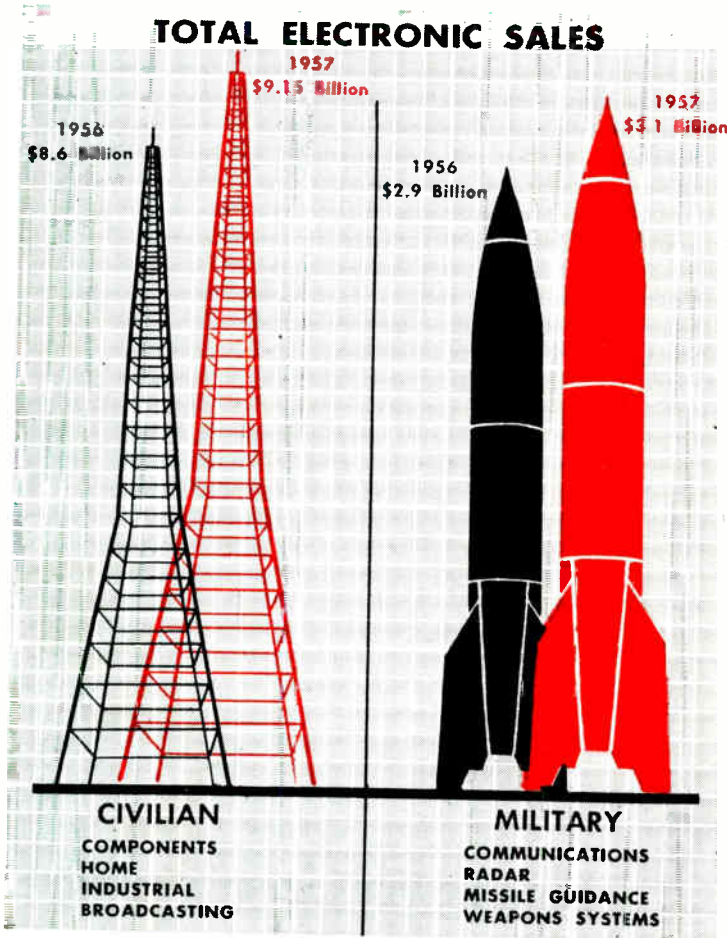


JANUARY 10, 1957

electronics

business edition

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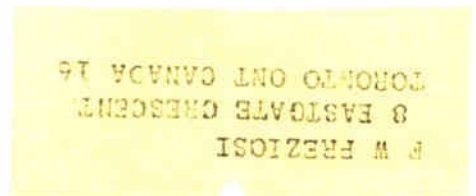
NEWS AT A GLANCE

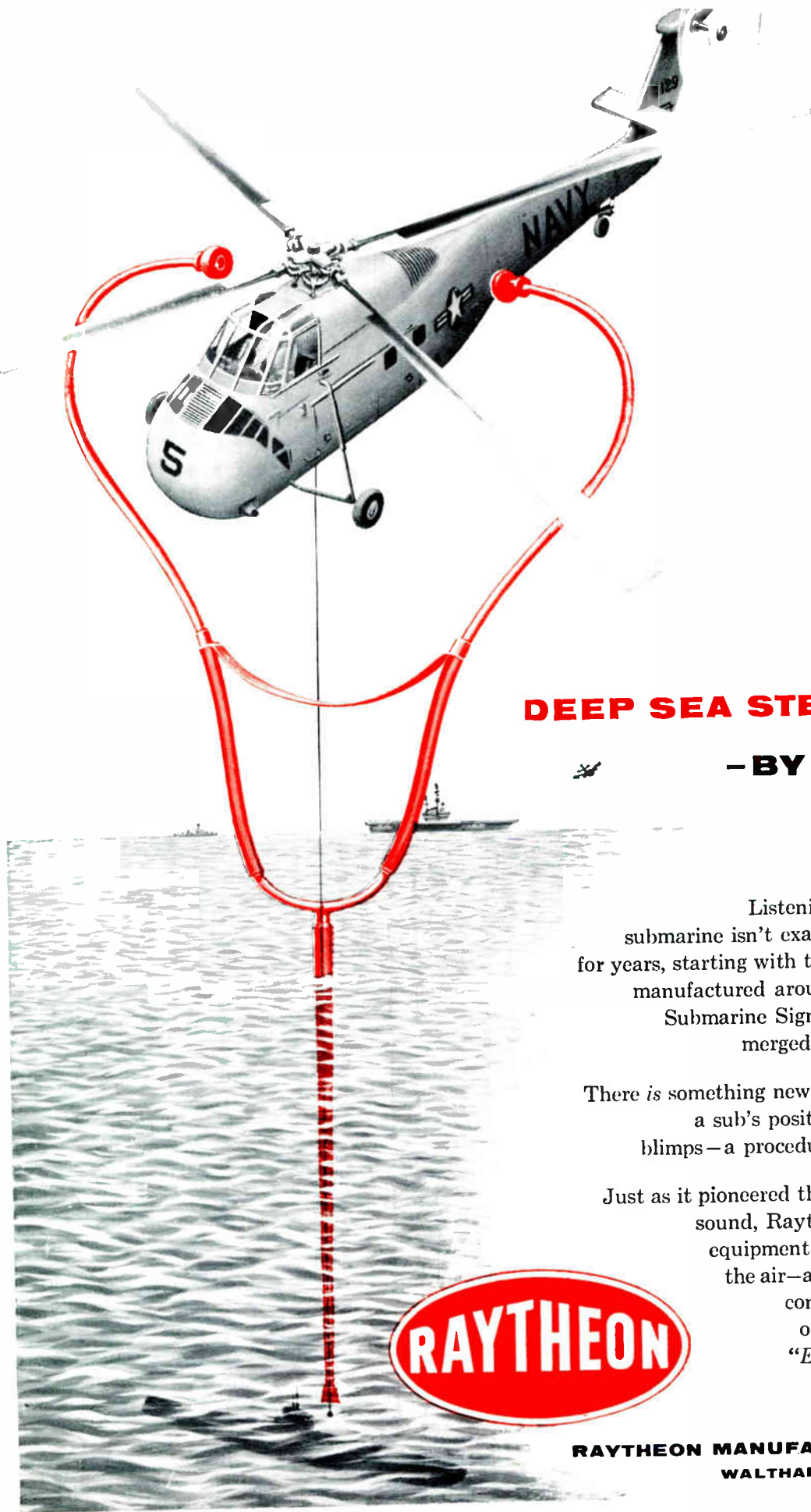
INDUSTRY OUTPUT WILL RISE 6½% IN 1957 AS
 . . . Industrial and commercial sales bolster civilian business; missiles pace government spending (page 13) / Employers will need 10,000 engineering grads next June, but class of '57 is just about gone (page 17) / Computer manufacturers find it good business to send prospective customers to school (page 20) / Long overshadowed by television, radio is staging comeback, but on local level (page 37)

