

OCTOBER 20, 1957

# electronics

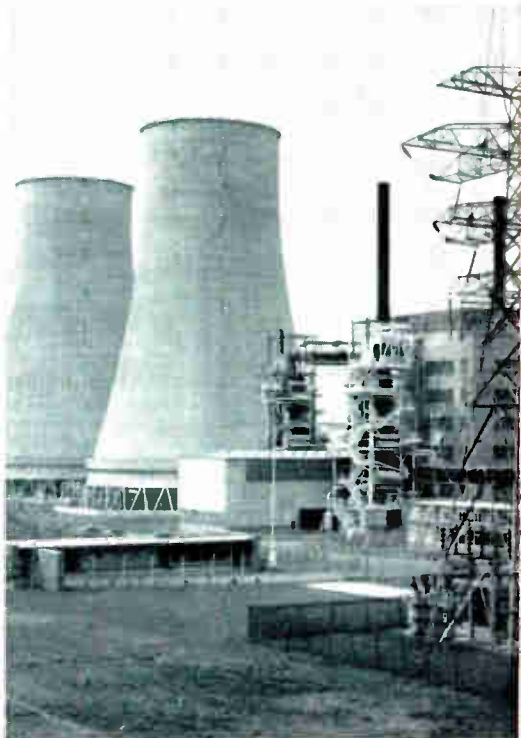
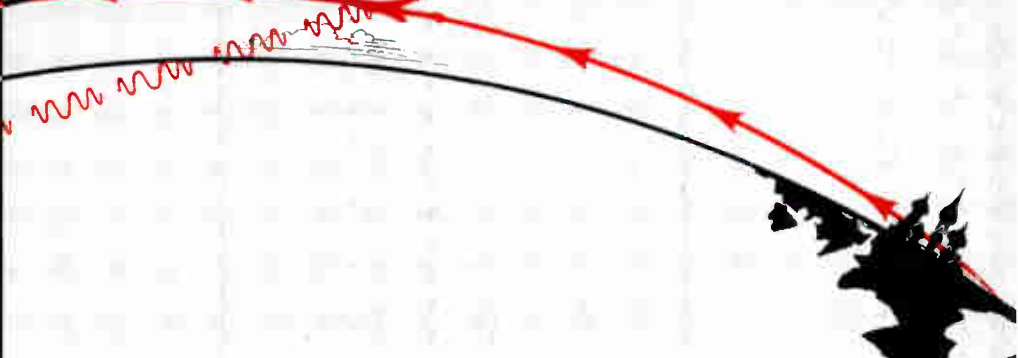
business edition

A MCGRAW-HILL PUBLICATION • VOL. 30, NO. 10B • PRICE FIFTY CENTS

New radar can detect hostile ICBM before it passes midpoint . . . p 13

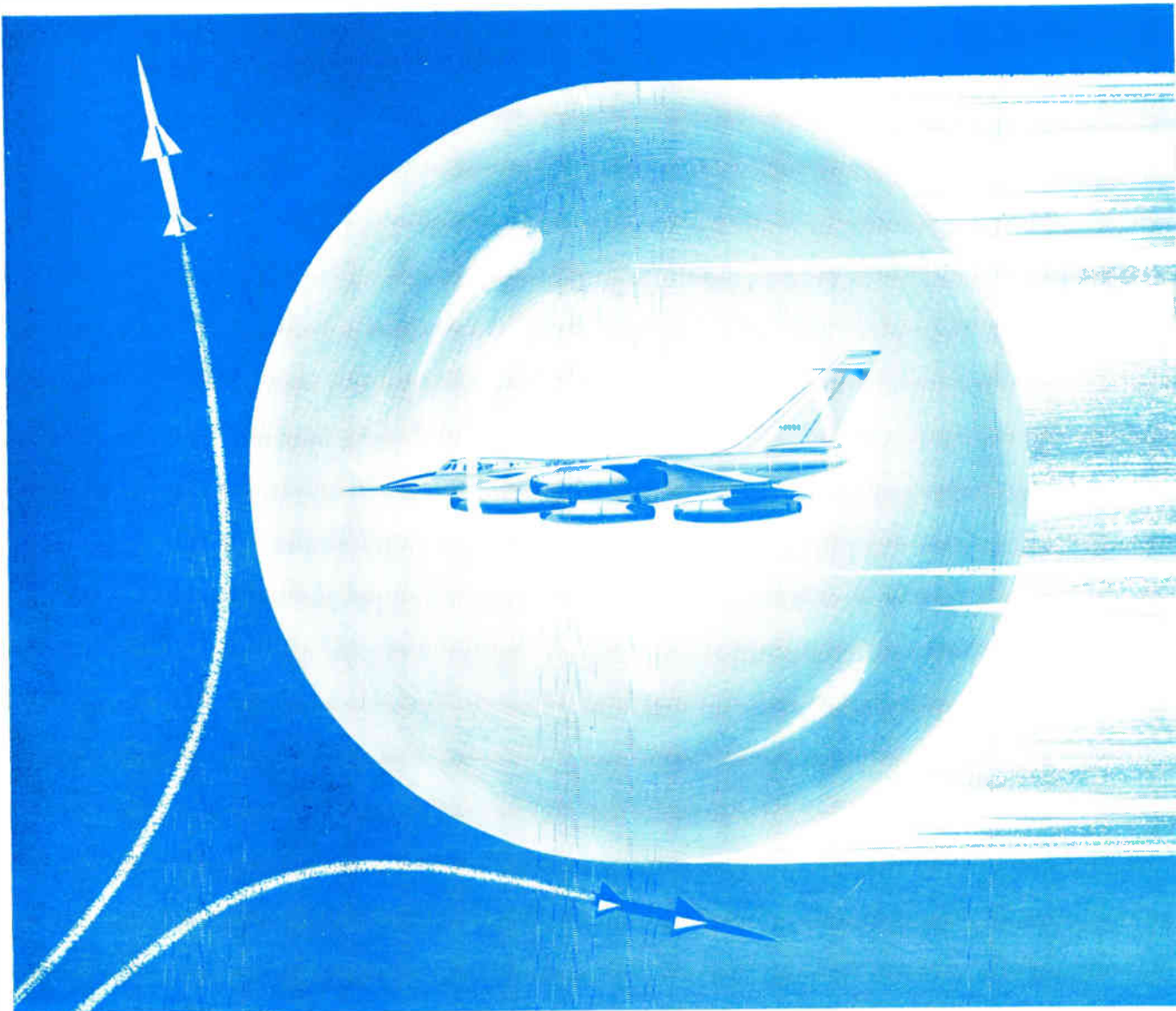
A diagram showing a missile's trajectory from the bottom left towards the top right. A white curved arrow indicates the path. A red wavy line with arrows pointing towards the missile represents radar waves. A black silhouette of a radar dish is shown on the right, emitting the waves. The background is black.

## Anti-Missile Well Along



## Atomic Bonanza In Europe

Power plants like Calder Hall may make \$50-million instrument market . . . p 19



The Convair B-58 Hustler, first U. S. Air Force supersonic bomber, will be protected by Sylvania's electronic countermeasure equipment.

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Now, an invisible electromagnetic shield will protect our United States Air Force's first supersonic bomber against electronically guided weapons.

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# electronics business edition

A MCGRAW-HILL PUBLICATION • VOL. 30, NO. 10B • OCTOBER 20, 1957

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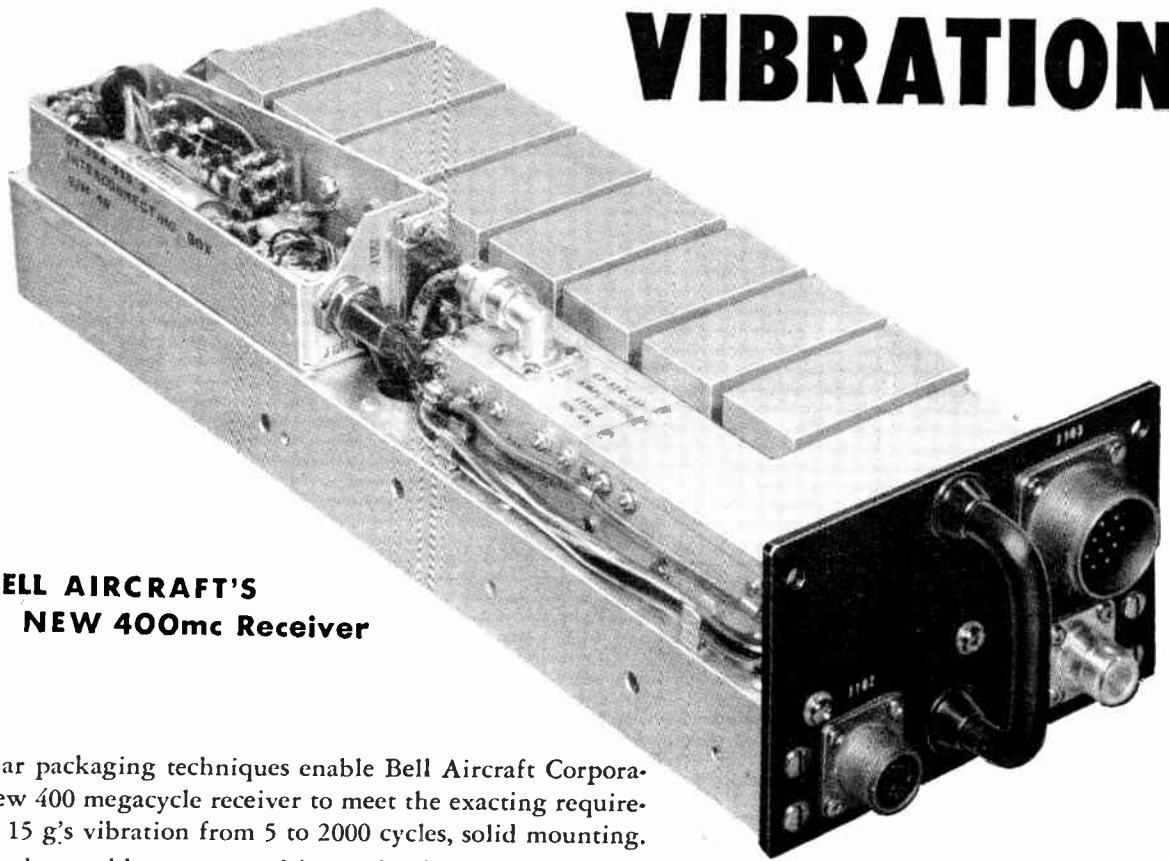
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Now thoroughly proven and in production, this receiver is available immediately for any application where demodulated control signals are needed for the activation of command systems requiring a high signal-to-noise ratio, high sensitivity and stability, and a wide audio bandwidth with low harmonic and phase distortion. It is equally at home in guided missiles — as a range safety instrument — or as a ground monitor receiver.

The new 400 mc receiver is only one of many examples of the ability of Bell Aircraft's new *Avionics Division* to design, develop and produce avionic systems, units and components for any needs, however complex. If you have design or production problems in this field, write, wire or phone: Sales Manager, Avionics Division, BELL AIRCRAFT CORP., Post Office Box One, Buffalo 5, New York.

### ELECTRICAL SPECIFICATIONS

**TYPE:** FM 300 KC Deviation  
**TUNING RANGE:** 406 to 420 megacycles  
 Plug-in assemblies to extend range to 500 mcs available  
**OSCILLATOR:** Crystal controlled  
**SENSITIVITY:** 5 microvolts or better for 10 db quieting  
**INPUT IMPEDANCE:** 50 ohms  
**BANDWIDTH:** 1.15 mcs  $\pm$  .1 at 3 db  
**IMAGE AND SPURIOUS RESPONSE:** Better than 60 db  
**OUTPUT:**  $\pm$  0.5 db 40 cps to 40 kc 3 db at 100 kc  
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**SQUELCH:** Adjustable squelch relay from 10 to 100 microvolts input  
**POWER INPUT:** Less than 50 watts. Power supplies available for 115V - 400 cps or 28VDC

### MECHANICAL SPECIFICATIONS

**DIMENSION:** 3.6 x 5.5 x 15.25 inches.  
**VOLUME:** 300 cubic inches  
**WEIGHT:** 10 pounds  
**MOUNTING:** Solid — 9 mounting screws  
**OPERATING ENVIRONMENTS:** 15 g's  
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THIS NEW BOOK telling of many new and unusual developments in the field of Avionics is yours for the asking. Send request on your letterhead to: Sales Manager, Avionics Division, BELL AIRCRAFT CORP., Post Office Box One, Buffalo 5, N. Y.



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Eimac fills another important transmitting need with this air-cooled, ceramic-metal, one-kilowatt tetrode... the 4CX1000A. Specifically designed for single side band operation the 4CX1000A is a low-voltage, high-current Class AB<sub>3</sub>, RF or AF linear amplifier tube, exhibiting high power gain and exceptionally low distortion characteristics. The 4CX1000A achieves its maximum rated output power with zero grid drive, thus minimizing driver stage design problems and eliminating one source of distortion.

Eimac stacked ceramic design gives the 4CX1000A excellent immunity to damage by mechanical and thermal shock. Electrical stability is assured by internal ceramic support of the tube elements and clean internal

design. Ideal for applications where space is at a premium, this mechanically-rugged, electrically-reliable thousand watt tetrode measures less than 5 inches high and 3½ inches in diameter. High temperature processing, made possible by Eimac ceramic-metal design, produces an extremely clean tube. This ideal environment assures long life for the efficient oxide-coated cathode.

Efficient, trouble-free socketing and cooling is provided for the 4CX1000A by the new SK-800 Air System Socket and SK-806 Chimney.

Write our Application Engineering Department for a brochure and data sheet describing this important new tube in detail.

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### MAXIMUM RATINGS (Per Tube)

DC Plate Voltage	3000 Volts Max.	Plate Dissipation	1000 Watts Max.
DC Screen Voltage	350 Volts Max.	Screen Dissipation	12 Watts Max.
DC Plate Current	1.0 Amps Max.	Grid Dissipation	0 Watts Max.

### TYPICAL OPERATION SINGLE-TONE SSB

DC Plate Voltage	2500 Volts	DC Plate Current	1.0 Amps	Actual Power Output	1460 Watts
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# -hp- 150A

## HIGH FREQUENCY OSCILLOSCOPE

**New reliability • New convenience**  
**DC to 10 MC. Plug-in preamplifiers**  
**24 direct reading sweep times**  
**Sweeps 0.02  $\mu$ sec/cm to 15 sec/cm**  
**"Universal" automatic triggering**  
**New, ultra-conservative design**

### SPECIFICATIONS

**Sweep Range:** 0.02  $\mu$ sec/cm to 15 sec/cm.

**Calibration:** 24 sweeps: 1-2-5-10 sequence, 0.1  $\mu$ sec/cm to 5 sec/cm. 3% accuracy.

**Triggering:** Internal, line voltage or external 0.5 v or more. Pos. or neg. slope, +30 to -30 v trigger range.

**Preset Trigger:** Optimum setting for automatic stable triggering.

**Horizontal Amplifier:** Sweep magnification 5, 10, 50, 100 times. Vernier position control selects any 10 cm part of sweep. External input pass band dc to over 500 KC. Sensitivity 200 mv/cm to 15 v/cm.

**Vertical Amplifier:** Pass band dc to 10 MC. Optimum transient response and rise time less than 0.035  $\mu$ sec. Signal delay of 0.25  $\mu$ sec permits leading edge of triggering signal to be viewed.

**Amplitude Calibration:** 18 calib. voltages, 1-2-5-10 sequence, 0.2 mv to 100 v peak-to-peak. Accuracy 3%. Approx. 1 KC square wave, rise and decay approx. 1.0  $\mu$ sec.

**Prices:** -hp- 150A High Frequency Oscilloscope, \$1,100.00

-hp- 151A High Gain Amplifier, \$200.00

-hp- 152A Dual Channel Amplifier, \$250.00

New Model 150A is not a "warmed-over" imitation of previous oscilloscopes. Instead it is a totally new kind of instrument whose radical design approach obsoletes old standards of oscilloscope versatility, simplicity and dependability.

Specifications given here spell out the 150A's unique usefulness. Its simplicity and reliability stem from such unique features as: *Unitized circuits*, easily isolated for testing or service, etched and mounted on translucent plastic. *Highest quality components*, operated well below ratings. *Concentric, color-coded*, functionally-grouped controls. *Direct sweep-time selection*; no mental gymnastics. *Universal automatic triggering* system wherein one preset adjustment provides optimum triggering for almost all conditions.

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**also offers -hp- 130A Low Frequency Oscilloscope, dc to 300 KC, sweeps 1  $\mu$ sec/cm to 12.5 sec/cm.**

# Money Men Needed

**Wall Streeters urge small firms to get well-trained comptroller-treasurers on the staff**

TALK to almost any investment banker about underwriting small electronics firms and one of the first comments you will hear is: "We want to see a good financial man on the management team."

Question further and they reply: "We want a man who can control costs, knows budgeting and who can manage the financial problems."

This Wall Street point of view counts for a great deal. Raising money is one of the most pressing problems of our industry. And the investment bankers sit astride the crossroads where those who supply and those who need capital meet.

W. Hardie Shepard, partner in the venture capital firm of Payson & Trask, former treasurer of Perkin-Elmer and Lehman Brothers staff member, points out that usually it is only the smaller firm, in the \$1-\$10 million sales range, where need for a financial man is a problem. Larger firms usually have this function adequately covered, he says.

Shepard says the financial man in a small firm has to be a combination comptroller-treasurer and handle both accounting and financial functions. "The small company doesn't have enough work of this nature to employ separate executives."

"Most firms should be able to get an able man for \$8-\$10,000 a year," Shepard says. Some may require a more experienced executive, worth \$15-\$20,000, but cannot afford the price. If so, there are many worth the price, but willing to take less

if given opportunity to buy stock, he says.

"The best sources are investment banks, commercial banks and public accounting firms that are active in the electronics industry," Shepard says.

Though agreeing with need for a financial man, George K. Haydu, president of Haydu Electronics of Plainfield, N. J. favors public accounting as best source for a small company treasurer-comptroller.

Right now, Haydu is taking steps to fill the last gap in his management team by acquiring a financial man. Haydu Electronics has sales currently about \$1 million a year. The firm has just completed its first public stock issue.

"The public accountant fits the job well because his accounting background will enable him to pick up gaps in his financial background as he goes along," George Haydu says. The reverse situation may be more difficult.

A somewhat different view was obtained from Harold A. Goldsmith and Herbert Herz of Magnetic Amplifiers of New York City. They jointly head this firm which designs, develops and manufactures technical products. Annual sales are about \$2 million.

They agree with Wall Street that the financial-accounting function must be adequately handled. "You don't have a sound business unless this is done," they say.

But, they don't feel that a small electronics company has to bring in an outside financial-accounting management specialist.

The two engineers who head Majestic Amplifiers have jointly handled financial and accounting management and policy since the firm was founded in 1950. They have accounting employees to handle the basic work, but make the policy and management decisions themselves. They also make use of their public accounting firm and board of directors for advice and guidance.

## SHARES and PRICES

REPAIR and remodeling of instruments and other electronic equipment offers opportunities for many firms to offset declines in new

equipment contracts. The armed forces economy wave is increasing rather than decreasing this type of expenditure.

Both small and large firms can effectively compete for this busi-

ness. Haydu Electronic Products of Plainfield, N. J., has just set itself up in the repair and remodeling business with a fraction of the proceeds from its recent \$300,000 stock issue.

