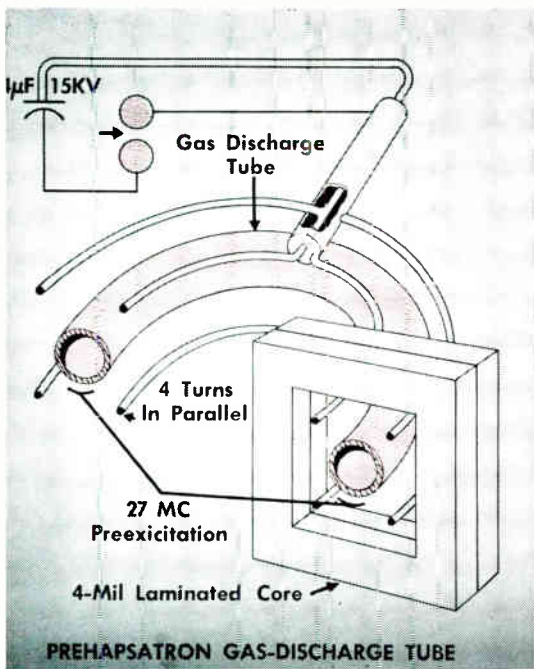


SEPTEMBER 10, 1957

electronics

business edition

A MCGRAW-HILL PUBLICATION • VOL. 30, NO. 9A • PRICE FIFTY CENTS



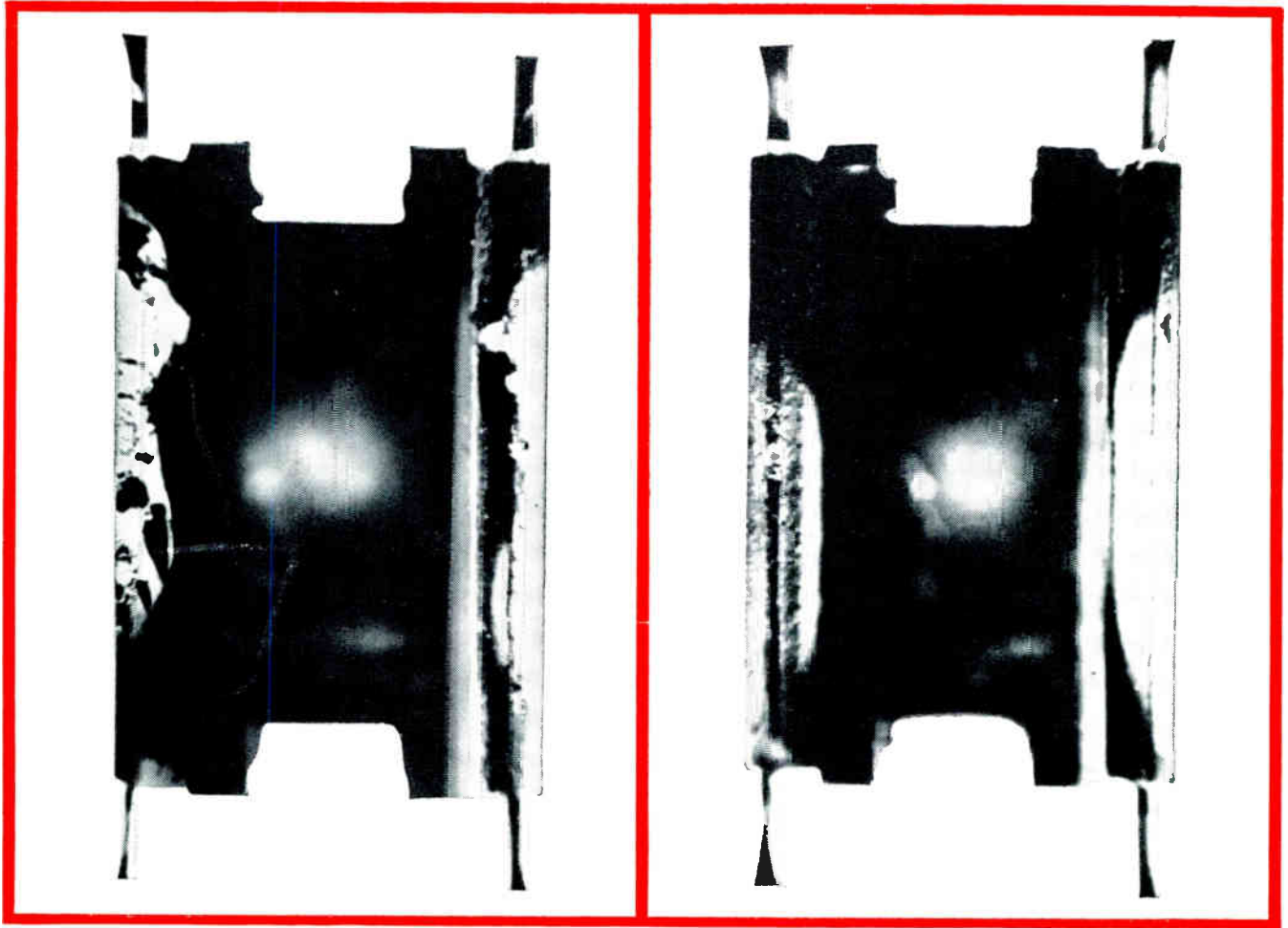
Bottling H-Bombs

Nuclear-fusion power reactors
will need more electronics p 17



New Railroad Markets Seen

Modern electrification programs
include telemetering and control . . p 19



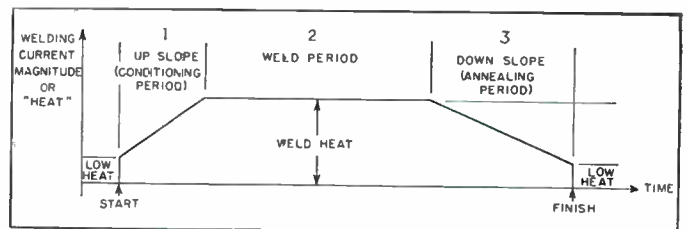
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A typical application is the carbonized tube anode shown above. The left-hand photo illustrates how conventional welding causes splashes and a weak joint. The strong, clean weld (right) is produced with the Heat Program Timer. Because perfect welds such as this can be made without pre-cleaning of parts, savings in time and money result.

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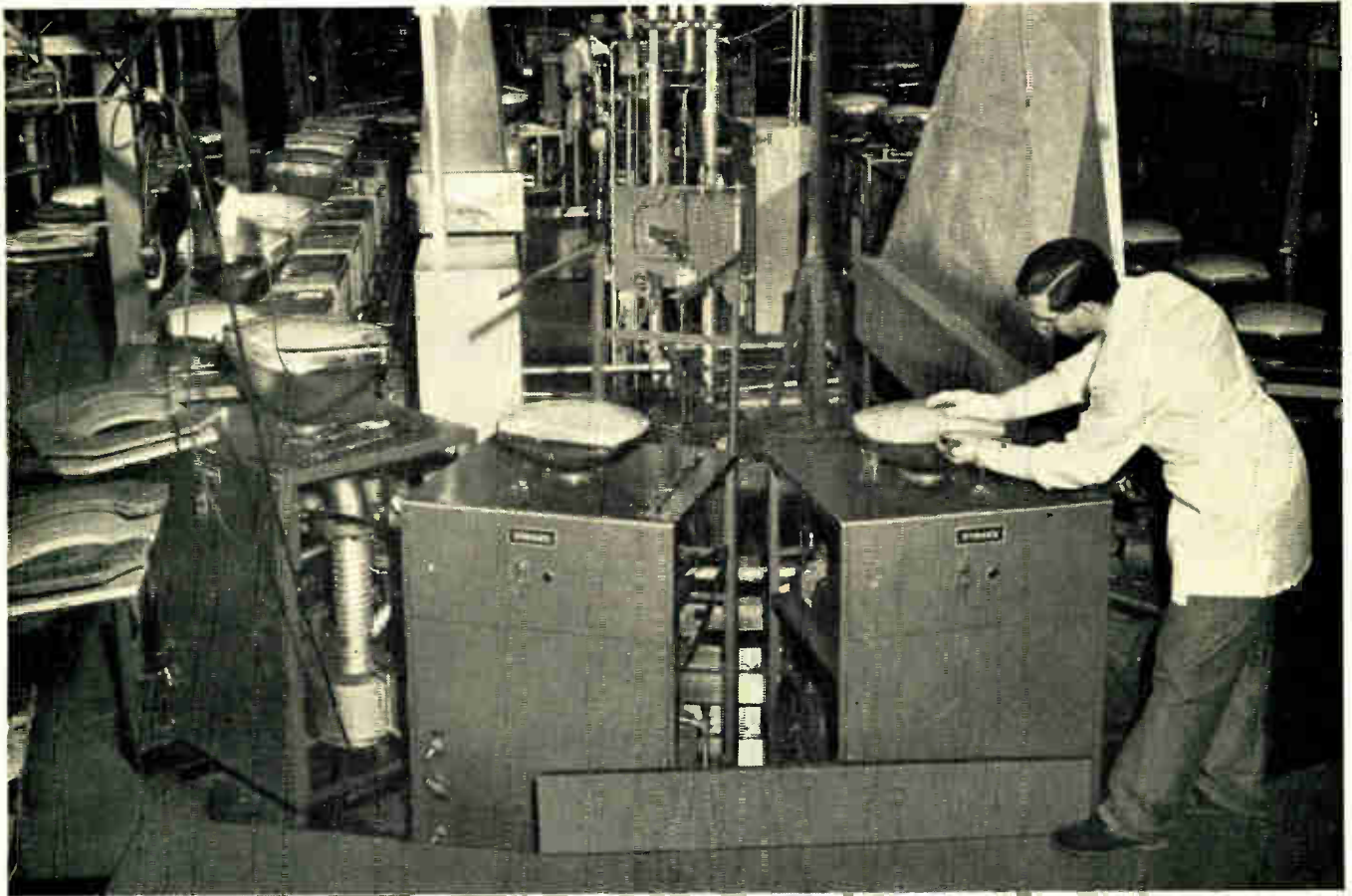
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World Radio History





Sylvania "Silver Screen 85" TV picture tubes get Brighter Film . . . with Stokes In-Line Aluminizing System

A new Stokes In-Line Aluminizing System is making news in TV tube production by putting an aluminized reflector on Sylvania Electric Products' popular "Silver Screen 85" picture tube. This automatic equipment—now in operation at Sylvania's Seneca Falls, New York, plant—assures maximum control in the application of aluminum film to TV picture tubes.

The new system provides a bright and uniform film . . . operates at greater speeds than previous aluminizing equipment . . . provides the needed vacuum in the shortest possible time . . . requires a minimum of maintenance.

Here are other ways it can boost production and lower costs:

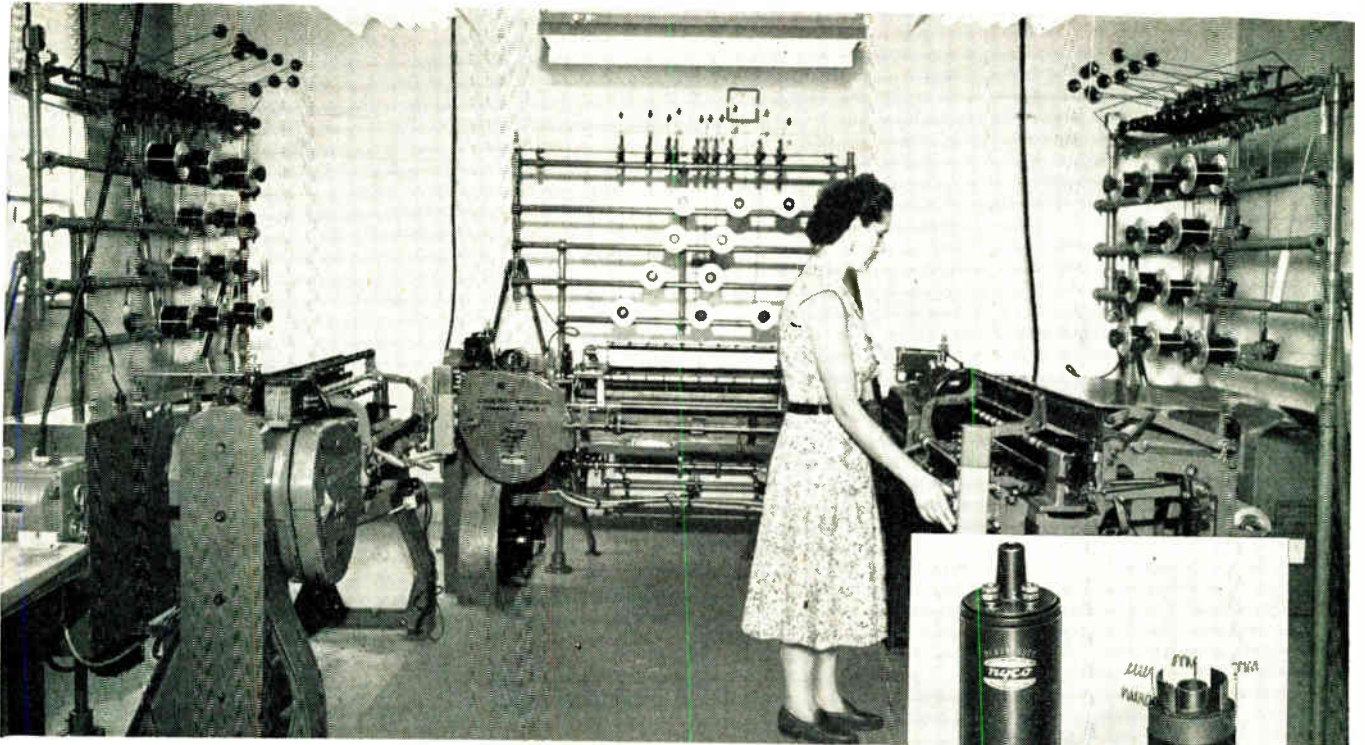
- versatile . . . adaptable to any size black and white tube, including the new 110° design . . . can meet changes in production rates.

- fully automatic . . . operator simply loads—and then unloads completely aluminized tube.
- saves time . . . makes possible the processing of maximum number of tubes in minimum amount of time.
- compact . . . single or twin tube units can be mounted singly, in banks, or adapted to in-line system—circular or straight line.

A Stokes engineer will be glad to talk about how this new system can be integrated into your production line . . . and about your specific tube production needs. He can help you apply Stokes 30 years of experience in high vacuum engineering and automatic production technology. For a consultation, or for informative literature, write to Stokes today.

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STOKES



Leesona No. 107 Coil Winder winds high quality ignition coils for New York Coil Company, Phoenixville, Pa., important parts and assembly suppliers to the automotive, electronics and TV industries. Although plant operates only on a 40-hour week, investment return per annum on the No. 107 is 40%. Inset shows Nyco automotive ignition coil, wound on these machines.

At New York Coil Co. — Leesona® No. 107 shows 40% Investment Return

Would it pay New York Coil Company, manufacturer of automotive ignition, electronic and TV parts and assemblies, to install Leesona No. 107 Coil Winders for producing ignition coils? It did!

The operator handles the three machines you see pictured. The machines wind 26,000 turn ignition coils of superior quality. The company is realizing a 40% annual return on its investment. J. R. Zikmund, president

of New York Coil, commenting on the company's experience in its newly expanded plant says, "We are paying for our new Leesona equipment out of savings being realized on current production output."

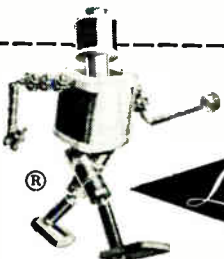
The Leesona No. 107 Machine has an automatic feed and is particularly suited to precision work at a high production rate. Sensitive "strap type" tension insures a smooth flow of fine wire. Insulation sheets are

automatically inserted. The traverse mechanism is readily adjustable. "Down time" and "Set-up time" are at a minimum.

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... how you can make your operations more economical and flexible with the Leesona No. 107 Coil Winder. Send the coupon for details on this and other coil winding machines.

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Continuing Leadership . . .**

From 1951 through 1956 **electronics** was America's largest monthly magazine in terms of advertising pages sold.

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Now **electronics** is again increasing its service to subscribers and advertisers by providing the most complete editorial package available in the field. Starting in January, 1958 **electronics** will be published once a week with alternate Engineering and Business Edi-

tions. Since each Engineering issue will also contain a summary of business information, subscribers will be provided with timely news at weekly intervals.

**Tangible Evidence
of a Growing Need . . .**

electronics bases its policy decisions on facts sifted through a 20-man sales force; on 27 years of leadership; on evaluation of READEX Reader Interest scores; on McGraw-Hill Reader Traffic Studies; on the Editor's continuous polling of his readers; on special projects by the McGraw-Hill Research Department conducted by both personal interviews and direct mail.

The evidence accumulated in these surveys leads to a single conclusion: that a weekly publishing plan — providing engineering and business editorial coverage — is demanded by **electronics** subscribers!

In 1958 it Will Take 52,000 Circulation to Adequately Cover The Electroni

electronics

offers complete services
for taking sales messages
to \$6.914-billion market*

* At-factory sales of electronic equipment and replacement parts

EDITORIAL STAFF, 1958! This full-time editorial board is comprised of twenty-five specialists, backed up by the McGraw-Hill's world-wide news service with offices in principal cities throughout the U. S. and abroad (except for Iron Curtain countries).

ELECTRONICS BUYERS' GUIDE, published in mid-June, lists over 4,000 electronic and allied manufacturers for 1957, their products and services. Advertisers' names are bold faced in the product listings. The page number is given for their specially prepared catalog type advertisements. Purchasers turn to this authoritative volume for where and what to buy.

READER SERVICE CARDS are forwarded daily to manufacturers and agencies. READEX is a measurement of Reader Interest, the results of which verify editorial policy and offer benefits to advertiser and agency. Printed READEX Reports are available on request.

MANUFACTURERS' REPRESENTATIVES LISTS are kept on file in all branch offices, containing extensive up-to-date information on lines carried, territories, personnel, warehousing facilities, etc. Over 1,000 manufacturers' representative firms are questioned each year. (Manufacturers' representatives account for over 80% of electronic sales.)

MARKET DATA going back over the years is cross-indexed in **electronics** files to offer the most complete statistics available for electronic and allied products. Industry requirements are projected into the future as a regular service by the **electronics** Research Department.

"ELECTRONIC MARKETS" is published by the Business Department each month to interpret electronics for advertising, sales, and management people interested in the future of the electronic industry.

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power supplies**

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These high quality electrolytic capacitors are especially designed for use as energy storage components in DC circuitry where peak power requirements exceed the maximum output of the associated power supply.

Sangamo Type DCM Capacitors provide exceptionally low equivalent series resistance . . . have extremely high capacity for case size in low voltage ranges . . . are designed to permit high ripple current without overheating. They minimize ripple voltage and insure steady, stable DC voltage. Use of the Sangamo DCM eliminates any need for heavy, bulky choke components.

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Write for Engineering Bulletin TSC-114C.

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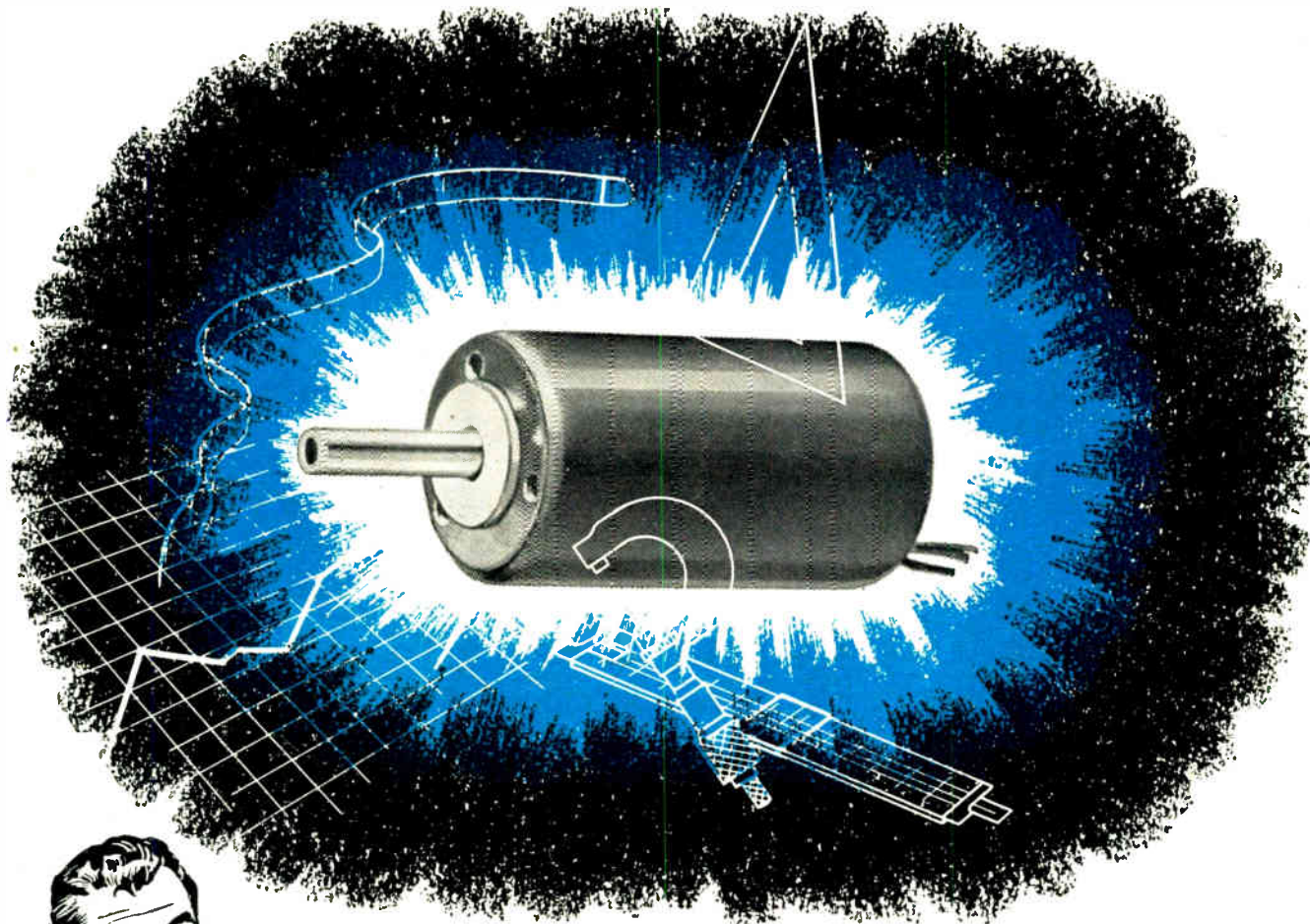


SC57-9

CAPACITY CHART

Rated Voltage	Surge Voltage	Max. Cap. 1 3/8 x 4 1/8	Max. Cap. 1 3/4 x 4 1/8	Max. Cap. 2 x 4 1/8	Max. Cap. 2 1/2 x 4 1/8	Max. Cap. 3 x 4 1/8
5	7	8500	15000	20000	33000	45000
15	20	6000	10500	13500	24000	35000
25	40	4500	8000	10000	17500	25000
50	75	1750	3250	4250	8000	10000
75	100	1000	1500	2250	4250	6000
100	135	675	1250	1500	3000	4000
150	185	600	1000	1250	2500	3500
200	250	300	500	600	1000	1500
250	300	275	375	450	850	1200
300	350	200	350	400	750	1100
350	400	170	300	375	700	1000
400	475	140	250	325	575	850
450	525	125	225	275	500	800

For additional capacity and voltage combinations, write us.



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EAD'S 1" Diameter Motor Exceeds 3500 Hours at 20,000 RPM

An EAD customer required a small, 1" diameter motor with a minimum life of 1000 hours, running at 20,000 rpm at a temperature of 85° C. The result was peak performance at specified temperature and speed for more than 3500 hours operation with no signs of deterioration!

