

JANUARY 24, 1958

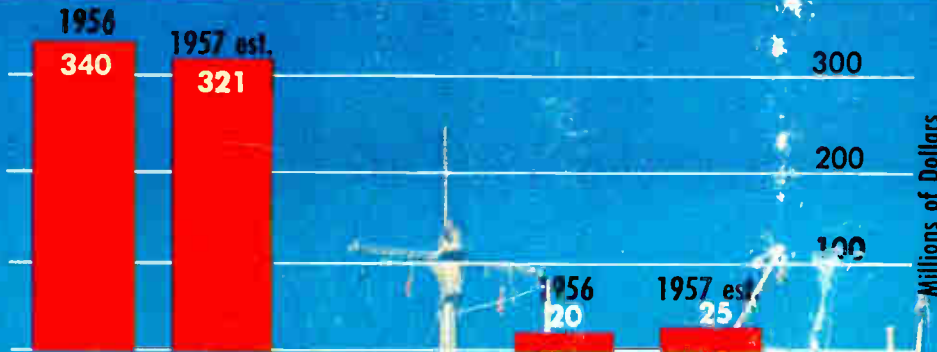
electronics

business edition

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VOL. 31, NO. 4

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EXPORTS
Decline Slightly ...

IMPORTS
Register a Gain ... page 25

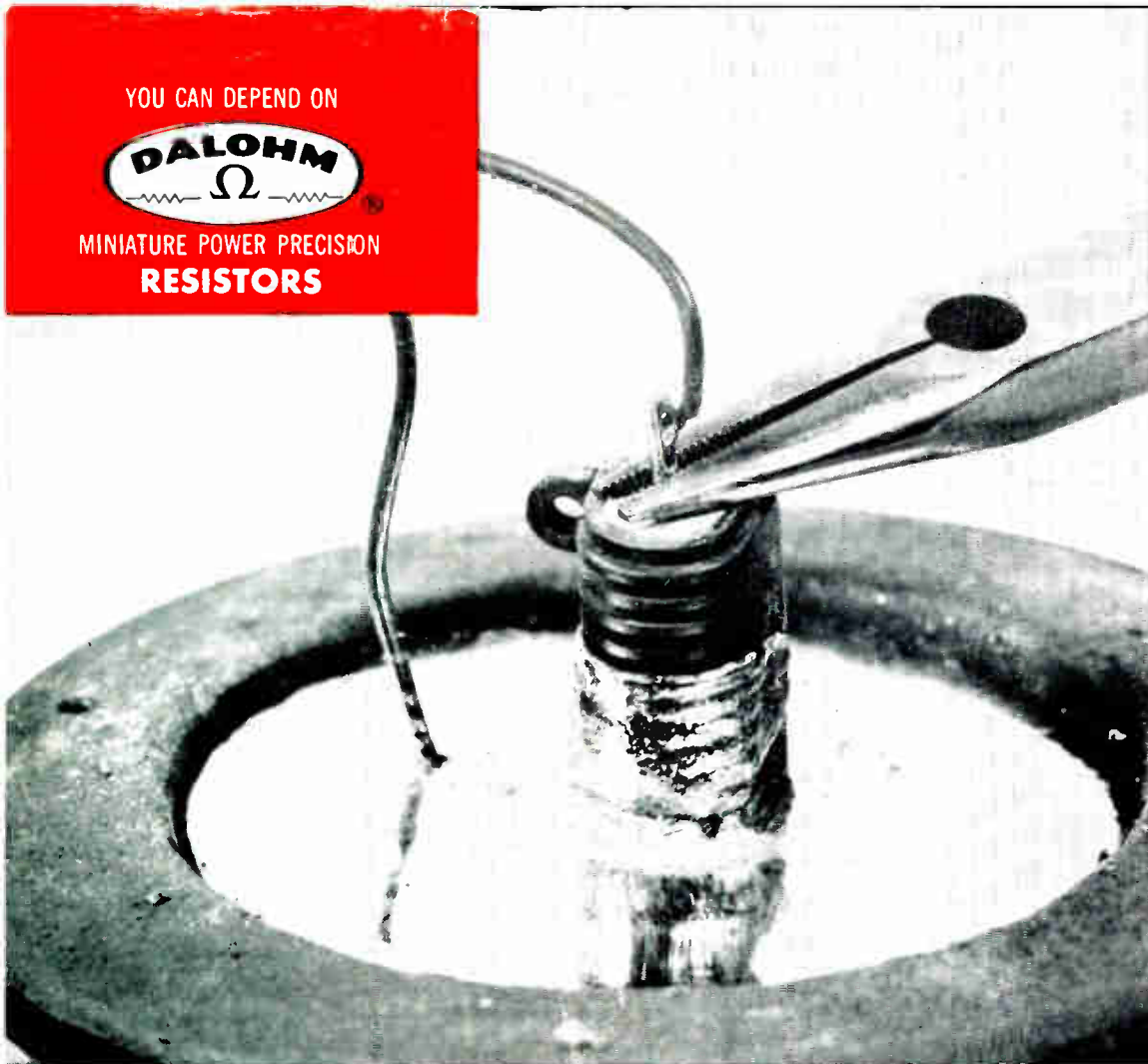


F. W. PHEZZIOSI
& EASTGATE CRESCENT
TORONTO ONT CANADA 16

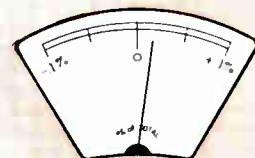
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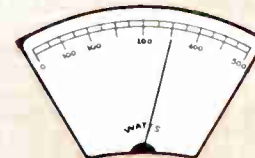
MINIATURE POWER PRECISION
RESISTORS



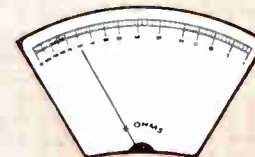
HI-TEMPERATURE
65° C to + 275° C



HI-PRECISION
± 0.05% to ± 3%



HI-WATTAGE
10 to 250 WATTS



HI-RESISTANCE
0.1 Ohm to 100K Ohms

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- Powered at 10, 25, 50, 100 and 250 watts.
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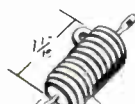
DALOHM line includes a complete selection of precision wire wound, power and precision deposited carbon resistors. Also trimmer potentiometers, precision wire wound and deposited carbon; and collet fitting knobs. Write for free catalog.

If none of DALOHM standard line meets your need, our engineering department is ready to help solve your problem in the realm of development, engineering, design and production. Just outline your specific situation.

RH-10



10 watts, derating to 0 at 275° C. 5 Ω to 30K Ω. ± 0.05% to ± 3%. Max Working voltage: 500 volts



RH-25

25 watts, derating to 0 at 265° C. 1 Ω to 15K Ω. ± 0.05% to ± 3%. Max Working Voltage: 800



RH-50

50 watts, derating to 0 at 265° C. 3 Ω to 100K Ω. ± 0.05% to ± 3%. Max working voltage: 1000 V DC or AC



RH-250

250 watts, derating to 0 at 265° C. 3 Ω to 30K Ω. ± 0.05% to ± 3%. Max working voltage: 1000 V DC or AC

PH TYPE

New hole mounted power resistor in shock absorbing compound and in black anodized aluminum radiator finned housing.



PH-25

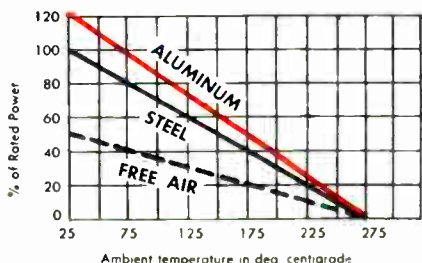
25 watt, derating to 0 at 265° C. 1 Ω to 60K Ω. ± 0.05% to ± 3%. Max working voltage: 800 V DC or AC



PH-100

100 watts, derating to 0 at 275° C. 5 Ω to 30K Ω. ± 0.05% to ± 3%. Max working voltage: 1000 V DC or AC

TYPICAL RH-25 DERATING CURVE



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In This Edition . . .

• **An Electronics Special Market Report—Recent Export/Import Trends.** Here is a penetrating study of a \$321-million market. Why did U.S. electronics exports drop nearly six percent last year from their all-time high in 1956? Which of the 32 electronic export categories registered a gain last year—and why? Also, why did electronic imports leap 25 percent last year—to \$25 million? Where are the fastest-growing export markets? Which countries are providing the keenest competition?

To get the answers to these questions, and many more, Associate Editor Janis sorted through reams of statistics and reports to get the picture. Then he interviewed scores of exporters, importers, U. S. and foreign trade officials. It is all here, packed into four fact-filled pages—the very latest rundown on one of the fastest-changing markets in the electronics business.

p 25

• **New field for the electronics engineer: Magneto-hydrodynamics—use of ionized gases under the influence of magnetic fields.** Here are just a few applications: cooling the skins of aircraft and manned rockets to make possible speeds of mach 25 and beyond, converting heat energy directly into electricity, propeling space ships, and taming the hydrogen bomb to produce useful power. New England Editor Maguire explains what MHD is and what it can do.

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Coming In Our January 31 Edition

• **Recording Eye Motion.** A detector which plots eye movements is described by Messrs. Shackel, Sloan and Warr of EMI Electronics of England. The sensitive measuring equipment detects 10 to 40 microvolts potential difference between the front and rear of the eyeball to indicate eye position change while subject is reading. Scan data is recorded by pen or with a camera from cathode-ray tube display.

• **Missile Target Simulator.** A system that eliminates expensive test drones in evaluating missile performance has been developed at the U.S. Naval ordnance Test Station at China Lake. According to C. E. Hendrix cam-actuated linear potentiometers and noise generators provide azimuth and elevation drive signals for missile radar that approximate actual tracking conditions. The missile in the radar beam is photographed by boresight camera and its instantaneous position with respect to the beam center can be determined. The system adds reliability, flexibility and economy to operational testing of anti-aircraft missiles.

• **Ultrasonic Gage.** A sweep-frequency sensing system and a direct-reading indicator assembly measure thickness ultrasonically by determining the frequency of a standing wave generated within the material. Magnaflux's H. N. Nerwin says that a pulse, generated as the oscillator frequency passes through the resonant point of the material, lights the lamp attached to a rotating disk. Rotational position of flashes is matched with graduations on a transparent harmonic scale and read out directly on the thickness scale. Two percent accuracy is obtained for any thickness in range of 0.027 to 4 inches.

• **Noise Figure Monitor.** Radar noise figures are displayed on a Westinghouse Monitor described by Leo Young. Direct and continuous measurements of receiver noise figure are provided by comparing in a difference amplifier d-c signals proportional to a gated monitor pulse and the noise generated during receiver dead time. Since pulse and noise have passed through a logarithmic receiver, their difference represents the logarithm of their ratio. The device does not affect radar performance and a sensitivity up to 5 microamps/db is obtainable.

ISSUE AT A GLANCE

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More Lenders Eye Us. Growing outlays for defense electronics make electronics firms increasingly good financial risks. Today many commercial financing firms are seeking this industry's business. Last year, only a handful didp 7

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What's Ahead in 1958? Recent doings in Washington preview the coming year for electronics manufacturers. On the whole, things look good. They always do with more money on the wayp 22

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New Method Bonds Plastics

Recent Export/Import Trends—An ELECTRONICS Special Market Report. The year 1957 saw electronics exports dip \$19 million to \$321 million. But exporters are generally enthusiastic about the future. .p 25

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electronics

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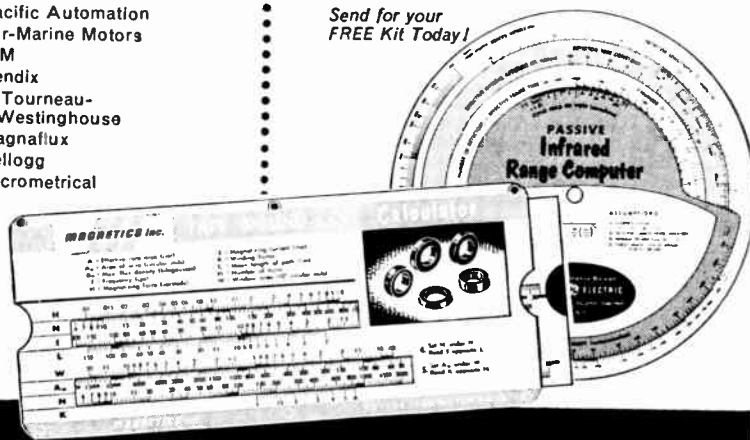
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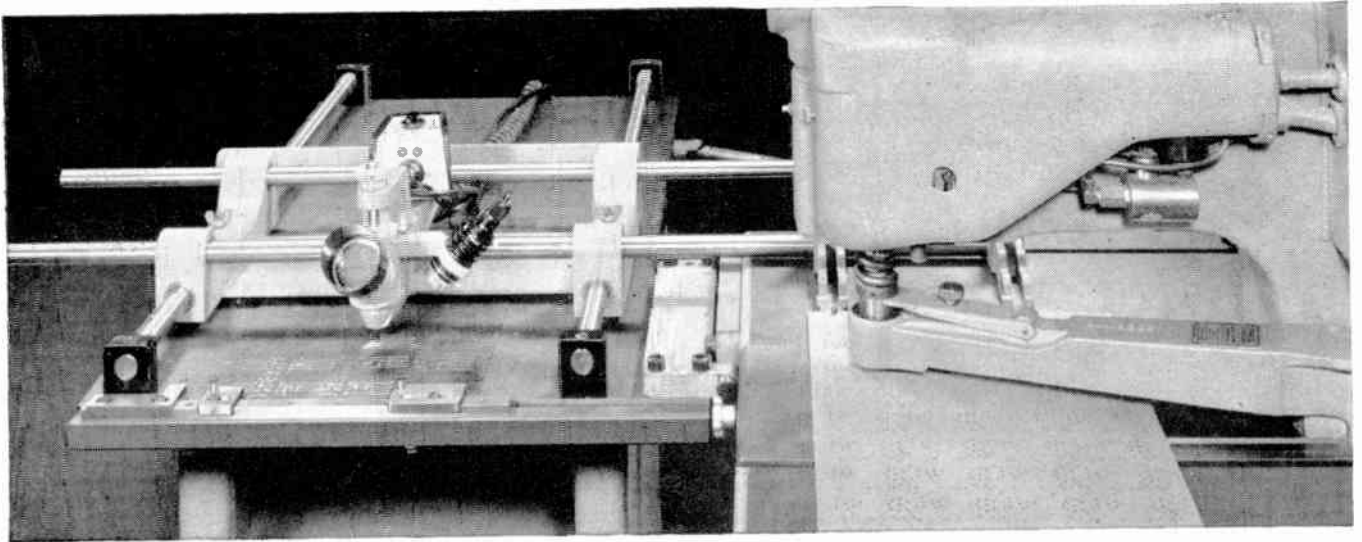
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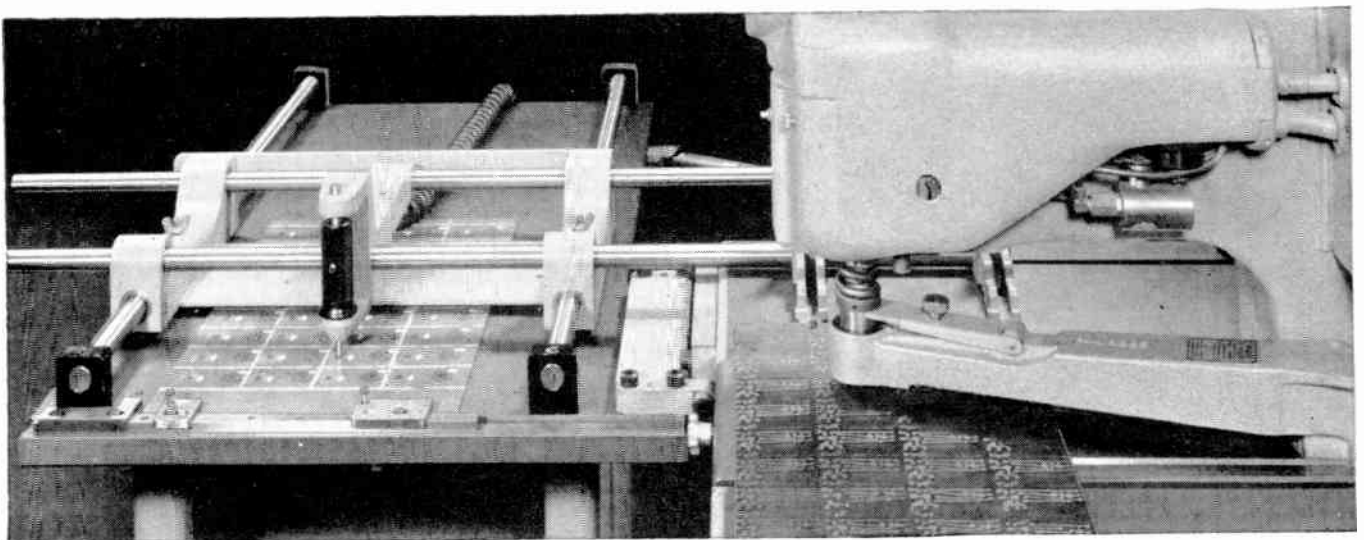
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More Lenders Eye Us

Today most commercial financing firms seek electronics business. A year ago, only a handful did

WITHIN THE PAST YEAR commercial financing firms have increased tremendously their interest in the electronics industry, William J. Drake, executive vice-president of the National Commercial Finance Conference, said last week.

"Most of our members are seeking electronics lending business today in contrast with a handful a year ago," Drake said. The group included Coastal Commercial, James Talcott, Inc., Mill Factors and Inland Credit, all of New York City.

Lending interests of this group dovetail with needs of many in electronics. They are geared to lend to small and moderate-sized growth firms who lack or have used up their ability to command regular commercial bank credit.

Individuals starting a business on a shoestring, firms with deficit working capitals, others looking for loans several times their net worth find their needs met by the commercial financing industry.

Loans are made on secured collateral—accounts receivable, inventory and plant equipment. Rates generally range from 1¼ to 1½ percent per month on outstanding balances. Period of lending commitment is usually two years.

Though rates are high, commercial financiers figure a growth firm can make upwards of 25 percent on borrowed capital and is able to more than meet interest requirements.

Because of the need to profitably employ borrowed capital, commercial financing firms give companies with poor future prospects a wide berth. "We are not interested in giving anyone an expensive burial," they say.

Chief reason for growing interest in electronics financing is decline in number of growth situations available as a result of general business slowdown. Because of prospects for booming military business, electronics has become one of the few areas of the economy that is currently growing at a rapid rate.

Interest in electronics lending was awakened among the commercial financing fraternity by Franklin Elias, president of Coastal Commercial in a speech on electronics at their 1956 convention.

More Than A Stunt

USE OF CLOSED CIRCUIT television to dramatize listing of Siegler common stock on the New York Stock Exchange earlier this month was more than a publicity gimmick.

Keith Funston, president of the Exchange, and John Brooks, president of Siegler, watched the first trade over closed circuit tv in Funston's office instead of descending to the trading floor, the usual procedure at listing ceremonies.

Hallamore Electronics, a Siegler subsidiary, hopes to sell a number of similar systems to exchanges and branch brokerage firms throughout the country. Systems would enable users to keep in instant touch with stock prices by tuning in on stock exchange trading posts.

Ticker tapes at best are several minutes behind trading. At times of great activity they may trail sales by 13 minutes.

SHARES and PRICES

ATOMIC PLANES are coming closer to reality. Latest reported development is that the Defense Department has decided on the type of plane it wants and is ready to set up a definite program for flying

a specific plane at a certain time. It's expected that the first atomic plane will fly by 1965. The Strategic Air Command could have a fleet of atomic planes sometime between 1965 and 1970. Annual expenditures by this time would be considerably above the \$200

million estimated expenditure for the current fiscal year. Early experience of firms listed in the table below, which are already engaged in electronic research and development for atomic planes, should, according to experts, pay future dividends.

Atomic Plane Developers	Recent Price	Indicated Dividend Rate	Percent Yield	Earned Per Common Share			Traded	1957 Price Range
				1957	Period	1956		
Admiral	9	0.24	(9 mos)	0.76	NYSE	6¾-14¾
General Dynamics	59¾	2.00	3.4	3.50	(9 mos)	2.51	NYSE	46-¾-68½
General Electric	65½	2.00	3.0	2.10	(9 mos)	1.85	NYSE	52¾-72¾
Motorola	45¼	1.50	3.3	2.76	(9 mos)	2.49	NYSE	35¾-51¾
RCA	32¾	1.50	4.1	1.87	(9 mos)	1.82	NYSE	27-40
Servomechanisms	8	0.40	0.5	0.33	(9 mos)	0.63	ASE	6½-12½

MERGERS, ACQUISITIONS and FINANCE

• **American Securities Corp.**, New York investment banking firm, is still planning to purchase Western Union's cable facilities. Date when agreement will take effect is uncertain. Franchise agreements and stipulations of government agencies have to be worked out first. Recent rumors that W.U.'s cable facilities were to be sold to other parties have proved to be unfounded.

• **RCA president, General Sarnoff**, expects that 1957 earnings of the big electronics manufacturing firm will be slightly less than 1956. Total 1957 sales of \$1.18 billion topped 1956 sales by five percent. Softening of general economic conditions in the fourth quarter, plus a highly competitive situation in the radio-tv segment of the industry, were responsible for

weaker earnings in 1957 by RCA. Nine-months earnings were slightly higher in 1957 than in 1956.

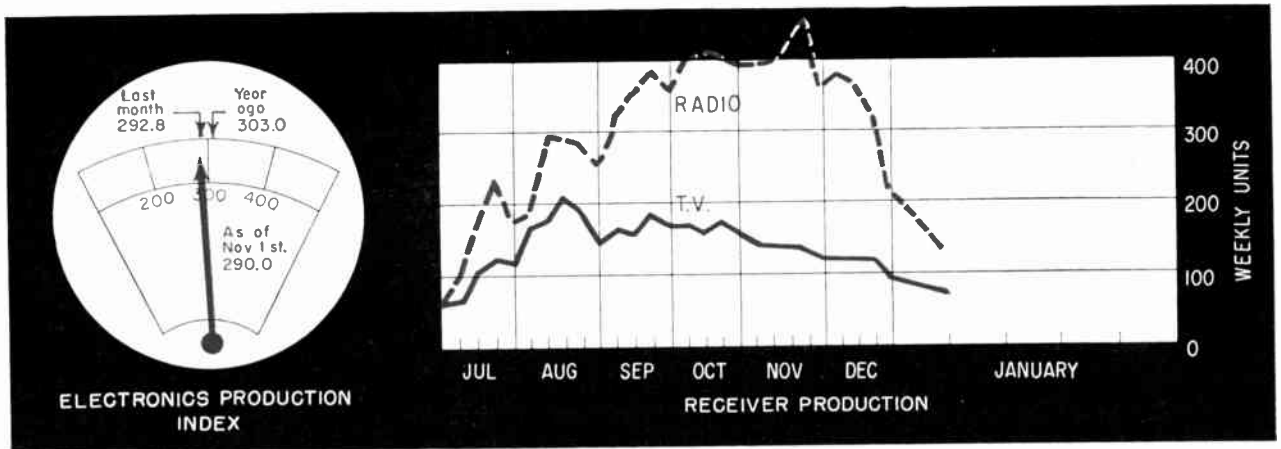
• **J-V-M Microwave**, Lyons, Ill., issues 96,000 shares of common stock at \$3 per share. Proceeds are to be used to repay bank loans and for general corporate purposes. J-V-M makes oscillator cavities, radar test equipment and microwave assemblies. Actua Securities Corp. of New York is the underwriter.