Typical Repair and Remodeling Contractors	Recent Price	Dividend Rate <sup>2</sup>	Percent Yield	Earned per Com. Share		Traded	1957 Price Range
				1957	1956		
Haydu Electronics.....	3 <sup>1</sup>	....	....	0.07 (yr) <sup>4</sup>	....	OTC	....
General Precision (Kearfott)....	38 $\frac{3}{4}$	2.40	6.1	2.10 (6 mos)	1.63	NYSE	36 $\frac{1}{2}$ -47 $\frac{1}{4}$
Norden-Ketay.....	8 $\frac{1}{8}$	....	....	0.29 (6 mos)	d-0.39	ASE	7 $\frac{1}{8}$ -11 $\frac{3}{4}$
Standard Coil (Kollsman).....	7 $\frac{1}{8}$	....	....	0.001 (6 mos)	d-1.24	NYSE	6 $\frac{1}{2}$ -9 $\frac{3}{8}$
Temco Aircraft.....	11 $\frac{1}{2}$	0.60 <sup>3</sup>	5.3	0.61 (6 mos)	1.35	NYSE	10 $\frac{1}{2}$ -18 $\frac{3}{8}$

<sup>1</sup>bid    <sup>2</sup>indicated    <sup>3</sup>plus extras    <sup>4</sup>fiscal ended June 30, first year of operation.

# Life Loans Grow

## Life insurance firms are active in helping small electronics firms grow

DESIRE of life insurance firms to share in profits of electronics borrowers is increasing.

Example of this interest is the recent loan of \$1.6 million to Aircraft Radio of Boonton, N. J. by Prudential Insurance. The loan package included warrants to purchase 10,000 shares of stock.

More loans like this, giving the insurance firm opportunity to benefit from equity growth, can be expected, a spokesman for the life insurance industry said last week. Insurance companies feel they are practically taking an equity risk on small company loans and consequently they ought to share in future growth. Also, they like the hedge it gives them against further inflation.

Several firms insist on a "kicker," like warrants or rights, to convert to common stock on all debt-issue private placements, comments a leading investment banker.

"The notion that insurance firms are interested only in safe loans to big companies is a widespread misconception," says a life insurance spokesman.

A study being prepared for Representative Pat-

man's committee on small business problems will show a substantial amount of insurance firm loans in the half to two-million-dollar category.

There are more than 50 insurance firms reported to be particularly interested in these small and moderate-sized loans. In the insurance industry they are in the small and moderate-sized firm category. A few examples are: Fidelity Mutual and Provident Mutual of Philadelphia, Pacific Mutual of Los Angeles, Massachusetts Mutual of Springfield, Connecticut Mutual of Hartford, Kansas City Life of Kansas City, Co. and Jefferson Standard of Greensboro, N. C.

Prudential, one of the giants of the industry, is also active in the small loan field. Last year Pru set up a special commercial and industrial loan department under vice-president Ernest S. Allsopp. Designed to serve home town business, it reaches small borrowers through its nation-wide chain of regional offices. Size of its loans vary from \$150,000 to \$3½ million. Total loans for 1957 are expected to hit \$70 million.

Most money supplied by life insurance companies to industrial firms is through medium of debentures or notes. Loan period is most often 15-20 years. Interest rates usually vary within the range of five to six percent. To qualify, a firm generally needs a record of several years of earnings.

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## MERGERS, ACQUISITIONS and FINANCE

• **General Tire & Rubber** issues \$12 million of six-percent subordinated debentures with common stock purchase warrants attached. Starting Jan. 1, 1958 and until Oct., 1, 1962, holders of each \$1,000 debenture can purchase 20 shares of stock at \$25. Between Oct. 1, 1962 and Oct. 1, 1967 the purchase price will be \$27.50 a share. The stock was recently traded at \$23. Diversified General Tire makes tires and tubes, metal, plastic and chemical products and electronic guidance and tracking systems. Through subsidiary RKO Telradial Pictures it operates a number of radio and television stations. Proceeds of the loans will be used to retire short-term bank loans.

• **Wayne-George Co.** of Boston, Mass. receives financial commitment from **Payson & Trask**, New York venture capital firm. The Boston firm develops and produces electronic and electromagnetic subsystems and components. Its

activities are primarily directed to automation applications. Following its usual practice, **Payson & Trask** took its interest in form of debentures with warrants to purchase common stock. **W. Hardie Shepard**, **Payson & Trask**, joins the electronics firm's board of directors.

• **El-Tronics, Inc.**, Philadelphia manufacturer of electronic and nucleonic equipment, acquires **Parkchester Machine** of New York City. The acquired firm makes missile switches, spinner motors and generators, wind-speed and direction indicators and flash range sets. Terms were not disclosed.

• **Belock Instrument**, College Point, N. Y., acquires **Sonic Industries** of Lynbrook, N. Y. All outstanding shares of Sonic were exchanged for 75,000 shares of Belock common. Belock closed recently at 10¼ on the American Stock Exchange. Sonic manufactures high fidelity and standard phonographs and ra-

dios. Its annual sales are estimated at \$5 million. Sonic will operate as a Belock subsidiary and **Ben Birns** will continue as its president.

• **Link Radio** of New York City acquired by the **Gonset Division** of **L. A. Young Spring & Wire Corp.** through purchase of assets. Gonset, located in Burbank, Calif., manufactures amateur mobile radio equipment. The Link acquisition gives Gonset a complete line of a-m and f-m mobile radio equipment.

• **Haveg Industries**, Wilmington, Del., acquires **Reinhold Engineering and Plastics** of Norwalk, Calif. Haveg produces and fabricates plastics for the aircraft-missile industry. It also makes chemical corrosion equipment. The acquisition enables Haveg to extend its services on the West Coast and productive facilities for missile and aircraft parts. Reinhold will be operated as a Haveg subsidiary.





Larry Cowan, President of the Lionel Corp., tells why:

## "I put trains in the sky!"

"Boys hate waiting for trains, especially Lionel trains! So when a store orders, delivery has to be fast.

"It always is, when we ship our trains through the sky... by Air Express!

"No store in the country could possibly stock all the hundreds of different Lionel models. Air Express delivers for us anywhere in the 48 states — inside of a day!

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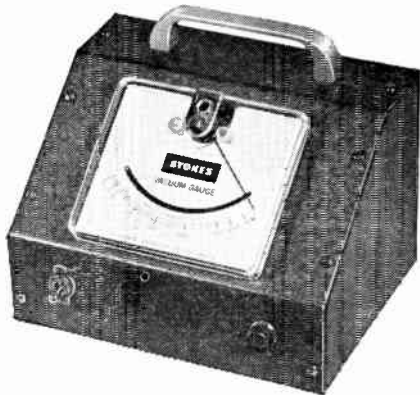
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## STOKES

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## WASHINGTON REPORT

AIR FORCE has taken the most drastic action to date in the current drive to squeeze down defense expenditures. It has told its 42 largest contractors—excluding top-priority ballistic missile makers—that specified sums will be withheld from monthly payments to be made over the next nine months. Rumor has it that amount averages 20 percent.

Contractors hit by the new policy are those with unpaid backlogs of at least \$5 million; they reportedly account for some 85 percent of the Air Force's total production expenditures. Electronic prime producers and component manufacturers are high up on the list.

Here's what is behind this action: the Defense Dept. is in the midst of a desperate drive to cut out at least \$2.2 billion from burgeoning military expenditures, thus to stay close to the \$38-billion spending ceiling clamped down by the administration.

To do this, major weapon production and development projects have been cancelled, stretched out and reduced; force levels have been cut by 200,000 men; new contract awards have been postponed; contractor overtime has been restricted; "installment buying" for planes, missiles, and other equipment has been banned; progress payments to contractors have been reduced 5 percent; contractor payrolls are being cut 5 percent; military bases are being closed.

But these decisions have not slowed down defense spending fast enough to meet demands of the administration's tight financing and debt management policies.

So the Air Force was ordered to survey its major contractors, to get estimates of anticipated billings on progress payments and outlays due on delivery of equipment until next July 1. The total exceeded the Air Force's cash on hand—by some 20 percent, some observers say.

In disclosing plans to defer payments, the Air Force has asked contractors to reduce in-process inventories and overhead and to finance a larger amount of work in process before "proposing a reduction in present delivery schedules."

But most industry observers seem certain the payment deferral will mean a new slowdown in military output. The Pentagon says that the decision to defer payments was taken as an alternative to direct production cuts or orders to put most defense plants on a four-day schedule.

- **Electronic** research and development paid for by the Army, Navy, and Air Force is due for a cutback. All three services are paring expenditures for R&D, just as they are reducing orders.

Air Force expects to cut its R&D spending back 8 percent. Facilities of the Air Research and Development Command—which account for some \$330 million of the Air Force's total \$660 million for R&D—are expected to be merged, curtailed or even eliminated. The big squeeze will be on starting up new projects.

- **Network** domination of tv broadcasting has taken one of its sharpest blows from a group of advisors to the FCC who spent two years investigating the industry. The committee came up with changes which would put a new look on tv broadcasting.

One of the main points:

Network ownership of tv stations should be limited to three vhf stations in the top 25 markets; they're now allowed five regardless of the size of the city. The other two vhf and two uhf now allowed would have to be in smaller cities.

**SMALLEST...lightest in its class!**

*NEW*  
**OAK**  
 SERIES M  
 DC-AC low level inverter



\*Depending on packaging



**designed for 30G vibrations  
 from 0-500 CPS**

While the rugged Series M is probably the smallest, lightest, polarized relay ever built, electronic designers will find that it has other characteristics equally exciting. For example, tests indicate that variations of the standard unit produce the *lowest* noise level ever achieved in this class of chopper.

Another valuable feature is the unusually wide selection of custom-built packages available to designers. These include: side, vertical, and flange mounts; coil leads at top or bottom; straight plug-in; flexible pigtailed; solder mounts; dual unit package; and double sealing with shock mounting between the two cans.

Investigate the Series M now. Contact your Oak representative, or write for complete data.



1260 Clybourn Ave., Dept. B, Chicago 10, Ill.  
 Phone: MOhawk 4-2222

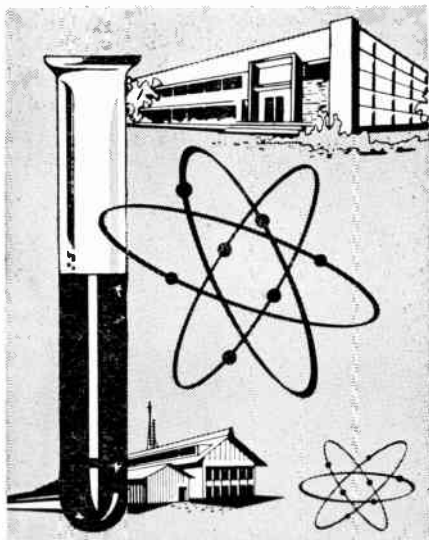
**UNIQUE DESIGN ELIMINATES  
 PARTS FOR UNUSUAL SIMPLICITY**

The Series M chopper gains its extreme simplicity from a new design approach based on the advantages of an oriented ceramic magnet. In addition, the switch unit contains no organic insulation, is mounted independently of the drive coil, and has its own hermetic seal.

**Operating Frequency**—0-1000 cps; special units to 1800 cps.  
**Coil**—6.3 volts  $\pm 20\%$  at 60 to 500 cps; 60 ma max at 400 cps; 85 ohms (DC).  
**Phase Angle, Lag**— $55^\circ \pm 10^\circ$  at 400 cps;  $20^\circ \pm 2^\circ$  at 60 cps.  
**Dwell Time**—165° min.  
**Dissymmetry**—15% max.  
**Mounting**—Any position.  
**Temperature**—From  $-55^\circ\text{C}$  to  $+100^\circ\text{C}$ ; special to  $+125^\circ\text{C}$ .  
**Weight**—Less than  $\frac{3}{4}$  oz. for the plug-in unit.



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Atom Power  
Development?...**  
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**SHOW YOU!**

Many great technical centers stand ready to help you . . . Mallinkrodt and Monsanto Chemical, St. Louis, Washington and St. Louis Universities, Missouri University at Columbia and Midwest Research, Kansas City. Empire Electric of Joplin is joining in the construction of an experimental reactor.

Already one of the nation's great chemical and electronic centers, Missouri's plants continue to grow both in size and in number.

For this, there are many good reasons—plentiful water, fuel, power—splendid transportation, excellent labor, a sympathetic tax structure. Many perfect plant sites are still available. And in 117 Missouri communities, organized industrial development corporations are ready to help you get started.

**PHONE COLLECT or write**



Richard Kinne, Industrial Director, Dept. J792  
Missouri Division of Resources and Development  
Jefferson City, Missouri

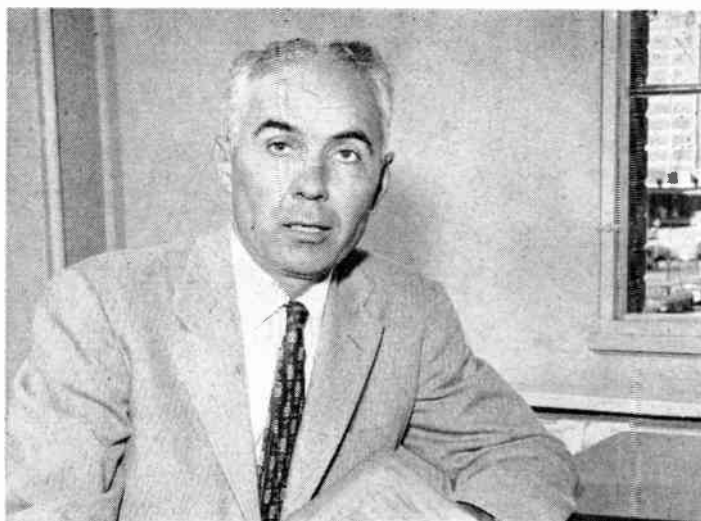
Please send our copy of Missouri's Industrial Location "Fact Finder", with facts on tax and labor laws, utility rates, resources, and organized industrial development corporations.



Name \_\_\_\_\_  
Company \_\_\_\_\_ Title \_\_\_\_\_  
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City \_\_\_\_\_ State \_\_\_\_\_

Circle 7 Readers Service Card

## EXECUTIVES IN THE NEWS



### Norris: for engineers, capitalism

RECENTLY William C. Norris took himself and a handful of associates away from Sperry Rand and set up Control Data Corp., new computer development firm in Minneapolis. This isn't the first time 46-year-old Bill Norris has gone into business for himself; if his history repeats, it won't be long before some big company will be bidding to buy his new venture.

Norris is a quiet, intense man, afflicted with what associates describe as "scientific restlessness." His interest in computing machinery dates from Navy years. After the war, he and some ex-Navy colleagues formed Engineering Research Associates, built a raft of magnetic-drum computers.

The Minnesota firm grew fast, caught the roving eye of James Rand, merged with Remington Rand in 1952. Ultimately it became a keystone of RemRand's Univac division. Norris took over as v-p and general manager of Univac operations after the Sperry Rand merger, then became restless.

His new firm illustrates his double interest in both scientific matters and the capitalistic system. Key staffers are also stockholders: "engineers," he believes, "like the opportunity to work at their professions and still participate directly in capitalistic enterprise."

Confirmed Midwesterner Norris was born and educated in Nebraska (B.S. from University of Nebraska in 1932), has put down roots in Minnesota. The new firm is "tied to the community—many businessmen in the Twin Cities are among the stockholders." Control Data is publicly owned. "We'll have to grow fast to be effective," says Norris, "and you can't finance fast growth out of profits."

His wife and six children (ranging from a 12-year-old downward) take up much of his leisure time. What's left he uses up on his farm. There the restless and impatient Norris sits quietly with a high-powered rifle and does what he calls "precision shooting." Object: crows.

## LETTERS

### Colleges Expand

As an educator, I appreciate your occasional news about schools. The

news item on Lowell Technological Institute ("College Expands in Electronics," Sept. 20, p 27) was very informative.

I would like to point out that the far West is doing an equal if not

more extensive job in electronic engineering education.

This year California State Polytechnic College graduates the tenth class of its electronic engineering department. Alumni number around 300 and are spread throughout the United States. The department was organized in 1946.

Recently, the state of California completed a new \$2-million facility of 55,000 sq ft to house the rapidly expanding department, which numbers nearly 700 students out of 4,300 in the college.

Today, Cal Poly is conducting the largest four-year undergraduate program in electronic engineering in the far West.

CLARENCE RADIUS  
CALIFORNIA STATE POLYTECHNIC  
COLLEGE  
SAN LUIS OBISPO, CALIF.

### Magnetic Tape Shares Up

We noted with interest your listing of shares and prices of stocks of "typical magnetic recording tape manufacturers" ("Shares & Prices," Sept. 20, p 5).

Inasmuch as ORRadio Industries is now generally recognized as one of the four leading manufacturers of magnetic recording tape, you might be interested in including information on our company's stock in subsequent issue.

CECIL S. STOWE  
ORRADIO INDUSTRIES INC.  
OPELIKA, ALA.

ORRadio common, traded over the counter, appreciated during 1957 from a January low of  $4\frac{1}{2}$  to high of  $25\frac{3}{4}$  recorded Sept. 3. Last week it was  $17\frac{1}{4}$  bid,  $18\frac{3}{4}$  asked. Company earned \$0.28 per common share in the fiscal year ended Feb., 1957, plowed all earnings back into expansion.

### We Moved It

(Re "New Firms Spring Up," Sept. 10, p 53) . . .

This is just to let you know that Reltron Corporation is located in Newton, Mass., and not in Montclair, N. J., as you announced.

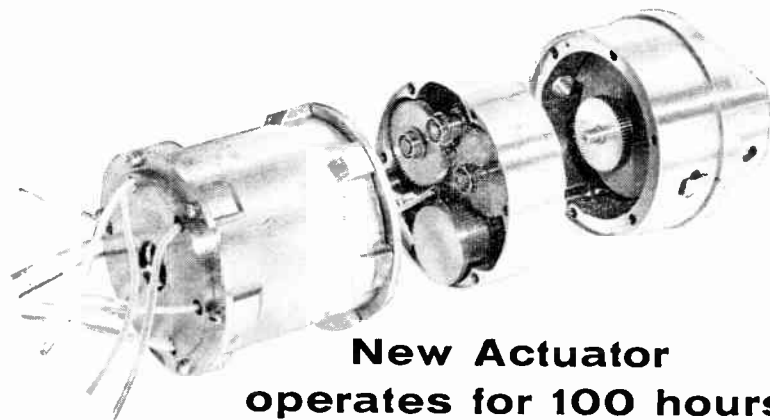
ROBERT B. WADMAN  
RELTRON CORP.  
NEWTON 58, MASS.



## New servo-controlled "Tilt Table" for missile guidance testing

This Thompson-engineered mobile unit aids in the functional check of an intercontinental missile's internal guidance gyroscopes. It generates angular position and velocity inputs to the gyros. Unit

consists of electro-mechanical assembly, electronic pre-amplifiers and pick-off amplifiers, and quadrature rejection unit. Two-gimbed support structure will carry a 125-lb. guidance package.



## New Actuator operates for 100 hours at 550°F submerged in jet fuel

Pictured is a new Thompson-developed actuator used in missiles. It consists of motor, gearing, feed-back pick-off and jacket. Unit has been tested for 100 hours of operation at 550°F submerged in jet fuel. Power out-


put is 10 watts (mechanical). Torque output is 150 inch-ounces at 30 rpm at 550°F. Servo performance in conjunction with a computer produces a positional accuracy of  $\pm\frac{1}{2}$  degree. Approximate size: 3" diameter x 4".

Call on Thompson for development and production of electronic control sub-systems and components, countermeasures and microwave components. We invite your inquiries.



ELECTRONICS DIVISION  
**Thompson Products, Inc.**

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power wirewound  
resistors in*  *1% and 2% as well as 5%  
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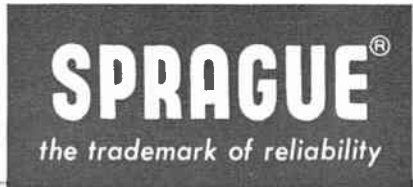


THE NAME TO BE REMEMBERED...

