

JANUARY 10, 1958

# electronics

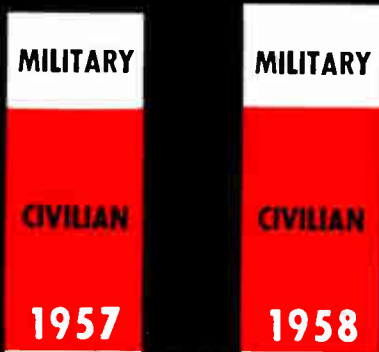
business edition

A MCGRAW-HILL PUBLICATION

VOL. 31, NO. 2

PRICE FIFTY CENTS

\$13.2 BILLION      \$13.7 BILLION



## Our Market for 1958

Rising defense spending takes up  
slack, pushes up ceiling a bit . p 13

## Big Tubes Purify Metals

R-f "levitation-melting" process is one  
new tool of the metallurgist . . p 22



Raytheon — World's Largest Manufacturer of Magnetrons and Klystrons



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Today great companies in an ever-widening circle depend on Raytheon to supply magnetrons and klystrons for their microwave equipments.

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*is published weekly!*

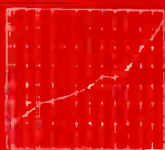
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electronics information  
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*Here are the facts  
behind this new service*



# AN IMPORTANT CHANGE IS INITIATED TO FULFILL YOUR NEEDS

(A policy statement by H. W. Mateer, Publisher of *electronics*)

Many factors are significant in understanding why *electronics* is further augmenting its service to provide alternate Engineering and Business Editions in a weekly publishing cycle.

It is not possible to separate the interests of Engineering, Production and Management people engaged in electronics. This is probably a unique characteristic of our industry. We have been saying for years that management is derived from engineering, is part of engineering, and thus reads the technical material published by *electronics*. Conversely, we knew back in 1952 that you, our readers, were becoming business-information minded.

To fill your need for topical, non-technical, interpreted business information, a department was conceived for *electronics* in February 1952 titled "Industry Report".

In January 1957 this coverage of business information was further expanded by publishing two Business Editions each month plus the regular Engineering Edition, which continued to contain commercial and marketing information.

Over the past year the usefulness of the Business Editions has been carefully measured. The editorial value of readership has been tested by every means at our disposal: READEX Reader Interest Scores; McGraw-Hill Reader Traffic Studies; extensive personal interviews in the field; special direct mail projects by the McGraw-Hill Research Department; and the Editor's continuing polling of his readers—and all this accumulated evidence points to a single conclusion: you need this Business Edition published every other week.

This research also established that your requirements now call for an increase in the frequency of receiving technical material.

To aid you in keeping abreast of technical news as well as non-technical news in a rapidly expanding and fast moving industry, *electronics* editorial output will be enlarged by the publication of technical material every two weeks instead of monthly.

The *electronics* Buyers' Guide, published in mid-June, continues to provide the number one market place for condensed catalog-type information on products and services. After seventeen years of continuous publishing, the Buyers' Guide enjoys a reputation second to none as the prime information source for products, materials and services in this market.

*electronics* has maintained leadership through 27 years of industry growth, and in 1958 both readers and advertisers will find added strength in the publication that continues to reflect community interests throughout the electronics industry—whether in engineering, production or management.

Because we, at *electronics*, want to serve you best . . . we would appreciate any comments you may have about our new weekly publishing plan.

HW Mateer

# **electronics**

**is now published weekly**

## ISSUE AT A GLANCE

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# electronics

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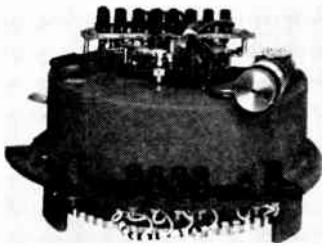


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# TEST EQUIPMENT FOR SERVO SYSTEMS AND COMPONENTS

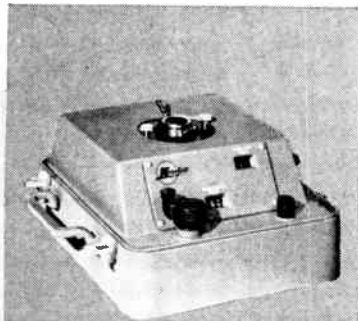
Kearfott recognizes that test equipment must provide precision, convenience and speed in testing plus versatility and non-obsolescence. Accordingly the equipment illustrated combines these features with the assurance that the buyer uses the same techniques and precision in testing servo components and systems as the manufacturer.

## INDEX STANDS



### INDEX STAND WITH PRECISE INTEGRAL BRIDGE

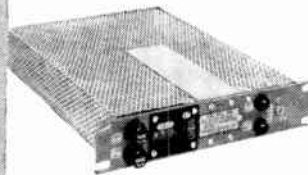
Accuracy of stand within 24 seconds of arc. Tests performed at 5 degree intervals. Positional accuracy of bridge, 10 seconds of arc. Electrical accuracy .002%. Higher accuracies on request.



### PORTABLE INDEX STAND

Calibrated to 24 seconds of arc. Available for sizes 8, 11, 15, and 18 components. Simplicity of Index Stands makes them desirable for high volume testing.

## ANGLE POSITION INDICATORS



### RACK PANEL UNIT

Provides a counter presentation of an unknown angular position of a synchro to be measured. The compact unit shown is for both laboratory and production use. May be supplied in carrying case for field tests. Accuracy 6 minutes of arc in standard unit, higher accuracies available.



### "JAN" UNIT

Packed to meet the design requirements of MIL-D-8512. May be installed in aircraft control panel or in portable carrying case. Accuracy 6 minutes standard, higher accuracy can be provided.

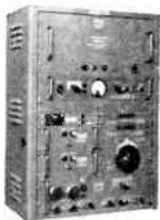
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Scorsby and tilt tables, ratiometers, PSVM and VTVM, automatic ohmmeters, synchro and resolver bridges, power supplies and other related equipment.

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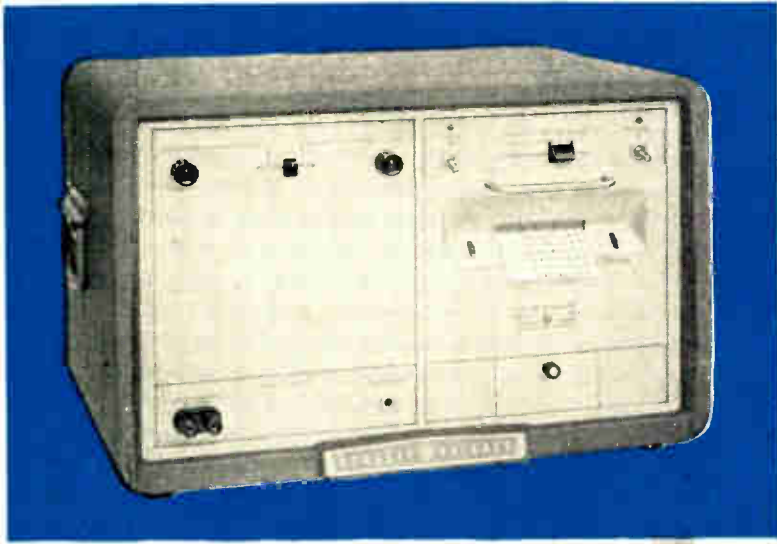
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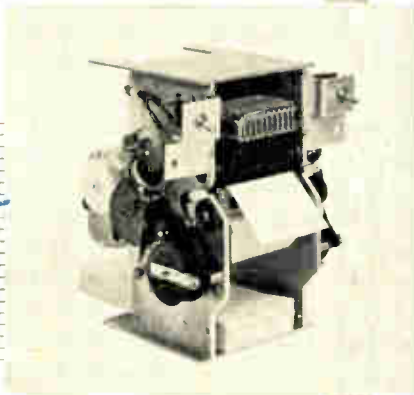
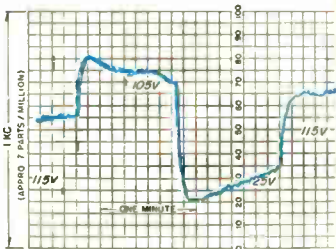




# new -hp- 560A DIGITAL RECORDER

**Continuous digital record  
for your frequency counter!**

Frequency stability vs. line  
voltage; 150 MC oscillator



**Prints 11-digit information  
at 5 lines per second**

**Controlled by electronic or  
mechanical devices**

**Direct print-out from  
all -hp- counters**

**Analog output for strip-chart  
recorder**

**Expanded scale; full scale can  
represent  $1/10^7$**

## SPECIFICATIONS

- Accuracy:** Identical to that of basic counter used.
- Printing Rate:** Controlled by counter, 5 lines/sec. max.
- Digit Capacity:** 11 digits per line.
- Driving Source:** Parallel entry staircase voltages derived from standard digital frequency counters such as Hewlett-Packard types. Staircase descends from +135 v to +55 v as the count progresses from 0 to 9. Internal impedance of staircase source should be approximately 700,000 ohms.
- Print Command Signal:** 1  $\mu$ sec or greater, positive or negative pulse, 15 volts p-p or greater.
- Paper Required:** Standard 3" roll or folded paper.
- Line Spacing:** Single or double, adjustable.
- Analog Signal:** Any three consecutive digits may be selected by selector switch. Output is function of selected digits. For example, if consecutive digits were 3, 8, and 6, output voltage would be 38.6 millivolts or 0.386 ma.
- Output Available:** 1 milliamp for galvanometer strip-chart recorders. 100 millivolts for potentiometer strip-chart recorders.
- Power:** 105/125 volts, 60 cycles, 250 watts.
- Dimensions:** Cabinet Mount: 20 $\frac{1}{2}$ " wide, 12 $\frac{1}{2}$ " high, 18 $\frac{1}{2}$ " deep. (Rack Mount available).
- Weight:** Net 60 lbs. Shipping 100 lbs.
- Accessories Available:** 1052-24, 3" folded paper, 48/carton.
- Price:** Price on request.

*Data subject to change without notice*

Model 560A is a new kind of continuous duty instrument designed from the chassis up for digital recording of frequency counter output and similar information. It is specifically useful in recording time functions, telemetered data, information to be monitored, tabulated and plotted and system drift phenomena. It is also a convenient digital/analog converter for strip-chart production.

### Frequency counter accuracy

Since -hp- 560A is a slave to its information source, accuracy is that of the counter or other source. The instrument's motor-driven print mechanism comprises 11 number wheels and associated mixing-comparator circuits. The print mechanism is controlled by a staircase voltage and external print command pulse. The availability of 11-digit lines means secondary or coding data may be printed on the same line as primary data.

Complete details from your -hp- representative, or write direct.

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Field engineers in all principal areas



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# Stocks Resist Drop

**Electronics stock index gains 3 percent in 1957 while industrial stock index drops 11 percent**

DESPITE a big drop in average stock prices in 1957, electronics stock prices near year's end were higher than at the beginning of the year.

Stock prices of our industry, as measured by Standard & Poor's index of electronics manufacturers, gained 3.3 percent between Jan. and Nov., going from 49.53 to 51.16. Stocks of seven firms are used in the index—Beckman Instruments Daystrom, IT&T, Raytheon, GE, RCA and Westinghouse Electric.

Over the same time spread general industrial stock prices, measured by S&P's index of 425 industrial stocks, fell 10.5 percent, from 48.43 to 43.35.

If you limit stock price changes to the period since June, start of the 1957 market drop, electronics still comes out ahead. Starting in July the electronics stock index dropped 15.5 percent, from 60.59 in July to 51.16 in Nov. The general industrial index dropped 17.5 percent, from 52.54 to 43.35 over the period.

This better price performance of electronics stocks improves prospects of electronics manufacturers contemplating future stock issues.

One stock broker put it this way:

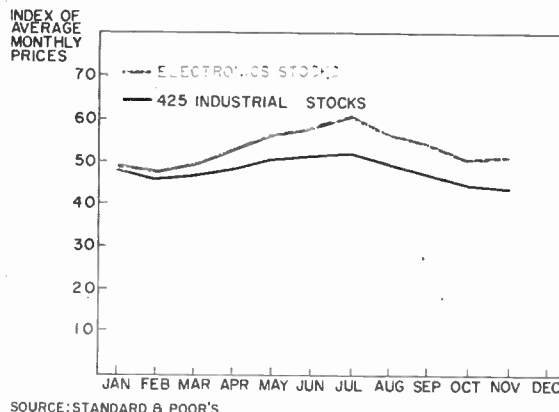
"We can always find customers for good electronics stocks because they are exciting. They have

glamor and excellent growth prospects."

However, another broker points out that while investors are still attracted to electronics stock, they are getting more sophisticated.

"A little while ago the word electronics was enough to build buyer enthusiasm. Today, buyers are more choosy. They want to know if a firm has assets in fast-growing military fields and if military business is protected with industrial business."

The record reflects this change in investor think-



This tells the story: electronics stock index climbs from Jan. to Nov. while industrial index tumbles

ing. Another electronics stock index—limited to manufacturers with an important stake in entertainment electronics—did not fare as well as the general electronics stock index.

Stock index of radio, tv and electronics manufacturers, also prepared by S&P, dropped 11.4 percent between Jan. and Nov., from 51.56 to 42.48. Not only did it fall while the general electronics stock index rose, but the drop even exceeded the 10.5 percent drop in general industrial stock prices.

## SHARES and PRICES

DATA PROCESSING equipment manufacturers were the darlings of stock

market advisors only yesterday. Today, they are in the market analysts' dog-house. Recent quarterly earnings reports, trailing last year in

most cases, spurred Wall Street's about-face. Current opinion is that big EDP profits will be a long time coming.

Typical Data Processing Equipment Manufacturers	Recent Price	Indicated Dividend Rate	Percent Yield	Earned Per Common Share			Traded	1957 Price Range
				1957	Period	1956		
Addressograph-Multi	137½	4.00 <sup>1</sup>	2.9	1.50	(3 mos) <sup>2</sup>	2.22	NYSE	132-204
Burroughs	29¼	1.00	3.4	1.11	(9 mos)	1.49	NYSE	29-52¾
IBM	293	2.40 <sup>1</sup>	0.9	5.40	(9 mos)	4.69	NYSE	270½-376½
Marchant Calculators	16⅞	1.30 <sup>1</sup>	8.1	1.06	(9 mos)	2.19	NYSE	15⅞-38
Minneapolis-Honeywell	82½	1.75	2.1	2.08	(9 mos)	2.20	NYSE	73½-131
National Cash Register	51⅝	1.20	2.3	1.73	(9 mos)	1.89	NYSE	46¼-70⅝
Sperry Rand	18¼	0.80	4.4	0.62	(6 mos) <sup>3</sup>	0.70	NYSE	17⅞-26⅞
Underwood	13¾	0.40	3.0	d-0.72	(9 mos)	d-7.82	NYSE	13-33¼

<sup>1</sup> plus stock

<sup>2</sup> ended Oct. 31

<sup>3</sup> ended Sept 30

# MERGERS, ACQUISITIONS and FINANCE

• **Electro Instruments** of San Diego, Calif., issues 150,000 shares of stock at \$12.50 per share. Price was set at about 10 times annual per share earnings with underwriters commenting that days when electronic stocks could be sold at 20 times earnings are gone. Some 50,000 shares were sold for account of the company and 100,000 shares for account of selling stockholders, founders of the firm and family members. Company proceeds, along with borrowings of \$300,000, will be used to retire short term indebtedness and to pay for new main building under construction in San Diego. The firm produces digital measuring instruments, graphic recorders and precision am-

plifiers. About 82 percent of its sales are to the missile industry.

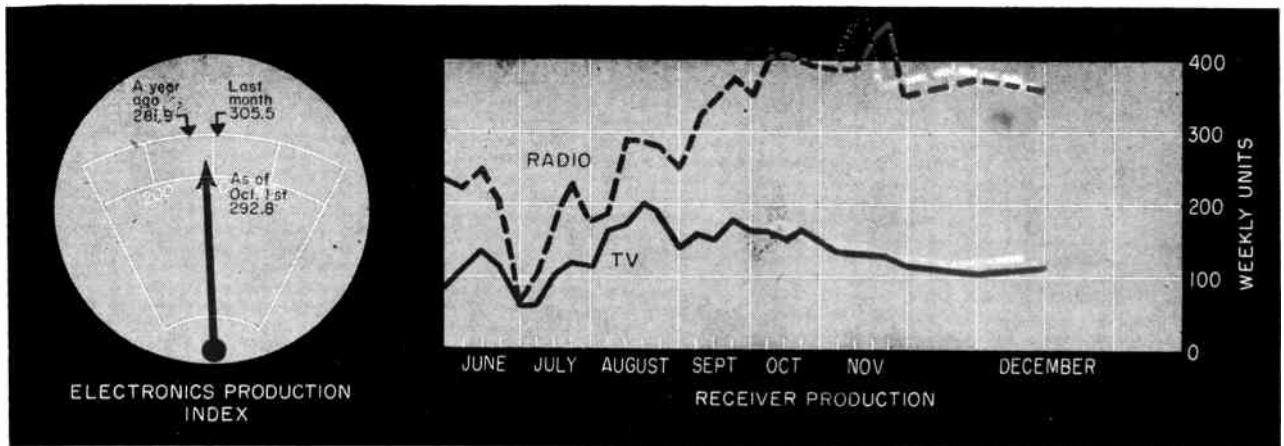
• **Van Norman Industries**, New York City, joins **Transitron, Inc.** and **Insuline Corp. of America**, both of Manchester, N. H., into one electronics division. Transitron produces electronic test instruments and Insuline makes electro-mechanical devices. Transitron president Samuel K. Lackoff will manage the new division. Transitron has been operating with small but steady profits while Insuline has lost heavily in past two years.

• **AMF Pinspotters, Inc.** of New York City refinances \$60 million bank credit by direct placement of

like amount of 5-5½ percent long term notes with institutional investors. AMF, subsidiary of American Machine and Foundry, manufactures automatic bowling alley pinspotters.

• **Litton Industries'** stockholders vote in Beverly Hills, Calif., to increase common stock from 2 million to 3½ million shares and authorize 160,000 shares of new voting preferred stock with \$100 par value. Newly authorized stock substantially exceeds amount needed for planned purchases of Monroe Calculating, Aircraft Radio and Maryland Electronic to enable Litton management to make additional acquisitions in future.

## FIGURES OF THE WEEK



### RECEIVER PRODUCTION

(Source: EIA)	Dec. 13, '57	Dec. 6, '57	Dec. 14, '56
Television sets, total . . . .	116,296	109,339	138,149
Radio sets, total . . . . .	373,322	387,597	383,063
Auto sets . . . . .	118,284	121,784	181,553

### STOCK PRICE AVERAGES

(Source: Standard and Poor's)	Dec. 24, '57	Dec. 18, '57	Dec. 26, '56
Radio-tv & electronics . . .	50.16	50.27	52.44
Radio broadcasters . . . . .	51.22	50.09	65.55

## LATEST MONTHLY FIGURES

### EMPLOYMENT AND PAYROLLS

(Source: Bur. Labor Statistics)	Aug. '57	July '57	Aug. '56
Prod. workers, comm. equip.	409,800-p	393,700-r	392,300
Av. wkly. earnings, comm.	\$77.81 -p	\$75.85 -r	\$75.76
Av. wkly. earnings, radio	\$75.81 -p	\$75.24 -r	\$73.75
Av. wkly. hours, comm. . .	39.9 -p	39.1 -r	40.3
Av. wkly. hours, radio . . .	39.9 -p	39.6 -r	40.3

### TRANSISTOR SALES

(Source: EIA)	Oct. '57	Sept. '57	Oct. '56
Unit sales . . . . .	3,544,000	3,231,000	1,290,000
Value . . . . .	\$7,075,000	\$6,993,000	\$3,930,000

### TUBE SALES

(Source: EIA)	Oct. '57	Sept. '57	Oct. '56
Receiving tubes, units . . .	47,075,000	44,382,000	42,921,000
Receiving tubes, value . . .	\$38,421,000	\$35,545,000	\$34,362,000
Picture tubes, units . . . .	995,629	1,071,662	1,165,740
Picture tubes, value . . . .	\$19,495,574	\$20,819,036	\$21,117,261

## FIGURES OF THE YEAR

Totals for first 10 months

	1957	1956	Percent Change
Receiving tube sales . . . . .	388,738,000	390,357,000	-0.4
Transistor production . . . . .	22,386,300	9,403,000	+138.1
Cathode-ray tube sales . . . . .	8,304,181	9,233,780	-10.1
Television set production . . . .	5,251,158	6,050,052	-13.2
Radio set production . . . . .	11,945,534	10,884,760	+9.7

New from Clevite!

# SILICON JUNCTION DIODES

These latest additions to Clevite's complete line of computer and general-purpose diodes offer you the advantages of:

**ULTRA FAST RECOVERY TIME . . . (JAN-256)**

(Typical: from +5.0 ma to -40v  
. . . 400K in 0.3 $\mu$ s)

**HIGH FORWARD CONDUCTANCE**

(Typical: 50 ma at 1.5v)

**EXTREMELY LOW REVERSE CURRENT**

**FREEDOM FROM THERMAL RUNAWAY**

at high voltage and up to 150°C

**RUGGED, HERMETICALLY SEALED GLASS PACKAGE**

**OTHER CLEVITE DIVISIONS:**

*Brush Instruments  
Clevite Ltd.*

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*Clevite Harris Products, Inc.*

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*Clevite Research Center*

*Intermetall G.m.b.H.*

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write or phone:*

## CLEVITE

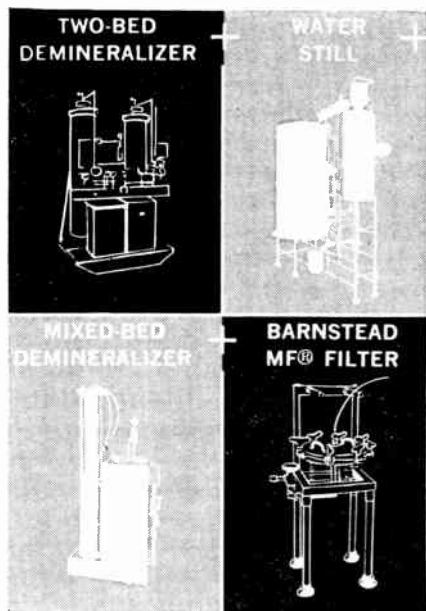
**TRANSISTOR PRODUCTS**

241 Crescent St., Waltham 54, Mass.  
Twinbrook 4-9330

*A Division of*



**DEMINERALIZATION ALONE IS NOT ENOUGH TO PRODUCE 15,000,000 OHM WATER . . . FREE OF ORGANICS, BACTERIA AND SUBMICROSCOPIC PARTICLES**



**THIS BARNSTEAD EQUIPMENT EMPLOYING DEMINERALIZATION, DISTILLATION AND SUB-MICRON FILTRATION PRODUCES PUREST WATER—HOH ABSOLUTE IN PRODUCTION QUANTITIES**

The above combination of Water Demineralizers, Water Still, and Barnstead MF Filter, operated in series, will produce 15,000,000 OHM Water in production quantities . . . free of bacteria, organics and submicroscopic particles. Write for Catalog 127, and Bulletin 141.