• **Electro Instruments**, San Diego, Calif., obtains \$200,000, six-year term loan, at six percent. It is repayable in monthly installments between March 1958 and February 1964. Loan proceeds, with \$562,500 received from recent stock issue, will be used to construct new main plant in San

Diego and for other corporate purposes.

• **Van Norman Industries**, New York City, plans to issue up to 58,808 common shares at market price under employe stock plan. Company will contribute 20 percent toward purchase of stock. Money from stock sale will be used to reimburse company for purchase of stock for plan on open market.

• **General Controls** establishes an integrated manufacturing and sales team in its new Electronics Controls Division at Glendale, Calif. Major products of the new division include high performance analog servos for position and velocity control as well as control system computation and transistor and magnetic amplifier packages.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	Jan. 3, '58	Dec. 27, '57	Jan. 4, '57
Television sets, total	61,824	87,497	75,919
Radio sets, total	127,890	210,493	194,768
Auto sets	36,789	102,561	59,816

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	Jan. 8, '58	Dec. 31, '57	Jan. 9, '57
Radio-tv & electronics	45.10	41.51	48.13
Radio broadcasters	57.49	51.77	63.30

FIGURES OF THE YEAR

	1957	Totals for first 11 months 1956	
			Percent Change
Receiving tube sales	428,688,000	429,846,000	- 0.3
Transistor production	25,965,000	11,232,000	+131.2
Cathode-ray tube sales	9,076,982	10,191,545	- 10.9
Television set production	5,825,804	6,760,045	- 13.8
Radio set production	13,634,402	12,266,591	+ 11.2

LATEST MONTHLY FIGURES

EMPLOYMENT AND PAYROLLS

(Source: Bur. Labor Statistics)	Oct. '57	Sept. '57	Oct. '56
Prod. workers, comm. equip.	412,000-p	417,900-r	413,100
Av. wkly. earnings, comm.	\$76.44 -p	\$78.40 -r	\$78.12
Av. wkly. earnings, radio	\$74.40 -p	\$76.02 -r	\$75.70
Av. wkly. hours, comm. ...	39.0 -p	40.0 -r	40.9
Av. wkly. hours, radio ...	39.0 -p	39.8 -r	40.7

TRANSISTOR SALES

(Source: EIA)	Nov. '57	Oct. '57	Nov. '56
Unit sales	3,578,700	3,544,000	1,829,000
Value	\$6,989,000	\$7,075,000	\$5,559,000

TUBE SALES

(Source: EIA)	Nov. '57	Oct. '57	Nov. '56
Receiving tubes, units	39,950,000	47,075,000	39,489,000
Receiving tubes, value	\$33,166,000	\$38,421,000	\$31,476,000
Picture tubes, units	772,801	995,629	957,765
Picture tubes, value	\$15,138,438	\$19,495,574	\$16,014,839



George E. Steiner, General Manager

“OUR THANKS TO YOU— FOR THE GREATEST PLANT EXPANSION IN OUR HISTORY”

Yes, it's true. By your wholehearted acceptance of electrical connectors made by Scintilla Division of Bendix Aviation Corporation, you have made possible the largest single plant expansion we've ever undertaken. We're mighty grateful.

More and better electrical connectors of the many types needed by American industry will be available to you in the future. They'll be manufactured in our new plant facilities, built on the confidence you have shown by your ever increasing purchases of Bendix* connectors.

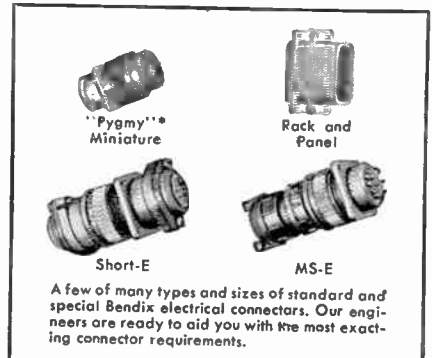
After only a little more than ten years in the field, connectors have become a major part of our business—by far our fastest growing product line. We like to think this startling growth is due, in great

part, to the reputation Scintilla Division of Bendix Aviation Corporation has earned through the years as an organization that never gives anything less than its best.

Perfection is a difficult thing to achieve. We would be fooling no one if we said we achieve it every time. Very few people do. But we do not exaggerate when we say that we are never *satisfied* with anything less. This constant striving for perfection is a way of life at Scintilla Division.

This, then, is a twofold message to the aviation, electronics and missile industries. First, a sincere appreciation for your acceptance of our products. Second, a pledge that the greatly increased output of electrical connectors in our new facilities will be accompanied by the same

continuing search for improvements in quality and performance that has been our creed since we were founded.



*TRADEMARK

Scintilla Division

SIDNEY, NEW YORK

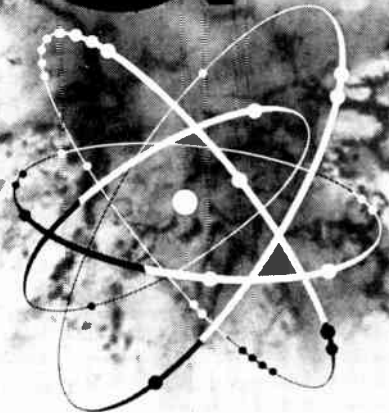
Canadian Affiliate: Aviation Electric Ltd.,
200 Laurentien Blvd., Montreal 9, Quebec



ACCEPTED SYMBOLS

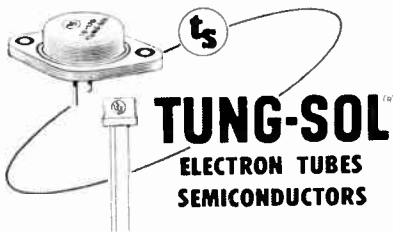
32

Ge
72.60

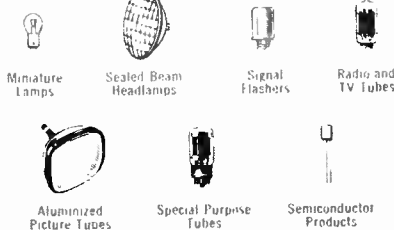


Symbol for germanium . . . element basic to the new physics of semiconductor materials.

Just as engineers readily recognize Ge as the symbol for germanium, so do they associate the name Tung-Sol with quality production of semiconductors. Insistence upon quality production *only*—the policy which has earned Tung-Sol its position as America's largest independent electron tube manufacturer—will always characterize Tung-Sol's semiconductor program.



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



CIRCLE 4 READERS SERVICE CARD

WASHINGTON OUTLOOK

THE NOTE of national urgency sounded in President Eisenhower's State of the Union message will be increasingly reflected in federal actions touching on the electronic industry. The impact will be both in dollars spent and in management—that is, who will be doing the production and development planning and the contract awarding for military electronic goods.

First off, the effect on expenditures. Even before the fiscal 1959 budget (see p 23)—with record sums for military electronic procurement—was sent to Congress, the administration rushed through a \$1.26-billion supplemental appropriation for the current fiscal year.

A good chunk of the extra money is earmarked for electronics: \$329 million for ballistic missile detection—or long-range radar developments—and \$29 million for the Air Force's Sage electronic air defense system. In addition, at least 20 percent of the \$683 million for the step-up in ballistic missile production can be considered electronics money. So can some of the \$219 million in funds set aside for new SAC alert and dispersal plans, the \$10 million for new space projects, and \$50 million to \$150 million emergency R&D fund.

But it is in the fiscal 1959 budget where the added stress on electronics is most pronounced. This will mean a continually rising volume of electronics procurement for as long as military planners can now see.

The President's message outlined in general the administration's plan to overhaul Pentagon organization—a long-simmering issue which has been underscored by Lt. Gen. Gavin's dramatic resignation, the recent Rockefeller report and the organizational proposals generated by the Johnson missile investigation in the Senate.

Details of the administration's military reorganization plan were still unavailable as ELECTRONICS went to press. But it's obvious the administration is moving toward stronger defense unification to reduce inter-service rivalry and duplication. Moving space development projects into the new Advanced Research Projects Agency, apart from the individual services, was the first step. What this adds up to is this: there will be far more centralized control over military requirements, weapon development, and procurement from here on out.

Reorganization proposals differ in some specifics, but the basis of all of them boils down this way: a General Staff of top-level military planners, independent of the services, must be set up to replace the Joint Chiefs of Staff.

Under the present system, three of the joint chiefs have dual responsibilities—they are members of the top U. S. strategic planning staff and also commanders of their respective services. The fourth member, the chairman, has no direct authority over the services, serves mostly as a presiding officer over a debating society.

- The private Rockefeller report, prepared by a panel of noted defense and industry experts, is more ammunition for the administration's growing number of defense policy critics and another impetus for beefing up the program. It echoes the highly-touted Gaither committee's grim conclusions about expanding Russian military might, and is an influential plea for still greatly increased military spending and stronger unification.

There's plenty of room at the top ... but there's lots more room at the bottom

Look around you. How many men do you see at about your job level and income? Know them pretty well, don't you? Are they smarter than you are? Do they work any harder? Do they possess some "something" that you don't have?

No, of course they don't. And yet, five years from now, some few of you are going to be lots closer to the top of your company. There's lots of room up there — management needs able-brains as never before. But, warning! There's still lots more room at the bottom!

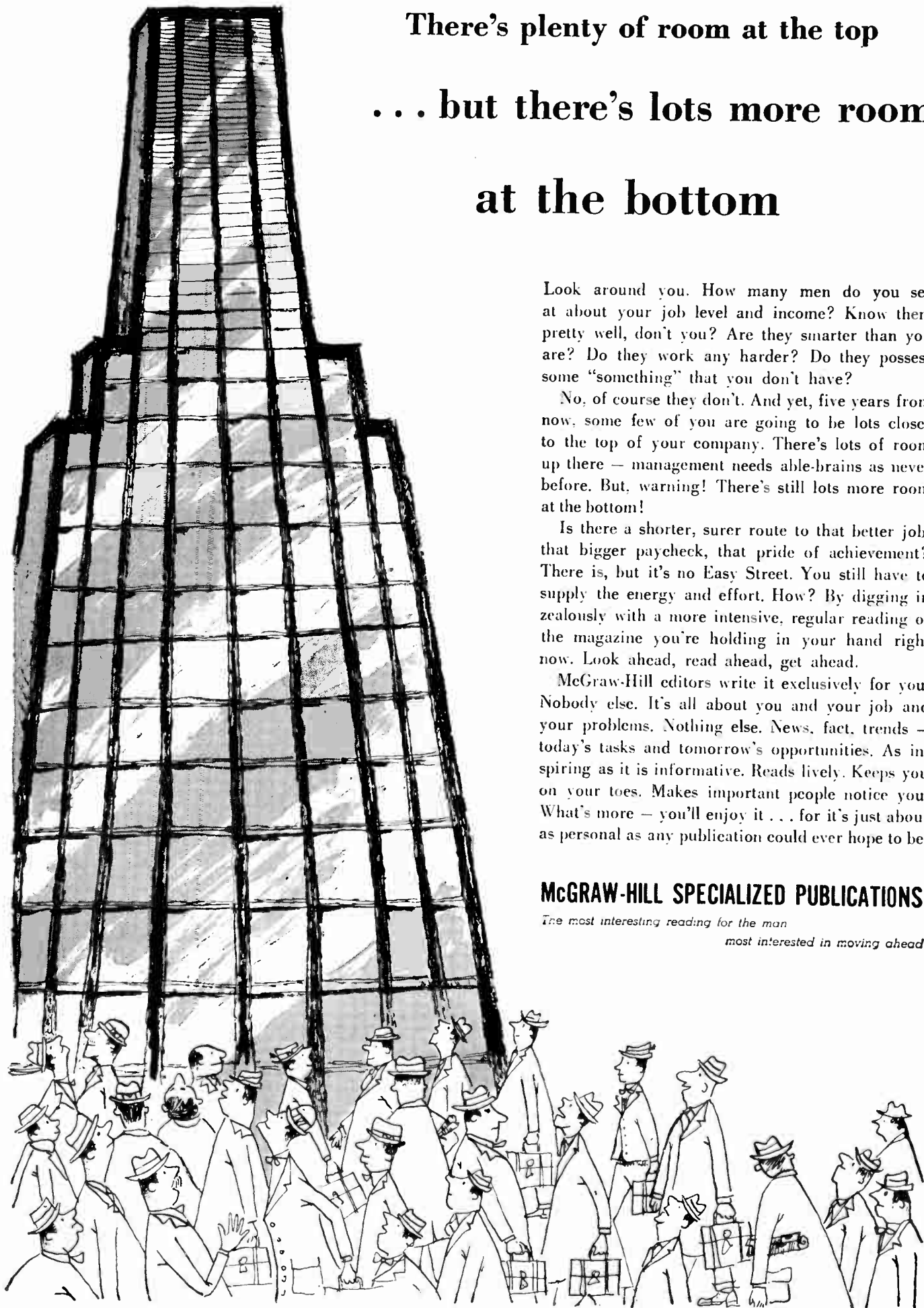
Is there a shorter, surer route to that better job, that bigger paycheck, that pride of achievement? There is, but it's no Easy Street. You still have to supply the energy and effort. How? By digging in zealously with a more intensive, regular reading of the magazine you're holding in your hand right now. Look ahead, read ahead, get ahead.

McGraw-Hill editors write it exclusively for you. Nobody else. It's all about you and your job and your problems. Nothing else. News, fact, trends — today's tasks and tomorrow's opportunities. As inspiring as it is informative. Reads lively. Keeps you on your toes. Makes important people notice you. What's more — you'll enjoy it . . . for it's just about as personal as any publication could ever hope to be.

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EXECUTIVES IN THE NEWS



Cresap: new ideas

LATEST of the professional managers to take over a big electronics firm is Mark W. Cresap Jr. He became president of Westinghouse Electric on Jan. 1, two days before his 48th birthday, will call the shots in the Westinghouse "power up" campaign to sell the industrial market.

Fireball Cresap, a graduate of Williams (BA '32) and Harvard Business ('34), got his first job with Chicago management consultant Booz, Allen & Hamilton. In 1939, he became merchandising manager for hatmaker John B. Stetson Co., held the post until late 1941. The war put him into Army's service forces, where he ran into Dick Paget, whom he had known at BAH. Paget was working for Navy Secretary Frank Knox, had a deputy named Willard McCormick.

After the war, Cresap, McCormick & Paget set up a management consultant firm in New York, kept it together with shoestring until Ford Motor asked them to do a purchasing study. In 1948, Westinghouse chief Gwilym Price called CM&P to study his firm's sales program. After seeing the results, he asked Cresap to map a whole new command setup for the sprawling Pittsburgh concern.

Cresap became an officer of Westinghouse in February 1951, moved up to exec v-p in 1955. Coordinating the company's 67 "profit centers" keeps him on the road a third of the time. He's up in the air a lot, flew 15,000 miles in six months last year, met with 8,500 management men at 50 meetings. "We want new ideas," he says, "and challenges to old ideas, and above all differences of opinion."

Cresap takes time to relax—"at least on weekends"—with his wife and two children at his hillside home near Pittsburgh, where he indulges in gardening. He reads some 20 books a year, likes the swimming and fishing at Martha's Vineyard in the summer. He also plays a mean game of gin rummy.

COMMENT

Still More Sputnik

Re "More Sputnik" (Comment, Dec. 10 '57, p 13), let me commend Mr. Duggan on his intense

interest and his courage in claiming to be the first in reporting reception. Although I don't claim to be first, I can prove that I beat

Mr. Duggan by a long shot.

Bill Lance (W9PNS), Mt. Vernon, Ill., and I received Sputnik I on the 40 mc frequency several hours before news of the launching was ever released to the American public. Bill, an ardent astronomical fan, had said for several days that the time was ripe for a launching. I had heard beeps on 40 mc a day or so earlier but figured they were telemetering signals from Europe.

The day of the launching we were by our receivers copying press from overseas stations. We got information on the satellite from one of these stations and had a receiver on both frequencies about mid-afternoon. Before dusk we had recorded two passes. During the following days we made no less than a score of recordings.

When and if the U.S. launches a satellite we will be waiting for it. An almost continuous watch is maintained by both Bill and myself because we personally expect the satellite to be in the air before the public knows about it.

ED HOWELL

WCSC-TV
CHARLESTON, S. C.

Plastic Confusion

(In "Bakelite: New Chief Plant" Dec. 10 '57, p 46), there has been an unfortunate confusion of similar sounding but very different plastic materials.

Union Carbide is building its ninth plant for the production of Bakelite polyethylene. The company is withdrawing from the sale of polyester resins as of Jan. 1, 1958.

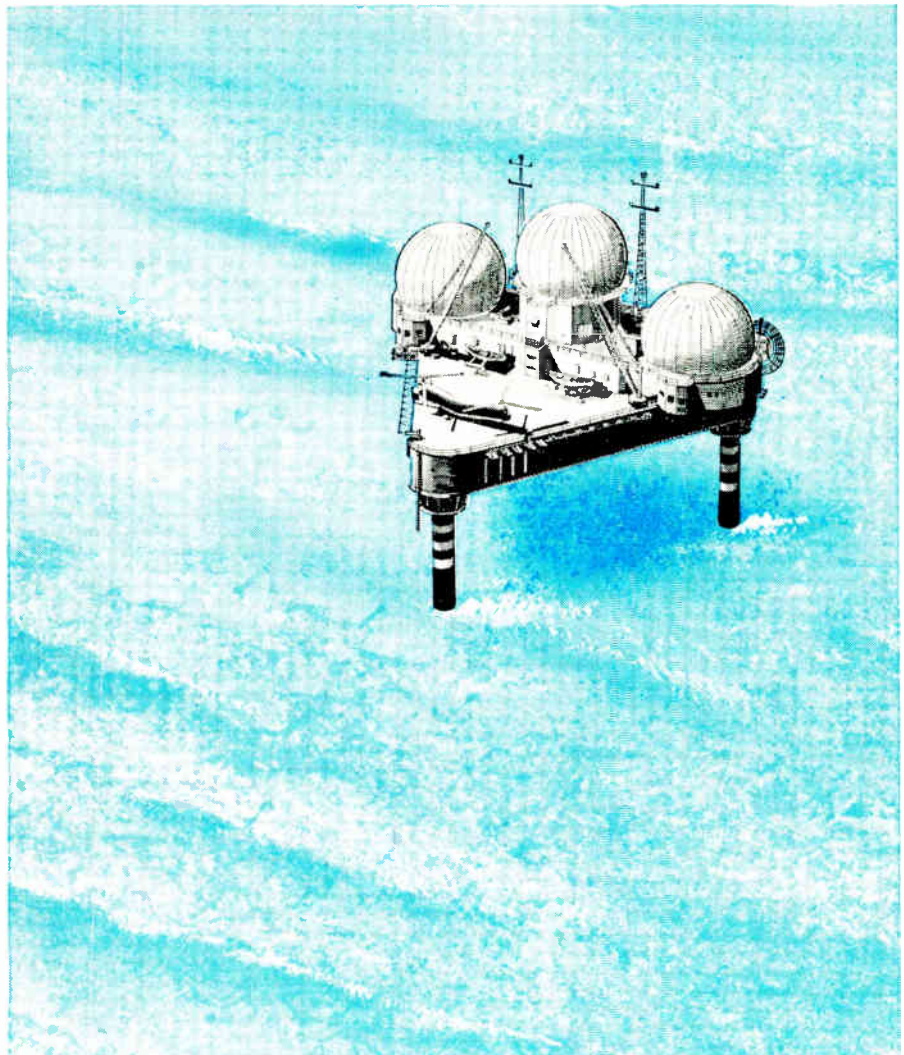
GEORGE GRAY

BAKELITE COMPANY
NEW YORK 17, N. Y.

Credit Where Due

The article "How Transistors Operate Under Atomic Radiation" (Dec. 1 '57, p 125) should have had the credit line "By Robert L. Riddle and Robert D. Laughlin." Mr. Laughlin is a senior engineer for this firm.

ROBERT L. RIDDLE
HALLER, RAYMOND & BROWN INC.
STATE COLLEGE, PA.



WARNING -- Radar Trap!

One way to get a ticket that can't be fixed is to try a high-speed sneak attack past the line of "Texas Tower" radar sentinels now guarding our shores.

When an intruder approaches, his range, bearing, course and speed are instantly flashed to our Air Defense Command, along with voice and intercept command signals. This information, "multiplexed" by Lenkurt single-sideband carrier equipment, rides ashore on a microwave radio beam.

The carrier picked for this application is standard Lenkurt equipment — the same that is in daily use by America's telephone companies. Its adaptability, proved reliability and ease of maintenance have made it the logical first choice for many vital defense installations. It offers frequency economy, saves installation space, provides a maximum number of channels at a minimum unit cost.

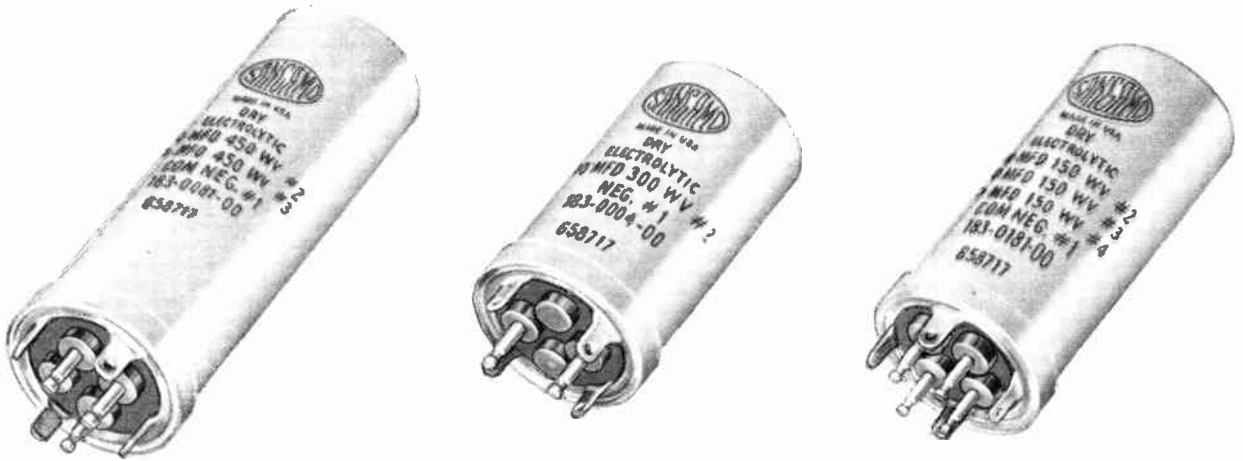
To carry forward your own communications projects, join the growing list of commercial and government users who look to Lenkurt for leadership in telecommunications.

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NEW HIGH RELIABILITY



IN ELECTROLYTIC CAPACITORS!