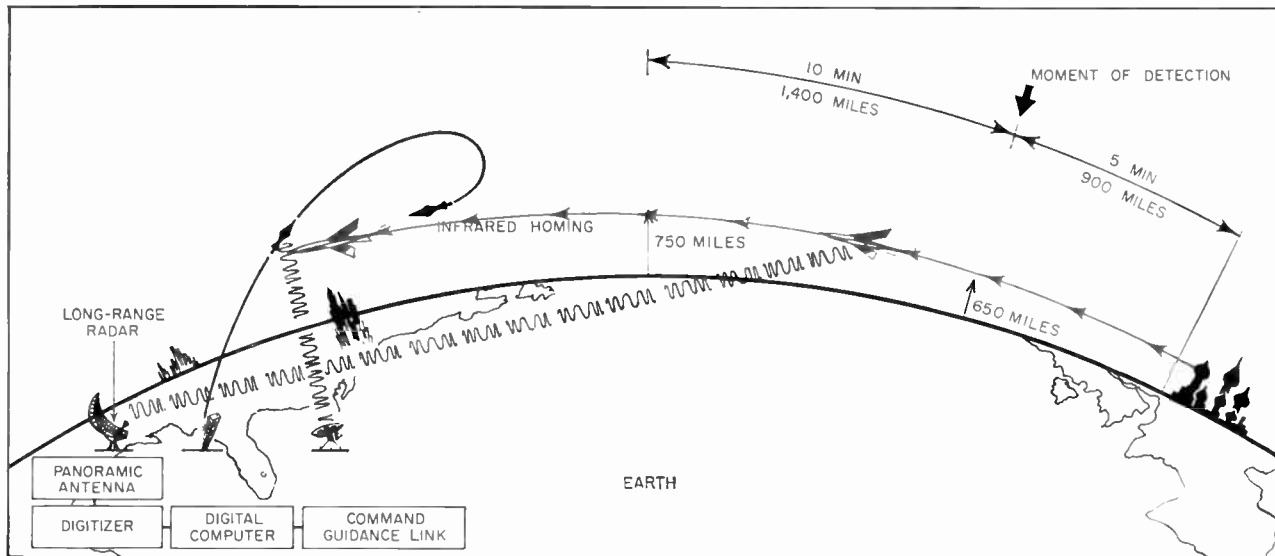
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27E	5	1 1/4	3/8	5,500 Ω	30,000 Ω
28E	10	1 3/8	3/8	12,000 Ω	50,000 Ω

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ICBM-defense problem is not yet solved, but . . .

## Anti-Missile Clears Hurdle

**Early-early warning radar that detects missiles 3,000 miles away sets the stage for development of an anti-missile missile that will intercept an enemy ICBM. Army, USAF, five prime contractors and scores of subcontractors work toward development of the bird**

ANNOUNCEMENT at the Pentagon on Sept. 20 by USAF Chief of Staff, Gen. Thomas D. White, of new 3,000-mile-range radar reveals that progress toward defense against an enemy intercontinental ballistic missile is past the first hurdle.

Although details of the early-early warning system are top secret, known contributors are Lincoln Labs at Massachusetts Institute of Technology, RCA, Hughes Aircraft, Sylvania and General Electric.

Obvious design requirements of radar of such range and for objects moving at such velocities are high transmitter power, fine resolution, immunity to noise and a high-speed scanning mechanism.

Required scanning speed of anti-missile antennas—unless the enemy missile is approaching dead on—is faster than scanning mechanism capabilities presently known publicly. Possible solution: electronic

scanning antennas using a pattern of ferrite rods.

Noise, power and resolution obstacles were recently overcome by Columbia University's ORDOR, OmniRange Digital Radar (ELECTRONICS, Sept 1) which uses a signal enhancement technique operating on a digital principle. Although how it works is classified, the technique no doubt is similar to the way video signals such as tv can be reconstructed and cleaned up when they are transmitted by pulse-code modulation. The echo signal in ORDOR, though many times weaker than that usable by previous systems, is still recognizable.

Another possible missile detection system is PANAR, developed by Sanders Associates (ELECTRONICS, Oct 10). Using a pulsed doppler technique, Panoramic radar enables quick determination of both velocity and position of a detected object.

All three systems mentioned above are applicable

to anti-ICBM problems. They may possibly all three be integrated into a major plan.

Second step in knocking down a hostile ICBM is development of a weapon that can act on early warning information, get into the air and find and destroy the enemy bird. Army and USAF are both working on such programs.

Development of Army's Nike Zeus—getting the largest amount of Army's \$410 million fiscal 1958 R&D funds—is contracted to Bell Telephone Labs, Sylvania and Douglas. Probable division of responsibilities is: BTL, electronic design; Sylvania, manufacture of electronic gear; and Douglas, air frame.

USAF'S Wizard is contracted to Convair and RCA, responsible respectively for airframe and guidance.

Subcontractors involved are probably as numerous as those contributing to the ballistic missile program, last reported to have hit 200.

Army's Nike-Zeus is tactically an extension of the antiaircraft artillery problem soon to be taken care of by Nike Hercules. Initial guidance of Zeus could conceivably be command-guidance data link, directed by computing a collision course from information obtained from the radar plus known ballistic trajectory patterns. Extremely high-speed digital computers will be needed for this. Such links could, however, be jammed by equipment built into the enemy missile if crowded payload quarters allow its being carried.

Final collision guidance might be accomplished by radar homing but more likely will be infrared. Believed to attack the intruding ICBM from behind, the anti-missile missile would have to double the ICBM's speed of 15,000 mph.

USAF's present interceptor missile is Boeing's Bomarc with radar guidance made by Westinghouse. Whether Bomarc will be the springboard for USAF thinking toward a missile with this greater performance capability is only speculation.

To avoid enemy jamming Wizard's guidance might be initially inertial and later, to close in for the kill, infrared.

## Sounds From Space

**Amateurs, scientists hear signals as Soviet satellite circles the earth**

SOMEWHERE north of the Caspian sea, at 5:05 p.m. on October 4, the Soviets blasted off a three-stage rocket that rose to 560 miles, then hurled the first man-made satellite into an orbit around the earth.

At 7:00 p.m. Radio Moscow announced that a Russian satellite, weighing 184 pounds and measuring 22.8 inches in diameter, was then circling the earth at 18,000 miles per hour.

At 8:07 p.m. RCA engineers monitoring 20.005

mc heard a steady series of dashes with a low-sounding tone "just a little higher than a frog's croaking." Modulation of the signal was estimated at 400 cps. A slight echo was heard and diagnosed as possibly resulting from interference.

A sister signal at 40.002 mc seemed much like the 20.005 transmission. But RCA, its equipment better suited for reception of the lower frequency, settled down to monitoring on 20.005 mc.

The signal lasted 45 minutes, then died.

One hour and thirty minutes later RCA picked it up again. This confirmed that the Russians had done it — there was a brand new moon in the sky.

Although certain of the existence of satellite transmissions, listeners disagreed on the nature of the signal. Some heard dashes of 2½ to 3 seconds duration. Some said the dashes lasted 0.3 second. And others heard a continuous tone.

Speculations as to cause of these irregularities included weakening batteries, malfunctioning transmitter, and intentional coding of the signal.

At any rate, the early signals took American IGY officials by surprise. "Satellite listening posts" were caught with their frequencies down. Nine government sponsored tracking stations in North and South America were ready to track a satellite — the planned American satellite scheduled to transmit on 180 mc.

Seeing antenna and receiver conversion would take some time, the national committee of International Geophysical Year called on the American Radio Relay League. Amateur operators were asked to monitor the 20.005 and 40.002 mc bands, reporting their findings to the Vanguard Control center at Naval Research Laboratories in Washington.

Using information from hundreds of calls from ham operators, IGY officials plotted an orbit essentially the same as that predicted by the Soviets.

They found the orbit inclined at 65 degrees to the earth's axis. If the globe stays up long enough it will pass over virtually every point on the earth.

Everything claimed by Moscow seemed to fit except the satellite's weight. There was much skepticism as to whether a satellite of such weight (184 pounds) could be launched at this time.

British scientists said the decimal might have been misplaced from 18.4 to 184 when specifications were announced by Tass, Soviet news agency.

Another big question concerns source of power. RCA monitors recorded a weakening of signal after the satellite was aloft only three days. Did this mean the first moon had no solar batteries?

For the moment, Russia wasn't answering these questions. To get answers on their own, American interests started "Operation Moonwatch." Early in the morning of October 7, Gordon B. Little sighted a strange object in the sky over an observatory at the University of Alaska. IGY officials checked their plotting boards, found the satellite actually was due over Alaska near that time. Little had been the first American officially to sight the new moon.



# Firms Turn to Nondefense

**More firms are looking for security by adding nonmilitary lines to their defense business. But 90-percent mortality rate of new electronic products is making them take market research more seriously**

STILL more military cutbacks are in the wind. Defense Department spending for August, despite slashes, is still running at a \$42-billion annual rate—not the \$38 billion budgeted. An increasing number of military electronics producers are looking for a cushion against cancellations and stretchouts by diversification into nonmilitary markets.

Switching to nondefense electronic products looks like a formidable task to many small operators who started solely in defense work. Some authorities say about 90 percent of new electronic products fail.

The small manufacturer who can least afford a product failure is also the firm that cannot invest heavily in establishing a market research department.

H. Rainie, Jr., vice president of market consultant firm Stewart, Dougall & Associates, told *ELECTRONICS* about a firm that was formed in 1947. After the

start of the Korean War, it expanded quite rapidly, but only in the military field. The firm felt the need for some nondefense business.

Low-cost preliminary surveys indicated that only a few of the firm's products were used anywhere but in the military. Of these, two looked promising. One, a servo amplifier, could be used in industrial applications. However, it would lose its identity in systems made by other manufacturers. The firm would not be furthering its reputation. The competition also looked pretty stiff.

The other product was almost an accident. It was a test set haywired for use on the firm's own production line. It worked but it was crudely packaged. Expensive military-type components were used in its design.

Another market survey was undertaken to determine whether other manufacturers of similar equipment would be interested in such a test set for their

---

## TECHNICAL DIGEST

- **Electrostatic** charges which might develop dangerous sparks in industrial processes or hospital operating rooms can be measured with a ruggedized portable electronic instrument having the sensitivity of laboratory apparatus. Developed by E.N.P.I. in Italy, the apparatus has electrode-probe connected to grid of electrometer triode to give perfect insulation from earth, so it can carry potential dependent on electric field. Following d-c amplifier and bridge circuit actuate meter.

- **Ice detector** for inflated plastic radomes of unmanned radar stations uses beam of beta rays directed toward thin aluminum-foil window inserted flush with radome shell. Formation of ice on outside increases backscatter, picked up by beta-ray detector unit and used to trigger automatic deicing system, in SRI development.

- **Radar parallax error**, occurring

when search radar pictures are retransmitted to a gunfire control radar at a higher or lower remote point, are corrected automatically in Societe Francaise Radio-Electrique radar. Coordinates of desired target on centered ppi display at repeater are fed into computer which corrects azimuth and range data of echo for parallax while taking into account differences in elevation of radars.

- **Rare earths** and intermetallic resins processed with zirconium tetrachloride have resulted in new family of transducers for sensing strain and pressure, made by Clark Electronic Labs. Over 30 compositions include one which changes 200 megohms in resistance as pressure is applied; another withstands 250,000 psi explosion shock. All are rated for 500 F, can be made for 1,100 F, and will still have original ratings when cooled down from red heat.

- **Laminates** and resins for microwave propagation can be tested at

temperatures up to 500 C with new Microcell Electronics (England) test set giving direct readings of permittivity and loss tangent. Only limited knowledge of microwave measurements is needed by personnel. Reflex klystron gives fixed spot frequencies in 8,500 to 9,600-mc band, to energize 3-db hybrid coupler which divides microwave energy equally between sample in one waveguide arm and calibrated short-circuit in other arm.

- **Magnetic-amplifier** deflection yoke for picture tubes, proposed by Technical Assistance Co., greatly reduces power requirements of deflection circuits, thereby permitting use of transistors or small tubes. Horizontal sweep signal is applied to control windings of horizontal-axis magnetic amplifier toroids, vertical signal to control windings of the other pair of toroids. Resultant flux through deflection toroid on neck of tube gives sweep action which may be linearized to desired accuracy by use of a feed-back winding.

production lines. The results were positive, so the manufacturer got busy redesigning with less expensive components and using a more functional package. Sales are good and the company estimates that it is already breaking even on this product.

The firm is not a threat to the giants in the industry, but it does have a foot in the door.

The case history may be more of a success story than is typical, but Rainie points out that the switch to nondefense products does follow a pattern. It starts with finding out what the firm does make or could make easily with its present facilities and personnel. An exploratory search will tell whether or not any market exists for the products.

Before spending more money on market research, other problems within the plant are considered. How much would it cost to design or redesign the product?

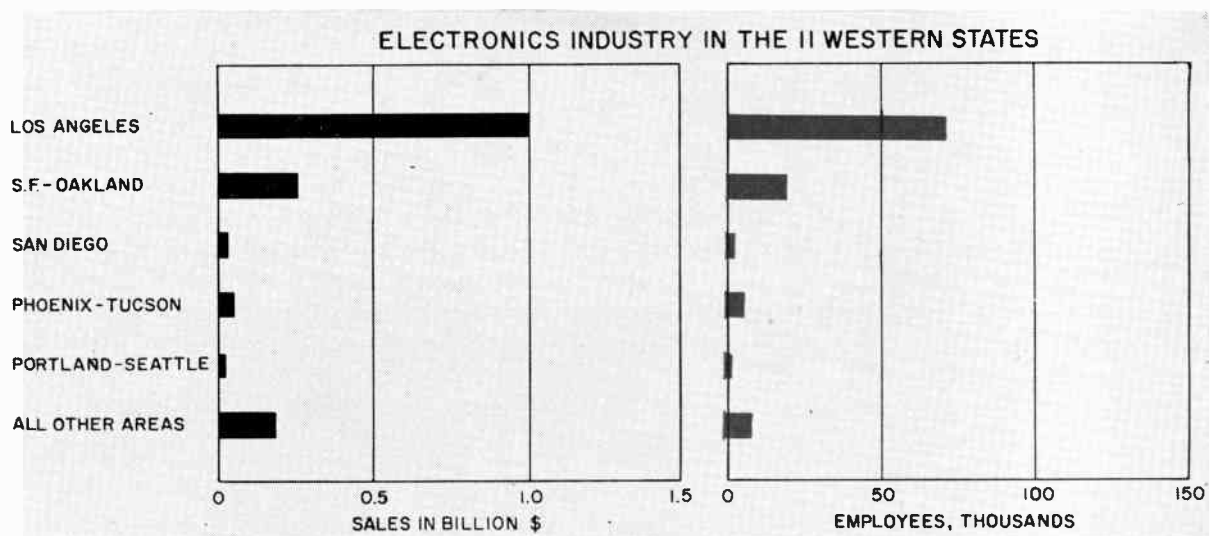
Would changes in personnel be required? In plant layout? Test facilities?

If design and manufacturing problems don't look too bad, more effort may be exerted in marketing. How many such items are used? What percentage of the market can the firm hope for?

Assuming everything looks good so far, the firm may go into business. Market research continues, however, to establish the distribution picture. Are such items usually handled by reps? By wholesalers? How quickly do buyers expect delivery?

No one seems to know the ratio between investment in technical research and investment in market research. In smaller firms, it seems to approach infinity. But the cost of market research seems pretty small in the face of the money wasted on technical research when a product fails.

## PRODUCTION and SALES



## \$2 Billion Seen for Western States

INDUSTRY forecasters look for a \$2 billion western electronics industry (excluding broadcasting) by 1965. Sales by western manufacturers hit \$1.562 billion last year, equal to 24.2 percent of the \$6.444 billion national total.

This western region comprises the 11 states of California, Oregon, Washington, Arizona, Nevada, Idaho, Utah, New Mexico, Colorado, Wyoming and Montana. But, five smaller areas produce the bulk of the region's electronic business: Los Angeles, San Francisco-Oakland,

San Diego, Phoenix-Tucson and Portland-Seattle.

The Los Angeles area leads all others by far. With sales of \$1.0 billion in 1956, it accounted for 64.3 percent of total western electronic sales. Its sales were a sizable part of the national total, 15.5 percent. With 470 firms and 73,000 employees LA had 64 percent of the 641 firms and 112,800 employees in the West last year.

The San Francisco-Oakland area is growing fast. Its sales last year of \$260 million accounted for 16.5

percent of the regional total. It also had 20.0 percent of all employees. Plant capacity in 1957 is expected to expand by 50 percent. New capacity is expected to yield a 25-percent sales increase the first year.

The remaining \$302 million of sales by the region in 1956 was divided as follows: San Diego, \$30 million or 2.1 percent of the regional total; Phoenix-Tucson, \$55 million or 3.3 percent; Portland-Seattle, \$25 million or 1.7 percent and \$192 million or 12.4 for the balance of the 11 western states.

# Rating the New Man

**Equation evolved with the aid of giant computers may help find an equitable starting salary for engineers and scientists. Class standing and rating of college are ruled out with other time-honored standards as predictors of success on the job**

A SUPERVISOR establishing the starting salary of an engineer often may be influenced by factors not really related to the man's potential value to the company. Similarly, some of the factors used to establish relative standings of engineers and scientists may be suspect.

Now, however, the conclusions indicated by a study made by R. A. Martin and J. Pachares at Hughes' research and development laboratories may help put both hiring and rating on an equitable, scientific basis.

The aim of the study was to evolve an equation for determining objectively an entrance rating for a newly recruited engineer. It also entailed a statistical evaluation of some of the standards used in rating technical personnel. It was checked against the actual ratings of 279 engineers in the lab.

A total of twenty-seven factors usually used to evaluate engineers were checked for correlation with a group of factors felt to reflect actual success in the lab. Eight of the twenty-seven showed significant correlation. Presumably starting engineers could be evaluated on the basis of these eight factors. Those with the highest potentials would then be given the highest starting salaries.

The researchers arrived at an equation which would give an entrance quality rating and a basis for establishing starting salary. With Y equal to the quality factor, the equation is:

$$Y = 80.0 + 2.4X_1 + 0.72X_2 + 0.86X_3 - 3.7X_4 - 3.6X_5 - 2.8X_6 + 0.57X_7 + 0.69X_8$$

In the equation,  $X_1$  is the level of academic degree (B.S. 2; M.S. 3; E.E. 4; Ph.D. 5);  $X_2$  is number of professional publications;  $X_3$  is number of honor societies to which elected;  $X_4$  is unity for a major in physics;  $X_5$  is unity for a major in other than M.E., E.E. or physics;  $X_6$  is unity for a major in E.E.;  $X_7$  is number of patents and  $X_8$  is number of fellowships.

The factors are given in the order of their significance. The larger the value of Y, the greater is the chance of success.

Perhaps the most startling conclusion of the study is the discovery that a number of factors usually considered when hiring engineers may not be related to

success. Class standing and the standing of the college are two of the most noteworthy. Other factors of little value, according to the survey, include number of previous jobs and average length of service in each, age and marital status.

A number of personality traits were also ruled out in a separate part of the study to determine whether they were related to salary growth. These included experimental ability, analytical ability, initiative, industry, originality, general knowledge, sincerity, appearance, personality and leadership.



## Army's World Spanner

Metal-encased vacuum-tube being lowered into Army's new 24-million-watt single-sideband short-wave transmitter. Soon to be installed for Pentagon use, the World Spanner, designed by Army Signal Engineering Labs and Continental Electronics, will send 64 teletypewriter messages or four separate voice signals simultaneously at frequencies from 4 to 30 mc. Second version will cover the 20 to 65-mc range.



# Tampa's recreational living builds employee morale — steps up productivity



Employees who *live better, work better.*

The men and women who work in Tampa *live better!* They, and their families, get more out of life because they can fill their leisure time — *year 'round* — with all of the healthful, outdoor fun and sun-tanned relaxation seven million visitors come to Florida for every year!

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*Get the facts on Tampa!* Plenty of uncrowded sites with "clean air" . . . excellent air, rail and truck transportation . . . low water rates through Tampa's deepwater port . . . and an expanding market for electronic equipment are a few special advantages.

For specific information about any industrial phase of Tampa, write Henry L. Toland, Chairman, Committee of 100, Greater Tampa Chamber of Commerce. Your inquiry will receive immediate — *and confidential* — action.

