes, and masers, will be summarized with particular emphasis on the characteristics of each type of system. Field experience with parametric amplifiers used in airport, weather and fire control radars will be reviewed. Stability, reliability and diode replacement problems will be discussed.

Various types of tunnel diodes available and their noise performance, as well as other system performance characteristics typical to tunnel diode amplifiers that have been constructed will be described. A discussion of tunnel diode mixers will include theoretical and practically realizable noise figures. A tunnel diode receiver will be reviewed which includes a tunnel diode amplifier, a tunnel diode mixer and a tunnel diode local oscillator.

Mention will be made of various types of cryogenic devices which promise further improvements in low-noise receiver technology. The state of the art of cooled parametric amplifiers will be reviewed. The successful operation of GaAs and InSb varactors at liquid helium temperatures has opened the way to microwave amplification with low-noise performance heretofore achievable only with the maser. Special problems encountered in simultaneously satisfying the electrical and thermal design requirements of cooled parametric amplifiers will be discussed.

The moderator of the session, Paul Penfield, Jr., is Assistant Professor of Electrical Engineering, MIT. He received a B.A. degree in physics from Amherst College in 1955, and an Sc.D. degree in electrical engineering from MIT in 1960. His research since then has included many analyses of low-noise amplifiers, and he is a co-author of the book, *Varactor Applications*.

Mr. Carl Blake is Assistant Group Leader of the Microwave Components Group at MIT, Lincoln Laboratory. For the past five years he has led a program of research and development in low-noise microwave amplifiers. Prior to joining Lincoln Laboratory in 1957, Mr. Blake was Assistant Professor of Electrical Engineering at the University of Maine. Mr. Blake received his B.S. and M.S. from MIT.



PAUL PENFIELD
MIT



CARL BLAKE
MIT Lincoln Lab

Matthew T. Lebenbaum received his B.A. degree in electrical engineering from Stanford University in 1938 and his M.S.E.E. from MIT in 1945. He was a research and teaching associate at Stanford and MIT from 1938 to 1941, and a research associate at Radio Research Laboratory, Harvard University, from 1942 to 1945. Mr. Lebenbaum, Head of the Department of Applied Electronics, joined AIL at its inception in 1945 as Assistant Supervising Engineer of the Receiver Section. He became Assistant Supervising Engineer of the Radar Section in 1949 and Head of the Department of Applied Electronics in 1952.



M. T. LEBENBAUM
AIL

Norman E. Chasek received the B.S. degree in Electrical Engineering from Rutgers University in 1951, and the M.S. in Electrical Engineering in 1952 from Brooklyn Polytechnic Institute. While at Brooklyn Polytechnic Institute, he held the position of Research Fellow in the Microwave Research Institute. As the Chief, Jamming Section at the U.S. Air Force Base, Rome, New York, Mr. Chasek was in charge of R & D jamming techniques for radar systems. From 1955 to 1961 he was employed by Bell Telephone Labs. at Homdel, New Jersey. Mr. Chasek was responsible for research in microwave systems and developed new circuits and techniques incorporating varactors and other solid state components. In 1961 Mr. Chasek founded International Microwave and has developed several proprietary devices incorporating solid state components such as tunnel diode oscillators, amplifiers and transistor IF amplifiers.



N. E. CHASEK
International
Microwave

Peter A. Rizzi received his B.S. degree from the University of Rhode Island in 1951; the M.Eng. in 1952 and his D.Eng. in 1955, both from Yale University. Dr. Rizzi is presently president and technical director of Microwave Technology Incorporated since the company's incorporation in April, 1961. He is engaged in the design and development of ferrite devices, parametric amplifiers, masers, frequency multipliers, filters and semiconductor switches.



PETER A. RIZZI
Microwave
Technology, Inc.

WEDNESDAY, NOVEMBER 13
Dinner — 6:30pm — Raytheon Executive Offices, Lexington
Meeting — 8:00pm

High Accuracy Celestial Navigation Systems

A. PRAZNIK

D. C. SMITH

C. S. BROWN

THE modern Navy's need for highly accurate position fixes in any part of the globe under all weather conditions has spawned a new class of navigation systems. Similar in principle to the sextant, these systems use a variety of tracking sensors to obtain celestial observations. Under favorable sky conditions, optical devices can track stars during both day and night. On the other hand, radiometric trackers can make navigational sightings on the sun or the moon regardless of the weather conditions. The complementary nature of the optical and radiometric system provides the Navy with a capability for accurate navigation at any time or place in the world.