These new dry electrolytic capacitors are especially built for applications that require an extremely high level of reliability over long periods of time.

Sangamo Type TR capacitors are designed to operate in a temperature range from -20°C to $+85^{\circ}\text{C}$.

The Type TR is well suited for use in communication systems; in all types of electronic industrial controls, laboratory test instruments, computer equipments, and in many other similar applications. Type TR capacitors are available in ratings from 3 to 450 volts D.C.

Sangamo Type TR TWIST-TAB ELECTROLYTICS



have a life expectancy of at least 10 years when operated within their

ratings These high reliability dry electrolytics are designed with safety factors to pass high ripple currents.

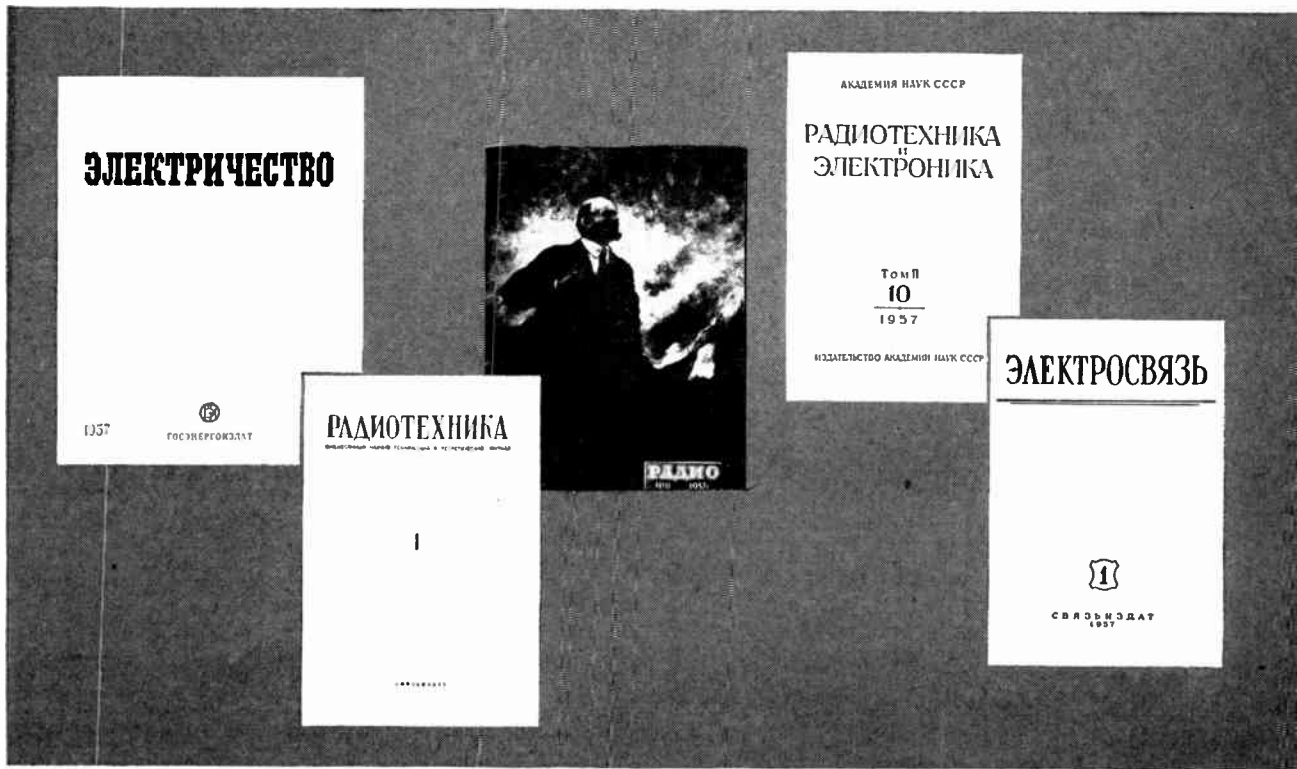
The use of high purity aluminum foil assures lower leakage current, and a highly effective end seal gives these capacitors unusually long operating life provided they are operated within their ratings.

Engineering Bulletin TSC 119 gives full information.

SANGAMO
Electric Company
SPRINGFIELD, ILLINOIS

6C58-1

JANUARY 24, 1958



Some Soviet technical journals in the electronics field are, left to right, "Electrical Engineering," "Radio Engineering," "Radio," "Radio Engineering & Electronics" and "Electrocommunications"

Soviet Translations Rushed

- National Science Foundation is the hub of several efforts to disseminate more Russian technical translations in electronics
- Commerce Dept. will channel to industry translation work done under U. S. contracts by Joint Publications Research Service

MOUNTING government effort is underway to translate Russian technical journals into English for use by industry as well as government and university scientists, *ELECTRONICS* learned this week.

Electronics, radio and communications are getting priority attention.

After years of unrewarded efforts by the National Science Foundation to get funds to do a massive

translation job, the Soviet sputniks may have released the purse-strings held by Congress.

It takes about \$25,000 to launch an average translation journal and get it through its first year, NSF estimates.

Several translation projects are now supported by new NSF grants, and plans are being made to make Russian technical translations available to industry

through the Office of Technical Services of the Department of Commerce.

However, six months before the first Soviet sputnik went orbiting along its merry way, the U. S. Joint Publications Research Service was unobtrusively set up in New York. A study showed that this was the area richest in multilingual scientists.

JPRS was set up in accordance with a Hoover Commission recommendation for a centralized translation contracting service for all government agencies. Previously, each agency that thought it needed something translated did its own and kept it to itself.

Without fanfare JPRS began to recruit scientists to do translating work on a part-time basis. Several hundred are now available for this work, and the program has been stepped up.

First objective of JPRS was to publish several series of English abstracts of Russian technical articles. One series, "Telecommunications in the USSR," is of particular interest to our industry.

The sputniks pinpointed the need for this as a stopgap translating effort. Abstracts in English are available as soon as possible after the Soviet publications are received. These projects and others, such as surveys of particular scientific fields in Russia, are being done for government agencies under contract. Program is just getting up steam.

Ralph E. O'Dette, NSF program director for foreign science information, sits atop the whole government translation effort, which began to concentrate on Russian journals even before the Sputniks.

Reason for initial concentration on Russian technical literature, says O'Dette, is that "we have recognized for some time that this is the largest body of potentially useful information that we are making the least use of."

To O'Dette's perch are now coming copies of the non-security translations JPRS does under contract for any government agency. He will, as soon as administrative and production procedures have been established with the Commerce Department, make them available to industry and university scientists.

At first the Office of Technical Services is expected to order overruns of individual JPRS printings and sell these to industry. Later, groups of these translations may be produced in the form of U. S. Government research reports.

Right now, one of the biggest translation efforts supported by NSF is going on at MIT in the electronics field.

William N. Locke, MIT Director of Libraries, with the collaboration of Jerome Wiesner, director of MIT's Research Laboratory of Electronics,

and Professor Robert Fano, are administering a \$70,000 NSF grant for the translation of three Russian journals: Radio Engineering, Radio Engineering and Electronics, and Electro-Communications.

MIT, in turn, has let a contract to Pergamon Press, a British firm with an office in New York, for translation, sub-editing and publishing. Translations are expected to be sold on a subscription basis of 2½ cents per English page, with complete journals in the range of \$30 a year.

American Institute of Physics offers four translated Russian journals, for which NSF makes up any deficits. This fiscal year the deficits amounted to just under \$40,000.

Soviet Physics—Journal of Experimental and Theoretical Physics, has been published for about 4 years, and just about breaks even with a circulation of 1,000. At a \$75 per year subscription rate, mostly libraries get this monthly.

Soviet Physics—Technical Physics is another monthly with a subscription rate of \$90. Acoustics Journal is a quarterly with a \$12 subscription rate, and Doklady, the physics papers from the Proceedings of the USSR Academy of Science, is published bimonthly at a \$25 rate.

Recently, the American Institute of Physics offered all four at a reduced annual rate of \$150. In addition, there are plans to publish Russian translations in the field of crystallography and one in astronomy for the American Astronomical Society.

American Mathematical Society receives NSF funds to publish 1,000-1,200 pages a year. These, it is pointed out, are not complete journals, but lengthy, selected papers.

NSF and the National Institutes of Health jointly support work of the Special Libraries Association Translation Center, which is situated in Chicago. This organization acts as a clearing house for the assembling, indexing and distribution of translations.

SLATC has more than 17,000 separate translations of a wide range of scientific matter in some 21 languages. Some electronics and radio engineering are included. Newly available translations are reported in "Translation Monthly." Subscription is \$5 a year.

NSF's O'Dette says anyone who translates a scientific article can offer a copy to SLATC, which may then index it and announce it in the monthly bulletin. Microfilm or photocopies of the papers are sold at cost. The organization depends on loans and gifts of translation manuscripts and declares that, upon request, it definitely will withhold the identity of corporate donors.

Tomorrow's New Horizons?

- **Magnetohydrodynamics—interaction of ionized gases and magnetic fields—shows promise of significant breakthroughs**
- **Researchers see more efficient source of electrical energy, applications in high altitude flight, propulsion**

ADVANCED LABORATORY WORK in magnetohydrodynamics—the interaction of ionized gases and magnetic fields—promises to bring startling breakthroughs in the direct conversion of heat energy into electrical energy.

"I fully see a type of technology which will possibly be as rich as developments in the field of solid-state electronics," Dr. Lloyd P. Smith, president of Avco's Research and Advanced Development Division, said this week.

Applications of the new medium, which is in a very general sense an extension of gaseous electronics:

A great new source of energy—generation of electrical power directly from nuclear or other thermal sources without the use of mechanical energy as an intermediate step.

Higher flight altitudes and speeds.

Controlled fusion, leading to electrical power.

Propulsion mechanism for space flight.

MHD could produce electricity "less expensively, using smaller stations and generating power in the mega-mega watts," says Dr. Richard M. Patrick of Avco's Research Laboratory in Everett, Mass.

How soon, depends on development interest and funds. One of the largest power companies in the world has expressed interest in the evidence indicating that conversion of chemical and nuclear energy to readily applicable electrical energy can be accomplished at very much higher efficiencies by applications of MHD.

The efficient energy conversion will require the conversion medium to be at much higher temperatures, much higher in fact than the melting point of any known solid. This means the conversion medium must be contained by means of magnetic fields, which in turn means the medium must be a highly ionized gas.

Applications in the field of higher altitude-higher velocity flight are sufficiently promising, Dr. Smith says, that Avco is going ahead with further investigations.

For flight velocities above a certain threshold, he points out, there is an altitude for each velocity above which a conventional wing will not be able to

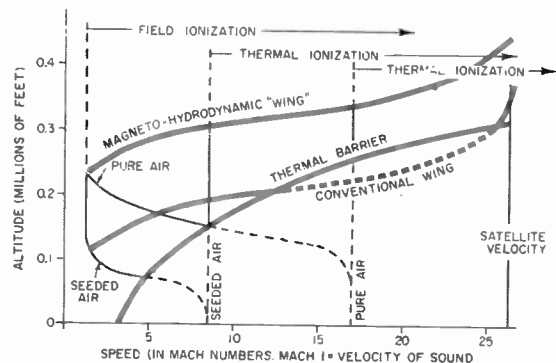
operate because of aerodynamic heating and loss of lift.

However, in this range of altitudes and speeds, the air is ionized in the shock wave around a moving wing and if the object carries a magnetic field with it, the ionized air moving around it will be influenced in such a way as to make the "wing" effectively larger without increasing the aerodynamic heating.

The heating of the solid wing might in fact be decreased because the magnetic field would divert some of the moving gas particles which would otherwise strike it. The result would then be a wing with possibly less heating but a larger lift coefficient so that it could operate at higher altitudes and higher speeds.

MHD technology will be ready for thermonuclear reaction, says Dr. Smith, pointing out that only magnetic fields can contain the tremendous heat which will be generated. "The clever application of magnetohydrodynamics (not yet sufficiently understood) is the basis for all efforts to convert the nuclear energy available from the fusion of deuterium," Dr. Smith declares. "It is my belief that very significant results can be obtained in the efficient conversion of energy to electrical energy even before success is achieved in the thermonuclear field."

In developing propulsion systems for flights to outer space, the MHD researchers say, MHD could



How MHD may make hypersonic aircraft possible

compete successfully against both chemical rockets and ion rockets.

A whole new field of heat transfer mechanisms and "revolutionizing of engines" are also envisaged by Dr. Smith through MHD conversion of heat into electrical energy "without moving parts." MHD vacuum pumps, with ionized gases being expelled by a magnetic field, is another possibility.

Dr. Smith, former head of the physics department at Cornell, describes MHD as a coalescence of the fields of gas dynamics, gaseous electronics and electromagnetic theory.

Dr. Patrick defines it as the "production of body forces and pressures through the use of a magnetic field in gas which are of the same order as the total force and pressure on the gas." The gas conditions must be such that the conductivity is large enough to produce the pressures and body forces.

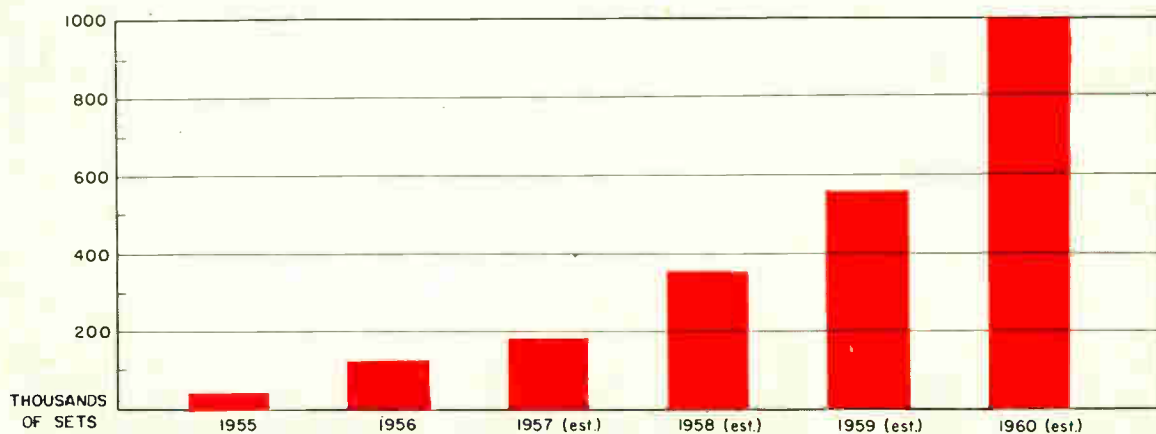
The work has to do with essentially completely ionized gases, over very large density and temperature ranges.

Instead of working in temperature ranges where newer solids are created to withstand the heat, MHD "leaps" into the range of 10,000 to 1,000,000 K—out of the area where solids can be used.

By means of electromagnetic drivers, regions of gas at temperatures approaching a million degrees are produced and studied for very short periods of time. The medium of confinement is a magnetic field, the "solid wall" against which the charged particles are driven.

In the Aveo laboratory, the phenomena in some domains are studied in shock tubes. In this way, fairly uniform regions of high temperature gas of known density and enthalpy can be produced and studied for short times.

PRODUCTION and SALES



Color Tv Sales: Triple In 2 Years?

COLOR TV SET SALES will start to take off for the high-volume regions in 1960. Until then sales will increase by moderate annual amounts.

This is the consensus of industry opinion at this time. Taking both optimistic and pessimistic viewpoints into account, reasonable forecast of color tv factory sales is: 1957—180,000 sets; 1958—350,000; 1959—550,000; and 1960—1,000,000.

One manufacturer estimates color tv set sales will increase annually by 1-2,000,000 units in each

of the five years following 1960.

Key to the expected color tv sales take-off is the number of sets in use. By end of 1960 about 2 million color sets will be in use. At this time, one out of 25, or four percent, of the 50 million families with wired homes will have color tv.

A small ratio to be sure, but in some economic groups, geographical areas, favorable programming areas, etc., the degree of market penetration will be much higher. It is expected that it will be high enough for the social force known

as "keeping up with the Joneses" to become effective.

A big reason why color tv sales growth will be gradual for the next few years, says another manufacturer, is that so few homes have color tv that most people are not conscious they are missing something.

For instance, there are probably no more than 350,000 color sets in use today. With a total of 47.4 million wired homes in 1957, the degree of market penetration is now only three tenths of one percent.

Classroom Tv Makes Grade

- **Open-circuit and closed circuit tv gain ground in school systems throughout the nation**
- **Massachusetts plans regional in-school tv network to serve 68 cities and towns**

THE "21-INCH CLASSROOM" is gaining ground in America this week. Latest entry of tv into education is in the New England area, where 68 cities and towns within a 25-mile radius of Boston are planning open-circuit in-school tv next Spring.

Meanwhile, in Keene, N. H., New England's first closed-circuit school tv is being used for high school biology classes.

Schenectady and Chicago pioneered in open-circuit tv, but the Massachusetts venture is unique, encompassing the majority of school systems in the eastern part of the state. It will require the cooperation of school boards in each community.

"It's not a matter of selling, so much as informing," says Michael J. Ambrosino, consultant for in-school tv at WGBH-TV, a non-commercial station in Cambridge, Mass. WGBH got a \$15,000 grant from the Fund for Advancement of Education to develop in-school tv in Massachusetts.

Legislation allows use of school funds, not to exceed \$1 per pupil. To get the program started, 25 cents per pupil is being asked. For Boston, with 90,000 pupils, this means \$22,500 out of an annual school budget of \$31,000,000.

Tv sets will be purchased by PTA's, school systems or civic groups, or donated by distributors. Master antenna systems will be needed in some instances.

As a start, half-hour programs will be presented for elementary grades. Experts in various fields will teach the subjects and, since the programs will come over Channel 2, parents will be able to "attend" the classes at home.

Closed-circuit tv, operated most notably in Hagerstown, Md., is also drawing the attention of educators. It enables "master teachers" to reach hundreds or thousands instead of 30 or 40. At Albany State Teachers College it is used for teacher observation. An unobtrusive tv camera in an elementary school 20 miles away enables students at the college to watch a real classroom in operation.

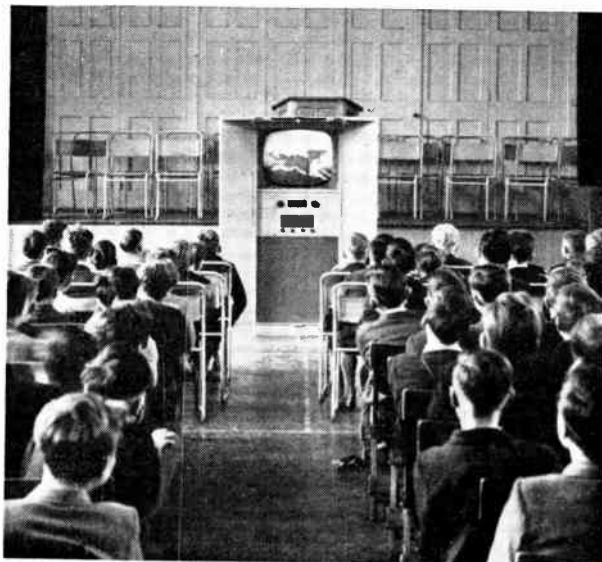
Closed-circuit tv is also used for the "blow-up" of experiments in a large lecture hall, so that everyone has a front-row seat, or better.

Closed-circuit tv promises to expand the market for small, simplified cameras. Already active in the field are the Dage Television Division of the Thompson Products Company, GE and RCA. The cameras sell for less than one-third of the \$21,000 it costs for a regular tv camera.

Enthusiastic proponents maintain tv is no more of a "gadget" in education than textbooks are. They agree that tv must be adapted to education, not education to tv.

Challengers fear that conventional teaching will be replaced, that the teacher-pupil relationship will be damaged, that for-credit courses on tv will "cheapen" degrees.

Champions of televised teaching reply that it is one more educational aid, to be integrated and given its proper place—but that it is an aid of more significance to education than anything since the invention of printing.



Waiting market of classrooms and students beckons more and more. Example is this photo taken in Britain. In some U.S. quarters educational tv is termed the greatest teaching aid since the invention of printing. With a teacher shortage and a swelling population, the classroom tv market figures to be good business for years to come

Women Spark Plant Shifts

- **Small communities with a plentiful supply of female help offer real savings—so firms are leaving established centers**
- **But before you leap, do some checking. Any hidden fringe benefits? Employee selection wide enough? How's absenteeism?**

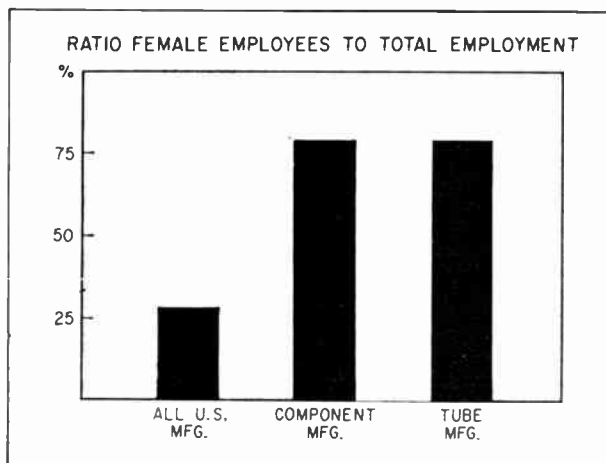
LOOK FOR CONTINUED decentralization of the electronics industry, with a drift away from established centers and toward smaller communities in the months ahead.

Leonard C. Yaseen, senior partner of Pantus Factory Locating Service of New York, expressed this view last week.

His firm has located plants for more than 1,500 companies in its 36 years of plant location work. It has made studies for Sylvania, Admiral, Kellogg Switchboard, IT&T and W. L. Maxson in the last two years, and for a host of other electronic firms in previous years.

The need to locate in areas with a plentiful supply of low-cost female help is the main drive behind the decentralization trend, says Yaseen. Light assembly operations which women perform well are the basic manufacturing activity of a large segment of the industry. Consequently, he points out, firms of this type are both labor-oriented and heavily dependent on female workers.

Employment statistics on electronic tube and component manufacturers demonstrate the importance of female help to assembly type manufacturers. Female workers represent 79 percent of total employment of electronic tube manufacturers and 68 percent of component manufacturers' employees.



Large number of female employees needed by assembly-type electronic companies is a key factor today in many plant location decisions

Yet for all U. S. manufacturing the female employment ratio is only 29 percent.

Except for the cases cited, comparable female employment ratios exist for a major portion of the electronics industry. This portion will steadily increase, Yaseen claims. Basic pattern of the industry is this: once a new product is developed, future production becomes a relatively simple assembly operation.

Big disadvantage of the industry's established centers is high hourly wage rates, according to Yaseen. Rates for unskilled female help in established centers have climbed from \$1.10-\$1.15 an hour in 1946 to \$1.60-\$1.70 an hour today. However, a large supply of female help at \$1.15 to \$1.25 an hour can be found today in many of the nation's smaller communities.

The importance of the wage differential between established centers and small communities is compounded by the high ratio of wage costs to total costs found among assembly-type electronic firms. For instance, payroll costs for both tube and component manufacturers represent a very large 36 percent of total product value.

Yaseen has a few words of caution for firms which may be thinking of locating plants in communities with low female wage rates.