For information about Tampa business, industry, schools, recreation, living, etc., ask for copy of 36-page booklet "Tampa Facts." It's FREE!



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# Tampa

HILLSBOROUGH COUNTY, FLORIDA

# Atomic Bonanza in Europe

- **Western Europe will spend \$5 billion on atomic power plants by 1967, including some \$50 million for reactor instrumentation**
- **Firms without licensees will get little power-reactor business but may sell research reactors and off-the-shelf instruments**

AN ATOMIC power bonanza is shaping up in Europe. But business, technical and political complications are working to curtail the share that could fall to U.S. nuclear instrument suppliers.

To build a stake in European markets, U.S. atomic contractors are busily signing marketing and licensing arrangements with European firms. One big switch to a European base of operations came in July and August, when Westinghouse announced construction licensing arrangements with big Belgian and Italian firms.

Effect is that part of the atomic instrument market is shifted to Europe, in that built-in reactor control instruments are generally purchased where the reactor or core is built.

Frank Low, Tracerlab's foreign sales manager, recently returned from an extensive tour of Europe. The market as he sees it is this:

- Sales of research reactors built in the U.S. will continue healthy. A good market can be developed in low-power reactors to underdeveloped countries.

- Exports of large power reactors will be scanty. On the large jobs, it is easier to do the building in Europe with U.S. firms sharing via licensing or joint venture.

- A significant market can be maintained in the kind of instruments which are not built into the reactor, particularly as these become mass-production items. These include such instruments as personnel monitors and analytical equipment.

Other Americans with atomic know-how agree with Low. Harold Vance, AEC member; Michael Michaelis, of A. D. Little, and Leo Macklin, of Combustion Engineering all warn the U.S. will find no assured market in Europe for power reactors.

U.S. firms are doing a fair business in Europe. By August, the AEC had licensed 10 research reactor shipments valued at \$4.65 million. Orders on hand totalled at least another \$105 million, including a few power reactors.

The U.S. atomic industry needs overseas business because atomic power won't be profitable in the U.S. until the 1960's. Europe is today's market.

The program of the European Community for Atomic Energy (EURATOM) calls for 15-million-kilowatt capacity, costing \$5 billion, by 1967. Built-in electronic instrumentation should take \$50 million.

But this is a market that will likely be denied U.S. control makers unless they also go into joint ventures overseas. European countries are striving to build a home-based atomic industry individually and through EURATOM. However, they will pay for technological aid.

A British specialty, gas-cooled reactors, is the chief competition to U.S. pressurized water reactors. What they lack in efficiency, they make up in Britain's lower construction costs.

The U.S. is beating Britain about 4-1 in research reactor exports. But Britain has gained a 2-1 or 3-1 edge in power reactors, where the big money lies.

Furthering Britain's position is the requirement of U.S.-type reactors for enriched uranium (U-235). Britain emphasizes natural uranium.

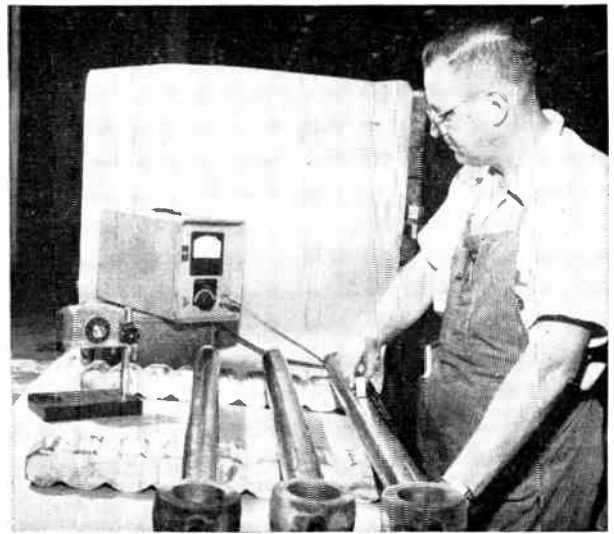
There is little chance of Europe abandoning its atomic aims. Electricity costs 50 percent more there because of higher fuel costs. Western Europe, Vance says, imports \$2 billion in coal a year now and would spend \$6 billion annually 20 years from now.



Sales engineers demonstrate research reactor model to customers from Italy



Alarm system looks for trouble



Pulses pinpoint surface roughness

# Building the Big Cats

**About \$500,000 worth of electronic equipment at Caterpillar Tractor Company's Joliet, Ill., plant assists in plant protection, production and quality control. Company spent \$200,000 on an alarm system and \$300,000 for controls, communications and testing**

CATERPILLAR Tractor Company's plant in Joliet, Ill., is big—two million square feet under roof, on 315 acres.

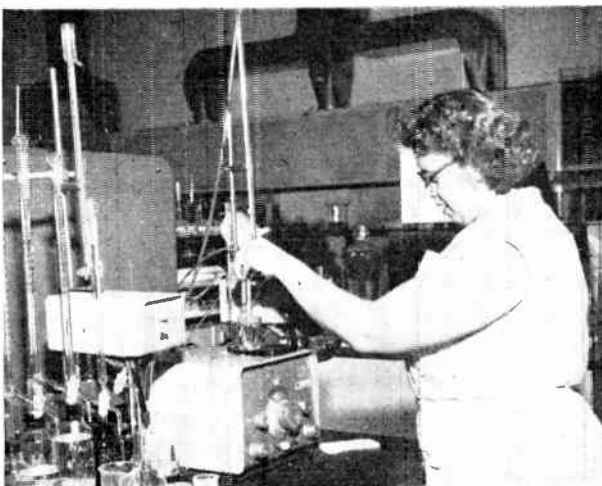
A plant that size needs a protective system that will stop trouble before it needs a cure. Electronics helps in a \$200,000 alarm system designed by Autocall Company.

A paper tape recorder records all alarms, patrol reports, conditions in storage tanks, oxygen and acetylene gas pressures, high-pressure CO<sub>2</sub>.

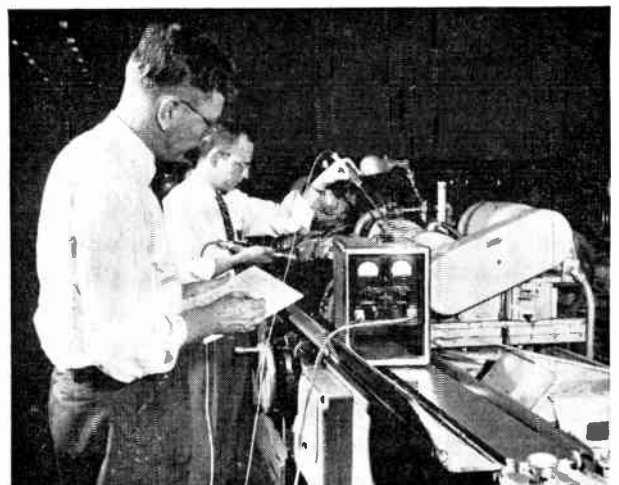
The console is equipped with a system-condition indicator which supervises the system's operation and pinpoints any failure in the system. In addition, 10-watt transceivers are used in four security and maintenance vehicles.

Another \$300,000 is invested in electronics equipment used by production people. A leased Tel-Auto-graph system provides intraplant communication.

Production workers make daily use of arc and resistance welding controls, high-frequency brazing



Process water passes pH test



Vibration analyzer tests grinder



Furnace performance is charted



Thyratrons govern arc welders

equipment, voltage regulators and d-c power supplies also instruments which control gas supply and record operation of heat-treating furnaces.

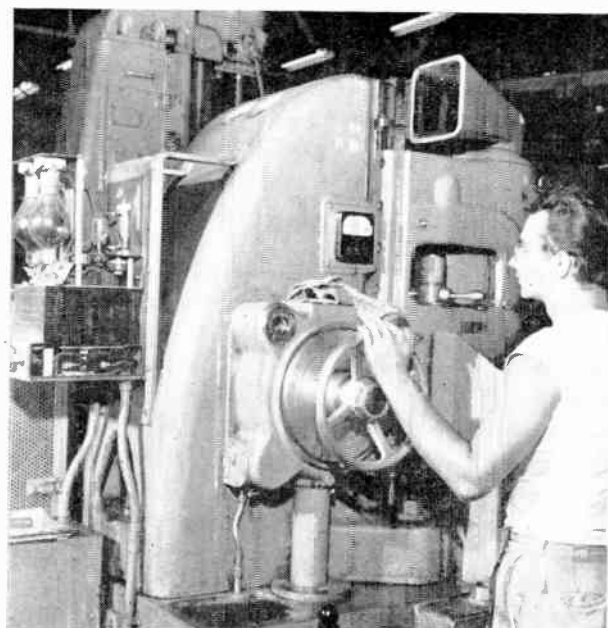
Quality-control equipment includes vibration analyzer to check production machinery, surface roughness meters and electronic gages for machined parts, automatic titrator to monitor plant water pH and an assortment of laboratory apparatus, including

spectrograph, photometer and vacuum-tube voltmeters.

The company's attitude towards electronic equipment is hard-headed. According to Elmer Dixon, chief plant engineer, an electronic unit must save money on maintenance of original purchase, or it must contribute to lower product cost or increased output. The deciding factor in purchases is quality.



Amplifier picks up piston taper



Diodes magnetize grinder table

# Cryogenics Shows Promise

**Companies and universities announce low-temperature superconducting memory devices. Compact computer refrigerating units foreseen. Trapped-flux superconducting memory cell might mean response speeds 100 times faster than fastest now available**

AT A HIGH-BROW, low-temperature physics and chemistry conference at the University of Wisconsin recently, a number of scientists announced research advances in cryogenics.

What was described by an IBM scientist as a "trapped-flux superconducting memory cell" will, if proved feasible in a computer, mean response speeds 100 times faster than the fastest computer now commercially available.

Though still in its earliest experimental stages, results so far with the IBM memory device are promising. The device retains information through the use of persistent circulating currents which occur in superconductive materials at very low temperatures. IBM scientists can now admit to being "enthusiastic" about the possibilities of low-temperature circuitry for computers.

At the same conference F. C. Crittenden Jr. described for Ramo-Wooldridge a computer memory element employing superconducting persistent cur-

rents. Pulse lengths of about 100 millimicroseconds can be used with films of tin as switching elements. Printed circuit techniques can be used in making the memory elements, which occupy about 0.3 cm<sup>2</sup> of surface.

Duke University's M. J. Buckingham described another device, the Persistatron, a superconducting memory and switching element. Based on persistent current in a superconducting loop, it's said to hold possibilities for very fast computer memories with large storage capacity. As a switch, the device has operated in one microsecond.

Extrapolation of this result to smaller units made of thin films, says Buckingham, suggests production units 100 times faster.

Aiding many efforts in low-temperature computer circuitry is the Cryostat, manufactured by the A. D. Little Co., which makes liquid helium available to laboratories.

A computer using the new IBM superconductive memory devices would require a temperature below 10 Kelvin. The Little development, some scientists believe, is the forerunner of a compact computer refrigerating unit. Even with such a unit, a future computer may be only about half the size of present models.

IBM scientists expect that low-temperature circuitry based on such superconductive memory cells will lick many problems of noise, high power requirements, and magnetic cross-fields that are now associated with magnetic-core matrices.

Coincident current or other common techniques are used for cell selection in the memory described by James W. Crowe of IBM. The cells need less than 150 milliamperes of drive current.

The IBM cell is made by vacuum-depositing "soft lead" on "hard lead," both of which are superconductive at temperatures near absolute zero. A hole is cut out of hard lead, and a thin bar of soft lead is deposited across the hole. On one side of the cell is a drive wire. Insulated from the drive wire, and parallel with it, is a sensing wire. The sensing wire reads out binary data by detecting changes in flux—whether or not the cell is superconductive.



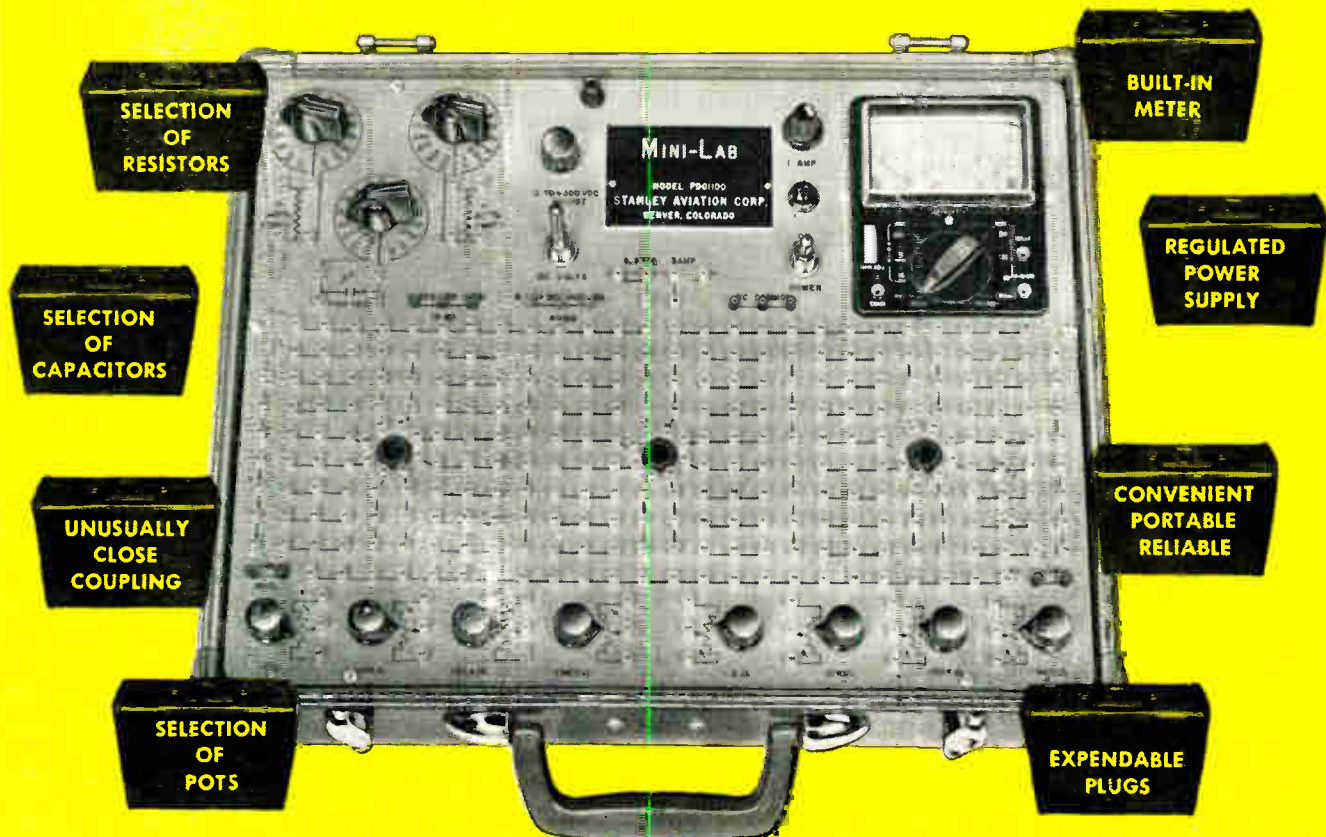
## Automatic Fact-Finder

Engineer at Applied Science Corp. of Princeton checks out new multicode capable of sampling 88 channels of low-level information. It is designed for automatic data handling



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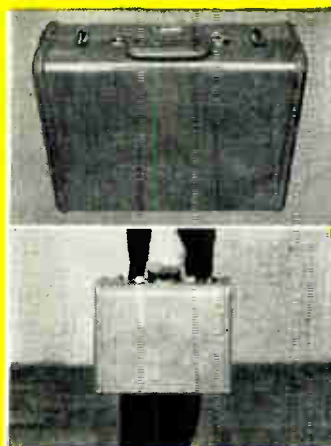


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# Soviet Moon Spurs Vanguard

**First U. S. earth satellite expected to go into orbit may be 6.4-in. Moonlet scheduled for launching about May 1. Six full-scale 20-in. satellites will follow at six-week intervals. But pressure from Congress may speed up timetables.**

APPEARANCE of the Soviets' Red Moon, Sputnik, on October 4 is affecting our own satellite program, Vanguard, in at least two ways. Congress is eagerly willing to foot the bill for getting Vanguard up as soon as possible. And technically, Vanguard scientists and engineers are learning much from the already-orbiting Russian sphere.

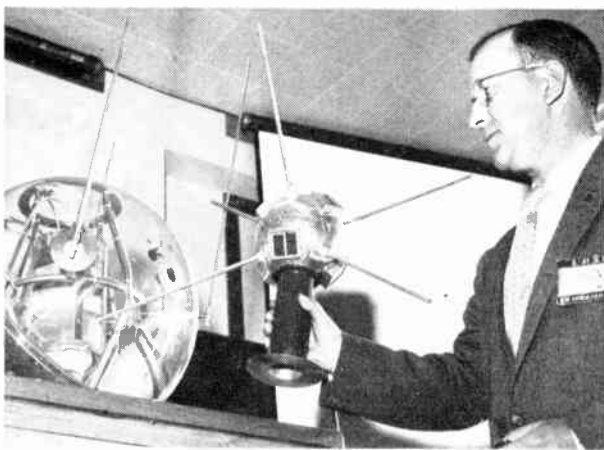
Other than speeding up the project, basic plans for Vanguard remain the same. Ten spheres will be launched. A reconnaissance patrol consisting of four 6.4-in. aluminum test spheres will be sent out prior to launching six 20-in. satellites.

Weighing a total of 4.5 lbs before separation from the third-stage rocket and 3.75 lbs afterwards, each test sphere will carry two Minitrack transistorized radio transmitters and six 12-in. antennas.

Current planning allows for a six-week interval between launchings with the first test sphere setting forth for outer space about December 15. The same type three-stage-rocket carrying-vehicles will be used for all spheres.

Glenn L. Martin, prime contractor for the three-stage launching vehicle under the direction of the U. S. Naval Research Laboratory, is collaborating with scores of subcontractors.

Minneapolis-Honeywell is building the three-axis reference system to be carried in the second-stage rocket. Vickers is making a magnetic-amplifier auto-



Moonlet, held by Vanguard's director John P. Hagen of Naval Research Lab, may be first sphere to orbit when launched about May 1. Full-scale 20-in. satellite to go six weeks later is at left

pilot that will take its instructions electronically from the gyro reference system.

Objectives of the test spheres, besides testing the performance of the rocket vehicle, are to test range facilities, Minitrack receivers, how the satellite will separate from the third rocket and the temperature both inside and outside the sphere's aluminum shell.

The first three test spheres will probably not go into a stable orbit. Weight of rocket instrumentation for testing the rocket itself may be too heavy to get the sphere high enough (250 miles) and moving fast enough (18,000 mph) to orbit successfully.

The fourth test sphere, however, might become Moonlet I. The rocket carrying it will be stripped for action and may push the sphere to sufficient altitude and velocity for orbiting. In fact, due to low drag, it might go even higher and stay up longer than the 20-in. satellites to follow. Tentative date for this launching is May 1, 1958.

After compiling data from test sphere IV, the first of six full-scale satellites should start circling the earth on about June 15, 1958.