**NEW: TRANSISTOR WASHER**

This apparatus washes and rinses transistors and other small electrical parts in hot distilled, demineralized water. New repurification process conserves thousands of gallons of demineralized water each day.



**WRITE FOR BULLETIN #146**



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# WASHINGTON OUTLOOK

THE PRESSURE for an ever-bigger defense program won't taper off despite the administration's own backing of more spending. See p 19. One of the biggest factors that will be felt throughout the early months of this year is the Gaither Report—study of U.S. defense needs made by a top-level group of industrialists, scientists, bankers, educators.

Their findings are that the U.S. is in mortal peril and that defense spending should rise by at least \$8 billion a year over our present \$40 billion spending level.

Among those on the committee itself: Robert C. Prim, of Bell Labs; William Webster of the New England Electric System; Prof. James B. Wiesner, of MIT; Robert C. Sprague of Sprague Electric; Hector R. Skifter, of Airborne Instruments Laboratories. On the advisory panel were: Adm. Robert Carney of Westinghouse Electric; Mervin J. Kelley and James B. Fisk of Bell Telephone Laboratories; James Killian, ex-MIT, and now the President's scientific advisor; Frank Stanton, Columbia Broadcasting System and I. I. Rabi, chairman of the President's Science Advisory Committee.

- Among the programs which would benefit from such increased spending: a better—and extremely costly—alert system to warn against enemy missiles, something we lack entirely now; an across-the-board step-up in missile spending; an increase in airborne and short-range nuclear weapons; a pooling of allied brainpower.

The Report's basic premise: a massive build-up of U.S. offensive power is our first line of defense against Soviet advances; without this step, U.S. is in danger of really becoming a second-rate power.

- The administration will make a strong bid to Congress next year to raise the pay of government scientists and engineers. It will be in addition to a recent Civil Service pay boost given some 45,000 such employees with individual increases up to \$1,000.

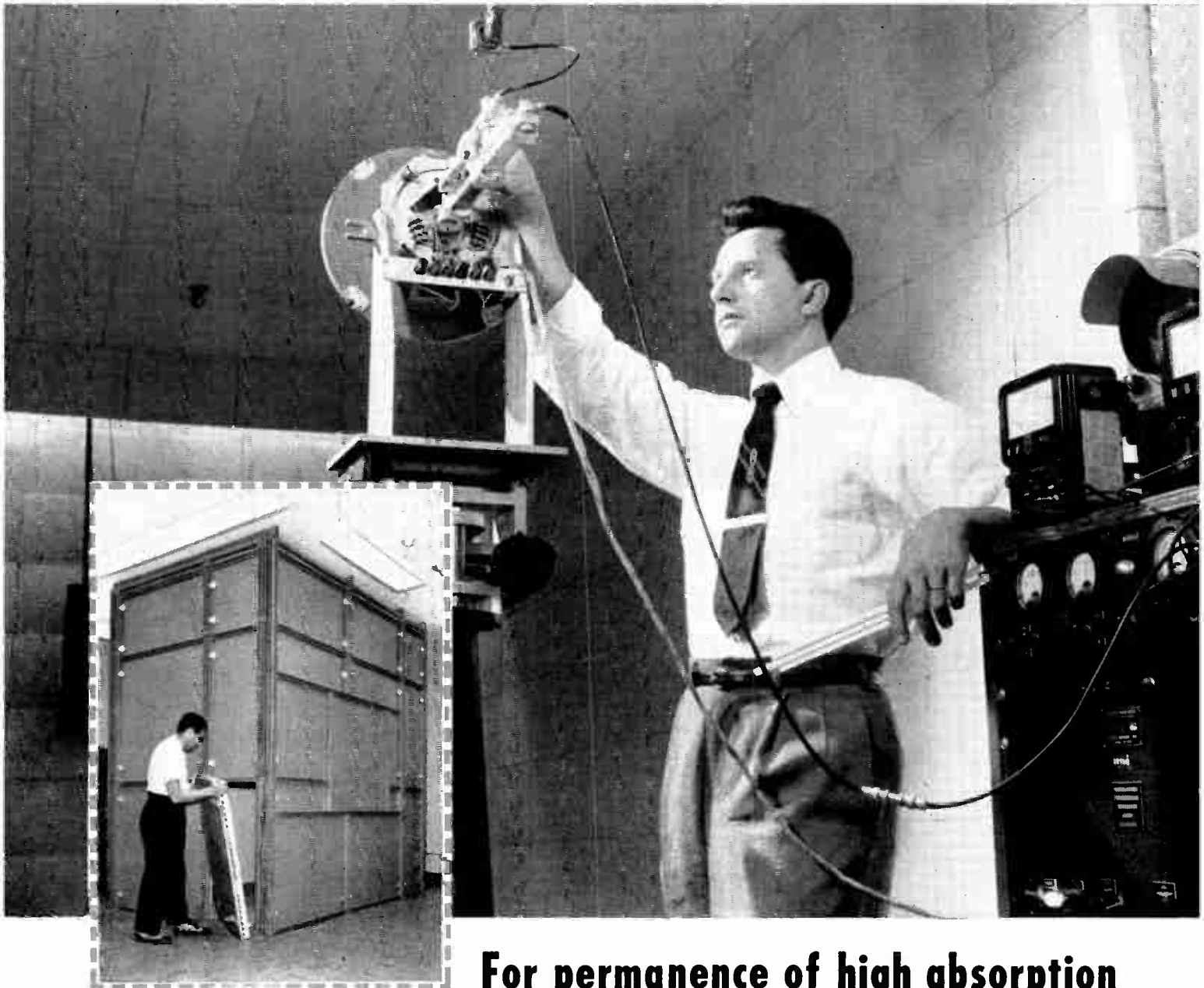
What the administration wants is to have restrictions on pay and fringe benefits stripped away so that it can compete with industry for this hard to attract and keep talent.

Tip off to the move came recently when a top-level committee report to the President was made public. Made by top government officials, the report listed a group of recommendations—including higher pay—as being "of such a critical nature that federal scientific programs will suffer unless some remedial measures are obtained during the next six months."

- A new role for electronic computers is being explored by the U.S. Patent Office. A small group of scientists—guided by an outside advisory committee headed by Vannevar Bush—seeks ways to mechanize present time-consuming patent searching operations.

The object: coding of information in existing patents and literature in chemistry so an amateur can quickly tell if a patent application covers in any way a patented invention.

The scientists plan to feed patent data into an electronic computer; it will answer back with segments of the application that are already a part of an existing patent. The long-range hope is that electronic sorters will eventually indicate the coverage of the 600,000 outstanding U.S. patents at the touch of a button.



## For permanence of high absorption ... Raytheon specifies McMillan microwave absorbers

Peak quality products are prime requisites at Raytheon Manufacturing Company. As one of the outstanding contractors in *aircraft weapons systems, guided missile systems, major defense radars and fire control systems*, their superior quality work requires the finest radar testing facilities. They must have *both* high initial performance *and* stable, guaranteed performance. To satisfy these conditions they specify McMillan Microwave Absorber Products.

In their 17 large test stations at Maynard, Bedford, Lowell, and Andover, Raytheon has installed McMillan products—either block absorber material or modular prefabricated “free space” rooms. For all types of antenna and radome testing McMillan Absorber Products are specified because their high attenuation characteristics are long lasting.

In the main illustration above, a permanent test area has been “walled” with McMillan “BL” Plastic Foam Block. Inset shows a McMillan

Prefabricated “free space” Room. McMillan Microwave Absorbers are available in hair material, plastic foam block and thin flexible material, for ground, shipboard and airborne use, for frequency ranges from *40 mc* to *35,000 mc*.

With their long experience in the field, backed by complete design, testing and manufacturing facilities, McMillan engineers are ready to assist you in any antenna and/or radome testing problem.

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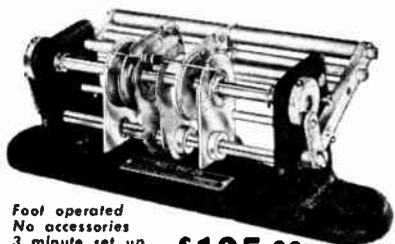
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## EXECUTIVES IN THE NEWS



### Holaday: no scapegoat

WHEN some Capitol Hill hatchetmen decided, about a month ago, to go after missiles chief William M. Holaday's scalp, they didn't realize what a hunk they were biting off. Holaday's tree shook but it didn't fall. And it probably won't unless bigger winds blow.

Holaday is an anomaly in the nation's capital. He's a dedicated engineering manager, doing the job at hand the best way he knows how. "He doesn't," says a close associate, "blow his own horn." Nor does he cater to the whims of the consumer press; he's almost hostile to newsmen. But he could—if he chose to—point to a good record in a job that before sputnik was hamstrung by Pentagon politics.

The 56-year-old Holaday started as an engineer, took a BSMIE from Ohio State University in 1925. He worked two years in Westinghouse Air Brake's development labs, then spent ten years as an automotive engineer for Standard Oil of Ohio. He went to Socony Mobil in 1937, took a wartime leave of absence to serve in the Petroleum Administration, went back to Socony as director of its research lab.

Charles Wilson recognized him as an expert in aircraft fuels and hired him for the missile job last spring. When President Eisenhower turned the spotlight on him in the sputnik speeches, he looked for a while like a fine political scapegoat. The trouble is he does his job too well, and Atlas flew its 500-mile test just in time to prove it.

The tall, husky ex-football tackle is still a team player, organizes his work and delegates it. He used to keep a calm, deliberate schedule. Lately he's been working a 12-hour day six and seven days a week. "We'll be here tonight," said his secretary one recent Friday, "until all hours—and tomorrow and Sunday too, probably."

Holaday avoids Washington's eternal partying, lives quietly in a colonial house in Alexandria, Va. A reflective thinker, he reads a lot, smokes a lot, likes his food plain and his occasional Scotch with soda. He was married in 1925, has three children, all grown.

### COMMENT

Precious Compression

(Re "Shop Talk" Sept. 1, p 2) . . .

Mention was made of your estimated cost of producing a cigarette (-package) size radio receiver using the smallest available components. The figure quoted was \$474, which

works out to about £150 sterling.

You might be interested to learn of a receiver constructed by the writer. Apart from using transistors and one or two components of similar dimensions, no great effort was made at miniaturization. Nevertheless the entire receiver was included within a standard-size cigarette packet.

It is estimated that the cost of producing this receiver would be in the region of £5-£6.

J. A. ROBERTS  
SIEMENS EDISON SWAN LTD.  
LONDON WC2, ENGLAND

#### Around the World

I have long been a subscriber to your magazine. If you still have my old addresses, you will note that you have forwarded *ELECTRONICS* to me in eight different foreign countries. I am presently in Bangkok, Thailand.

CHARLES E. BLANTON  
APO 74, Box B  
SAN FRANCISCO, CALIF.

#### Instrument Makers

We were flattered to have you devote space to us in the October 1 issue of *ELECTRONICS* (in "Instrument Makers Appraise Developments," Oct. 1, p 8). Permit me, however, to call some inaccuracies to your attention.

Daystrom Systems has not yet installed an electronic data-processing system in Louisiana. Installation will not take place until March. Installation will be at the Sterlington, not Sterling) Steam Electric Station. Editing has slightly changed the connotation about closing the loop since, to the best of our knowledge, Chalmer E. Jones has not made that dogmatic a statement. Finally, Mr. Jones is general manager of Daystrom Systems, not of the Controlonics Group. The latter is a group of divisions (including Daystrom Systems) which is headed by Thomas Allinson.

B. E. HOLTSMARK  
DAYSTROM SYSTEMS  
LA JOLLA, CALIF.

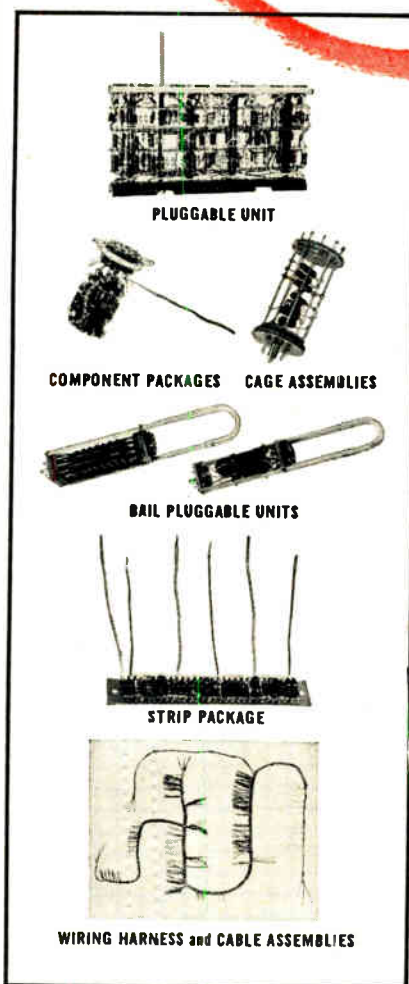
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*Big dish with a big job...*

## NEW 84' KENNEDY TRACKING ANTENNA



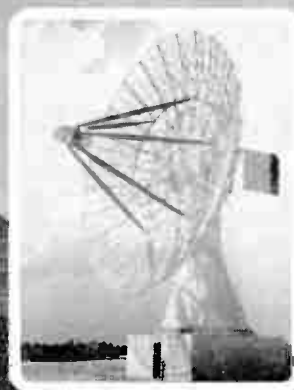
OWERING 90 feet above the New England countryside at Westford, Mass., this giant 84' tracking antenna is part of a new, long-range radar installation now studying problems in ballistic missile defense.

Equipped with an elevation-azimuth type mount designed and fabricated in cooperation with M. I. T.'s Lincoln Laboratory, the big dish can make a full 360° horizontal sweep and has a vertical rotating capability of 90°. Like all Kennedy steerable antennas, it features a light weight, aluminum dish supported by a steel pedestal mounted on a concrete base.

This kind of achievement in antenna design and construction is solid proof that Kennedy is the name to remember when you are faced with antenna problems.



28' RADAR TRACKING ANTENNA



60' TELEMETRY TRACKING ANTENNA

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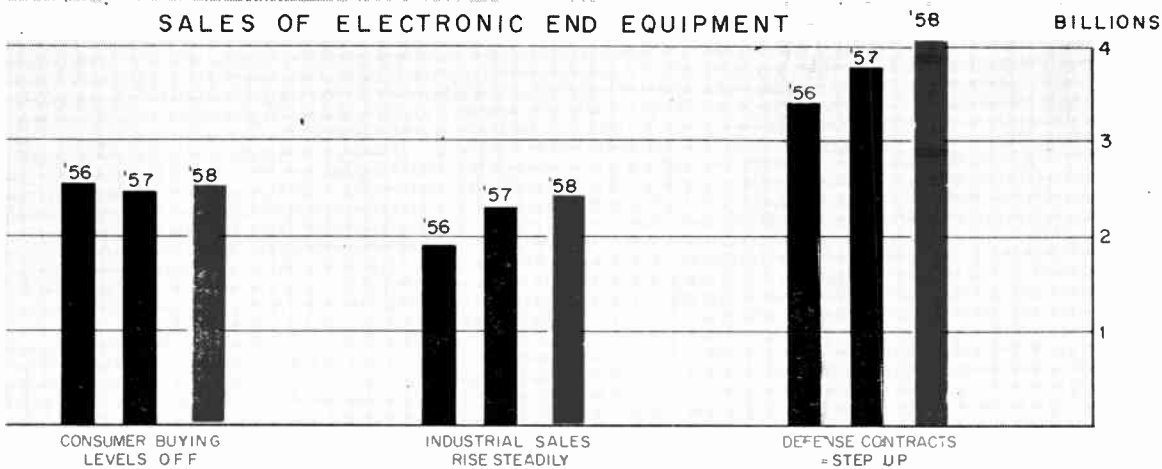
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## 1958: Year of the High Plateau

This will probably be the Year of the High Plateau.

We may not see anything like the industry-wide annual increase that we've seen the last couple of years. It'll be more like a 5-percent increase; some segments of the industry look forward to as much as 10 or 20-percent rise, but this will be offset by slimmer margins in other sectors.

With a little luck and a lot of work, the industry may wind up 1958 with about \$14 billion sales and service gross. Between \$9 and \$9.5 billion of this will be the value of delivered goods, or \$7 to \$7.5 billion at factory door. The rest of the \$14 billion is money spent for repairs, service and installation, plus the broadcast industry's income.

### *I The Indicators*

Economic indicators point in every direction. Let's look at the bad news first.

**Personal incomes are down.** The American consumer has been taking home a steadily slimmer pay envelope since last August.

**Unemployment has jumped,** even in electronics. Hard hit are giants of industry such as the auto makers. In a few areas unemployment is running twice last year's level and still going up.

Industry's capital spending plans are leveling off. Manufacturing industries may spend 16 percent less in 1958 than the almost \$14 billion that went into capital expansions in 1957. But nonmanufacturing industry plans are down only one percent.

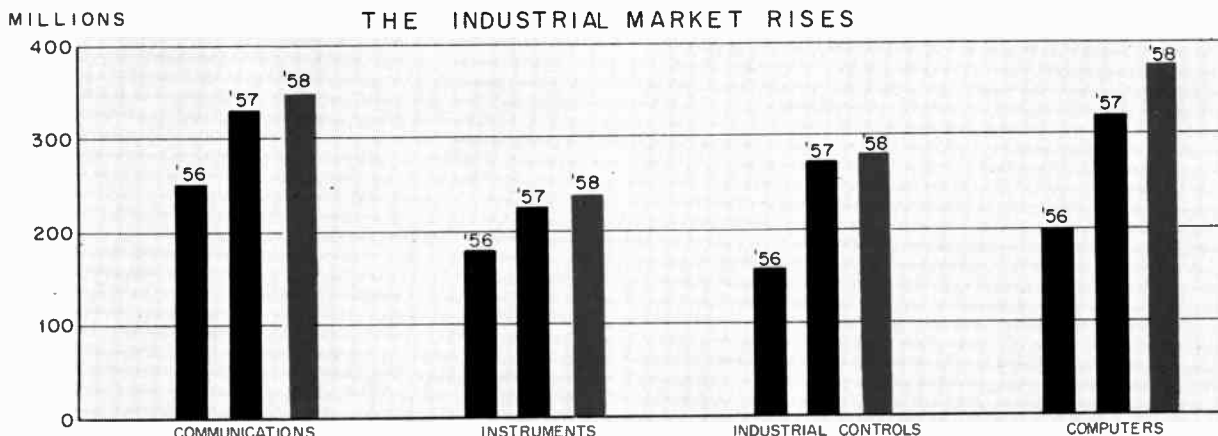
The industrial production index has fallen 6 percent since late summer, now stands at 139 percent of the 1947-49 average. In our own industry, more than one firm is holding off moving into newly finished plant capacity, waiting to see what the first quarter brings.

There are strong pressures at work on the upward side, however.

**Brightest star is the Defense Department's budget,** going before Congress next week. Next brightest is the market for industrial and commercial products—firm and steadily rising.

As ELECTRONICS reported earlier ("Industrial Electronics: 1957-1960," Nov. 20, 1957), capital spending for electronics continues up as most other industrial buying falls off.

These two things alone are reason enough for the sentiment, widespread among electronics executives, that our industry will hold its head above water even



if the rest of the economy slows down—so long as it doesn't grind to a halt.

In the year just ended, when all the figures are added up, electronics sales and services will have racked up more than \$13 billion. Of this, just over \$2 billion was revenue to the broadcast industry, and something over \$2.5 billion was income for installation, service and repair of home entertainment products. The rest—about \$8.6 billion—is for goods delivered to industry, government and the consumer; about \$7 billion at factory door.

In former years, all these areas moved up together. As this year begins they're milling around, some stable, some rising, some softening.

### II The Upside Forces

The upside forces are led by the post-sputnik budget. Regardless of administration attempts to hold it down, the Defense Department budget will undoubtedly go above the \$39-billion ceiling that's been bandied about the capital.

There's no doubt that government expenditures in our industry will rise from last year's \$3½ billion to \$4.2 billion or more. But it's not going to be easy to sell this market. Government buyers will be under pressure to make every dollar count.

Missiles and allied gear will get the biggest play. The beefed-up budget will buy more guidance, a lot more radar, and such commodities as the network of Athena computers and radio controls that will guide Titan.

There'll be less piloted aircraft equipment ordered as USAF reduces its purchases. There won't be so much communications equipment, either, especially for small units, since all services will be cutting back manpower.

Research—basic and applied—will get more money. The services will probably spend at least twice the amount that they put into R&D last year.

Sales of industrial and commercial products will

show an overall rise. Factory-door value of such equipment ran near \$1.3 billion in 1957, will move up to over \$1.4 billion this year.

Computers and communications equipment (including microwave) will spark this part of the market. Factory-door value of both types of products will soar well over \$300 million each this year.

Instruments and industrial controls will rack up in excess of \$200 million each. Other commercial and industrial sales are holding steady or advancing slightly.

Distribution channels will add a round billion dollars to the factory-door value of the commercial and industrial market for a gross of \$2.4 billion.

Combined value of the defense and industrial markets—projected at between \$6.5 and \$7 billion—compares quite favorably with last year's \$5.9-billion total.

### III The Downside Pressures

The downside pressures come from the consumer, and affect the other three general classes of electronics goods and services: consumer products, repair and installation services on these products, and the income to the broadcast industry.

The year ahead will be marked by fierce competition for the consumer dollar. Prices last fall moved up into what more than one radio-tv manufacturer called "a more realistic range." If consumer resistance comes with a drop in consumer income—as it probably will—the prices could turn right around and go down again.

Combined value at the factory door of all radio, television and phonograph sets (excluding hi-fi) will probably not go much above \$1.4 billion. Distribution revenue for these products will add \$1 billion to the value, for a gross of \$2.4 billion.

Sales of home radios will rise slightly over 8.5

million this coming year, and monochrome tv sales should hold steady in the 7.5-million region. Color sales should at least double from 1957's 160,000 units. Export sales of radios will drop 10 percent from last year's 300,000. Auto radios will hold steady at about 5.5 million.

Hi-fi and magnetic recorder sales will both rise. Estimates for hi-fi range from \$200 million in retail sales for 1958 to \$400 million, with the most probable figure in the neighborhood of \$250 million. Magnetic recorders for the home follow the rise in hi-fi appeal.

Average factory price of both monochrome and color tv will drop. Distribution revenue will also drop. As a matter of fact, it may be slimmer revenue in the distribution channels that will pressure manufacturers to shave prices.

Equipment producers are going to be looking very carefully this year for ways to trim production costs and beef up sales. Distributors and reps are going to find themselves being hound-dogged by manufacturers. It's inevitable in a soft market.