This is a typical example of EAD's high-output, long-life, power-packed miniature components doing a big job!

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Consider first the excellence of the electro-mechanical design and the "built-in" precision. What quality are the bearings and lubrication? Can you hold air gap clearances of less than .002" required for high efficiency? How does the motor measure up under extreme environmental conditions? **EAD pioneered precision in small motors . . . specialized in small precision motors for more than 15 years!**

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Can you obtain a 1-inch diameter motor with high-power output and efficiencies exceeding 60%? Is it capable of extremely high speeds for fan or blower applications requiring maximum air deliveries? How does it measure up in reliability, long life in control equipment, actuators, pumps, generator drives, gear motors, antenna drives, or automatic devices.

EAD motors are performance-proven for more than 15 years in vital, stringent military and industrial uses!

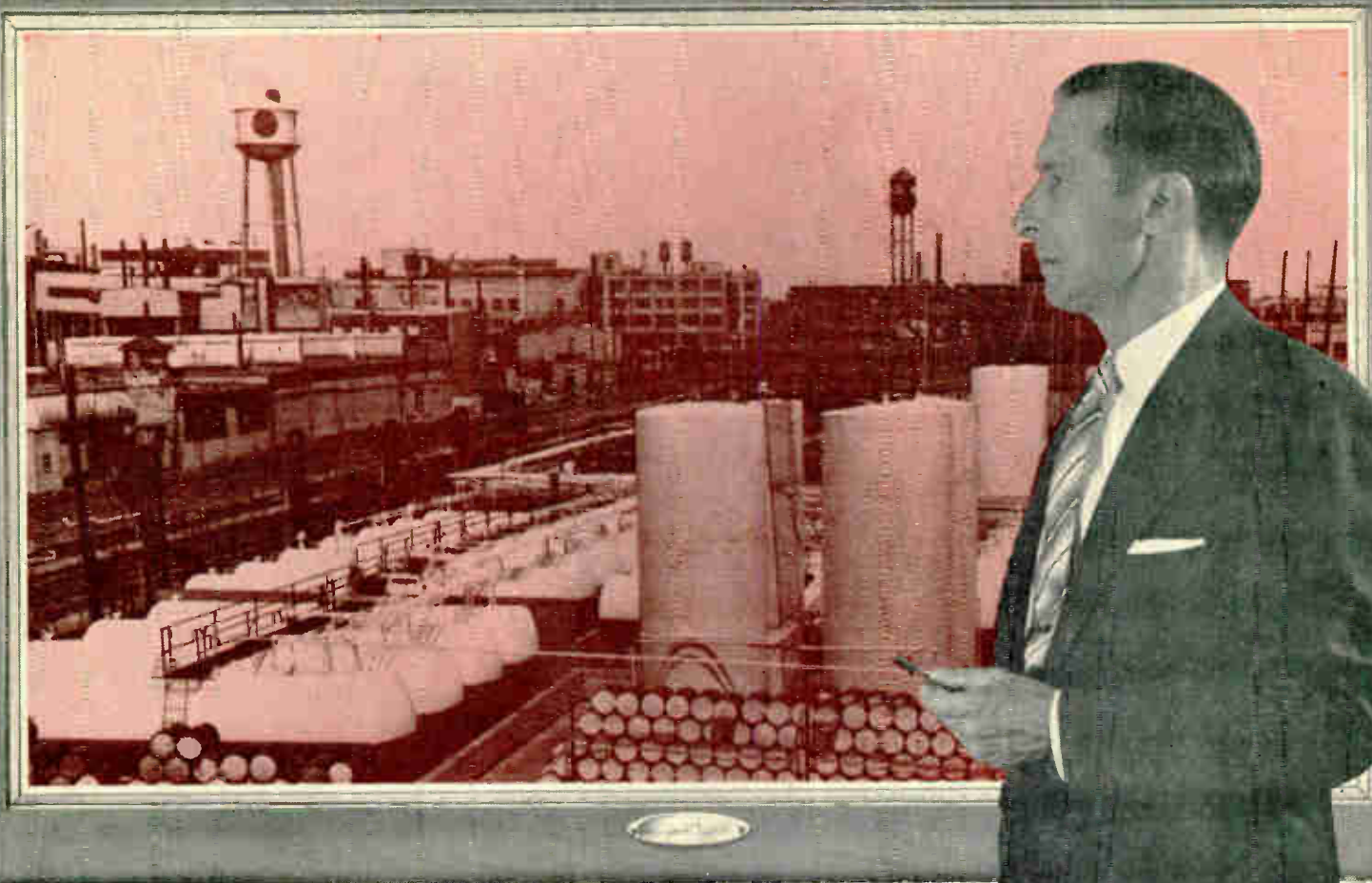
by **PRICE**

Can you get premium performance, high-accuracy, specialized design at production prices not much greater than you now pay for standard motors? **EAD has the years of experience to convert complex engineering designs into mass-producible items. You get highly specialized units at standard motor prices!**

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3
at EAD**

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TRANSISTORS HERE?

You might be in this same position tomorrow — looking toward the future and planning how your business can become more efficient. You've heard many things lately concerning electronic advances and the latest "miracle" transistors, but you wonder — can transistors be used here?

Let's take a long realistic view of what transistors can do. They are extremely reliable, have exceptionally long life, are easy to work with, reduce complex circuitry, help to lower production costs, and in comparison to conventional components, may result in overall reduction in cost.

You've seen in the last few years bulky complicated radios reduced to a size that will slip into your pocket . . . large heavy weight business machines designed into modern compact efficient packages, control equipment for temperature, friction, humidity, and other environmental conditions become more efficient when designed with transistors. America's industry is built on progress and is continually on the alert for new advances. Below is a list of some of the advances in several different industries made possible with transistors.

GENERAL TRANSISTORIZED DEVICES:

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|------------------------|-----------------------|
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Faster Depreciation

Plans to kill certificates of necessity focuses attention on declining-balance and sum-of-digits methods

ACTION by Congress to close the door on fast write-off of plant and equipment through certificates of necessity focuses attention on two other fast depreciation schemes: the declining-balance method and the sum-of-the-digits system.

The congressional plan will kill the certificate-of-necessity program by the end of 1959. Meanwhile, fast tax write-offs will be sharply curtailed.

Since 1950 certificates of necessity have been granted on \$23 billion of new plant and equipment, with electronics firms receiving a substantial share. These fast write-off certificates allow full depreciation of facilities in five instead of the 10-20 years normally required.

The declining-balance and sum-of-the-digits methods of computing depreciation allow a firm to write-off two-thirds to three-fourths of new plant and equipment cost in the first half of its life.

Although approved for income-tax use since 1954 many electronics firms have neglected to take advantage of either method. Up to now even faster tax write-offs were available through certificate-of-necessity approval by the Office of Defense Mobilization.

Electronics and other growth industries have the most to gain from using accelerated methods of computing depreciation, says the public accounting firm of Peat, Marwick & Mitchell.

Growth industries put more money into new plant and equipment than other industries, explains

a spokesman. Another advantage: growth industries feel the pinch of tight money more than others. Prime advantage of accelerated depreciation is that it "lends" a firm extra cash for a number of years at no charge.

The cash saving obtained by higher depreciation, lower earnings and lower income taxes in the early years is compensated for by lower depreciation charges, higher earnings and higher income taxes in the later years.

Many economists feel creeping inflation will be with us for some time. If so, users of accelerated depreciation would pay lower taxes in early years when money is dearer and higher taxes in later years when money is cheaper.

Figure declining-balance depreciation by using twice the percentage that would have been charged under straight-line. On a 10-year life, 20 percent would be applied each year against the undepreciated balance. By switching over to straight-line in later years depreciation can be fully charged off.

Sum-of-the-digits works this way: for a 10-year life sum of digits is 10+9+8+7+6+5+4+3+2+1 or 55. First year's depreciation is 10/55 of total value and the last year's is 1/55.

Surveys indicate that as many as two-thirds of all large manufacturing firms have already taken advantage of either one of the two methods.

IBM switched to sum-of-digits method of computing depreciation on rental machines in 1956. Switch reduced reported net income by \$4.2 million last year and by \$1.2 million for first half of 1957.

A few of the other firms active in the electronics industry which have switched to either one of the two accelerated depreciation methods are: Avco Mfg., Allis Chalmers, Burroughs, Cutler-Hammer and General Tire and Rubber.

SHARES and PRICES

RAPID SALES growth is predicted for magnetic heads by Herman Fialkov, president of General Transistor Corp. whose General Transistor Western subsidiary makes magnetic heads. They are used for reproduc-

ing and recording data on magnetic drums and tapes.

The potential for magnetic computer components is as great as that of transistors, he says.

• Booming data-processing busi-

ness. Manufacturers expect sales of \$200 million this year.

• Trend among computer manufacturers to buy magnetic components instead of manufacturing their own units.

Typical Magnetic Head Manufacturers	Recent Price	Dividend Rate ¹	Percent Yield	Earned per Com. Share		Traded	1957 Price Range
				1957	1956		
Clevite	23	1.00	4.3	1.48 (6 mos)	2.06	NYSE	18-25½
General Transistor	29¾	.....	.....	0.43 (6 mos)	0.64	ASE	8¾-29½
Litton Industries	49¾	.....	.....	1.47 (yr) ²	0.97 ²	NYSE	29½-56½
McGraw-Edison	44¾	1.40	3.2	0.89 (3 mos)	6.11	NYSE	32-47

¹ indicated ² fiscal

Station Income Grows

Average U. S. television station will earn a profit of \$170,000 this year

LAST year, an average U.S. television station earned a profit of \$146,400 before taxes. Total broadcast revenue was \$920,700. Operating expenses amounted to \$774,300.

This data on typical tv station operations was obtained from a National Association of Television

Broadcasters survey of 391 television stations.

Profit margins are widening. The pretax profit margin is expected to increase from 15.9 percent in 1956 to 17.7 percent in 1957. In 1955 the profit margin was 7.2 percent.

Total revenue for 1957 for the average station is estimated at \$960,000. Expenses will be \$790,000, and profits \$170,000.

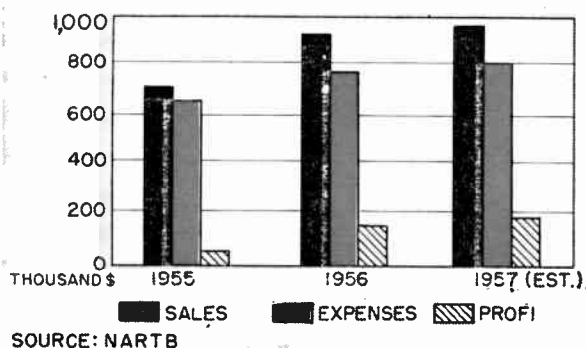
National and regional advertisers contributed 47 cents of the video station sales dollar last year. Thirty cents came from local advertisers and 23 cents from network sponsors.

Programming took 37 cents of the expense dollar, while 33 cents went for general and administrative costs, 18 cents for technical costs and 12 cents for selling.

Revenues, expenses and profit margins varied with market size. The typical station in markets of more than one million population had revenue of over \$3 million. The typical station in markets of less than 25,000 population grossed \$331,000.

The proportion of sales derived from national and regional advertisers did not vary substantially by market size. The proportion of total revenue secured from networks was greater in larger markets. The proportion from local advertisers was greater in smaller markets.

TYPICAL TV STATION
SALES - EXPENSES - PROFITS
(before taxes)



MERGERS, ACQUISITIONS and FINANCE

- Sanders Associates, Nashua, N. H., sells 100,000 shares of Class A nonvoting stock at \$15 a share through Kidder, Peabody & Co. An additional 10,000 shares were sold to employees at \$13.80. Sanders is primarily in military work with 82 percent of its business coming from R&D and 18 percent from manufacturing activities. Major R&D fields include guided missiles, antisubmarine equipment, Panar (a special type of radar), pulse-doppler radar, countermeasures equipment and autopilots. It manufactures rate gyroscopes, hydraulic servo valves, microwave systems, sonobuoys, flexible printed cabling, instruments and components. Proceeds will be used to reduce outstanding bank loans, provide additional working capital and increase its industrial printed-cable business.

- Servomechanisms, New York, purchases physical assets of Precision Components of New Cassel, N. Y. Servomechanisms produce

control equipment and electronic components. Precision's main product was a tachometer generator.

- Haydu Electronic Products' first public offering of 100,000 shares of common stock, priced at \$3 per, nears completion. Haydu, located in Plainfield, N. J., manufactures component parts, instruments and industrial gas burners. Proceeds will be used to expand facilities for manufacture and overhaul of airborne and electronic instruments. Berry & Co. of Plainfield, N. J., is the underwriter.

- Amphenol Electronics, Chicago, acquires Danbury-Knudsen, Inc., of Danbury, Conn. Acquired firm will be operated as an Amphenol division. Amphenol plans sale of 200,000 shares of common stock to finance new plant construction. Hornblower & Weeks will be the underwriter.

- Controls Company of America, Schiller Park, Illinois, increases regular quarterly dividend from

15½ cents to 20 cents per share.

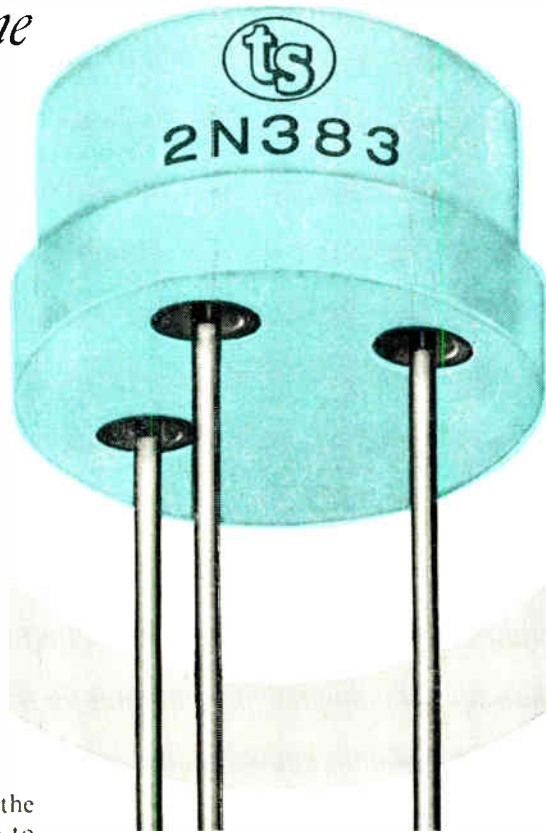
- L. H. Carr & Associates, Washington, D. C., acquires controlling interest in Scatter Communications, Bethesda, Md. Lester H. Carr, owner of the acquiring firm, also owns half interests in Developmental Engineering of Leesburg, Va., and Continental Electronics of Dallas, Tex. The scatter firm will operate independently but will get technical assistance and support from the other Carr firms.

- Cook Electric, Chicago, places \$2 million of sinking fund notes with Mutual Life Insurance, Springfield, Mass., through Blunt, Ellis & Simons, Chicago. The money will be used to pay off existing bank loans.

- Page Communications Engineers sells all interests in subsidiary Rixon Electronics, Silver Spring, Md., to James L. Hollis. Purchaser is former executive vice-president of Rixon. He is now president as well as sole stockholder.

A Complete Line

TUNG-SOL GERMANIUM PNP TRANSISTORS NOW IN JETEC 30 PACKAGE



The proposed JETEC 30 package brings the convenience and economy of standardization to the users of germanium PNP transistors. All the desirable electrical characteristics, without the confusion over mechanical and electrical interchangeability, can now be obtained in one standard package.

The new JETEC 30 package features a highly reliable welded hermetic seal, an extremely durable metal housing and a lead-basing design which facilitates use with printed circuitry.

For additional information about this complete line of Germanium PNP Transistors please contact Semiconductor Division, Tung-Sol Electric Inc., Newark 4, N. J.



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STANDARD EIA (RETMA) MEDIUM POWER TRANSISTORS						
Power Output	RATINGS (25°C)		TYPICAL CLASS B OPERATION (25°C)			
	V _c	P _c	E _{cc}	Power Output	Distortion Max.	Power Gain (Po-100MW)
2N381	25v	200 MW	-12v	500 MW	5%	31 db
2N382	25v	200 MW	-12v	500 MW	5%	33 db
2N383	25v	200 MW	-12v	500 MW	5%	35 db

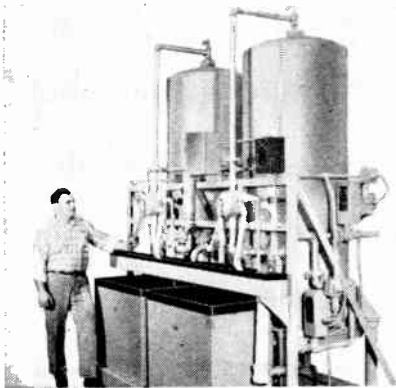
Premium Quality General Purpose	RATINGS (25°C)			TYPICAL CHARACTERISTICS (25°C)		
	V _c	P _c	T _j	Max I _{cb0} At -45v	Frequency Cutoff	Forward Current Ratio
2N460	-45v	200 MW	+100°C	15 μa	1.25 MC	.96
2N461	-45v	200 MW	+100°C	15 μa	1.25 MC	.98

STANDARD EIA (RETMA) HIGH FREQUENCY TRANSISTORS								
Computer	RATINGS (25°C)		TYPICAL CHARACTERISTICS (25°C)					
	V _c	I _c	f _{aco}	h _{FE1} I _b = -1ma.	h _{FE2} I _b = -10ma	Rise Time	Storage Time	Fall Time
2N425	-20v	-400 Ma	4 mc	30	18	0.5 μs	0.25 μs	0.3 μs
2N426	-18v	-400 Ma	6 mc	40	24	0.5 μs	0.25 μs	0.3 μs
2N427	-15v	-400 Ma	11 mc	55	30	0.4 μs	0.25 μs	0.3 μs

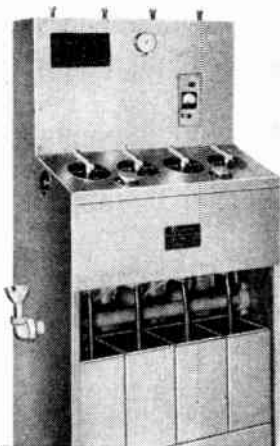
Portable Radio	Application	Max. V _c	TYPICAL CHARACTERISTICS (25°C)		Power Gain 455 Kc	Conversion Gain
			f _{aco}	C _c		
2N413	Oscillator	-15v	3 Mc	12 μmf	—	—
2N413A	IF Ampl.	-15v	3 Mc	12 ± 2 μmf	32 db	—
2N414	Converter	-15v	5 Mc	12 μmf	—	26 db
2N414A	IF Ampl.	-15v	5 Mc	12 ± 2 μmf	35 db	—

STANDARD EIA (RETMA) HIGH POWER TRANSISTORS						
Power Switch	RATINGS (25°C)		TYPICAL SWITCHING APPLICATION (25°C)			
	V _c	P _c	E _{cc}	Switching Power	Load Current	Switching Power Gain
2N378	-40v	15 W	-14v	26 W	2 amps	24 db
2N379	-80v	15 W	-28v	52 W	2 amps	23 db
2N380	-60v	15 W	-28v	54 W	2 amps	29 db

Also Available: New! 2N459 rated for 100 volt peak operation; 2N242, AUDIO POWER AMPLIFIER and 2N307, GENERAL PURPOSE.

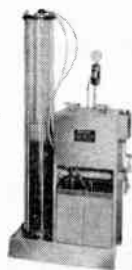


DEMINERALIZED WATER AT CAPACITY OF 2000G.P.H. is produced by this Barnstead Model TM-6, Two-bed Demineralizer. A complete package-type unit such as this includes heavy steel columns lined with thick sheet rubber, handy multi-port valves, acid and alkali resistant throughout.



EASY TO REGENERATE 4-BED CABINET TYPE Barnstead model FR-2 produces extremely pure demineralized water at flow rates of from 30 to 100 gallons per hour. Stainless steel cabinet. Standard equipment includes filter, purity meter, flow rate indicator, pressure gage, valves, regenerant tanks.

1,000,000 OHMS RESISTANCE demineralized water is produced by this mixed bed demineralizer. Transparent lucite column. Stainless Steel cabinet with polyvinyl chloride piping and valves. Other mixed bed models produce up to 2,500 gallons per hour.



BOSTON Jamaica 4-3100	NEW YORK Kingsbridge 8-1557	CLEVELAND ACademy 6-6622
CHICAGO Financial 6-0588	PHILADELPHIA LOCust 8-1796	LOS ANGELES RYan 1-9373
JOHNSON CITY 3113	SAN FRANCISCO TEmplebar 2-5391	CHATTANOOGA 6-5663

- Catalog "G"—Barnstead Water Stills
- Catalog 127—Barnstead Demineralizers
- Bulletin 141—MF Submicron Filter

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WASHINGTON OUTLOOK

NEIL H. McELROY, the new Secretary of Defense, takes over the Pentagon from the retiring Charles E. Wilson in the midst of a major reshaping of defense production programs. The major cutback decisions to sweat out about \$2.2 billion from fiscal-year 1958 spending have already been made. But McElroy will be taking over responsibility for what in effect is a second round of economy measures—to be reflected in new contract awards and expenditures for fiscal-year 1959. This will consist of new decisions to cancel overlapping development projects, stretch out some more weapons production and postpone volume output of some items still in development—all aimed to hold next year's defense appropriation request close to the \$38.5-billion sum in the administration's last budget.

Presistent rumors are heard in Washington about Deputy Defense Secretary Quarles' resignation. Quarles, onetime Western Electric vice president, according to authoritative sources, had been Wilson's own choice as a successor. Now, it's reported that Quarles is miffed at being passed over by the White House, wants to quit government. President Eisenhower, however, has asked him to stay on.

The military economy drive has forced the Pentagon to make a quicker decision to settle once and for all duplicating Army-Air Force efforts to produce an IRBM. Both the Army's Jupiter and the Air Force's Thor are deep into production of prototypes.

Months back, the Thor team seemed a cinch for production contracts. But recent successes in Jupiter tests have upset the earlier expectations. A major decision to be made shortly: whether the prime contract for the IRBM guidance system will go to Thor's General Motors AC Sparkplug div. or Jupiter's Ford Instrument div. of Sperry Rand.

- Deep congressional cuts into this year's foreign military aid program will fall hardest on the \$900-million plan to supply U.S. allies with newest weapons and equipment. Electronic equipment plays a major role in the plan. Original schedules called for shipment of 400 latest planes—mostly F-100 supersonic fighters and antisubmarine aircraft, guided missiles such as Corporal, and destroyers, tanks and mine-sweepers all equipped with the latest electronic gear. Now, many orders will be postponed or shelved.

But the appropriation cut will not touch another part of the foreign military aid program in which electronics is a major element. This is the Nato infrastructure program of building bases, communications systems, radar nets, transportation systems and the like, to be at the disposal of all Nato forces and to be paid through contributions from all member nations. The total program will cost about \$2 billion by 1960, of which the U.S. will bear half the cost. Of this sum, Congress has already authorized \$780 million, about \$500 million of this has been committed to date. The new appropriation adds \$109.4 million to the fund.

- Electronics manufacturers are slated to get at least \$26 million worth of orders for marine equipment over the next several years out of a big federal-subsidized merchant ship replacement program. Right now, shipyards have orders for 119 new ships. And, over 250 more are due to build within the next 20 years.

The average merchant vessel is outfitted with about \$70,000 worth of electronic gear—radio transmitters and receivers, radar, gyro compasses, navigational equipment and safety devices.

Right now, 43 ships are building; 32 more are due to be ordered this year, and about 50 next year.

ALONG THE WAY... OF **TWA**

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WAREHOUSING HEADACHES?

