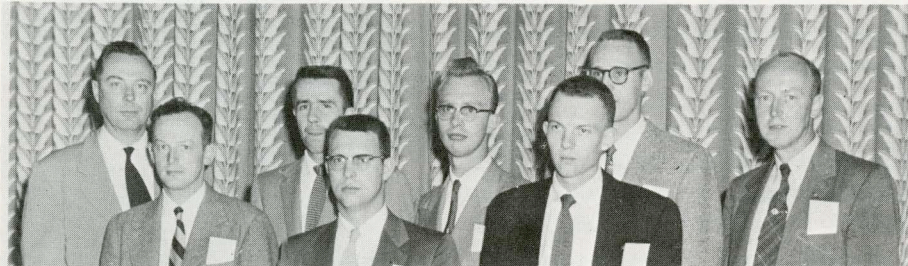


STUDENT AWARD & PAPERS MEETING



Left to right: Richard C. Webb, I. F. Davis, Harold Sparks, Glen E. Stone, Edward C. Orris, William N. Mills, Gilbert S. Johnson, Jack W. Herbstreit.

On March 30, 1956, the Denver Section held its Student Award and Papers Meeting at the Student Union Lounge, University of Denver, Denver, Colorado. The meeting was preceded by a dinner at the Pioneer Room of the Union and a total of 200 IRE members and their guests attended. The National IRE Awards were presented to Mr. Gilbert S. Johnson, Colorado A and M College, Fort Collins, Colorado; Mr. Frederick J. Zobel, Jr., University of Colorado, Boulder, Colorado; and Mr. Harold Sparks, University of Denver, Denver, Colorado. This award is given by the National IRE headquarters to the outstanding senior student from each student section and consists of one year's paid-up membership in the IRE and an engraved certificate.

Four student papers were entered in the papers contest, and short versions of all four papers were presented at the meeting. The papers

were as follows: "Electrophysiology of the Eye," by I. F. Davis of the University of Denver; "The Traveling Wave Tube," by Edward C. Orris, University of Denver; "The Hall Effect," by Glen E. Stone, Colorado A and M College; and "Present-Day Feasibility of Dielectric Amplifiers," by William N. Mills, Colorado A and M College. The papers were judged on the basis of originality, technical soundness, neatness, and oral presentation. First prize of \$25 was awarded to Mr. I. F. Davis, second prize of \$15 was awarded to Mr. Edward C. Orris and there was a tie for third prize of \$10 between Mr. Glen E. Stone and Mr. William N. Mills. Congratulations to all the students and we wish them success in all their future endeavors.

After the student papers the Section was treated to a fine illustrated lecture by an expert in the field of artificial satellites. Mr. L.

(Continued on page 6)

THE DENVER DECIBEL

Editor James F. Hurlbut

Chairman R. C. Webb
Vice Chairman R. C. Kirby
Sec. Treasurer Stanley Peterson
Asst. Sec. W. L. Worcester

Published quarterly by the
Denver Section of IRE

CHANGES IN MEMBERSHIP

New Members

Fred P. Venditti	M
Frank R. Bean	S

Change in Status

Richard C. Webb	SM
Carl L. Sturgill	M
Gilbert L. Johnson	M

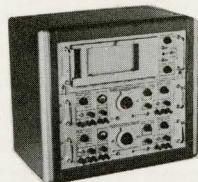
Transfer to Section

Albert J. Bradt	M
Harold E. Beaver	A
Wm. J. Utterback	M



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Analyzer Amplifier



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- *Balanced or single ended circuits
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- *Input impedance: 1 megohm
- *Quadrature rejection: 100 to 1
- *Quadrature overload indication
- *May be used as medium gain D.C. amplifiers

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- BL-372 Third harmonic filter-400 cps

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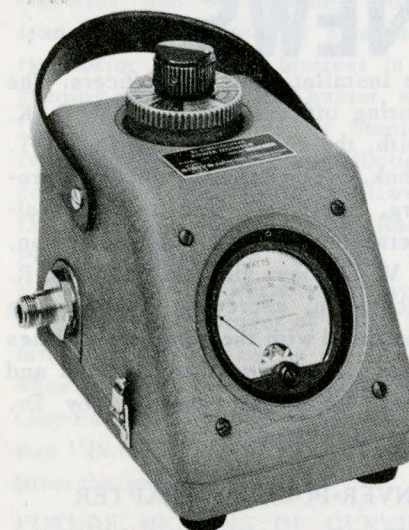
BIOGRAPHICAL SKETCH ON ALAN H. SHAPLEY



Mr. Alan H. Shapley is chief of a recently established sun-earth relationships section of the Boulder Laboratories of the National Bureau of Standards. This section is a part of the radio propagation physics division of the Central Radio Propagation Laboratory.