The income for repair, service and installation will remain about the same. With many consumers putting off the purchase of new television sets, there may even be a slight rise from last year's \$2.55-billion gross. But it will be slight; more money spent for repair could be offset by a drop in installation fees.

Included in the \$2.55-billion figure is over \$900 million spent for replacement components: about  $\frac{1}{3}$  for tubes (including picture tubes) and  $\frac{2}{3}$  for other parts. Distribution revenue on these components is about \$600 million. The remaining \$1-billion-plus is money spent for service.

Revenue to the broadcast industry will remain steady at slightly over \$2 billion. Networks and local stations may find most sponsors worrying their budgets a little more, and the tight economic situation may shake some out. But with a waiting list for prime time, executives aren't too concerned.

In looking over the whole industry, you can see one especially bright spot—transistors.

Although use of transistors in consumer products is still pretty much limited to portable sets, the government and industrial market is rising sharply. Industry leaders think about 20 percent of all commercial and industrial products will be transistorized this year.

Some executives feel that other solid-state devices are equally as promising, talk about ferromagnetic and ferroelectric materials, both solids and thin films.

#### IV Industry Opinion

Industry opinion about the coming year is varied but most of it is either cautious or slightly bullish.

There are few out-and-out bears loose in electronics at the moment.

**ELECTRONICS** asked a hundred of the industry's top executives how they feel about 1958. Eighty percent of the answers indicated that sales will go up. The rest were about evenly divided between "sales the same" and "slightly down."

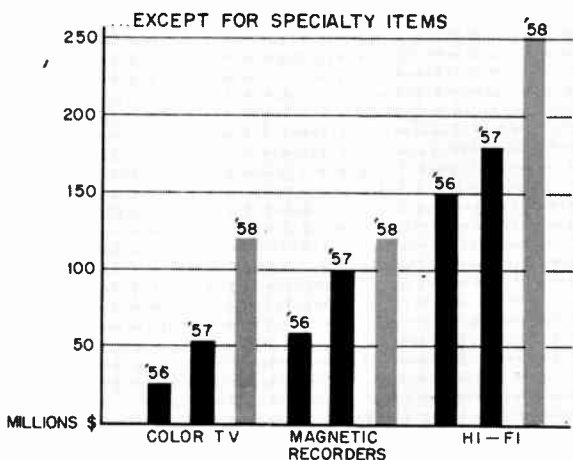
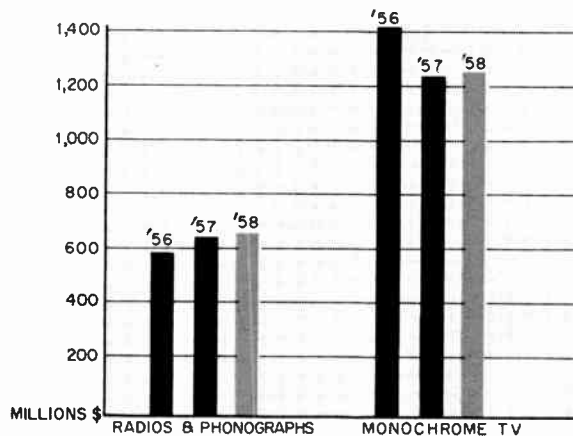
But only a small handful would go so far as to say that business was absolutely good right now.

Most executives in our industry feel that defense spending on guided missiles will be the big prop this year. Areas that they feel will grow most, besides missiles, are computers, industrial controls and semiconductors. Cryogenics and instrumentation were also mentioned as strong possibilities.

Most men (a) think the profit squeeze is still on, may get tighter; (b) don't think that tight money constricts the industry too much; (c) think small firms in electronics will have tougher going.

The consensus of men who put the industry where it goes is that in this Year of the High Plateau, more than in any other year for the past decade, good management—across-the-board in marketing, engineering, production—is going to tell the tale.

RETAIL VALUE OF CONSUMER MARKET LEVELS OFF...





New designs—magnetostriction memory, high-speed tape perforator, etc.—and after-hours conference discussions point to . . .

## More Computer Progress

ENTHUSIASTIC response by businessmen and engineers to last month's belwether Eastern Joint Computer Conference in Washington foretells that 1958 will be a boom year in the computer trade. Both digital and analog manufacturers will share in the increased business. Next year also will see: further engineering refinements, especially in memory, storage and input/output devices; more research into electronic document reading, pattern recognition and the like; and stepped up programs to train more computer designers and programmers.

Buyer interest at the show was exceptional. One maker of missile computer equipment confided that a \$33,000 transaction was handled on the exhibit floor. An analog computer concern stated they took orders in excess of \$100,000. Still another company contracted to deliver \$250,000 worth of data processing equipment.

Hottest talk at the show concerned RCA's proposed attempt to compete with IBM in large-scale digital computer market. Nucleus of their unit will

be BIZMAC; however, new developments in ferrite core planes is expected to reduce memory unit production cost.

Among new designs shown were: magnetostriction memory by Deltine (left photo) and high-speed tape perforator by Soroban (right photo).

Availability of ready-made computer auxiliary equipment and a trend toward its standardization promise to smooth the way for more business applications of computers this year. As Sperry Rand's John Mauchly put it, "There has been a high rate of progress in development of equipment that can be bought directly off a shelf—a few years ago, such equipment couldn't be built to order."

Current emphasis on peripheral equipment was evident by the large number and variety of units displayed. One engineer explained, "Logic circuits seem relatively unchanged since 1951, but the industry's concentration on input-output, memory and converter devices is now equalizing what had been an unbalanced condition."

**Simplification, size reduction and decreased power**

requirements of the new analog and digital equipment will serve to spur industrial acceptance of computers. One computer man commented, "Trend is towards small units using cores and transistors. For a parallel situation, look at the progress in miniaturizing radios!"

Fact that many units shown were virtually production items impressed most engineers. Singled out as especially significant was Stromberg-Carlson's 4,680-line-per-minute printer which combines a character-reproducing crt with a high-speed dry-printing process.

Indications of rank-thinning among general purpose analog manufacturers was pointed up when Goodyear announced discontinuance of the GEDA. Rumors circulated that at least three manufacturers also plan to drop general-purpose analogs. Nevertheless, most observers feel that the dollar value of analog equipment produced during the coming year will increase. Small desk-type computers and analog machines designed to tie into digital equipment should take up the slack.

You can always start a lively discussion with the question: "Will digital equipment replace analog?" Manchly says, "Nothing will replace digital or analog computers as such; however, because of accuracy and feasibility requirements, some analog computer work will be taken over by digital machine."

One designer of air-navigation gear feels that digital units will replace many analog units for real-time computation in the near future. He explains that reduction of weight and size have enabled designers to use digital units as servos in physical control systems.

Consensus of opinion was that hybrid computers that handle both digital and analog problems will open new markets in computer application. A representative of one large digital computer concern said that the greatest use of hybrid computers will be in military and process control applications.

What about computer research this year? University of Michigan's H. H. Goode says, "U of M expects to receive \$12 million worth of research work in 1958. Of this, \$4 to \$4½ million will be used in the computer research area".

Major industrial research effort was forecast by papers presented at EJC. One heavily attended session dealt with document reading, pattern recognition and written character analysis. After-hours discussions revealed this to be a vital link in future development of computers. Enthusiasm among engineers indicates that all manner of electronic switching techniques will be thoroughly investigated in many labs this year.

Development of small computers, application of

computers to dynamic problems of aircraft, automobile and machinery manufacturers, and further research in automatic programming are all scheduled to receive intense study. Current work in millimicrosecond computers being done by Sperry Rand, IBM and RCA and others will continue at a stepped-up rate.

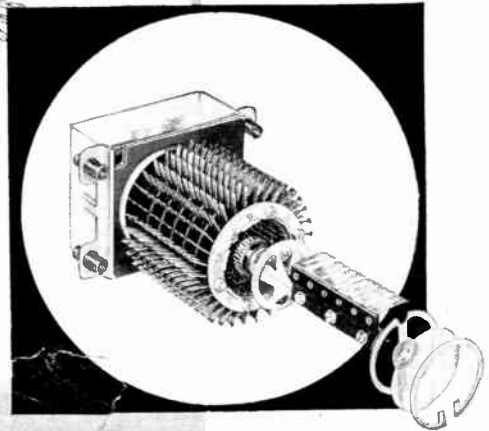
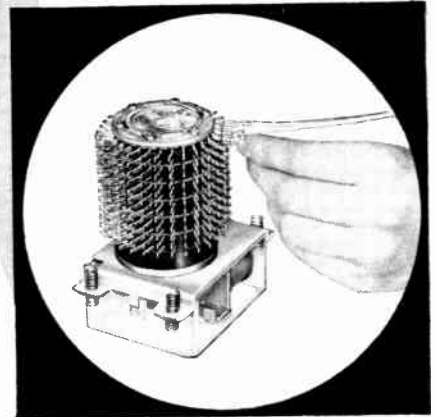
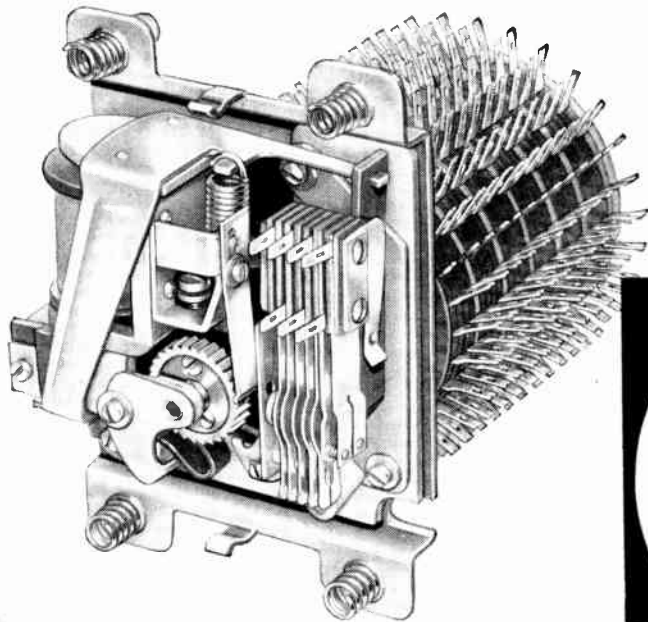
How many men will receive specialized computer training this year? Here's a sample of one university's program. Goode of Michigan says his school now has 15 to 20 EE's studying for master's or doctor's degrees in analog and digital computer design; 20 aero engineers studying for master's or doctor's degrees in analog applications; 12 post-graduate management science majors taking courses in systems engineering, operations research and data processing techniques; and one man taking a doctor's degree in computer organization.

All computer schooling will not be done by universities, however. R. Favreau of Electronics Associates says, "Not enough programs are currently underway in colleges, and most of those that are concentrate on special areas." EA's two-week analog applications course will be one of several similar industrial efforts to familiarize operators with more effective computational methods.



## King-Sized Load Cells

Armco Steel's Sheffield division weighs open-hearth furnace charges with Baldwin-Lima-Hamilton load cells rated at 100,000 pounds. Spilled metal mined exposed beam scales formerly used



## **FIND THE PIVOT PIN IN THE STEPPING MECHANISM OF THIS NORTH RVF ROTARY SWITCH**

*The RVF Rotary Switch can be furnished with 2, 4, or 6 levels, 30 points, each with single wiper. With double wipers, the same switches become 4, 8, or 12 level units respectively with 15 points per level. Bank contact ratings: 1 amp. at rest; 2 amp. resistive when stepping. Off normal contact ratings 4 amp. resistive. Switch may be driven self-stepping or externally. Gold plated bank contacts and wipers are available for low level switching. Available with 12, 24, 48, 110 V. D.C. coils. Built-in spark suppression on 24 and 48 volt switches. Mounting dimensions: 1.968" x 3.661" O.C. Overall height: 4 1/4" height above mounting, 3 1/2" (max. dimensions for 6 level switch). Weight: 1.32 lbs.*

Give up? So did we! A rotary switch cannot be designed with a pivot pin in the stepping mechanism and meet North Electric's standards of reliability!

Result: North's high speed RVF Rotary Switch has no pivot pin — *no wear point to change critical dimensions of any part of the stepping mechanism* — reliable, accurate stepping for the life of the switch!

The North RVF Rotary Switch allows maximum flexibility in circuit approach — no longer is the engineer limited to one input per bank level — *any combination up to 30 inputs and/or outputs per bank level affords a flexibility hitherto unknown.* North's RVF Rotary

Switch is being used for programming, sequence control, routing test equipment, as an impulse counter, memory device, and for tallying and counting in production control.

The bank terminals on the North RVF Rotary Switch are designed for use with either soldered connections or solderless connectors.

The switch is completely dust enclosed, and has vibration-proof mounting.

For the most versatile, flexible, reliable Rotary Switch on the market — **NORTH RVF ROTARY SWITCH.**

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# Missiles Pace Defense Sales

Here's the military budget picture in brief:

	Fiscal '58 (ending June 30, 1958)	Fiscal '59 (ending June 30, 1959)	Percent Change
Missile Guidance .....	\$1,250 million	\$2,000 million	+60
Aircraft Electronics.....	\$ 900 million	\$ 875 million	-28
Marine Electronics.....	\$ 99 million	\$ 99 million	0
Radar, Communications Parts, etc.....	\$ 770 million	\$ 770 million	0

AGAINST the backdrop of the Senate's missile investigation, the Pentagon's revamped weapon development and production plans are shaping up more clearly than ever. As *ELECTRONICS* went to press, the Dept. of Defense finished work on the budget for fiscal 1959, starting July 1, 1958, to go to Congress shortly.

Expenditures will run to at least \$39.5 billion—almost \$1 billion over the current rate—and new appropriation requests will be for slightly more than this sum.

The major spending rise is set for missile production—from about \$2.5 billion in fiscal 1958 to about \$4 billion in fiscal 1959. Roughly half these sums are for long-range ballistic missile output—IRBM's for overseas sites. ICBM's for domestic bases. Pentagon sources put electronics' share of the overall missile dollar at 50 percent, for ballistic missiles at least 25 percent.

This is the outlook for other types of military procurement:

**Manned aircraft** spending will continue to drop—probably to under \$7 billion for the first time since fiscal 1952. The big reduction will be in fighter planes; bombers will remain steady or rise some. Spending now runs at an annual level of \$7.2 billion. Of \$8 billion expenditures in fiscal 1957, \$1 billion went for electronic equipment.

**Shipbuilding** will remain at the fiscal 1958 level of \$1.1 billion. Of the \$897 million spent in fiscal 1957, \$81 million went for electronic gear.

**Combat vehicles, support vehicles, artillery, weapons and ammunition:** production of all these items will fall sharply off from this year's \$671 million total. It won't be a big loss as far as our industry is concerned. Only \$10 million of this year's sum goes for electronics.

**Radar, communications and parts** expenditures are expected to be close to this year's \$770 million.

Impetus for the administration's IRBM-ICBM production speedup comes from the Senate's missile investigation—headed by Senate Majority Leader Lyndon B. Johnson—and other political pressures.

As recently as two months ago, the administration was saying the ballistic missile program was on a crash basis, could not be profitably accelerated.

In the wake of this speedup, the administration has prepared a supplemental appropriation request of about \$1 billion for fiscal 1958 to get the accelerated ballistic missile program under way.

The funds will cover new production orders for the Thor (major electronic contractors—GM's AC Sparkplug Div.) and Jupiter (Sperry Rand's Ford Instrument Div.); advance procurement of electric gear, production tooling and other long lead-time items for Atlas (GE and Burroughs) and Polaris (GE and Westinghouse); and to push up base construction and crew training programs. Plans include wide-scale buying of electronic simulators.

## Pinpointing Our Missiles

- The Air Force's Convair Atlas ICBM development project is being speeded up substantially. A similar stepup was ordered for the Navy's Polaris solid-fueled IRBM.

- Output of the Air Force's Douglas Thor IRBM will now be kept to six per month over the next year; it will not rise to capacity production—rated at least 30 per month. Production schedule for the Army's Chrysler Jupiter IRBM is unofficially slated to be five or less monthly.

- Production of the Air Force's Northrop Snark intercontinental, subsonic missile is being cut in half. Deliveries of the Atlas ICBM will be under way in two years.

- The Air Force has awarded a contract to North American Aviation for development of the WS-110A—the so-called "chemical bomber"—a manned bomber to be powered by boron, lithium, or other high-energy exotic fuels, capable of speed over 2,000 miles and an altitude close to 100,000 feet.

# Science Need Not Be



## EDUCATION—

"In . . . college, the importance of English and writing should be stressed . . . But the basic problem must be attacked through the elementary and high schools . . ."

*John G. Truxal, Head,  
Electrical Engineering  
Dept., Brooklyn Poly-  
technic Institute*

FACULTIES are becoming increasingly aware that engineers must be able to write—and they're doing something about it.

Iowa requires a student to write 60 technical papers, two for publication. At the University of Virginia, there's a "penalty" for writing poorly.

The Universities of Michigan and Colorado are making a drive to place writing on equal footing with engineering subjects.

Stanford, RPI, and Carnegie Tech are among schools now making scientific or technical composition courses mandatory.

Other schools stress instruction in report writing in engineering labs. This occurs at MIT, Lehigh, Case Tech, and UCLA.

At MIT, the English and engineering staffs work side by side. English instructors lecture on report

## GOVERNMENT—

"Need for clear and simple writing in the fields of science and engineering is no less urgent in the federal government than in private industry. . . ."

*James A. Mitchell, Asso-  
ciate Director, Manage-  
ment and Public Affairs,  
Natl. Sci. Foundation*

writing. Then, with engineering professors, they jointly grade reports.

---

ACCORDING to some estimates, 6 percent of the total defense budget goes for the writing and production of proposals, handbooks and reports required for military equipment.

There are about 16,000 people directly involved in writing engineering information for this purpose. There is, however, no central agency within the Department of Defense that directly controls either the people involved or the money.

In the nonmilitary end of the government, such organizations as the National Bureau of Standards and the National Science Foundation actively support groups formed to improve engineering writing.

---



# Inarticulate



## INDUSTRY—

"The engineer has two principal obligations . . . communicate progress, results of his work to colleagues . . . sell his ideas and results to production and marketing . . ."

*E. W. Engstrom, Senior Executive Vice-President, Radio Corporation of America*

BLEARY-EYED from trying to machete a path through the word jungle of an engineer's report, an electronics firm president phoned his personnel manager at 2 a.m. "From now on," he thundered, "don't hire an engineer who can't write." Here are some steps companies now take to correct the situation:

1. Send engineers to writing courses (pay all or part of tuition).
2. Publish own writing manuals.
3. Distribute reprints of good magazine articles on writing.
4. Encourage engineers to take "becfing up" courses.
5. Run a writers' award program.
6. Operate in-plant courses.
7. Give engineers time to attend outside workshops.

IBM has a compulsory course—given on company time—on writing reports, letters. Such courses reap dividends; a study shows engineers spend 5 to 20 percent of their time writing.



## ENGINEERING—

"Some engineers find writing so painful that they fail to record their work before going on to the next job. . . . Writing takes time, but the time is well spent. . . ."

*J. R. Pierce, Director, Communications Research Bell Telephone Laboratories*

On another front, many organizations are active. These include the Society of Technical Writers, Association of Technical Writers and Editors, and the Technical Writing Improvement Society.

WRITING may well be considered the engineer's right arm—and he is rapidly becoming more and more aware of this fact.

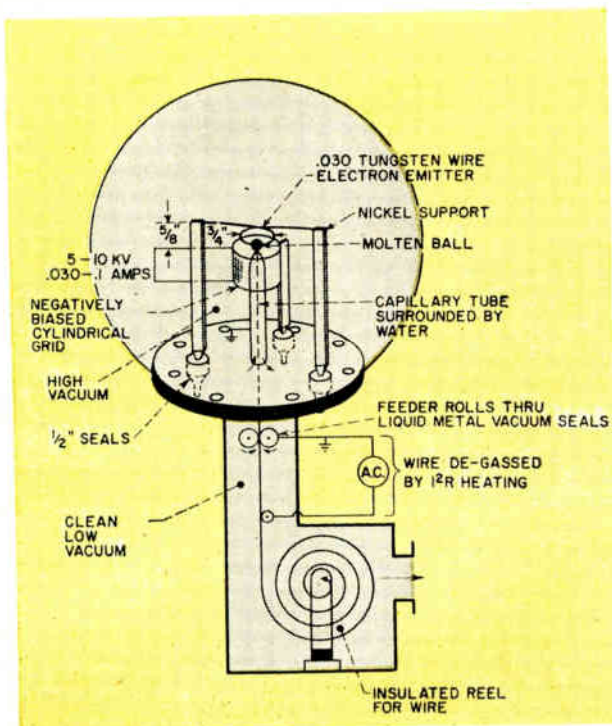
The past few years have seen engineers apply a form of "Operation Bootstrap" to their problem by active participation in the many broad engineering writing groups such as the IRE Professional Group on Engineering Writing and Speech.

About 300 engineers and writers attended the PGIEWS' first symposium recently. Interesting statistics: 70 percent of these people were engineers whose primary jobs were in design and development.

# Use Big Tubes As Furnaces

- Need for high-purity melting fosters electronic furnace work
- Two experimental methods: electronic bombardment, field floating

"TODAY IS THE ERA of the electron beam furnace—tomorrow the solar furnace—and on the horizon, the neutron furnace will convert metal to gas and reconvert it."



Continuous feed is achieved in electron bombardment metal evaporator



Niobium ball floats and melts in h-f field

The speaker, Col. John M. Dick, manufacturing methods chief of Air Materiel Command's industrial resources division, is referring to the metallurgical needs of new missiles and aircraft.

Air Force is counting on materials breakthroughs, new methods of metal refining, to provide future aircraft with structural integrity at high temperatures. The electron furnace is one likelihood.

"As we move into the fields of exotic materials," Dick says, "melt house problems that would normally be overcome by evolution must be overcome by revolution."

One problem: how to melt and mix alloys and metals without recontamination by contact with furnace walls or gases.

Much progress has been made in vacuum and controlled atmosphere furnaces. But electronic furnaces have the added advantage of focusing pure heat energy on the metal while the metal touches nothing at its top heat.

Such an electron beam furnace has been jointly developed by Temescal Metallurgical, Stauffer Chemical and Mallory-Sharon Titanium Corps.

Temescal says the principle is old, but that it apparently has never been tried on a large scale. The furnace uses a 100 kw beam emitted by tungsten filaments in a high vacuum.

Metal is fed into the electron beam. After it is

melted, it drips into a copper crucible, where it freezes and is withdrawn.

Similar in principle is a metal evaporator developed by Norman Milleron at the University of California's Radiation Laboratory, under AEC contract.

Wire is outgassed and fed into a vacuum chamber where it is bombarded by electrons. The electrons are supplied by a tungsten emitter and focused by a grid.

A ball of molten metal forms at the tip of the supply wire and is balanced there by surface tension. The wire is fed at a rate that continuously replaces the evaporated metal.