Look at the wage rates of men as well as women. Earnings of male employees should not be too high. A large number of women will enter the labor force only if they need supplementary family income.

Look for a generous supply of prospective employees. The ratio of permanently and locally available employees should be at least four to one to insure reasonable selectivity. Many firms which move to new locations underestimate the available supply. They fail to allow for the overage, physically handicapped, drifters and others who do not meet employment standards.

Look beyond average hourly rates in weighing wage costs. Hourly fringe benefits may vary as much as \$0.06 to \$0.47 per hour from community to community. Equally important are hidden wage costs due to over-time patterns, absenteeism, turnover and time lost in strikes and labor disturbances.

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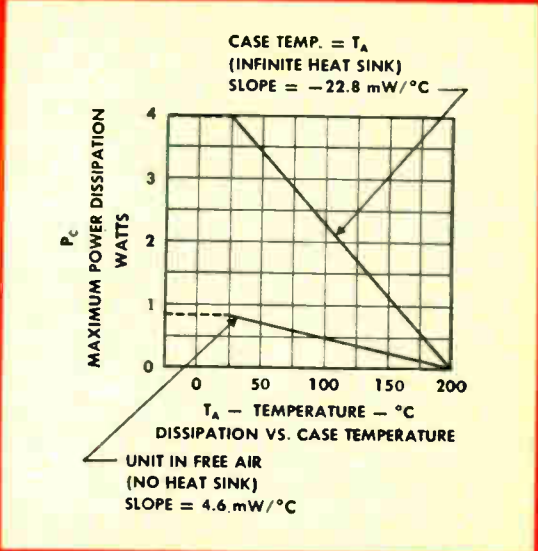
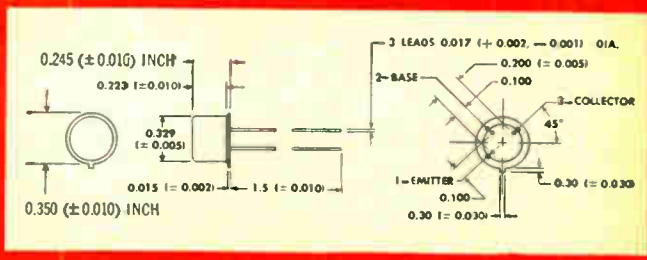
	type 2N497	type 2N498	unit
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BV_{CEO} ($I_C = 250 \mu A$)	60	100	V
BV_{CBO} ($I_C = 100 \mu A$)	60	100	V

design characteristics @ 25°C (case temperature)

	min.	des. cen.	max.	unit
R_{CS} ($I_B = 40 \text{ mA}; I_C = 200 \text{ mA}$)	—	20	40	Ohm
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What's Ahead in 1958?

- 1. Ballistic missile spending will rise; planes will slip. Polaris IRBM may be a dark horse**
- 2. Atomic carriers are out; subs in. Look for more Federal money for atomic power**
- 3. More money is in the works for weapons R&D, basic research, science education**
- 4. Tax cuts are out; as are patent law changes. The Reciprocal Trade law will be extended**

WASHINGTON—THE NEW SESSION of Congress opened on a note of crisis and urgency never before felt in peacetime Washington. The dominating matter: how to beef up U.S. military preparedness.

At the center of all plans to step up defense stands the capabilities of U.S. electronic producers. For fundamental to defense expansion are programs to increase production of guided missiles, strengthen radar defenses and to speed up research on missile and submarine defense systems.

As a key element in the U.S. defense picture, the electronics industry will be shipping well over \$4 billion worth of defense products annually over the next decade. As defense production plans shape up now, electronic goods will account for about one-third of the military hardware dollar.

The Democrats want to take Eisenhower and his administration to the woodshed for being in charge when the U.S. is discovered to be lagging behind the Russians in important areas of military preparedness. You can be sure of the outcome of many of the really big issues; some aren't so sure. Here's a rundown of most of them:

Military spending will be increased. Military appropriations—that is, the military's authority to make long-term contracts—will go up even more.

Missiles spending will show the biggest percentage increase. Most of the increase will go to the long-range ballistic missiles.

Manned aircraft spending will slide some, overall. Fighters will be hit the most; bomber spending will stay steady or even increase a little.

Conventional weapons will benefit from some re-

search and development spending. But orders for production will be cut.

Navy will benefit in some ways from the new look that's being given our military defenses. One thing is sure: atomic submarines are the Navy's weapon of the future. A sub fleet is to be built to become a world-wide launching platform for intermediate range missiles.

Navy's Polaris IRBM made by GE, Westinghouse, Lockheed and Aerojet is reckoned by some as the most technically advanced IRBM. It's the only one with a solid fuel, and the experts agree that solid fuel is what these weapons will have to come to eventually.

The atomic super-carrier may have had its day if it's ever launched. Navy has one under construction, but was not able to get authorization for beginning another out of the new budget. Some experts guess that not another such super-carrier will ever be built.

Aid to scientific education is sure to be voted. Hundreds of millions may be spent each year. The president's program would put a billion of federal funds in scholarships, teachers' salaries, expanding laboratory equipment and the like over a four-year period.

A tax cut is out. The precarious balance of the big new budget won't permit it. The administration has to have a higher debt ceiling to accommodate more borrowing to pay the government's bigger bills.

Continuing high taxes may curtail some small firms' ability to grow big, thus a significant business slide isn't expected. Washington's economists are

practically unanimous in predicting an upturn by mid-year. The military and industrial portions of our industry will hardly feel any pinch. But if the recession grows instead of fading away, then the administration would back a tax cut. But the Federal Reserve board would be sure to pump up supplies of credit long before tax cut talk becomes very meaningful.

Atomic-energy instrument makers should get a boost. There is a drive to put more federal money into the atomic power field. Up to now, private utilities have been having trouble providing enough capital to keep the infant atomic-power industry growing.

Reciprocal Trade law will be extended. But with the current softness in business, industry demands for more protection from imports will be given more of a hearing in Congress. Some complaints will come from some component and home-entertainment-equipment makers, pressed by aggressive foreign competition. More restrictions on the administration's ability to negotiate lower rates are sure to be part of any extension.

Patent law hearings are likely. They will be aimed at piecemeal tinkering with the law. But any new patent legislation seems out.

Basic research programs both inside federal agencies and in grants to outside researchers will be stepped up. The National Science Foundation, National Institutes of Health, National Bureau of Standards and the like probably will all get more money.

Budget & You

IN A NUTSHELL, here's Defense Dept. budget section affecting our industry:

	Expenditures (Shipments) \$ Million		New Appropriation Requests \$ Million		Appropriation, Plus Supplemental Pending \$ Million	
	FY 59	FY 58	FY 59	FY 58	FY 59	FY 58
Total Military Electronic Production	3,700	3,700	3,700	2,900		
Aircraft Electronics (A) ..	1,700	1,900	1,100	1,400		
Missile Electronics (B) ..	1,000	870	1,100	690		
Shiphorne Electronics (C) ..	117	100	117	162		
Other Electronics & Communication	864	839	1,000	703		
Electronics R&D (D).....	500	450	570	450		

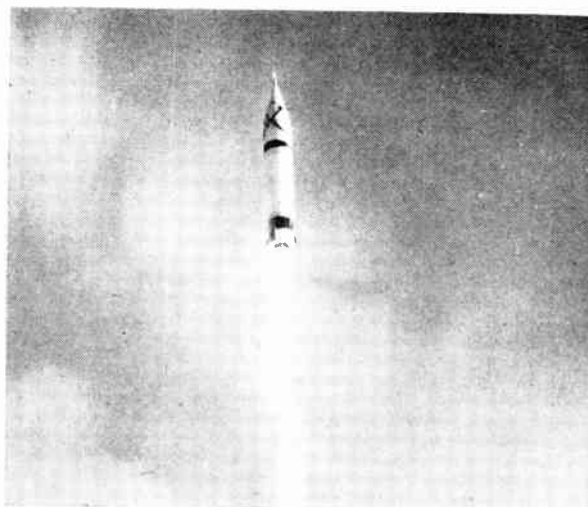
Footnotes:

(A) Based on authoritative but conservative estimate that about 25 percent of aircraft production involves electronic equipment

(B) Based on authoritative but conservative estimate that about 30 percent of missile production involves electronic equipment

(C) Based on authoritative but conservative estimate that about 9 percent of shipbuilding involves electronic equipment

(D) Includes estimate of (1) aircraft and missile research devoted to electronic gear and (2) so-called "clean" electronics — that is, ground radar, ground communications, and other items not related to weapon systems



Two Missiles Sure To Get More Money In '58

USAF's Thor (left) and Army's Jupiter here zoom toward test flight targets. Production of these two IRBM's—they're slated for NATO bases—means big

business in electronic controls, inertial guidance systems, ground test equipment, radar tracking, data reduction equipment

MATERIALS

Specific gravity	0.90-0.91 kg/liter	Dissipation factor (1 mc)	0.0002-0.0003
Tensile strength	4,300-5,000 lbs /sq in	Dielectric strength . . .	75-80 v/mil
Compressive strength	8,500-10,000 lbs/sq in	Volumic resistivity . . .	10^{16} ohm-cm
Hardness, Rockwell	85-95	Thermal conductivity	0.95 B.T.U./in/ ft ² /hr/° F
Impact strength	19 ft lb/in	Resistance to heat	302° F (150° C)
Dielectric constant (1 mc)	2.0-2.1	Transition temperature	329-338° F

Manufacturer offers salient physical properties as . . .

Polypropylene Arrives

Italian producer offers U. S. firms sample quantities of recently-developed thermoplastic. Material handles like polyethylene, but at 300F

A NEW CLASS of thermoplastic resins, isotactic polypropylene, is being made available in evaluation quantities in the United States for the first time.

Polypropylene is fabricated with the same equipment used for polyethylene. But as shown in the table above, it has higher heat resistance, is lower in density and is a good high-frequency dielectric.

The manufacturer is Montecatini of Italy, in production for a year. Its U. S. agent is Chemore Corp., of New York City. The plastic's electronic uses in Italy include cable and wire covering, cabinets, knobs and other molded parts.

Several U. S. firms are reported bidding for manufacturing licenses and others are reported readying their own processing method.

When Montecatini announced U. S. distribution during the Chemical Industries Exhibition in New York, no price was set. Polypropylene is sold in Italy for 62 cents a pound and polyethylene at about 45 cents. Company spokesmen said the U. S. price might be

higher per pound than polyethylene but lower on a cubic basis since it is lighter. Propylene, the raw material, is cheaper than ethylene.

Moplen, as it is trade-named, comes in two granular forms. One form, with a melt index of 20, is used for extruded film and blown moldings. The other, melt index of six, is for injection molding and extruded shapes. Others are being developed and the raw plastic can be produced to custom specs.

The plastic is highly resistant to chemicals and is insoluble at temperatures under 80 C. It has a gloss like styrene and can be dyed any color, according to Montecatini.

Stretching orients polypropylene and increases its tensile strength. Improvement through cross-linking is also being investigated.

The new plastic was made possible by catalysts developed by Prof. Giulio Natti, of Milan Polytechnic Institute. The catalysts are expected to help create other crystalline thermoplastics. Future polymers of this class are expected to approach steel in tensile strength.

New Method Bonds Plastics

AN ALTERNATIVE to the chemical etch method of making Teflon surfaces bondable has been developed by Hitemp Wires, Inc. The company is presently producing Teflon-insulated wires finished by its new method.

Details of the process are not out. Examination of the wires indicate that the original Teflon coating is supplemented with an overlay of bondable material. The firm is filing patents on a method of bonding any Teflon product.

Teflon's natural slipperiness causes problems when untreated wires and coils are varnished or encapsulated. Good bonds between the plastic and potting compounds or varnishes are hard to attain.

Customary solution is dipping wires in sodium-ammonia bath, which makes Teflon surface bondable. This method, however, affects the surface. If the wire has been color coded, the bath degrades the color also.

Hitemp's process slightly improves the dielectric strength of the wire, does not effect color coding. The new surface is not harmed in any way by normal heating and may be marked by normal methods.

Bond strength tests made by the company in accordance with MIL-W-19583 Specification show large improvements in bond strength over untreated Teflon. Performance equals or slightly exceeds sodium-treated wire.

Treated number 30 and 36 magnet wire broke before it could be pulled free of a potting compound or varnished twist. Untreated wire pulled out. Treated lead wire showed pull-out strength 50 to 500 percent greater than wire that was not treated.

Impregnated coils made with the new bondable wire are usually more homogenous than those made with untreated wire. This reduces hot spots, allowing operation nearer Teflon's temperature limit. The tighter bond lessens moisture creepage along the surface of the wire, the company says.

Recent Export/Import Trends

- Estimated 1957 electronics exports total \$321 million, down \$19 million from record 1956, but industry sees trend up
- Effect on U. S.-Canada trade of "Buy British" mission not yet clear; South America expanding rapidly

By Howard K. Janis—Associate Editor, ELECTRONICS

TREND is towards more export business in electronics in 1958. That's the opinion of executives associated with long-time international operations, who answered questions put to them by ELECTRONICS.

This bright outlook is based generally on the feeling that many overseas markets are expanding rapidly because of recent national economic developments.

South America was mentioned most often as experiencing the greatest rate of growth, but right now Canada is by far the Number 1 customer for most exported electronic products. In one field—computers and data processing equipment (and some think others too)—there's little doubt Europe will be the biggest market for some time to come.

EXPORT SALES IN 1957—Estimated export sales in 1957 were \$321 million, some \$19 million behind the record 1956 total. This estimate and other figures given here are based on tabulation of Department of Commerce commodity-by-commodity foreign trade statistics.

There seemed little chance that the final quarter would see the \$340 million mark of 1956 equaled.

That peak represented a whopping gain of \$63.6 million over the 1955 total. Earlier annual sales abroad are obscured by differences in the government's statistical sampling procedures. However, overall electronic exports more than quadrupled from 1950 through 1953.

Of the 32 commodity categories ELECTRONICS counted in the annual sales, 17 showed increases and 15 showed drops in 1957, according to preliminary estimates.

Biggest losses among the leading commodities dollarwise in 1957 were in "radio and television apparatus," down from \$131,807,474 in 1956 to

\$113,777,859; and in "tv sets and receivers without cabinets," off from the 1956 total of \$20,338,774 to \$16,561,959.

On the plus side, the stars were:

"Recorders, disk, tape and wire, and parts," a healthy climb from \$7,278,715 to \$11,300,202.

"Radio and television broadcast station transmitting equipment," a jump from \$8,081,280 to \$11,875,621.

"Electrical testing equipment," which rose from \$16,272,547 to \$19,688,847.

"Phonographs and parts, coin-operated," showing a gain from \$14,003,687 to \$17,170,147.

"Crystal diodes and transistors," a rise from \$1,171,246 to a new high of \$3,559,134.

DESTINATIONS—Using Department of Commerce figures for 1956, ELECTRONICS calculated the top five destinations for each of the 32 commodities. (See chart for top destinations of ten leading export commodities). The top-five list includes 24 countries, 14 of which purchased more than \$1 million worth of U.S. electronics commodities.

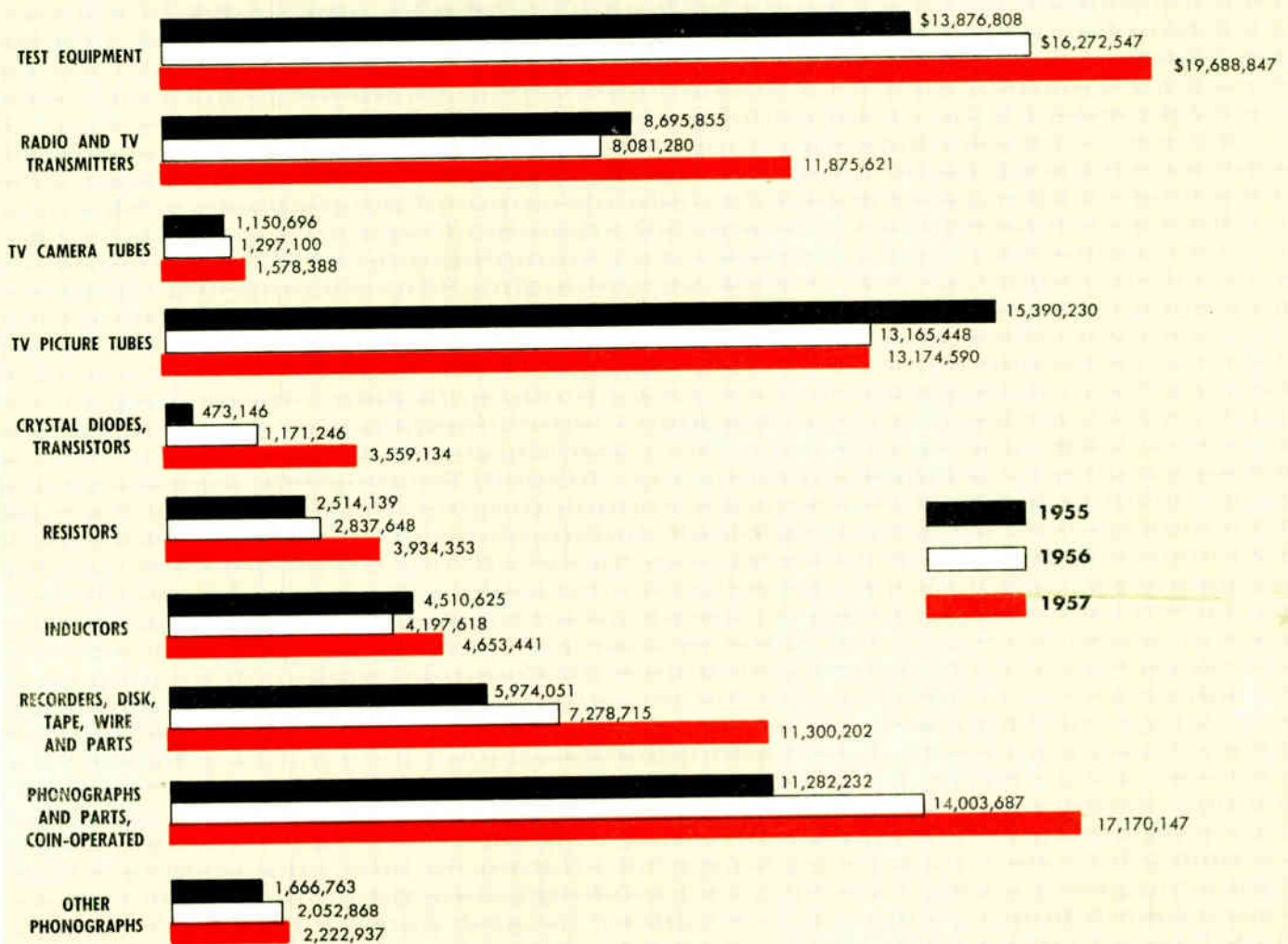
Canada's purchases, excluding classified equipments not revealed in government statistics, added up to \$54,264,251 in 1956.

Many American electronics manufacturers are watching for the results of trade talks between Canada and Britain.

WHAT SELLS BEST—Apart from what the statistics show about leading export items, here are some of the answers given by manufacturers and export houses to the question, "In your estimation what electronic commodities are selling best abroad?"

"Radio, tv and hi-fi components have taken a significant upsurge in sales while f-m communica-

LEADING COMMODITIES SHOWING EXPORT GROWTH IN 1957



tions equipment has also seen a gradual steady rise the past few years.”

Active items of one manufacturer’s line were in “the fields of communications, radars of various types, semiconductors, and special purpose tubes.”

The so-called technical lines (communication equipment of all types, radar, electron tubes, etc.), said one large international operator, “mostly contributed to the increase in U.S. exports of electronic products while exports of consumer goods have remained relatively static.”

Another company mentioned commodities of a specialized nature, and of relatively advanced design. It also specified “commodities that can be shipped in semi-assembled or incomplete form, since these can more readily be imported by countries having protective restrictions.”

The manufacturer who cited radio, tv and hi-fi components attributed these sales to consumer demand abroad, explaining: “Sound entertainment is still the major factor in most countries outside of the United States. Its accepted and continuing popularity accounts for the steady and increasing

sales of this type of equipment.”

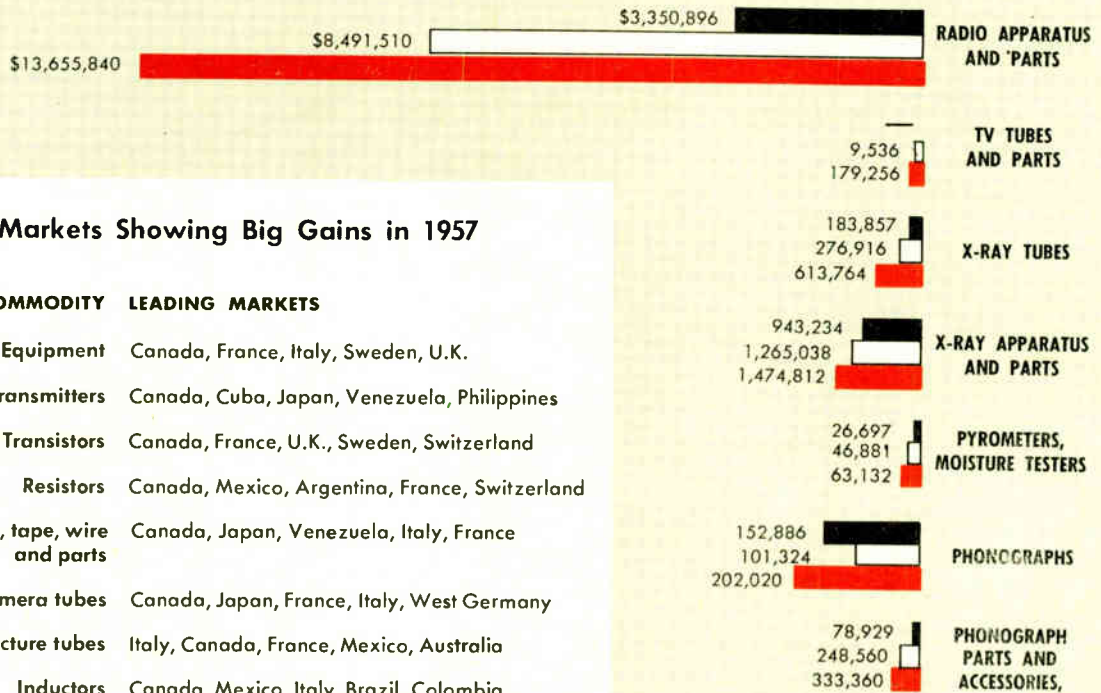
This same company singles out f-m two-way communications equipment declaring: “Two-way radio, and its effective use in maintaining lines of communication with outlying districts, in addition to its intra-urban operation, has been self-promoting; i.e., when once placed in use in a country its use by other communities soon follows.”

The firm which listed communications equipment, radars, semiconductors and special purpose tubes said these were selling best because of “superior performance and reliability.” It adds, “Our prices and terms of payment are often non-competitive.”

Widening applications in all fields for electronic gear and the U.S. edge in these technical lines, said another company, have been responsible for increased export of such equipment. This firm feels foreign consumer demand for goods such as radio and tv sets remains strong.