Mr. Shapley's work is concerned with studying sun-earth relationships that necessarily effect radio transmission since the sun is the chief source of radiations that produce the ionosphere—the upper portion of the earth's atmosphere which makes possible long-distance reception of radio waves.

Before joining NBS in 1947, he was consecutively assistant astronomer at the Harvard Observatory; engineer with Sylvania Electrical Products Corporation in Massachusetts; and physicist with the terrestrial magnetism department at the Carnegie Institution.



Sierra 164 Series Bi-Directional Power Monitors are compact, versatile instruments for intermittent or continuous measuring of incident and reflected power, or precise, convenient matching of loads to lines. Power is read directly on a linear scale with accuracy of 5%.

Sierra 164 series monitors connect directly into the transmission line to read power delivered to the load as well as power reflected from the load. Reversal of rf connections is not required to measure the two directions of power flow.

SPECIFICATIONS

- Insertion VSWR: With type N connectors less than 1.08 except on 1 watt ranges; less than 1.15 on 1 watt ranges.
- Accuracy: 5% full scale, all ranges
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- Weight: 7½ lbs. with one plug-in element.

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JOINT IRE-ISA MAY 4th MEETING

Servomechanisms were the topic of a talk by Stanley Schneider at the May 4 joint meeting of the Denver sections of the IRE and ISA. A brief history of Servomechanisms and a definition thereof were given, and such control systems were traced back to steam engine governors and kindred devices. It was pointed out that, although individual Servo problems had been solved as early as the 1800's, no overall approach existed until the 1930's.

The concept of Block Diagrams was introduced next, and, by way of illustration, a typical fire-control system involving a Position Servo was set up on Block-Diagram form and its equations derived. The advantage of Servo over open loop control was then illustrated with a numerical example. It was shown how, by means of transform theory and the Root Locus method, the transient response of the system could be deduced. From the Root Locus Diagram, necessary circuitry could be introduced into the system to improve its transient response. It was pointed out how this essentially graphic method could vastly reduce the Servo engineers labors and isolate system performance as a function of any variable involved.

Mr. Schneider has a degree in physics from Columbia University in New York. He has five years experience in systems and control circuitry design and is presently employed by Helipot Corporation as Chief Research Engineer.

SS.IR

PGAP NEWS

FIRST ANNUAL MEETING OF THE DENVER-BOULDER CHAPTER OF PGAP

On May 23 the Denver-Boulder Chapter of the Professional Group on Antennas and Propagation (PGAP), celebrated the completion of its first operating year. Organized in the fall of 1955 with the initial membership of twenty it is the sixth chapter of this group which is one of the largest of the IRE professional groups with a national membership of over 1800.

The activities marking the anniversary began with a technical meeting held in the afternoon at the Radio Building of the National Bureau of Standards, Boulder Laboratories, open to the public, and concluded with an annual meeting and a banquet for the members held in the evening at the Memorial Building of the University of Colorado. Between the two events a reception was held for members of the PGAP and their friends at the home of Dr. and Mrs. E. K. Smith. Hosts and hostesses for the reception were Dr. and Mrs. Smith and Dr. and Mrs. J. R. Wait. Dr. Smith has been the Chairman of the Chapter for the past year. Dr. Wait is the newly-elected Chairman for the forthcoming year.

The technical session featured Dr. A. D. Wheelon of the Ramo-Wooldridge Corporation of Los Angeles. Dr. Wheelon spoke on the subject of certain theoretical aspects of scatter propagation.

The annual meeting served to mark the termination of the first year's activities of the PGAP chapter and to begin the new year with

the installation of new officers. The retiring officers, besides Dr. E. K. Smith, the chairman, were Dr. K. T. Johnk, vice-chairman, and K. Hornberg, secretary. The incoming officers are: Dr. J. R. Wait, chairman, H. V. Cottony, vice-chairman and R. Silberstein, secretary. The meeting concluded with the showing of slides taken during visits to England and other European countries by Dr. Wait and Cottony.