Milleron's model is a small one, used to supply ion-absorbing metallic coatings to high vacuum equipment. It could be used for continuous feed metallizing and might be adapted to semiconductor refining.

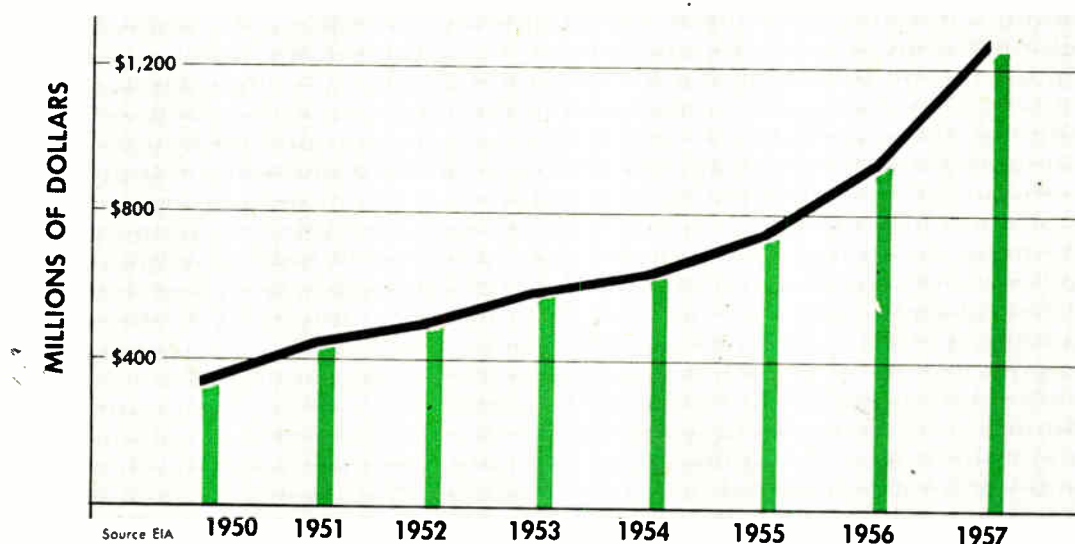
Another electronic technique is levitation melting. Compressed metal powder is placed in a high frequency field. The field floats, melts and stirs the metal or alloy.

The furnace was developed for metal research by Westinghouse and the University of British Columbia. It is an alternative method of preventing crucible contamination of chemically active metals like niobium. The molten ball is floated in an inert atmosphere.

The electronics industry has itself contributed to metallurgical processing. Zone refining of semiconductor metals results in purities of one part in one billion.

A recent zone refining advance is Bell Labs' technique of floating zone refining. Crucible contamination is avoided by suspending semiconductor rods in an inert atmosphere before applying the field.

## PRODUCTION and SALES



## Industrial Sales Hit Record High

INDUSTRIAL equipment sales took a sharp upward spurt in 1957, according to Electronics Industries Association.

James D. Secrest, EIA executive vice president, recently estimated that factory sales of industrial equipment increased from \$950 million in 1956 to \$1.3-billion in 1957. Industrial business last year amounted to about 18 percent of the \$7 billion-plus total industry

factory sales, he estimated.

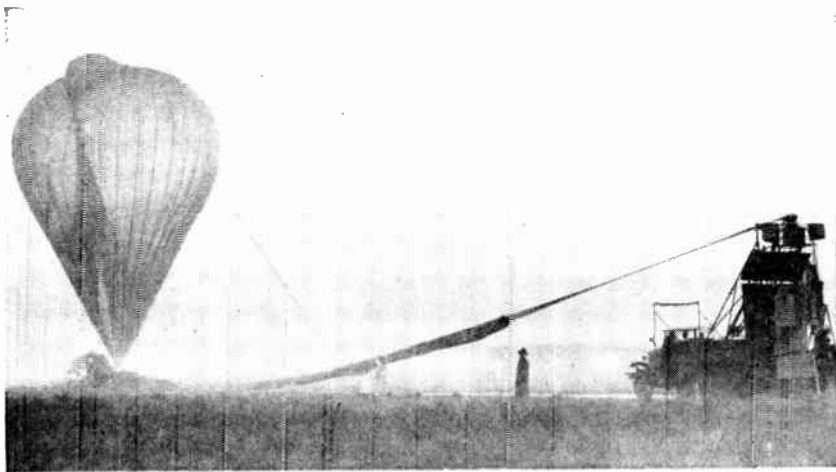
ELECTRONICS magazine was recently told that American industry planned to spend \$1 billion on industrial equipment in 1957. But this survey did not include expenditures by commercial users and value of rented equipment.

The \$350 million, 37 percent industrial sales increase estimated for 1957 would be the largest one year hike since 1950. It is almost twice

the next largest single year: \$200 million between '56 and '57.

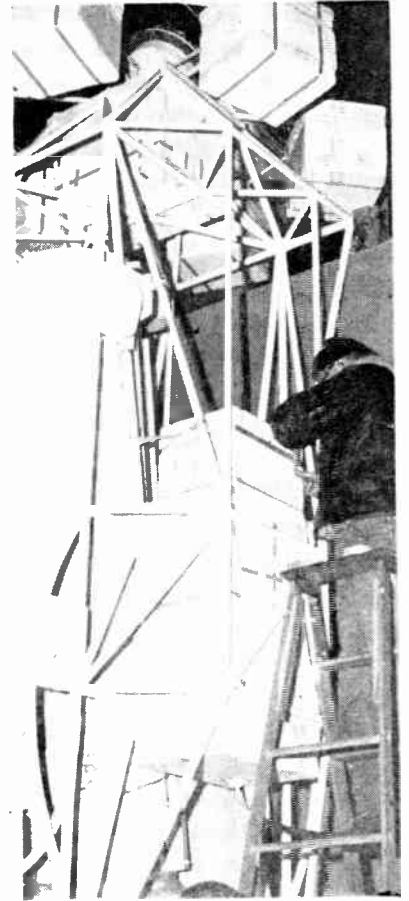
Larger sales of instruments, test equipment and industrial controls to companies manufacturing military products were a big factor behind the record 1957 sales.

Partial reports on the specific products included in the \$1.3 billion estimate indicated good gains in computer, closed circuit tv and sound equipment sales last year.



**Balloon (above) carries automatic telescope (right) 16 miles aloft to photograph sun when . . .**

## Navy Probes Space



ROCKETMEN have been busy lately predicting the day when space platforms, hurled into orbits 'round the earth by exotic fuels and sophisticated engines, will be used as rocket-launching and observation bases. Amid all the gee-whizz talk, the old-fashioned balloon has been quietly doing the same thing proving quite successful.

High-altitude research leans heavily on electronics. Electronic instruments automatically control telescopes, cameras and other recording and measuring equipment.

Electronic telemetering gear insures results, despite any destruction of instruments in rough landings. The results themselves do much to improve radio communicators' understanding of the ionosphere, magnetic storms, etc.

USAF's *Farside* rockets were launched from a balloon some 100,000 ft over Eniwetok. Freed from the retarding effect of atmosphere, one of the rockets lofted over 4,000 miles before falling back to earth.

More recently, Navy's *Stratoscope* project put a *Skyhook* balloon 83,200 ft over the upper Mississippi valley. While it was up there, a 12-in. telescope (pictures) peered at the sun, shot some of the clearest pictures ever taken of its boiling, stormy surface.

The unmanned *Stratoscope* instruments were built by Perkin-Elmer, are controlled by servo systems developed at the University of Colorado. Telescope

uses a 12-in. quartz reflector with a secondary aluminumized-quartz mirror mounted on a swinging arm.

The relay lens is designed to hunt across a fixed region for correct focal point to account for changes in focal length caused by solar heating.

Pointing system includes the gimballed frame in which the telescope is mounted. Magnetic clutches drive the framework in azimuth and elevation. A 175-lb flywheel mounted atop the frame reacts against the azimuth drive, and the frame itself reacts against the elevation drive.

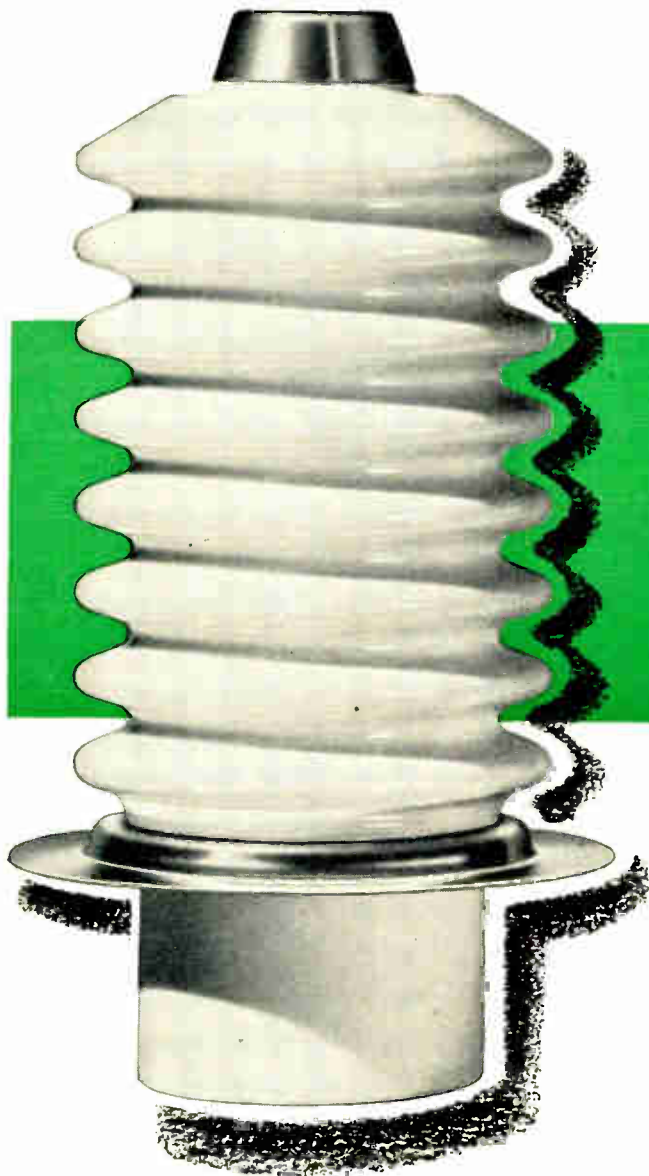
Clutch torques are controlled by the amplified output of photodiode "eyes." A coarse pair and a fine pair control each drive system.

The coarse eyes are photodiodes working behind deep red filters, are sensitive across 180 degrees of arc and accurate to within a few degrees. The fine eyes work behind miniature telescopes, are sensitive across a few degrees and accurate to less than a minute of arc.

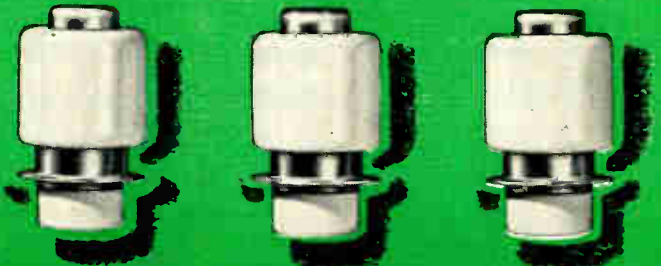
Damping controls on the servo amplifiers minimize overshoot, reduce "jitter" and other higher-frequency errors. Integral controls cancel slow drifts in the pointing mechanism.

Plans are afoot now to modify the 12-in. *Stratoscope*, use it as the objective lens of a 1,000-line tv pickup. Skyborne electronic gear would be powered by silver-cell or solar batteries.

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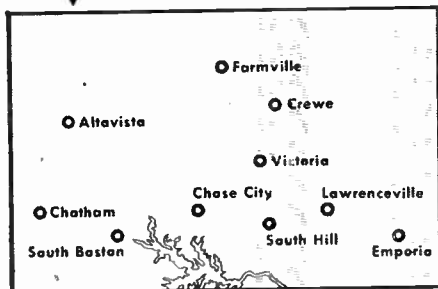
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# Hi-Fi Console Sales Rise

**New market shapes up as manufacturers aim at home folks instead of audiophiles. This year new sales marks loom for hi-fi console cabinet packages. Units making history as living-room furniture**

BOOM IN CONSOLE packaged high fidelity equipment seems a certainty for 1958. Components that were once the exclusive province of a small group of audiophiles are now making sales history as living-room furniture.

Figures released by Electronics Industries Association at the end of 1957 show that 50,000 hi-fi phonograph consoles were sold in 1956; 225,000 in 1957. This is an increase of more than 300 percent. Hi-fi radio-phonograph consoles sold 350,000 units last year as compared with 100,000 in 1956. In deference to the elasticity of definition of the term hi-fi, the figures cited include only console combinations priced over \$100. Tabulations were screened to exclude low-priced equipment that EIA believes does not merit being included in the hi-fi category.

RCA's manager of market development estimates 1957's hi-fi dollar volume at about \$250 million for the entire industry. Firm expects hi-fi makers to see a 25 to 30 percent increase in units for 1958, and 30 to 40 percent increase in dollar volume.

**Manufacturers attribute the rise to improved records, more and better f-m broadcasts, and a growing need for a new form of entertainment for American homes.**

Fairchild Recording points out that individual component sales are also setting records, sees console packaging as a two-headed problem: components must appeal to male purchasers, and cabinets must please the ladies.

With an eye on the gentle sex, manufacturers are making a variety of sizes and shapes bearing such titles as Chatham, Normandy, Provence, Sutton Place and others calculated for milady's ear. Woods and finishes run the gamut of the cabinetmaker's talent.

Fisher Radio has 28 cabinet designs, Olympic, nine with four finishes. Sales volumes are reported as "fantastic" . . . "a few hundred percent higher than ever."

Cabinet proxy Sid Herbstman takes a long look at the situation and sums it up like this: "The era of the hi-fi technical enthusiast has passed. We are today facing the same type of merchandising requirements essential to the promotion of hard

goods." Others now share Herbstman's viewpoint.

Some critics denounce the console package as not being true hi-fi. Emerson Radio and Phonograph replies by claiming their better consoles can match any average component setup in a blindfold test. Console sales for the firm are reported to be at "an all-time high."

Capchart, no tyro in the audio field, says their consoles are "as good as the average human ear can perceive." They began manufacturing console packages last November and already look to brisk sales during 1958.

Fisher and Pilot Radio use the same components in production consoles they sell to do-it-yourself fans. Both firms place high reliance on cabinet enclosures designed to exploit the features of each of the factory-installed components.

Audiophiles gripe about factory products. Persons doing the complaining say they're not loud enough. Olympic Radio sums up and expresses manufacturer sentiment by saying "consoles are for homes, not music halls." The firm points out that maximum volume for their sets is more than adequate for the largest homes.

**Tape recorders are riding the hi-fi boom. RCA's new Cambridge, O. plant makes prerecorded tapes as well as recorders for the company's hi-fi line. RCA expects about 407 million hi-fi dollars this year from its recorders and tapes.**

"Every major producer of home entertainment equipment is either manufacturing or planning to manufacture a tape recorder," says Pentron's Irv Rossman, president of Magnetic Recording Industry Association. He also says that all major record companies have entered or plan to enter the recorded tape business in the near future.

MRIA's prediction for 1958 is that more than 90 percent of the year's sound-recording tape production will be for stereophonic use. The association predicts a tape recorder audience of "about four million for 1960".

Console or package, tape or disk, sales are rising for hi-fi—the medium whose beauty is entirely in the ear of the beholder.



*special report to:*

# UNITED STATES AIR FORCE

*Ballistic Missile Division*

*Air Research and Development Command*

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**SUBJECT:**

PACIFIC AUTOMATION PRODUCTS, INC. Systems Cabling Program

**REFERENCE:**

Fall 1955 forecasts by PAPI of benefits to be derived from establishment of sole responsibility for missile site cabling and activation.

**ACTION:**

The validity of our subject forecasts has been thoroughly tested by our service to USAF and Convair (Astronautics) a Division of General Dynamics Corporation. We have provided the services described below\* for test and launching sites of the ATLAS intercontinental ballistic missile, with the following results:

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2. 14,000 cables are now in service, with no malfunctions due to cabling.
3. Substantial savings are indicated by comparison of actual costs with predictions based upon former techniques and methods.
4. Superior design and simplified operational characteristics of completed sites are due to our integrated approach to cabling and activation.

**CONCLUSION:**

Original estimates of the benefits to be derived from PAPI services have proven to be conservative-- actual performance warrants extension of PAPI services to other missile projects of USAF.

\*HERE IS THE COMPLETE SYSTEMS SERVICE OF PAPI--THE SERVICE WHICH WE ARE NOW FULLY PREPARED TO OFFER TO ALL MISSILE AND MISSILE SYSTEMS CONTRACTORS



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SYSTEMS DOCUMENTATION: *Complete Operational Information in Approved Form*

Address Inquiries to Arthur P. Jacob, Executive Vice-president

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One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

## TECHNICAL CHANGES TO WATCH

- Use of computers for tracking radio-controlled jet aircraft is definitely on upswing. Announcement of new entry in this field by Hughes in December coincided with Navy demonstration of successful radio-controlled flight of swept-wing jet. Craft is Grumman Cougar with control system devised at Naval Air Development Center, Johnsville, Pa. Although prototype uses no computer, refined systems now on drawing boards do incorporate them.

- Stereo phono disk race is still being run hard and fast. Starting gun in this country was fired at audio show in October, but system demonstrated there is far from enjoying unanimous acceptance by record and hi-fi industry. Impor-

tant factor is that competing vertical-lateral system is right now commercially available in Europe. Still other systems are about to emerge from behind closed doors. There will be much testing and some skirmishing before standardization agreements are reached on this development.

- Current excitement about infrared obscures fact that other end of the visible spectrum is also subject of experiment. Residents of suburbs north of Philadelphia were recently startled by deep blue light flying overhead in dark of night. Explanation is experimental Navy photo plane fitted with 12 mercury-filled quartz lamps, each smaller than a cigarette, but the combination capable of 36,000 candle-

power. Standard aerial camera is used with special blue-sensitive film. Power supply for lamps is wind-driven airborne generator. Demise of incendiary flares is further accentuated by other Navy experiments with electronic flash.

- Subway strike in New York City at peak of Christmas buying season cued announcement by city's Transit Authority that some trains may soon be operated by electronic motormen. Experiment is said to be planned for shortest haul in the system, four-block crosstown shuttle service between Times Square and Grand Central Terminal. The reports from Paris indicate that such a system is being used there using magnetic tape control.

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## ENGINEERING DIGEST

- Pressure-sensitive paint which gives over a megohm of change in resistance with only 2-lb differential in pressure is now available in 1-ounce bottles from Clark Electronic Labs for making pressure transducers and for coating propellers, wind tunnel configurations and other complex shapes acted on by wind or water pressure. Connections to paint may be made with printed circuits.

- Transmission of speech in two channels, with 3,000-cps bandwidth for the frequency component and 100 cps for the amplitude component, permits receiving intelligible speech when signal-to-noise ratio is as low as 4 db in Frenac system developed by Philips in Holland. Amplitude component is coded to indicate at each instant whether or not a distinct speech sound (phoneme) is present.

- Ferromagnetic microwave amplifier developed by Bell Labs shows possibilities as amplifier for very weak signals in radio astronomy,

radar and microwave relays. Solid-state ferrite material, placed in microwave cavity simultaneously resonant at two frequencies, undergoes gyromagnetic resonance at sum frequency when these two frequencies are pumped into cavity which is properly oriented in dc magnetic field. With appropriate linear coupling to ferrite, amplification, oscillation or frequency conversion is obtained at much lower noise level than conventional microwave amplifiers.

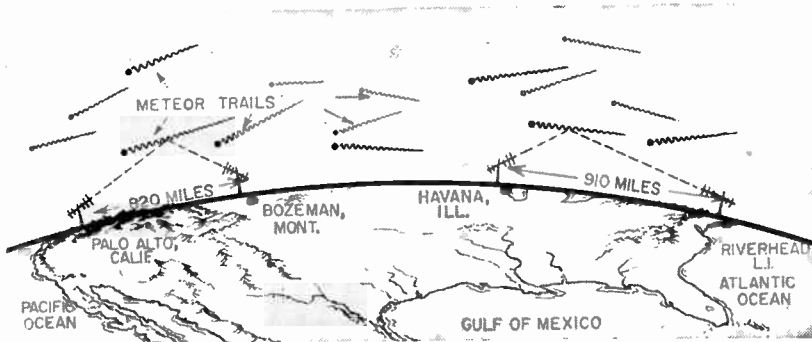
- Setting time of cement is accurately determined by measuring dielectric constant of grout placed between two capacitor plates in new electronic instrument developed by Building and Cement Technical Institute in Spain. Admittance of capacitor is measured at 28 mc. Peak in output meter reading or recorded output curve corresponds exactly to setting time as determined by mechanical tests.

- Borehole televiewer having diameter of only 2.5 inches permits examining wall surfaces of drill

holes for fissures, directions of veins and other geological structures at depths up to 1,000 feet. Camera tube, six lamps and rotating mirror are mounted inside hermetically sealed tube having pressure-proof circular window, and connected by cable to monitoring television receiver in trailer at surface. Holes as small as 2.5 inches in diameter may thus be inspected, even if filled with water or not absolutely straight. Manufacturer of equipment is Firma Grundig, Firth, Germany.

- Blimps can carry largest airborne radar search antennas in gas bag without penalizing performance in sustained flight, for dual missions of early warning and anti-submarine warfare.

- Painted coating of Aquadag on stem glass between two leads of cold-cathode fluorescent lamp gave required 600-ohm resistance value for focusing electron beam inside electrode shell, thereby increasing life of lamp made by Ideal Lighting Co.



Two experimental systems show how . . . .

## Meteors Relay VHF Signals

***Ionized meteor trails reflect signals from point to point. May be means of supplementing overcrowded radio spectrum***

IONIZED meteor trails, at times a bothersome influence on VHF voice scatter circuits, today show increasing evidence of becoming a means of supplementing the overcrowded radio spectrum.

Later experimental success with meteor trail (or meteor burst) propagation is reported by RCA Laboratories. By reflecting signals from meteor bursts, researchers were able to transmit images of visual material a distance of 910 miles.

Meteors passing through the atmosphere 60 to 100 miles above earth leave a trail of ionized air which persists from a fraction of a second to several minutes. These usually appear several times a minute along a given transmission path.

The experimental facsimile system first records the material in a manner similar to tv film transmission. This signal is continually transmitted by a directional antenna. When a trail reflects the signal to the receiver, the circuit is closed. The receiver displays the

information on a cathode ray tube, from which it is photographed.

Scanner and transmitter operate continuously, sending copies of the picture twice a second. The receiver is on continuous standby. The transmitter produces 20 kw of power at a frequency of 40 mc.