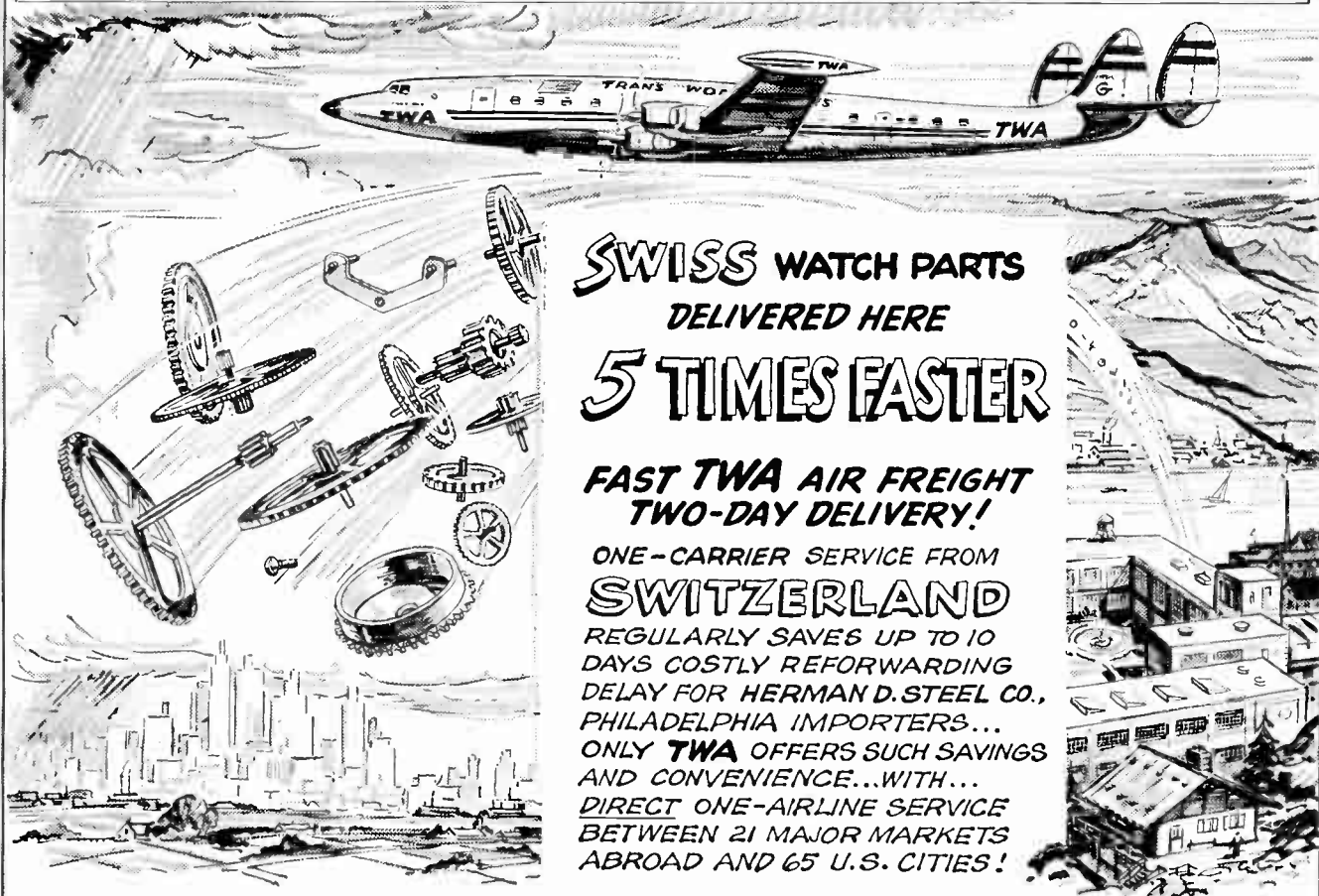
The chosen altitude will be 300 miles above the earth. Based on present estimate of densities, it is calculated that the satellite will exist at that height for about one year. If the height were 200 miles the lifetime would be only 15 days. At 100 miles the lifetime would be less than one hour. The Soviet Sputnik is about 400 miles above the earth.

Measuring 20 inches in diameter and weighing a total of 21.5 lbs, the satellite will carry approximately 10.75 lbs of instrumentation.

Once in orbit, the satellite will be tracked by the Naval Research Laboratory-developed Minitrack. Making use of radio interferometry, the Minitrack system utilizes a 3-lb transmitter.

Satellite I will be equipped primarily for environmental experiments. Satellite II will study the lower energy cosmic rays which do not penetrate the earth's atmosphere. Satellite III, equipped with a magnetometer, will attempt to obtain a time record of the earth's magnetic field above the ionosphere. Satellite IV may measure solar radiation influx to the earth as well as radiation efflux in the satellite's orbital belt. Satellites V and VI have not yet been earmarked for specific tests.

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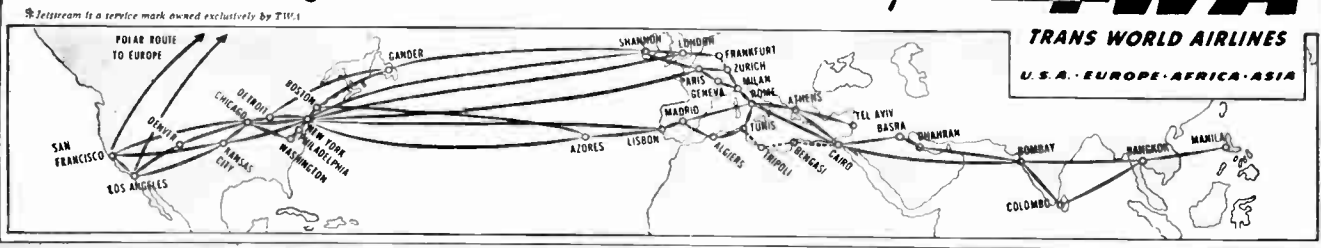


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# Use Personality Tests?

One division cut its turnover 30 percent by wise use of psychological tests. A tip: it pays to have an outside expert give them

PSYCHOLOGICAL testing is spreading. One Raytheon division has slashed its turnover rate 30 percent. A firm using tests, thinks Raytheon, can save \$1,500 per man.

From firms testing successfully come these tips:

- Find a competent psychologist, let him give and evaluate the tests.
- Instead of testing wildly, try to match a certain man to a specific job.
- Move slowly, expand the program only when successful.

A psychologist's normal fee is \$150. "Package" tests, to be given by a company man, cost \$50.

The higher fee is worthwhile, says Raytheon. A trained psychologist is more successful. The added \$100 isn't vital since it costs the

firm \$1,500-\$2,000 to have a man one year, then lose him.

Tests last about four hours. Of a general nature, they probe the applicant's basic aptitudes, personality, interests.

"Few men object to taking them," says Daniel J. Webster, marketing manager, Raytheon commercial equipment division.

"We point out the tests are to the man's advantage, as well as ours."

Sending the psychologist a description of the job a man seeks is strongly recommended. This way the consultant knows precisely what to ask and look for.

Tests aren't graded in the usual sense. Matching man-to-job is the prime objective.

## NEC Draws 10,000 to Chicago

Big midwestern pow-wow for the electronics industry took over the Hotel Sherman in downtown Chicago last week as some 10,000 industry engineers and businessmen met for the National Electronics Conference.

The big hotel was temporary home for 230 industry exhibits and a score or so of technical sessions. The 100 technical papers covered everything from components to radioastronomy.

Special emphasis in technical sessions was on techniques for using transistors, magnetic amplifiers and other solid-state devices. Servomechanisms, communications and microwave systems were also stressed. The conference included a handful of sessions on tubes and components and one group of talks on computer technology.

Featured speakers at special all-industry luncheons during the conference were Harold E. Gaskill, planning v-p of Collins Radio, and USAF General Thomas S. Power, chief of the Strategic Air Command.

Gaskill discussed the coming-of-age of electronics, suggested that the industry will have to move fast to keep up with other expanding technologies. Electronics, he said, is delaying progress in use of jets, which must have better communications, navigation systems and traffic control.

General Power pointed out that missile warfare cuts the warning time for SAC to a few minutes. He said that electronics is the key element in permitting his command to cope with possible air attacks.

Several trends in equipment design could be noted on the exhibit floor. One of the most noticeable: instrumentmakers are going in for modern design. Many instruments and packaged power supplies appeared in smoothly designed and styled cabinets. Manufacturers admitted that styled housings are cheaper to produce once deep-drawing techniques are mastered.

Oldtimers noted a 35 percent drop in help-wanted advertising on conference bulletin boards.



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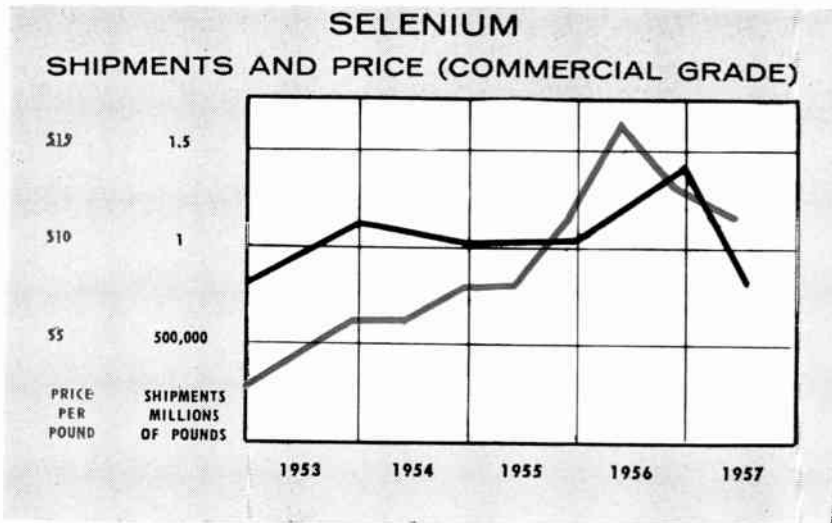
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## Turnabout in prices and sales as . . . Selenium Demand Dips

**Buyer's market holds as refinery production exceeds demand for rectifier material. Prices dip 50 percent as consumers use up inventory**

RECTIFIER makers enjoy a buyer's market in selenium today.

Prices, \$13.50 a pound for high-purity material and \$10.50 for commercial grade, are a third less than a year ago. Refinery shipments were 45,000 pounds monthly at midyear, half capacity. Producers have about 400,000 pounds in stock, the Bureau of Mines reports.

But how long this abundance will last is problematical. Selenium is a byproduct of copper refining. Copper producers, also overstocked, cut primary production almost 10 percent in June. Less copper, less selenium.

Refiners say selenium shortages thought to exist in 1955-56 were real only on paper. Rectifier makers, who take half of shipments, and others bought all they could find and ordered more as a hedge against the then rising prices.

Now, consumers are holding back orders while reducing inventory. But sales will bounce back. While the government indeed has ceased stockpiling, it has for all practical purposes, taken the lid off exports which opens a new market.

Competition of germanium and

silicon rectifiers is having little effect on selenium market. Selenium rectifier makers state they have experienced no slump in sales. They figure the overall market is growing fast enough to fill in sales lost to other types.

Further selenium price cuts may make germanium rectifiers less attractive. But silicon rectifiers appear to be gaining independently of cost considerations. Both semiconductor types have some power-handling advantages over selenium.

Refiners optimistically expect that lower selenium prices will create new markets. Two new electrical markets may shape up.

Auto makers are expected to swing from d-c car generators to alternator-rectifier systems. The choice between germanium and selenium rectifiers will probably be made on price.

Selenium may also be substituted for tellurium-bismuth elements in thermoelectric refrigerators and heaters now under development.

Selenium supply situation is today a far cry from 1954 when a congressional committee called selenium one of the most troublesome problems in the overall mobilization program.

## Computers Study Air Traffic Flow

AN ELECTRONIC computer is being used in studies of air traffic control. Scientists at Armour Research Foundation of the Illinois Institute of Technology, are simulating the flow of air traffic on a digital computer to find a solution to the increasing congestion in the air.

"They are investigating air traffic control systems for use by commercial, private and military operators in the common system of the continental United States," said Virgil H. Disney, manager of the ARS Electrical Engineering Research department. They are determining the effect of the changes in the route structure and rules of the control system on air traffic capacity.

Sponsored by the U.S. Army Signal Engineering Laboratories, Fort Monmouth, New Jersey, and the Air Navigation Development Board, Washington, the studies are being conducted in the Foundations Computer Center in Chicago and its southwestern laboratories in Tucson, Arizona.

ARS project leader Gaylew Bond of the staff at Tucson says, "the maximum handling capacity of air traffic is being reached and new techniques for air traffic controls are needed to handle more aircraft in the same amount of space with an adequate margin of safety." For purposes of the investigation, the New York to Washington area has been selected.

The initial portion of the program has been primarily concerned with stipulated improvements in present air traffic control. Such improvements as alteration of the airway structure, rearrangement of aircraft navigation and communication facilities, revised procedures and additional personnel have already been made.

The latter portion of the program will be concerned with system improvements resulting from the assumed use of facilities which might be expected or could be made available in 1965, such as a complete radar network in the U.S. and improved communications.

## New Rules in Campus Hiring

LAST spring, efforts to recruit electronic engineers from college campuses got out of hand in some cases. Now efforts are being made to protect the student, the college and the employer from high-pressure recruiting.

The Chamber of Commerce of the United States just published a set of recruiting standards for voluntary acceptance by colleges and employers.

Organizations actively seeking future employees on college campuses rose from less than 1,500 before World War II to more than 6,000 today. This, the Chamber believes, is the cause of high-pressure tactics. Cooperation of colleges, employers and students is seen as the remedy.

Colleges are asked to provide individual counseling as a part of their general responsibility for development and guidance of the individual student.

Employers should supply only strictly factual information to the student. The student should be given a clear understanding of the requirements of his employment.

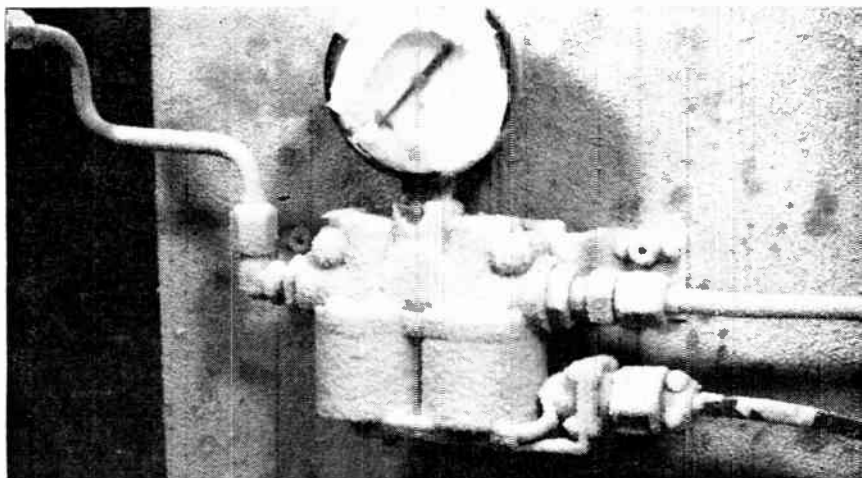
Students should accept positions only if they have sincere intentions of honoring their commitments.

Practices specifically disapproved by the new recruiting guide include:

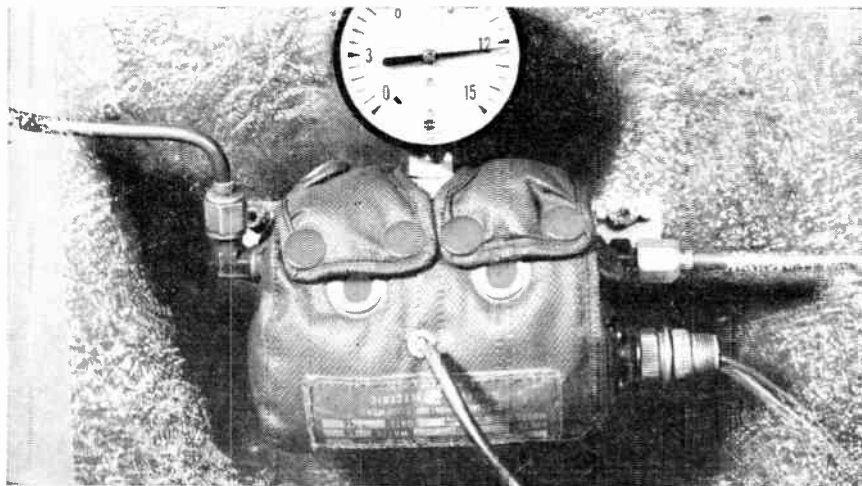
- Bidding up salary offers of competing employers.
- Elaborate entertainment of students.
- Special payments or gifts.
- Undue influence by faculty members.
- Expense account padding by students visiting plants.

The recommendations are based on studies by business groups, federal agencies, college placement officials and officers of private and state universities.

Earlier statements on recruiting were incorporated including those of the Midwest College Placement Association, the American Society for Engineering Education, the Eastern College Personnel Officers and the Manufacturing Chemists Association.



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# Cite Research Needs

## Military spokesmen cite specific needs in communications, surveillance, data processing and physics

SPOKESMEN for Army, Navy and USAF have each recently outlined certain specific requirements in basic and applied research.

Both Army Signal Corps Labs' Harrison J. Merrill and Office of Naval Research's Arnold Shostak ask for work on better frequency utilization in the crowded electromagnetic spectrum.

The Army also suggests studies to develop new communications systems in addition to existing techniques. Urgency for improved communications results from the plan for future Army tactics: troop units will be smaller, more mobile and more widely dispersed to avoid creating attractive atomic artillery targets.

Army needs also to see beyond the horizon. "Progress in electronic surveillance has not kept pace with weapon control," Merrill says.

Navy wants more information on propagation characteristics, diffraction theory and antenna design. Improved filter design; intelligent frequency allocation; single-side band, time-sharing and extremely narrow-band communications systems are urgently needed.

All three branches want better data-processing equipment. Big bottleneck Army wants to eliminate exists at military supply depots. They move too

slowly. There are too many of them.

USAF's Maj. Gen. B. A. Schriever asks for data-extraction devices to convert information from analog to digital form.

Schriever also wants more accurate instrumentation for missile flights, improved packaging for protection against vibration and light-weight electronics to be used with gyros and inertial guidance systems. He stressed the need for a "really outstanding accelerometer."

Both Navy and USAF mention need for further work on solid-state devices.

In the field of electron physics, Navy calls for improved tube cathode characteristics, studies in cold-cathode field emission, more information on semiconductors, ferrites, ferroelectrics, magnetic materials, gaseous plasmas and other electronic processes in matter.

Network synthesis, Navy says, is a major problem. Design and fabrication of networks which will yield prescribed output for a given input, or vice-versa are needed. Synthesis of nonreciprocal networks, using gyrators and other Faraday-effect components; synthesis of coaxial multicarrier telephone channels; systems for transmitting digital data; and transistor circuits are problems that must be studied.

Other general categories of interest to Navy: automatic ships' control devices for station-keeping, computer components and devices, medical electronics and auxiliary apparatus of nuclear and solar energy systems.

## MILITARY ELECTRONICS

- ARDC announces a new high-alumina ceramic radome free from certain deficiencies found in many materials currently used for radomes. The material is said to be a good conductor of radar waves, has the required temperature plus adequate resistance and strength.

Developed by Gladding McBean, the technique used begins with high alumina ( $Al_2O_3$ ). This is mixed with a small amount of organic binder for strength before firing. Made up in a watery mixture about the viscosity of cream it is sprayed on a chrome-plated steel core. Radome is then oven dried.

- New certifying standard composed of a direct read-out precision

power meter and a voltage ratio calibrator, developed for ARDC by Weinschel Engineering, will be installed at several USAF depots. Electronic equipment manufacturers served by each of the depots will be able to bring test equipment to the depot at intervals for certification.

- Airborne encoder called RAFAX has been developed for the Army by Haller, Raymond and Brown that reduces airborne radar information to narrow band video and azimuth signals which are transmitted to the ground via radio link. Received signal is fed into the RAFAX decoder/indicator which recreates the original radar display.

## CONTRACTS AWARDED

Crosley division of Avco gets \$1,747,835 AMC contract for MPS-16 radar sets, mobile tactical devices for use by field troops.

Elgin National Watch wins three R&D contracts with BuOrd covering guided-missile components totaling \$500,000.

Lear gets \$4 million contract with USAF to improve design of cockpit instrument panel.

GE sells electron tubes to Dayton AF Depot under \$134,500 contract.

West Coast Electronics gets \$459,-



003 contract with BuShips for antenna couplers.

Raytheon wins \$654,646 contract with BuShips for navigational radar, AN/SPN-21.