DENVER-BOULDER CHAPTER

The Denver-Boulder Chapter of PGAP was organized at CRPL in Boulder, Colorado and was approved by the IRE Executive Committee on September 9, 1955.

Five lecture meetings were held during the first ten months of the Chapter's existence; in the first three of these the meetings were jointly sponsored by the local chapter and the CRPL Radio Propagation Colloquium. On October 28, 1955 Dr. James R. Wait of CRPL spoke on "Theoretical and Experimental Investigation of Slot Antennas." He was followed on November 26, 1955 by Dr. Kenneth L. Bowles of CRPL whose topic was "VHF Radio Echoes from Aurora." On January 25, 1956 Dr. Carl T. Johnk of the University of Colorado (and vice-chairman of the Chapter) delivered a lecture entitled "A Method for Synthesizing Plane Circular Aperture Antennas." The most ambitious technical meeting which the Chapter has sponsored was one which took place on February 16, 1955. A "whistler" conference had been going on at the NBS Boulder Lab-

oratories and the visiting participants were invited to summarize two major points of interest in an evening meeting of the Chapter, with Dr. R. A. Helliwell of Stanford coordinating. Their contributions consisted of talks by Dr. Helliwell, Dr. L. R. O. Storey of the Radio Physics Laboratory (Ottawa), Dr. M. G. Morgan of Dartmouth University and Harold Dinger of NRL. The fifth talk was given by Dr. A. D. Wheelon of the Ramo-Wooldridge Corporation. The title of his lecture was "Back Scatter of Radio Waves" (from the ionosphere).

FUTURE MEETING OF DENVER-BOULDER PGAP CHAPTER

The next meeting of the chapter will have as its speaker Dr. Glenn Keitel who is a Fulbright Fellow at the Cavendish Laboratory in Cam-

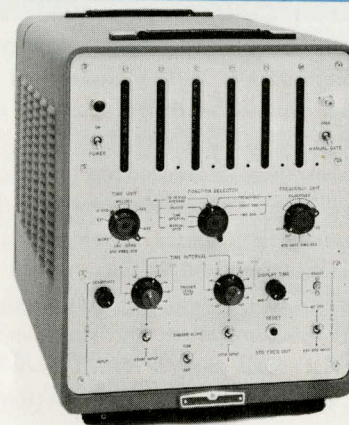
bridge University, England. He is stopping at Boulder on the way to his home in Oregon. The date and time will probably be the 19th of July at 7:30 PM.

The title of Dr. Keitel's talk is "A Survey of Current Ionospheric Research at the Cavendish Laboratory." The talk will consist of a survey of several of the more important ionospheric investigations at the Cavendish Laboratory. Topics will include self-demodulation experiments at 200 kc, measurements of anisotropic irregularities in the ionosphere, and an investigation of the production of the F-region.

Glenn obtained his Ph. D. at Stanford in 1954 where he investigated the scattering of radio waves from meteor trails. He has published several papers on this subject.

(Continued on page 12)

hp ELECTRONIC MEASURING INSTRUMENTS



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- *Frequency measurements 10 cps to 1.1 mc
- *Period measurements .00001 cps to 10 kc
- *Time interval measurements 3 u sec to 27.8 hrs.
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- *Voltage level selection of input signal for frequency measurement
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- *Six place registration
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- *Standardization against WWV

-hp- 506A Optical Tachometer Pickup

Versatile, flexible light source and pickup for measuring rotational speeds 300 to 300,000 rpm. Ideal for use on moving parts which have small energy or can not be connected mechanically to measuring devices. Output voltage at least 1v rms, 300 to 100,000 rpm, into 1 megohm or greater impedance. 21 candlepower, 6 v bulb; type 1P41 phototube. \$100.00.

-hp- 508/B Tachometer Generators

Transducers for use with electronic counters or frequency meters in making direct reading rpm measurements, 15 to 40,000 rpm. Relationship of shaft speed to output voltage is linear to 5,000 rpm. -hp- 508A produces 60 cycles output frequency per shaft revolution. (-hp- 508B is identical, except produces 100 cycles output frequency per revolution.) -hp- 508A or 508B, \$100.00.