Another firm says specialized components and test gear are selling best because “more standard components as well as the less expensive test equipment are generally being produced locally or purchased at

LEADING IMPORTED COMMODITIES SHOWING GAINS IN 1957



Export Markets Showing Big Gains in 1957

COMMODITY	LEADING MARKETS
Test Equipment	Canada, France, Italy, Sweden, U.K.
Radio and TV Transmitters	Canada, Cuba, Japan, Venezuela, Philippines
Crystal Diodes and Transistors	Canada, France, U.K., Sweden, Switzerland
Resistors	Canada, Mexico, Argentina, France, Switzerland
Recorders, disk, tape, wire and parts	Canada, Japan, Venezuela, Italy, France
TV camera tubes	Canada, Japan, France, Italy, West Germany
TV picture tubes	Italy, Canada, France, Mexico, Australia
Inductors	Canada, Mexico, Italy, Brazil, Colombia
Phonographs and parts, coin-operated	Belgium, Venezuela, West Germany, Canada, Mexico
Other phonographs	Venezuela, Cuba, Canada, Panama, Mexico

lower prices from European or Japanese sources.”

GROWING MARKETS—In answer to the question, “Which countries offer the most rapidly expanding markets?” **ELECTRONICS** got these replies: “Latin America probably still stands as the high-potential area, experiencing the greatest growth.”

One firm listed Latin America but added: “. . . India, the Philippines and various Far Eastern countries are also showing gratifying expansion. Brazil and Argentina have begun to show greater activity.”

But one big company dissented from the vote for South America. It said: “Europe as well as certain countries in the Middle East and Far East offer the most rapidly expanding markets for electronic products. Exports to these markets from the United States, however, frequently depend on dollar availability and do not always follow local demand.”

A manufacturer that stressed communications gear, radars, special purpose tubes and semiconductors cited “the Scandinavian countries, Japan, Germany, Australia, and a few South American countries.”

OTHER FOREIGN ACTIVITY—Consensus is there’s a trend towards more overseas manufacturing.

Reports one company: “Foreign assembly is generally gaining, preferably from U.S. components; if restrictions do not allow importation of components from the U.S. these are purchased locally or imported from other soft currency countries.”

Joint-venture firms are finding much favor as a type of overseas electronics operation, particularly in Britain. Many observers see this pattern spreading.

U.S. research and development organizations are becoming more common abroad, with Switzerland getting considerable attention for this type of activity. The nature of computers has spurred American firms in this field, especially, to overseas operations rather than export of equipment. This includes manufacture or assembly of machines, r & d and operation of computer centers.

U.S. eminence in computers and the early emphasis on overseas business have placed the foreign subsidiaries of U. S. computermakers in a very favorable market position. All signs point to continued expansion as European industrialists set aside more

funds for computers and automatic operations using computers. Medium-sized computers are said to be especially in demand in Europe.

One U.S. company alone has computer centers in London, Paris, Stuttgart and Brussels, and has announced plans for other centers in Amsterdam, Stockholm, Zurich and Milan.

PATENT LICENSING—American electronics firms may be getting as much as \$25 million a year from patent rights and technical information under both patent-licensing and technical-aid agreements, one expert believes. He adds that this business is still growing at a considerable rate.

Since World War II, says this patent-licensing man, the sale of patent rights and information has accelerated rapidly from virtually nothing. He said some firms consider this “found money”—one of the most profitable aspects of their business. His advice to electronics firms who have not entered this market:

“Sell your information and get darn busy keeping ahead of the other fellow. If you don’t sell it, someone else will. . . Put your money in r & d and a good, strong sales staff and make the other fellow support similar activities.”

CHOOSING A MARKET—ELECTRONICS asked, “What do you believe are the most important factors involved in deciding whether to sell a particular country?” One succinct answer listed two: “first, whether you are going to get paid promptly, and second, can your transactions show a profit.”

An export manager stated his opinion thus: “demand for the commodity, feasibility of arranging payment, and legality of the transaction with particular reference to U.S. export regulations.”

Another company summed it up this way: “. . . whether they want to purchase your product or not. Having sold your item, the rest of the problems can eventually be worked out in one way or another.”

A big international operator listed: dollars available, monetary exchange, import restrictions and regulations, market potential, consumer money in circulation, demand for the product and its present acceptance, and “the stability and philosophy of the government of the country.”

EUROPEAN COMPETITION—In selling electronic products even to a rapidly expanding market such as the Latin American countries, American firms get good, tough competition from long-established European firms.

This stems largely from the trading tactics of some European concerns. In chats with men in international sales, engineering and patent licensing, ELECTRONICS found that the conversation invariably turned to the methods of the Europeans but that

nobody wanted to be quoted. German and Dutch firms were most often mentioned.

European companies, with some measure of government support, were pictured as “cartel-minded,” believing in a “protected market,” and having “different business ethics.” Government support of many big European electronics firms, said one official of a U.S. company, is “frank and complete—it is a subsidy.”

In West Germany a 3 percent “turnover tax” is paid on electronic and most other manufactured goods at the time they are inventoried. But a 100 percent rebate is made on some items exported.

German and other European electronics firms are said to provide seven-year terms of payment to relatively underdeveloped nations. Low down payments and commodity exchanges involving electronics are believed to have occurred too, but to be less common in electronics than in other fields.

“Full line forcing” is another technique said to be used by European firms.

Some European firms, it is said, are slashing their prices drastically to “buy” markets, especially in South America. One official of an export organization declared that this is happening right now, even in some countries where there is a 40 percent levy over and above the regular customs tariffs.

IMPORT PICTURE—Increased U. S. imports of electronics equipment have coincided with expansion of the industry around the world. From a level of \$11.9 million in imports in 1955, the total rose to \$20 million in 1956.

In 1957 a continued rise was indicated, with a preliminary annual rate of \$25 million likely on the basis of Department of Commerce statistics.

Examining some 11 commodity categories, ELECTRONICS found seven were on their way up in 1957 while four were down.

Biggest import category is “radio apparatus and parts” which climbed from \$8,491,510 in 1956 to an estimated \$13,655,840 in 1957. Other big jumps indicated from the previous year were: “Tv tubes and parts”—from \$9,536 to \$179,256; “X-ray tubes”—from \$276,916 to \$513,764.

On the loss side, the biggest decline seemed to be indicated for “photocells and electron tubes”—from \$814,472 in 1956 to \$412,560.

Generally speaking, the increased imports of electronic products are not alarming U.S. industry. Germany, Japan and Holland were mentioned most often by executives as sources of increased imports. Some comments:

“This does not seem to have reached a percentage of the total United States production to be a matter of concern.”

“There would seem,” said another, “to be no readily discernible trend.”

Countermeasures On New Tack

ELECTRONIC COUNTERMEASURES and counter-countermeasures rank high on the list of critical development areas. Until recently the Air Force has relied for defense against hostile radar on barrage jamming. Latest technique is to receive hostile signal with a traveling-wave tube, then rebroadcast the enemy's own signal, usually after first delaying it in some low-loss microwave network. One application: pre-detonating missiles and artillery shells.

- Radar engineers are noodling over problems of how to get a really sharp beam for accurate target location. Oversize dishes just don't go along with modern planes and missiles. One answer may be optical "radar." This would use a high intensity light source and short pulse width. Detection and display of information would be by electronic means similar to that used in radar itself.

- Extreme heat produced by reentry vehicles such as the ICBM is pushing microwave development to higher and higher frequencies. Cloud of ions around white-hot nosecone attenuates commonly used radar and control frequencies. Development is under way on 80 and 100 kilomegacycle systems to get through the ion cloud. Another application: electronic tracking of beacon-equipped artillery shells to their destination.

- Active radar homing for air-to-air missiles may be up for another go-round. Some infrared systems have indicated a tendency to home in unpredictable fashion—even up the mother-plane's tail pipe. Radar sets designed for active homing are now using an extremely long duty cycle to aid in tracking the target. Parallel developments in IR are aimed at developing extremely sharp infrared filters to make target identification even more positive.

- When radio control teams with inertial guidance, the results can be astonishing. Reportedly one navy missile can be dropped into a pickle barrel several hundred miles from the launching site. The missile uses inertial guidance corrected all along the way by control signals from picket ships. In wartime, submarines could handle this end of the detail.

- Analog computers may stage a comeback in the gun-bomb-navigation setup for piloted interceptors and bombers. Right now, the trend is towards transistorized digital computers. But Air Force engineers feel "the possibilities of analog computers in these applications have yet to be completely explored." One reason for renewed interest in analog instruments: some engineers feel they can increase speed of system response.

TECHNICAL DIGEST

- Eutectic alloys of gallium, indium and tin, liquid at room temperature, form excellent vacuum seals for rotating shafts, valves and flanged joints in vacuum systems. The alloy is readily wetted on W, Mo, Ta, pyrex, quartz and certain ceramics by ultrasonic soldering techniques and withstands up to 350C. The alloy has negligible vapor pressure, high surface tension and costs only about 8 cents per inch of seal length, according to University of California Radiation Lab report.

- Oscilloscope tube requiring only 400 v anode voltage, developed by Philips as type DG 7-32, permits appreciable reduction in bulk, weight and cost of cathode-ray oscilloscopes by eliminating need for special high-voltage trans-

former. Two-inch screen is flow-coated over fired-in transparent tin oxide conductive coating, using special willemite phosphor having Mn/Si ratio of about 3.5 to 100 to prevent fall-off in brightness with age of tube.

- Luminous frame surrounding tv screen is most pleasing when between 10 and 20 candles per square meter and between 2 and 3 inches wide for average lighted rooms, according to research by Philips. Current models of U. S. tv sets fall within this range when using light-colored frames that derive their brightness from light reflected from room and screen.

- Ferroelectric capacitors provide voltage-tuning characteristics for r-f amplifier, mixer and local oscillator

of new panoramic receiver developed by University of Michigan, covering 35 mc to 200 mc in 3 bands. Tuning capacitors are sub-miniature titanate ceramic units fitting inside plastic-filled transistor cases. Peak tuning value of 2,000 v gives 100 $\mu\mu\text{f}$ change in capacitance.

- Radiated energy from tv transmitter up to 5 miles away serves as power source for batteryless portable transistor radio developed by Diamond Ordnance Fuze Labs. One antenna, for tv station, charges electrolytic capacitor through diode and tuned circuit to provide 6 v d-c for operating transistor radio having its own antenna. Technique opens way to operation of almost any transistorized electronic devices from radiated energy.

Maser Operates at 2 Degrees K

21-cm waves are amplified by a solid-state maser developed at Harvard University

Further development of the maser is reported by Harvard University. The application of this particular version of the amplifier is for a radio telescope, although future use in radar is a definite possibility.

The three-level solid-state maser operates on 21 cm, the frequency of emission from interstellar hydrogen. The single crystal that is the heart of the device is of potassium cobalticyanide, with an intentionally introduced one-half percent impurity. The crystal is kept at a temperature of 2 K.

Electrons of the impurity in three discrete energy levels are used. Amplification is obtained by shifting electrons between levels.

Usually when an electron falls from a higher level to one below it, it gives off energy at a specific wavelength. When radiation of the same wavelength strikes an electron in the lower level, it drives the electron back up.

Normally, each energy level has fewer electrons than the level be-

low it. When radiation is applied, more electrons are driven upward than downward. However, a competing process known as relaxation tends to return the system to equilibrium, sending the electrons back down. The time it takes for such downward trips to restore equilibrium is known as the relaxation times.

In the Harvard maser, an applied electromagnetic field pumps the electrons continuously from the lowest to the highest of the three energy levels. By keeping the crystal cold, the relaxation time is lengthened. A maximum number of electrons is kept at the highest level.

An incoming impulse of the 21-cm radiation stimulates emission from the top energy level. Its electrons drop to the middle energy level, emitting 21-cm radiation. They give off far more radiation than the incoming trigger signal. The net effect is to amplify greatly the incoming signal.

signed specifically for the set.

Six tetrode-transistor stages of i-f amplification are used to offset the shortcomings of present-day transistors as r-f amplifiers. The i-f section provides a gain of more than 100 db.

Audio amplification is accomplished with conventional power transistors.

The filament of the 90-degree, 14-inch picture tube operates on 12 volts. The 10-kv high voltage is derived from a silicon-diode quadrupler.

Seventeen seconds are required for warmup. Excessive power drawn by some sections of the set are said to be eliminated by what Motorola calls a "scan magnifier." However, the firm is not revealing any details.

Pickup Aids Heart Study

HEART-SOUND pickup is hearing heart murmurs inaudible to conventional recording instruments. It detects chest wall movements as small as one-half billionth of an inch.

The capacitive-type transducer was originally designed to measure automotive engine pressure. The highly sensitive instrument can detect faint heart murmurs that may reveal the presence of defects in the heart's valves at an earlier stage than was possible before.

It was developed cooperatively by Dale Groom, M. D., assistant professor of medicine at the Medical College of South Carolina, and Yro T. Sihvonan of General Motors Research Staff. The new device is now being applied in heart research carried on in a soundproof room at the Medical College Hospital, Charleston, S. C.

The instrument differs from microphone-type pickups commonly used in phonocardiography (the recording of heart sounds) that depend on acoustical transmission of sound through an enclosed column or pathway of air. It converts chest wall vibrations directly into electrical signals.

These faint signals are amplified and reproduced on an oscilloscope

All-Transistor Tv Is Announced

TWO 12-volt nickel-cadmium batteries are used to power a completely portable tv set. The receiver has been designed by Motorola, and economic factors are said to be the only deterrent to production.

The 31-transistor set consumes 10 watts, giving a battery life of 6 hours. Batteries are said to withstand 2,000 recharges for about 12,000 hours of life.

It weighs 32 pounds with batteries, and a charger weighs 8 to 10 pounds. The set can also be operated directly from an automobile cigaret lighter.

The antenna is a quarter-wave whip type balanced into twin 300-ohm line, which is the input to the tuner. The tuner is conventional except that tetrode transistors are used.

Major problem in the design was

getting suitable transistors. Although some had been used in other products, a number had to be de-



Completely portable all-transistor tv set uses rechargeable nickel-cadmium batteries

where they can be photographed or recorded on tape.

Sensitivity of the new instrument is such that, when used in a special

soundproof room to exclude extraneous noise, many normal murmurs and sounds arising from the flow of blood through the heart and large

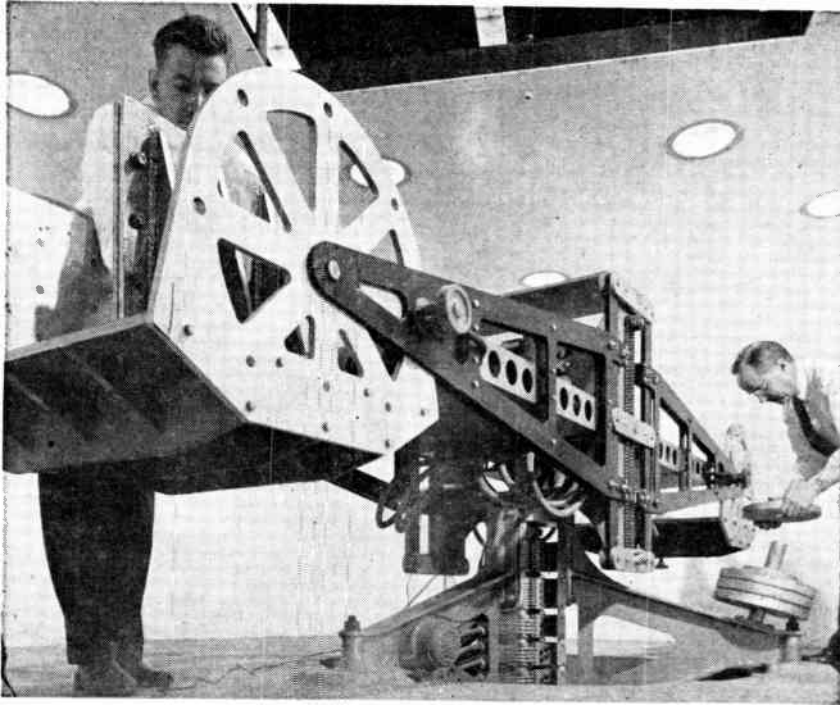
blood vessels are heard. These are not audible on ordinary stethoscopic examination.

Also, fetal heart sounds—produced by a baby before birth—can be picked up and recorded at an earlier stage of development than has been possible before.

A unique application of this type of pickup is that of recording sounds directly from the heart itself while exposed during surgery. Sounds are said to be picked up without actually touching the exposed heart, and these sounds bear a striking resemblance to those ordinarily recorded from the outer chest wall. By this method it may be possible for researchers to learn more of the origin of some of the heart sounds heard outside the chest wall.

The capacitance principle uses the variation that occurs in electrical capacitance between two charged conductors as the relative distance between them is changed. With the heart sound pickup, the skin on the patient's chest can serve as one electrode. Or a suitable diaphragm may be used, applied directly to the skin. The other electrode is suspended a fraction of an inch above the skin surface, inside the pickup, and is connected by cable to the amplifier.

Missile Parts Ride Merry-Go-Round



Carnival-like apparatus is centrifuge which whirls missile parts at gravitational forces up to 100 g's. Three-hundred pounds of electronic gear can be supported at each end of the GE machine.

MEETINGS AHEAD

Jan. 20, 27; Feb. 3, 10, 17, 24:

Lecture Series on Modern Communications, AIEE, IRE, Univ. of Penn., Philadelphia, Pa. Contact: Mr. S. Sharp, Franklin Inst., Phila., Pa.

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

Jan. 27: Four Corners District of A.S.T.M., technical sessions planned for New Mexico, Arizona, Utah and Colorado. Contact: J. L. Abbott, 1902 Richmond N. E., Albuquerque, New Mexico.

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

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

Feb. 14-15: Cleveland Electronics Conference, Fifth Annual, IRE, AIEE, ISA, CPS, Masonic Auditorium, Cleveland, Ohio.

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

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

Mar. 18-19: Conf. on Extremely High Temperatures, AF-CRC, Air Force Cambridge Research Center, L. G. Hanscom Field, Bedford, Mass.

Unification: Better For Us?

Here are pros and cons on what more unifying of armed forces may mean to electronics industry

TIGHTER COORDINATION among the armed services will undoubtedly be one outcome of the 85th Congress. Accordingly, ELECTRONICS has just completed a survey to find out what such unification may mean to our industry.

Interest in the subject is high. Although no one wanted to be indentified, everyone was willing to talk.

The principal advantages and disadvantages of more coordination, industry leaders say, are the following:

Pros: State of the art will progress faster. Inter-service "security" restrictions will disappear enabling better dissemination of information. With no duplication of effort, more projects can proceed simultaneously. Faster action in signing and com-

pleting contracts can result due to consolidation of funds and to lack of competition.

Also, centralized procurement facilities will eliminate much of the now existing red tape. Contact personnel might be reduced, since a man at every depot will no longer be needed.

One company sees this factor providing relief in the manpower search. "Such relief in this area could free some of our sales personnel to strengthen other departments in our company—such as tech reps," says an executive.

Cons: Benefits of competition derived from duplication of effort will be lost. This might affect the speed of completion as well as the quality of the project.

Too, natural formation of a secondary source will be eliminated. And although the government would still be able to create secondary sources as it sometimes does now, there is still the fear that satisfaction with a good producer might lead to complacency.

MILITARY ELECTRONICS

• Electronic gun tester, developed by Westinghouse under BuAer contract, will enable a Navy fighter plane to check the accuracy of its guns in a few minutes without firing them. Built into the plane as an integral part of its electronic gun-aiming system, the equipment weighs 15 lbs.

• Second successful test firing of the ICBM Atlas on Jan. 10—hot on the heels of its first successful firing 24 days before—brings production day one step closer.

• Production of a photo reconnaissance system pod for the B-58 "Hustler" will begin at Fairchild Camera and Instrument under letter contract from Convair.

Closed circuit tv in the nose of the 65 cu ft pod enables operator to view terrain and select photo targets.

• Tape recording machine, developed by Ampex for ICBM Atlas, survived a free-ejection drop

into the ocean from an altitude of 12,000 feet.

Called the MR-100, the recorder can be used in other airborne and ground applications characterized by severe conditions of temperature, vibration and shock. Miniaturized electronic components for both recording and reproducing are housed separately from the tape transport mechanism. The recorder's two channels provide a total of eight minutes recording time at a tape speed of 60 in/sec. with a frequency response up to 70,000 cps.

• Another rugged survivor is a Sperry-developed precision klystron oscillator used in "a critical guidance and data system built for several missiles." The oscillator was subjected to a mid-air explosion and a 1½-mi free-fall impact against the sea. Dredged from the ocean floor and returned to the lab, it proved to be precise within 0.01 percent of its "ideal" operating frequency.

CONTRACTS AWARDED

Grumman and Hazeltine will share a \$46 million contract with BuAer for design, development and production of the WF-2 Tracer, carrier-based early warning patrol plane. Grumman as prime contractor will produce the aircraft while Hazeltine as subcontractor is responsible for the large circular, fixed radome containing electronic detection equipment carried on top of the plane. Tracer's mission is presumed to be detection of enemy airborne vehicles.

Westinghouse gets \$46,050,000 contract with BuShips for reactor compartment components in the projected nuclear powered aircraft carrier. Items will include instrumentation, controls, valves and pumps.

Kearfott will provide AMC with tech rep services for a central gyro reference system used for service testing and comparison

with all altitude fighter-type heading equipment. Contract totals \$106,058.

Landers, Prary and Clark, New Britain, Conn., sells radiosonde receptor, AN AMR-3, to AMC under \$155,806 contract for use with WB-66 aircraft.

Federal Television Corp. sells 205 modulators, MD-141A GR, and 38 receivers, R-361A GR, to Rome Air Force Depot under \$120,606 contract.

Admiral gets \$334,558 contract with BuAer for ARW electronic equipment.

Sperry will provide BuAer with automatic pilot and spare components under \$131,399 contract

Convair is awarded \$2,531,000 contract with USAF for modification of fire control systems in 131 F-102A jet interceptors. The F-102A, in service with Air Defense Command, is equipped with the Hughes MG-10 fire control system and fires either the Falcon GAR-1 or GAR-2 guided missiles.

Westinghouse gets \$1,442,902 contract with BuAer for test equipment for armament control systems.

Webeor wins \$1,268,871 contract with BuAer for ARA-25 electronic equipment.

GE is awarded \$1,118,084 contract with Los Angeles Army Ordnance District for digital computation facility operations.

Lockheed gets \$100 million contract with USAF for quantity production of Hercules long-range combat transport, C-130B. Production will last through 1960.

Western Electric gets new R&D contract with N. Y. Ordnance District for Nike-Zeus totaling \$27,964,000.

Collins gets \$3,302,947 contract with CAA for 15 radar microwave terminal pairs, 50 radar microwave link repeaters, beacon control backup equipment and test equipment for the terminal pairs.



HONEST JOHN artillery rocket depends on G-E electric heating blanket (inset) to bring missile to uniform operating temperature before launching:

HONEST JOHN FIRING SHOWS HOW . . .

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Successful launch—and flight—of the Honest John depends upon exact propellant temperature at the moment of firing. A General Electric heating and insulating blanket—which shrouds missile from nose to nozzle—provides and maintains that temperature!