Hazeltine will sell 1646 coder-decoders, AN/UPA-39, to BuShips for \$1,180,283.

Kennedy will sell U. S. Naval Research Laboratory one 60-ft paraboloidal antenna for \$111,420.

Ford Instrument gets a \$328,455 contract with New York Ordnance District for design and development of inertial devices.

Varian Associates will sell 800 klystron tubes to San Francisco Ordnance District for \$144,000.

Lockheed will manufacture and install prototype electronic equipment kits in one RC-121D aircraft for Sacramento Air Materiel Area, McClellan AFB, Calif. Total: \$1,536,253.

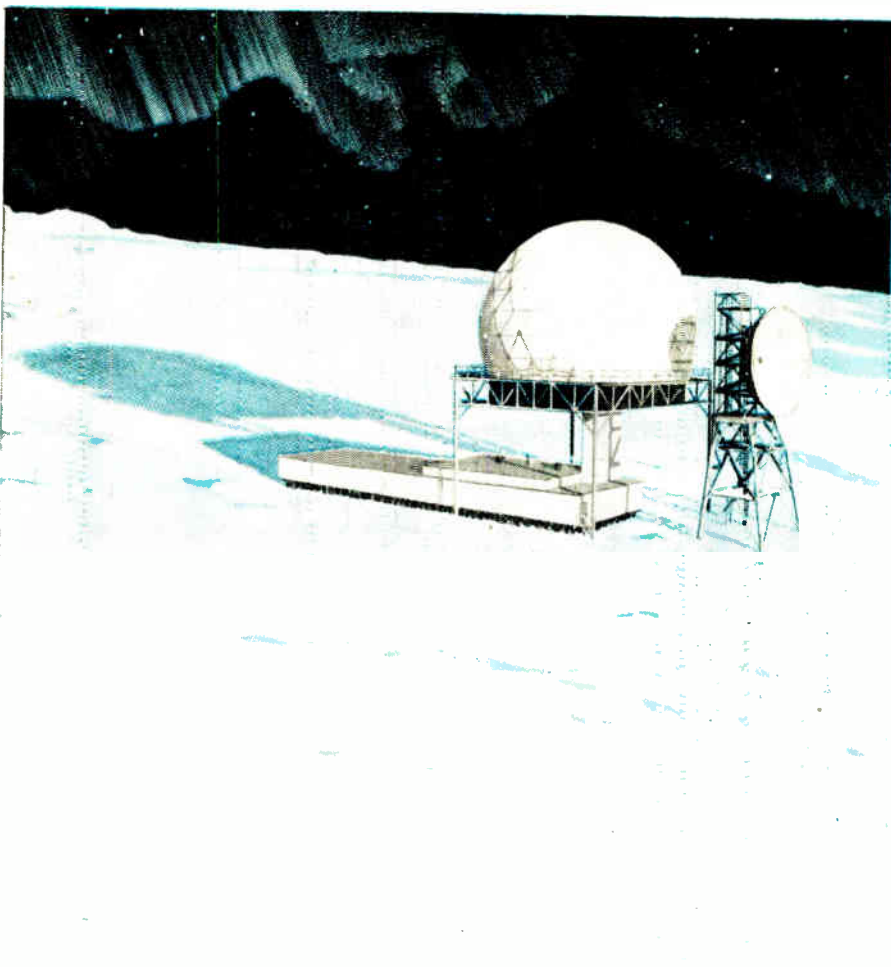
Packard-Bell announces two contracts totaling \$750,000: R&D on missile test equipment for Naval Ordnance Lab and R&D and production of mobile electronic equipment for detection and identification of friendly aircraft for Army.

Republic is awarded two Army contracts for drones totaling \$4.7 million. One contract calls for drones immediately operational, the other for an advanced, future type to be operated by Army units in battle area for surveillance using photography, radar and infrared.

Sperry is awarded \$3,984,700 contract with AMC for production of APN-59 radar sets for use in troop and cargo aircraft.

GE gets \$5,135,266 production contract with AMC for over-the-horizon scatter communications equipment. This is a follow-up of GE's \$4.56 million contract last February for development, mock-up and testing of the equipment.

W. L. Maxson wins \$2,050,000 Army contract for arming and detonating system in Nike-Hercules.



## HALT--Who Goes There?

This lonely DEW Line outpost may someday mean the difference between life and death for millions of Americans. It is a sentinel of freedom, probing the sky with unblinking eyes, ready to give instant alert to our Air Defense Command.

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Lenkurt is a specialist in communications systems for public and private use, for commercial and government installations. The company's unique experience and facilities give it a decisive advantage in solving many types of communications problems, including yours.

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For users, designers and producers of electronic and allied equipment and services, the 1957 electronics BUYERS' GUIDE (now in your hands) features an alphabetical product listing with all advertisers' names bold-faced and page-numbered. It contains an industry-wide Index of Manufacturers of better than 4,000 names. Included are 14 pages of manufacturers' representatives, 700 pages of catalog-type advertisements revealing the most complete designs and specifications of electronic and allied equipment for your easy reference, 25 pages of listings and guides for the buying of used equipment, professional services and an Index for Advertisers. Also of great importance are the 64 pages of useful editorial feature articles that provide lasting reference type technical material.

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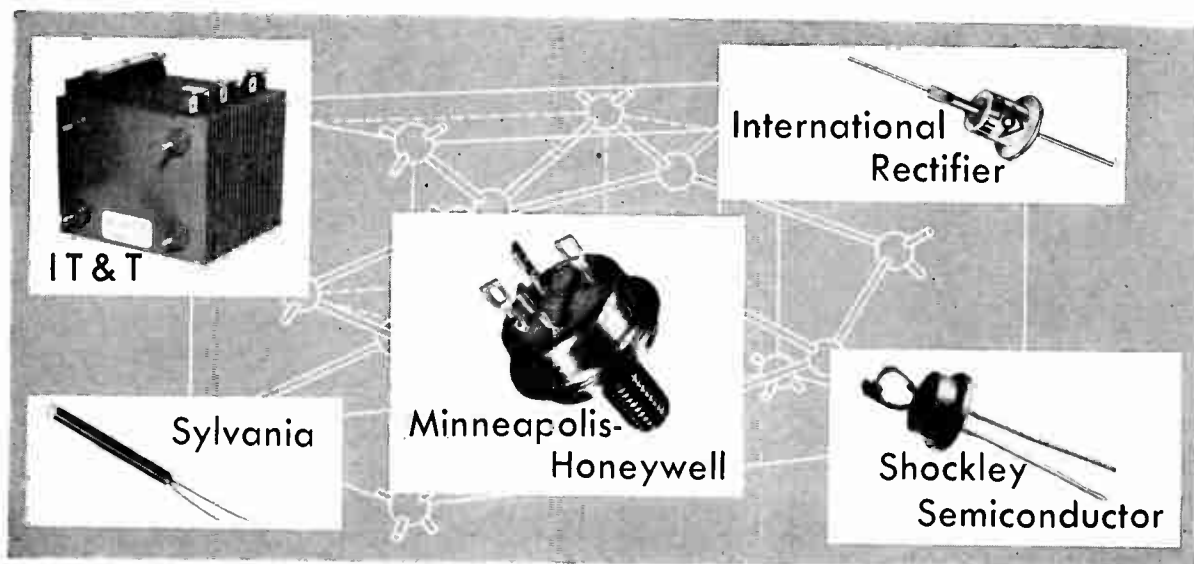
# electronics BUYERS' GUIDE

 A MCGRAW-HILL PUBLICATION

330 WEST 42ND STREET • NEW YORK 36, NEW YORK



# Semiconductors Make News



## Perform More Functions

BROADENING characteristics of semiconductor devices are making them available for a greater variety of functions. Four-layer switching diodes being manufactured in limited quantities by **Shockley Semiconductor Lab** (41) are said to perform the functions of aggregates of transistors and related components in certain circuits. The type 1N77B photo-diode announced by **Sylvania** (42) is expected to have a wide range of applications including scanning and reading, infrared detection and light-control systems.

Silicon diodes, comparable in cost and electrical ratings to the 1N91, 1N92 and 1N93 germanium diodes, are announced by **International Rectifier** (43) for operation at temperatures up to 85 C. Ten-ampere tetrode transistors have been developed by **Minneapolis-Honeywell** (44) to operate in 28-volt high-fidelity equipment. High-temperature selenium rectifiers developed by **IT&T** (45) for aircraft use are said to meet the requirements of MIL-P-7212B.

Ratiometers made by **Servonics** (46) for applications with d-c analog computers feature fast readout, continuous balance, automatic polarity indication. . . . One-mc oscillators designed by **Manson Labs** (47) are said to have a frequency stability of one part in 10<sup>7</sup> per day. . . . **Associated Research** (48) announces a portable 30,000-volt d-c high-potential tester for bench testing insulation of electronic components.

The series 850, hermetically

sealed, metal-film resistors have been designed by **Daven** (49) for use where noise is a problem. . . . A redesigned Codetypewriter announced by **Codetypewriter Labs** (50) contains only 12 miniature tubes and is said to be smaller and lighter than a portable typewriter.

Quadrature rejectors available from **Feedback Controls** (51) to eliminate saturation in high-gain servo amplifiers are said to pass signals with a maximum of 6 db attenuation and reject quadrature

with a minimum of 40 db. . . . Both a-c and d-c insulation testers are offered by **Slaughter Co.** (52) for lab, field and maintenance use.

Panel-mounting phase meters by **Trio Labs** (53) can be built into operating or test equipment. . . . Exceptionally stable time delays are said to be furnished by **Microsonics'** (54) line of ultrasonic solid delay lines. . . . **Universal Transistor Products** (55) announces transistorized survey meters for detecting alpha and beta radiation in labs, hospitals, reactor installations.

Anodized aluminum name plates released by **W. H. Brady Co.** (56) are applied by peeling off a liner on the back and require no heat or solvent. . . . An improved version of the 3U1 flat-faced cathode-ray tube by **Raytheon** (57) utilizes a two-piece bulb design to permit a flat face plate of uniform thickness. . . . Silvered mica used in the manufacture of **General Radio's** (58) standard capacitors is said to result in stability, accuracy and low losses.

Ceramic-cased, high-voltage capacitors have been introduced by **Film Capacitors** (59) for use in high-voltage power supplies, video

For more information use **READER SERVICE CARD**



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AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information—advertising. You might call it the "with what" type—which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better—save your company money.

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**McGRAW-HILL PUBLICATIONS**



coupling circuits, energy-storage systems. . . Bomac Labs (60) announces the BL-612, an L-band pre-TR tube designed with ceramic windows for use in high-power applications. . . High-perveance beam-power tubes (type 6973) are announced by RCA (61) for use as power amplifiers in high-fidelity audio equipment.

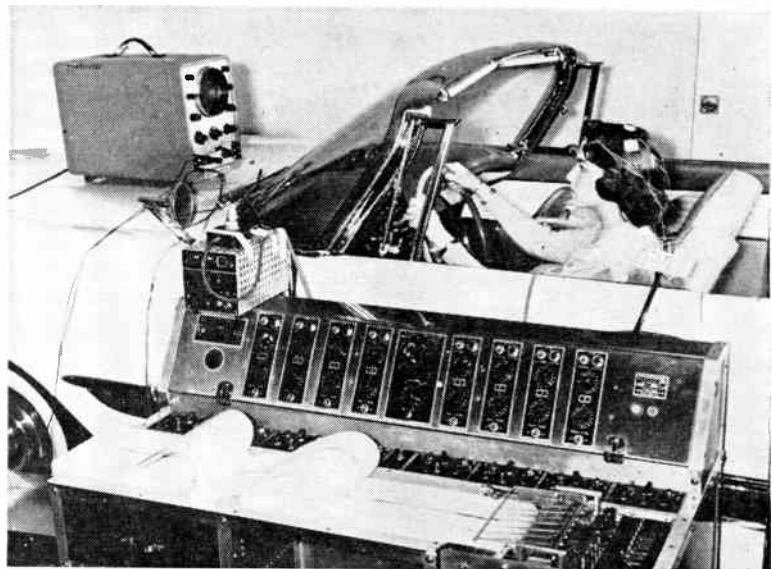
Electronic gage block checkers developed by The Sheffield Corp. (62) feature reduced operating time and point-to-point measurement of warped blocks. . . Linear amplifiers introduced by Victoreen Instrument (63) amplify low-level pulses from radiation detectors such as ionization chambers, proportional counters and scintillation counters.

Applications in aircraft and missiles are seen for type N and IIN hermetically sealed, light-weight coaxial connectors announced by Don-Lan Electronics (64). . . Low-capacitance cable produced by Times Wire & Cable (65) is said to be suitable for low-frequency pulse transmission, high-frequency coupling links and low-shunt-capacitance lead applications.

An S-band STALO announced by Pitometer Log (66) is tunable over a 10-percent frequency range and features short-term stability of 7 to 10 cps. . . The type 12DF5 full-wave rectifier by Sylvania (67) is intended for use in test equipment, phonographs and mobile radios. . . Cryogenic applications are seen for an all stainless-steel shut-off valve developed by Hydromatics (68) for use with highly corrosive fuels and oxidizers.

A hard-tube, closed-loop servo system is used to control an auto transformer in Tel-Instrument Electronics' (69) a-c line-voltage regulator. . . Gyro-stabilized magnetic compass heading is provided for small aircraft in GE's (70) low-cost, light-weight compass system. . . Battery-operated radiation-monitoring systems developed by Riggs Nucleonics (71) measure, display, record and control alarms for gamma radiation.

Varian (72) announces a klystron amplifier tube with internal resonant-cavity circuits capable of tuning from 1,700 to 2,400 mc. . . Production and laboratory tests are said to be made faster



## How Drowsy Is the Driver?

Electroencephalograph study by Chrysler and Harper Hospital in Detroit tests how long drivers remain alert. Brain waves show drowsiness sets in after 90 minutes. Recorded engine and traffic noises add realism.

with a megohmmeter announced by Keithley Instrument (73) with six decades of resistance and 5, 50 and 500-volt test potentials.

An alpha, beta and gamma detector offered by Victoreen Instrument (74) for use in nuclear installations is said to meet the requirements of the health-physics group at Oak Ridge National Laboratory. . . . A magnetic amplifier and relay are combined in a single package by Torwico Electronics (75) to form a sensitive relay that operates on as little power as 25 microwatts.

Spectrum analyzers have been developed by Edin Co. (76) that present a bar graph showing frequencies included and amplitude of each frequency. . . . United Transformer (77) announces a series of toroid coils for high-frequency applications. . . . Direct-writing oscillographs by Offner Electronics (78) record up to 19 channels. . . . Called the Deltameter, a development by Miljan (79) measures voltage rates of change with an accuracy of two percent or better.

A gold alloy for precision potentiometer wire is available from Secon Metals (80) and has a resistance of 80 ohms per circular mil foot. . . . The product of two input voltages with frequencies from d-c to 5 kc is supplied with an accuracy of 0.1 percent of full scale by an analog computer multiplier announced by Chadwick-Helmuth (81).

Springer Aircraft Radio (82) announces a 180-channel vhf aircraft transceiver unit with a transmitter power of 5 watts. . . . Epoxy paper laminate being produced by GE (83) for printed circuits, tube sockets, terminal strips features clean punching at room temperature. . . . Crystal filters offered by Bulova Watch (84) have been developed for single-sideband application.

Ceramic high-voltage relays announced by Resistron Labs (85) have been designed for use where extreme shock and vibration are encountered. . . . PCA Electronics (86) announces a miniaturized 246-

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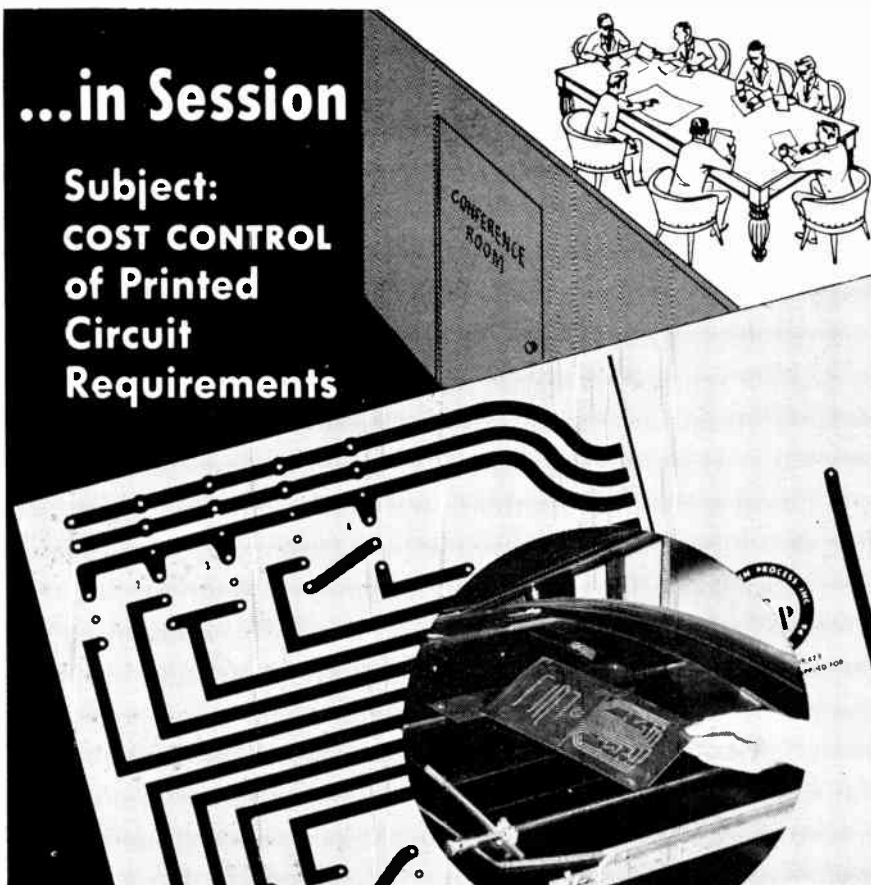
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# ...in Session

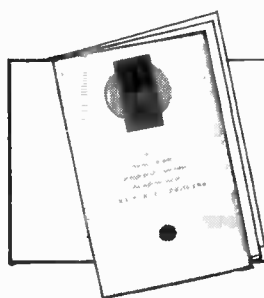
## Subject: COST CONTROL of Printed Circuit Requirements



When the subject of cost and/or quality control comes up for discussion in relation to printed circuits, remember that Dry Screen Process is the remarkable production method which gives you lowest unit cost, much greater volume, with practically no rejections. Quality-wise, Dry Screen Process sets a new high standard of reliability.

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Add D.S.P. to the agenda for discussion at your next meeting.



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microsecond delay line with a tap at 6 microseconds and every 20 microseconds thereafter. . . . Electronic choppers developed by **Kearfott** (87) with no moving parts can convert in both directions between d-c and a-c.

Video dummy loads are available from **Levinthal Electronic Products** (88) that handle 50 kw of average power. . . . Miniature plug-in modules announced by **North Atlantic Industries** (89) contain complete strain-gage balancing circuitry for aircraft and missile applications. . . . Ultrasonic transducers for industrial cleaning and degreasing by **Massa Labs** (90) feature 40-percent efficiency with 100 watts input, delivering sound pressure of one million dynes per cm<sup>2</sup> radiating into water.