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Engineering Notes & News

New Research Group Formed

The Colorado Research Corporation has been established in the Denver area as a research and development center to work in the field of electronics and applied physics.

Officers in the new organization are: Dr. Richard C. Webb, President; Dr. William R. Jewell, Vice President; and Mr. Stanley B. Peterson, Secretary-Treasurer. All were formerly associated with the Denver Research Institute of the University of Denver.

Laboratory and model shop facilities will be offered to Government and industrial clients. The permanent Denver location of the new research laboratory has not yet been announced. Mailing address is: P. O. Box 8439, University Park Station, Denver 10, Colorado.

National Electronics Conference

"Fifty Years of Progress Through Electronics" will be the theme of the 12th annual National Electronics Conference in Chicago on Oct. 1-3.

This year marks the golden anniversary of the electronics industry—founded in 1906 when Lee De Forest developed the first three-electrode vacuum tube, known as the audion.

Approximately 100 technical papers and a record 240 commercial exhibits will be featured at the three-day conference at the Hotel Sherman in Chicago's Loop.

More than 10,000 persons are expected to attend the meeting—the nation's leading forum on electronic

research, development, and application.

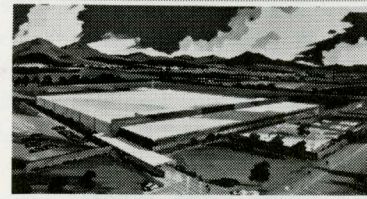
The conference is sponsored annually by the American Institute of Radio Engineers, Illinois Institute of Technology, University of Illinois, and Northwestern University.

Also participating in the conference are Michigan State, Purdue, Michigan, and Wisconsin universities, as well as the Radio-Electronics-Television Manufacturers Association, and Society of Motion Picture and Television Engineers.

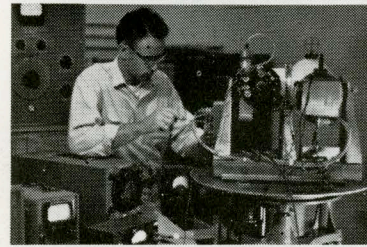
Proceedings of the 1955 National Electronics Conference now can be obtained at \$5 per copy from the NEC headquarters, 84 E. Randolph St., Chicago.

STUDENT AWARD (Continued from page 1)

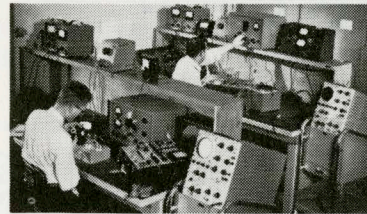
G. DeBey, Assistant Chief of the Ballistics Measurement Laboratory of Aberdeen Proving Ground, Aberdeen, Maryland, gave a talk on "A Minimum Earth Satellite—The Scientific Objectives and Observing Methods." Mr. DeBey described the basic idea of satellites as an outgrowth of guided missiles. He discussed the determination of choice of scientific objectives with a five-pound weight limit. There are many uncertainties which may affect the success of the program, one of these is the temperature estimates. The satellite will carry a small transmitter which will give information on radio propagation as well as provide a means for tracking and positioning by means of doppler frequency shifts. He stated that optical viewing will be very limited. Visibility will last from 30 seconds to 4 minutes near sunrise and sunset for only a limited area of viewing.



Denver manufacturing plant now under design



Infrared laboratory

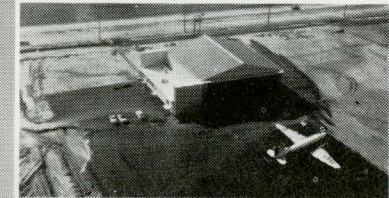


Instrumentation laboratory

At Ramo-Wooldridge today there exists a wide range of projects intended to aid aircraft in navigating to the vicinity of targets, finding the targets, destroying them, and returning safely to base. Work is under way in such fields as infrared and microwave detection, information display, communication and navigation, and analog and digital computing. Some projects are in the laboratory development stage, some in the flight test stage, some in pilot production.

Good progress is being made in the establishment of facilities and operational patterns that are well tailored to the unique requirements of advanced electronic systems work.