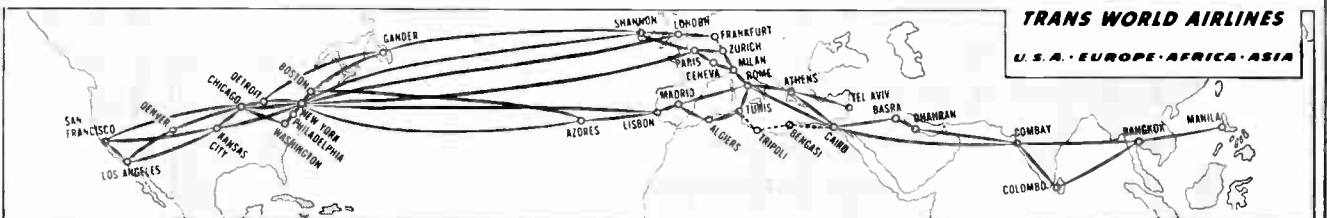
REGULAR **TWA AIR FREIGHT**
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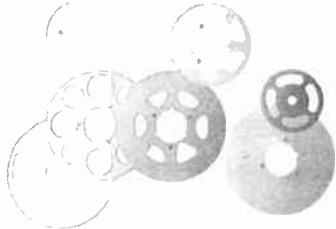
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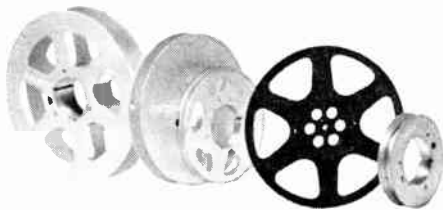




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EXECUTIVES IN THE NEWS



Garman: Cinemascope and boats

MOVING up to be board chairman at General Precision Laboratories is Raymond L. Garman, onetime research physicist and consultant. The 50-year-old scientist set up GPL back in 1945, has been its technical director ever since.

This quiet, serious man worked in fairly academic environs from the time he got his doctorate (NYU '32) until the war's end. Trained as both physicist and chemist, he pioneered such fields as the electronic measurement of pH. In 1945, General Precision Equipment (GPL's parent) asked him to organize and staff a research arm. Starting with 20 men from Harvard's Radio Research Lab, he built up an organization of some 2,000 employees, with two manufacturing facilities.

GPL started out to do motion-picture research, developed the Cinemascope sound system. Defense business has taken precedence, however: what started as a 50-50 guns-and-butter product mix has become more like 85-15. Garman's special enthusiasm is a self-contained navigation device that makes use of the best features of both doppler and inertial systems.

The Garman family has two children, a girl at Skidmore and a boy in high school. Garman, who says he couldn't carry a tune in a #10 washtub, likes music—"the familiar classics"—tries to keep the kids from playing Presley on the family hi-fi.

When he can take the time ("I don't have any spare time," he remarks somewhat wistfully), he goes up to an island in the St. Lawrence River. "I break completely," he says, "no phones, no radio, nothing but a boat. I can't take my worries along, or I might as well not go." He agrees with author Kenneth Grahame that there's nothing half so much worth doing as simply messing about in boats.

STRICTLY PERSONAL

Traffic & Transistors

As the cost of transistors is progressively reduced, they may find extensive use in devices for controlling traffic on main highways. Such devices, coupled with receiv-

ing sets located in automobiles, would be highly desirable for providing information on traffic conditions several miles ahead of the advancing vehicle.

This might be a means of communication to prevent congestion.

and more importantly, a means for preventing accidents. Any method that would provide the driver with more advance information on road conditions is of primary importance to future highway safety programs.

Highway radar screens for scanning heavy traffic areas might provide signals to the driver, perhaps by plotting car movement—or lack of movement—in the various lanes. In this way a driver could select his lane well before entering a right-turn lane, a left-turn lane or an interrupted center lane. It would give drivers ample time to turn off the main express route and switch to other open roads.

Any such system, of course, would require the extensive study and cooperation of highway engineers, automotive engineers, electronics engineers, and Federal, state and municipal agencies before it could begin to become a reality.

THOMAS C. GLEASON
CHRYSLER CORP.
DETROIT, MICH.

Forked Adder

Either your editors or Mr. R. Rutz of IBM seems to have tried to bypass a mathematical law. Your *Technical Digest* (Aug. 20, p 15) says of Mr. Rutz's multi-electrode transistor: "a single two-collector unit in a simple circuit performs a complete binary addition." To do a complete binary addition, with carry, it seems to me you'd need three collectors—and a slight delay as well.

Isn't Mr. Rutz's device actually a half adder?

JOHN LITTLEJOHN
PHILADELPHIA, PA.

No, it's a full adder. It has three inputs mixed at a common emitter, and only two outputs: sum and carry. That's all it needs.

But we did pull a boner in our Aug. 20 *Executives in the News* when we said that Paul Roberts was taking over the Don Lee and Yankee networks as well as Mutual. Only Mutual was sold; RKO Tele-radio still owns the two smaller nets.

"We raised \$100,000 in one day to help you build your new plant in our town—Douglas, Georgia!"

\$100,000 in the first day! That's what the 8,200 people of Douglas pledged to help new industry settle in Georgia—a remarkable feat for so small a town but typical of the vitality which marks Georgia's economic progress!

Douglas will now finance a new plant up to 100,000 sq. ft. This financial aid, however, is only one of Douglas' prime assets. A readily available labor force (59,000 population in a 25 mile radius) is willing to work and easily trainable. A model Urban Renewal Plan, one of two in the nation backed by Federal aid, has been initiated. Eight buildings, 14,000 to 200,000 sq. ft., and numerous sites are available. Beyond this Douglas has the basic advantages of Georgia: excellent transportation, low cost power and water, mild climate, a central location among major southeastern markets!

The people of Douglas and Georgia are working hard planning how best to put their resources at your service. Join their profitable progress by locating in Georgia! Call, wire, or mail the coupon for details! All inquiries confidential.

Georgia Forward

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This message sponsored jointly by: The State of Georgia, and the Douglas, Ga., Chamber of Commerce.

EHF MICROWAVE GENERATORS AND SOURCES

18,000 to 50,000 mc

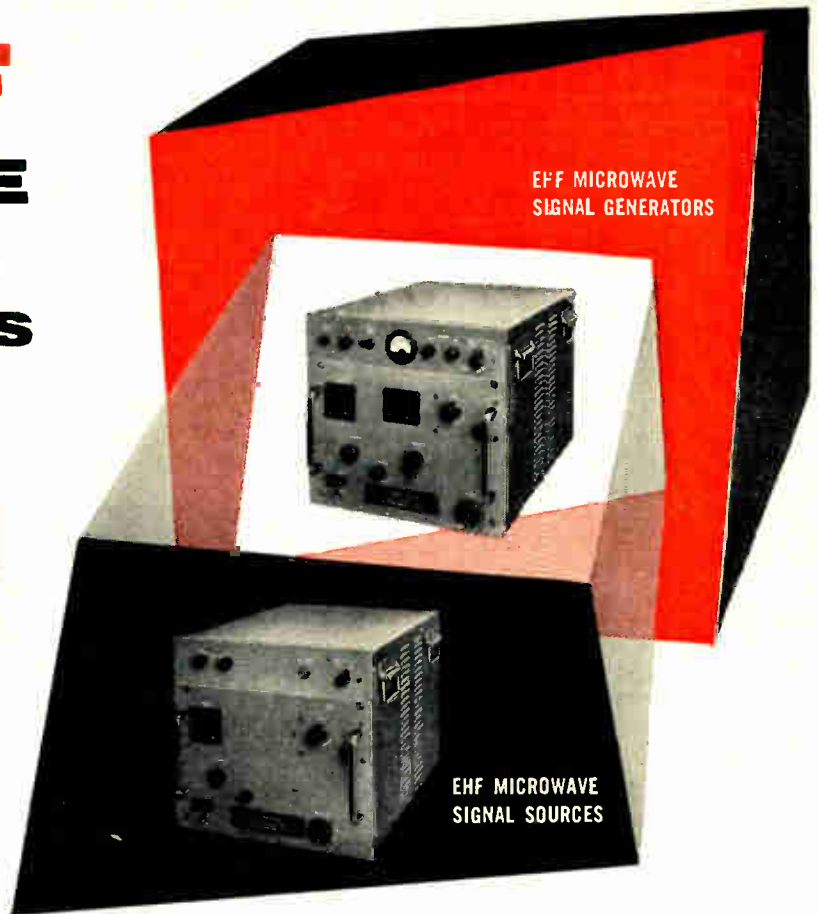
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PLUG-IN TUNING UNITS

Now, with the Polarad plug-in interchangeable tuning unit feature you can equip your laboratory with Extremely High Frequency generators and sources covering 18,000 to 50,000 mc permitting wide flexibility of operation at minimum cost. Each of the various tuning units requires no further adjustment after plug-in — all voltages and controls are automatically set for proposed operation.

These new Polarad self-contained instruments operate simply with direct reading, wavemeter dials. They provide cw or modulated signals of known frequency for field, production line and laboratory testing of microwave equipment, components and systems.

Write to Polarad or your nearest representative for complete information.



EHF Microwave Signal GENERATORS

- 7 plug-in r-f tuning units cover the frequency range from 18,000 to 39,700 mc.
- Direct-reading calibrated attenuator output, accuracy ± 2 db.
- Frequency calibration accomplished by a $\pm 0.1\%$ direct-reading wavemeter.
- Internal 1000 cps square-wave modulation.
- Capable of external modulation, both pulse and fm.
- Equipped with integral electronically-regulated power supplies.

EHF Microwave Signal SOURCES

- 9 plug-in r-f tuning units cover the frequency range from 18,000 to 50,000 mc.
- Internal 1000 cps square-wave modulation.
- Capable of external modulation, both pulse and fm.
- Equipped with integral electronically-regulated power supplies.
- Frequency calibration accomplished by a $\pm 0.1\%$ direct-reading wavemeter.

SIGNAL GENERATORS Basic Unit Model MU-2		FREQUENCY RANGE	SIGNAL SOURCES Basic Unit Model MU-1	
Plug-In Tuning Unit Model No.	Power Output Calibrated		Plug-In Tuning Unit Model No.	Power Output Average
G1822	-10 to -90 dbm	18,000 — 22,000 mc	S1822	10 mw
G2225		22,000 — 25,000 mc	S2225	10 mw
G2427		24,700 — 27,500 mc	S2427	10 mw
G2730		27,270 — 30,000 mc	S2730	10 mw
G3033		29,700 — 33,520 mc	S3033	10 mw
G3336		33,520 — 36,250 mc	S3336	9 mw
G3540		35,100 — 39,700 mc	S3540	5 mw
		37,100 — 42,600 mc	S3742	Approx. 3 mw
		41,700 — 50,800 mc	S4150	Approx. 3 mw

Model SG-1218, Signal Generator and Model SS-1218 Signal Source are available to cover the frequency range 12,400 to 17,500 mc.

MODULATION:

Internal modulating:

Frequency 1000 cps square wave.

Requirements for external pulse modulation:

Pulse repetition frequency..... 100 to 10,000 pps.
Pulse width rate..... 0.5 to 10 microseconds.
Pulse amplitude..... 10 volts peak, minimum.
Pulse polarity..... Positive.

Requirements for external frequency modulation:

Waveform Sawtooth or sine wave.
Frequency 50 to 10,000 cps.
Amplitude Approx. 10 volts rms, to produce 40 mc deviation.

Reliable maintenance service throughout the country is an important part of the Polarad instrument.

For private demonstration without obligation ask for the

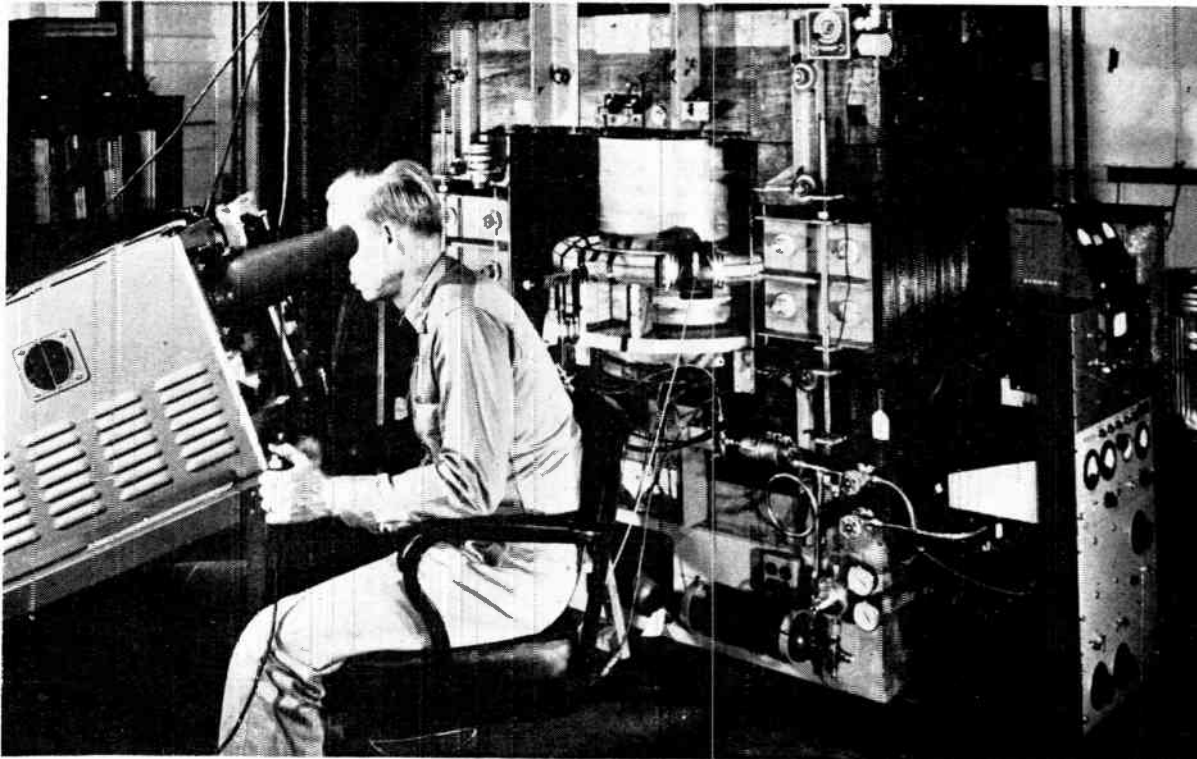
MOBILE FIELD DEMONSTRATOR

to stop at your plant



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Los Alamos "Perhapsatron" a forerunner in . . .

Bottling H-Bombs

- Atom scientists believe they can solve world power needs for at least a billion years with thermonuclear fusion reactors
- Fuel, ionized deuterium, is too hot to handle mechanically, so magnetic bottles and instruments yet unborn will be needed

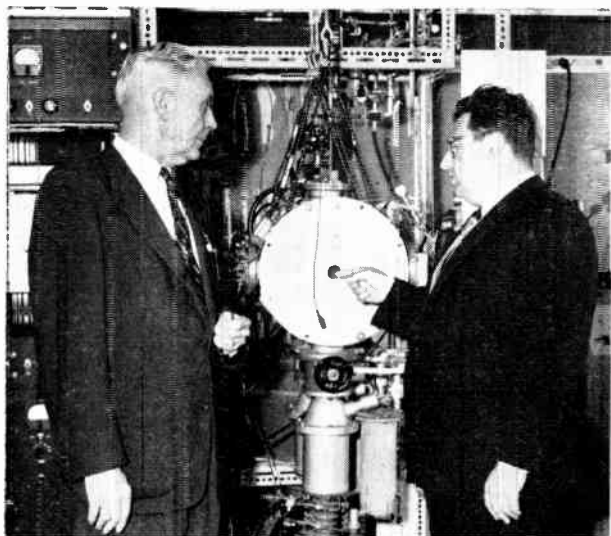
Atomic scientists are on the trail of a fabulous prize. If they succeed, they can reshape the growing nuclear electronic instrument market.

The task: to tame the mighty H-bomb by containing the intense heat and force of thermonuclear reaction within a controllable fusion reactor.

Fusion reactors would have four main advantages

over the fission reactors now coming into more widespread use:

- Uranium will be scarcer and costlier in time. But there are unlimited supplies of deuterium, two-electron isotope of hydrogen and the most likely fusion fuel. There is enough deuterium readily available in seawater to supply the world's power needs for



Hydrogen beam apparatus at General Dynamics will hit 10 million degrees

literally 1,000,000,000 years.

- Each fission reaction creates two radioactive waste particles. Disposing of these is a mounting problem. Nuclear fusion trades mass for energy, producing little waste to be buried or sunk at sea.

- A problem with fission reactors is limiting the reaction to prevent runaway or explosion. With fusion, the problem is the reverse, maintaining a reaction.

- Fusion can generate electricity directly. Fission reactors are essentially heat producers dependent on heat exchangers and generators.

Fusion's advantages, however, still remain wishful thinking. So far, fusion occurs only inside of the H-bomb, the sun and the stars. No known substance will physically contain a thermonuclear reaction.

The AEC has stated several times that a variety of containment methods are possible. Without naming the alternatives, the AEC and other investigators seem to be staking success on bottling the reaction in a magnetic field.

With this method more clearly in sight now, scientific doubts are turning to cautious optimism. Magnetic fields assisted by "electronic bunsen burners" to preenergize the deuterium may do the trick.

Comments AEC Chairman Strauss: "We think the fact that we have worked with it for a number of years and have not been able to prove it impossible is a very good gage of its eventual success."

An early magnetic field device at Los Alamos was dubbed perhasatron. Now they are called more optimistically stellerators, devices which will duplicate the power of the stars.

The trickle of AEC, industrial and university spending on fusion reactor research shows signs this

summer of turning into a flood.

A big privately financed project was launched in May. General Dynamics and 11 Texas utilities will spend \$10 million in a four-year fusion effort.

AEC will build a new stellerator at Princeton between 1958 and 1961. The cost will be \$5.6 million for buildings and \$17.5 million for equipment, under the appropriation request to Congress.

In 1953, 20 AEC people were working on controlled fusion. This year's payroll is 500 people.

Westinghouse has begun an AEC-fusion high-vacuum R&D program. GE has been researching fusion over a year.

Nobody is sure yet magnetic containment is feasible. Experts say they will know possibly in 10 years, perhaps in 20, probably in 30. GE thinks pilot plant production is 20 years away.

While experimental details are mostly classified, general theories of control forecast far more electronics in fusion reactors than in fission reactors.

For fusion, deuterium is ionized and placed in the magnetic field while its temperature is raised to 100 million degrees Kelvin or higher. At that temperature, pressures of 100 million psi are needed.

At around 300 million degrees, however, lower pressures now attainable would do. Pre-energizing the ionized gas, called plasma, by accelerating it or feeding it electrical energy may raise the heat to a point where the magnetic pinch would be effective.

A two-atom fusion would yield over three million electron volts. A four-stage, six-atom reaction would give about 45 mev. One-third would escape as x-rays or the kinetic energy of neutrons.

The instrumentation picture is still vague. Researchers say they will need both monitoring and power handling gear linked by complex feedback circuits—unless there is a radical shift in theory.

The shape and reactance level of the plasma must be known constantly. Microwave apparatus may serve because plasma won't transmit microwaves. Reactance may be monitored by neutron counters and spectrum analyzers.

Since magnetic lines of force flex under pressure, the magnetic pinch is extremely unstable. The magnetic fields would have to counterpoint every wiggle of the plasma while compensating for energy loss.

Power could be generated directly by the electromagnetic interplay and from neutron bombardment of the reactor vessel. Part of this will have to be fed back to keep the reaction cooking.

Early reactors will probably need timing circuits. R&D is aimed at continuous operation, but pulsed discharges of plasma and current may have to suffice. The million-ampere currents required suggest banks of capacitors or coils and huge switching gear.

New Railroad Markets Seen

Expected resurgence of electrification in railroads will expand market for electronic telemetering and control gear. Association of American Railroads committee report shows how capital-hungry railroads can afford electrification by using commercial power

RAILROADERS believe a resurgence of railroad electrification is near. When it comes, it will expand markets for electronic telemetering and control gear.

Electrification has been stymied for 20 years by the high cost of railway power systems and by limited capital. Railroad purchases of electrical power-control equipment have been correspondingly slim.

Railroads still are short of cash for electrification. In addition, by 1967 they must raise over \$10 billion for other capital improvements.

A way out of the dilemma was proposed this summer by an Association of American Railroads electrification committee—use 60-cps power to cut the cost of electrification.

The recommendation, culmination of a four-year study, is considered “momentous” by the committee.

Siphoning 25-kv, 60-cycle power from the utility lines handy to many railroads would:

- Reduce first costs of power generation and transmission systems.
- Reduce operating costs as much as 16 percent in comparison to low-voltage railroad systems now used.
- Save on construction costs by permitting use of lighter catenary (trolley wires) and by standardization of fixtures.

The committee chairman, L. B. Curtis, Pennsylvania RR, believes electronics will play an important role in future railway electrification.

“Any future electrification,” he says, “will utilize remote control and monitoring of power distribu-

TECHNICAL DIGEST

• **Wireless loudspeakers** will be installed this month in a Dover, N. J., drive-in movie. A low-power transmitter, classified by the FCC as a limited radiation device, transmits the soundtrack to transistor receivers placed in each car. The system, designed by Video Sound Corp., is said to cut average drive-in wiring costs by \$50,000 to \$80,000.

• **Living cells** may be observed for up to 9 hours with a new ultraviolet microscope developed jointly by Phileo and the Southwestern Medical School. A 2-inch magnetically deflected CRT with ultraviolet-emitting phosphor serves as a flying-spot scanner. The raster, projected through a microscope, scans the cell with an extremely fine spot. Ultraviolet transmitted by the cell is passed to a multiplier phototube. Standard TV techniques are used to display the image on a high-persistence screen.

• **Blood counts** are performed electronically by a Coulter Electronics instrument. A diluted blood specimen is drawn through a 1/10-mm orifice by vacuum where it is used to conduct a current. The presence of a blood cell displaces some of the conductive fluid, raising the electrical resistance through the orifice. A short voltage pulse for each cell results the amplitude of which is proportional to the cell size. Minimum cell size counted is selected by a threshold circuit.

• **Hall effect sensors** are used in a railroad train-control system developed by the British Railways. The Hall effect is the voltage which appears across the edges of a semiconductor strip when a current is passed through it longitudinally in the presence of a magnetic field normal to the plane of the strip. The sensor, a thin slab of indium antimonide, is mounted on the underside of the railway cars. It is actuated by electromagnets mounted between the rails, trigger-

ing the brakes if the train tries to pass a red light.

• **Automobile carburetors** are adjusted for maximum efficiency by the use of a Wheatstone bridge in a combustion analyzer produced by Allen Electric. Two arms of the bridge are formed from 0.001-inch diameter tantalum wire. One arm is surrounded by exhaust gases sampled from the engine and cooled to ambient temperature; the other arm is placed in the open air. Bridge current heats both arms equally, but since the thermal conductivity of the exhaust gases differs from that of air, the resistances become unequal. The bridge unbalance is therefore a function of the exhaust gas thermal conductivity, which is proportional to the air-fuel ratio of the carburetor.

• **Crystal-controlled communications receiver** now being produced by a British company, Racal Engineering, uses the harmonic spectrum of a single crystal to tune continuously from 500 kc to 30 mc.

tion." The Pennsy already uses "quite a bit," he adds.

Electrification would also add to markets for high-power rectifiers. Three electrified railroads recently bought 24 ignitron locomotives and 100 cars, a boomlet for this kind of apparatus.

Only 3 percent of American trackage is electrified. Virtually all is pre-1938. In 1956, only five miles were added, by the Chicago, South Shore and South Bend RR.

F. J. Corporan, ways and structures chief of the South Shore, is also sure future electrification will employ electronic telemetering. Only limited capital, he says, prevents replacement of his road's 20-year-old electrical power-control system with a combination telemetering and communications microwave system.