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Progress Is Our Most Important Product

GENERAL  ELECTRIC

Diamond Output To Leap

Home-made ones—3.5 million carats a year—
due from a single plant by late '58. Even so, sales
of ultrasonic grinders are seen holding up

MAN-MADE diamonds will be coming from GE's pilot plant in Detroit at the rate of 3.5 million carats a year by the end of 1958.

GE is making the abrasive sizes used in grinding wheels and lapping compounds. They perform as well as natural diamonds on resinoid and vitrified wheels, but have not been fully studied in metal-bonded wheels used for crystal cutting.

The opening price, \$4.25 a carat, is higher than natural diamonds. The diamond syndicate charges \$2.85, open market price is around \$4, and reclaimed abrasive suitable for wheels is \$2.80 a carat.

The new source, one grinding wheel maker says, will make him breathe easier about supply. But he doesn't expect any reduction in wheel costs unless diamond prices fall. GE says it has a cost reduction program underway.

The announcement aroused speculation whether cheaper wheels will



Diamond makers report success. R&D efforts date as far back as 1797

about the growing market for ultrasonic impact grinders, now selling under \$1.5 million a year. Even at pennies a carat, diamonds would be relatively expensive. There seems to be a place for both methods.

Three Firms Drop Prices

AT START of the new year two firms made capacitor price cuts and one lowered transistor prices.

P. R. Mallory reduced prices from 11 to 47 percent on its complete line of tantalum high temperature capacitors. Subminiature types, TNT and STNT, were reduced 47 and 45.5 percent, respectively; miniature type XTM, 11 to 28 percent; military types XII and XIII, from 14 to 28 percent and from 22 to 28 percent, respectively; and solid electrolyte, new type TAS, 26 to 27 percent.

Sprague Electric reduced prices by 25 percent on its solid-electrolyte tantalum electrolytic capacitors, type 150D. Since their introduction in March 1956 the price

of these miniature size capacitors has been reduced nearly two-thirds. Further price reductions may be forthcoming before the end of 1958.

Philco dropped prices as much as 35 percent on many types of transistors. Included in these price reductions were the surface barrier, medium power alloy junction and high power alloy junction transistors. In large quantity lots, price of Philco's micro alloy transistor was reduced from \$8.35 to \$6.25.

Growing sales volume and more efficient production techniques figured in both the capacitor and transistor price cuts. Philco foresees new transistor applications growing out its price reductions.

Printer Narrows Speed Gap

New printing device unveiled a short time ago has computer users buzzing with interest. The S-C 5000 high-speed printer was jointly developed by General Dynamics' Stromberg-Carlson division and the Haloid Company, sells for about \$150,000. It translates computer data electronically, prints xerographically—and quietly—at 4,680 lines a minute.

The S-C 5000 fits online, receiving computer output directly, or off-line using magnetic or paper tape. The printed result, which resembles teletypewriter copy, flows at about 65 ft a minute.

The printer uses a Stromberg-Carlson Characteron tube to translate computer information into a visual display. The Characteron is a shaped-beam CRT; a tiny 8 by 8 matrix inside the tube contains the alphabet, 10 numerals, and 28 symbols of the user's choice. The electron beam is deflected through the matrix, then focussed on the tube face. The seven-inch tube can show one million characters a minute.

Xerographic printing technique in the S-C 5000 was developed by Haloid. A prism transfers the character image to a selenium-coated drum which changes light energy into electrostatic charge. Pigmented powder that sticks to the charged area is then dusted over the drum. The drum can print directly on paper rolls, sheets, or any paper stock including vellum. Offset masters can be made if large numbers of reprints are needed. One drum lasts for about 700,000 ft of printing, costs \$295 to replace. Powder and paper are the only other expendables.

Stromberg-Carlson and Haloid expect most applications will use S-C 5000 off-line. On-line users may be scientists and engineers for whom it can supply answers in readable form by plotting curves and labeling them at the same time.

In addition to graph-plotting at 65 ft a minute, the S-C 5000 can also produce magazine mailing labels at the rate of 150,000 an hour, and bank statements at 3,000 12-inch forms an hour.

CD: \$6.7 Million

Federal civil defense buying in fiscal '57 stressed radiation detection, communications gear

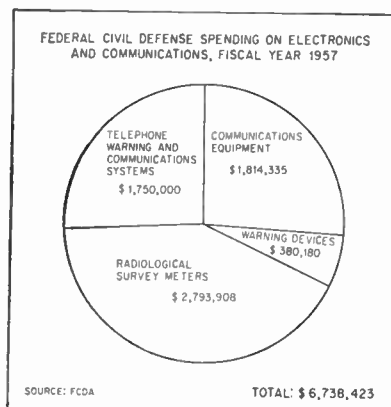
FEDERAL CIVIL DEFENSE Administration spent approximately \$6.7 million for electronic equipment and communications services during fiscal 1957, according to the latest accounting from FCDA headquarters in Battle Creek, Mich.

The biggest single item in the electronics budget was \$3,898,967 for radiation detection instruments. The bulk of this, \$2,793,908, went for Geiger counters and other survey meters.

FCDA bought 35,000 GM survey meters, \$815,000; 69,000 medium range survey meters, \$1,208,000; 36,000 high range meters, \$734,000; and 200 fixed station remote reading instruments, \$38,000.

Communications equipment purchases under the matching funds program (FCDA pays half the cost and state and local governments pay half) accounted for \$1,704,404. This was mostly mobile, base station and portable radio equipment and monitors.

About 90 percent of the radio gear is being used by local public safety departments. The remaining 10 percent supplies Radio Amateurs Communications Services (RACES) and other special services.



In addition, FDCA spent \$84,931 on replacement and maintenance of equipment purchased on the 50-50 plan and about \$25,000 for replacement and maintenance of FCDA's own equipment.

Warning devices bought under matching funds took \$293,953 and their maintenance, \$86,227. Not all of this is electronic, but the total includes electronically operated sirens and public address systems.

Some 28,000 miles of telephone lines are leased annually at a cost of \$1,750,000 for the national attack warning and communications systems.

Ferrite Cores Gain Momentum

IN FIVE YEARS, better than 50 percent of telephone inductors will be ferrite pot cores, and pot cores will also be ahead in other suitable applications which now use toroids and metal or metal powder cores.

Pot cores predominate in new telephone designs and are coming into wider use in telemetering, multiplexing and other filter-requiring systems.

Some coil manufacturers have already made the switch. Others, however, will stick to toroids because of heavy investment in toroid winding machines. Pot core coils are wound on bobbins.

These predictions are made by spokesmen of Ferroxcube Corp. of America. The occasion: introduction of a line of preadjusted ferrite pot cores, by which the company hopes to accelerate the trend.

Pot cores, shaped like half-rings placed together, surround the coil with a flux path.

Two ways of adjusting the air gap are trial and error grinding of a center post or by moving a ferrite slug in the posts. Grinding, with diamond tools, is too expensive.

The slugs, however, require insertion, adjustment and sealing in place. Ferroxcube's preadjusted cores are ground in production to effective permeability tolerances as low as one percent.

Radio Telescope To Hear Space Sounds

THE UNIVERSITY OF MICHIGAN, at a cost of over \$300,000, plans to construct by next June a giant radio telescope that will have the double duty of following the sun by day and spending its nights picking up, from outer space radio waves that are only a few centimeters long.

With a "dish" shaped reflector 85 ft in diameter and standing 100 ft high, the unit will hear solar signals, faint whispers from the moon, planets, galaxies millions of light years away, turbulent gas clouds, "radio stars", and other sources, some possibly beyond the range of the best optical telescope.

These signals are produced by the interaction of electrons with atomic particles or magnetic fields, and yield data about the regions in which they originate.

Though not the largest, the U. of M. instrument will work at wave lengths five to 10 times shorter than the 250-foot "dish" in England. It will have three times the collecting area of any in its class. A combination of declination and hour-angle gears will permit it to follow a sunspot or solar flare region all day, or to execute elaborate scanning operations.

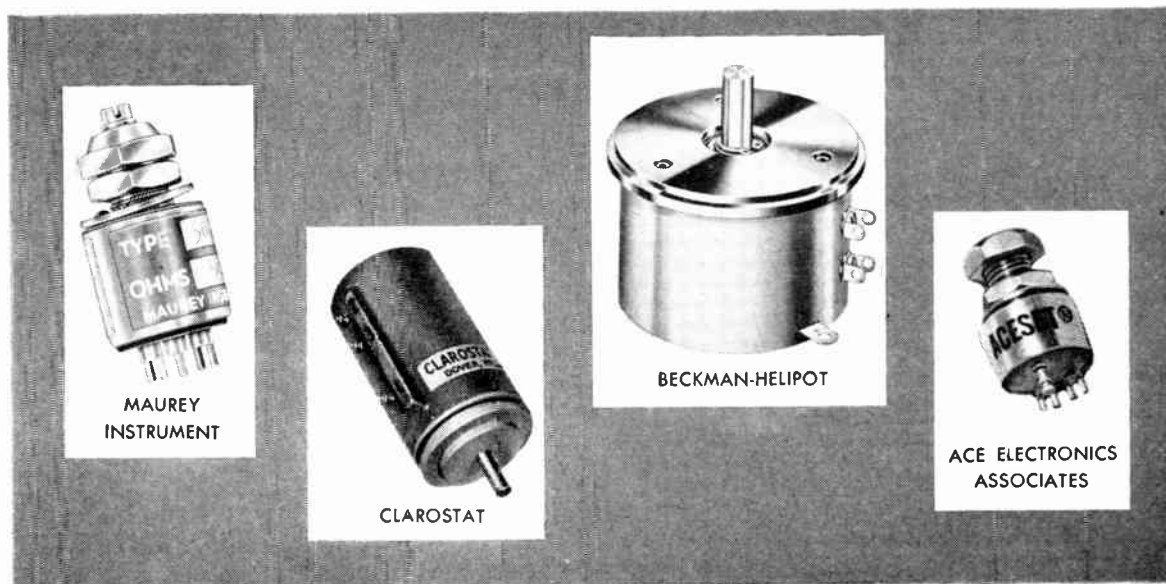
The device will require 160 tons

of steel and aluminum (the "dish" is made entirely from aluminum), 50 tons of lead counter-weights, and 250 cubic yards of concrete foundation.

Most of the \$300,000 cost was supplied by the Office of Naval Research, and the instrument will be erected on Peach Mountain, 16 miles from Ann Arbor.

The contractor for fabrication and erection, Blaw-Knox, is building a similar instrument for Associated Universities, Inc., a group of nine Eastern colleges, at Green Bank, W. Va. The completion date for this project is also June.

Potentiometer Demand Grows



Stability Stands Out

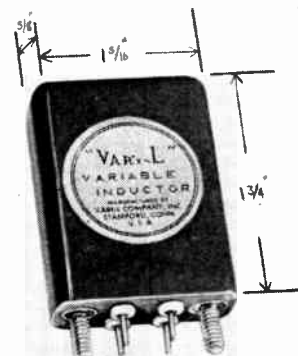
DEMAND continues to grow for potentiometers that will withstand the most severe environmental conditions. Manufacturers are setting a high-water mark in the production of these components.

Ace Electronics Associates, Inc., 99 Dover St., Somerville, Mass., (40) has introduced a new line of microminiature precision wirewound potentiometers which reportedly offer greater stability under the temperature cycling than other types of comparable size, and will dissipate 2 w at 60 C. These Accsets are available for immediate delivery in nine different resistance values between 100 and 25,000 ohms.

Latest development of Beckman-Helipot Corp., Newport Beach, Calif., (41) is the model 9303 high precision, three-turn pot for servo mounting. Unit is $1\frac{1}{8}$ in. in diameter and weighs 3.75 oz. The pot is said to have exceptional stability, with standard independent linearity of ± 0.25 percent, and minimum noise characteristics.

Clarostat Mfg. Co., Inc., Dover, N. H., (42) announces the series 55, a $\frac{5}{8}$ in. diameter multiturn precision potentiometer providing up to 20 percent more winding length in a given 10-turn outside diameter. Rated at 3 w, it is available in several resistance values up to 100,000 ohms. Minimum runout and end resistance, maximum stability, resolution and reliability are featured.

A new wire-wound trimmer pot is offered by Maurey Instrument Corp., 7924 So. Exchange Ave., Chicago 17, Ill. (43). It will dissipate $\frac{1}{2}$ w at an ambient temperature of 150 C and derated at 250 C. Model 50-M14 is housed in a stainless steel case $\frac{1}{2}$ in. in diameter, $\frac{1}{2}$ in. long. The ceramic cover, terminals and winding have been encapsulated in a high temperature cement which serves to protect the assembly under most severe vibration and shock conditions, as well as providing a vapor seal at the terminal end.



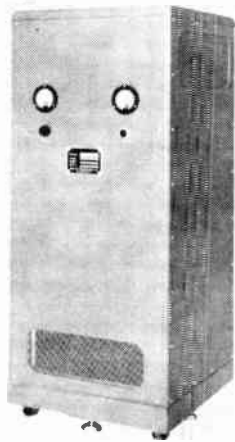
Inductors new miniature units

VARI-L CO., INC., 432 Fairfield Ave., Stamford, Conn. A new group of miniature units, designated the MF series, has been added to the Vari-L line of electrically variable inductors. These incorporate new developments in ferrite core materials and have wider range, higher sensitivity, and higher Q than any types heretofore available. They are potted in silicone rubber and are hermetically sealed.

Permanent magnet bias is employed, using ceramic magnets which have been stabilized to such a degree that damage by external fields is virtually impossible. Types

For more information use READER SERVICE CARD

are being produced for frequencies from 1 mc to 200 mc, and the higher frequency types have been employed in conjunction with conventional tank circuits at frequencies up to 400 mc. **Circle 44 on Reader Service Card.**



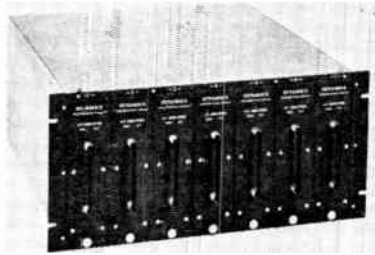
Power Supply transistorized unit

PACKARD - BELL ELECTRONICS, 12333 West Olympic Blvd., Los Angeles 64, Calif. This new transistorized Magamp power supply provides a fast response time to load changes, a greatly reduced overshoot and undershoot of regulated voltages, and remote regulation at long distances.

It delivers a 27 v to 42 v output at 0 to 300 amperes, regulated at the load, which can be located up to several hundred feet away. Surge capacity is 400 percent overload for 2 seconds. Regulation across the load is 1 percent or better. Recovery time is less than 50 millisecc from initial load change to regulated voltage setting. Overshoot and undershoot are less than 25 percent, with a 30 percent change in load. Ripple is 1 percent of output voltage from no load to full load.

The new power supply can be used for ground handling and bench testing of aircraft; motor vehicle testing; any kind of remote installation where this type of power is required; small airfields and aircraft carriers.

It is packaged in a 22 in. by 22 in. by 4 ft aluminum cabinet. **Circle 45 on Reader Service Card.**



Preamplifier a 7-channel system

DYNAMICS INSTRUMENTATION CO., 1118 Mission St., South Pasadena, Calif. The a-c voltage amplifier system, model 1060, is a 7-channel preamplifier for piezoelectric transducers. Some of its features are: 100 megohm input impedance, 0.4 cps to 200,000 cps bandwidth, 1.00 and 10.0 voltage gains (remotely controlled), and full output into 6,000 $\mu\mu\text{f}$ of cable capacitance up to 70 kc. Shock-mounted subminiature tubes are used to obtain high input impedance, and silicon transistors are used to provide high output current capability.

The system is designed to minimize ground loop problems since each amplifier has its own isolated power supply with doubly-shielded transformer. All amplifiers are insulated from the cabinet. The instrument is ruggedly constructed for severe environments. **Circle 46 on Reader Service Card.**



Microwave Regulator for use with a twt

D. C. BROCKER LABORATORIES, P. O. Box 967, Sunnyvale, Calif. Model 301 microwave regulator is designed primarily for use with a traveling wave tube and for the twt manufacturer. It is the con-

necting link for a 1 kc square wave modulated constant power source. The device itself operates at an audio frequency, hence is completely independent of microwave power and frequency. **Circle 47 on Reader Service Card.**



Xenon Thyratron for high-peak currents

RADIO CORP. OF AMERICA, Harrison, N. J. A new three-electrode, forced-air cooled xenon thyratron, designed primarily for use in applications in which high peak currents are required, such as welding and x-ray tube operation, has been introduced.

The RCA-7086 can also be used for grid-controlled rectifier or inverter service. It has a negative-control characteristic, high commutation factor, and relatively short deionization time. Capable of withstanding a maximum peak forward and inverse voltage of 650 v, the thyratron can deliver a maximum peak anode current of 400 amperes in intermittent service, or 160 amperes in continuous service. In a single-phase inverse-parallel circuit, two 7086's can control a maximum peak a-c output of 130 kva in intermittent service or 40 kva in continuous service.

The negative-control characteristic is essentially independent of ambient temperatures over the wide range from -55 to $+75$ C by virtue of the xenon gas content.

Design features of the tube include use of a copper grid having high heat conductivity to provide



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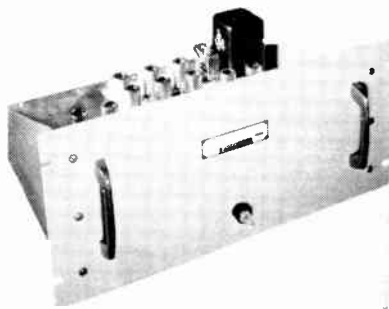
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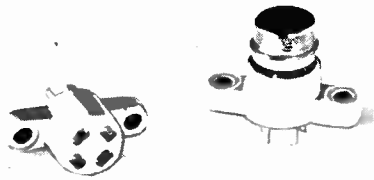
cool operation of the grid and resultant reduced grid emission; a large cup-shaped anode with a copper face to provide uniform heat distribution over the faced area, and heavy copper filament leads and terminals. Circle 48 on Reader Service Card.



Multicopler for telemetry antenna

RADIATION, INC., P. O. Box 37, Melbourne, Fla. Model 1104 multicopler provides a means for connecting as many as nine telemetry receivers into a single antenna output. (By cascading two couplers, 17 outputs are provided.) It was designed for and used in the TLM-18 telemetry antenna which automatically tracks missiles along the 5,000-mile AF missile test range.

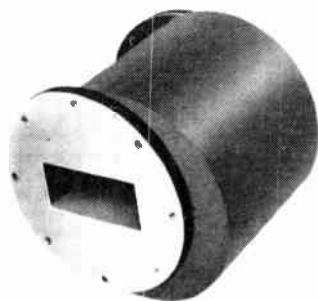
Frequency is 216-255 mc; bandwidth, 30 mc; isolation, 55-85 db; and gain, 2 db nominal. Circle 49 on Reader Service Card.



Socket for transistors

GRAYHILL, INC., 561 Hillgrove Ave., La Grange, Ill., has designed a socket for use with 3 and 4 pin Jetec 30 transistors. The socket body is moulded from mica-filled phenolic per MIL-M-14, type MFE.

The beryllium copper contacts are wrap-around style, silver plated and gold flashed for good contact and corrosion resistance. Contact numbers, moulded into the rear of the socket, make identification very easy. Key mark is moulded into the top of the socket for line-up with transistor case tab. Either rivets or No. 2 screws can be used for mounting. Circle 50 on Reader Service Card.



Ferrite Isolator for C-band use

AIRTRON, INC., 1101 West Elizabeth Ave., Linden, N. J., offers a new C-band 350-kw ferrite isolator presenting constant isolation over the frequency band, thereby eliminating the need for correction of "long line" effects by frequent mechanical adjustment of a phase shifter.

The C-band ferrite isolators are designed to cover a frequency range of 5,400 to 5,650 mc and 5,400 to 5,900 mc respectively in miniature design for applications where size and weight are critical. This makes retrofitting in existing systems possible, and enables new systems to utilize these isolators in the original design.

Maximum insertion loss is 0.5 db. A maximum vswr of 1.15 with matched load, and a minimum isolation of 15 db is provided in the 5,400 to 5,650 mc range, whereas the 5,400 to 5,900 mc range provides a maximum vswr of 1.10 with matched load and a minimum isolation of 10 db. These ferrite isolators will withstand repeated temperature cyclings from -55 C to 100 C.

Design of the unit protects the oscillator tube, preventing burnout

and local oscillator radiation, thus increasing magnetron efficiency and greatly improving the overall reliability and economy of the system. Circle 51 on Reader Service Card.



Rotary Switches for computers

UNISON PRODUCTS CO., Route 46 & 6th St., Saddle Brook, N. J., has announced a new line of precision rotary switches for computers. Design parameters, such as number of segments, case size and mounting dimensions can be varied to suit the need of the purchaser.

The unit pictured incorporates 60 separate circuits of 6 deg on and 6 deg off; one separate circuit of 354 deg on and 6 deg off. Two slip rings supply the input voltage. It meets environmental specification MIL-E-5400. Overall size is 1.812 in. diameter by 2 1/4 in. long. For further information write on your company letterhead.

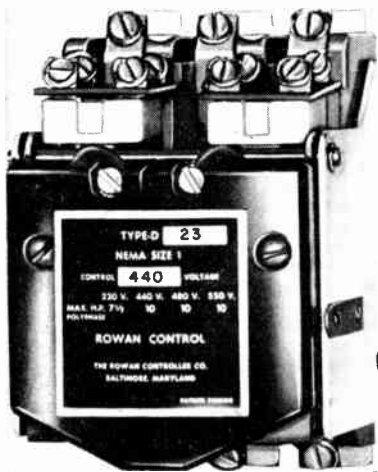


Power Transistors in matched pairs

BENDIX AVIATION CORP., Red Bank Division, 201 Westwood Ave., Long Branch, N. J. Two new power transistors are supplied in matched pairs for low distortion in audio and servo push-pull power

amplifier applications.

The 2N399 and 2N401 can readily dissipate up to 25 w. Typical class B undistorted output power for both types is 8 w. The 2N399 is a high gain transistor and the 2N401 is a medium gain power output unit. Both feature welded construction with a vacuum tight seal to insure long life and stable operation. Circle 52 on Reader Service Card.



Magnetic Contactors for motor controls

ROWAN CONTROLLER Co., 2315 Homewood Ave., Baltimore 18, Md., has introduced an a-c magnetic contactor called type D, which is available in sizes 0 through 5.

This contactor allows much faster inspection by making all parts readily accessible. All moving and stationary contact surfaces are fully exposed by simply snapping open the contact cover. Coils can be changed quickly by merely disconnecting the coil leads from the terminals and depressing from the holder.

To assure longer contact life, the new design employs an exclusive deceleration arm that reduces bounce.

Because the new contactors contain only a single moving part which rotates only 22½ deg, longer mechanical life is assured. There are no links, pivots or sliding members to cause mechanical failure.

For greater safety, the new de-

sign permits the armature to be locked in the open position thus showing that the circuit is open. Circle 53 on Reader Service Card.

Motor two-speed, reversible

THE HOLTZER-CABOT MOTOR DIV., National Pneumatic Co., Inc., 125 Amory St., Boston, Mass., has introduced a new 2-speed reversible subfractional hp motor, available with basic speeds of 1,800 rpm to 3,600 rpm. This new motor RBC-2514, is being built into the standard Holtzer-Cabot R-25 frame series and is available with standard gear reductions from 3/1 to 3,600/1.