Signals sent from the National Bureau of Standards transmitter at Havana, Ill., were received at RCA's station at Riverhead, Long Island, N. Y. The system was developed for ARDC's Cambridge Research center, which initiated a meteor propagation program in 1953.

Basic research is also conducted by Stanford University and by researchers in Canada and the United Kingdom. Stanford has a voice and teletype system operating over the 820 miles from Bozeman, Mont., to Palo Alto, Calif. To make the brief meteor bursts usable, Stanford sends teletype at 600 words-per-minute, rather than 60 wpm., and sends voice at five times normal speed. Recorders are employed to step up signal speeds.

## Amputees May Use Electronics

ELECTRONIC principles that guide missiles may soon be applied to artificial limbs and braces.

The Prosthetic Research Board of the National Academy of Sciences has opened discussions with

electronics manufacturers. The Board met in Los Angeles a short while ago with Simon Ramo, of Ramo-Wooldridge.

Chester C. Hadden, of Denver, a board member, said the board is

attempting to find a method of electronically releasing and controlling at the will of the wearer the energy required to operate an artificial limb or brace.

"If we are successful," Hadden said, "entirely new vistas of rehabilitation will be opened, particularly for polio patients who have lost a major portion of their muscular control and reflexes."

## Putting Sputnik to Work

SPUTNIKS will beam radio navigation signals, tv and radio, Russian scientists predicted recently over Radio Moscow.

Professor D. K. Manayev said it is now possible to figure out the type of transmission required for radio contact with future and "much more distant *Sputniks*, interplanetary ships or objects."

Knowledge of radio waves gained so far, he declared, will help in establishing standards for wave lengths and equipment. When this is done, "it will help in organizing the radio navigation service in quite a new way.

"It is apparent it will be possible to process swiftly and effectively the data received from these *Sputniks* and apply it to the navigation of planes and ships."

Manayev reported "still another" prospect: A *Sputnik* 600 to 900 mi above the earth that can send television signals. From such a height the *Sputnik* tv signals may be received on tv sets in an area of many thousand square miles.

"That is," adds Manayev, "it will be possible to raise the transmitters of the Moscow tv center and project transmission to an area such as the whole of the European part of Russia."

In this connection, *ELECTRONICS* (Nov. 20) pointed out that, according to monitor reports, *Sputnik II* transmitted pertinent information only in the Eastern hemisphere. Theoretically it is also possible for radio signals to be beamed from a Russian transmitter to a *Sputnik*, then have the *Sputnik* beam the signals back to earth over the Western hemisphere. The possibilities for propaganda broadcasts or jamming are obvious, although Manayev spoke only in

terms of advancing Russian tv. Another Soviet scientist, Dr. Y. B. Rumer of Novosibirsk, declared that "development of radio

physics will arrive at a stage when all the satellites sent into cosmic space will transmit, not merely radio signals of the observations

carried out by instruments on them, but will transmit directly to tv screens what the radiophysical eye of the satellite sees."

## Transistors Catch British Speeders

DIGITAL techniques are making it tough on British speeders. Fifty-four transistors are used in an electronic vehicle speed measuring system developed by Venner Electronics, Ltd.

Two rubber tubes are laid parallel to each other across the road. Meter indications register the interval starting when the front wheels pass over the first tube until they pass over the second tube.

The equipment uses a crystal oscillator operating at 10 kc. Output of the oscillator is passed to two binary dividers to produce a 2.5-kc signal fed to a gating circuit.

An automobile passing over the first tube opens the gate and passing over the second tube closes it. The number of pulses that the gate passes while it is opened are counted by three decade-counting stages. This data, with the known separation of the two tubes, is used to calculate speed in miles per hour.

Accuracy is plus or minus  $\frac{1}{4}$  per-

cent at 30 mph, plus or minus one percent at 100 mph.

The equipment is battery operated. It is expected that the rubber

tubes will be left permanently in key locations. The set can then be set up at will where it is felt to do the most good.



Elapsed time system uses fifty-four transistors to measure automobile speed

## MEETINGS AHEAD

Jan. 13-15: American Management Assoc. Conf. on Product Planning, Top-management, R&D programs, Roosevelt Hotel, N. Y. C.

Jan. 22-24: Electronic Industries Assoc. (formerly RETMA) 1958 Conference on Automation, Auditorium of Arizona State College, Tempe (Phoenix) Arizona.

Jan. 27-28: Sixth Scintillation Counter Symposium, IRE, AIEE, AEC, NBS, Hotel Shoreham, Wash., D. C.

Feb. 3-7: American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, N. Y. C.

Feb. 7-8: American Society for Quality Control, "Management By Exception", Administrative Application Division, ASQC, Second Annual Conf., Hotel Carter, Cleveland, Ohio.

Feb. 18: Fourteenth Annual Quality Control Clinic, Rochester Society for Quality Control, War

Memorial, Rochester, N. Y.

Feb. 20-21: Conf. on Transistor and Solid State Circuits, PGCT, AIEE, Univ. of Penn., Phila., Pa.

Mar. 17-21: Nuclear Eng. & Science Congress, PGNS, EJC, ANS, International Amphitheater, Chicago, Ill.

JANUARY						
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MARCH						
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# NATO Sparks Production

**Specific missile business needs should be told by spring. Right now for us, big increases loom**

THE GENERAL feeling in the Dept. of Defense is that NATO countries will eventually accept the responsibility of providing launching sites for IRBM's wherever needed. This optimism prevails despite the "in principle" qualification injected in the acceptance by most of the NATO nations.

The series of successful launchings from Florida the week before Christmas and their expected continuance will undoubtedly brighten the prospects, according to observers close to the scene. Technical proficiency displayed then at least eliminates the feeling among the European countries that they are casting their lot with drawing boards instead of performing hardware.

Military conference "to be held at ministerial level in the early months of 1958" should bring NATO leaders squarely to the problem: how many missiles will be needed in Europe, what types, and where they will be used?

Apart from IRBM's, four missiles are already

slated for delivery to European forces: Nike-Ajax (later to be replaced by Nike-Hercules), Honest John, Corporal, and the Matador.

All four are already in Europe, deployed among U.S. forces. Expected delivery date to European forces: Honest John by mid-summer and Nike by October. IRBM's will be set by year's end.

The Danes and Norwegians, most outspoken against accepting IRBM's, are nevertheless ready to accept Nike installations. Both countries, as well as Italy, already have personnel in training at Fort Bliss to operate Nike.

Britain will accept IRBM's—in spite of some popular disapproval at home; Germany has said "yes" to the Matador; and all countries have agreed on "the need" for missile protection.

Although no announcement has been made concerning supplying smaller air-to-air type missiles to NATO forces, it is nevertheless a possibility. Japan's acceptance before Christmas of the Sidewinder might be a trend.

Regardless, however, of how the final defense picture in Europe shapes up, production increases for the electronics industry will be large.

## MILITARY ELECTRONICS

- Republic has two Army contracts, totaling \$4.7 million, for design and production (in service test quantities) of two battlefield surveillance drone models. Both will use radio command guidance systems, also designed by Republic. They will be zero-length launched and recoverable.

Three interchangeable nose units are capable of photographic, radar and infrared observations. The first drone, designated SD-3, has a pusher prop. Propulsion type and designation of the second drone have not been announced.

- North American is buying \$1.8 million worth of General Precision Lab's 89-lb doppler navigation equipment, Radan, for an undisclosed military plane. Operating speeds must go up to 1,000 knots.

Largest single production order to date for military Radan (APN-102), delivery will begin in June.

- New million-dollar electronics vacuum test chamber has been installed at Convair's San Diego plant to test electronic and air-conditioning components of the F-106A Delta Dart. Large enough to enclose a full-scale fuselage (12 ft by 70 ft), the steel cylinder is divided into two 35-ft sections. One section can be rolled back on a track to expose the forward half of the F-106A for adjustment of the electronic systems.

Altitudes up to 100,000 ft and aerodynamic heating up to 830 degrees F can be generated. 750 infrared tubular quartz lamps (2,500 watts) line the interior of the test stand.

## CONTRACTS AWARDED

RCA Service Co. gets \$498,606 contract with AMC for operation and maintenance of SAGE powerhouse equipment including custodial services for the direction of the center.

Ryan will provide product improvement for the Q-2 drone system for AMC under \$165,000 contract.

GE will supply technical professional services of electronics field engineers to BuShips under \$241,260 contract.

Western Electric gets \$600,000 contract with NY Ordnance District for R&D of Nike-Zeus in addition to the \$5,086,481 contract announced in *ELECTRONICS*, Nov. 20.

McDonnell Aircraft gets \$125,000 contract with Ogden Air Materiel

Area Headquarters for modification of MA-7 radar depot test equipment.

Motorola is awarded \$306,602 contract with BuShips for four microwave radar relay terminal systems, including transmitting and receiving terminal equipment both with 6-ft parabolic antennas.

Raytheon has \$159,740 contract with Dayton Air Force Depot for klystron tubes totaling \$128,700.

United Electronics has two contracts with Dayton Air Force Depot for rectifiers totaling \$128,700.

Byron Jackson div. of Borg-Warner wins \$202,365 contract with Dayton Air Force Depot for four test sets for AN/MSM-11 radar equipment.

Radioplane will provide the Los Angeles Ordnance District with supplies and services for missile targets under \$370,438 contract.

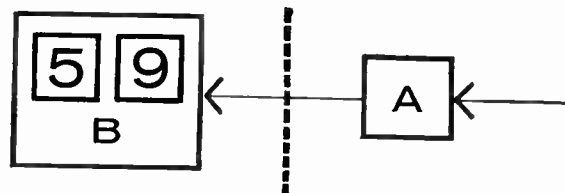
Sperry wins \$521,620 contract with Army Signal Supply Agency for research and development for six months study on passive airborne battle area surveillance system.

Olympic Radio & Television div. of Siegler is awarded an additional \$½ million contract from BuShips to produce ground test and monitoring equipment for TACAN. This contract brings Siegler's total for TACAN to over \$5 million.

Crosley div. of Avco gets \$1 million contract with AMC for fire control systems for the B-52 (type AN/ASG-15).

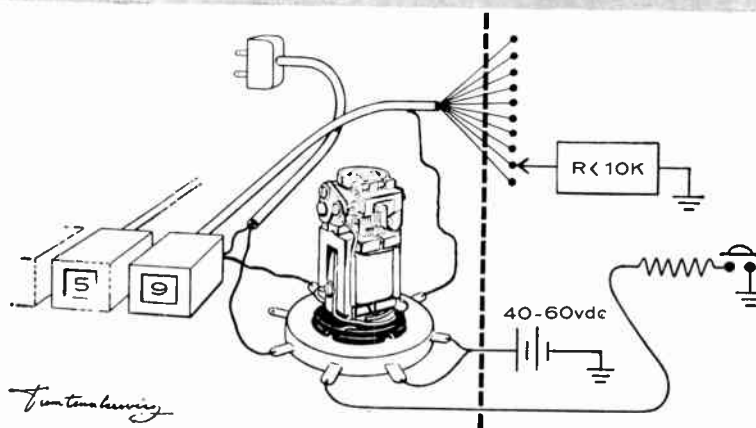
Arma div. of American Bosch Arma will repair, rework, refurbish and/or modify type MD-9 fire control systems used on the B-52 for AMC under \$122,240 contract.

University of Texas has a \$300,010 contract with AMC for application testing (engineering services) for the MD-7 and MD-9 fire control systems used in the B-52.



## fast switch ON THE NUMBERS

Taking coded information, translating it into decimal form (A) and displaying it on the wall (B) seems to be a matter of concern to a fair number of people these days. Part "B"—making the right number come up—offers an opportunity to demonstrate the virtues of a Sigma Series 72 polar relay. As explained below, halting of display devices can be accomplished in a variety of ways. But because of the 72's combination of high speed, precision and sensitivity, the problem of consistently keeping up with a high speed number drive on very little signal power is solved all at once.



The breadboard diagram to the left of the dashed line has been drawn by our artist, who feels that schematic symbols can never do justice to a Sigma Type 72AOZ-1000-TS High Speed Polar Relay. Of course this may be an expensive way to run a cycledec, but if you are in a hurry you don't want to have to dish up nine separate pulses from the info department (right of the dashed line). Besides, what if it missed counting one of them? To be sure, the relay could be eliminated and the cycledec run directly through its own internal switch contacts. But then AC

supply voltage would have to be put on all switch points except the designated one. This would make it rough for any little solid state peanut you tried to put in that box marked R < 10K.

As it is, the 72 will remove the supply from the cycledec .0005 seconds after it lands on the right number, and restore the supply .0008 seconds after you move the ground to another switch point and "push" the reset button. Incidentally, completion of selection puts power on the other contact of the 72, which can then run lights, bells or some other success signal.

Some of the virtues of a Type 72AOZ-1000-TS TCP\* SPDT polar relay are:

Contacts rated 500,000,000 operations 60 ma. 120VDC

Coils, two, 1000 ohms each

Either-side stable, operate 0.56 ma. either way either coil

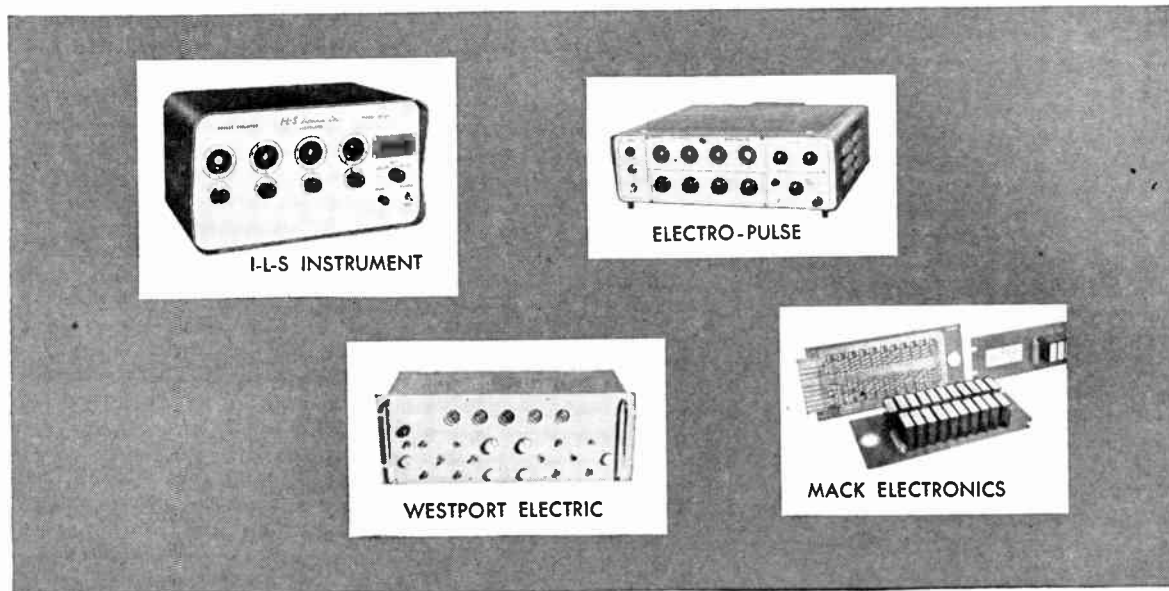
\*Armature tungsten, fixed contacts copper-palladium

You can get one such 72 relay with removable dust cover for \$30.00, or for less money in quantity. Samples are available on order, or a bulletin simply on request.

## SIGMA INSTRUMENTS, INC.

62 Pearl Street, So. Braintree 85, Mass.

# Counters Appear In Volume



## Exhibit High Versatility

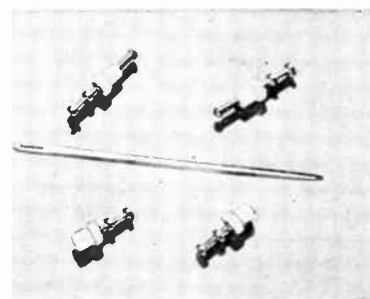
COMMON denominator for the latest counting devices on the market is versatility of application. Small size, high reliability and simplicity of operation are featured.

A small and reliable counter is put out by Westport Electric, 149 Lomita St., El Segundo, Calif. (40) It is used as a frequency and time interval meter. As a frequency meter, time bases of 0.01, 1.0 and 10 sec are provided. Frequency range covered is 10 cps to 100 kc with a minimum sensitivity of 100 mv. Time interval time base frequencies are 100 kc, 10 kc and 1 kc, with an accuracy of  $\pm 1$  count,  $\pm$  crystal stability of 0.001 percent.

Mack Electronics, 40 Leon St., Boston, Mass. (41), has a line of magnetic core-transistor counters for industry and military, requiring one voltage supply and no standby power. A counter with 100 million count capacity at 100 kc count rate would use only 0.2w average power. Counters are available as plug-in units or with solder lugs, or printed board mounting.

Available from Electro-Pulse, Inc. 11861 Teale St., Culver City, Calif. (42), is a preset counter and digital frequency divider. Switches, photocells and pressure pickups are typical transducers. Modular construction, printed wiring and snap-off top and bottom plates for ease of adjustment and maintenance are featured. The unit occupies a minimum of bench space.

I-L-S Instrument Corp., 4530 W. 160th St., Cleveland, Ohio, (43) offers a preset counter for automatic control. It can be used as a totalizing counter at rates up to 5,000 counts per sec or as a pre-set counter adjustable from 1 to 9,999 counts up to 1,000 counts per sec without error.



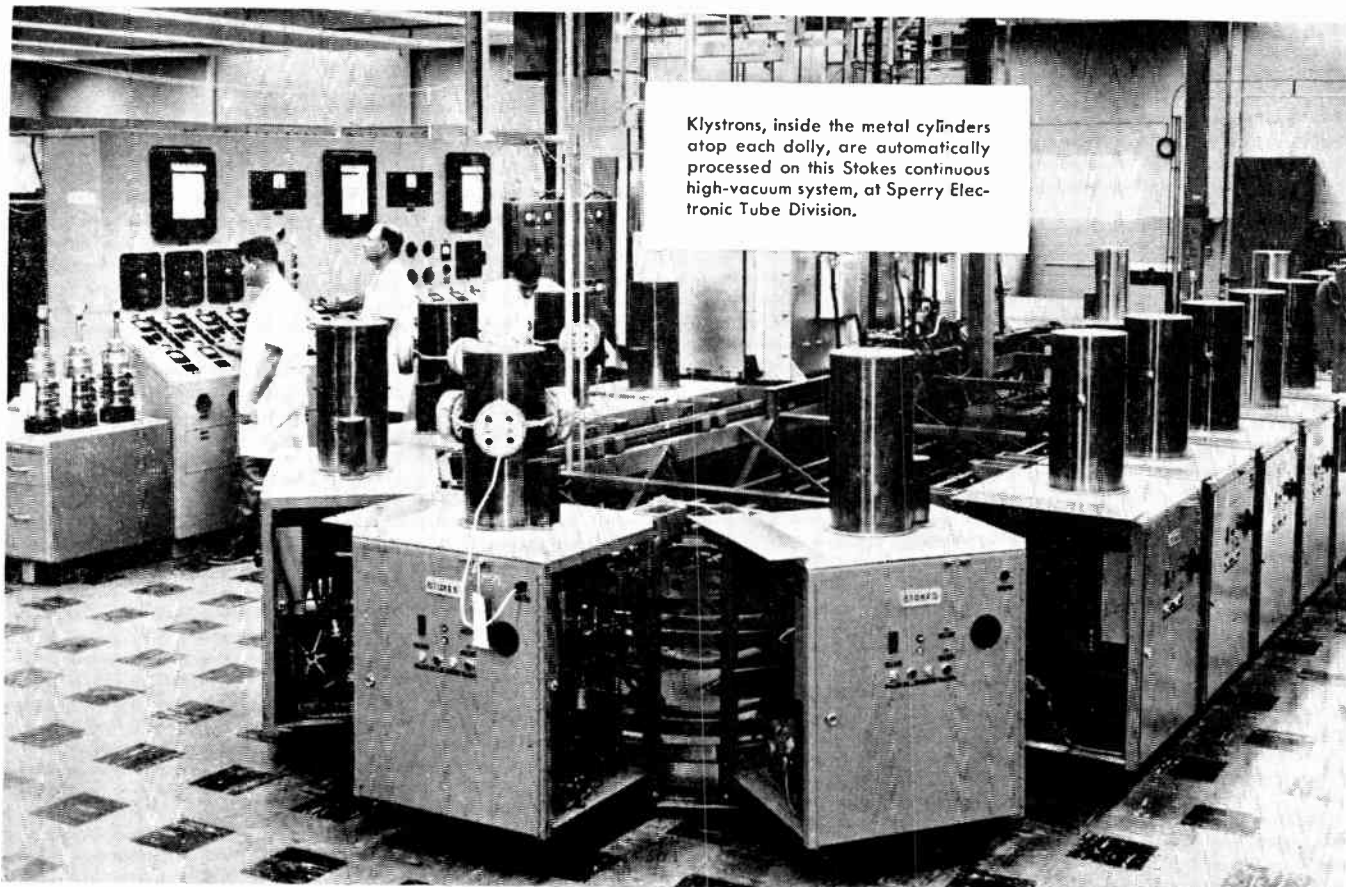
## Insulated Terminals With turret lugs

SEAELECTRO CORP., 610 Fayette Ave., Mamaroneck N. Y. The advantages of Teflon insulation and handy turret connections are now available even in the tiniest Press-Fit terminals.

Types ST-SM-16 TUR and FT-SM-16 TUR Press-Fit terminals install in 0.080 in. diameter holes and maximum chassis thickness to 0.075 in. Overall length including one or two lugs is 0.350 in. for standoffs and 0.500 in. for feedthroughs. Lugs are of brass, solder finish. The Teflon body insures not only ideal insulation over a temperature range of  $-65$  to  $+ 200$  C, but also the simplest, fastest, most positive Press-Fit in

For more information use READER SERVICE CARD





Klystrons, inside the metal cylinders atop each dolly, are automatically processed on this Stokes continuous high-vacuum system, at Sperry Electronic Tube Division.

## Klystron production automated with Stokes high-vacuum system

THESE Sperry Klystrons have *got* to be rugged and stable... they're the heart of transmitters for precision, all-weather navigation systems. Producing Klystrons requires extremely high vacuum and elevated temperatures to completely de-gas and dry the tubes internally. These conditions must be attained on a high-production, automatic basis.

Stokes, pioneer in high-vacuum processing equipment for the electronic industry, designed and built a continuous evacuating and conditioning system that performs these functions and eliminates the need for duplicate accessory equipment for each of the separate units formerly used. The system consists of an endless loop of evacuating stations, each housed in an individual dolly. As the dollies index around

the loop, the tubes are successively degassed, evacuated, aged, conditioned and sealed.

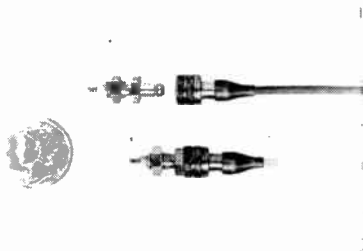
Each Klystron is enclosed in a stainless steel bell in which a reducing atmosphere is maintained to prevent oxidation of the copper tube body during the heating cycle. All operations are automatically sequenced and controlled, with interlocking circuits and limit switches giving added protection. Any dolly can be removed and replaced without shutting down the system.