It may be bought, Corporan says, next time a severe storm knocks down trackside wires. "We're getting tired of stringing wire around the country every five years."

Railroads have by-passed straight electric locomotives for diesel-electrics. Indications are, however, oil will go the way of coal as a fuel, especially in

heavy railroad traffic areas such as the East.

- The price of liquid fuels is expected to rise 25 to 50 percent of 1970 in terms of 1950 dollars. Price of electric power will drop 10 percent, according to a survey made for the AAR.

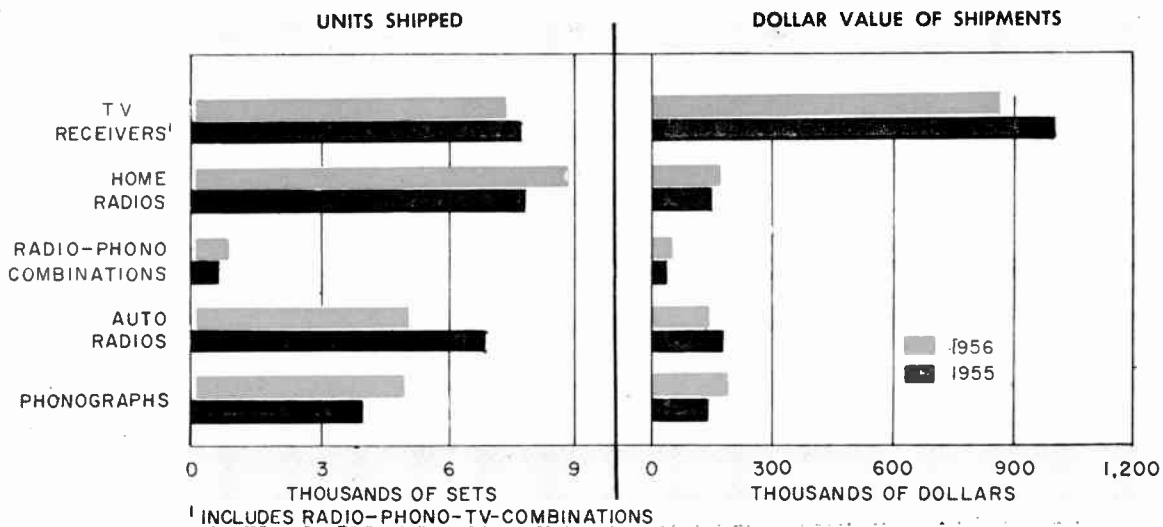
- Fluid fuel supplies are limited, may not be economically produced beyond the 1970's or 1980's. Coal and atomic fuels for power plants are relatively abundant.

- Railroaders say electric locomotives are only half as expensive to maintain as diesels, are in service longer with less down time.

A trend toward more electrification is already underway overseas. England plans to extend its railroad electrification by 1,460 miles and Japan by 2,050 miles.

Most of the conversion in these two countries will involve commercial-frequency power. British and Japanese railroad agencies found that savings made possible by using high-voltage commercial power justify the projects.

PRODUCTION and SALES



Census Verifies '56 Tv Dip

THE CENSUS Bureau last month reported 1956 factory shipments of tv's, radios and phonographs.

A total of 7,374,000 tv sets was shipped at a manufacturer's value of \$897.9 million. Units decreased from 1955's 7,678,000 value decreased from \$1,026 million.

TV shipments in 1956 comprised 4,515,000 table and portable

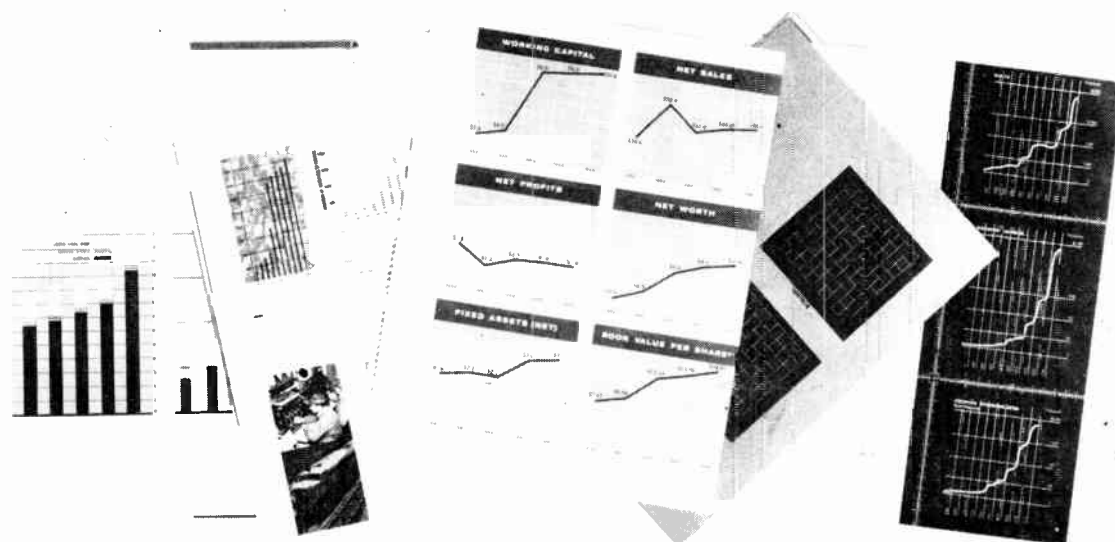
models worth \$458.8 million; 2,788,000 consoles worth \$425.7 million and 71,000 radio-phono-tv combinations worth \$13.4 million.

Home radio shipments totaled 8,974,000 sets. Dollar value was \$163.7 million.

Home radios shipped in 1956 included 3,401,000 table models worth \$50.2 million; 2,435,000

clock models worth \$44.8 million, 3,096,000 portable radios worth \$67.6 million, and 42,000 non-portable, battery-powered models worth \$1.1 million.

Radio-phono combinations shipped in 1956 totaled 602,000. Dollar value was \$29.7 million. Some 4,906,000 auto radios worth \$125.8 million were shipped.



Streamlining statistics with graphs helps . . .

Annual Reports Go Modern

- Reports to stockholders become business relations tools, talking about company's prospects, products, policies and people
- Traditional format gives way to modern design in keeping with growth of electronics industry and its experimental spirit

ON JULY 26, a West Coast electronics firm began mailing approximately 6,250 copies of its fiscal 1956-57 annual report. Of these, only about 2,000 will go to stockholders.

The rest are for brokers and investment analysts, 1,500 copies; employees, 1,050; customers, 1,000 and suppliers, 700. The cover introduces a new trademark.

This report, from Topp Industries, illustrates a public relations trend gaining ground in the electronics industry. Like others, the report fills more than legal requirements.

Reports in the modern manner tour plants, outline management thinking and bare financial history. They build good will, attract investors and customers and advertise products and product development.

Servomechanisms adopted a new format this year. It is intended to show potential investors, customers and employees the "sophisticated nature" of the business, give a feeling of experimentation. Seven full-page illustrations show development of an airborne system from math to flight.

Financial balance sheets are still the heart of all

reports. But many firms put current statistics into perspective with summaries, tables and graphs, using color for emphasis.

Photos, often placed in text margins, show what the firm's products and people are doing.

Daystrom has been using modern format several years. This year's report fills 24 pages, 8 more than last year. Added space allows for a rundown on operating division activities and an illustrated management chart.

Virtually all reports open with a president's letter reviewing the past year and analyzing the coming year's prospects in general terms. Units of the firm are covered in detail elsewhere.

Lengthy reports are following a magazine format with tables of contents and feature articles designed to show the firm's stature in the industry.

Indicative of these reports-within-reports are: Consolidated Electrodynamics, five pages on its marketing program; Robertshaw-Fulton, five pages on plant expansion; Airborne Instrument Lab, five pages of product press clipping reproductions; Lear, six pages product applications; General Instrument, six pages, product status.

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Women Engineers? Why Not?

Society of Women Engineers president suggests mothers with engineering training be employed part-time to ease engineer need. Experts see no hope, however, for large numbers of women engineers unless qualified high-school girls elect more science and math

THIS SUMMER, 4,000 new science and engineering graduates are settling into positions in electronics. But another 6,000 positions go begging because of a shortage of qualified young men.

Mrs. Miriam Gurla, Society of Women Engineers president, suggests that women engineers may help ease the engineer shortage in some places. Specifically, she is thinking of women engineers who have quit engineering to raise a family.

Many of her associates, she says, do some engineering work at home during maternity periods and work part-time while rearing children. When such a woman engineer resumes her career full-time, she will be technically up to date.

A survey made by the Society in cooperation with the Department of Labor shows that a third of America's professional women engineers are unemployed. And three-fourths of those unemployed have children under six.

Some firms think that the tight engineering manpower situation could be solved if more women were encouraged to enter engineering.

Westinghouse, for instance, recently circulated a speech by one of the firm's five women engineers. In it, she urged educators not to discourage able schoolgirls with an aptitude for engineering.

Of 34,000 engineers graduated this year, less than 100 are women. The proportion was true in the past. It will probably continue unless, as the National Manpower Commission suggests, emphasis in occupational guidance shifts.

Women engineers agree that it takes early recognition and encouragement of engineering ability for an engineering career. Less than one-tenth of high-school girls take the six semesters of math required to get into engineering school.

Professor Cecelic Froehlich, chairman of City College of New York's electrical engineering department, sees the "masculine tradition" in engineering as a reason for the scarcity of women engineers. Nevertheless, "Girls who graduate have as many job offers as male engineering graduates," Miss Froehlich says.

Women engineers find electronics attractive be-

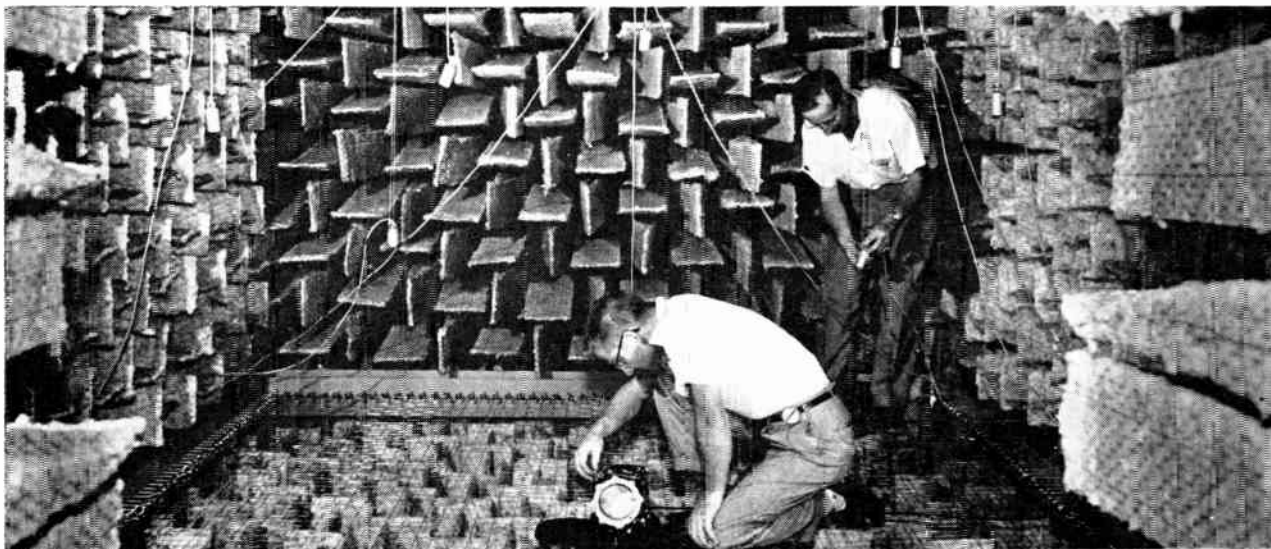


Eleanor Ullman heads Gulton's thermistor section

cause it is new and growing. Electronics manufacturers queried say their doors are open to the women. Most add that they have had few or no applicants for positions.

Miss Eleanor Ullman, head of Gulton's thermistor section, says, "It is harder for women to advance in engineering." But once the employer is confident of competency, she believes, the opportunity for advancement is there. She advises keeping "womanliness" on the job.

IRE membership rosters show a sprinkling of women among larger firms, in family-owned firms and in government agencies. Concentrations appear rare. One exception is Sperry, with 30 graduate women engineers on a staff of about 2,000.



Anechoic room is rigged for sound test, one way

Noise Sells Instruments

- **Commercial and military interest in sound analyzers picks up while \$20-million market for electronic noise makers is seen**
- **Mounting loss-of-hearing claims against industry help push sales of sound-level meters and audiometers past \$3-million mark**

IN BURBANK, California, groups of Lockheed employees are busy blasting noise at an airliner mockup and listening to equipment sounds in an anechoic room.

When the Electra prop-jet goes into service next year, Lockheed will have spent \$500,000 on sound-proofing R&D, including \$25,000 for such acoustical equipment as sound analyzers and recorders.

One reason for commercial interest in noise and noise instruments is sales appeal. The quietest airplane or air conditioner, the machine tool that makes the least racket have an edge with buyers.

Noise control is more vital to the military. Ships must run quietly to avoid detection. Rocket and jet noises can damage electronic components, fatigue metals and injure ground personnel.

Electronic high-intensity noise generators for testing equipment are now appearing on the market in quantity.

RCA, for example, introduced this spring a plane-wave chamber producing controlled sound up to 145 decibels. It comes in two sizes for \$68,000 and \$12,000 respectively.

Bruni Electronics figures the next few years will see \$20 million cumulative sales of electronic noise makers and associated equipment. In addition users will buy \$2 to \$3 million worth of audio oscillators, analyzers and sound spectrometers as noise-control instruments.

Another factor pushing sales is industrial hygiene. The first loss-of-hearing claim against industry was paid in 1951, and since then claims have mounted to an estimated \$2 billion. Excessive noise also adversely affects safety and efficiency.

General Radio says that although commercial sound-level meters are 20 years old, industrial interest has broadened only in the last five years.

Noise-level surveys for corrective purposes and audiometer tests of employees' hearing are becoming routine in noisy industries. Annual sales of sound meters, audiometers and associated equipment for noise-level surveys have swelled from under \$1 million to over \$3 million in less than a decade.

About 300 acoustical engineers make their living in noise control, according to Lewis Goodfriend of the Acoustical Society of America. Each uses at least \$2,000 to \$3,000 in instruments.

Goodfriend values his own collection at \$10,000 and estimates some larger consulting firms own \$100,000 worth. In addition, about 1,000 people are indirectly involved in noise study. These need at least the basic sound level meter and sound analyzer.

Efforts have been made to create commercial electronic sound absorbers. One approach by Harry Olson of RCA, blanks out low-frequency sound in a confined area. It has a microphone, amplifier and loudspeaker connected in inverse feedback. Sound waves are generated out of phase with the offending sound to blank it out.



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McGraw-Hill PUBLICATIONS

Missile Designers Dig In

Russian success in firing an ICBM spurs missile work. New electronic developments cut design time, provide lighter, more reliable components and furnish performance results faster. Miniature batteries, power transistors and microwave tubes have major roles

RECENT announcement by the Russians of a successful intercontinental ballistic missile test adds weight to the heavy emphasis already placed on missile electronics.

Interest in missiles was much in evidence at last month's Western Electronics Show and Convention in San Francisco. Exhibits, papers and products covered the missile business from initial design to final test. Engineers at the conference presented several papers on missile design, particularly on servo systems for attitude stabilization.

Weight-saving, reliability and miniaturization set the theme of several exhibits. For example, Yardney Electric in emphasizing the weight-saving characteristics of its silver-zinc batteries estimates that the flyaway weight of missile airframe and propulsion is increased 30 to 70 lbs to carry each added pound of instrumentation.

Rototest Laboratories thinks it has one answer to more reliable components and therefore more

reliable missiles. X-ray motion pictures are used to study the behavior of electronic components under stress to determine the causes of failure. Industrial x-ray was linked with closed-circuit television in another demonstration.

Infrared equipment attracted a good deal of attention but because of security regulations equipment shown was largely limited to industrial rather than military applications.

Servo Corp. showed a 6-inch infrared transmitting dome for missile applications. The dome is said to offer physical, chemical and optical advantages. A low-cost infrared detection method shown by Hoffman may have uses in missile guidance.

A scale model of the guidance computer for the Atlas ICBM was shown by Burroughs. Also on display was the Dovap, a doppler velocity and position indicator designed by Packard-Bell for an ICBM.

Much of the test equipment shown has applications in the field of missiles. Low-frequency noise generators made by Intercontinental Dynamics for performance simulation of servos are an example. Roger White Electron Devices is making gas-tube noise generators for checking radar systems.

A direct reading of the closest approach to a target by a missile is provided within 15 seconds by a miss indicator shown by Ralph M. Parsons Co. Operating in the range from 10 to 3,000 ft. at line-of-sight distances to 100 miles, it provides a permanent record of missile performance.

Other developments seen at the show have even wider applications. A simplified electrostatic memory unit was shown by Electric Machinery Mfg. Mechanically coupled ceramic disks are used.

Germanium transistors with collector diode ratings of 100 volts were shown by Deleo Radio. Other transistors with 12-ampere, 55-watt ratings were included. Power tetrode transistors by Minneapolis-Honeywell operate on 28 volts with currents up to 10 amperes.

Applications in tropospheric communications were seen for a wide-tuning-range klystron by Varian. The amplifier has internal resonant cavity circuits capable of tuning from 1,700 to 2,400 mc.

Wescon in a Nutshell

ALTHOUGH attendance at the Wescon show fell below early estimates of 30,000, exhibitors manning the 765 booths felt a high concentration of purchasing power was represented.

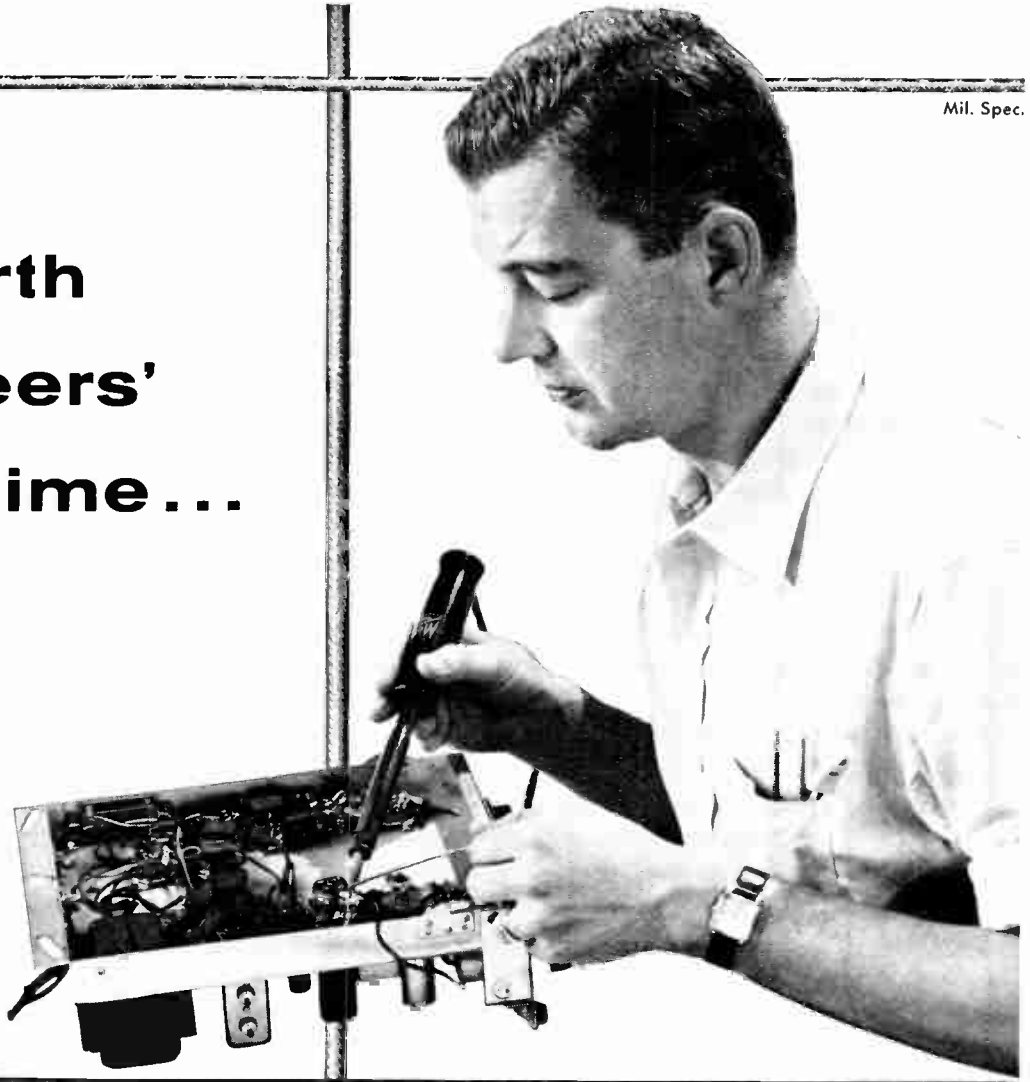
High points of the show included speeches by Army Secretary Wilber Brucker and Ballistic Missile Chief Gen. B. A. Schriever.

Brucker predicted no substantial cutbacks to contractors in the foreseeable future. He reported that development of the Army's IRBM Jupiter is ahead of schedule. Admittedly favoring Jupiter over the Air Force's Thor, he made a plea for the subordination of inter-service rivalry to the main goal.

Gen. Schriever echoed Mr. Brucker's faith in continued prosperity. Two particularly urgent needs cited by Schriever are for advanced data-extraction devices and a reasonably priced, high performance accelerometer.

Three members of a 16-man Russian delegation delivered papers at a specially arranged symposium. Asked what were the most highly automated industries in the USSR, group leader Kotelnikov replied "bread and ball bearings."

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time...



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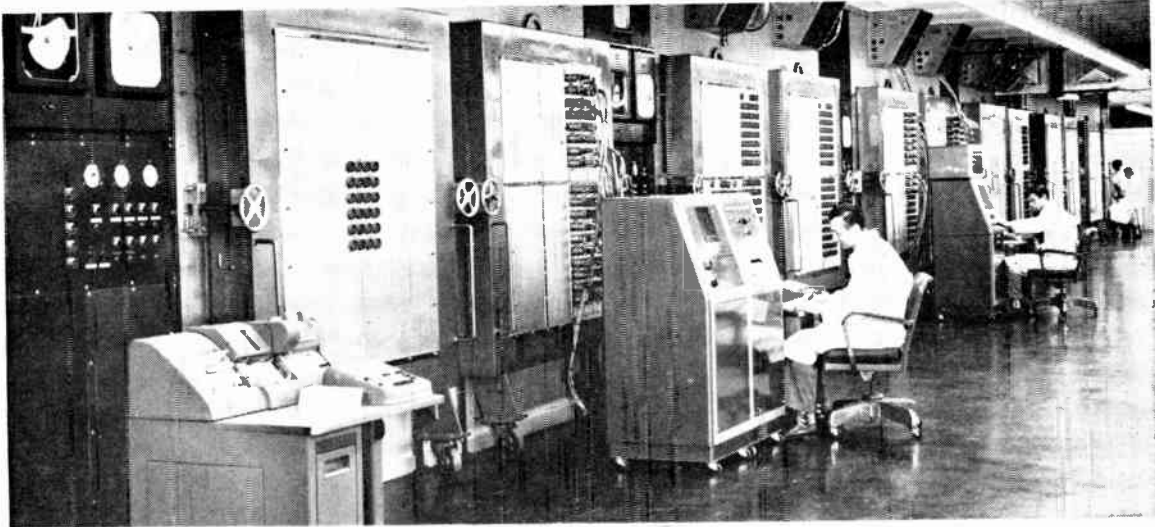
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Technicians test components in mass as . . .