Essential ingredients in each system are a precision mount for the tracking sensor and a high-accuracy positioning servo which is built around the direct-drive dc servomotor. The inherently high torque-to-inertia ratio of the direct-drive motor plus the elimination of the gear train make possible servos which can outperform conventional geared drives by a wide margin. However, the price paid for high performance is the requirement for sophisticated electronic circuits which will maintain stability under both normal and saturated conditions.

The group making the presentation are members of Northrop-Nortronics' Marine Equipment Department, which has had extensive experience in the design and production of precision tracking systems. Mr. Anthony Praznik will discuss the design of high-performance direct-drive servos. Mr. David C. Smith and Mr. Clayton S. Brown will then elaborate on the pros and cons of optical and radiometric systems.

Anthony Praznik is the Supervisor of the Servo Analysis and Design Branch at MED and has been respon-

sible for the design and development of control systems such as the Stabilization Control for the Azimuth Monitor, the Mark II Radiometric Sextant Noise Balance Servo and the Type 11 Periscope Servo Test Set. Prior to joining Nortronics, Mr. Praznik supervised a group engaged in the design of nuclear reactor power plants and their control systems. He is a graduate of MIT, where he earned a B.S. in Electrical Engineering and an M.S. in Nuclear Engineering. Mr. Praznik also received an M.S. in Electrical Engineering from Northeastern University.

David C. Smith is the Chief of the Instrumentation Systems Group, where he has had the responsibility for developing marine navigation and instrumentation equipment for both military and civilian applications. Among the products developed under Mr. Smith's guidance are the Type 11 Optical Star Tracking System and the Azimuth Monitor. Mr. Smith's prior experience includes the development of control systems for ground, shipboard and airborne radars. He received a B.S. in Electrical Engineering from Cornell University and an M.S. in Electrical Engineering from Northeastern University. He is a member of the IEEE.

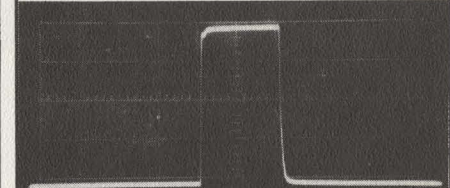
At present the Supervisor of the Test Instrumentation Branch, Clayton S. Brown has had a broad background in radiometric navigation equipment. He recently completed an assignment as Project Engineer in charge of a data acquisition program using the Mark II Radiometric Sextant. Mr. Brown's previous experience is in the fields of RF circuits and data handling equipment. He is a graduate of Worcester Polytechnic Institute where he received both B.S. and M.S. degrees in Electronics Engineering.

THURSDAY, NOVEMBER 14
Dinner — 6:00pm — Northrop-Nortronics — Marine Equipment Dept.
Meeting — 8:00pm — Northrop-Nortronics, 77 A St., Needham

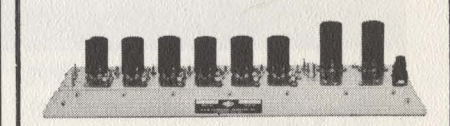
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UNRETOUCHED PHOTO OF OUTPUT PULSE,
MODEL L2005
(Horizontal scale: 5 μsec/cm)



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L1003	10 mc	3 mc	80 db	0.3 μsec
L1505	15 mc	5 mc	80 db	0.2 μsec
L2005	20 mc	5 mc	80 db	0.2 μsec
L3002	30 mc	2 mc	90 db	0.5 μsec
L3010	30 mc	10 mc	80 db	0.1 μsec
L6002	60 mc	2 mc	90 db	0.5 μsec
L6010	60 mc	10 mc	80 db	0.1 μsec
L6020	60 mc	20 mc	80 db	0.05 μsec
L7002	70 mc	2 mc	90 db	0.5 μsec
L12020	120 mc	20 mc	80 db	0.05 μsec