Special Market Report

TRANSISTOR SALES

POTENTIAL... (page 16A)





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A McGraw-Hill Publication
Vol. 30. No. 1A

JANUARY 10, 1957

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Industry Outlook

THE nice old lady who asked her broker to buy 100 Dow-Jones was in the right church but the wrong pew. To take advantage of our expanding economy she should have specified electronics.

Electronics stands among the three top growth industries.

- Industrial controls, now only about 5 percent electronic, could take one-third of electronics production within 5 years.

- Industry as a whole is taking electronics more seriously. Nearly every aircraft, automotive, machinery and business-machine firm has an electronics division.

- Transistorization of automobile, portable, console and table radios means more business for manufacturers of electronic consumer products. Single-side-band and other channel-saving equipment will help break the gathering communications logjam. Possible cutbacks in color tv set production will not mean deemphasis of the medium; only a chance for customer demand to catch up with supply.

- Recent Defense Department orders reassigning guided-missile tactical roles have a delayed fuze. Projects now underway will probably be allowed to continue.

There's nothing steadier than a three-legged stool and electronics, heavily in consumer, industrial and military production, bids fair to grow as fast, if not a lot faster, than burgeoning industry as a whole.

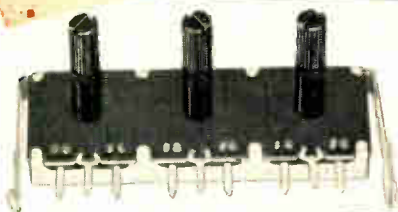
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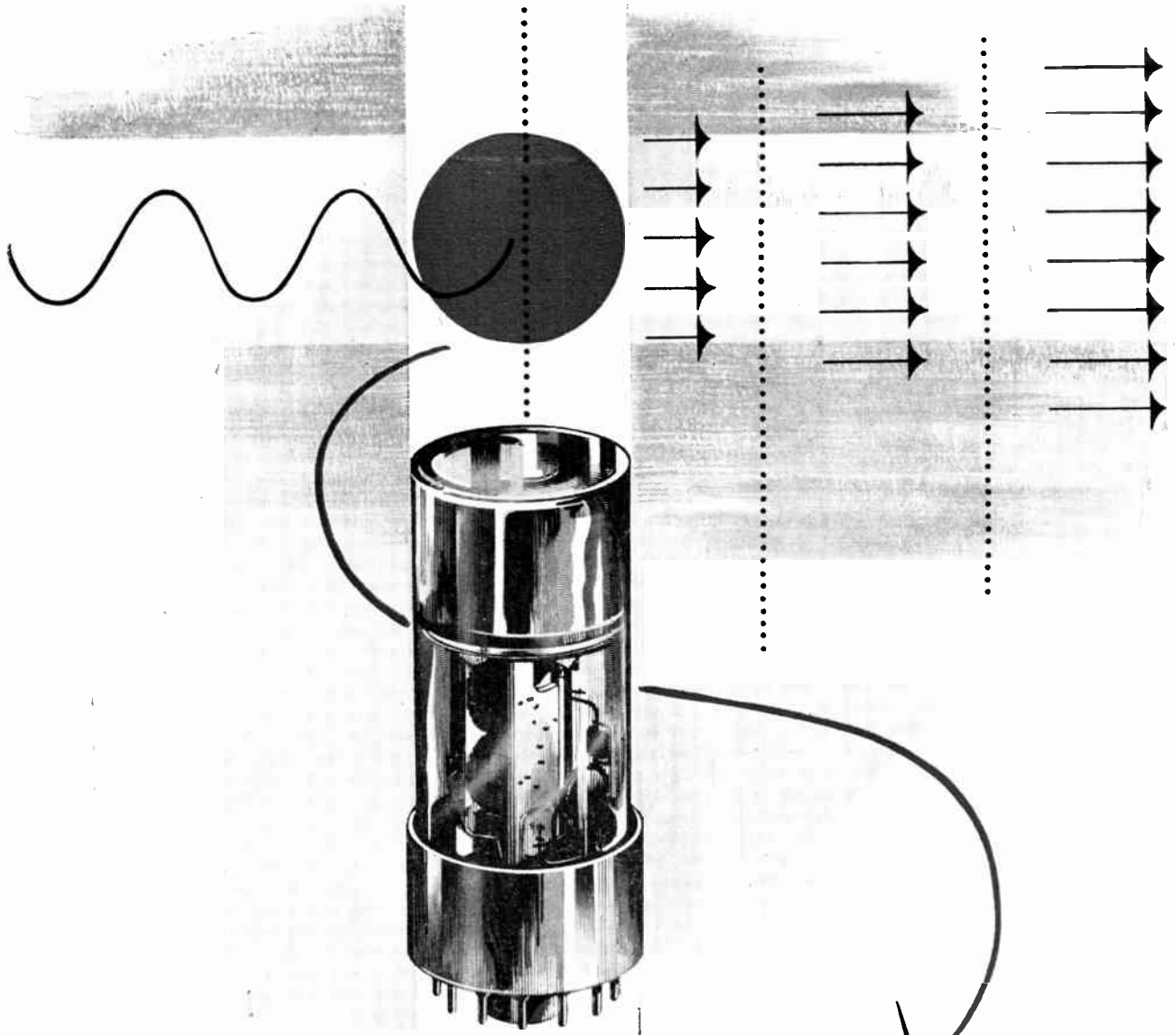