HELPR Aids Parts Choice

- Testing program plans to supply comprehensive data on electronic component reliability to users and makers
- Subscription plan will include detailed analysis of component failures occurring under controlled conditions

RECENTLY released report by the Advisory Group for Reliability of Electronic Equipment in Washington indicates the need for comprehensive data on the reliability of electronic components. One effort in this direction is HELPR (Handbook of Electronics Parts Reliability).

Cook Electric's Inland Testing Laboratory, Morton Grove, Ill., plans to originate, collect and disseminate component reliability data to manufacturers and users on a subscription basis.

Inland's manager, George G. Brown describes the major features of the plan this way: Handbook will aid in choosing reliable components, estimating rates of failure, generating derating curves, designing accelerated tests, writing procurement specifications and establishing acceptance test criteria.

Inland will also conduct detailed analyses on components which fail under controlled test conditions. Data will be available to component makers, supplementing their own research.

At least 9 of a minimum of 40 subscribers needed to initiate the program are ready to sign up. Each subscription will be \$25,000, and additional copies will be \$350 each. Subscribers will get HELPR service for one year.

Subscriptions are not limited to 40. More subscribers mean more components can be evaluated. After program starts, partial subscriptions on component types will be available at reduced rates.

Subscribers will be periodically surveyed to determine components to be evaluated, test procedures, methods of data reduction, and manner of presentation. After selection of components, samples will be screened. Screening will consist of relatively short-term tests, utilizing test-to-failure methods to select manufacturers producing components of a quality level justifying long-term reliability tests.

Screening tests will also establish kinds of failure in different environments, providing a basis for environmental test conditions to be used during more extensive tests. Statistically significant quantities of components will be procured from manufacturers whose parts pass screening tests. Components will then be subjected to the reliability tests. Data obtained will relate component operation and failure rate to environments.

Cook scientists are also considering forming a consultant group within the HELPR framework. It would consist of applications engineers who would conduct training programs for subscribers. Training would be directed toward application of HELPR manual to their specific requirements.

Areas to be covered would include data interpretation, design of nondestructive acceptance tests, statistical implications of reliability studies, utilization of automated instrumentation, preparation of component test specifications and company reliability organization.

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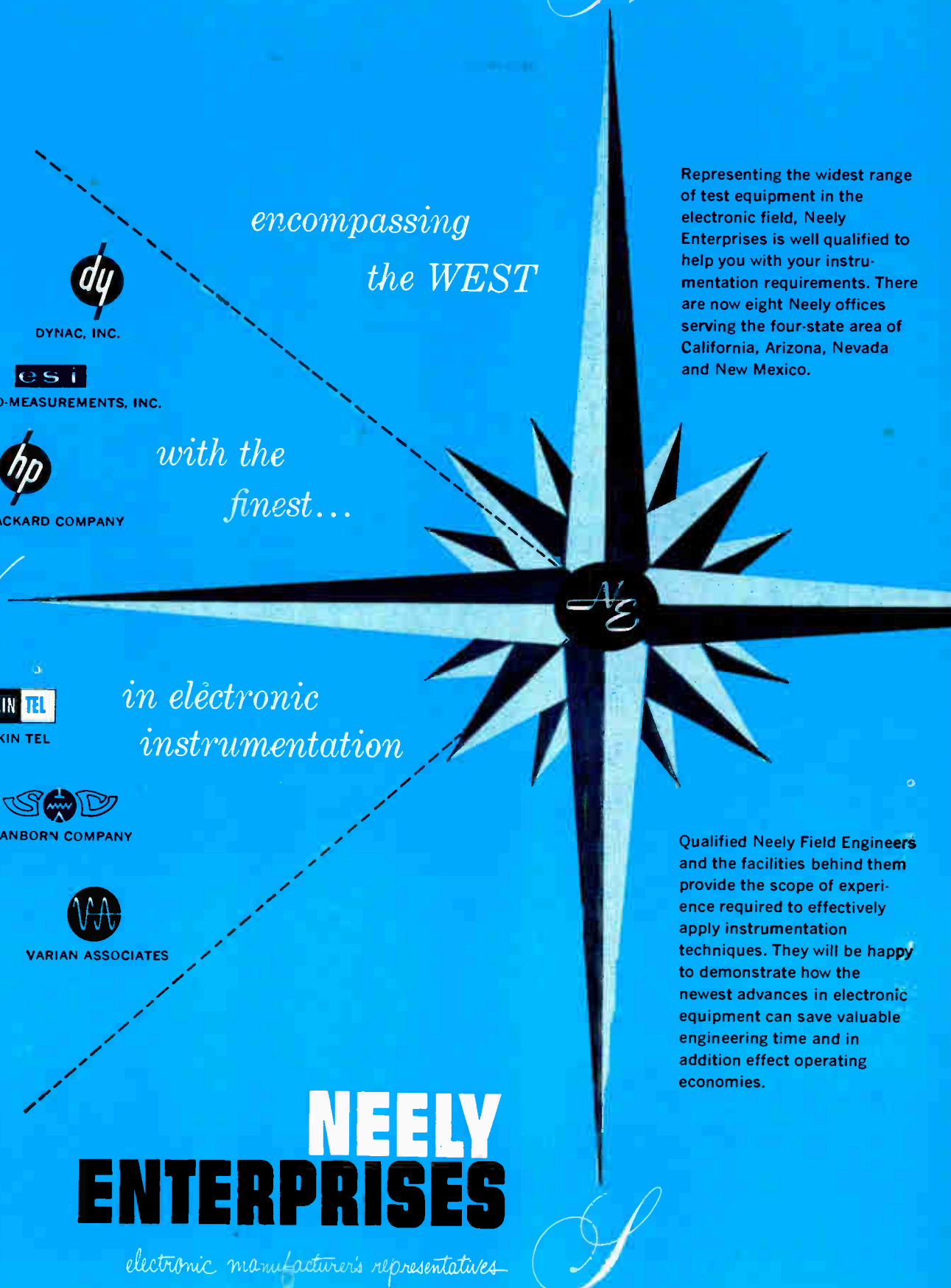


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Sideband Faces Tests

Air Force ready to put synchronous detection system for double-sideband suppressed-carrier transmission through its preliminary paces

MAJOR decisions in the realm of military communications are now shaping up as products of development contracts are put through stringent trials by the armed services.

Undergoing exploratory tests by the Air Force is a technique called synchronous detection. Synchronous detection is named for a method of demodulating double-sideband suppressed-carrier transmissions.

Tests are, at the moment, merely for the sake of setting up procedures. A one-kw DSBSC transmitter is pitted against a one-kw SSB transmitter, a synchronous-detection receiver against an SSB receiver. Rome Air Research and Development Command spokesman emphasizes that present tests are not run primarily for comparison, but to take a look at synchronous detection.

Result so far, says a spokesman, are inconclusive. "There are indications that both techniques have merit for various uses."

Another set of tests will be run by GE under Air Force contract in August. These will be on DSBSC technique for data-handling.

These are the latest developments for a radio technique which originated in seedling form in a 1951 MIT doctorate thesis. The man who wrote the thesis was John Costas. From MIT, Costas went to General Electric, and continued

his interest in synchronous detection.

The thesis was a mathematical analysis of modulation techniques. At GE, Costas went to work bringing a-m "up-to-date."

Enough work was done by 1953 to warrant a Rome ARDC contract worth \$100,000. Project called for development of one 100-watt double-sideband suppressed-carrier transmitter and one 2-30 mc synchronous-detection receiver.

GE produced the development gear. The transmitter, instead of 100 watts, was 150 watts.

In 1954, Rome ARDC amended its contract by increasing the order to 10 receivers and five one-kilowatt transmitters, awarded an additional \$260,000.

To date, all but one transmitter have been delivered. Total money spent: \$360,000 from ARDC contracts and an undisclosed sum by GE.

ARDC intends to purchase another piece of synchronous detection gear from GE—a synchronous adapter. Intended as replacement for a diode detector, it will reputedly make any superheterodyne receiver compatible with everything but wide-band f-m.

"We've delivered some pretty good-looking breadboards so far," says Costas. "We're at the point where we need patience. This is no time for a sales job. It's time for facts."

Cable to Europe Set for 1959

AGREEMENT has been reached on a \$40-million, 36-channel undersea telephone cable to Europe involving the American Telephone & Telegraph Co., the West German Federal Post and the French Post and Telegraph.

Cable-laying will take place in the summer of 1959, with the opening expected later that year.

About 5,000 mi of cable for twin links will be required.

AT&T will have a 64-percent interest in the new cable; the French and Germans will each own 18 percent. Thirteen channels will terminate in Paris, thirteen in Frankfurt and ten in other cities. France now has one cable and nine radio circuits. West Germany now has

twelve radio and two cable circuits,

This is the second European cable project for the American company. The first was carried out in 1955-56 with Britain and Canada. Britain and Canada plan a \$22-million third cable of their own.

The new European cable will be similar to the \$42-million first one opened last year. Deep-sea amplifiers made at the Western Electric Co. Hillside, N. J. plant will be spaced about 38 nautical mi apart. Standard Telephones & Cables will supply shallow water amplifiers.

Terminal points will be Penmarch, France and Clarenville, Newfoundland.

Cable manufacturers are Simplex Wire & Cable Co., Newington, N. H.; Submarine Cables Ltd., Erith, England; Cables de Lyon, Calais; Norddeutsche Seekablewerke, a subsidiary of Felten and Guillaume of Cologne; and Siemens-Halske, Berlin.

Picture Tube Price Up

LAST WEEK tv picture tube makers bowed to inflationary pressures and boosted prices of aluminized picture tubes four to five percent. This is considered a delayed result of last May's increase in price of tube blanks by glassmakers and the rising price of labor.

One example of the rise: GE's 21ALP4A now has a new distributor price tag of \$27.90, up from \$26.65.

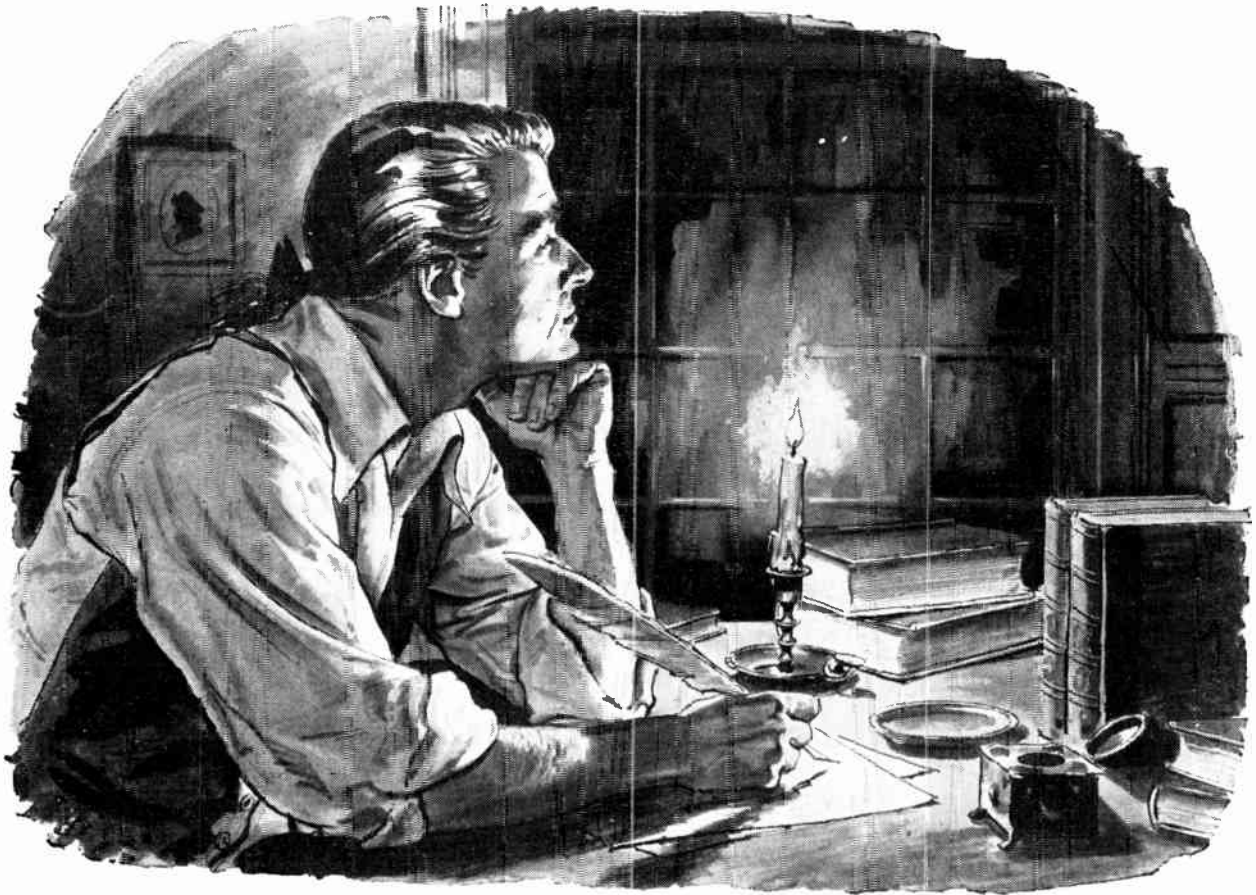
Nonaluminized tubes have not gone up in price. RCA's reason for continuing nonaluminized tube price structure is that these tubes are a small part of the RCA total output.

Sylvania has not now raised the price of aluminized tubes for the equipment market. It had raised them three to seven percent last spring.

Estimates of the picture tube market for the next six months:

- For the equipment market, 3,710,000 aluminized and 75,000 nonaluminized.

- For the renewal market, 2,148,000 aluminized and 1,316,500 nonaluminized.



Where Do Great Ideas Come From?

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So, at the very core of our progress is the college classroom. It is there that the imagination of young men and women gains the intellectual discipline that turns it to useful thinking. It is there that the great ideas of the future will be born.

That is why the present tasks of our colleges and universities are of vital concern to *every*

American. These institutions are doing their utmost to raise their teaching standards, to meet the steadily rising pressure for enrollment, and provide the healthy educational climate in which great ideas may flourish.

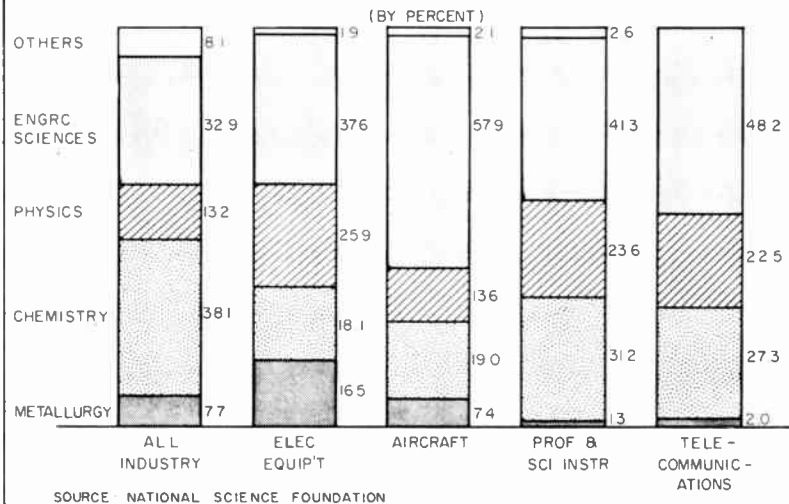
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Distribution of Basic Research by Scientific Fields in Industry



Cost of Basic Research

National Science Foundation reveals industry spends 4% of R&D funds on basic work; chemicals top with 10%, electrical gear and aircraft 2-3%

BASIC research costs in all industries in 1953, compiled and just released by the National Science Foundation, show the electrical equipment industry's \$19.1 million second only to the chemical industry's \$37.8 million.

Based on interviews with research executives of 200 large corporations, NSF classified as basic research:

"Projects which are not identified with specific product or process applications, but rather have the primary objective of adding to the scientific knowledge of the firm."

Cost in 1953 of basic research done in all industries amounted to \$150 million, or 4 percent of the \$3.7-billion cost of all industrial research and development.

NSF compared basic research costs with total R&D in each industry. In electrical equipment and aircraft, basic research cost, though large in dollar terms, represented only 2 or 3 percent of all R&D costs. The same industries each accounted for about 20 percent of all industry R&D. Professional and scientific instruments devoted 6.8 percent of R&D funds to basic re-

search.

Here's how the distribution of basic research shapes up percentage-wise for four scientific fields throughout industry: chemistry, 38.1; physics, 13.2; engineering sciences, 32.9; metallurgy, 7.7.

Within the electrical equipment industry, breakdown of basic research by these four fields puts engineering sciences on top with 37.6 percent, followed by physics, 25.9; chemistry, 18.1; and metallurgy, 16.5.

For professional and scientific instruments: engineering sciences, 41.3; chemistry, 31.2; physics, 23.6; metallurgy, 1.3.

In telecommunications the engineering sciences account for 48.2; chemistry, 27.3; physics, 22.5 and metallurgy, 2.0.

DOLLAR COMPARISON

	BASIC RESEARCH	TOTAL R&D
ELECTRICAL EQUIPMENT	\$19,100,000	\$743,000,000
AIRCRAFT	\$18,100,000	\$758,000,000
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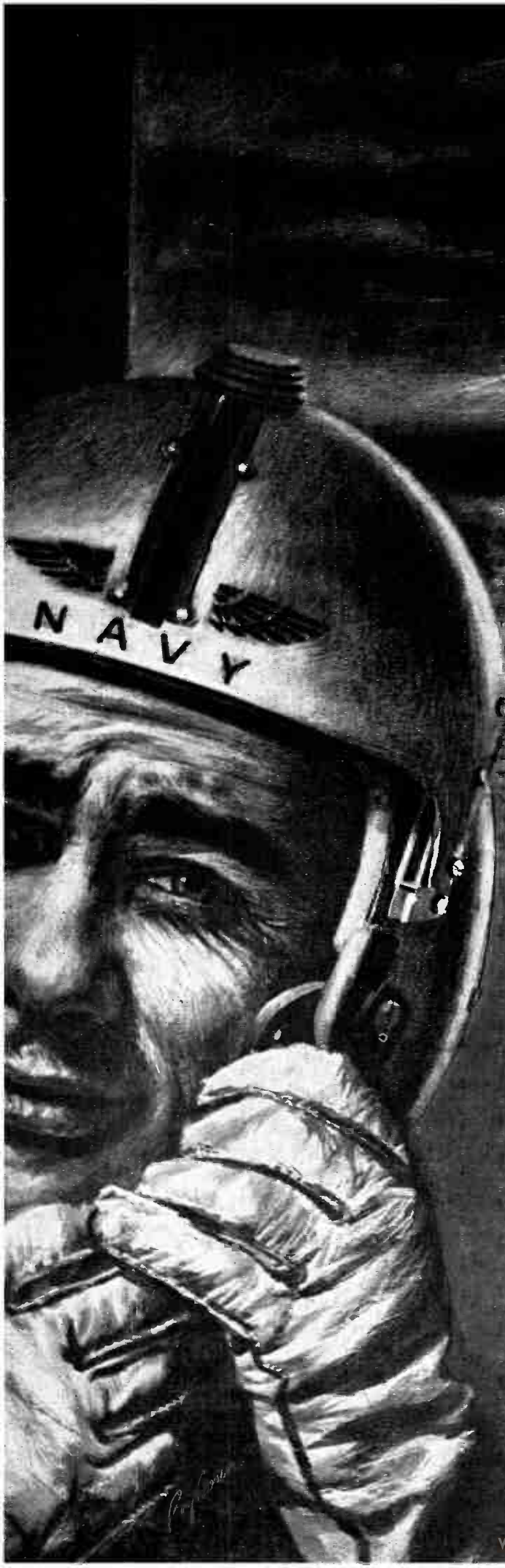
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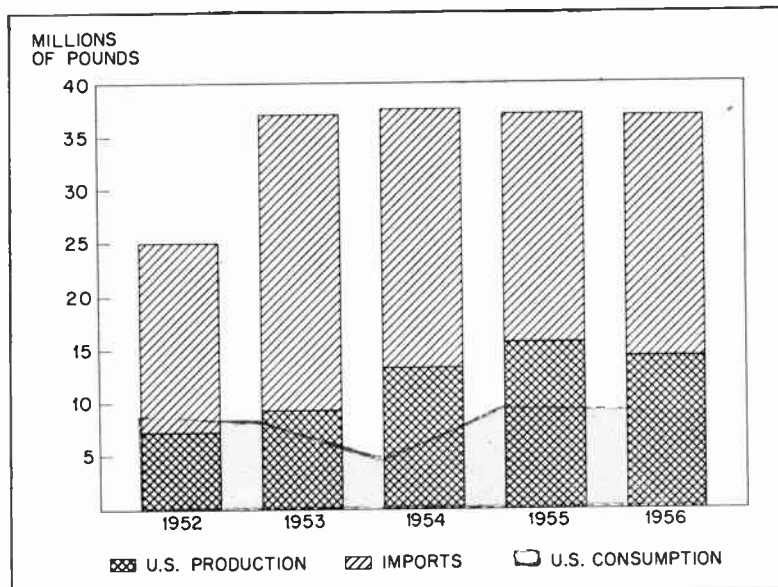
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Consumption levels off as . . .

Tungsten Price Slips

Pure tungsten metal drops 90 cents a pound as government stockpiling ends and market is flooded with ore concentrates. Miners seek higher tariff

ELECTRONICS INDUSTRY, with a need for tungsten for things like electron-tube parts and resistor elements, has somewhat of a vested interest in recent tungsten market developments.

Cost of tungsten is dropping fast. Congress has repeatedly refused to provide \$70 million stockpiling appropriation. By mid-summer, the market was flooded with domestic and imported ore concentrates.

Until mid-1956, stockpiling took all domestic tungsten ore concentrates at \$6,300 a ton. Then payment dropped to \$5,500 and ceased in December.

The world market price dropped from \$3,300 to \$1,400 a ton now. Purified tungsten has eased from \$5 to \$4.10 a pound since mid-1956.

In two years, the number of domestic tungsten mines has plummeted from over 700 to a mere four.

U. S. tungsten producers say they cannot exist at current concentrate prices—about \$2,200 a ton including \$793 duty on imports. They

want a duty-maintained floor of \$4,500 and government purchase of small mines output.

Tungsten stockpiling is law of the land, but Congress is economy-minded. Opinions differ on whether the U. S. will have sufficient supplies in a war.

In the past, wartime needs created fabulous prices. U. S. prices were held in World War II, but at one point Axis and Allied agents bid \$50,000 a ton for concentrates in neutral countries.

Critics of stockpiling argue that 160 million pounds of concentrates on hand are sufficient. High prices, they also say, hold back development of tungsten uses.

Tungsten interests say current consumption and stockpiling figures will be meaningless when high-temperature tungsten alloys go into jet planes, engines and atomic reactors.

In 1956, 1.24 million pounds of tungsten was purified. Most of this went to the electronic and electrical industries—about 14 percent of total U. S. consumption of 8.6 million pounds.

High Altitude Markets Grow

WITH INCREASING traffic to and from regions 15 to 4,000 miles above the earth a new market is growing for equipment to communicate with balloons and rockets, know-how is acquired in meeting demands for long-range telemetry equipment, and knowledge of conditions at extreme altitude is brought back.

- Most recent manned flight by balloon carried USAF Major David Simons to a record 102,000 feet. Contractor Winzen Research supplied telemetering equipment. Signal was c-w, single-channel, 1.7 mc. Low-frequency was chosen so direction finders could track the balloon.

- Before Sept. 20, Office of Naval Research's Project Stratoscope will send a telescope-camera by balloon to 80,000 feet to make photographs of the sun.

Purpose is to study turbulence in the solar atmosphere. Increased knowledge in this field should throw light on radio communication problems.