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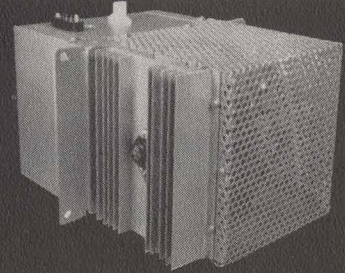
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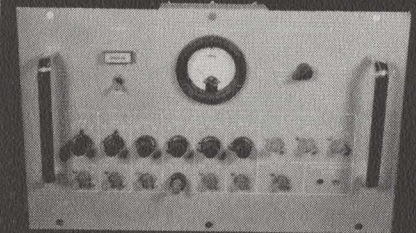
COMPUTER SYSTEM SUPPLY

Input: 108/220 VAC., 60 cps $\pm 10\%$ 3 phase, 4 wire
Output: 4.4 VDC @ 0-12 amps. (overvoltage, overcurrent protection)
Regulation: $\pm 0.1\%$
Ripple: 1 MV, peak to peak
Temp: 0-50°C
Mil Specs: Mil-E-4158, Mil-Q-9858



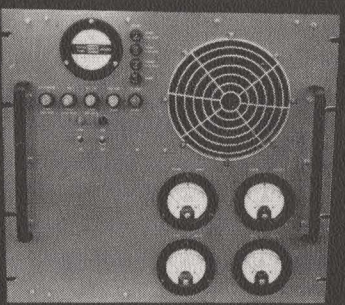
ADJUSTABLE HIGH VOLTAGE SUPPLY

Input: +20 VDC @ 1.4 amps max.
Output: Adjustable 4 KVDC to 5 KVDC @ 2.0 ma.
Regulation: $\pm 1\%$
Ripple: $\pm 0.05\%$
Temp: 0-65°C



MULTIPLE OUTPUT SYSTEM SUPPLY

Input: 115 VAC $\pm 10\%$, 400 cps $\pm 10\%$, 3 phase
Outputs: +50 VDC @ 0.25 amps
+10 VDC @ 3.0 amps
-5 VDC @ 12 amps
-10 VDC @ 8 amps
-12 VDC @ 0.75 amps
-30 VDC @ 1.5 amps
Regulation: 1%
Ripple: 8 MV, peak to peak
Temp: -29°C to +55°C
Mil Specs: Mil-I-945, Mil-Q-9858



GROUND SUPPORT POWER SUPPLY

Input: 120 VAC $\pm 10\%$, 48-62 cps. Single phase
Outputs: 145 to 155 VDC, 0-2.5 amps
10 to 16 VDC, 0-2.5 amps
6.2 to 6.8 VDC, 25 amps
Regulation: 1 and 2...0.15%, 3...2%
Ripple: outputs 1 & 2 less than 0.05%
output 3, less than 5%
Temp: 0-55°C
Mil Specs: Mil-E-4158, Mil-E-4970, Mil-R-26474

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Survey of Computer Applications in the Electric Power Industry

MR. Bigelow will cover, in general, the applications of computers in the electric power industry with emphasis in the engineering and operating fields. In particular, three major areas will be discussed.



R. O. BIGELOW
N. E. Electric System

1. The use of computers in system planning and other engineering studies.
2. The use of computers for control of system and power plant operations.
3. The use of accounting records to extract data by machine for engineering, operating, and other management studies.

The final portion of the discussion will be devoted to some speculation as to where the utility industry is headed in the future and wider use of the computer in its operations.

MONDAY, NOVEMBER 18

Dinner — 6:00pm — Wirth's Inc. —
42 Amesbury St., Lawrence

Meeting — 7:30pm — Branch Hall —
173 Methuen St., Lawrence

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- TRANSMISSION studies involving communication by voice, data and video systems.
- COMMUNICATIONS THEORY concerned with statistical applications associated with random noise, use of queuing theory, multi-channel loading effect related to amplifier design.

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ers ■ Pulse Packages ■ Test Equipment

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New Electronic System for Tactical Air Traffic Control

THE United States Armed Services has a requirement to provide rapid deployment of air traffic control and communications facilities in support of air operations anywhere in the world. A new system, the AN/TSQ-47 is soon to be added to the U. S. Air Force inventory to provide air transportable facilities for navigation air traffic and landing control, and long-range point-to-point communications.