### New Product Makers

- 41: Shockley Semiconductor Lab, Mountain View, Calif.
- 42: Sylvania, 1740 Broadway, New York 19, N. Y.
- 43: International Rectifier, 1521 E. Grand Ave., El Segundo, Calif.
- 44: Minneapolis-Honeywell, 2753 4 Ave. S., Minneapolis 8, Minn.
- 45: TR&P, 100 Kingsland Rd., Clifton, N. J.
- 46: Servonics, Alexandria, Va.
- 47: Manson Labs, P. O. Box 594, Stamford, Conn.
- 48: Associated Research, 3758 W. Belmont Ave., Chicago 18, Ill.
- 49: The Daven Co., Livingston, N. J.
- 50: Codeltaper Labs, 1027 Casa Vista Dr., Pomona, Calif.
- 51: Feedback Controls, 899 Main St., Waltham 54, Mass.
- 52: Slaughter Co., Young and College Sts., Piqua, Ohio
- 53: Trio Labs, 4025 Merrick Rd., Seaford, N. Y.
- 54: Microsonics, Hingham Industrial Center, Hingham, Mass.
- 55: Universal Transistor Products, 143 E. 49 St., New York 17, N. Y.
- 56: W. H. Brady Co., 727 W. Glendale Ave., Milwaukee 9, Wis.
- 57: Raytheon, 55 Chapel St., Newton 58, Mass.
- 58: General Radio, 175 Massachusetts Ave., Cambridge, Mass.
- 59: Film Capacitors, 3400 Park Ave., New York 56, N. Y.
- 60: Bonnac Labs, Beverly, Mass.
- 61: RCA, 50 Rockefeller Plaza, New York 20, N. Y.
- 62: The Sheffield Corp., Dayton 1, Ohio
- 63: Victoreen Instrument, 5806 Hough Ave., Cleveland 3, Ohio
- 64: Don-Lan Electronics, 1101 Olympic Blvd., Santa Monica, Calif.
- 65: Times Wire & Cable, Wallingford, Conn.
- 66: Pitometer Log, 237 Lafayette St., New York 12, N. Y.
- 67: Sylvania, 1740 Broadway, New York 19, N. Y.
- 68: Hydromatics, Cedar Grove, N. J.
- 69: Tel-Instrument Electronics, 728 Garden St., Carlstadt, N. J.
- 70: GE, West Lynn, Mass.
- 71: Riggs Nucleonics, 2390 Olive Ave., Altadena, Calif.
- 72: Varian, 611 Hansen Way, Palo Alto, Calif.
- 73: Keithley Instruments, 12415 Euclid Ave., Cleveland 6, Ohio
- 74: Victoreen Instrument, 5806 Hough Ave., Cleveland 3, Ohio
- 75: Torvico Electronics, 1090 Morris Ave., Union, N. J.
- 76: Edlin Co., 207 Main St., Worcester 8, Mass.
- 77: United Transformer, 150 Varick St., New York 13, N. Y.
- 78: Offner Electronics, 5320 N. Kedzie Ave., Chicago 25, Ill.
- 79: Midlan, P.O. Box 396, Paramount, Calif.
- 80: Secor Metals, 7 Intervale St., White Plains, N. Y.
- 81: Chudwick-Behnuth, 472 E. Duarte Rd., Monrovia, Calif.
- 82: Springer Aircraft Radio, Sky Harbor Airport, Indianapolis, Ind.
- 83: GE Laminated Products Dept., Coshocton, Ohio
- 84: Bulova Watch, Woodside 77, N. Y.
- 85: Resltron Labs, 2908 Nebraska, Santa Monica, Calif.
- 86: PCA Electronics, 16799 Schoenhorn St., Sepulveda, Calif.
- 87: Kearfott Co., Little Falls, N. J.
- 88: Levinthal Electronic Products, Stanford Industrial Park, Palo Alto, Calif.
- 89: North Atlantic Industries, 603 Main St., Westbury, N. Y.
- 90: Massa Labs, 5 Fottler Rd., Hingham, Mass.

# Sideband Goes to Work

**Compatible single sideband gets first extensive test next month over radio station WSM, Nashville, Tenn.**

NEXT month a young (31) engineer will help install a new unit of equipment at station WSM in Nashville, Tenn. The equipment hooked to the transmitter will convert the normal a-m double sideband signal to something the engineer, Leonard Kahn, calls compatible single sideband (cssb).

This is the first sale of cssb equipment Kahn Laboratories has made to a U. S. a-m station. The Voice of America has been using it for several years successfully. Stations WMGM and WABC in New York, N. Y., have run tests with borrowed equipment.

The man who bought the converter, J. H. DeWitt, Jr., president of WSM, says of his purchase, "I thought I'd invest a little money to see how it will turn out. I met Kahn at the NARTB convention

last spring in Chicago. I was interested." The equipment cost DeWitt \$9,500.

"I hope to improve fading and the signal to noise ratio," says DeWitt. Besides being station president DeWitt is also an engineer, has held the chairmanship of the engineering committee for Clear Channel Broadcasting Service Association, a group of 14 clear channel stations.

For the first week he will run cssb on an experimental basis to fit the new equipment into an operational schedule. For the following six months he'll put it on a regular program stint.

After midnight cssb and a-m double sideband will take turns for comparative tests.

Two types of observations will be made—public response and technical. Tape recordings will also be made.

"I've been watching single sideband for years and trying to figure out how to get in. This might be it. It's single sideband and it works with present radio receivers. If it passes all our tests, when the six months is up we're going to keep right on with it."

## FCC ACTIONS

- Allows radio stations over 10 kw, with directional antenna systems, to operate their transmitters by remote control. Use of this system was formerly restricted to stations under 10 kw.
- Adds a third vhf channel (13) to the Albany-Schenectady-Troy area, substituting channel 2 for channel 13 in Utica-Rome.
- Grants RCA Communications special permission to establish rates and regulations for teleprinter service between Vatican City and the U. S.
- Amends Maritime Rules making the frequency pair 2,466 kc (coast) and 2,009 kc (ship) available on a 24-hour basis for use in the Tampa, Fla. area.
- Announces total tv broadcast revenues for 1956 were \$896.9 million, up 20.4 percent over 1955. Networks and their 15 stations accounted for \$422.3 of that figure, or about 49 percent.
- Permits unattended operation of amateur station W5FHS to provide a continuous signal for use by the American Radio Relay League in a propagation study in connection with the International Geophysical Year.
- Changes Land Transportation Radio Service rules. Tells licensees that if they are unable to solve their own interference problems they may be ordered by the Commission into time-sharing.
- Proposes amending amateur rules to require that operators notify the Commission of specific address where they can be reached when operating away from their authorized locations. For mobile station operations, this information would include license number of the vehicles from which transmissions originate.
- Allows RCA Communications and Western Union Telegraph to reduce rates for messages from Iran to the U. S.

## STATION MOVES AND PLANS

WNTM, Vero Beach, Fla., control moves from Central Florida Broadcasting to J. Frank Spires and J. M. Walters for \$52,500.

NBC finds tv stations equipped for color transmission now number 278, an increase of 21 since January 1.

WPTA (tv), Fort Wayne, Ind., begins operations.

KPLO-TV, Reliance, S. D., signs on as the second satellite of KPLO-TV.

WHMA-FM, Anniston, Ala., changes transmitter height to 190 feet, ERP to 3.7 kw.

KXLJ-TV, Helena, Mont., makes change in transmitter type and antenna height to 370 feet.

KRON-TV, San Francisco, Calif., gets Air Space Panel approval for a new antenna to reach 2,049 feet above sea level. A platform atop

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Contacts are rated for 0 to 2 MA at 0 to 100 volts.

Nominal phase angle is 65 electrical degrees.

Drive coil operates from 6.3 volts 400 CPS.

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the mast, large enough to support 12 different tv antennas, is planned for use as an "antenna farm."

WXRA, WXRA (FM), Buffalo, N. Y., control transfers to John W. Kluge for \$150,000.

KANV, Shreveport, La., control passes to John M. and Anne P. McLendon for \$100,000.

WABR, Winter Park, Fla., control shifts to James H. Sawyer for \$126,500.

WWRI, West Warwick, R. I., is sold to Grelin Broadcasting for \$108,750.

WTMV, East St. Louis, Ill., is bought by Radio Missouri (Robert W. Day, president) for \$212,500.

KRIG, Odessa, Texas, becomes property of Radio Odessa, Inc. (Carl S. Goodwin, Jr., and Houston Broadcasting) for \$100,000.

WEEK-TV, Peoria, Ill., installs power amplifiers, changes antenna to 710 feet and shifts erp to visual 371 kw, aural 186 kw.

KVSO-TV, Ardmore, Okla., shifts transmitter location.

WKST-TV, New Castle, Pa., moves transmitter location to Youngstown, Ohio.

KMGH-TV, Minneapolis-St. Paul, Minn., controlling interest transfers to National Telefilm Associates.

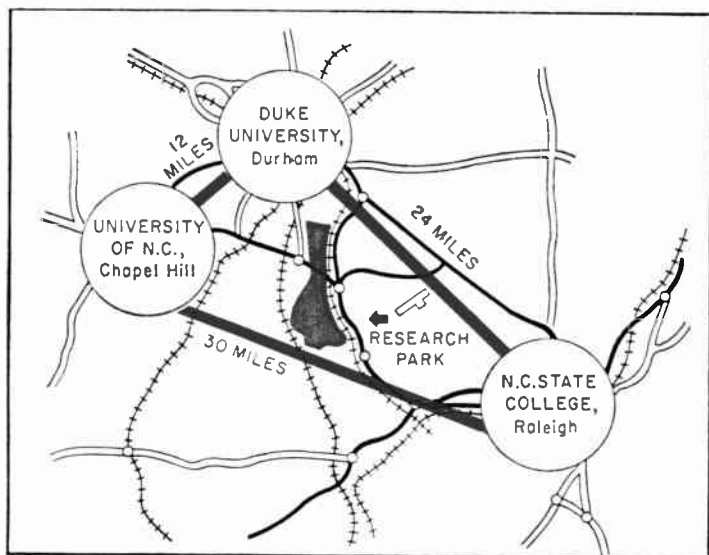
KMLB, KMLB-FM, Monroe, La., control bought by WSTV, Inc. for \$105,000.

KTBS, KTBS-FM, Shreveport, La., now belongs to Foster Associates (B. R. McLendon, president) for \$200,000.

WNKY, Neon, Ky., switches from 1,450 kc, 250 w to 1,480 kc, 1 kw.

KVII-TV, Amarillo, Tex., goes on the air late this year. New equipment includes a 12-bay transmitting antenna mounted 843 feet above average terrain.





College 'research triangle' seems . . .

## North Carolina's Top Card

**Planned research park in midst of three schools' research facilities increases attractions of this fast-growing electronics area**

PLANS were announced last month in North Carolina to build a million-dollar, 4,000-acre research park in the midst of the research triangle of Duke, North Carolina University and State College.

The planned research park is expected to speed up the growth of this already fast-growing electronics area.

To be located within 15-minute distance of the three universities, the park will provide an opportunity to develop a unique research industrial center, claims George L. Simpson, Jr., director of the Research Triangle Committee. The three institutions annually train 1,500 young people in science and have facilities for training scientists already with industrial laboratories.

The scientific and cultural advantages provided by the academic region, coupled with plans to develop the 4,000-acre tract especially for research work are counted on to draw industrial research labs to the park.

There is little doubt that many of the new firms attracted to North Carolina by the research cen-

ter will be from the electronics industry. The state has been successful in winning electronics firms in recent years.

In 1940 there were only three electronics firms, employing a total of 66 people, in the entire state. Today, state officials report about 25,500 electronics employees, earning nearly \$75 million per year. Inclusion of electrical with electronic equipment firms inflates these figures somewhat.

A recent listing of electronics manufacturers in North Carolina includes: Western Electric, General Electric, Cornell-Dubilier, International Resistance, Pyramid, Hammarlund Manufacturing, Kearfott, Douglas Aircraft and the Hicks Corp.

Electronic products include guided missiles, hardware, capacitors, resistors, batteries, insulated cable, radio and tv cabinets, tube parts, meters and synchros.

Ease of training personnel is one of the advantages most often cited by manufacturers who have built plants in North Carolina.

Another important advantage is

the highly flexible labor supply. A good portion of the state's residents are employed at working small, family-owned farms but welcome the opportunity to leave the farms for higher paying industry jobs. The trend toward mechanization of agriculture is intensifying this trend.

For instance, one industrial newcomer recently advertised for 550 employees in a county where only 408 persons were listed as unemployed. But between four and five thousand persons applied for the jobs.

## USSR Automates Diamond Process

RUSSIAN automatic x-ray processing of diamond-containing rock is reported in the German-language publication of the Soviet embassy in Bonn. The process, developed by the Russian Union Research Institute for Geology, is said to be used now in Jakutien, USSR.

Previously, says the publication, rocks were bombarded by x-rays as they moved through a dark chamber on a belt. The rocks were watched from a second chamber protected by lead glass screens. Then diamond-containing grains which became luminescent under the x-rays were taken off the conveyor manually.

Now, writes engineer P. Poleshchik, the crushed and graded rocks are moved along a belt through an electrical vibrator into a tube with a window permitting passage of x-rays. When the diamond grains become luminescent from the x-rays, they affect a multiplier phototube.

Impulses from this tube are amplified to control a relay which actuates a solenoid. This moves a slide plate to separate diamond-containing grains and conduct them into a tube leading to the "saving box."

Front wall of the dark chamber, in which the whole process takes place, contains control and measuring instruments, control buttons, signal lamps and the diamond grain counter. Use of the automatic process saves personnel and eliminates fatigue, says the Russian engineer.

# Budgeting Engineering

Setting up an engineering budget gives supervisors a road map of work to be done as well as a series of cost check points

THE ENGINEERING budget is more than a spending schedule. It's a "plan expressed in numbers," according to Harley Iams, referring to the business management of Hughes Aircraft's Systems Development Labs.

Iams looks at a budget not just as a list of monetary expenditures, but as an indispensable tool for forcing the planning of engineering operations in detail. Once established, the budget becomes a control medium insuring that work follows the plan. Essential for the success of any budget, of course, is an efficient accounting system. Actual figures must be accurately compared with predicted.

Work to be done, people to do the work, allocation of space and facilities, and materials and supplies are some of the entities dealt with in the Hughes budget. The successful budget interrelates each with the other to form a pattern consistent with the accomplishment of the problem.

When the jobs to be done in a given period are defined, budgeting is a relatively simple arithmetic chore. If the engineering work required cannot be anticipated with clarity, it becomes necessary to make numerical estimates on the basis of similarity to other known jobs.

For each item that is to be controlled by the budget, the engineering supervisor should be supplied with the following information:

- What expenditure had been expected as of a given date.
- What the actual expenditures have been.
- What the forecast is with respect to future expenditures.

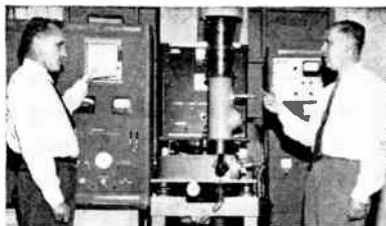
With such information he can judge whether he will meet his budget for successive months, or whether some corrective action is in order.

Iams stresses the long-range view, and the importance of planning the

future of the engineering department for more than a few months ahead. "If this is not done," he warns, "life becomes a series of emergencies, to be solved in haste, and perhaps unsatisfactorily."

Some companies make even further use of the engineering budget. Packard-Bell has found that planning the budget is excellent training for executives-to-be. Says vice president Richard Leng, "It is an excellent training tool, as well as a control tool. Project engineers, working within a framework of dollars as well as time, receive valuable experience which helps to fit them for higher managerial responsibilities."

Ramo-Wooldridge's Robert Sensibaugh warns that it is difficult to control creative work in the usual financial sense. "It is quite possible to have excellent financial control and very little development," he points out.



Studying a specimen with new electron-probe microanalyzer

## Install X-ray Microanalyzer

New electron-probe microanalyzer, designed and built at Battelle Memorial Institute, has just been placed in service at the Columbus, Ohio, research center. The analyzer, though not new in principle, is a relatively advanced working model with unique features in its design, says Charles M. Schwartz, chief of Battelle's Structural Chemistry Division.

The microanalyzer is expected to

be a valuable tool for scientists requiring an extremely exacting analysis of metals, ceramics, and chemicals. They will be able to isolate a region less than 1/10,000 inch in diameter (2½ microns) on any specimen being studied.

The microanalyzer can be used on all of the elements from element 13 (aluminum) through the remainder of the periodic table. The new apparatus is capable of performing chemical analysis on a much finer scale than is possible using conventional microanalytical procedures, the builders point out.

The equipment uses electrons from a 50,000-volt tungsten filament to bombard specimens. The focused electron beam excites x-radiation of the material being studied. The x-radiation then passes through a curved-crystal vacuum spectrometer. The crystal's position is varied to segregate each element being sought in a specimen.

A Geiger counter, also mounted in the vacuum chamber, detects the wavelength of x-radiation passing through the crystal and accurately counts the x-radiation for quantitative and qualitative analysis. An automatic recording device graphically portrays this information as a record of the analysis.

A microscope permits visual study of the specimen while it is in the vacuum chamber.

## Sarnoff Sees Big Future

ELECTRONIC developments in America's future include typewriters that obey verbal orders, and pocket radios for personal communications, RCA board chairman David Sarnoff said last month.

He said such electronic advances are important to the Western world in economic competition with the Communists.

"Over the years, the key to America's economic strength has been its rising productivity," he added. "In our efforts to accelerate this rise, automation can be a vital asset."

The verbal-response typewriter, Sarnoff says, is in development. A machine that can type a few simple words and phrases spoken into a microphone already exists.

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- Mechanical Design for Electronics Production by John M. Carroll, Associate Editor, *Electronics*. Publisher's Price, \$6.50. Club Price, \$5.50.
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- Random Processes in Automatic Control by J. Halcombe Laming, Jr., Deputy Associate Director and Richard H. Bartin, Assistant Director, Instrumentation Laboratory, Massachusetts Institute of Technology. Publisher's Price, \$10.00. Club Price, \$8.50.
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# French Tax Hurts Tv

**Anti-inflation cure so far hurts electronics more than the disease; setmakers eye new home market**

FRANCE's electronics industry this week is waiting to see what long-range effects the government's anti-inflation program will have on its sales, particularly of tv sets.

So far, electronics has not been slow among French industries in complaining that the inflation cure hurts more than the disease.

Most critical factor now is the 5½ percent boost in the tax on tv sets, one of many tax increases imposed on nonessential goods. The entire electronics industry, which looks to television for much of its financial support, is worried.

The 20-percent tax on imports which accompanied France's partial devaluation is raising prices on many materials the industry needs. A recent increase in French steel prices won't help either.

Increases cannot be passed on to consumers because a freeze holds prices to their July 31 level, except for small adjustments.

Since the tv industry's profit margin is small, spokesmen say, manufacturers plan to overcome present problems by expanding production and making a big sales effort. They are especially eyeing 50 percent of the families in France in areas not yet served by television. They are also prodding the government to get on with its program of building stations and other facilities. Budget difficulties have dropped the program behind schedule by more than a year.

Exports can't compensate for low domestic tv sales either. The 819-line French set is useless in other countries, except parts of Belgium and Luxembourg which pick up French stations.

As for other electronics exports, the industry should benefit somewhat from the 20-percent premium offered by the government for exports.

But even this is not very helpful, says one spokesman. His reasons: French electronics companies were getting a 12-15 percent allowance in the form of other export aids which are now abolished. And French prices are still about 35 percent higher than those of other countries.

## DEVELOPMENTS ABROAD

- **Britain's** Imperial Chemical Industries is using a completely remote-controlled process to make nitroglycerine. Transistors are believed to be the key in overcoming explosion hazards. Two tv cameras observe the process vessels in operation and relay a signal to monitors in the control room.

- **British** television-assisted welding plant is reported to overcome difficulties connected with interior welding of steel pipes. The whole operation is controlled from a console on which welding gear, Marconi tv monitor and camera control unit are mounted. An operator can then watch the pointer marking the line of the weld and control the adjustment of the welding head and roller bed traverse.

- **West German** firm Siemens-Schuckertwerke A. G. has developed equipment for measuring cloud altitude during daylight. Firm says the gear, which uses modulated light, photocells and

multiplier amplifiers, is suitable for meteorological stations and airports.

- **London's** Lintronic Ltd. uses numbers instead of analog voltages to represent a variable in a new digital differential analyzer. Firm says it provides the accuracy of a digital machine with the flexibility of an analog computer, and reduces programming time required by a digital machine. It consists of integrator, multiplier, constant multiplier, distributor and adder.