This Klystron production system is an example of how another major manufacturer is benefiting from Stokes' long experience in high vacuum engineering and automatic production techniques. For a consultation on your specific needs, call your nearest Stokes office.

*Vacuum Equipment Division*  
**F. J. STOKES CORPORATION**  
 5500 Tabor Road, Philadelphia 20, Pa.



metal chassis or casting, by means of a simple insertion tool available from Sealectro operated in a drill-press or arbor type equipment. These microminiaturized terminals are available in any one of the eight RETMA code colors. Circle 44 on Reader Service Card.



### Coax Connectors Have snap-lock action

ELECTRO-PHYSICS LABORATORIES, 2065 Huntington Drive, San Marino, Calif., offers a new micro-miniature coaxial connector featuring a snap-lock design for fast, easy connection in limited-access spaces and increased reliability. Connection is positive and withstands shock and vibration over long periods, without signal loss, loosening, or mechanical damage. Units will take 100 g shocks in any axis.

They are considerably smaller and lighter in weight than BNC connectors. A typical unit weighs only 0.10 oz. and measures only  $\frac{3}{4}$  in. by  $\frac{1}{4}$  in.

A small amount of finger pressure snaps the new connectors together instantly. Pressure in the opposite direction quickly separates the plug and receptacle. No pliers or special tools are required. Snap-lock action is made possible by a spring-loaded retainer ring that engages in the groove of the receptacle. The center conductor in each unit is recessed so that it cannot bend, break or short out against an airframe.

Frequency range of the connectors is 0 to 12 kmc and impedance values are 50, 75 and 95 ohms. Voltage breakdown is 1,500 v rms minimum at 1 atmosphere and temperature range is  $-70^{\circ}$  F to  $+550^{\circ}$  F. The units withstand vibration up to 10 g at 10-3,000 cps. Circle 45 on Reader Service Card.



### Klystron Supply Has new clamping circuit

CUBIC CORP., 5575 Kearny Villa Road, San Diego, Calif., has available the model 701-B klystron power supply which accommodates reflex klystrons requiring up to 600 v of beam voltage.

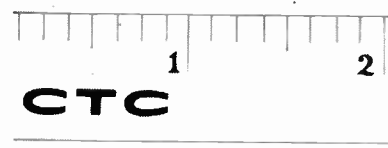
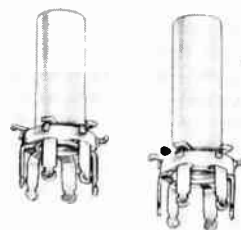
Basic features include a unique clamping circuit which allows c-w or square wave operation without readjustment of the reflector voltage, voltage stability far superior to r-f supplies because model 701-B has a shunt regulated reflector supply, minimized f-m modulation of the klystron as a result of square wave modulation with minimized rise and decay time. Circle 46 on Reader Service Card.



### Twin Triode Added to special tube line

RAYTHEON MFG. CO., 55 Chapel St., Newton 58, Mass. Type CK5687WA reliable miniature twin triode is now available. It meets military specifications and is ideal for pulse or servo driver applications in equipment which must operate well under conditions of severe mechanical environment. Electrically it has high emission

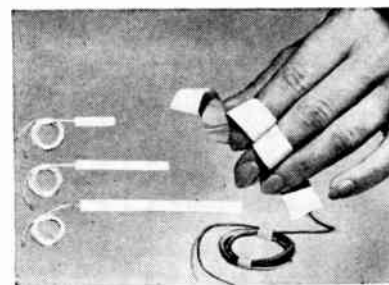
capabilities, high permeance, medium  $\mu$  (18.5) and controls for plate emission as well as for minimum formation of cathode interface resistance. The cathode current maximum for each section is 65 ma d-c and the total allowable dissipation for both plates is 7.5 w. Circle 47 on Reader Service Card.



### Terminal Collars Extend coil form use

CAMBRIDGE THERMIONIC CORP., 445 Concord Ave., Cambridge 38, Mass., announces two new terminal collars that extend the use of two of its regular coil forms for more complicated r-f circuitry.

The new five and six terminal collars have been designed for CTC's vertical mount ceramic printed circuit coil forms SPC 11 and SPC 12. They are silicone fibre glass with silver plated brass terminals. Circle 48 on Reader Service Card.

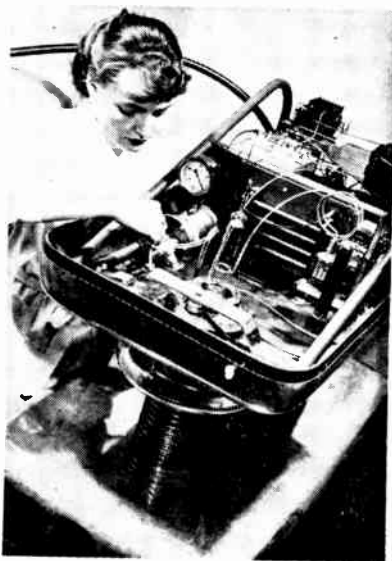


### Thermal Ribbon For accurate monitoring

MINCO PRODUCTS, INC., 740 Washington Ave. North, Minneapolis 1, Minn. The thermal ribbon pro-

vides a means of electrically detecting the temperature of the surface to which it is attached. Extremely flexible and with negligible thermal lag, the ribbons are ideally suited for use in aircraft, missiles, electronic equipment and other applications where it is necessary to accurately monitor or control temperatures of surface areas.

The thermal ribbon consists of a resistance element of high nickel content alloy wire encased in a flexible outer covering. Less than 0.020 in. thick, the ribbon may be cemented to flat, cylindrical, or irregular surfaces. Self adhering types are also available. Designed to operate over wide temperature ranges, at high altitudes, and under severe physical conditions, the ribbons are manufactured in several shapes and sizes. Circle 49 on Reader Service Card.

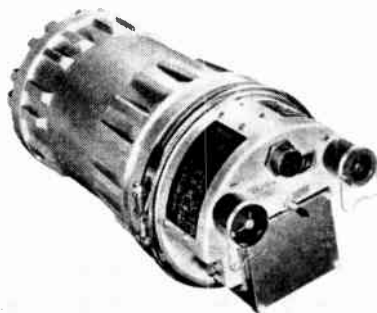


### Portable Accelerator Rugged, simple to operate

DOMINIQUE GIGNOUX, 50 Broadway, New York 4, N. Y., has announced a portable industrial accelerator (built by S.A.M.E.S. in France) which is supplied by 150 kv Felici electrostatic generator. It is rugged and simple to operate. With deuterium-tritium reaction, the accelerator produces  $10^{10}$  neutrons per sec of 14 mev energy level; with deuterium-deuterium reaction, it produces  $5.10^{10}$  neutrons

per sec of 2.5 mev energy level.

It is particularly well suited for universities, or industrial research centers. Transported in a truck the accelerator can be used to simulate in the field the radioactivity created by atomic explosions. Circle 50 on Reader Service Card.



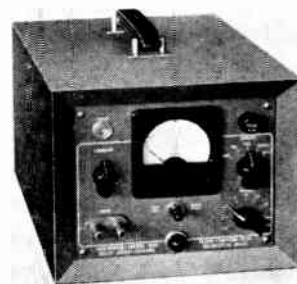
### Airborne Inverter A compact unit

WESTERN DESIGN & MFG. CORP., Santa Barbara Airport, Goleta, Calif., announces an airborne inverter power supply designed to invert 27.5 v d-c to a regulated source of 115/200 v, 400 cycles, a-c at a 3,500 volt ampere load for various components within an airframe.

Weighing 68 lb and measuring less than 19 in. in length by 11 in. in diameter, the model 433 inverter may be modified at the factory to provide volt amperes ranging from 1,500 to 3,500 depending upon application requirements.

Both voltage and frequency regulation are obtained by a hermetically sealed, potted magnetic amplifier regulator. A  $\pm 1$  percent excursion on both frequency and voltage is maintained over any combination of load-temperature-input voltage change within the limits of variation in load of 50 percent within temperature range of  $-65^{\circ}\text{F}$  to  $+165^{\circ}\text{F}$  ambient and input voltage of  $\pm 5$  percent.

Packaging and mounting provisions are such that the operating unit will withstand shock up to 100 g or vibration accelerations to 12 g at frequencies from 20 to 2,000 cps. Circle 51 on Reader Service Card.



### RMS Voltmeter Random signal instrument

FLOW CORP., 85 Mystic St., Arlington 74, Mass. Model TBM random signal true root-mean-square voltmeter provides accurate, steady long-time-average measurements in the presence of h-f signal components. It features a panel switch selection of "Fast" (about 0.1 sec) for quick estimates of rms level and "Slow" (about 10 sec) for exact measurements. The slow reading provides accurate true rms voltage measurements through a thermal squaring-averaging device. Readings are steady, unambiguous, reproducible, and accurate to 2 percent full scale on all ranges.

Bandwidth is 2 cps to 250,000 cps flat  $\pm 0.2$  db. Eighteen voltage ranges are provided, 500  $\mu\text{v}$  to 250 v rms full scale. Peak factor is 10. Calibration and overload protection are built in. Size is 8 in. wide, 7 in. high, 12 in. deep. Circle 52 on Reader Service Card.



### Tiny Connectors Snap lock series

VIKING INDUSTRIES, INC., 21543 Roscoe Blvd., Canoga Park 1, Calif., is introducing a new series of environmental miniature connectors which feature a simple, but positive automatic locking device. This quick-disconnect device locks

From 0 to 10,000,000 Megohms

accurate within 3% to 1,000,000 megohms . . . only \$200.00

## SIE Model C-6 Resistance Meter



DIRECT  
READING  
•  
THREE  
TEST  
VOLTAGES

- Pre-settable "charge adjust" control for rapid go-no go capacitor checking
- 1½, 50 and 500 volt test voltages
- Three ranges: 0 to 500,000 ohms;
- 100,000 ohms to 1,000,000 megohms;
- 1 megohm to 10,000,000 megohms.

237-58



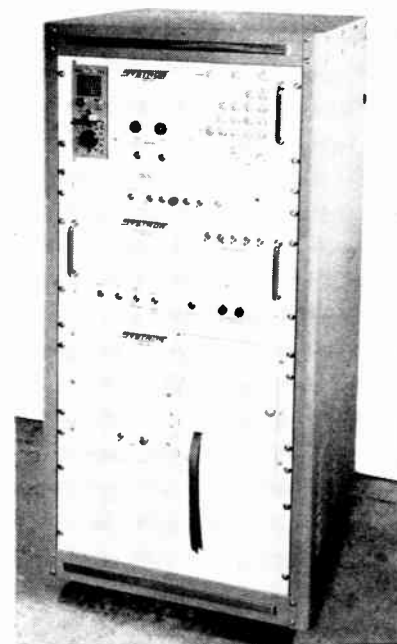
**SOUTHWESTERN INDUSTRIAL  
ELECTRONICS COMPANY**  
2831 Post Oak Road • P. O. Box 13058  
**Houston 19, Texas**

automatically when engaged. The connector has an orange colored band which is visible only when connector is disengaged and is covered when engaged.

The environmental characteristics are achieved by a resilient interfacial gasket between the plug and receptacle mating faces which is compressed when connector is locked. A resilient grommet which is compressed in the rear of the plug and receptacle after soldering has been performed, completely captures and isolates each individual solder pot. All contacts, one to another and to ground, are completely isolated by resilient gasket and grommet.

The connector has been tested under water at 16 psig pressure for one hour and has been found completely waterproof.

Viking connectors are available in 1 through 13 No. 20 contacts with a choice of mounting styles or as a cable connector with plastic or glass (hermetic) insulation. Circle 53 on Reader Service Card.



### Data Processor For in-plant use

SYSTRON CORP., 2055 Concord Blvd., Concord, Calif., is producing the series 160 analog to digital data processor to meet the need for a rugged, yet versatile roll

around" data handling unit for industrial in-plant use.

Pressure, temperature, force, rate, acceleration, or any variable that can be presented as an analog voltage may be employed as input information to a series 160 data processor. The information, the company says, is converted to digital form and made available either visually as a direct reading in-line numerical 3-digit indication, as a number printed sequentially on paper tape or in punched tape form.

The processors range from relatively simple single channel, single output equipments to the more versatile multichannel devices with output in several selectable forms. Typical specifications would provide a range of  $\pm 5$  mv full scale, a sampling interval of 0.001 sec at repetition rates of up to 400 samples per sec or as otherwise limited by output device, and an accuracy of  $\pm 0.1$  percent of full scale. Circle 54 on Reader Service Card.



### Industrial Triode Radiation-cooled

AMPEREX ELECTRONIC CORP., 230 Duffy Ave., Hicksville, L. I., N. Y. Type 7092 is a compact, radiation-cooled, high power industrial triode. The new internal anode is designed for industrial oscillator applications in ultrasonic, induction or dielectric heating equip-

ment. Since the tube does not require water cooling it has lower initial and operating costs than similarly rated tubes, with savings of approximately 40 percent in tube and accessory costs.

The heavy-duty anode is able to withstand heavy overloads. The tube envelope is constructed of extra-thick, hard glass for temperature resistance and ruggedness.

Used in continuous class C operation, 2 kw power into industrial loads can be obtained, and 3 kw in intermittent operation. The thoriated-tungsten filament of the type 7092 is rated at 6.3 v, 32.5 amperes. Circle 55 on Reader Service Card.



### Magnetic Amplifiers Feature variable gain

DYNAMICS RESEARCH ASSOCIATES, P. O. Box 5841, St. Louis 21, Mo. Two new operational magnetic amplifiers, featuring variable gain to allow full output for a wide range of input signals, have been added to the Dynamag line. They are designed to amplify signals from thermocouples, strain gages, photoelectric cells, demodulators, and instrument pickoffs to drive meter movements, electro-hydraulic valves, and power amplifiers.

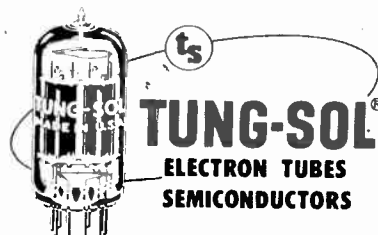
Feedback parameters of these units determine overall gain and may be arranged so that either the load current or load voltage is independent of changes in the load value. Stability is maintained by a current or voltage negative feedback external to the amplifier. Zero drift is low, less than 0.2 percent of full scale output for a temperature range of 0 to 170 F. Fluctuations in supply power voltage

## ACCEPTED SYMBOLS

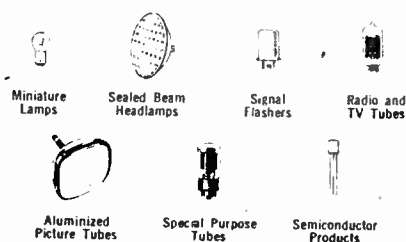


Symbol for zirconium . . . ideal element for absorbing unwanted gases at the high temperatures at which some electron tubes operate.

Just as Zr is the accepted symbol for zirconium, so Tung-Sol represents the highest quality production of electron tubes to volume requirements. This ability is a major reason why Tung-Sol is America's largest independent electron tube manufacturer.

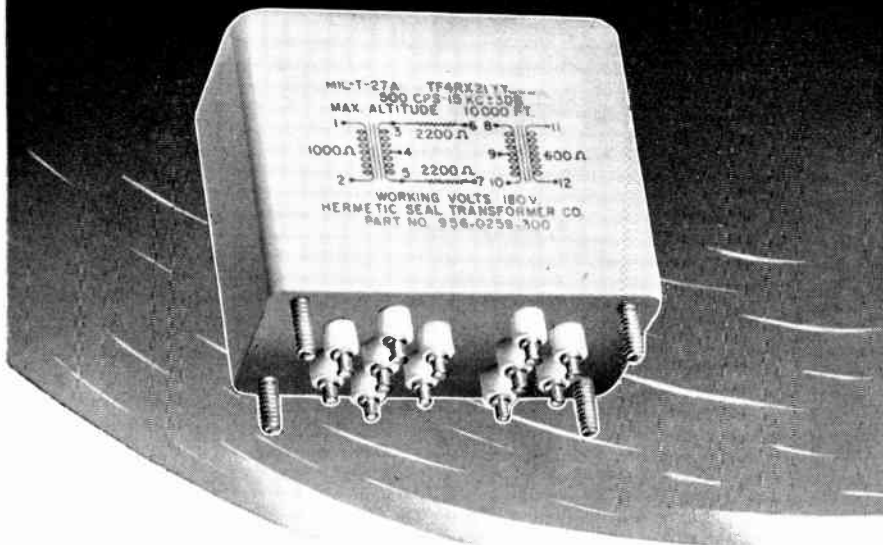


Tung-Sol Electric Inc., Newark 4, N. J.  
Manufacturers of Automotive and Electronic Components.



CIRCLE 26 READERS SERVICE CARD

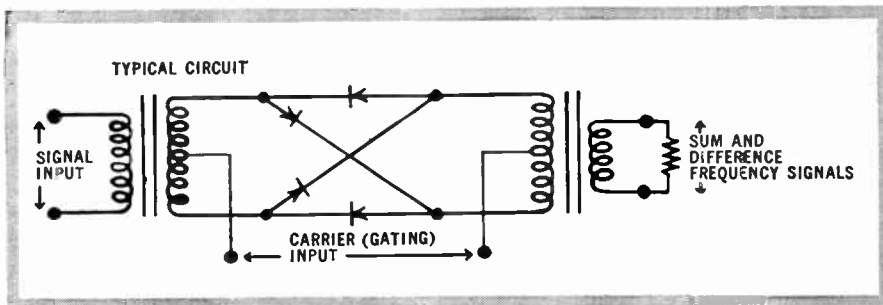
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transformer co.



## SPECIAL BALANCED MODULATOR TRANSFORMER Custom-Engineered to Customer Requirements

**APPLICATION:** Used to impress a carrier frequency source upon a signal frequency source to generate signals of sum and difference frequencies while simultaneously suppressing the carrier from the input and the output circuits and also isolating the input and output circuits. See schematic below:

**NOTE:** By impressing a pulse signal on the carrier input terminals, the input signal is effectively switched (gated) on and off at the output circuit. Polarity of the switching pulse determines phase of the output signal.



### SPECIFICATIONS (H.S.T. PART 956-0259-300)

**DESIGN SPECIFICATIONS:** MIL-T-27A, Class R, Grade 4  
**SIGNAL SOURCE IMPEDANCE:** 1000 ohms  
**SIGNAL INPUT VOLTAGE:** 45 volts P-P maximum  
**SIGNAL INPUT FREQUENCY:** 1300 cps  
**GATING SOURCE IMPEDANCE:** 400 ohms  
**GATING SOURCE VOLTAGE:**  
 Square Wave + 18 to - 18 volts P-P

**GATING SIGNAL FREQUENCY:** Square Wave, 650 cps  
**OUTPUT LEVEL:** 0.25 to 2.0 volts P P  
**BANDWIDTH:** 500 cps to 15 kc ± 3 db  
**CARRIER SUPPRESSION:** 50 db minimum  
**SIZE:** 1 3/8" x 2 5/8" x 2 1/4" high  
**WEIGHT:** 0.6 pounds maximum

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and frequency of 10 percent give a zero error of less than 1 percent of full scale output.

Their linearity of output, in terms of input signal, is less than 2  $\mu$ a, (0.5 mv) over the maximum output and less than 10  $\mu$ a (1.4 mv) over full output.

Cylindrically shaped model MA41, with a maximum power rating of 62 mw, has an output of 10 v, d-c maximum across a 10,000-ohm load and 18-ma d-c through a 200-ohm load, and a time constant approximately equal to the voltage gain divided by 1,500 (in sec). It measures 2 in. in diameter by 3 1/2 in. long, weighs 12 oz., potted, and requires supply power of 1.5 w, 115 v rms, 400 cps. Circle 56 on Reader Service Card.



## Signal Generator Features high accuracy

ADVANCE ELECTRONICS LAB., INC., 249 Terhune Ave., Passaic, N. J. Type 209 standard frequency signal generator consists of a tuning fork oscillator, with negative feedback for amplitude stabilization; a twin-T filter with a cascade amplifier for elimination of harmonic distortion; an output cathode follower; a resistive attenuator with 2,500 ohms impedance; an output meter circuit to indicate the signal voltage at the output terminals; and a regulated power supply.

Standard frequency is 400 cps; other frequencies can be supplied on request. Output voltage range is 0 to 10 v continuously variable. An output meter is supplied for direct indication of a signal voltage at output terminal on panel meter in rms value, with an accuracy of ± 3 percent. Output impedance is 2,500 ohms. Distortion is less than 0.5 percent. Circle 57 on Reader Service Card.

# New Literature of the Week

## MATERIALS

**Laminated-Plastic Sheets.** New England Laminates Co., Inc., 481 Canal St., Stamford, Conn., has available a loose-leaf catalog describing its Nelco thermosetting laminated-plastic sheets for printed-circuit and similar uses. Circle 58 on Reader Service Card.

**Urethane Coatings.** B. B. Chemical Co., 784 Memorial Drive, Cambridge, Mass. New low viscosity, high temperature resistant coatings that boast of fast low temperature cure, good dielectric properties, and high adhesive and mechanical strength are described in recent data sheets. Circle 59 on Reader Service Card.

## COMPONENTS

**High-Speed Rotary Switches.** Instrument Development Laboratories, Inc., 67 Mechanic St., Attleboro, Mass. A new bulletin covers high speed rotary switches for telemetering, programming, sampling and scanning. Circle 60 on Reader Service Card.

**Motors Catalog.** Servo-Tek Products Co., 1086 Goffle Road, Hawthorne, N. J. Catalog No. 43 lists many new synchros, a-c/d-c motors, servo motors, inverters, actuators, gear motors, generators and other components. Circle 61 on Reader Service Card.

**R-F Filters.** The Magnavox Co., Ft. Wayne 4, Ind. A 4-page brochure contains general characteristics and frequency vs attenuation curves for a line of r-f filters. Circle 62 on Reader Service Card.

## EQUIPMENT

**Composition Controls.** International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. Catalog data bulletin A-4a covers a line of

type Q composition controls. Comprehensive data on construction, materials, identification, dimensions, and other information are given. Circle 63 on Reader Service Card.

**Current Governors.** North Hills Electric Co., Inc., 402 Sagamore Ave., Mineola, N. Y. Bulletin 957 covers applications of current governors, a specially developed series of current control and testing devices with ranges extending from 1 ma to 30 amperes. Circle 64 on Reader Service Card.

**Frequency Meters.** Varo Mfg. Co., Inc., 2201 Walnut St. Garland, Texas, has available a booklet describing its line of precision frequency meters with accuracies to 0.01 percent. Circle 65 on Reader Service Card.