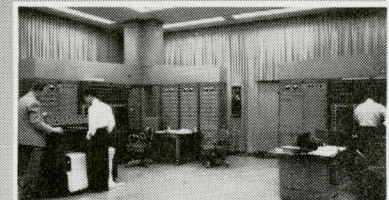
AIRBORNE ELECTRONICS AND WEAPON CONTROL SYSTEMS



Initial unit of flight test facility



Communications pilot line production



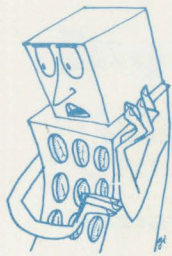
Simulators in computing center

**Positions are available for
scientists and engineers
in these fields of current activity:**

Communications Systems
Digital Computers and Control Systems
Airborne Electronic and Control Systems
Electronic Instrumentation and Test Equipment
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Automation and Data Processing
Basic Electronic and Aeronautical Research

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SIGMA'S DONE IT AGAIN!

We're sorry to report that the new "Vast-New-Era" has hit a roadblock. Systems engineering, in at least one aspect, is stalled, delayed and obfuscated (patented).

A while back, Sigma Instruments, Inc., squinted into its corporate tea cup and described the need for a freshly minted name, something to described "...the automatic production of electronic equipment... the wedding of Electronics and Automation."

The name would denote the floriation of this new Vast-New-Era, and would submit tamely to usage by engineers, eagle scouts and advertising men. It would fit easily into a sentence. Viz and to wit: "There's no (new name) like an old (new name)." Or, "Sam, you made the (new name) too dignitaceous."

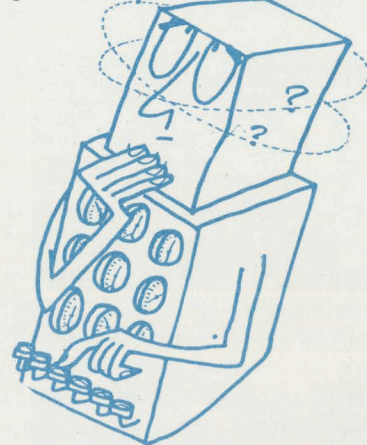
To settle on a distinctive syllabic arrangement, Sigma ran a contest... Did they rev up the encabulators? Uh-uh.

Sigma called on that faltering, fumbling, unprogrammed commodity-people. Offered them prizes. We had been panting along under the impression that any such matter could be decided by a strip of paper with a cunning arrangement of holes punched in it. Run it through a machine and out pops the answer, new, shiny, untouched by human logic... Be that as it may.

With Sigma's grudging permission we're printing excerpts from some of

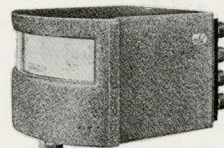
the entries in their contest. In doing so we want to disclaim any bias toward people, as opposed to (the new word). This whole business is presented in the interests of progress, and if you can fight that we'll just stand here on the sidelines and cheer impartially.

Sigma's Grand Prize Winner: "Mc-



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INSTRUMENTS FOR**



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Limit Controls
*Production
Testing
*Inspection

go-no go gage

*Adjustable contacts *Thyratron control

*Manual reset *Contact resolution of .1%

*Isolation from power line *\$125 plus cost of instrument

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Gee" Yes, "McGee." Submitted by Dr. Edgar S. Ball, of Lorain, Ohio. Dr. Ball's simple, forceful reasoning in support of his entry made the contest judges' decision no problem at all. We quote from his letter:

Gentlemen:

Here is a dandy for your contest: "McGee."

1. 'Mc'... Contraction for mechanical.
2. 'ee'... Contraction for electronic.
3. 'Gee'... Shows a proper awe for this new era.
4. Read backwards you can almost get the magic formula $E=Mc^2$, which should work into this thing somehow.

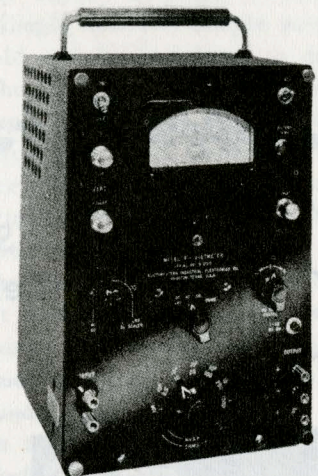
Yours for a safe and sane International Geophysical Year... Signed, E. S. Ball."