- **India** plans an \$840,000 television station in New Delhi, but has temporarily dropped the idea of setting up a station in Bombay because of foreign exchange problems. About half the necessary equipment for the New Delhi station, which the government regards as a tv training ground, has already been delivered. When a complete tv system eventually starts operation, it will do so under the government's broadcasting monopoly.

## EXPORTS and IMPORTS

Czechoslovakia has ordered Marconi "fast-pull-down" telerecording equipment for her Prague tv studios. The "fast-pull-down" device is said to produce high quality telerecordings by advancing the film for sequential exposure during frame blanking. It thus gives a "full information" recording.

**Havana, Cuba**, this month sees the operation of the first color television station outside the U. S. An RCA 10-kw color transmitter and a 60-ft antenna have been bought by the station, Canal 12, S. A. The station expects 10,000 color sets will be sold in Cuba the first year, with live programming to start when 20,000 sets are in use. At first a two-hour film program will be repeated ten times daily, with news and other film inserted as it becomes available.

**West Germany** expects to repeat this year its 1956 radio set export volume of 1.6 million units. At the

same time the industry expects last year's record output of 3.8 million sets to be down. Total production value of radios, tv sets, phonographs and records exceeded \$240 million last year. Industry outlook for 1957 is \$310 million, a 30-percent jump.

Britain's Ferranti Ltd. announces three foreign and seven domestic orders for its Mercury scientific computer. The firm says they will be produced at the rate of one every six weeks by the end of the year, with a factory door price equivalent to \$280,000. First export model is expected to go to Norway this month, with others scheduled for France and Switzerland later this year.

South Africa has relaxed import controls on electronic items, making them subject only to the formality of an import license. In effect, the following may be imported up to any value: hearing aids; scientific research instruments; instruments for control of manufacturing, industrial operations or for exploration; computers for navigation; instruments for land and geological survey; x-ray and other medical apparatus.

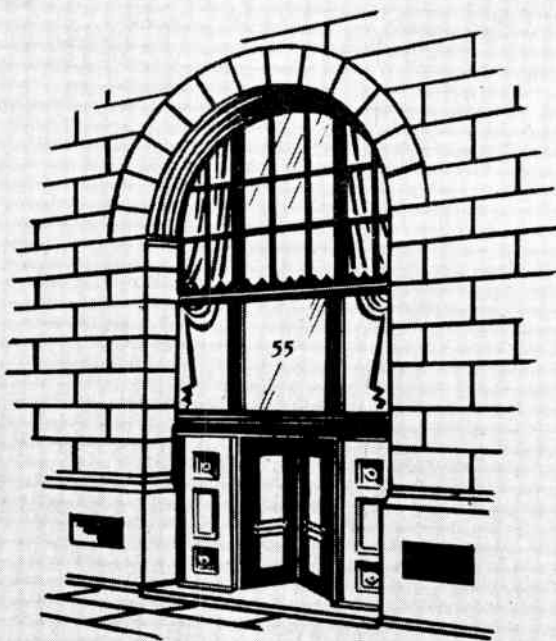
In London the 15th annual Radio Component Show, organized by the Radio and Electronic Component Manufacturers Federation, will be held April 14-17, 1958. It will overlap with the Instruments, Electronics and Automation Exhibition April 16-25, at which members of the Radio Communication and Electronic Engineering Association will exhibit.

West Berlin's Institute for Nuclear Research is installing a solution-type atomic reactor from North American Aviation's Atomics International division. It will be used to train students in peaceful applications of atomic energy to science, medicine and industry.

Israel Institute of Technology in Haifa has ordered from Leeds & Northrup an electronic reactor simulator for training students in reactor operation. It's believed to be the first such equipment destined for the Near East.

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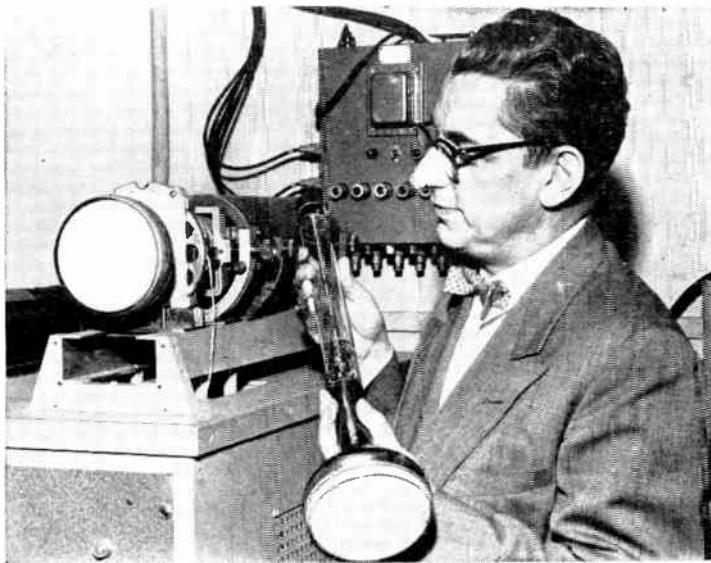
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### Sylvania Builds R&D Plants

SYLVANIA Electric is spreading out all over.

On its 57-acre site in Bayside, N. Y., the company last month broke ground for a million-dollar addition to its physics laboratory. The 34,000-sq ft addition will be completed by mid-1958, increases available space to 72,000 sq ft. New wing includes a 150-seat auditorium.

Manager of the physics lab is Rudolf G. Hutter (pictured, with his special crt called the Wamoscope). Lab's activities concentrate on microwave and pulse techniques, solid-state and thermionics research, advanced circuitry.

Hutter says activities in the new wing employ over 250 scientists, engineers and technicians.

Early this month, Sylvania laid the cornerstone for its new R&D center, now going up in Amherst, near Buffalo, N. Y. To be largely

devoted to military projects—countermeasures, missiles and missile controls, communications and command links—the new center is being rushed to completion by February.

Novel feature of the 90,000-sq ft center will be its compound compression air-source heat pump system. This system, made by York Corp., will extract heat from winter air to heat the building, will reverse itself to cool the center in summer.

According to York officials, the Amherst lab is the northernmost building ever to be heated by this method without supplementary heating equipment.

The system has a summertime capacity of 250 tons of cooling, delivers up 2.4-million Btu in winter. Minneapolis-Honeywell built the supervisory data center and control gear that runs the York system.

### Bosch Arma Expands

AMERICAN Bosch Arma will expand and modernize its big central plant at Garden City, New York, to the tune of some \$2 million. Aim behind the expansion is to cut production costs of the military hardware that is becoming increasingly important to ABA.

Operations that were to have gone forward in the big Chicago plant for which Bosch last year

received a USAF facilities contract will be conducted in Garden City instead. Defense Department stretch-outs are partially responsible for the decision to update and expand the central plant.

New facilities to be built include an 8,000-sq ft sterile room for manufacture of inertial components, as well as 22,000 sq ft of new assembly facilities. Engineer-

ing laboratories will also be added. Plan calls for completion of the expansion within a year.

ABA is also in the process of shifting all manufacture of automotive products—voltage regulators, ignition systems, and the transmission controls for the Edsel—to its Columbus, Miss., plant. Plant in Springfield, Mass., will concentrate on manufacture of diesel engine controls.

New marketing director for the commercial products of both plants is Bertram Cole, who leaves a marketing vice presidency at Atlas Plywood to take the job.

### Method Moves

CHICAGO componentmaker Methode Manufacturing Corp. is moving some of its operations into a new one-story plant in Chicago's Harwood Heights section, near O'Hare International airport.

New 40,000-sq ft plant sits on a 2½-acre site, will more than double Methode's production space. Facilities include plastic molding and fabricating gear, metal-stamping equipment and a tool and die shop. Mechanized printed-circuit production facilities in the plant will be able to turn out 250,000 sq ft of etched wiring panels a month.

Old plant is now wholly given over to assembly of sockets and connectors. About a third of the firm's employees move to the new building.

### MPB Grows, Adds Wing

UP in Keene, N. H., Miniature Precision Bearings has already outgrown its year-old plant, is building a 25,000-sq ft addition onto it.

The \$300,000 addition is scheduled for completion by year's end. It will increase production space more than 50 percent and boost the workforce from 550 to 700. Existing plant space is operating at capacity on a three-shift schedule.

### Rototest Spreads Out

ROTORTEST Laboratories Inc., Lynwood, Calif., is spreading out into

a 5,000-sq ft addition. New space will extend Rototest's facilities for three types of environmental and functional testing.

For vibration work, three big shakers will allow engineers to test at frequencies up to 3,000 cps and excursions up to 1.0 in. Existing equipment for white noise tests will be expanded, aiming toward an ultimate 10,000-cu ft, 165-db chamber. X-ray apparatus is being installed for cine-radiographic test work.

## Execs Move Up at General Tel

GENERAL Telephone System reshuffles part of its top-management hand.

The senior v-p of General Telephone Corp., Thomas A. Boyd, moves up to become executive vice president for administration.

Leslie H. Warner, president of Chicago-based subsidiary Automatic Electric, moves to New York to become exec v-p for manufacturing of the parent company. Automatic Electric exec v-p Herbert F. Lello moves into the presidential spot vacated by Warner.

## AMF Gets Plans Head

FORMER commander of Allied Air Force in Southern Europe Laurence C. Craigie takes on job of long-range planner for AMF's defense products group.

Once director of Air Force R&D, Craigie was first service pilot to fly a jet when he flight-tested the XP-59 in October, 1942, at Muroc Dry Lake, Calif.

Firm's R&D department gets a new technical manager as Haywood C. Smith moves up to headquarters from the Raleigh, N. C., labs.

## New Faces at IT&T

RECENT moves at International Telephone & Telegraph bring in some new faces, shift a couple of familiar ones around.

Robert F. Bender leaves Minute Maid Corp., where he was a v-p,



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treasurer and director, to join IT&T as exec v-p for finance.

Firm's staff director of planning and organization, John T. Jackson, moves up to become an assistant vice president.

Retiring deputy chief of the Army Engineers, Major General C. Rodney Smith, moves into a billet at International Standard Electric Corp., IT&T's holding company

for foreign manufacturing subsidiaries. Smith takes over ISE's contract with Supreme Headquarters, Allied Powers, Europe (SHAPE) to engineer and install a command microwave network from Norway to Turkey.

H. Ronald Eldridge leaves subsidiary Federal Telephone & Radio to become comptroller of IT&T's industrial products division.



## Science Sparks Growth

BREAKTHROUGHS in technology "spark the growth of the economy," H. Leslie Hoffman told some 250 representatives of the Los Angeles electronics and aircraft industries recently.

Speaking at dedication ceremonies for Hoffman Labs' new R&D center, the president of parent Hoffman Electronics pointed out that technological advances also raise the standard of living, and ultimately cause the growth of new companies and new industries.

New 60,000-sq ft lab, across the street from Hoffman's manufacturing facilities, provides engineering space for eight military groups. Chief engineer of the laboratory is Richard A. Maher.

Additional plant nearly doubles the size of former engineering facilities in Los Angeles. An electro-mechanical assembly department for production of gyros and servo-mechanisms has also been added.

Hoffman (center in the picture, with daughter Jane and Grand Old Man Lee de Forest) discussed some of the problems he expects electronics to be called upon to solve. The constant quest for knowledge in these areas, he said, "will create

new products, new techniques and new services that will contribute to our country's security and to the wellbeing of our people."

## Paraplegics Up Profits

FOUNDED six years ago to subcontract precision assemblies for electronic end-equipment manufac-

## BUSINESS MEETINGS

Oct. 31-Nov. 1: Society for Advancement of Management; Conference on Measurement of Management, Hotel Statler, N. Y.

Nov. 4-8: Institute on Electronics in Management, the American University, Washington, D. C.

Nov. 10-15: National Electrical Manufacturers' Association annual meeting, Hotel Traymore, Atlantic City, N. J.



turers, Paraplegics Manufacturing Co. (Pamco) of Franklin Park, Ill., now is scouting for new production space. The little firm, whose stockholders, officers and employees are all physically handicapped, racked up \$356,000 in sales during the fiscal year ended June 30, expects to up that level considerably this year.

Big project at the moment for president and board chairman



Dwight Guilfoil (picture) is to expand production sufficiently to hire 100 more of Chicago's handicapped technicians. His company currently employs 100, occupies a bright new plant in Franklin Park, chalks up a decent profit without accepting handouts from anybody. Pamco's products include magnetic amplifiers, test instruments, resistor blocks for communications switchgear, and a special emergency service for companies that need assemblies in a hurry.

Much of the firm's precision assembly work is done by hand. Special tools and fixtures are installed at many of the workbenches to permit handicapped workers to match industry production standards.

Being chairbound apparently no more interferes with the work in the plant than it does with Guilfoil's travels. Though handicapped himself, the peripatetic Guilfoil takes his wheelchair all across the land to stimulate interest in useful employment for handicapped skilled workers.

## Plant Briefs

INSTRUMENTMAKER Gertsch Products Inc. moves into new two-story building in Los Angeles. New fa-

cility, quadrupling previous space, houses production and engineering areas, plus administrative offices, in some 30,000 sq ft of space. Plans provide for expansion of production space by 5,000 sq ft if needed.

In Lansdale, Pa., Brooks Rotameter Co. moves into a new 27,000-sq ft manufacturing facility.

Perfection Mica moves its magnetic shield division's West Coast office and lab into expanded quarters in Van Nuys, Calif. Aircraft electronics chief engineer Irv Glerum is in charge at Van Nuys; non-aircraft electronics activities move to Chicago under new chief applications engineer C. M. Jorgensen.

## Executive Moves

RETIRING Air Force colonel Robert L. Johnston becomes assistant to the president of Advance Industries Inc. Johnston was formerly deputy R&D director at USAF headquarters.

Cecil J. Harrison leaves a sales managership at DuMont to become sales vice-president of Rixon Electronics, Silver Springs, Md.

Systron Corp. moves its chief engineer, Norman Perlmutter, into a vice-presidency with responsibility for new product development.

Houghton Laboratories president Russell M. Houghton resigns, and former exec v-p Donald Roon moves into the top slot.

New president of Ray-O-Vac is Elmer B. Ott, former v-p for administration and finance.

John F. Thompson Jr. assumes a vice-presidency of Nuclear Corp. of America. Thompson is head of parent Englehard Industries' nuclear department.

Lawrence E. Walkley leaves GE's circuit protective devices department, where he was general manager, to become finance v-p of Westinghouse Air Brake Co.

Gulton Industries gets a new controller as Joseph Marks moves in from a parallel slot at Lubin Wecker Co.

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Sworn to and subscribed before me this 3rd day of September, 1957.

JANET A. HARTWICK,  
[SEAL]

(My Commission expires March 30, 1959)

# Reps Push Test Gear

TEST instruments of all kinds continue to be big business, and manufacturers' representatives are taking on an increasingly larger share of the instrument market.

Six new reps have taken on the test equipment line of American Electronic Laboratories. **Maury E. Bettis**, Kansas City, Mo., now handles the line for the heart-of-America region. Dallas rep **George Weinreich** services AEL's products in Texas and the delta states, and **Norman Hardy Associates** covers the eastern seaboard from New Jersey to Florida. In the great Northwest, **Jas. J. Backer Co.**, Seattle, gets the appointment, and the upper Midwest will be covered by Minneapolis rep **Irvin I. Aaron**. **Rockbar Corp.**, Mamaroneck, N. Y., handles metropolitan New York.

Los Angeles rep **C. W. Reed** now handles sales and service for

the precision instruments of Cary Electrometers in the western states.

San Marino, Calif., rep firm **G. S. Marshall Co.** now represents Edcliff Instruments in California and Arizona.

Marion Electrical Instrument Co. appoints two new reps for the central and western states. Cleveland's **Robert K. Demk** handles northern Ohio, western Pennsylvania and West Virginia. Iowa, Kansas, Missouri and Nebraska are covered by **W. E. Fry**, Kansas City, Mo.

Perfection Mica Co.'s magnetic shield division has a new rep in **Jules J. Bressler**, Union City, N. J.

New rep firm in the mid-Atlantic: **Polymetric Devices Co.**, Glenside, Pa. The new rep outfit will concentrate on physical and environmental test and measuring gear.

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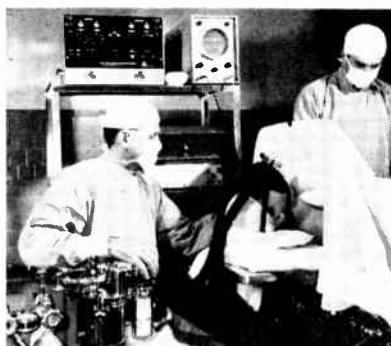
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## Coming In Our November 1 Engineering Edition

• **Tapered Transitions.** A procedure for designing well-matched transitions between waveguides where the guide wavelength varies along the taper is offered by **B. J. Migliaro** of Microtech. A simple graphical method is employed using presented data. Specifically intended for double-ridge-to-rectangular transitions, the procedure may also be used for rectangular-to-rectangular or ridge-to-ridge tapered transitions with corresponding accuracy.

• **Missile Mockup.** **S. E. Dorsey** of U. S. Naval Ordnance Test Station describes a photoelectric target for missile tests. The rectangular coordinates of a test missile can be determined at a selected point along its trajectory by two banks of multiplier phototubes located at ground level. Each phototube in the banks sees narrow segment of sky; missile passing through segment momentarily decreases light incident on phototube causing output pulse. Phototube banks, acting together, give coverage of flight area.



During operation surgeons keep check on patient's heart with electronic monitor.

• **Heart Meter.** Tones of heart's electrical action are monitored in the system developed by **Morris and Swanson** of Levinthal Electronic Products. The frequency of a neon-tube oscillator is controlled by the amplitude of the heart's electrical signal. Resulting series of rhythmical tones gives the surgical team a constant check on the patient's heart. Explosion proofed circuitry includes low-distortion differential preamplifier which discriminates against hum.

• **Gas Control.** An electronic control system for gas chromatography, **Beckman Instruments'** **Walt Donner** explains, employs a heat-controlled instrumentation unit with a thermistor as temperature sensing element. System automatically maintains any preset temperature between 40 and 225 C within a thermal compartment. Precision voltage regulator supplies 2 to 4 volts at a maximum of 400 ma with overall stability superior to a storage battery source. Power supply uses cascode amplifier with v-r tubes operated from a regulated B supply for reference.

• **Studio Automation.** Dual-track recording of program material and control signals permit studio automation for small broadcasters. According to **J. K. Birch** of Gates Radio a unique packaging of **Seeburgh and Magnecord** tape machine provides automatic programming of a-m broadcast station using combinations of music and announcements switched by tones recorded on a second channel of the program tape.



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- RCA-5820—Image Orthicon for Black-and-White TV
- RCA-6474—Image Orthicon for Color TV
- RCA-6198 } Vidicons for Industrial TV
- RCA-6198-A }
- RCA-6326 } Vidicons for Broadcast TV
- RCA-6326-A }
- RCA-6849—Low-light-level Image Orthicon
- Dev. No. C-73456—½-inch Vidicon for Portable TV Cameras

#### RCA Progress Report on TV Camera Tube “FIRSTS”

- 1939 RCA announced commercial availability of the iconoscope—the camera tube that made electronic television possible.
- 1940 RCA announced the Amateur Iconoscope—opened the television field for experimenters.
- 1942 RCA introduced the first small iconoscope—for aerial weapon guidance.
- 1944 RCA provided the military services with the first Image Orthicon—a supersensitive camera tube.
- 1946 RCA introduced the first Image Orthicon (the camera tube that revolutionized TV camera techniques)—for studio and outdoor pickup.
- 1952 RCA produced the first Color Image Orthicon—for use in compatible color television cameras.
- 1952 RCA announced the first commercial Vidicon—for industrial TV.
- 1955 RCA announced a developmental ½-inch Vidicon—for miniature portable TV cameras.
- 1956 RCA designed and built a low-light-level Image Orthicon—a new camera tube especially useful for “night” military operations