Telemetry equipment, by Radiation, Inc., uses an f-m electron-tube transmitter on 225 mc, 1,000 cycles maximum bandwidth. Approximate weight is 15 pounds. Equipment will sample 30 channels per minute.

- Project Farside, Air Force Office of Scientific Research's million dollar program, will launch a four-stage rocket from a balloon 100,000 feet high. Final rocket carrying 3½-lb. instrument payload is expected to soar 4,000 miles.

Telemetry equipment was developed and built by Aeronutronic Electronics Lab. Superimposed pdm a-m channels, each having 10-cycles bandwidth, transmit information by modulation of the carrier with two distinguishable pulse widths.

The transmitter relies on 17 transistors for most of its functions, although the crystal oscillator and r-f amplifier are vacuum tubes.

- Another current high-altitude project, being carried out at Fort Churchill, Canada by USAF, Navy and Army uses Aerobec rockets. Seventy-six rockets will be launched during IGY.



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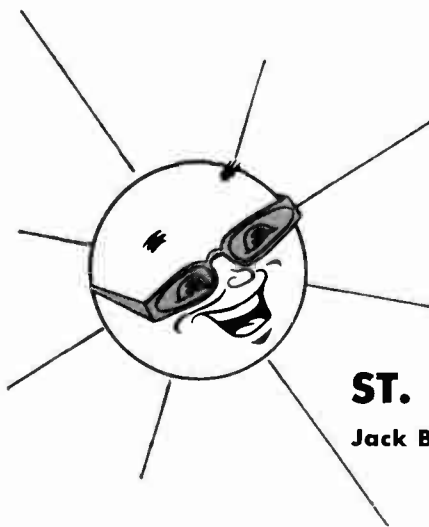
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Army Forms Missile Group

Activation of Redstone group brings operational missile strength to 3 guided-missile models

ARMY's first field artillery missile group was activated September 9, at Huntsville, Ala. Assigned to the 3rd Army as part of the Strategic Army Force, the group will employ Chrysler's Redstone—62-foot-long, inertially guided, surface-to-surface artillery missile.

Two other Army missiles and one rocket are currently operational. They are deployed in battalions as elements in groups stationed in Northern and Central Europe, Italy, Japan and the U.S.

Probably furthest from operational status and most heavily classified of this group is Sergeant, being created to succeed the Corporal. Guidance (type classified) is being developed by Sperry who

also shares prime contractor responsibility with Jet Propulsion Lab.

Fate of Army's IRBM Jupiter against USAF's Thor is currently being discussed by Secretary Wilson's committee consisting of Wilson's special assistant for guided missiles, William H. Holaday, director of Army's Redstone Arsenal, Maj. Gen. John B. Medaris, and commander of ARDC's Ballistic Missile division, Maj. Gen. Bernard A. Schriever.

In answer to recent rumors that "Army is developing six more guided missiles." Under Secretary of the Army Charles C. Finucane says, "Limited feasibility studies of so-called medium-range missiles, with ranges beyond 250 miles, are being conducted."

Army's anti-missile missile program is still top secret. Gen. Gavin has said, however, that Army is putting the largest amount of its fiscal 1958 R&D funds (\$410 million) into the project.

OPERATIONAL						
Name	Category	Range (Mi)	Prime Contract	Guidance Contract	Type Guidance	Remarks
Nike-Ajax.....	Surface-to-Air	25	Western Electric	Western Electric	Command	US Army Air Defense
Corporal.....	Surface-to-Air	100	JPL	Gilfillan	Command	7th Army & SETAF
Honest John.....	Surface-to-Surface	20	Douglas	(none)	Unguided	7th and 8th Armies
Redstone.....	Surface-to-Surface	200	Chrysler	Ford Instr.	Inertial	3rd Army
NEAR OPERATIONAL						
Nike-Hercules.....	Surface-to-Air	85	Western Electric	Western Electric	Command	US Army Air Defense
Little John.....	Surface-to-Surface	...	Emerson	(None)	Unguided	Field Artillery
Lacrosse.....	Surface-to-Surface	12	Martin	FTL	Command	Field Artillery
Dart.....	Surface-to-Surface	1.7	Utica-Bend	Wagner	Visual/electrical	Anti-tank
Hawk.....	Surface-to-Air	25	Raytheon	Raytheon	Radar homing	Low-altitude
Talos.....	Surface-to-Air	100	Bendix	Sperry	Radar	Adopted from Navy
Sergeant.....	Surface-to-Surface	100+	JPL Sperry	Sperry	.....	Successor to Corporal
DEVELOPMENTAL						
Jupiter.....	IRBM	1,500	Chrysler	Ford Instr.	Inertial	
RESEARCH STAGE						
Nike-Zeus.....	Anti-ICBM	...	Douglas BTL	.....	.....	.....

MILITARY ELECTRONICS

- Miniaturized instrumentation converter box for aircraft and missile flight testing will, according to developer McDonnell Aircraft, replace conventional bridge balance boxes and telemeter adapter boxes in flight testing. Size of device is less than 100 cu in. Seven printed circuit cards can be plugged into equipment, replaced according to needs.

- Inflight refueling of USAF planes is now considered routine operation due to compact beacon installed in tanker. Aircraft in need

of fuel interrogates beacon which in turn identifies itself, gives exact range and bearing. Beacon, designated AN/APN-69, was developed jointly by ARDC and Sperry.

- New Charactron shaped-beam tube that reproduces conventional radar display on 5-in screen with identifying notes superimposed on the radar presentation has been developed by Stromberg-Carlson.

Time sharing technique is used, whereby electron beam alternates between printing the radar map and the identifying characters.

CONTRACTS AWARDED

Radioplane gets \$3,692,000 contract with USAF for XQ-4, radar-guided, supersonic target drones. Built with both air and ground-launch capabilities and recoverable by parachute, XQ-4's will be targets for guided missiles and defense aircraft.

Army Ordnance will buy from Radioplane, RP-77D Rangemasters, radio-controlled aerial targets for training Army air defense guided missile crews. Rangemaster can also be used as a drone to carry aloft photographic or tv cam-

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cras, nuclear radiation samplers or weather recording equipment.

Consolidated Electrodynamics will supply ARDC with additional magnetic-tape, recorder-reproducer equipment for testing ICBM's at Air Force Missile Test Center. Contract: \$80,000.

Packard-Bell Electronics gets R&D contract with Army Ordnance District, Los Angeles, for a high-speed, digital computer to work in conjunction with equipment at Army Computation Center, Redstone Arsenal. Equipment will compute the behavior of such dynamic systems as aircraft and missile airframes, inertial guidance and fire control devices.

Packard-Bell also wins two BuAer contracts: \$300,000 for design, development and production of radar test equipment; \$1 million for production of iff equipment for military aircraft.

Texas Instruments has \$1,394,318 contract with USAF for a photographic mapping radar system. When airborne the system produces a continuous strip photograph of the picture appearing on the radar scope covering a broad corridor of the terrain below.

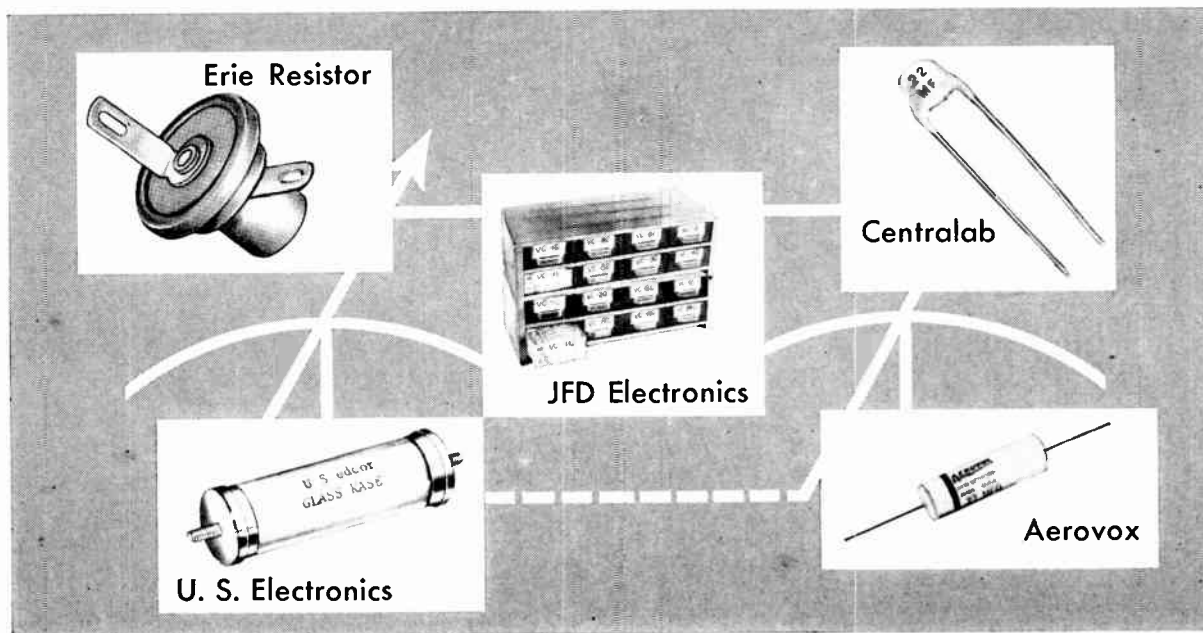
National Co. wins \$609,525 contract from Army Signal Supply Agency for development of military-type Atomichrons. The Atomichron utilizes the atomic principle of frequency control. It compares the precise unvarying resonance of the atoms of cesium with the output of a crystal oscillator to obtain a high degree of stability.

Philco will build f-m multiband radio-relay units and associated parts for field-telephone circuits for Army Signal Supply Agency. Contract: approximately \$10 million.

Magnavox gets \$1,618,800 contract with BuAer for listening sonobuoys, AN/SSQ-2B.

Edo will sell 48 high-precision radar units, AN/SPN-23, for use on small boats to BuShips. Total contract: \$287,712.

More Capacitors Introduced



Resist Heat, Moisture

SMALL SIZE and high voltage ratings, in addition to heat and moisture resistance, are featured in new capacitors. Mica button capacitors announced by **Erie Resistor** (41) for aircraft and missile applications are said to operate continuously at 350 C. **U. S. Electronics Development** (42) announces capacitors hermetically sealed in glass to withstand moisture with voltage ratings from 600 to 50,000 volts for use in oscilloscopes, computers, r-f and pulse circuits.

Disk capacitors for bypass and coupling applications in printed circuits are available from **Centralab** (43). **Aerovox** (44) announces paper tubular capacitors for radio and tv applications said to be completely free of wax. A line of variable piston capacitors is offered in kit form by **JFD Electronics** (45) for research and development engineers.

Rheem Mfg. (46) announces a 120-watt r-f amplifier for use in guided missiles and telemetering systems for long-range coverage. . . . Portable radiotelephones for geophysical applications developed by **Kaar Engineering** (47) operate on 6 or 12-volt batteries. . . . Called the Planimeter, a desk-size analog computer by **Libroscope** (48) can be used for integrating from chart recordings of quantities such as flow, pressure, specific gravity.

PCA Electronics (49) announces

120-microsecond delay line with a rise time of 1.4 microseconds. . . . Rated at 40 watts peak pulse power, an X-band magnetron is announced by **Microwave Associates** (50) for airborne radar beacon and navigation systems. . . . A scope-type data display unit that will present a visible record of up to 20,000 alphanumeric characters per second has been developed by **Advanced Electronics Mfg.** (51).

The type PA3C-1 magnetic amplifier, produced by **Magnetic Con-**

trols, (52), has been designed specifically to provide proportional temperature control in response to resistance changes in a temperature sensor. . . . Hermetically sealed in a stainless steel housing, **Gulton Industries'** (53) ultrasonic transducer is suitable for cleaning, degreasing, processing.

British designed electronic reader by **Solartron Electronic Group, Ltd.** (54) converts printed data automatically into computer language. . . . Small size digital control computer is announced by **Ramo-Wooldridge** (55) for control of industrial process plants. . . . **George A. Philbrick Researches** (56) announces a computing device which provides an output voltage that is an arbitrary function of two independent varying input voltages.

Diffused silicon diode-rectifiers by **Texas Instruments** (57) feature 400-ma average forward rectified current and 600-volt peak inverse voltage ratings. . . . Vibrator power supplies in kit form are offered by **Heath** (58) for operating electronic equipment away from power lines on either 6 or 12-volt batteries.

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that require no ion trap are added to Sylvania's (59) line. . . . **Hycon Eastern** (60) announces availability in mass quantities of crystal filters. . . . Antennas for operation at frequencies from 27 to 90 mc are available from **Tele-Beam Industries** (61) for use at base stations in two-way radio communication systems.

Farrand Controls (62) announces Inductosyns in 7 and 10-inch sizes with accuracies of 2 and 1 second of arc, respectively. . . . A transistorized instrument for civil engineers, contractors, geologists has been designed by **Geophysical Specialties** (63) that determines the depth to bedrock up to 50 feet without drilling. . . . **Saxton Products** (64) now has 300-ohm open-line transmission wire for community tv installations.

Relays for low-power circuits offered by **Iron Fireman** (65) feature total operating time of one to two milliseconds. . . . Two high-voltage fused glass-to-metal hermetic terminals for transformer applications have been developed by **Fusite Corp.** (66) with ratings of 3,500 and 5,000 volts rms. . . . Crystal ovens offered by **Monitor Prod-**

ucts (67) are said to meet or exceed the requirements of MIL-I-1681B and MIL-E-5400.

A transfer function analyzer by **Solartron** (68) is claimed to save engineering time in designing open and closed-loop servo systems. . . . Transistorized dual-pen strip-chart recorders by **Mount Sopris Instrument** (69) are servo-driven, self-balancing potentiometer types. . . . Photoelectric sensing probes announced by **Autotron** (70) feature curved light-conducting Lucite probes to reach hard-to-get-at places.

Accelerometers introduced by **Edcliff Instruments** (71) operate in the range of ± 0.5 g to ± 150 g. . . . Frequency-sensitive detectors have been developed by **Airpax** (72) to operate directly from the transistor amplifier of an electronic tachometer, speed meter, frequency meter or telemetering receiver.

Jan Hardware (73) announces a high-impact shock tester for testing diodes, transistors, relays in accordance with MIL-T-12679A and MIL-S-19500A. . . . Vibration resistant quartz for frequencies from 20 to 150 kc are available from



Outside Looking In

Conductivity meters allow thickness measurement of rough or oxide-coated surfaces says **Magnaflux Corp.** Foundryman uses one to check casting

Adams Associates (74) for missile and aircraft applications. . . . A sensitive relay by Ebert Electronics (75) is said to control 60-ampere loads from a 2-microampere source.

Accelerometers developed by Pacific Scientific (76) feature dual or single potentiometer and/or switch pick-offs. . . . Oscillographs for flight-test recording announced by Consolidated Electrodynamics (77) are said to operate at temperatures from -65 to 250 F at altitudes up to 120,000 ft. . . . Chopper stabilization is used in d-c amplifiers offered by Mandrel Industries (78) for use as preamplifiers with recorders of the meter-movement type.

Machlett Labs (79) announces the type 6623 transmitting tube for use as a power amplifier or oscillator in the 2 to 5-kw power level. . . . Half sine-wave voltage pulses are supplied by Burroughs (80) pulse generator for 1.6 to 10.4 mc. . . . Said to have flat response from 50 to 15,000 cps, Stancil Hoffman's (81) transistorized amplifier is said to have unusually good automatic gain control.

Replacements are available from Amperex (82) for 12AT7, 12AU7 and 12AX7 twin triodes at no extra cost that are said to provide improved performance and reliability. . . . A data logger by Hanson-Gorrill-Brian (83) will sequentially log up to 50 analog variables, continuously, on demand or at timed intervals.

Subminiature connectors are now available from Elco (84) with 16, 40 and 48 contacts of silver-plated phosphor bronze. . . . Glass-reinforced plastic sheet and Teflon are used in space and weight-saving terminal boards announced by Tri-Point Plastics (85) for miniaturized equipment.

Inverters offered by American Television & Radio (86) supply 110-volt, 60-cycle output from d-c sources. . . . Noise chambers for testing electronic components and assemblies used in jet aircraft and guided missiles are announced by RCA (87). . . . Transistorized

power supplies are used in Motorola's (88) mobile radio units, eliminating the need for a vibrator.

Programmed current pulses are provided by a generator introduced by Rese Engineering (89) for the research, development and testing of digital systems and components. . . . Wheatstone bridges covering the range from 0.01 ohm to 1,111 megohms are available from Leeds & Northrup (90) for calibration of resistors and making laboratory resistance measurements. . . . Precision wire-wound resistors featuring tension-free windings are now available from Kelvin Electric (91) with axial leads.

Miniaturized, encapsulated blocking-oscillator pulse generators announced by Spivey (92) are available with triggered and fixed or variable frequency repetition rates from one cps to 200 kc and with pulse widths from 0.5 to 20 microseconds. . . . Potentiometers for pad or trim resistance functions have been designed by Clarostat (93) for use in extreme ambient conditions of temperature, moisture, shock and vibration.

Output voltage from less than 500 to 5,000 volts d-c with regulation of 0.005 percent is furnished by a power supply introduced by Hammer Electronics (94) for use in scintillation counting and ionization chamber work. . . . Rechargeable nickel-cadmium button cells announced by Gulston Industries (95) deliver 1.2 volts for missile testing and telemetering.

Fourteen-channel magnetic tape recorder-reproducer systems have been designed by Consolidated Electrodynamics (96) for handling analog, pdm and f-m signals. . . . Pacific Semiconductors (97) is producing a diode recovery-time tester that allows measurement of the switching transient when a diode is switched from the forward-biased to the reverse-biased state.

A line of capacitors announced by Electron Products (98) in 200, 400 and 600-volt ratings is said to meet all requirements of proposed high-reliability specification MIL-E-14157A. . . . Called the Compu-

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before you decide!



Mr. W. A. Abbott, Jr., Manager of the San Jose Ford plant, made this comment. "Our objective was to increase volume of production. Since opening our new plant in Santa Clara County, we have broken all previous records." Ask any other industrial firm why this community was selected. The answers will convince you!

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Now available
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This popular booklet points up the important sales problem of personnel turnover in industry. Out of every 1,000 key men (over a 12-month period) 343 new faces appear . . . 65 change titles . . . 157 shift . . . and 435 stay put. These figures are based on average mailing address changes on a list of over a million paid subscribers to McGraw-Hill magazines.

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P&B PROGRESS/

UNIQUE DESIGN IMPROVES WEIGHT, SIZE, PERFORMANCE FACTORS

NEW!

Miniature telephone type relay has superior shock/vibration resistance



NEW
POTTER & BRUMFIELD
MG SERIES RELAY

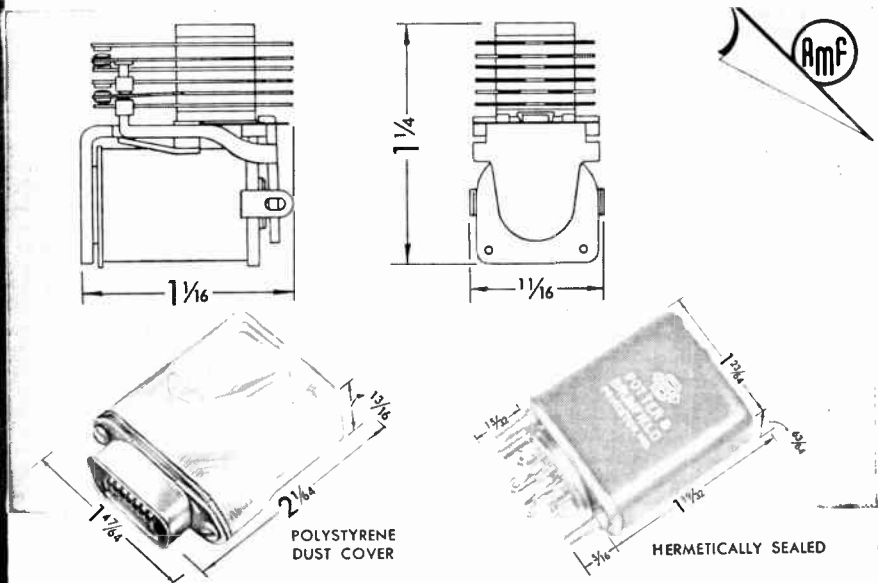
Unusual for a telephone type relay, the MG Series has excellent stability under high shock and vibration conditions. Tests show this miniature, light weight (only 1.2 oz., open) relay withstands vibration of 10g 55 to 500 cycles per second and will operate under shock to 30g according to Mil-R-5757C.

The superior performance of the MG is due in part to its unique single stack con-

struction and to an exclusive hinge design which provides zero heel gap.

Open, dust covered or hermetically sealed, the MG is available with contact arrangements up to 4 Form C (4PDT). It is rated for ambient temperatures of -55°C to $+85^{\circ}\text{C}$. A high-temperature version with a range of -65°C to $+125^{\circ}\text{C}$ will soon be available. Write or wire today for complete specifications and delivery.

POTTER & BRUMFIELD, INC., PRINCETON, INDIANA—SUBSIDIARY OF AMERICAN MACHINE & FOUNDRY COMPANY



MG SERIES

TERMINALS:

Open Relay: Pierced Solder Lugs.

Contacts: Two #18 AWG wires. Coil: Two #20 AWG wires.

Hermetically Sealed:

Miniature plug-in header with 7, 9 or 14 pins. Multiple Solder header with hook and terminals for three #20 AWG wires.

Polystyrene Dust Cover: Micro Ribbon plug-in type.

Mating receptacle: Amphenol #57-20140 or similar.

INSULATION RESISTANCE: 100 megohms min.

VIBRATION: .065" excursion 10-55 cps.

10g 55-500 cps. upon request.

SHOCK: 30g according to Mil-R-5757C upon request.

TEMPERATURE RANGE: -55°C to +85°C.

WEIGHT: 1.2 ozs. (open) 2.0 ozs. (sealed).

PULL-IN SPEED: Approximately 15 ms at nominal voltage.

DROP-OUT SPEED: Approximately 10 ms at nominal voltage.

CONTACTS: 3/32 silver.

CONTACT ARRANGEMENT: 4 pole, double throw (4 Form C).

COIL POWER: 3 watts max. DC @ 25°C. Continuous duty.

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Potter & Brumfield, inc.

PRINCETON, INDIANA

SUBSIDIARY OF AMERICAN MACHINE & FOUNDRY COMPANY

Manufacturing Divisions also in Franklin, Ky. and Laconia, N. H.

Mail the coupon below for further engineering data on P&B's MG Relay plus new compact catalog of standard type relays. If you need answers to a specific application problem, write in detail.

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Attn: T. B. White, Brig. Gen. USMC (Ret.)
Special Projects Engineer

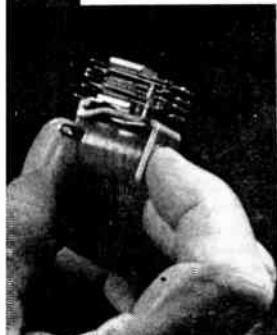
Please send me complete engineering data on the MG Relay plus the new compact catalog of P&B standard relays.

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Company _____

Address _____

City _____ Zone _____ State _____



Coder, a system introduced by Epsco (99) gathers asynchronous digital information and records it on magnetic tape in selected sequence with record numbers and manually inserted fixed data.

Hermetically sealed miniature d-c relays announced by Joseph Pollak Corp. (100) feature 5 percent differential between pull-in and drop-out.