**Oscillographic Recording Equipment.** Sanborn Co., 175 Wyman St., Waltham 54, Mass. A new 16-page catalog contains descriptions, specifications and prices of all the company's "150" oscillographic recording systems. Circle 66 on Reader Service Card.

**Tape Recorder Directory.** Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y. Volume 13, No. 3, of Audio Record is a 24-page house organ illustrating and giving quick facts on a wide variety of magnetic tape recorders. Manufacturers of each are listed. Circle 67 on Reader Service Card.

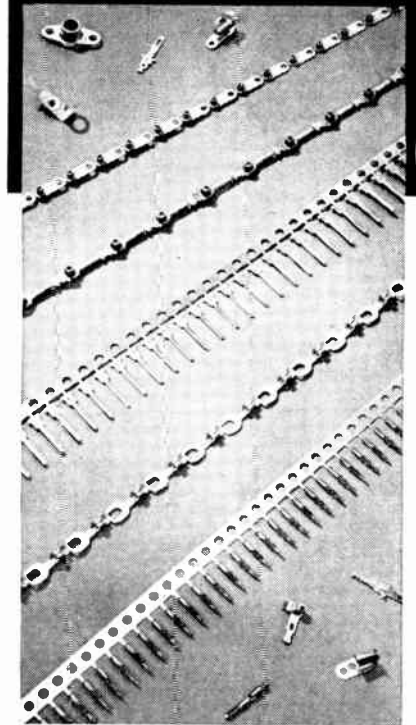
## FACILITIES

**Transistor Manufacturing.** General Transistor Corp., 91-27 138th Place, Jamaica, N. Y. With the help of 15 photographs and a flow chart, an 8-page brochure shows the step-by-step operations in the production of the germanium alloyed junction transistor from raw material to finished product. Circle 68 on Reader Service Card.

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# USSR Shifts Industry Heads

## Latest move points to blending of electronics into more unified military production effort

SOVIET ELECTRONICS is apparently being woven into a more unified military production effort. Last month four defense ministries were abolished and a new Deputy Premier appointed, with apparent control over military technology.

Dmitri F. Ustinov, former Minister of Defense Industries, was made the fourth Deputy Premier of the Soviet Union. The Ministry of the Radio-Technical Industry was abolished and reorganized as the State Committee for Radio and Electronics.

Defense Industry, Aviation Industry and Shipbuilding were the other ministries abolished. All were reorganized as State Committees under the Soviet Council of Ministers.

V. D. Kalmykov, former Minister of Radio-Technical Industries, is now chairman of the State Committee for Radio and Electronics. Ministers for two of the other three industries were similarly named state committee chairmen, presumably downgraded because they report to the Council of Ministers.

Only Ustinov, a member of the Central Commit-

tee of the Communist Party, appears to have gained power by his appointment as a Deputy Premier. Exact meaning of the ministerial shuffle is not yet clear.

Direct supervision of the defense industries would seem to mean that all technology has been moved closer to the policy-making level in the person of Ustinov. This might mean not only tighter defense management but also better access to scientific information for propaganda purposes.

There has been a concerted propaganda effort at home to tie scientific advancements in with the destiny of Mother Russia. A recent issue of the magazine "Knowledge Is Strength" carries replies to the editor's question: "What progress will science and engineering make in 40 years?" One reply:

A photon rocket may be developed and launched experimentally within the next few years. Professor Georgi Babat wrote that the test launching would provide necessary data for later development of a quantum rocket that could streak out beyond the lunar orbit in a few seconds.

Anyway, it's a sure bet the Russian high command is thinking big and giving scientists and engineers the broadest kind of encouragement, knowing these efforts all eventually flow towards greater military strength.

## DEVELOPMENTS ABROAD

- Soviet scientists say a "molecular clock" designed by the Physics Institute of the Academy of Science loses no more than 0.1 microsecond a year. Clock is said to be based on electromagnetic impulses, with frequencies up to 240 kmc, and is described as a blend of radio engineering and quantum physics. With the clock, generation and reception of microwaves will be 3,000 times more accurate than with present Russian equipment. Clock is also an amplifier potentially useful for radio, trans-horizon radar and wide-band microwave communications.

- In Britain a 4-million electron-volt linear accelerator has been ordered from Mullard by British Petroleum. Traveling wave type machine uses r-f power generated

by a magnetron valve operating at 3,000 mc. Mean electron energy will be 4.0 mev, and mean electron output 800 watts at 500 pps. Pulse repetition frequency will vary between 100 and 500 pps. Maximum x-ray output using tungsten target is 700 roentgens per minute at 1-meter distance.

- Australia plans a new missile launching site this year at a cost of about \$12 million. There are plans also for extension of instrumentation at the existing South Australian range, and extension of the range itself over the Indian Ocean towards Christmas Island. Possibility of testing U.S. missiles is said to hinge on the awaited report of an American technical commission that recently visited Australian installations.

## EXPORTS and IMPORTS

In Frankfurt, West Germany, Daystrom has formed Daystrom Elektro GmbH as a new subsidiary of Daystrom International. Firm expects to increase export sales by more than 300 percent in a five-year period. Daystrom believes European Common Market will be a big factor in increasing electronics exports, sees Daystrom Elektro as a first step towards establishing a position to take advantage of it.

Australia is limiting transistor imports to strengthen local manufacturers. Recently, several import applications have been refused. At least three large firms have indicated plans to manufacture transistors in Australia. They include the Australian subsidiary of Philips and Melbourne Electronic Indus-



tries. Another manufacturer expects to open a transistor plant in Sydney. Standard Telephones & Cables of Sydney, an IT&T affiliate, is already making transistors.

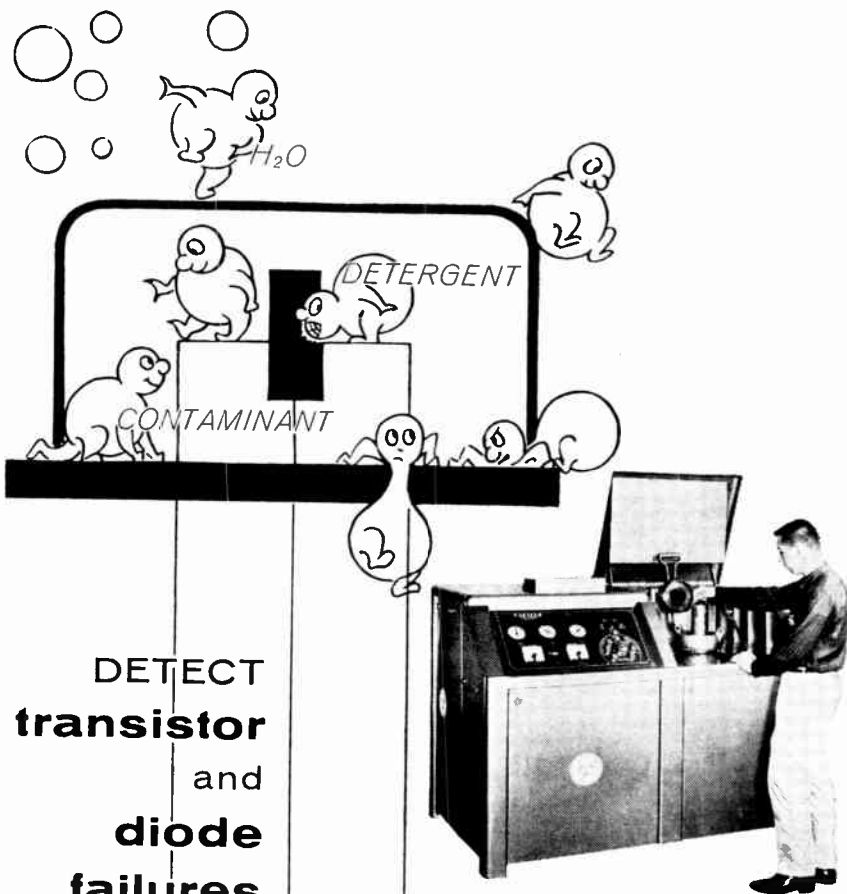
In Glenrothes, Scotland, newly-formed Beckman Instruments Ltd. will start operations next month in its new \$250,000 plant. Beckman expects the subsidiary to augment its foreign sales by at least 20 percent during the next three years, believes it will open new instrument and component markets in the United Kingdom and other Sterling areas. Ultimately, Beckman expects its Scottish operation will include products which must now be exported from the U. S.

In Tokyo contracts have been signed to implement a licensing agreement between Servomechanisms (Canada) Ltd., of Toronto, foreign sales arm of Servomechanisms Inc., and Mitsubishi Electric Co. Initial contracts for more than \$75,000 call for sample units, parts kits and technical services to aid Mitsubishi. Servomechanisms calls the agreements a definite step in its "planned program to greatly expand its activity in overseas markets."

In Milan Belock Instruments Corp. signed a licensing agreement with C. E. A. (Costruzioni Eletttroniche Automatismi), which gives the Italian firm permission to make and sell Belock products in Europe. Electronic technical assistance is also provided.

Japanese firm Hitachi Ltd. has signed a contract with International Importers, Inc., of Chicago, for exclusive U. S. distribution of Hitachi electronics products, including receiving tubes for radio and tv sets, transistor radios and other specialty items.

British firm G. F. Miles and Bell Helicopter Corp. of Fort Worth, Texas, last month reached an agreement covering various phases on exchange of information on servo-electronic developments and visual presentation projection systems made for use in helicopter simulators.



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RADIFLO Operation

Parts to be tested for leaks are placed in a container and subjected, under pressure, to an inert, non-toxic, radioactive gas. They are then air washed and the amount of the gas which penetrated the transistor or other sealed unit is accurately measured to determine leak rates as small as 1 cc per 5000 years. Testing of parts may be done quickly and in quantity to prevent production delays. RADIFLO may also be used directly on the production line for automatic acceptance or rejection of parts whose leak rate exceeds pre-determined limits.

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## Another First: Share Computer

SHARED use of electronic data processing equipment among tenants of an industrial park took place for the first time recently.

The step is significant because shared or joint use of computers is one of the main avenues to widespread use of EDP by small and medium-sized companies. Many firms in this category now point out that individual installation costs are so high as to be decidedly beyond their reach.

Occasion for the recent "first" was the opening of an electronic data processing center at the Westbury Industrial Park, located at Westbury, Long Island, N. Y. The center is operated by Scientific Tabulating Corp., headed by Richard M. Hallet, Jr., board chairman, and Robert J. McKenny, president. McKenny has been in the computing field 12 years.

The Westbury center will serve the EDP requirements of 12 tenants of the park and also those of companies in the general neighborhood.

The center represents an investment of \$320,000, including \$160,000 in Rem Rand electronic and tabulating equipment. Heart of the center is a Univac 120. Supporting equipment ready to be used includes a battery of key punch, sorting, verifying, collating and tabulating machines.

Center services include payroll preparation, sales, production, inventory analysis, etc. The equipment will also be employed to find answers to engineering and scientific problems for the center's clients.

An engineer is available on the premises at all times to supervise the data processing and act as consultant to tenants of the industrial park, as well as the company's other customers.

Hallet and McKenny say they expect to see similar centers in industrial parks throughout the nation in the near future. They have already made preparations to set into operation similar ones in the Boston and Cincinnati areas during this year.

# Maine Dangles \$ Bait

State forms new organization to ease financing of new industrial plants—and hopes this will lure more electronics firms 'down east'

MAINE to date has been less successful than any of the other New England states in winning electronic firms. Two branch electronics plants—Sylvania and General Electric—pretty much sums up current Maine electronics activity.

But, Maine's industrial development leaders believe their competitive position in bidding for electronic firms has been strengthened by the new Maine Industrial Building Authority.

MIDA has been set up to ease financing of new industrial plants.

It will guarantee 90 percent of the value of new plant construction loans. Guaranty on individual plant projects will be as high as \$1 million. Maturities will be up to 25 years. Interest rates will be one percent higher than going rates to take care of defaults and expenses.

Here's how the act will work. Communities seeking new industries will set up local non-profit corporations. When a community has found a company which would move if a new factory could be financed, the local corporation will ask the authority to insure a loan. However, actual loan will be made by private financial institutions.

Maine's youthful Governor Edmund S. Muskie is confident that money is the key to winning the hearts of electronic firms.

Casting about for the best way to attract electronic and other growth industries, Maine leaders decided on financial inducement in preference to tax privileges or other advantages, after conferences with electronic firm executives.

They were told that the industry's small and medium-sized firms need a financial bridge at moving time. Usually strapped for cash beforehand, they find the extra expenses of moving, training new workers and organizing a new operation leaves few of them with plant construction money.

Not relying on financial aid

alone, Maine feels it has real productive advantages to offer.

It points particularly to low wage rates prevalent for female workers so important to light assembly firms. It is claimed rates are as low as \$1.00 an hour in many of the smaller communities. Throughout the state, rates range from \$1.00 to \$1.50 an-hour.

Maine also has many labor surplus areas since more and more textile plants are leaving the state.

Maine has one disadvantage which may hurt its efforts to win electronic plants. In the past many firms have turned down Maine to locate near the Cambridge and Boston research center.

## Now Producing Plane Computer

PRODUCTION of a miniature digital computer for airplanes has been underway at Hughes Aircraft for seven months, the firm is now able to reveal.

Miniaturization know-how at Hughes has been able to shrink the conventional monster-sized digital computer down to a compact airborne unit weighing only 120 pounds.

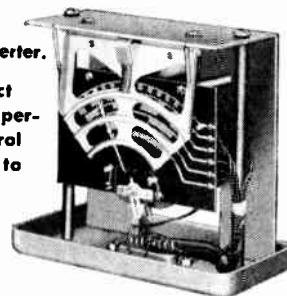
In a jet airliner, this brain, named Digitair, can automatically navigate, continuously compute airplane speed and altitude for best performance, automatically program fuel consumption from take-off to landing, automatically process and display navigation data, and control communications between ground traffic and automatic landing control.

About 4,000 match-head-sized diodes are used to replace various tubes normally used in conventional computers, and 75 percent of the tiny-sized giant brain's wiring is etched circuitry. The brain fits snugly in an Air Force jet interceptor.

## LIAD 2-in-1 Control Instrument

- Analog-to-digital converter.
- Multi-contact meter-relay permitting control action of up to 64 points.

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Applications for the LIAD (Low-Current-Analog-Digital) include telemetering, automatic testing, sorting, reading of maximum values, and accumulating quality control data.

It has a D'Arsonval movement, operating from any sensing element. A printed circuit scale replaces the normal dial. Read-out takes place when contacts under the pointer are clamped to the scale.

The LIAD converts low-level signals for transmission over great distances. Accuracy with a six-band scale is 1 part in 64. Fastest operation is about two times a second.

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# Tv Gets Instant Ratings

**New system to make national tv surveys every 90 seconds, show instantaneous tallies**

FONDEST HOPE of a tv researcher's heart became a reality last month with the announcement of a system that automatically and instantaneously tells how many tv sets are tuned to what channel at any moment.

The Arbitron is the development of American Research Bureau, New York, and Teller & Cooper division of American Electronics. The equipment is completed, tested and being installed in 300 sample homes in New York as this issue of *ELECTRONICS* goes to press. Other cities where Arbitron will be used are Chicago, Philadelphia, Detroit, Cleveland, Baltimore, and Washington. Target date is January 31, with 200 sample homes in each city.

The system operates through leased telephone lines. A small transponder is placed in the chassis of each home tv set. The transponder replies to individual interrogation pulses and automatically emits a return pulse telling whether or not the set is on, and if on, which channel is being used.

The transmitter station consists of an analyzer and counter, a printer and the transmitter proper. The analyzer sorts received information pulses, and acti-

vates the counter which totals the data and activates the printer. The printer then supplies the processed information in visual form, showing how many sets are tuned to each channel, how many are turned off. A separate column indicates date and time. Readings for the entire group may be taken every 90 seconds.

The printer also drives one or more display boards keyed to show percentage ratings or numerical counts. The printer will also report transponder failures in the field.

Projected network use would provide 1,200 samples spread over the entire system on a nationwide basis. The 1,200 figure does not include all homes wired for Arbitron, but is chosen in accordance with conventional sampling techniques to represent typical viewing audiences across the country. The results of nationwide samplings will be transmitted to key central offices which relay their reports to the main office in New York. In this way networks with competing programs will also immediately see which portions of any given program are switched in favor of the competing show.

Rates for Arbitron service will be predicated on station time charges. Equipment will be rented and will include a tv screen built into the display boards to enable researchers to observe programs of interest. Participating set owners get free 90-day service for their sets and periodic gifts.

## FCC ACTIONS

- Names March 1 as new deadline for f-m stations providing background music to complete switch to multiplex; hardship cases may ask for special hearings.

- Advises that next International Telecommunication Union will convene in Geneva, Switzerland on July 1, 1959; invites comments on U.S. agenda by January 23, 1958—13 days from now.

- Amends Civil Air Patrol rules to give CAP more spectrum space and temporary land stations.

- Notes petition filed by Joint Executive Committee for Improvement and Development of Philadelphia Port Area, requesting assignment of frequency space for navigation safety and bridge-to-

bridge shipboard telephones in Delaware Bay area.

- Issues c-p to Neighborly Broadcasting Co., Providence, R. I., for class B f-m station to operate on 99.9 mc, 10-kw erp with 225-ft antenna.

- Changes class B f-m allocations to substitute channel 287 for channel 284 in San Diego, Cal., where station KDFR wants to shift from channel 284 to 287.

- Gives c-p for 250-watt a-m station to Basin Broadcasting Co., Durango, Colo., on 1,240 kc.

- Extends deadline for comments on tv repeater stations to February 14 at request of Colorado's governor.

## STATION MOVES and PLANS

**WBFM**, New York, petitions for FCC amendment to let f-m stations use multiplex channels for background services.

**KPSR**, Palm Springs, Calif., files for extension of completion date.

**WKOV**, Wellston, O., changes control from Dexter Parks Robinson to Court House Broadcasting Co.

**KSCU**, Santa Clara, Calif., gets c-p to replace expired permit for new f-m educational station.

**WKVM**, San Juan, P. R., seeks permission to change frequency, increase power, install new trans-

mitter and change location of studios.

**KIJV**, Huron, S. D., requests c-p to change antenna system and height by top-mounting f-m antenna.

**KBKW**, Aberdeen, Wash., files for license to cover c-p allowing increase in antenna height by adding remote pickup antenna.

**WRWB**, Kissimmee, Fla., applies for renewal of license.

**KTFN**, Olympia, Wash., proposes change from 920 kc at 500 watts, to 1,440 kc at one kilowatt.

**KWJB-FM**, Globe, Ariz., receives license for f-m station.

**KBEE**, **KBEE-FM**, Modesto, Calif., is denied permission to use "KB Double E" as station identification.

**WROD**, Daytona Beach, Fla., transfers control from J. S. Murphy and J. F. McDonough to Radio of Daytona, Inc.

**KFTO**, San Bernardino, Calif., asks for c-p to put in new transmitter.

**WDRC**, Hanover, N. H. (Dartmouth College), plans to change transmitter type.

**KREM-AM-FM-TV**, Spokane, Wash., wins FCC approval for sale of station by L. Wasmer to KREM Broadcasting.

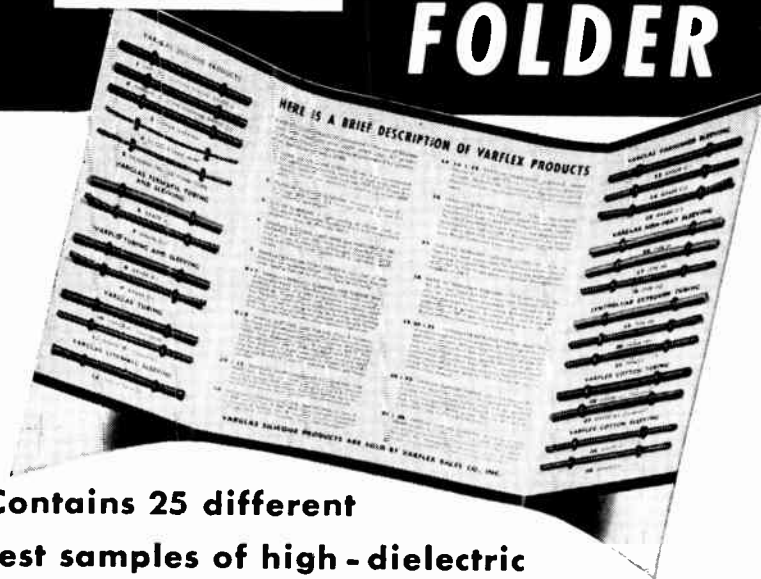
**KANS**, Wichita, Kans., awaits FCC approval for ownership transfer to J. William O'Connor & Associates.

**KNXT**, Hollywood, Cal., slates two educational programs with UCLA participation.

**WKXY**, Sarasota, Fla., goes from daytime operation at 1 kw, 930 kc, to 1 kw daytime, 500 watts night.

**KPOA**, Honolulu, seeks permission to change frequency from 630 to 650 kc, change power from 5 to 10 kw.

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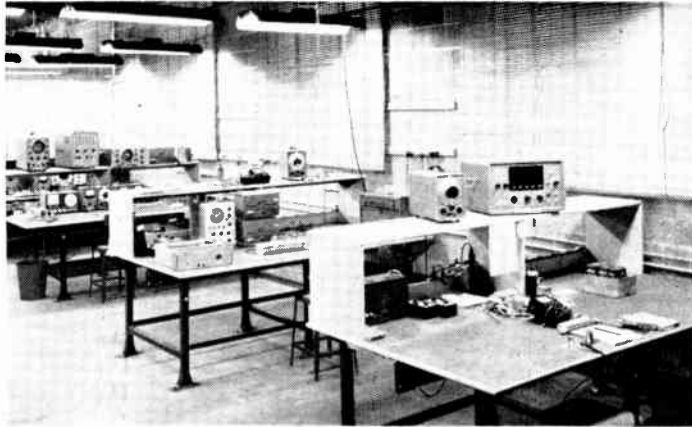
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## Specialists Start Firm

Producing a complete instrumentation system in four months is the aim of a new firm formed by a quartet of specialists.

Data-Control Systems, Inc., in Danbury, Conn., was conceived, financed and operating in less than two months' time.

The founders are: Robert J. Jeffries (president), Gunther J. Martin, Weems E. Estelle and Raymond A. Runyan. R&D laboratories (see picture) are located at 59 Rose St. in Danbury. Manufacturing facilities will be provided on a subcontract basis by several companies in the firm's field.

The new company will be active in the development and application of proprietary products and sponsored research in four principal areas—measurement, computation and data handling, telemetry, and control. Each of these areas will be under the direction of an authority in the field. The company plans to develop individual components in systems and have a four-way perspective on how to combine the components into a required system.

Jeffries will direct technical developments relating to measuring equipment. He was formerly assistant to the president of Daystrom, Inc., has been a consultant on instrumentation to the Army, Navy and Air Force, and the National Bureau of Standards.