R. E. DAVIS
RCA

This system includes a one-mega-watt search radar, a precision approach radar, and a transportable version of a compact RAPCON, all linked by a microwave system of militarized design. These radar components are augmented by an air-traffic control tower, dual-channel TACAN, and a point-to-point communication central. An interesting application was made in this system of airborne equipment, largely solid state, which has been designed for 400-c/s power. Small light-weight gas-turbine generators and compact external air conditioners provide the required power and climate control. Some of the features that will be dis-

cussed in a presentation of this new system will be the application of target trackers and symbol generators to the microwave remoted radar video displays.

Mr. Davis is the Program Manager of the AN/TSQ-47 Program at RCA, Burlington, Massachusetts and has had twenty years experience in the development, installation, and flight testing of electronic control and communications systems for airborne applications at Wright Field, Sperry Gyroscope, and the Radio Corporation of America. Mr. Davis was responsible for the development of the adapters for coupling bombsights to automatic pilots; the installation and flight testing of radio and telemetry equipment of EQT-33 drones; and the development of the air speed and automatic landing system for the pilotless QB-47 aircraft. He was the Project Manager on the development of a Microwave Command Guidance Weapon System using two-way time-division data link and directed a study program on a Landing Control System using data link; automatic tracking; and airborne instrumentation. He was also the Program Manager on the development of an automated data link for air traffic communications (AGACS).

WEDNESDAY, NOVEMBER 20

Meeting — 8:00pm — RCA — Burlington on Rt. 62
between Rt. 3 and Middlesex Tpke., in auditorium adjacent to new procurement lobby

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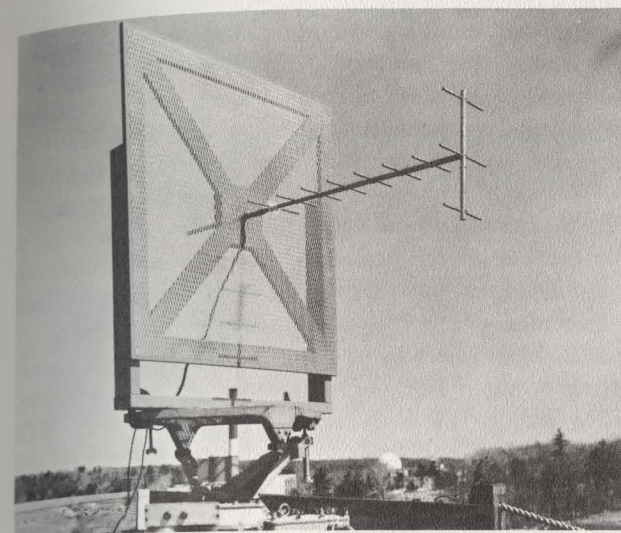
THE REFLECTOR

Types of Electromagnetic Boundary Waves

FRANCIS J. ZUCKER

A DESCRIPTION, largely qualitative, will be offered of the diverse types of boundary waves—including surface, leaky, lateral, creeping, and other waves—that can propagate along interfaces. The conditions under which these waves are excited will be specified. Applications to antennas, waveguides, plasmas, and scattering will be briefly indicated.

Francis J. Zucker received a B.A. from Columbia in 1945, and an M.A. in Physics from Harvard University. During the war he served as civilian instructor in the Army Air Corps, and as research associate in Harvard University's radar countermeasures work. After some time as an antenna engineer in industry, Mr. Zucker joined the Air Force Cambridge Research Laboratories, where he is currently Chief of the Waves and Circuits Branch in the Microwave Physics Laboratory. Mr. Zucker has on four occasions been a visiting professor at Brown University and elsewhere.



Near-Field Characteristics of a Linear Array

THE advance in the state of the art and the changes in the requirements of communication and radar antennas have increased the interest in the characteristics of their near field. Several papers on this subject have appeared in the literature, but in all cases continuous-aperture distributions were analyzed, or, in particular, the results were not applied to determine the expected near-field characteristics of a linear array. If one considers an aperture D greater than 10 wavelengths ($>10\lambda$), the data presented in the literature are usually limited to regions at least 3 to 4 aperture widths in front of the antenna.