New Product Makers

- 41: Eric Resistor, Eric, Pa.
- 42: U. S. Electronics Development, 1323 Airway, Glendale 1, Calif.
- 43: Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.
- 44: Aerovox, New Bedford, Mass.
- 45: JFD Electronics, 6101 16 Ave., Brooklyn 4, N. Y.
- 46: Rheem Mfg., 7777 Industry Ave., Riviera, Calif.
- 47: Kaur Engineering, P. O. Box 1320, Palo Alto, Calif.
- 48: Librascope, 808 Western Ave., Glendale, Calif.
- 49: PCA Electronics, 16799 Schoenborn St., Sepulveda, Calif.
- 50: Microvax Associates, Burlington, Mass.
- 51: Advanced Electronic Mfg., 2025 Pontius Ave., Los Angeles 25, Calif.
- 52: Magnetic Controls, 6405 Cambridge St., Minneapolis 16, Minn.
- 53: Gulton Industries, 212 Durham Ave., Metuchen, N. J.
- 54: Solatron Electronic Group, Ltd., Queen's Rd., Thames Ditton, Surrey, England
- 55: Ramo Woodbridge, 5730 Arbor Vitae St., Los Angeles 45, Calif.
- 56: Geo. A. Philbrick Researches, 230 Congress St., Boston 10, Mass.
- 57: Texas Instruments, 2929 Cedar Springs Rd., Dallas 21, Texas
- 58: Heath, 305 Territorial Rd., Benton Harbor, Mich.
- 59: Sylvania Electric, 1740 Bway., New York 19, N. Y.
- 60: Ixcon Eastern, Cambridge, Mass.
- 61: Tele-Beam Industries, Atlas Peak Rd., Napa, Calif.
- 62: Farand Controls, 4401 Bronx Blvd., New York 70, N. Y.
- 63: Geophysical Specialties, 4206 Longfellow Ave., Minneapolis 7, Minn.
- 64: Saxton Products, 1661 Bobue Ave., Bronx 16, New York
- 65: Iron Eleman, 2838 S.E. 9 Ave., Portland 2, Ore.
- 66: Fusite Corp., 6900 Fernview Ave., Cincinnati 13, Ohio
- 67: Moulton Products, South Pasadena, Calif.
- 68: Solatron, 10761 Burbank Blvd., North Hollywood, Calif.
- 69: Mount Sopris Instrument, 1320 Pearl St., Boulder, Colo.
- 70: Autotron, Box 722-II, Danville, Ill.
- 71: Edelbit Instruments, 1711 S. Mountain Ave., Monrovia, Calif.
- 72: Airpax, Fort Lauderdale, Florida
- 73: Jan Hardware, 75 N. 11 St., Brooklyn 11, N. Y.
- 74: Adams Associates, 28 N. Queen St., York, Pa.
- 75: Ebert Electronics, 212 26 Jamaica Ave., Queens Village 28, N. Y.
- 76: Pacific Scientific, P. O. Box 22019, Los Angeles, Calif.
- 77: Consolidated Electrodynamics, 300 N. Sierra Madre Villa, Pasadena, Calif.
- 78: Mandel Industries, 5134 Glenmont Dr., Houston, Tex.
- 79: Machlett Labs., 1063 Hope St., Springfield, Conn.
- 80: Burroughs, 1209 Vine St., Philadelphia 7, Pa.
- 81: Stachel-Hoffman, 921 N. Highland Ave., Hollywood 38, Calif.
- 82: Amperex, 230 Duffy Ave., Hicksville, N. Y.
- 83: Hanson-Gorill Brian, 85 Hazel St., Glen Cove, N. Y.
- 84: Eico, M. St., Philadelphia, Pa.
- 85: Tel-Polar Plastics, Albertson, N. Y.
- 86: American Television & Radio, 300 E. 4 St., St. Paul 1, Minn.
- 87: RCA, 30 Rockettelle Plaza, New York 29, N. Y.
- 88: Motorola, 4501 W. Augusta Blvd., Chicago 51, Ill.
- 89: Rose Engineering, 731 Arch St., Philadelphia 6, Pa.
- 90: Leeds & Northrup, 934 Stanton Ave., Philadelphia 44, Pa.
- 91: Kelvin Electric, 5907 Noble Ave., Van Nuys, Calif.
- 92: Spivey, Inc., 1908 Hampden Lane, Washington 14, D. C.
- 93: Clarostat, Dover, N. H.
- 94: Hammer Electronics, P. O. Box 531, Princeton, N. J.
- 95: Gulton Industries, 212 Durham Ave., Metuchen, N. J.
- 96: Consolidated Electrodynamics, 300 N. Sierra Madre Villa, Pasadena, Calif.
- 97: Pacific Semiconductors, 10451 W. Jefferson Blvd., Culver City, Calif.
- 98: Election Products, 430 N. Halstead Ave., Pasadena, Calif.
- 99: Epsco, 588 Commonwealth Ave., Boston 15, Mass.
- 100: Joseph Pollak Corp., Freeport St., Boston 22, Mass.

A-M Stations Near Limit?

Little room is left for new a-m stations. Possible solution to interference gets second test

Room is running out for new a-m radio stations. As of the end of July, 3,095 a-m broadcast stations were on the air. A total of 3,250 were authorized.

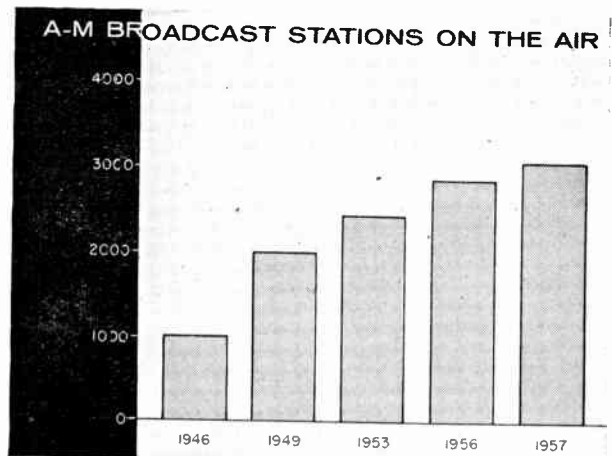
"There's a little room west of the Mississippi," says an FCC official, "but in the East, new stations are going to have to be shoehorned in."

No one has speculated as to the total number of a-m stations that can be fitted in under present FCC rules. One Commission guess: somewhere under 4,000.

That guess is based on the premise that every possible a-m station would be built. Actually economic factors bring the ceiling down considerably. Probably no wide expansion of a-m facilities will take place soon in low-population states such as Nevada, North Dakota and South Dakota.

What building activity is left (around 200 a year) is for local a-m stations. This takes in class 3 (500, 1,000, 5,000 watts) and class 4 (100, 250 watts).

Adding to the congestion is constant station desire for more power. Class 4 stations have recently been asking the Commission for permission to move



up to 1 kilowatt. Though rejecting blanket permission, FCC will hold hearings.

However, one possible solution to the congestion of a-m broadcast stations is now about to undergo its second test. The flagship station of the ABC Radio Network, WABC, New York, N. Y., has received FCC permission to use compatible single sideband transmission. WABC, with this transmission, will use approximately half of the spectrum space it uses with normal double sideband. First test on WMGM, New York, helped interference problems and cleared reception on standard a-m receivers.

FCC ACTIONS

- Grants temporary authority to the Office of Civil Defense of Puerto Rico to operate 15 base stations on frequency 159.57 mc in the Special Emergency Radio Service during the hurricane season.
- Exempts 23 vessels from new ruling that requires vessels carrying more than six passengers for hire be equipped with radiotelephone.
- Permits electric utilities to engage one-way signaling on mobile service frequencies to indicate electric-line failures.
- Proposes to amend aviation rules to make frequency 127.3 mc available for international aeronautical in-flight operations on the East Coast of the United States.
- Considers possibility of authorizing low-power television broadcast repeater stations, sometimes known as boosters. Commission asks for engineering data and comment. FCC had originally dismissed boosters on vhf channels but petition by Governor Steve McNichols of Colorado recently reopened the question.
- Proposes to substitute f-m channel 260 for 281 at Bangor, Maine.
- Adds tv commercial channel 5 to Waycross, Georgia.
- Amends Table A of the Canadian-USA Television Agreement after exchange of letters with its Canadian counterpart, the Department of Transport.

STATION MOVES AND PLANS

Westinghouse Broadcasting separates its four f-m stations from programming dependence on its a-m or tv facilities. WBC president Donald H. McGannon thinks f-m broadcasting is ready now to establish itself as a major medium of entertainment.

WCRW, Chicago, Ill., plans to install a new transmitter.

WMIL, Milwaukee, Wis., installs new transmitter.

WSTU, Stuart, Fla., increases power from 100 to 250 watts.

KCCT-FM, Corpus Christi, Tex., plans to move to Pasadena, Texas.

WRIV, Riverhead, N. Y., increases

power from 500 watts to 1 kilowatt.

WLWT, Cincinnati, Ohio, installs mobile color studio.

WVET, Rochester, N. Y., installs new auxiliary transmitter.

KOME, Tulsa, Okla., control passes from John Brown University to John W. Kluge and Marcus J. Austad. Price is \$100,000. Kluge already has an interest in five a-m stations and one tv station.

WNAM, Neenah, Wis., is bought by Neenah-Menasha Broadcasting (S. N. Pickard, sole owner) from Valley Communications. Price is \$154,000.

WDOB and WDOB-FM, Chattanooga, Tenn., are sold. Buyer Interstate Life and Accident Insurance Co. pays \$200,000 to Earl W. Winger for control.

KPEG, Spokane, Wash., changes hands. P. Kemper Freeman, Ellwell C. Case and Mrs. Florence G. Hayes pay Rogert D. and Martha M. Rapp \$137,500.

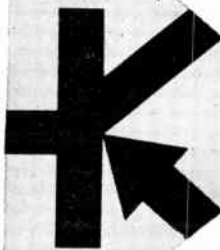
WAEB, Allentown, Pa., becomes the property of WAEB Broadcasters (president, William Rust, Jr.) on payment of \$200,000 to WAEB, Inc.

WNOW, WNOW-FM and WNOW-TV, York, Pa., is bought by WNOW, Inc. (president, William Rust, Jr.) from The Helm Coal Co. for \$255,000.

KCOK, Tulare, Calif., control passes to Joel K. and Harriet E. Munger from KCOK, Inc. for \$42,170.

WGAD, Gadsden, Ala., control goes to Escar L. Roberts, Edward Z. Carrell, Dendy L. Jackson and member of Congress Albert M. Rains. They pay \$25,000.

WFYC, Alma, Mich., control passes to Wayne G. Harris, David Sommerville, H. B. Gase and Gilbert E. and Betty Thomas for \$70,100.



NEW KEARFOTT COMPONENTS



**FOR LIGHT, MORE RELIABLE
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SERVO MOTORS

Standard Kearfott servo motors and servo motor-generator combinations are now available for operation with transistorized amplifiers. These units feature center tapped control phase windings rated 40 volts in series and 20 volts in parallel. Fixed phase excitation to size 8 and 10 units is 26 volts 400 cps and to size 11, 15 and 18 motors 115 volts 400 cps.

SUMMARY OF CHARACTERISTICS

Size	Stall Torque	No Load Speed	Watts Phase	Weight
8	.33 oz. in.	6200 RPM	3.4	2.1 oz.
10	.28 oz. in.	6500 RPM	3.1	1.5 oz.
11	.63 oz. in.	6700 RPM	3.5	4.5 oz.
15	1.53 oz. in.	5300 RPM	6	7.30 oz.
18	2.4 oz. in.	5300 RPM	9	12.2 oz.

TRANSISTORIZED AMPLIFIERS

A new transistorized servo amplifier suitable for driving size 8, 10, 11, and 15 servo motors is also available. This amplifier provides a 40 volt, 6 watt output. Designed to meet the requirements of MIL-E-5400 it is rated for operation over the ambient temperature range of -54°C to $+71^{\circ}\text{C}$. Two captured screws and a recessed connector are supplied with unit. Dimensions $1\frac{5}{8}'' \times 1\frac{1}{8}'' \times 1\frac{3}{8}''$ high, weight 4.7 oz.

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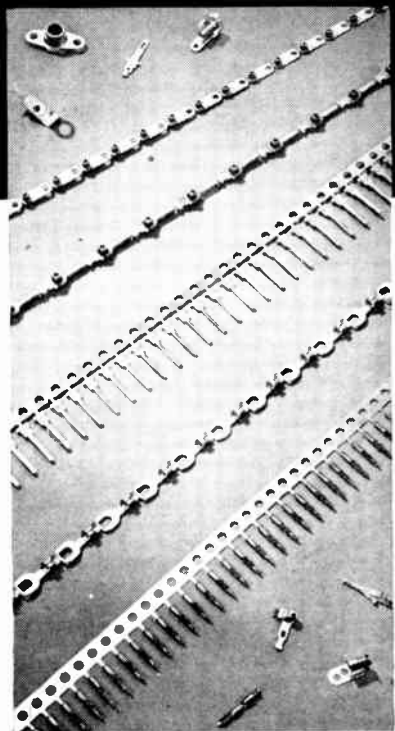
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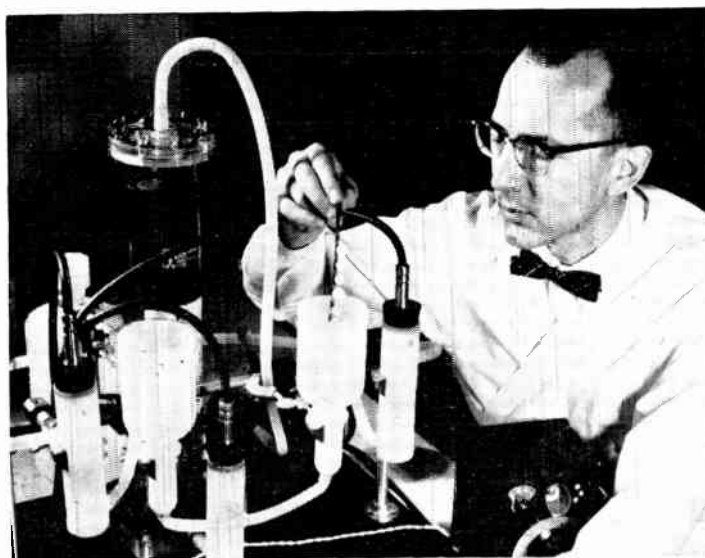


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Device shows new method of . . .

Washing Transistors

New Bell Labs distilled water way uses ionization as cleanliness check. It increases product reliability, reduces manufacturer's rejects

A CONTINUOUS water washing method of removing surface contamination from semiconductor components has been adapted from vacuum-tube techniques by Miles V. Sullivan of Bell Telephone Laboratories.

Bell says the method not only removes water-soluble etching residues, but monitors the effectiveness of the wash. The key is that chemical etches produce inorganic materials which are ionic.

Distilled water, replaced weekly, is continuously recirculated through the system at about two liters a minute. A small deionizing column first reduces the water's conductivity to about 0.1 microhm, as measured in a conductivity cell.

The deionized water then rises through a vertical standpipe in which the parts to be cleaned are suspended on a stainless-steel frame. After flowing over the upper edge of the standpipe, the water passes

through a second conductivity cell and then to a sump for recirculation.

The thoroughness of washing is specified by the conductivity. When the water is no longer picking up ionization, it indicates that the etching residues have all been dissolved and the part is chemically clear. Two minutes is usually enough time.

When used on transistors, Bell says, cleaning by this system has resulted in significant improvements in breakdown voltage, sharpness of voltage-current characteristics, saturation current and emitter reverse impedance. It increases reliability and reduces rejects.

The technique is not a substitute for fabrication cleanliness, Bell warns, since it handles just the inorganic etching materials. Customary precautions against physical and organic contaminants must be followed.

Trainer Simulates Wakes

AN INEXPERIENCED sonar operator picking up echoes from the zigzag wakes of an evasive submarine and a friendly destroyer will probably think he is surrounded by a hun-

dred ships. A new electronic simulator will help the novice to learn the difference.

Reason such normal and important sounds are unfamiliar to him:

existing sonar trainers do not simulate realistically the echoes and attenuation effects from wakes. Typical problem: a wake line between a target and the operator's sonar head will return its own echo as well as attenuate the all-important target echo.

To complicate the situation further, the degree of attenuation and the strength of the wake echoes will depend on such factors as age of the wake, speed of the vessel laying the wake and angle at which the sonar signal passes through the wake.

To train personnel before sending them to sea, Navy recently requested a training device that could remember for 25 minutes the moment-by-moment status of the sea as changed by the lingering effects of friendly and enemy maneuvers. The device must then reproduce to the trainee the realistic shape and intensity of all echoes he would normally receive due to these effects.

Solution to the problem has been devised by Naval Training Device Center, Port Washington, N. Y., and a breadboard model will probably be ready by January. Using either a memory drum or magnetic tape and an analog computer, the new device will memorize for 25 minutes the behavior of the sea and almost anything that occurs to it due to the presence of wakes.

The drum will know the time element and other factors affecting intensity of the signals. The analog computer will determine the proper echo level at any particular moment to send to the audio system of the sonar.

Gruen Applied Science Lab has been contracted to develop the wake simulator. When completed, it is planned that all of Navy's sonar trainers will be modified to incorporate the new device, designated 15R13.

Complete sonar trainers will then be able to reproduce such effects as target's and own ship's speed and course information, relative position information, echo signals and their reverberations, marine life, sea state and pings from other than own ship's sonar sets.

Worker Skills Count

Electronics parts maker finds potential production workers in Florida. One ad brought a flood of 200 job applicants

AN ELECTRICIAN working on a new plant in Fort Lauderdale, Florida, recently saw a toroidal winder being installed. "My wife can operate one of them." And she got a job in the new Airpax building now being occupied.

Although finding an experienced operator was a rare bit of good fortune, Airpax finds many Fort Lauderdale residents have high aptitudes for specialized electronic production work.

This reflects the experience of a number of electronic firms moving to rural areas. Space, low taxes, other advantages were anticipated. But the availability of potential production workers was an unexpected blessing.

Airpax was outgrowing its facilities in Middle River, Md. With no adjacent land on which to expand its plant, it had to seek new quarters. Florida looked good, since recruiting engineers to this vacationland would be easy. In fact, some officials of the company feel that the pleasant environment stimulates engineering creativity.

But what about production workers? A seven-inch ad in a Fort Lau-

derdale paper flooded the United States Employment Services office with more than 200 applicants.

Similar ads in Maryland papers used to bring one or two applicants. Seems most of the production workers already had good jobs with some of the larger firms in the area.

Biggest surprise was the results of aptitude tests for short-run production of special components, generally of the saturable-reactor type. About 40 of the applicants looked like top-grade material.

Frank Rockett, advertising manager, offered an opinion about the results. Many of the applicants are immigrants to Florida, often from rural areas. They're the kind of people with enough initiative to leave home and start a new life. These self-sufficient individuals are often good on this kind of production line. Only limited quantities of components are made before the product is modified. The production worker must change, learn new tricks, make judgments.

"I don't have anything against city people," says Rockett. "But country people seem more used to doing things on their own."

Computers Cut Design Cost

COMPUTERS are shrinking airplane development. So said Frank B. Cozzone, Lockheed's manager of mathematical analysis while speaking to the NATO Advisory Group for Aeronautical R&D in London.

Electronic computers have held mathematical analysis costs on development of Lockheeds' Electra to \$238,400 for the period July 1955 to April 1957. Without computers, states Cozzone, the cost would have been \$112 million or 470 times larger.

Computers let engineers set up more accurate and complete representations of a problem than previ-

ously possible, Cozzone says. Most of engineer's time can be spent analyzing the solutions and studying new fields. Computers do the dog labor.

Lockheed's computers gathered rapidly information about the Electra that would normally have taken months of wind-tunnel and flight-test work.

Computers have done complete analyses of the Electra over customer routes. They have been let loose on a variety of problems: aerodynamics, thermodynamics, acoustics, structures, engine performance, fuselage heating and many other items.

Nato: \$500 Million Kitty

U. S. may pay half of \$2 billion program that is 25% electronic; Nato silent on awards

WHEN CONGRESS passes a foreign aid bill, it may release more money for electronics in Europe under the Nato infrastructure program.

Infrastructure is the military and civilian construction program to provide facilities that would be needed by Nato forces in the event of war.

The administration wants to increase the U.S. contribution to the \$2 billion program from \$780 million to \$1 billion. Other Nato countries contribute the remainder.

An estimated \$500 million, roughly one-fourth of the overall construction program, is being spent by the Nato nations for telecommunications facilities, radar installations and radio navigation aids.

Infrastructure contracts, with the approval of the North Atlantic Council, are let by each "host" country under a system of international competitive bidding.

American firms that establish "proof of competence" with the Trade Development Division, Bureau of Foreign Commerce, are eligible to seek Nato contracts.

In Paris the U.S. Regional Office has made con-

solidated lists of certified firms and furnished them to all Nato countries. Recently, more information has been funneled back to Washington for publication by the Department of Commerce.

American firms that have been unaware of Nato contract procedures from the start have apparently been slow to show interest. In the face of a close-mouthed policy on the part of some European countries, the U.S. has come to realize that American companies could get more Nato contracts than they have been getting.

In asking Nato for information about communications contracts already awarded, ELECTRONICS discovered some of the international political intricacies involved in the Nato program. The infrastructure committee in Paris said it knew how much has been spent on communications in each country and which firms got the contracts, but that it would not release the facts.

The committee freely admitted that the information was classified for political, not military reasons. Much of the communications money is being spent on national telecommunications lines, an official explained. He suggested that individual nations did not like to tell their people that such improvements are being paid for in great part by the U.S. through the Nato program.

DEVELOPMENTS ABROAD

- **West Germany's** weather service has put into operation ten control stations for checking the radioactivity of air and rainfall all over the country. Measurements are taken every 20 minutes at each station, with a warning signal given if a critical amount of radioactivity is found in three subsequent measurements. Geiger counters are used to examine for radioactivity a filter that catches microscopic pollution particles. The service is also developing balloon-borne instruments for checking on high-altitude radioactivity.

- **In London** Mullard reports it developed the infrared photocell for the Firestreak air-to-air, heat-seeking guided missile, shown publicly for the first time this month.

- **France's** National Assembly has voted itself a \$500,000 electronic pushbutton system for recording votes. The system, which will go into operation by the end of the summer recess, will take seconds to tabulate votes by the assembly compared to the 90 minutes sometimes required now.

- **Britain's** General Post Office, which runs the nation's telephone system, plans to install an electronic telephone exchange by 1958. The GPO has been engaged in a research program with five British firms—Automatic Telephone & Electrical Co., Ericsson's Telephones Ltd., General Electric Co., Ltd., Siemens Brothers & Co. and Standard Telephones & Cables Ltd.

EXPORTS and IMPORTS

In Brussels, Belgium, IBM's rapidly expanding network of computer centers gets its latest addition Sept. 12. It's the fourth IBM 650 center to be opened outside the U.S. this year. Others are in London, Toronto and Caracas. A model 704 computer was also added to the Paris center. IBM World Trade Corp. expects that Amsterdam, Zurich and Stockholm will have model 650-equipped computer centers before the end of 1957.

Toronto firm of A. V. Roe Canada Ltd. and General Precision Equipment Corp. of New York have concluded an agreement to sell and manufacture their products on a reciprocal basis. Consolidated net sales in 1956 were \$201 million for A. V. Roe and \$153 million for

GPE. Canadian Applied Research is the member of the A. V. Roe group primarily concerned. GPE participants include Link Aviation, Kearfott Co., General Precision Laboratory and Askania Regulator Co.

Nato air defense radar equipment will be developed cooperatively by Compagnie Francaise Thomson-Houston of France and Decca Radar Ltd. of England. The French firm has specialized in antenna systems now used by French and other Nato forces. An agreement will enable these antenna systems to be hooked up with high-powered transmitters and displays, a Decca specialty.

West Germany's production of tv sets during the first five months of this year reached 288,000 units, 54 percent more than during the same period last year. So far sales have lagged behind the increased output but are expected to jump in the fall and winter. Total 1957 production of 800,000 tv sets is expected, compared to 600,000 in 1956. Export outlook is 160,000 units this year, compared to 60,000 last year.