Heading up tech developments in automatic computation and data handling will be Martin, who was formerly with Schlumberger Well Surveying Corp. Prior to that he

activated a computer group for the Ford Motor Co., and worked with the Willow Run Research Center on missile guidance systems.

Supervising programs in automatic control will be Estelle. He had been manager of engineering for Thomas A. Edison, Inc. Before that he was vice-president and general manager of McNab, Inc., designers and manufacturers of marine instrumentation and controls systems.

Runyan will be responsible for developments relating to commercial and military telemetry systems. He was formerly director of research of Electro-Mechanical Research Corp., Ridgefield, Conn. He also held design positions with Boeing Aircraft, North American Aviation, Pratt and Whitney Aircraft, and the National Advisory Committee for Aeronautics.

## HMA Forms Test Division

HORKEY-MOORE ASSOCIATES, Torrance, Calif., has set up a testing division for complete evaluation, qualification, and reliability testing of mechanical, electronic, hydraulic and pneumatic components for aircraft and missile use.

One of the division's most versatile pieces of equipment is a high-low altitude chamber, six feet in diameter and 18 feet long. Specially designed to check-out explosive ejection mechanisms for air-

craft, the unit can also be adapted to simulate conditions up to 150,000 feet altitude, with a temperature range of  $-100^{\circ}\text{F}$  to  $+350^{\circ}\text{F}$ .

Vibration testing facilities include a 1,500 force lb Calidyne machine and a 100 force lb Calidyne machine, both with electronic control. Facilities also include salt spray, rain, humidity, sand and dust, and so on, all being completely programmed automatically.

Robert J. Savage, formerly senior test engineer at Topp Mfg. Co., has been appointed director of the new division.

## SRI Fills Staff Jobs

New head of the microwave group in Stanford Research Institute's Antenna Systems Laboratory is E. M. T. Jones. He replaces Seymour B. Cohn who recently was named manager of the laboratory.

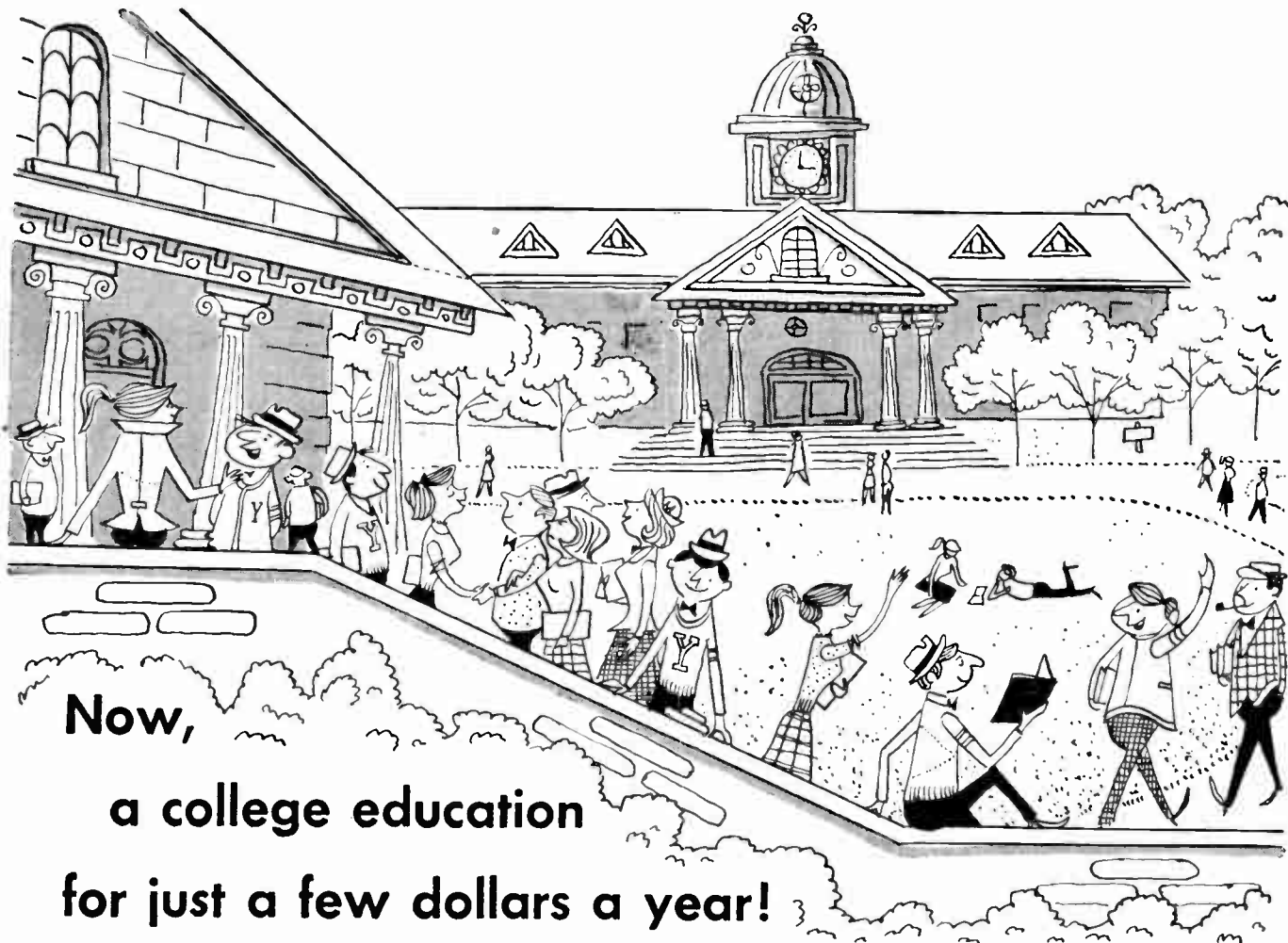
William G. Madow joins the staff as senior research mathematical statistician. He comes to the Institute from the U. of Illinois where he was professor of mathematical statistics and chairman of the Statistical Research Laboratory.

## Tape Firm Adds New Division

AUDIO DEVICES, INC., of New York, manufacturer of magnetic tape, has revealed a major expansion into a new field to cap its twenty years as a supplier to the recording industry. William C. Speed, president, announced the creation of a new manufacturing division to produce silicon rectifiers.

For its new division, Audio Devices has acquired a plant in Santa Ana, Calif., with 30,000 sq ft of operating space on five acres of land. The company goes into regular production this month.

Development and production in the magnetic tape field will be continued at a high level. The firm has been on a 24-hour manufacturing schedule to meet the demand for magnetic tape, and recently ac-



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quired an additional 20,000-sq ft plant in Stamford, Conn., for magnetic tape production. Company's annual sales have grown from the \$1,400,000 level in 1947 to an estimated \$5,000,000 in 1957.



## Zimmer Joins Control Firm

E. D. ZIMMER (picture) has joined the staff of Control Data Corp., Minneapolis, Minn., as a senior engineer.

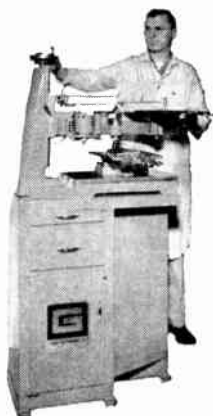
As project engineer since 1953 with Remington Rand Univac, Zimmer has had responsibility for engineering activities on several important data processing systems. Prior to that time, he was with Engineering Research Associates, Inc., St. Paul, where he took part in the development program that led to the original ERA 1103 computer.

## Lockheed Fills Three Posts

MANAGER of the control systems department of the Lockheed Missile Systems division in Sunnyvale, Calif., is Louis Strauss. Former chief of the aeronautical-mechanical engineering division of the Naval Air Missile Test Center at Point Mugu, Calif., he has been acting manager of the department. He will be directing control systems development work for the Navy's Polaris ballistic missile.

Also working on the Polaris will

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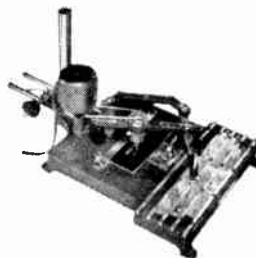
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be Irvin D. Black. He joins the division as staff engineer in the air-frame propulsion and internal systems department. His experience in rocketry goes back to 1945 when he researched the Germans' V-2 rocket center at Peenamunde for the Air Force.

C. Joseph Zohn has been promoted to manager of administrative services department of the Missile Systems' research and development branch. He had previously been in charge of administrative services for the electronic and radar laboratories.

## I-L-S Appoints

ROBERT LAULE, president of I-L-S Instrument Corp., Cleveland, announces the appointment of George R. Lippert as vice president-sales manager and Thomas J. Noveski as chief engineer.

Lippert has been with the company for seven years. Noveski, previously in product development at Hickok Electrical Instrument Co. and Brush Electronics Div. of Cleveland, will be in charge of engineering on all new products, special products, service and quality control.



## IRC Appoints Sales Engineer

INTERNATIONAL RESISTANCE CO., Philadelphia, recently appointed Louis F. Norris (picture) sales engineer. With IRC since 1950, Nor-

ris has held the positions of senior product engineer and senior product development engineer. He has a background in plastics and laminates, and has also engaged in development on IRC high-frequency resistors. Prior to joining IRC, he had been associated with the Monsanto Chemical Co., and with the U. S. Army-Ordnance Materiel as a chemical engineer.

## Hawaii Looks to Electronics

TINY electronics industry in Hawaii shows signs of getting bigger.

Kentron Hawaii, one of the two firms opened in the past year to renovate tv picture tubes, has purchased land to expand its plant. Present building, opened last June in Honolulu, will be devoted entirely to the production of tv picture tubes while a new building will house all electronic engineering and circuit work.

The firm has received Air Force and Navy contracts for the overhaul of airborne electronics, repair of radar equipment and calibration of electronic test equipment.

Meantime, an island development company, Dillingham Investment Co., has announced its plans to erect an electronics plant outside Honolulu and has offered it to two West Coast electronics manufacturers who produce missile parts. The plant will be ready next summer if negotiations are concluded.

## Mack Trucks Integrates

TO PERMIT a greater coordination of effort in the aircraft, missile and rocket fields, Mack Trucks, Inc., combines its electronic research and manufacturing facilities into a single division. The combined facilities will be operated as Mack Electronics Division of Mack Trucks, Inc.

Electronics manufacturing was previously carried on by Mack Electronics Division, Inc., of Plainfield, N. J., a wholly-owned subsidiary, while research and development activities were conducted by Mack



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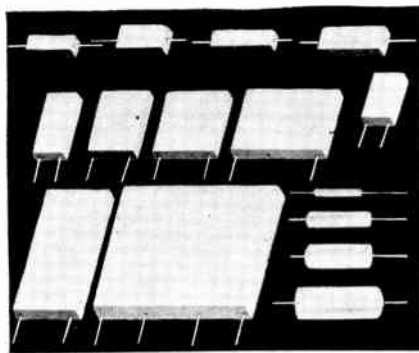
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Electronics, of Boston, a separate company division.

Both the Plainfield and Boston facilities will continue the same functions as before, but will operate under the single divisional command. Robert Edwards, formerly manager of the Plainfield unit, has been named general manager of the new electronics division. Glen H. Roundry is director of sales, and Paul Travers, director of engineering for the division. Both had held similar jobs previously with the Boston unit.

Mack president, P. O. Peterson, stated that formation of the new electronics division, besides increasing overall operating efficiency, places the company in a stronger position to compete for business in the constantly growing electronics market.

In addition to manufacturing communications, radar and other types of electronic equipment for military use, Mack's electronic facilities have specialized in development of new counters and computers for use in guided and ballistic missile systems.



### Control Names K. R. Dunne

At Huntington Station, N. Y., Control Electronics Co., Inc., announces appointment of K. R. Dunne (picture) as head of its delay line department.

Dunne, who for four years was in charge of maintenance of electronic equipment for the U. S. Navy, more recently was associated

with Filtron Co., Inc., and the Hammett Electric Corp. in delay line design and production. He assumed his new duties with Control Electronics just recently.

While in the Navy, Dunne was in charge of fire control on the Mark 12, 13, and 34 and also did considerable work in radars and communications.

## Nuclear Firm Moves

FLDORADO Electronics, manufacturer of nuclear electronic instrumentation, moves from its Oakland plant to larger facilities in Berkeley, Calif. The new 7,000-sq ft quarters will meet the need for increased research and manufacturing space.

## Dale Products Has New Plant

DALE PRODUCTS, INC., makers of precision resistors, trimmer pots and electronic equipment, announces completion at Columbus, Neb., of a new 16,000 sq ft resistor production facility. The new plant allows a substantial expansion of the former production capacity of the company's line of precision wire wound and deposited carbon resistors.

Equipment and engineering sections, along with business offices will be expanded at the former location of these resistor facilities.

## RTCA Elects New Officers

JOSEPH H. TIPPERS, director of the CAA's Office of Air Navigation Facilities, was recently elected vice-chairman of the Radio Technical Commission for Aeronautics by the executive committee. He has served as the CAA member of the executive committee since Oct. 10, 1956. He will continue in that capacity in addition to his new duties.

Earlier, John S. Anderson, presi-

dent of Aeronautical Radio, Inc., was elected to the chairmanship of RTCA upon the resignation of J. Howard Dellinger who held this office for the past 16 years. Anderson has been Aeronautical Radio member of the executive committee since May 1951 and served as vice-chairman from July 1953 to September 1957.

## Hydromatics Relocates

B. L. Moss, president, announces that Hydromatics, Inc., has completed the transfer of operations to a new plant at 70 Okner Parkway, Livingston, N. J. The new 15,000 sq ft plant will house engineering, production and administrative activities. Hydromatics was formerly located in Cedar Grove, N. J.

Production capacity has increased four-fold as a result of the move—a move made necessary by the increasing demand for the company's principal products, which include high performance valves for industrial, aircraft, and missile applications. Hydromatics valves are used on most of the major missile projects such as Vanguard, Atlas, Titan, Jupiter and others.



## Echolds Makes Chief Engineer

AMERICAN ELECTRONICS, INC. appoints E. F. Echolds (picture) as chief engineer of its Electro-Mechanical Division. For the past

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seven years he had served with the Department of the Navy Bureau of Ordnance. In his new position, Echolds is responsible for the Division's engineering effort and the continuing improvement and expansion of its product line.

The Division is presently producing h-f and d-c motors and actuators, h-f alternators, d-c generators, magnetic clutches, rotary electric components and d-c and a-c centrifugal blower and fan motor units for cooling electronic tubes and reducing hot spot temperatures in missiles, aircraft, computing devices and equipment, ground support equipment, and radar and radar jamming equipment.

## ASCOP Fills Key Posts

APPLIED Science Corp. of Princeton names Thomas S. Mederos sales assistant to the president. Robert E. Navin succeeds him as manager of the instrumentation division.

Mederos was chief engineer with the Brinnel Co. before he joined ASCOP in 1951 as senior engineer. He has been division manager since June, 1956.

Navin served as engineering vice president of the Hays Corp., Michigan City, Ind., and manager of that corporation's Metrotype division before he joined ASCOP last spring as assistant manager of the instrumentation division.

## Plant Briefs

Magnetic Circuits, Inc., relocates in new and larger quarters in Montrose, Calif. New building includes all facilities for the design, manufacture, and assembly of magnetic components.

W. A. Shaeffer Pen Co. has purchased Maico Co., Inc., Minneapolis. Maico will operate as a Shaeffer subsidiary under the name of Maico Electronics, Inc.

AMP Inc., Harrisburg, Pa., changes the name of its Chemical & Dielectric Division to Capitron Division.

Electrical Communications, Inc.,

expands by moving to a 10,000-sq ft plant at 555 Minnesota St., San Francisco.

Republic Electronic Industries Corp. moves from New York City to 111 Gazza Blvd., Farmingdale, N. Y.

## Executive Moves

RETIRED Col. Robert E. Jamon is named director of commercial electronics at Advance Industries, Inc., Cambridge, Mass.

Robert M. Rowe leaves SRI to become director of engineering for Pulse Engineering, Inc., in Redwood City, Calif.

Joseph F. Degen leaves IBM Corp. to become vice-president in charge of manufacturing for Western Electrical Instruments Corp. in Newark.

New national sales manager for Magnetic Research Corp. is J. P. Baker, former head of magnetic amplifier sales at Westinghouse.

## News of Reps

CALIFORNIA firm, Spectrol Electronics Div. of Carrier Corp., merchandises its potentiometer line in Canada through E. E. Whittaker, Ontario rep.

Jerrold Electronics Corp. appoints three manufacturers' reps specializing in instruments and test equipment. They are: Gerard G. Leeds Co., Inc., for New England, New York, eastern Pennsylvania, Virginia and Washington, D. C.; ARVA, an affiliate of the Ron Merritt Co., for Washington, Oregon, Montana and Idaho; and Instruments for Measurement for southern California and southern Nevada.

Electrical contacts of Gibson Electric Co., Delmont, Pa., are being sold in western Pennsylvania, eastern Ohio and West Virginia, by Robert R. Stone & Associates; in eastern Pennsylvania, Maryland, southern New Jersey, Delaware and the District of Columbia, by Cashman & Norton.

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23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99

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JAN. 31	FEB. 7	FEB. 14	FEB. 21
FEB. 28	MAR. 7	MAR. 14	MAR. 21
MAR. 28	APR. 4	APR. 11	APR. 18
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MAY 23	MAY 30	JUNE 6	JUNE 13
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AUG. 15	AUG. 22	AUG. 29	SEPT. 5
SEPT. 12	SEPT. 19	SEPT. 26	OCT. 3
OCT. 10	OCT. 17	OCT. 24	OCT. 31
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BUYERS' GUIDE ISSUE — JUNE 15

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**AT Livingston  
Studios...**

**recorded tapes get a  
quality boost with Audiotape**

Say "recorded tape" and chances are someone will say "Livingston." Livingston Audio Products in Caldwell, N. J., was one of the pioneers in the recorded tape field. Today, the Livingston library includes over 160 monaural tape titles and more than 90 stereos. And the list is expanding every month.

Art Cooper, executive vice-president at Livingston, says, "In this high fidelity age, the key to success in the recording business is quality. Our engineers have chosen equipment which they feel is the finest available. We make inspections and maintenance checks on this equipment every hour. And we approach magnetic tape in the same way—constantly testing and checking the quality. Our studies have shown that Audiotape consistently delivers outstanding performance. That's why we've been an Audiotape customer for years."

Livingston is just one of the hundreds of professional recording studios which rely on Audiotape for the finest sound reproduction.

The complete line of professional quality Audiotape offers a base material and thickness to meet every recording need. And no matter which type you select, you can be sure you're getting the very finest tape that can be produced. There's a complete range of reel sizes and types, too, including the easy-threading C-Slot reel for all 5 and 7-inch Audiotapes. Why settle for less, when professional-quality Audiotape costs no more?

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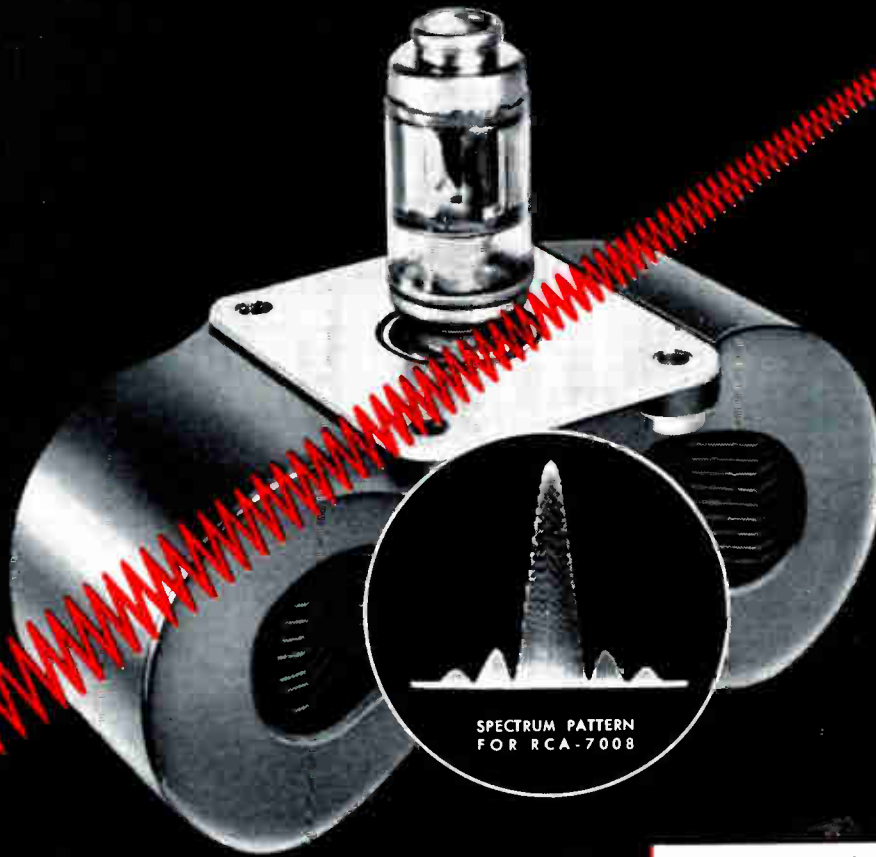
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# NEW TUNABLE MAGNETRONS...

RCA Design provides exceptional uniformity of characteristics over 1100-Mc tuning range



## These remarkable tunable X-band magnetrons feature:

(1) exceptional electrical stability at very high rate-of-rise of voltage pulse, (2) virtually constant power output across the entire tuning range, and (3) rugged mechanical construction to meet stringent military requirements.

Available for either servo- or hand-tuned applications, this new family of RCA tunable X-band magnetrons is interchangeable with the 4J50 type magnetron in many systems. All RCA tunable magnetrons are designed for maximum performance throughout warranted life.

If you are working on new designs or modification kits for government end use, investigate RCA's new tunable magnetrons. For additional information on RCA commercial or custom-designed tunable magnetrons, call the RCA Office nearest you:

Typical Characteristics of RCA 200-Kw Tunable Magnetrons

	RCA-6865-A	RCA-7008	Developmental Type*
Tuning Range	8750 to 9600 Mc	8500 to 9600 Mc	8500 to 9600 Mc
Pulse Width	Up to 2.5 $\mu$ sec at full power	Up to 2.5 $\mu$ sec at full power	Up to 2.5 $\mu$ sec at full power
Rate-of-Rise of Voltage Pulse	70 to 180 KV/ $\mu$ sec	70 to 225 KV/ $\mu$ sec	70 to 200 KV/ $\mu$ sec
Stability at Max. Rate-of-Rise of Voltage	less than 0.1%	less than 0.1%	less than 0.1%
Type of Tuner	Hand (with tuner lock)	Gearbox (for servo applications)	Hand (with tuner lock)
Approx. Weight	11.5 lbs.	13 lbs.	11.5 lbs.

\*Available with several different tuning mechanisms to meet customer requirements.

### Equipment Sales

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