Basic torque ratings are 115 v, 60 cps, 3,600 rpm synchronous range from 0.15 to 0.5 oz-in., with induction ratings approximately 100 percent higher. All ratings are for continuous duty with higher ratings available for intermittent duty applications. Circle 54 on Reader Service Card.



Magnetic Cartridges moderately priced

GENERAL ELECTRIC Co., W. Genesee St., Auburn, N. Y., announces the VR-II series, a new line of seven moderate-price magnetic variable reluctance cartridges with frequency response from 20 through 20,000 cycles at four-gram tracking pressure. They have 33 percent less tracking pressure and 40 percent greater compliance than GE's RPX types.

Composed with RPX types, the VR-II series have a narrower body with a 27-percent weight reduction, and a 10 percent lighter stylus. They also incorporate a new elec-

trostatic shield. This grounded shield is designed to eliminate electrostatic hum.

The narrower body of the VR-II series enables them to fit in slim tone arms. Circle 55 on Reader Service Card.



Plug-in Circuits in four standard series

DAYTON ELECTRONIC PRODUCTS Co., 320 Vermont Ave., Dayton 4, Ohio, has announced a line of plug-in electronic circuits in four standard series.

The NBS series comprises circuits recommended for use in Navy electronic equipment by the NBS. The instrument series includes gate circuits, multivibrators, d-c amplifiers and other instrument circuits with high degree of precision. The transistor series features miniaturized plug-in modules in a variety of circuit applications. The general purpose series includes a wide variety of voltage and power amplifiers plus control, regulating and computing circuits.

All new plug-in units are designed on a basic size module to simplify physical design problems. Square, rather than round physical shape provides better utilization of space, plus more efficient dissipation of heat.

Individual specification sheets on each plug-in are available giving application and descriptive data,

plus schematic and full specifications.

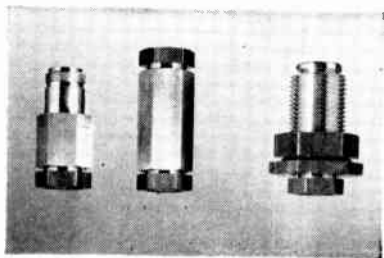
The DEPCO plug-in circuits have been designed for production and lab applications. Circle 56 on Reader Service Card.

Silicon Rectifiers diffused type

MOTOROLA INC., 4545 W. Augusta Blvd., Chicago 51, Ill. The M14 diffused silicon rectifier series is available in peak inverse ratings of 100 through 600 v with average forward currents of 500 ma. It is also available with the case common to either cathode or anode to provide maximum flexibility in application.

The diffusion process and the precise manufacturing techniques used result in extremely uniform forward characteristics over wide temperature ranges. This eliminates the need for expensive matching of rectifiers in many applications.

A unique single-ended package allows the user to employ automatic assembly techniques as well as the usual methods of installation in working with these devices. Circle 57 on Reader Service Card.



Connectors are pressurized

KINGS ELECTRONICS CO., 40 Marbledale Road, Tuckahoe, N. Y., announces a complete new line of connectors for Foamflex and Styroflex cables, manufactured by Phelps Dodge Copper Products Corp. Pictured are some of the connectors in this series. Complete adapters from Foamflex to RG-8A/U, including feed-through and bulkhead are available. All connectors are pressurized. Circle 58 on Reader Service Card.

New Literature of the Week

MATERIALS

Acid Gold Plating Process. Sel-Rex Corp., Nutley 10, N. J. A technical paper describes the new acid-type gold plating process, bath preparation and control, equipment needed and other topics of interest to printed circuit manufacturers. Circle 59 on Reader Service Card.

P-C Etching Process. Becco Chemical Div., Food Machinery and Chemical Corp., Station B, Buffalo 7, N. Y. A new process for etching printed circuits with a solution of ammonium persulfate instead of ferric chloride is described in bulletin No. 90. Circle 60 on Reader Service Card.

COMPONENTS

Clutches and Brakes. Auto-tronics, Inc., Route 1, Box 812, Florissant, Mo. A new 28-page illustrated catalog covers a complete line of miniature and sub-miniature electromagnetic clutches and brakes. Circle 61 on Reader Service Card.

Microwave Relay Components. Airtron, Inc., 1096 W. Elizabeth Ave., Linden, N. J., has available a brochure on WR-137 waveguide components from the transmitter receiver to the antenna, complete with a form covering special packaging to government and commercial specs. Circle 62 on Reader Service Card.

Potentiometers and Resistors. Clarostat Mfg. Co., Inc., Dover, N. H. A detailed, informative technical data file on precision potentiometers and resistors is now available. The file may be obtained by qualified engineers writing for it on their company letterhead.

Synchronous Motor. Cramer Controls Corp., Centerbrook, Conn., has published a bulletin giving technical, operational, and design data on the series 117 p-m

synchronous motor. Circle 63 on Reader Service Card.

Wire and Cable. Plastoid Corp., 42-61 24th St., L. I. C., N. Y. A 30-page catalog covers a line of coax cables, community tv cables, aircraft wire and hook-up wire. Circle 64 on Reader Service Card.

EQUIPMENT

Common Language Data-Processing. Remington Rand Div., of Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y. New advances in common language data-processing are shown in a six-page brochure. Easy-to-read diagrams show use of the equipment with wire transmission facilities. Circle 65 on Reader Service Card.

Frequency Measuring System. Beckman/Berkeley, 2200 Wright Ave., Richmond 3, Calif. Model 7700 microsensitive frequency measuring system, for detecting and measuring virtually all types of radiated signals in the range 0.5-30.5 mc, is covered in a four-page technical bulletin. Circle 66 on Reader Service Card.

Phase-Angle Voltmeter. North Atlantic Industries, Inc., 603 Main St., Westbury, N. Y. A self-contained phase-angle voltmeter that performs a multitude of laboratory, production and field tests, is described in detail in a technical bulletin. Circle 67 on Reader Service Card.

FACILITIES

Shielded Measurement Chamber. Magnetic Shield Division, Perfection Mica Co., 1322 No. Elston Ave., Chicago 22, Ill. Data sheet 131 covers a portable Permetic Co-Netic shielded measuring chamber designed for testing delicate instruments under simulated pressure, vacuum, altitude or non-pressurized conditions in lab or field. Circle 68 on Reader Service Card.

Motion Doubles Tube Life

Users also cite savings of \$1,000 a month. Orthicons get new lease as systems keep image on the move

MORE TV STATIONS than ever are using new devices to extend useful life of image orthicon tubes by combatting burn-in and sticking, the chief causes of tube failures. Manufacturers and users say they are doubling operating life hours and saving up to \$1,000 a month in costs.

Various methods now in use employ mechanical, optical and electronic techniques. RCA makes an electronic system for its monochromatic cameras, optical system for its color cameras. Both sell for \$750. Visual Electronics, New York, makes an electromechanical system with an electronic compensator, prices it at \$2,400.

In RCA's monochrome device, a rack-mounted signal generator originates sine and cosine currents. These, applied to a special deflection yoke, cause the image to rotate slightly in an elliptical orbit at the rate of one rpm. The movement prevents burn-in, reduces sticking and thus prolongs the useful life of the tube. RCA claims the movement is so slight

it cannot be noticed while in operation.

For color cameras RCA adds one more prism to the already complex optical arrangement between the objective lens and the tube. The extra prism has a 22-minute taper, is moved by a ring gear at one rpm. This causes a slight circular movement of the image on the photo-cathode.

An electromechanical system made by Visual Electronics is in use by some twenty stations. Called the Orth Saver, this device accomplishes its purpose with an eccentrically mounted lens turret made to rotate by a motor-driven bead chain linkage. The special turret is displaced 9/64 of an inch and moved at two rpm. The same motor that moves the chain drives a precision sine-cosine potentiometer which provides correcting signals to the tube deflection circuit. This eliminates any motion of the projected image.

John Wilner, chief engineer at WBAL, Baltimore, tells ELECTRONICS that the Orth Saver gives him 700 hours of additional use from tubes once ready for the scrap heap after 600 hours. "The system is too new to give exact figures on," he says. "But I'm sure that the combination of Orth Saver and new tubes is going to rack up some surprising numbers of hours."

FCC ACTIONS

- Grants station tv license to State of Oregon Board of Higher Education.
- Accepts petition for f-m educational station from Upsala College, East Orange, N. J.
- Gives approval for 1470-ke a-m station to Gold Coast Broadcasting, Pompano Beach, Fla.
- Invites comment by March 18 on proposal to extend daytime a-m station operating hours.
- Assigns WDAF, Kansas City, Mo., license to National-Missouri TV. Former holder was Kansas City Star.
- Approves construction permit for base station, 125 mobile units, for operation in Gainesville, Tex., by Southwestern Bell Tel. Co.
- Licenses WMOD, Moundsville, W. Va., to install new transmitter.
- Extends completion dates for KATF, Pittsburg, Calif.; WHYL, Carlisle, Pa.; WBOY, Clarksburg, W. Va.; WJDY, Salisbury, Md.
- Replaces expired o-p for KUFQ, Phoenix, Ariz. a-m station.
- Grants 20 licenses to Petroleum communications for use in various sections of Louisiana.
- Permits Texas Technological College to withdraw its application for channel 5 tv station in Lubbock, Tex.
- Allows Western Union further extension (to March 27) to divest international telegraph operations.

STATION MOVES and PLANS

- KCOR-TV, San Antonio, Tex., asks special authorization to operate on channel 9 pending action on rule making petition.
- WCLD, Cleveland, Miss., ownership goes from Voice of the Delta, to Radio Cleveland for \$40,000.
- KVIT-TV, Santa Fe, N. M., receives permission to move studio into town, place transmitter 14 miles from Albuquerque.
- WENS, Pittsburgh, gets thumbs down on request to shift from channel 16 to channel 9.
- WICE, Providence, R. I., files for e-p to install new transmitter as auxiliary for remote operation.
- WGBF, Evansville, Ind., seeks authority to determine operating

power by direct measurement of antenna power.

WNDB, Daytona Beach, Fla., requests license for new transmitter.

WDIX, Orangeburg, S. C., applies for renewal of broadcast license.

KBAY, San Francisco, Cal., receives extension of completion date to June.

KNEV-FM, Reno, Nev., modifies c-p to substitute certain tube types in final amplifier, ups crp to 35 kw.

KACT, Andrews, Tex., boosts power from 500 w to 1 kw, installs new transmitter.

WAMM, Flint, Mich., plans changes in directional antenna system.

KSHO-TV, Las Vegas, Nev., gets license for tv station; crp—visual 11 kw, aural 5.5 kw, with 130 ft. antenna.

WULA, Eufaula, Ala., passes license assignment from Christian and McClure to Dixie Radio, Inc.

KAPA, Raymond, Wash., receives approval to broadcast specified hours from 6:30 a.m. to 6:30 p.m. except for public service broadcasts later in evening.

WRIK-TV, Ponce, P. R., modifies c-p to change transmitter, antenna, and transmission line.

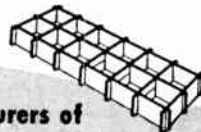
WYZZ, Wilkes-Barre, Pa., gets extension of completion date to June.

KIV-57, Augusta, Ga., slates change in transmitter location of tv stl station, and changes in antenna.

WHK-FM, Cleveland, Ohio, plans to install new antenna below present f-m antenna.

KFWB, Hollywood, Calif., receives o-p to install new auxiliary transmitter and operate it by remote control.

WDLB-FM, Marshfield, Wis., allowed to cancel license and delate call letters.

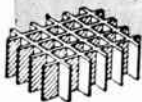


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Oregon Taxes Drop

Lower personal income tax and other tax benefits aid state's growing electronics industry. See four-fold growth by 1965

TAX REDUCTIONS and changes late last year by the Oregon state legislature are expected to step up development of Oregon as an electronics center.

Until recently Oregon had one of the highest state personal income tax rates in the nation. The special 1957 session of the legislature reduced those rates 17 to 25 percent. Federal tax law provisions for loss carryover and accelerated depreciation were also written into the law.

When the legislature again meets in 1959 (it assembles every two years), corporate income taxes may be reduced. Oregon has been able to make its tax rates more lenient because of a growing surplus in the state treasury.

Oregon electronics is currently a \$25-million-a-year business. The state now boasts around 25 electronic firms, largely concentrated in the vicinity of Portland.

Area leaders predict a four-fold increase in electronics business by 1965. This is based on Oregon's strategic location in the midst of the booming West Coast electronics-aircraft-missile complex. Though distances from customers may be long, freight costs have not been a handicap because of low ratio of shipping costs to product value.

Prominent in Oregon electronics has been Tektronix, Inc., well-known manufacturer of cathode ray oscilloscopes. Of the 2,000 persons employed in electronics manufacturing in the Portland area, about 1,200 work for Tektronix.

Other major firms include: Electro-Measurements, a components manufacturer; Osborne Electronics, magnetic components and potentiometers; Iron Fireman Electronics division, gyroscopes and high speed relays; Electric Controls, thermostats and load limiters; Morrow Radio, ham equipment; Oregon Electronics, power line supplies; and Linfield Research Institute.

Oregon electronic firm heads are particularly happy about the high quality of help available in this northwest state. Education level of Oregon residents is second highest in the nation.

The state's new development director, Julius R. Jensen, points to the stability of Oregon employes. Because of the state's advantages for attractive living, with many opportunities for outdoor recreation, Oregonians are happy to stay put. Consequently, area firms enjoy a low turnover rate.

A mild climate conducive to high production is another big advantage. Average temperature is 40.9-53.1 degrees in the winter and 65.3 in the summer.

Greater Portland has some 2,000 diversified manufacturing establishments, with 400 in metal-working trades. This industrial concentration assures facilities for construction of nonelectronic parts of electronic equipment.

Carriers Control A-Bomb Elevators

ENGINEERS erecting the 500 and 700-foot towers used in the "Operation Plumbob" atomic tests found that an electronic elevator control circuit avoids wind hazards which affect exposed cables.

Prevailing winds blow control cables into the tower framework, where the cables sometimes snap after being fouled. To avoid this, it was decided to use a system which Union Switch and Signal division of Westinghouse developed for tall tv tower elevators.

Control is accomplished with carrier wave transmission through a rigid conductor installed within the tower. This serves as a combination transmitting inductor and receiving antenna.

The transmitter, located in the elevator car, delivers 144 kc frequency carrier energy to a trans-

mitting coil which is mounted in position on the car roof.

Soviet Brass Cites 'Hams

RADIO "hams" in the Soviet Union are getting new encouragement this year and apparently their value to the military is being openly acknowledged.

Amateur radio operators are organized in radio clubs in the cities and towns. These in turn are affiliated with "societies" that cooperate with the military.

Evidence of this is supplied by a recent Pravda report. It said 20 of the best "hams" of the Kiev, Lvov, Kharkov, Nikolayev, Stalino and Simferopol Radio Clubs contended for the championship of the Ukrainian Republic Public Society for Cooperation With the Armed Forces.

The contest was a radio fox hunt, described as a "new and very interesting type of amateur radio sport" which "has only begun to develop in the Soviet Union in 1957." (Editor's Note: USN Communications Reserve did this in 1920's.)

Two ultra short wave radio stations, or foxes, were hidden near the village of Bortnicki, near Kiev, Pravda reported. They sent out signals every five minutes. The hunters had to find them in the shortest possible time.

New Standard Slashes Costs

STANDARDIZATION in the electronics industry got considerable attention at the Standardization Conference held in San Francisco. A paper by Stanley R. Jopson cited ways Eitel-McCullough saves money without sacrificing quality in turning out ceramic products. Using realistic standards is the answer.

A ceramic grid cylinder is a good example. Since ceramic contributes to cathode-grid capacitance, thickness of the cylinder walls must be closely watched. Eitel used to specify inside and outside diameters to 0.002 inch. A new standard specifies outside diameter and wall thickness to eliminate costly inside grinding.

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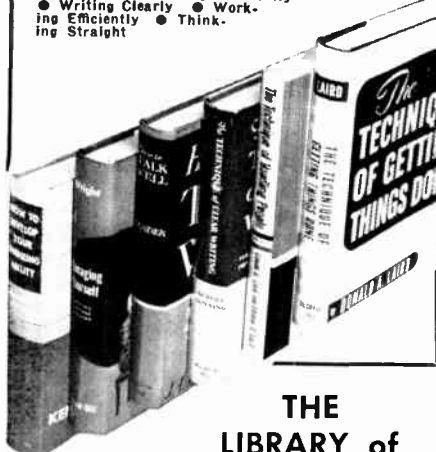
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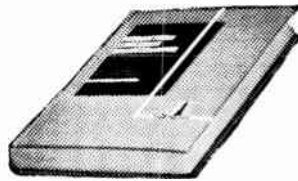
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TRANSISTORS

HANDBOOK OF SEMICONDUCTOR ELECTRONICS

Edited by LLOYD P. HUNTER

Senior Physicist, International Business Machines Corporation, Poughkeepsie, N. Y.
604 pages, 6 x 9, 484 illustrations, \$12.00

This book gives you a rounded view of semiconductor devices—all the help you need to prepare for practical circuit design and engineering of applications utilizing transistors, diodes, or photocells. Emphasis is on actual circuit design. The extensive section on this subject covers the use of semiconductor devices in band-pass and video amplifiers, computers, measuring instruments, industrial control equipment, oscillators, etc. In addition, theory of semiconductor devices, important aspects of how they are made, and background of analysis and measurement is given, to provide engineers with an intensive one-volume treatment of this growing new field.

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Canadian Market Looks Safe

Diefenbaker aims to divert trade to U. K. However, electronics firms see imports from U. S. steady

OTTAWA—Canadian electronics companies will continue to rely heavily on U.S. electronics products this year despite the asserted aim of Prime Minister Diefenbaker to divert 15 percent of Canada's import business from the U.S. to Britain.

Trade circles do not seriously believe this goal can be reached in a short period. In fact, it is pointed out that neither Diefenbaker nor his ministers now mention the 15 percent target, although they continue to assert that their objective is to bring Canadian-American trade into better balance by encouraging imports from the United Kingdom.

Canadian electronics manufacturers who have imported American components are expected to continue their dealings with American sources for two reasons:

- They have established inter-company arrangements that make them either subsidiaries or licensees of American firms.
- Equipment most in demand is of American type;

Canadian users know these types and the kind of service they can get on them.

Diversion of trade, observers feel, would be possible only through lowering tariffs against British imports or raising them against the U.S.

So far, the Canadian Government has shown no disposition to disturb the present tariff situation because it wants to improve the tariff access of Canadian materials into the U.S. More favorable terms for British producers could expose Canadian firms to stiffer competition.

In the military electronic field the Government is getting an increasing proportion of its equipment from Canadian sources. For example, fire control equipment for aircraft is now manufactured in Canada. Components, when imported, come mostly from the U.S. If any change should occur, industry sources believe, it would be an increase in purchases from Canadian, rather than British sources.

Canadian radio and television manufacturers are usually affiliates of U.S. firms; they market and make the same sets as those sold in the U.S., and enjoy tariff protection. A similar situation holds for industrial electronic gear. The consensus: It will be hard for British firms to crack Canadian electronics markets now dominated by U. S. firms.

Developments Abroad

- In Eindhoven, Holland, Philips has come up with a fountain-pen-shaped meter to be carried in the pocket of persons likely to be exposed to radioactivity. Models are supplied for limits varying between 250 milliröntgens and 20 röntgens. Lowest limit type is for low-intensity radiations over a period of about a week; the 20 röntgen type is for a user who is exposed to high-intensity radiations over shorter periods.

- Russia claims a new telescope receives radio signals on a wavelength of 3 cm, one-twentieth of the length of those received by Britain's giant Jodrell Bank telescope. Soviet publication in London reports it is 130 meters long, has a reflector area of 400 sq m and a semi-automatic control system. Results of observations are

said to be automatically recorded. A Soviet scientist predicts wavelengths down to 1½ cm will be received in the future.

- In Czechoslovakia opening of a tv set factory with an annual production rate of 100,000 sets is planned for Sept. 1. Radio Prague said recently the new centralized plant will be in Nizna na Orave and will eventually take over production now carried on in Prague. It added that Czechoslovakia plans to export some of the sets and hopes for a market in both the West and East.

- British industry this week heard American case histories of successes and failures in the use of computers for industrial data processing at a London course sponsored by the British Institute of Management.

EXPORTS and IMPORTS

British radio industry's 1957 export figures hit an all-time high of \$130 million, up 7.5 percent from the 1956 total and four times the 1947 figure. Export of capital equipment, such as transmitters, communications gear and navigational aids, amounted to \$50 million; sound equipment and test gear ran around \$30 million each; tubes and receivers (both radio and tv) were up also, standing at \$10 million for each.

Mexico is installing two French CSF microwave systems to link Mexico City with Guadalajara to the west and with Gulf of Mexico ports to the east. Guadalajara's 400-mi, \$540,000 system is expected to start operation in March; it has five relay stations and an 81-mi branch link. The 380-mi,

\$505,000 eastern system will link the capital with Veracruz and Coatzacoalcos; it has three relay stations and operation is slated for late 1958. CSF hopes to extend this system to Guatemala.

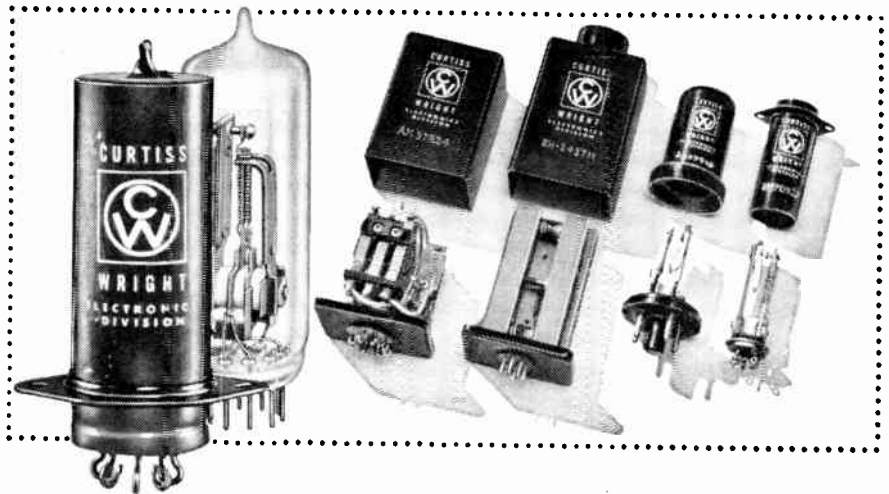
In West Germany INTERATOM has been formed as a jointly owned international company in the German nuclear energy field by Demag AG and North American Aviation's Atomics International Division. Initially, the firm will promote sales of nuclear reactors for power production and for scientific research. Officials say INTERATOM, or Internationale Atomreaktorbau GmbH, will develop peaceful uses of atomic energy, including design and manufacture of reactors and related products.

In Geneva, Switzerland, Lear SA has sold its sales and service activities to a new Swiss firm, Electraviva SA. Lear Inc. products will be handled by the new firm, but Lear reps will continue their support for distributors in Europe, North Africa and the Near East from present headquarters at Geneva's Cointrin Airport.