French firm Societe Anonyme Precilec of Paris will manufacture and sell Norden-Ketay synchro and servomechanisms in France under a new license agreement. Increasing demand in French industry and defense efforts for synchro and servo-mechanisms was cited in the announcement by the Norden-Ketay Corp., Stamford, Conn.

Federation of Nigeria has issued a policy statement describing plans to allocate \$12.6 to \$16.8 million for expansion of telecommunications services. Loan copies of the statement are available from the Near Eastern and African Division, Bureau of Foreign Commerce, Department of Commerce.

In Britain agreement is reached between Bendix Aviation Corp. and Thorn Electrical Industries for the manufacture in Britain of U. S.-designed multipin plug and socket connectors for guided missiles and supersonic aircraft.



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Write for Bulletin NA 100
 Electronic Instruments Department

ELECTRONICS DIVISION
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and guided
missiles*



The Sanders Minicube Blower contains both miniature blower and motor in a rugged, 1" cube. A single package, it is designed for use on aircraft and guided missiles operating under severe environmental conditions. It is operable over wide ranges of vibration, acceleration and temperature, and is suitable for many exacting applications.

The Sanders Minicube Blower can be used to:

- Eliminate hot spots in subminiature equipment
- Prevent fogging of lens or viewing glasses
- Cool Klystrons and other electronic tubes and devices
- Maintain uniform flow of air in restricted space

SPECIFICATIONS

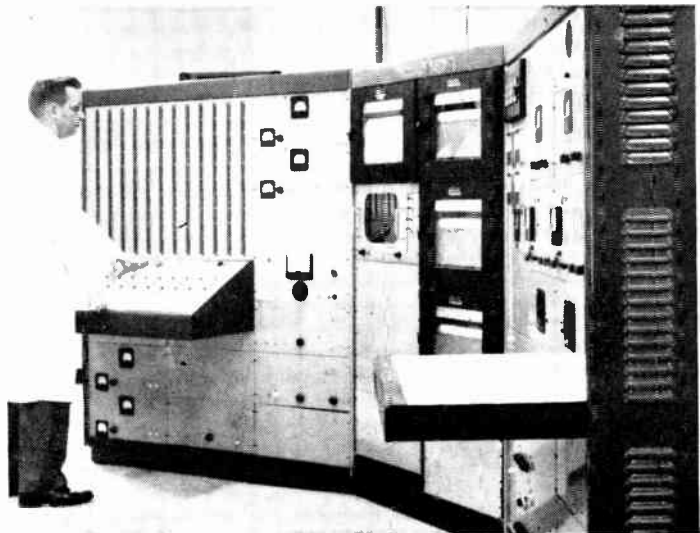
Output: 3 cubic feet of air/minute	Speed: 22,000 RPM
Input: 400 cps, 4 watts	Size: 1" x 1" x 1"
Voltage: Model 1: 6 volts Model 2: 26 volts	Weight: 1 oz.

For detailed specifications,
write Dept. E



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PLANTS and PEOPLE



Atom Test Center Opens

WESTINGHOUSE Electric opens a new reactor evaluation center (picture) on an 850-acre tract 29 miles southeast of Pittsburgh.

Charles H. Weaver, Westinghouse's atomic power v-p, says the center will be used "to check out reactor calculations and the value of various types of control rods in prototype cores for power reactors." Perry W. Davison moves up to manage the new facility.

First major job for the center will be to test the core for the big reactor Westinghouse is building to test nuclear materials. The testing reactor is going up on the same 850-acre site, will be completed late next year. Meantime the evaluation center is working on other industrial jobs.

The center contains a combined office and shop area, a control room and a critical experiment room. In the experiment room is a 37-ft steel-girder "tower" which will support nuclear core tanks as tests are conducted on the cores.

Engineers will take test readings on the monitor console in the control room by remote controls and instruments. Closed-circuit tv will let control operators observe activity inside the experiment room.

Meanwhile, the rest of Westinghouse has been busy. Firm's carrier-microwave department has expanded its facilities in Haleshorpe,

Md., with a new office building next to the manufacturing plant. Transformer division opens a new plant in Los Angeles especially to serve West Coast aviation and electronics firms with specialty transformer products. A new 24,000-sq ft manufacturing and repair plant will shortly go up on a 6½-acre site outside of Charlotte, N. C.

And the firm's electronic tube division in Elmira, N. Y., gets a new general manager as B. W. Sauter moves up from a plant managership. He replaces v-p R. T. Orth, who leaves Westinghouse to

BUSINESS MEETINGS

Sept. 17-18: Electronics Industries Association (ex-REITMA) Symposium on Machine Tool Control Systems, Ambassador Hotel, Los Angeles.

Sept. 24-25: Sixth Annual Conference on Industrial Electronics, Morrison Hotel, Chicago.

Oct. 7-9: National Electronics Conference, Hotel Sherman, Chicago.

go with Sanders Associates, Nashua, N. H.

Shifts at Royal Electric

ORGANIZATIONAL shifts at Royal Electric Corp., Pawtucket, R. I., follow the intracompany trade between Royal, an associate of IT&T, and Federal Telephone & Radio, an IT&T subsidiary.

FTR recently transferred its Federal Cable division to Royal Electric as part of IT&T's plan to clean up its organizational lines. Now Royal has hired Edwin R. Sine to take over as general manager of Federal Cable.

Sine brings J. Leon Brodsky in as chief product engineer. Brodsky is a longtime FTR man, served as chief engineer of its wire and cable department since 1949. He now heads up all product design, R&D and quality control.

Royal also hired Harold Roveda as manufacturing superintendent for its cable line. Roveda had to resign two jobs to take the Pawtucket appointment: one as manufacturing executive for a cable plant in New Jersey, the other the office of Sussex County (N. J.) Commissioner of Elections, to which Gov. Robert Meyner appointed him in 1954.

FTR sales executive Pat J. Morrisey moves to Rhode Island to become sales manager of Federal Cable.

Magnecord Moves

MAGNECORD division of Midwestern Instruments Inc. is moving from Chicago to Tulsa, Okla. All of Magnecord's management and most of the skilled technical employees will make the move southward, with Midwestern paying moving expenses.

Magnecord will occupy some 40,000 sq ft on the ground floor of Midwestern's home plant on a hilltop overlooking Tulsa.

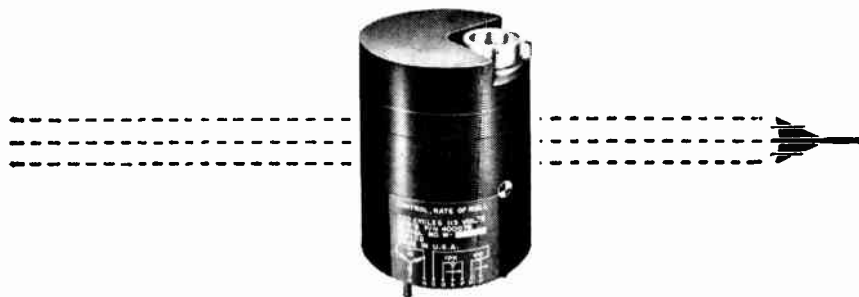
Senior v-p E. J. Handley, who has served as general manager of Magnecord since Midwestern bought the company last December, says Magnecord will keep a

Announcing...

WALTHAM FLOATED RATE GYRO

Type WG-4

The WG-4 Floated Rate Gyro is of miniature size for aircraft and missile use and is intended to supply a large output signal from each of two potentiometer pickoffs under severe conditions of temperature, vibration and shock. The basic design incorporates a single phase spin motor with high precision governor to render overall performance independent of line voltage and frequency. Gimbal fluid damping is provided with internal compensation for temperature, hence the unit does not require temperature control. A high degree of null and scale factor stability is achieved through a low stress torsion bar design. The gimbal system is supported on bearings independently of the torsion bar. A generous provision for differential expansion eliminates fluid leakage and hermetic seal problems.



SPECIFICATIONS FOR BASIC UNIT

INSTALLATION

DIMENSIONS: 2¼" dia., 3¾" long
EXTERNAL ELECTRICAL connections via Viking VR9/2AG1 connector. Weight 1.0 lb.

SPIN MOTOR

EXCITATION: 115 volts, 400 c.p.s., single phase
POWER: 5.5 watts
STALL CURRENT: 105 ma.
RUNNING CURRENT: 60 ma.

POTENTIOMETERS

TOTAL RESISTANCE: 10,000 ohms
MAX. RECOMMENDED EXCITATION: 50 volts

PERFORMANCE

MAX. INPUT: $\pm 75^\circ/\text{sec.}$
MAX. NULL OUTPUT: $\pm 1^\circ/\text{sec.}$
DAMPING FACTOR: 0.8 ± 0.2
NATURAL FREQUENCY: 19 c.p.s.
WARM-UP TIME: Less than 1 minute
AMBIENT TEMPERATURE RANGE:
 -55°C to $+71^\circ\text{C}$
LIFE: 1000 hours minimum
ENVIRONMENTAL: MIL-E-5272A

NOTE: Units can be supplied to this basic design with other motor inputs, pickoffs, etc., to suit particular applications. This information is for reference ONLY. Engineering Specifications and Drawings will be supplied upon request.

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firm's Grayson Controls division, moves into Taylor's old job.



TI Hires Nimitz

TEXAS Instruments cops Chester W. Nimitz Jr. (picture), 41-year-old son of the World War II Pacific fleet commander-in-chief, will groom him for a post in the apparatus division. Nimitz recently retired from a captaincy after 21 years in the Navy, mostly in the submarine service.

According to apparatus division chief W. F. Joyce, TI will rotate Nimitz through jobs in all divisions of the company before slipping him into a management slot in the apparatus division.

New Firms Spring Up

SUMMER'S end finds a rash of new companies springing up across the country.

In Montclair, N. J., the Reltron Corp. begins to manufacture high-temperature subminiature relays. Robert Wadman is president of the new firm.

In Redwood City, Calif., Henry Francis Parks sells the laboratory that bears his name, becomes v-p of a new instrument firm called Parks Electronics. New firm has leased 6,300 sq ft of plant space for manufacture of instruments and relays. J. Wm. Houck Sr. is secretary of the corporation and executive general manager of the plant.

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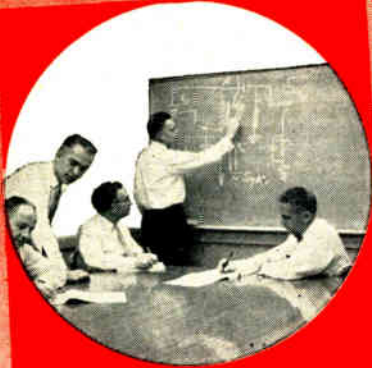
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will be handled by Nelson Park Corp., Seattle, Wash.

An automatic dip-soldering machine will be the principal product of the C Scientific Co., now doing business at the Santa Barbara airport, Goleta, Calif. The firm also plans to develop and make transistorized microminiature assemblies, production-line test gear and special test equipment for missiles. Consultant is Eugene R. Crippa, former chief engineer for Electronic Products Corp.

Telemetering Corp. of America is a new addition to the ranks of companies attacking the instruments-and-automation field. The firm will emphasize telemetry as applied to missiles, rockets and other airborne vehicles. Industrial telemetering will also be explored. Administrator William A. Cooke takes office as president of the firm, and Hugh F. Pruss, who helped develop the Navy's Lark, is v-p and chief engineer.

In the Midwest, J. R. Goldberg, onetime Allied Radio man, leaves Olson Radio Warehouse Corp., where he was merchandising manager, and sets up a new firm called Mars Manufacturing Co. The company is headquartered in Akron, O., will manufacture radio kits.

And in New England, CK Components starts doing business in a 9,000-sq ft plant in Watertown, Mass. CK will make magnetic shift registers and lumped-parameter delay lines. Heading the firm are two ex-Epsco men: Marshall M. Kincaid, president and Charles A. Coolidge, Jr., treasurer.

Shortage Still On, Teachers Told

REPORTS that the engineer shortage is a thing of the past continue to come in, but the denials are getting louder. John R. Mayor, director of education of the American Association for the Advancement of Sciences, was outspoken on the subject recently. "Do not believe," he told high school teachers meeting at Michigan State University, "that there is no longer a shortage of engineers and scientists."

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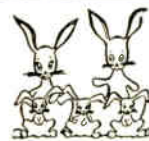
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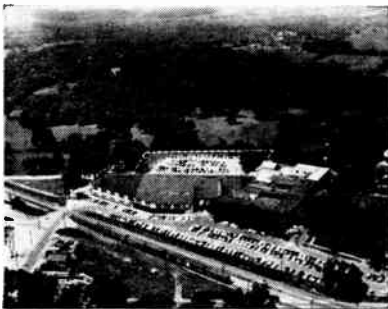
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Science Institute, Mayor cited a recent survey which showed that in southern California alone, where 30,000 engineers are employed, area industries say they could absorb 90,000 if they were available.

He described how more and more industries are backing programs in scientific education, both public and private, to keep the nation growing in the technologies.

Spokesmen for several electronics firms have indicated to *ELECTRONICS* that softness in the engineer market is at worst a local problem. "Take those men out at North American," said one recently. "They'd have no trouble finding good jobs if they'd move East."



DuKane Plant Grows

Over in St. Charles, Ill., the DuKane Corporation is building a 1½-acre addition onto its production plant (picture).

Construction work began last month, will be finished by late fall. DuKane expects to be making full use of the new production facilities by winter. Most of the space will be used for stepped-up production of defense products.

The company will add 250 employees to present 800-man complement when the addition is completed.

Dynac Gets New Execs

HEWLETT-Packard's instrument-making affiliate, Dynac Inc., draws a new top-management hand.

Robert E. Rawlins, general manager at Dynac since its incorporation early last year, moves into the job of president. Rawlins was a

longtime Lockheed man before joining Dynac, specialized there in electronic instrumentation.

At the same board meeting that moved Rawlins up, H-P exec v-p William R. Hewlett became chairman of Dynac's board. He had been president of the affiliate.

Plant Briefs

IN NEWTON, Mass., Datamatic Corp. acquires 75,000 sq ft of additional space to expand production of its coming-soon data-processing systems.

Weller Electric will add 40,000 sq ft to its plant in Easton, Pa., to enlarge production and engineering facilities. The 11-year-old firm makes soldering guns and electric power tools.

Hamilton Watch Co.'s Hathaway Instrument division moves into a new 45,000-sq ft plant in Denver which houses both lab and production facilities.

Northeast Electronics moves into a new 6,000-sq ft plant in the Concord, N. H., industrial park.

Executive Moves

LONGTIME Zenith merchandising expert Robert C. Wallace moves in as general manager of subsidiary Zenith Radio Distributing Corp.

New general sales manager for Potter & Brumfield is Nelson Havill, moving up from a field sales managership.

Lyle L. Clark leaves Armour Research Foundation to take over as manager of Fansteel Metallurgical Corp.'s \$6.5-million tantalum-columbium plant in Muskogee, Okla.

Engineer Peter Pohl leaves Hughes Aircraft to take the post of v-p and general manager of Los Angeles' Video Instruments Co. Condenser products division of New Haven Clock & Watch Co. gets a new general manager as Harold B. Rosenberg moves in.

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New Reps Open Shop

INDUSTRY emerges from the summer doldrums to find some new manufacturers' representatives doing business.

In Burlingame, Calif., G. S. Long leaves Westinghouse to form **Long & Associates**, serving northern California, western Nevada and Hawaii. Long's firm will handle test gear and control equipment.

Rep. Jack W. Falek and former Hycon salesman John R. Foster join forces in **J-F Sales Co.**, new rep firm in Los Angeles. The company will specialize in components and instruments, covering southern California, Arizona and southern Nevada.

Cappels & Associates, new rep organization in Chicago, will sell industrial instruments in Illinois, Indiana, Wisconsin, Iowa and Minnesota.

New reps for the components of Perkin-Elmer's Vernistat division

in Norwalk, Conn., are **John J. Goode Associates**, Ashland, Mass., and **Specialized Equipment Corp.**, Cocoa Beach, Fla. Goode will serve all New England, and Specialized Equipment will cover the deep South.

Chicago's **Harry Halinton** takes on the sound equipment line of **Mark Simpson Mfg. Co.**

Victoreen Instruments' line of components and instruments is now sold in northern California and Nevada by **R. L. Pflieger Co.**, San Carlos, Calif.

T. Louis Snitzer, Los Angeles, now serves **Polarad Electronics** in Arizona, California and Nevada.

Two new reps have taken on **Corson Electric's** pulse-forming networks. **Goode Associates**, Ashland, Mass. and **George H. Weiland**, N. Y.

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In Our Sept. 1 Engineering Edition, Don't Miss . . .

• **Rapid Tuning.** A high-power, quick-tuning uhf transmitter that improves scatter communications over line-of-sight distances is discussed by C. R. Ellis of General Electric and K. Owen of McIntosh Electronics. Equipment uses a low-distortion amplifier-modulator to cover the 225 to 400-mc range. Demodulated output feedback gives less than 3-percent rms harmonic distortion over 200 to 20,000-cps range within the stated r-f range, with 80-percent amplitude modulation of 1,000-watt carrier. An r-f drive of 80 watts is required.

• **Narrow Pulses.** Transistorized pulse generator produces pulse amplitudes of 28-v negative, 50-v positive with widths continuously variable from 1.0 to 10 microsec and rise-decay time of 0.3 microsec. According to E. J. Fuller of Sperry Gyroscope the internally generated repetition rates vary in steps from 50 to 5,000 pulses per second with external triggering by either positive or negative pulses. Time delay from 1 to 100 microsec is generated internally.



Coincident-sound system simplifies home movie projection

• **Two-to-one Economy.** A component-saving multivibrator consisting of three resistors, one capacitor, one diode and one unijunction transistor is discussed by E. Keonjian and J. J. Suran of General Electric. Circuit can be astable or monostable in operation and has particular applications in digital computers and counters where component cost and network complexity can be restrictive.

• **Rectangular Regulation.** William Seism of Convair describes a pulse-

type transistor voltage regulator which uses voltage-controlled pulse generators. An astable multivibrator provides square-wave output over frequency range of 100 to 3,600 cps. Frequency is determined by magnitude of control voltage over 12-to-one range. Pulse width of a monostable multivibrator is varied over 10 to 280-microsecond range by changing control voltage over four-to-one range.

• **Pic-Sync.** A method of locking in a home movie projector to tape sound track has been developed by James Whitaker of Hughes Aircraft. Movie sound and a power frequency control signal share dual track tape to synchronize picture to audio. Sync signal from projector supply line modulates tape through filament transformer and auxiliary record head without erase or bias. During projection, amplified control signal is fed to synchronous motor coupled to projector power train. Auxiliary motor acts as synchronous brake on projector speed which is adjusted slightly above frame rate.

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number of manufacturers increased to 4013 from 3727 in 1956. 87 new products were added in 1957 for a total of 1773.

USE: Whether you are concerned with the design, production, or use of electronic circuitry, turn to the listings of the **electronics BUYERS' GUIDE**. Here you will find the page numbers that refer you to catalog-type advertising, specially prepared to supplement the listings and give you the technical information you must have to specify and purchase electronic and allied products.



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World Radio History

Two Ways

to Break Sound Barriers . . .



1 . . . With the new REPUBLIC F-105B Thunderchief

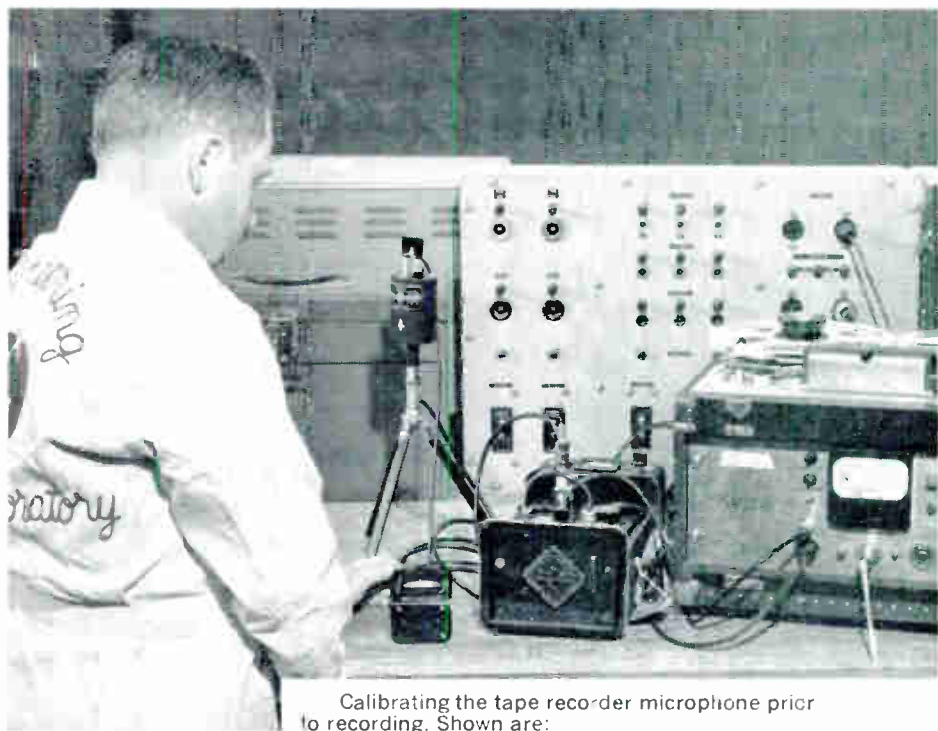
2 . . . With the GENERAL RADIO Sound-Measuring System

(Photographs Courtesy Republic Aviation®)

This G-R System is a fully-integrated line of instruments for the accurate measurement and analysis of both sound and vibration. Research engineers at Republic Aviation broke another sound barrier by putting the G-R Sound-Measuring System to use in their investigations of the effects of gunfire concussions on an airborne radar system. Physical shock to electronic components caused by gunfire becomes a problem of major proportions when designing equipment for maximum reliability.

The test procedure began with the calibration of the recording microphone's level — this was accomplished with the General Radio Sound-Level Meter, Transistor Oscillator, and Microphone Calibrator. The data was recorded on tape near the aircraft during gun firing, and was subsequently analyzed with the G-R Octave-Band Analyzer. Improved sound and vibration isolation for the electronic equipment solved this knotty problem for Republic. From start to finish, General Radio equipment furnished the correct answers to this problem.

The General Radio Sound-Measuring System can help you find the right answers to your sound or vibration problem. For further information, write for the Sound Bulletin, which gives a complete description of G-R sound and vibration instruments.



Calibrating the tape recorder microphone prior to recording. Shown are:

G-R Type 1551-A Sound-Level Meter	\$325
Type 1551-PIH Condenser Microphone Assembly with preamplifier and power supply	\$300
Type 1552-B Sound-Level Calibrator	\$ 2.50
Type 1307-A Transistor Oscillator	\$ 85

GENERAL RADIO Company

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miniature RCA-6973...for your compact high-fidelity designs

To help you endow your popular-priced high-fidelity amplifier designs with a noteworthy measure of concert-hall presence, RCA proudly presents its latest audio-tube development—the RCA-6973. Featuring linear operation over a wide range of power, a pair of these beam-power, 9-pin miniatures can deliver 20 watts of audio power with only 1.5% distortion. Here, too, is a tube that offers the advantages of low heater wattage (6.3v at only 450 ma)!

And, for a new measure of performance in medium-priced high-fidelity FM receivers, RCA presents two new tubes—the 6DT8 and the 12DT8. These new RF amplifier and mixer-oscillator tube types can make valuable contributions to your FM-tuner designs. Both types have inter-unit shielding enabling you to achieve substantial reductions in antenna radiation.

For data sheets on any of these new types, or for information on other well-known RCA "audio" tubes, such as the 12AX7 and 6L6-GB, write to RCA Commercial Engineering, Section 1-19-Q-2, Harrison, N. J.

Your RCA representative is ready to discuss your high-fidelity tube requirements. Why not call him today at the field office nearest you?

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