In order to increase the knowledge of the near-field characteristics of antennas, the total electric and magnetic fields of a linear array of dipoles having a $\lambda/2$ spacing and an overall length D were calculated assuming that each dipole radiated a spherical wave and that the induction field produced at the observation point was negligible. The linear array was oriented along the y -axis and the field patterns were generated by moving the observation

point parallel to the y -axis. The excitation current of each dipole element was set equal to unity and its phase adjusted so that all radiated signals would arrive at the focal point in phase. The radiation pattern is omnidirectional, and therefore the analysis reduces to a two-dimensional problem.

The characteristics of the data will be presented, and it will be shown that the minimum spot size is 0.343λ by 0.88λ for both a 50λ and a 500λ array. From the data it is concluded that the angular resolution and gain of a linear array are independent of the radius of its focal line if this radius is greater than the antenna aperture.

Leon J. Ricardi received his B.S. and M.S. in Electrical Engineering from Northeastern University in 1949 and 1952 respectively. He is currently with the MIT Lincoln Laboratory as Leader of the Antenna Group.



LEON J. RICARDI

WEDNESDAY, NOVEMBER 20

Dinner — 6:00pm — Charterhouse Motel — Exit 48 on 128

Meeting — 8:00pm — Sylvania — 100 First Ave., Waltham — Room 1A1

NOVEMBER 1963

IEEE POWER GROUP APPROVED

BOSTON SECTION SPONSORING A CHAPTER

A PROFESSIONAL Technical Group on Power (PTGP) was approved by the IEEE Executive Committee at its meeting on August 22, 1963. This move of the former AIEE Power Division, with its 2400 committeemen, into the IEEE PTG structure opens the way for fuller participation in technical activities for the estimated 30,000 power-oriented members of the IEEE.

All members of the IEEE who are interested in power will be invited to join. An informal poll of the sections, taken last Spring, indicated that at least 50 of the sections would be interested in having local chapters of a PTG on Power. The Boston Section is already laying plans to sponsor such a chapter, and further announcements about its organization will appear in future issues of the REFLECTOR.

Plans for the PTG include a monthly publication based on the present bimonthly *Power Apparatus and Systems*, with added features such as news of group and chapter activities, notices and reports of meetings, and abstracts of unpublished but available papers. Present subscribers to *Power Apparatus and Systems* will be pleased to find their publication expanded and appearing monthly and will enjoy the added privileges of PTGP membership at little or no increase in cost over the \$6 annual subscription they now pay.

Present plans are for the new PTG to be governed by a Council representing the members. Included in the Council will be all chapter chairmen, members-at-large distributed regionally, all department and committee chairmen, and the Group officers. An Administrative Committee of the Council will include members-at-large, department chairmen, and the Group officers. Related committees will be coordinated by departments. The twelve Technical Committees of the present IEEE Power Division, their subcommittees and working groups, along with a standards coordinating committee, will constitute the Technical Operations Department and will carry on many of the functions previously performed in the Power Division of the IEEE, and formerly in the AIEE. Five other departments are tentatively planned: (1) Law and Personnel, (2) Publications, (3) Meetings, (4) Organization, and (5) Finances.

July 1, 1964, has been selected as the date for the inauguration of the PTGP. This corresponds to the administrative year of the majority of the sections and PTGs and is the date on which PTG fees and *Power Apparatus and Systems* subscribers are billed. It will afford ample time for the Boston Chapter to promote membership, organize, and plan a program of service for the year 1964-65. Membership application forms will be distributed early in 1964.

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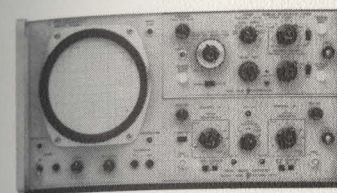
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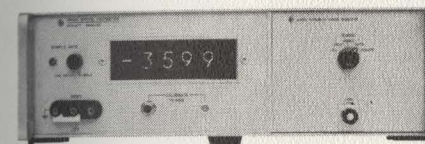