"AMBERDUZIT," second-prize winning entry, was submitted by Sherad M. McCall of Pittsburgh. "An excellent name for the combination of electronics and automation," says McCall. "The term election derives from the Greek word for amber. This is an ancient tidbit of useless information I have been longing for years to drive back to its origin... It's obvious to any really biased judge that automation implies some device that 'does it' by itself."

Third-prize winner was submitted by P. Paul Porcasi of North Hollywood, Calif. We quote from his letter:

'The word should draw upon the wedding aspects of those two comers, Electronics and Automation. From Electronics we might select the letters T, R and E. From Automation, the letters O and M. From

(Continued on page 11)



THE MODEL R-1 VOLTMETER is intended for precise voltage measurements in circuit design work. It offers accuracy, reliability, and convenience. In addition to its wide range AC and DC scales, it includes a precision ohmmeter, a D-C pre-amplifier for driving oscilloscopes and recording devices, a built-in standard cell for instant calibration, and provision for expanding the DC voltage scales.

SPECIFICATIONS

Range: 1mv. to 1000 volts, full scale AC and DC

Frequency response: 0 to 100 kc

Accuracy: DC, 1 1/2%. AC, 3%

Input Impedance: 10 megohms, 20 mmf.

Price: Standard model, \$620.00
Rack-mounted, \$700.00

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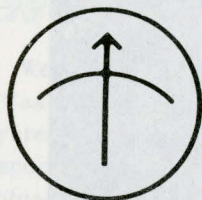
Houston, Texas

Represented by

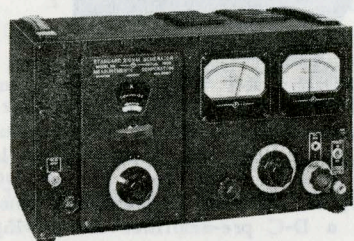
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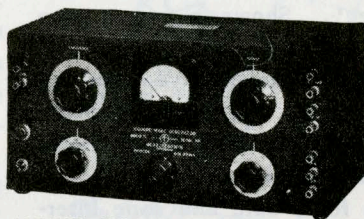
Laboratory Standards



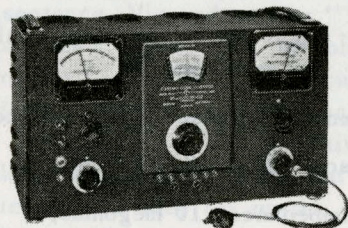
**Standards Are Only as
Reliable as the Reputation
of Their Maker**



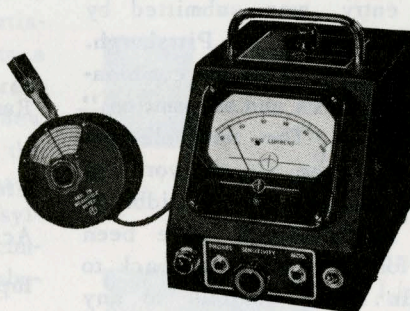
MODEL 80
STANDARD SIGNAL GENERATOR
Frequency Range: 2Mc—400Mc



MODEL 71
SQUARE WAVE GENERATOR
Frequency Range: 6-100,000 cys.
For AM, FM and Television Testing



MODEL 65-B
STANDARD SIGNAL GENERATOR
Frequency Range: 75Kc—30Mc



MODEL 59
MEGACYCLE METER
Frequency Range:
2.2Mc—400Mc

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BOONTON, N. J.

SIGMA (Continued from page 9)
the allied word Machine we abstract
the letter H. Put them all together
and there you have it, gentlemen, a
word that means the world to me—
MOTHER... Sell with Mother!"

Fourth prize was awarded Eugene
Wesselman, Riverside, Ill., for his
entry, "Puttertronics." Wasselman
says, "The word is formed by the
wedding of the words 'Putter' and
'Electronics.' The significance lies
in the fact that attempts at automa-
tion in the electronics industry so
far have usually kept all parties
concerned busy puttering to see that
the system remains in operation. In
many instances the number of pro-
duction operators has been over-
compensated by the number of such
putters employed."

From Great Neck, L. I., S. S.
Osder suggested the name, "auto-
cybernetamechanelectronation."