Australia's Postmaster-General is inviting tenders for several million dollars worth of television plants for the cities of Brisbane, Perth, Adelaide and Hobart, where tv is shortly to be introduced. Tenders will be received up to March 20 by Director, Stores and Contracts, 114 Russell St., Melbourne, Victoria, Australia.

Central and South American expansion by Olympic Radio and Television has boosted export sales by 25 percent in the nine-month period ending Sept. 30, over the comparable period in 1956. The Siegler Corp. division has just added new distributors in Lima, Peru, and in Ciudad Trujillo, Dominican Republic.

In Brazil an agreement has reportedly been reached by the International Resistance Co. and a Brazilian group for the manufacture of potentiometers and resistors for radio-tv factories and the Army.



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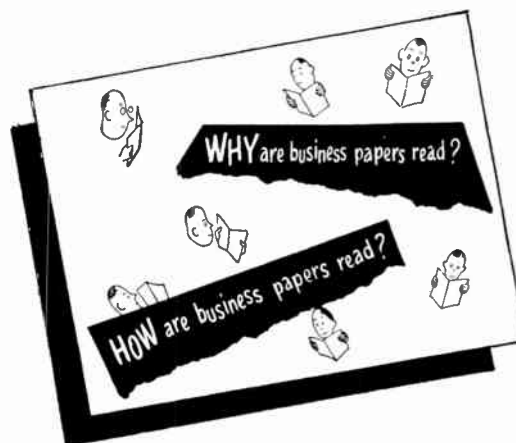
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NCR Opens Research Center

The National Cash Register Co. has dedicated a \$5 million six-story office automation research and engineering center (picture) in Dayton, Ohio. Each floor contains 35,800 sq ft, or approximately six acres of area in all. The new center houses almost 1,000 researchers and engineers, and provides an electronic computer, artificial weather and soundproof laboratories, and other test facilities.

At the dedication a number of research and engineering activities were shown. Included was a chemical memory system which NCR scientists envision as someday replacing some types of electronic memories currently used.

The new technique, built around small cells—more than 1,000,000 for storing information can be contained in a square inch—may possibly record an entire book on a square foot of chemically treated paper. When exposed to different wavelengths of light, the microscopic cells change color. The result, say NCR men, may eventually be less expensive memory systems.

Other types of automation devices were exhibited. Engineers demonstrated an electronic sorter developed jointly by Pitney-Bowes and NCR. It sorts 750 checks and deposit slips a minute. The sorter will be ready for delivery this year. Another machine shown was a magnetic character imprinter for placing dollar amounts on checks

in magnetic ink so the checks can be processed automatically. The imprinter was displayed in conjunction with engineering work in developing business machine languages that can be easily read—by both humans and electronic machines.

The engineering division, under vice president Charles L. Keenoy, and the research division, under vice president Robert G. Chollar, also maintains facilities at Hawthorne, Calif.; Ithaca, N. Y.; Dundee, Scotland; Zurich, Switzerland; and Augsburg and Berlin, Germany.

Smith-Corona Plans R&D Lab

A THIRTY-ACRE site in Rolling Meadows, A Chicago suburb, was recently acquired by Smith-Corona. Here the company will build a \$500,000 research and development laboratory for work on printed communications and integrated data processing.

Plans call for construction in 1958, and the 20,000 sq ft facility will be under the direction of Edward F. Kleinschmidt, vice president for R & D. The firm's progress in these areas has resulted from the purchase more than a year ago of the Kleinschmidt Laboratories, Deerfield, Ill.

New product development will

be the major interest of the new laboratory. Product engineering will continue on a decentralized basis with each of the company's plants providing its own engineering organization and services.

The labs will have a staff of 125 scientific and administrative workers, with plans allowing further expansion of the organization.

L.A. Firm Moves

QUALITY Electric Co. recently consolidated all of its functions and facilities into a new \$125,000 building in Los Angeles, Calif. The new structure represents twice the floor area the company previously utilized, and was specifically designed to meet the highly-specialized needs of an instrument service organization, including temperature and humidity control for all repair and calibration laboratories.



CEC Upgrades Moffatt

APPOINTMENT of John P. Moffatt, Jr. (picture) as director of quality control, Central Mfg. division, Consolidated Electrodynamics Corp., Pasadena, Calif., is announced by A. P. Stuhman, division manager. Moffatt succeeds Stuhman in the post.

He has been in CEC's quality

control department since joining the company in 1952. He was a test engineer, tooling group supervisor, and data analysis supervisor prior to appointment as assistant director in January, 1956.

All-Tronics Elects Execs

IN Westbury, N. Y., All-Tronics Inc. has elected George E. Geyer as president and Joseph Seton Smith as vice president and treasurer of the company. Both men have also been elected directors.

These appointments have been made in line with an expanded program of operations under way at All-Tronics, which heretofore has specialized solely in radio interference filters and noise elimination devices.

Geyer was previously assistant to the president of the Control Instrument Co. subsidiary of Burroughs Corp. Smith leaves the position of director of defense engineering of the Control Instrument Co. He was previously director of the analog computer laboratory of New York University.

AIEE Elevates Fifteen

THE GRADE of Fellow has been awarded to 15 members of the AIEE. This award, the Institute's highest, is given to members who have served with distinction in the electrical engineering profession.

Those honored are: Edward H. Anson, of Gibbs and Hill, Inc., New York, N. Y.; George W. Bean, of Texas Electric Service Co., Ft. Worth, Tex.; Robert S. Cannon, of Plantation Pipe Line Co., Atlanta, Ga.; Charles F. Dalziel, of the U. of California, Berkeley, Calif.; Edward N. Dingley, Jr., of Electronic Communications, Inc., St. Petersburg, Fla.; Alois Hoefle, of Toledo Edison Co., Toledo, Ohio; William M. Joslin, of Commonwealth Edison Co., Chicago, Ill.; Dewey D. Knowles, of Westinghouse Electric Corp., Elmira, N. Y.; Donald E.

Marshall, of Westinghouse, Elmira, N. Y.; John Maxian, Jr., of North American Aviation, Inc., Los Angeles, Calif.; Ambrose J. Petzinger, of Westinghouse Electric Corp., Newark, N. J.; Robert V. Shepherd, of General Electric Co., Schenectady, N. Y.; Howard D. Snively, of GE, Schenectady, N. Y.; Harry C. Steiner, of GE, Schenectady; and George C. Tenney, of McGraw-Hill Publishing Co., Inc., San Francisco, Calif.



NRL Advances Two Key Men

EMERICK TOTH (pictured top) has been named new head of the Radio Techniques Branch, Radio Division, Naval Research Laboratory. He succeeds T. McL. Davis, who recently retired. Toth's background of experience includes positions with the Bakelite Corp., Koister Radio Labs, Bell Telephone Labs,

Wired Radio Inc., DeForest Radio Co., Sylvania Corp., Pilot Radio Corp. and Bendix Radio Corp. He joined NRL in 1938.

Allen W. Coven (bottom) is the new head of the Radio Navigation Branch of the Radio Division, NRL. Since joining the Radio Division of NRL in 1946, he has served as an official of several scientific committees and has published numerous papers in the field of physics.

U. S. Firm Enters Italian Accord

BELLOCK Instrument Corp., College Point, N. Y., has entered into a licensing agreement with C.E.A. (Costruzioni Elettroniche Automatismi) whose principal offices are in Milan, Italy.

The contract grants permission to the Italian organization to build and sell Bellock products in the "free" European market. It also provides for Bellock's technical advisory assistance on problems involving automation, navigation, electronic systems and unclassified components of a military nature.

C.E.A. develops and manufactures equipment in the fields of automation and electronics.

Recruitment Spans Ocean

TWO YOUNG scientists arrived in the U. S. from Sweden recently to spend two years here under fellowships financed by Avco's Research and Advanced Development Division.

Nils Stalberg, 34 years old, and Bengt Sjoberg, 27, are the first successful applicants in a new Avco "talent hunt" program. They were chosen from 25 who applied.

Extension of Avco's recruitment project into European countries was started last January. But it's more a recruitment of scientific and engineering ideas than of personnel.

George W. Lynch, manager of Avco's Electronics Research Lab-

oratory in Boston, points out that the two scientists cannot, under U. S. law, remain here after their fellowships end, and they cannot return to this country for at least three years after that.

For the two years of their employment, however, Aveco has the use of their talent and expects to benefit from a cross-fertilization of ideas within the research laboratory.

They will work with other employees on Aveco projects, will have a chance to create new projects, and may take advantage of the company program by attending university or technical institute classes.

If the initial phase proves successful, the program will be expanded. Contacts have already been set up in Belgium, Denmark, Italy and Switzerland.

Lomartire, coordinator of apprenticeship and skill improvement.

The apprenticeship program itself is sub-college level. But graduates can move up into the Electronic Technical Training Program, attending evening classes at nearby colleges and technical institutes towards an associate degree in engineering.

Apprentices are trained in two fields, electrical and electromechanical. Graduates will be qualified as electronic technicians for about 40 classifications.

Apprentices in the electrical field will receive 1400 hours of related classroom instruction to supplement their shop and laboratory training during the four-year period. Those in the electromechanical field will get 1000 hours of classroom instruction. In addition to math, courses include AC and DC Fundamentals, Physics, Electronic Theory, Blueprint Reading, Principles of Magnetism, Power Supplies.



Industro Spreads Out

ACQUISITION of new plant facilities (picture) for the manufacture of transistors has been announced by Industro Transistor Corp. The new Long Island City, N. Y., quarters will use 20,000 sq ft for production facilities to manufacture germanium-junction alloy transistors.

Research and technical laboratories will remain in the firm's old plant in Elmhurst, N. Y.

Industro is expanding to meet transistor orders from manufacturers of portable radios, computers and allied gear, automation controls and audio equipment.

Humphrey Hires Design Man

HAROLD B. NICHOLAS goes from chief designer for Cubic Corp. to the engineering staff of Humphrey Inc., San Diego.

In his new post, Nicholas will assist in continuing research and development of Humphrey's full line of control instruments.

Offer Training For Technicians

RAYTHEON is now conducting an electronic technician apprenticeship program, believed the first in the electronic equipment industry.

Eighteen apprentices, some from the production department and some new employees, are in the first class. Eighteen more will be chosen each six months for the four-year apprentice course, so that eventually there will be 144 graduates per year.

The program, latest addition to Raytheon's "Off-the-Job Training," emerges from an agreement between the company and the Elec-

trical Workers Union. The Massachusetts State Division of Apprenticeship acted as consultant.

"Off-the-Job Training" at Raytheon now ranges from one-time special needs courses to the Advanced Management Program for top executives. All phases are financed by the company.

One goal is to enable talented employees to bridge the "gray area" between craftsman and engineer.

"It's possible for a kid out of high school to go through the company's training programs and end up with a Ph.D.," says Luke L.



West Coast Firm Moves

BEILMAN Engineering Co., Burbank, Calif., moves to new and larger quarters (picture) at 2911 Winona Ave., Burbank. The new

building has twice the floor space of the company's former location. The structure is designed so that a second story can be added to meet future expansion plans.

Balmes Shifts to MRC

MAGNETIC RESEARCH CORP., appoints Bob Balmes application engineer. He will headquarter at the company's main plant in Hawthorne, Calif.

Balmes was formerly area sales supervisor for San Fernando Electric Mfg. Co. and sales engineer for Southern Electronics Corp.

Cal-Tronics Appoints

EXPANDING its top level personnel, Cal-Tronics Corp., Los Angeles, Calif., announces appointment of

Eugene B. Juratsch as contract administrator.

Juratsch has 14 years of experience in the defense industry with five years as contract administrator for Northrop Aircraft. He comes to his new post from Servomechanism, Inc., where he was negotiator for its Western district.

The company has also engaged Ferdinand P. Diemer, technical consultant on missile programs, as director of engineering.

These appointments are a part of an overall expansion program by the company, due to increased orders and contracts for guided missile and radar test equipment.



Erie Coil Moves

Erie Coil Co. is settling into its new building (picture) in the suburbs of Erie, Pa. John E. Ziegler moves into the new plant as general

manager, with Herbert J. Palmer as his assistant.

The new plant facility provides Erie Coil with space for more ma-



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Fill Missiles Research Job

In Santa Barbara, Calif., Werner K. Gengelbach (picture) is appointed assistant manager of Air Force missile projects at Acrophysics Development Corp., a subsidiary of Curtiss-Wright Corp.

Gengelbach brings to Acrophysics more than 18 years in guided missile experience. Prior to joining the organization he was chief of the directorate of R & D at Holloman Air Development Center, responsible for such R & D projects as the Holloman range instrumentation master plan and establishment of a system for analyzing and reporting missile failure data now finding wide acceptance in the military services. Earlier in his career he served as chief test engineer, German Rocket Research Center at Peenemuende.

Executive Moves

THREE officials of the Kearfott Co., Inc., Little Falls, N. J., are elected to higher positions in the company: Frederick D. Herbert, Jr., and Herman R. Stuart to executive v-p's, and Robert N. Brown, to v-p and director of engineering.

John J. Hosemann leaves GE's Air-

craft Gas Turbine Division to become president of Electro Precision Corp., Arkadelphia, Ark.

S. Krinsky leaves Chromatic Television Laboratories, moves in as director of Telechrome Mfg. Corp.'s new western engineering division in Van Nuys, Calif.

Norden-Ketay hires Wladimir A. Reichel from a vice presidency at General Precision Equipment, makes him senior v-p.

Albert H. Carr, general manager of Communication Measurements Laboratory, Inc., Plainfield, N. J., is elected a vice-president of the company. He will continue to serve as general manager and a member of the board of directors.

News of Reps

SALES in the Midwest for New York firm, Tri-Point Plastics, Inc., will now be handled by H. A. Roes & Co. of Kansas City, Mo.

Semiconductor products of Radio Receptor Co., Brooklyn, N. Y., will be sold in New England by Rodgers Associates, Hampden, Mass.

San Fernando Electric Mfg. Co., makers of capacitors, filters and potentiometers, names the following sales reps: Robert T. Dean for upper New York State; Valley Electronics Inc., for southern New Jersey, Delaware, Md., Virginia, West Virginia, District of Columbia, eastern Pennsylvania; Don J. Phelps for Florida and Georgia; Saunders & Co. for New England; E. S. Gould Sales Co. for Quebec and Ottawa, Canada.

Two new reps for James B. Lansing Sound, Inc., are J. K. Dooley, Seattle, for the great northwest and British Columbia; and Stan Cluph & Associates, Denver, for Colorado, Wyoming and Utah.

New rep firm in Toronto: Tele-Radio Systems, specializing in communications gear of U. S. and overseas manufacture. Firm is headed by Pye Canada ex-sales manager Ivor H. Nixon.

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THE BIRTH OF RADAR

According to an old Croatian fable, the first experimental radar station was installed 102,000 years ago last Thursday by a tribe of Cro-Magnons. But no sooner had the station been erected than a dinosaur appeared on the scene and gulped down everyone in sight—everyone but one badly frightened survivor.

"Tell the truth, man," the dinosaur said, "or I'll make Filet Cro-Magnon out of you. What is this mess of bones

and stones you have here?"

"Ra-ra-radar," was the weak reply.

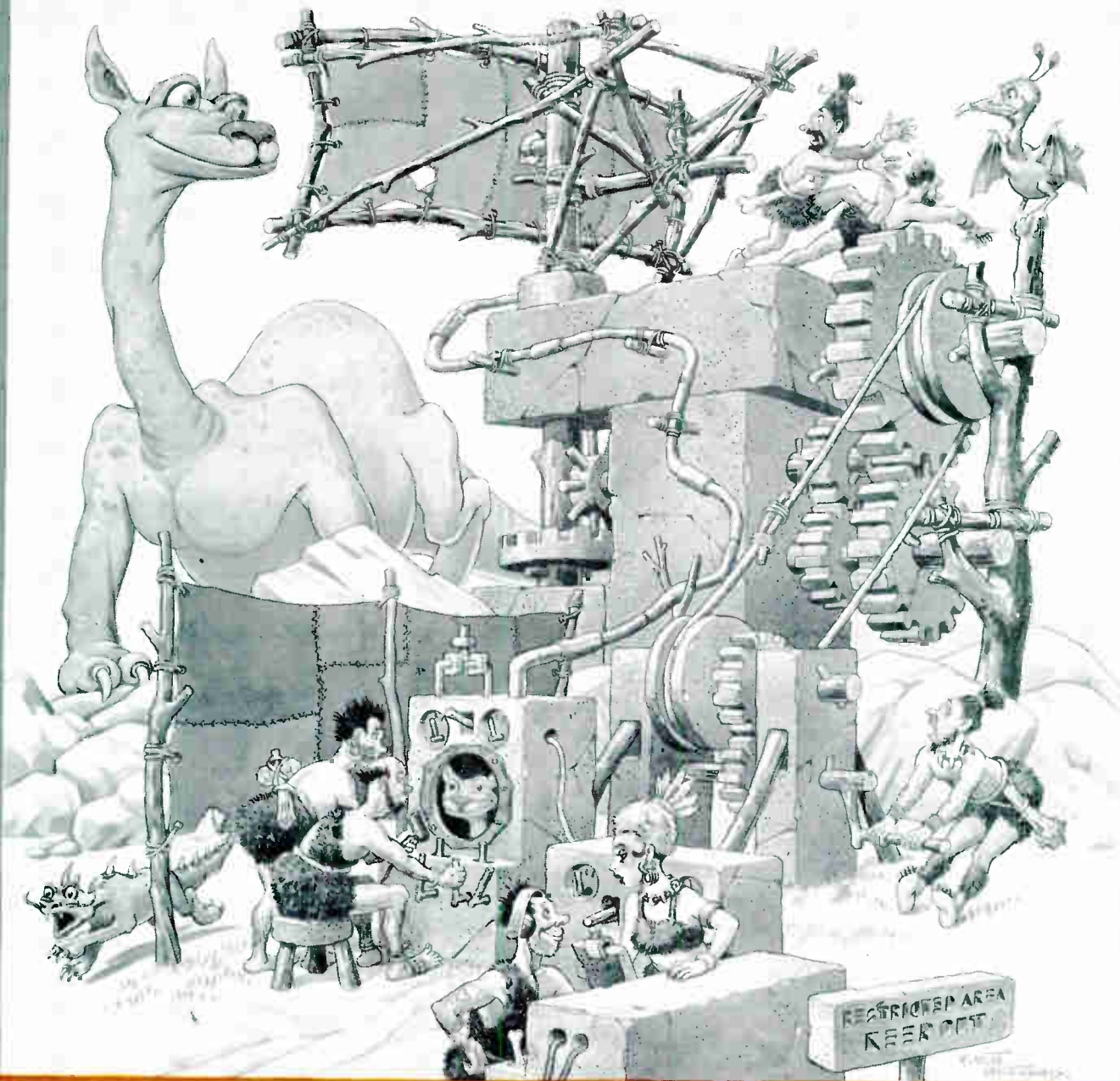
"Tell me another one," the dinosaur snorted. "If this is radar, I'm a ring-tailed brontosaurus. Does it use Bomac tubes?"

"No . . . but . . ."

"That does it," the dinosaur said. "Whoever heard of a radar set without Bomac tubes?" He opened his mouth wide.

"Whoever heard of a talking dinosaur?" the man asked. But he was too far inside the dinosaur to hear the answer.

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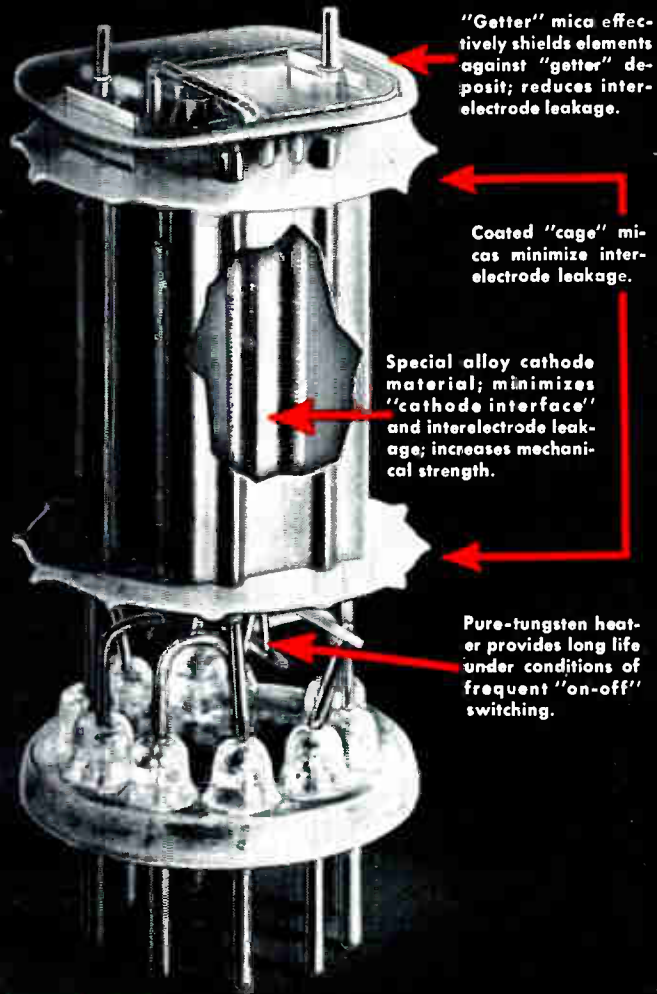
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"Getter" mica effectively shields elements against "getter" deposit; reduces inter-electrode leakage.

Coated "cage" micas minimize inter-electrode leakage.

Special alloy cathode material; minimizes "cathode interface" and interelectrode leakage; increases mechanical strength.

Pure-tungsten heater provides long life under conditions of frequent "on-off" switching.

Why

RCA TUBES

are specified for
COMPUTER DESIGNS

Long-life reliability ...the result of selected materials, rigid quality controls, and exacting inspection and test procedures...makes RCA tubes the right choice for electron computer designs. *Materials* are selected and processed to assure low gas-evolution and to provide relative freedom from "cathode interface". *Quality Control* extends from purity-control of manufacturing areas, through careful selection and training of personnel, to 100% microscopic inspection of tube structures at more than a half-hundred check points. *Sample Testing* of tubes from each production run makes certain that no tubes are released for shipment until long-life test data are complete for the "lot". Super-Sensitive tests for high resistance shorts, 100-hour survival-rate life tests and 5000-hour life tests on a continuous sampling basis weed out potential early-hour failures and provide a "quality monitor" to assure *long-life reliability*.

RCA tubes for computers are ideally suited to applications as gated amplifiers, frequency dividers, pulse amplifiers, cathode followers, "on-off" switching. Illustrated above are medium-mu twin triodes: 5963, 5964, 5965, 6211, 6350; pentagrid amplifier: 5915; power pentode: 6197; twin diode: 6887.

SEND FOR NEW BOOKLET RIT-104A — "Receiving-Type Tubes for Industry and Communications." Includes descriptions and basic data on RCA Computer and other special tube types. Designers of computer equipment are invited to discuss tube requirements with their RCA Field Representative at the nearest RCA Field Office. For your copy, write RCA Commercial Engineering, Section A-19-Q-4, Harrison, New Jersey.

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