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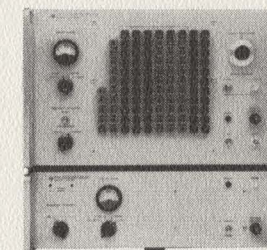
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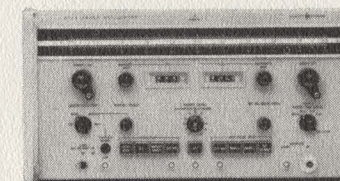
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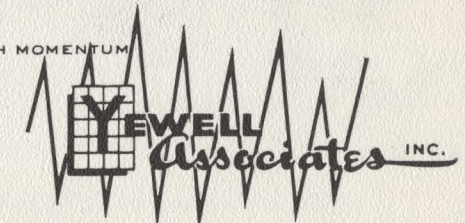
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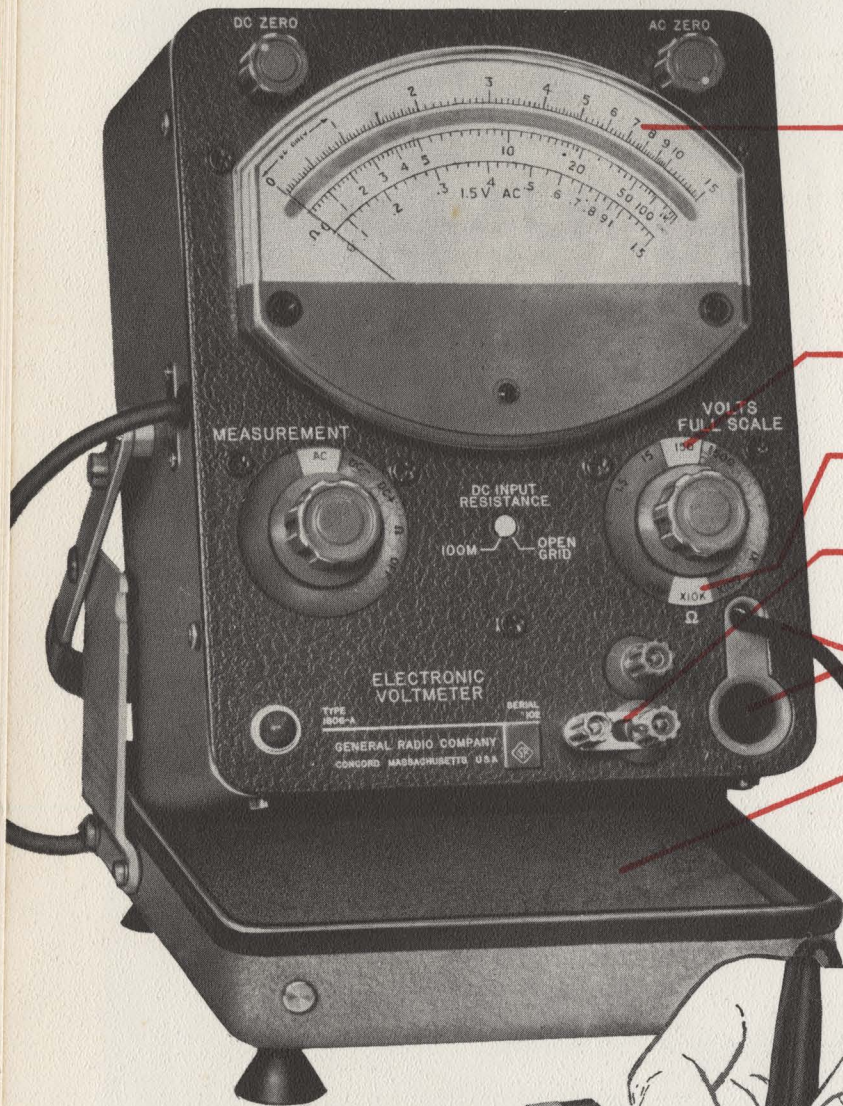
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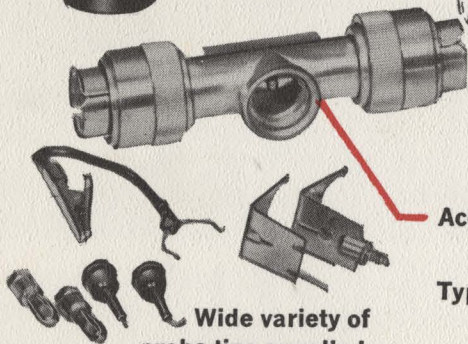
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