Osder says, "I refuse to yield to
the simple needs of simple men who
should not be permitted to dabble
in the profound field of automatic
control. This title, synthesized in
the true tradition of German science,
is certain to repel the untrained
dilettante who attempts to voice an
opinion on the subject. If he can't
pronounce it, how can he talk about
it? It is time we adopted the German
language technique of excluding the
common man from matters he should
not understand."

In terse verse, James Kilpatrick
of Norfolk (suh!) offers:

"Sig-mation is a lovely word,
It fills one with elation;
It's tailor made to sell your stuff
For any application."

"Frankenstein" is the name sug-
gested by F. Gregg Bemis, Jr., of
Wayzata, Minn. Bemis explains,
(Continued on page 12)



TYPE 545...DC-TO-30 MC With Accurate Sweep Delay

WIDE-RANGE SWEEP DELAY—
1 μ sec to 0.1 sec, continuously
variable.

Conventional Operation—Time-
jitter less than 1 part in 20,000.

Triggered Operation—Jitter-free
at any magnification, even in
the presence of actual signal
jitter.

Accurate—Range accuracy within
1%, incremental accuracy
within 0.2% of full scale.

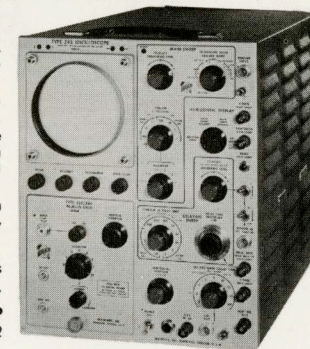
Trigger-Rate Source—10 cycles
to 50 kc, continuously variable.

**600,000,000-to-1 SWEEP
RANGE**—0.02 μ sec/cm to 12
sec/cm.

**PLUG-IN
PREAMPLIFIERS**

Type 53/54D, Differential High-Gain DC.....\$145
Type 53/54E, Low-Level Differential AC.....\$165
Type 53/54K, Fast-Rise DC.....\$125

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**WIDE-RANGE VERTICAL
AMPLIFIER**—Main-unit rise-
time better than 10 millimicro-
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Plug-In Preamplifiers—For con-
vertibility to different appli-
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Fast-Rise DC Preamplifier, over-
all risetime is 12 millimicrosec-
onds.

**10-KV ACCELERATING POTEN-
TIAL**—Bright display at low
repetition rates.

Price: Tektronix Type 545
Oscilloscope, \$1450 plus
price of desired plug-in
units.

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IRE AND JOINTLY SPONSORED NATIONAL MEETINGS

1956 Date	Meeting	Place	Sponsored by	For Info. Regarding Exhibits	For Info. Regarding Publicity	For Info. Regarding Program
Aug. 20-21	Nat'l. Tele-metering Conf.	Biltmore Hotel, Los Angeles, Calif.	PGTRC; AIEE; IAS; ISA	Ernest Robischon 7660 Beverly Blvd. Los Angeles, Calif.	John Spargo Wm. C. Copp Assoc. 1475 Broadway New York 36, N. Y.	R. E. Rawlins Lockheed Aircraft Corporation, Burbank, Calif.
Aug. 21-24	WESCON	Los Angeles, California Pan Pacific Aud., Ambass- ador Hotel	L.A. & S.F. Sec; WCEMA; All P.G.'s	Mal Mobley, Jr. Business Manager, WESCON 344 N. La Brea Ave. Los Angeles, Calif.	Mal Mobley, Jr. Business Manager, WESCON 344 N. La Brea Ave. Los Angeles, Calif.	Bruce Angwin, General Electric Co. 11840 W. Olympic Bl. Los Angeles, 64, Calif.

PGAP NEWS (Continued from page 5)

V. L. F. SYMPOSIUM

The chapter is planning to sponsor a two-day symposium in January, 1957 on the propagation of very low frequency (VLF) radio waves. Details in the next issue.

SIGMA (Continued from page 11)

"This is a simplified contraction of 'Benjamin Franklin,' and 'Albert Einstein.' i.e., Frank and Stein. Since Franklin was the discoverer

of electricity, and since Einstein was the epitome of modern man's logical attack on new, vast-new-era problems, it seems proper that they be singled out for tribute in naming this new field."

"Nonstopphitting." According to George Fass, Kew Gardens, N. Y., "The non-stop speaks for itself. To all who may have come in contact with electricity, the 'phit' is obvious... Isn't it?"

—Courtesy of Control Engineering,
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