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30	40	9,000	15,000	20,000
50	75	4,800	8,000	10,000
100	125	2,000	3,500	5,000
150	175	1,500	2,500	3,500
200	250	1,000	1,500	2,500
250	300	800	1,250	1,750
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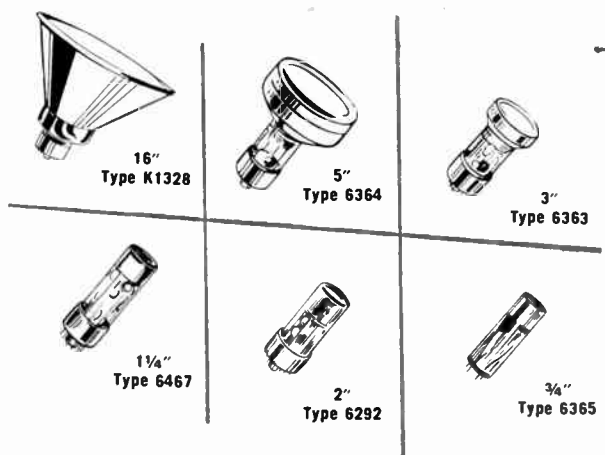


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TIGHT money hits hard

Borrowing ability declines
Large firms defer bond issues
Growth industries less popular

THE ELECTRONICS INDUSTRY is in a relatively weak position in today's tight money market. All business feels the pinch from a tightening supply of money and higher interest rates. But many electronics firms face additional loan hurdles, both as small business firms and as members of a growth industry.

Small business is getting less than its normal share of bank loans, according to a recent survey by Standard Factors Corp. Large companies are renewing short-term loans to obtain temporary long-term capital because of high interest rates on new bond issues.

Although a survey by the American Bankers Association indicated loans to small business had increased, investigation revealed that the survey was not representative of the banking industry. Confined to large banks, the experiences of the most important small business lenders, small and medium-sized banks, was excluded.

The electronics industry also suffers from what the bankers call a shift in emphasis. The number of loan application rejections for young companies with new products is increasing as bankers have shifted their

emphasis to companies with established sales-earnings records.

Recent experience of the Small Business Administration bears out these findings. The volume of SBA loans for the first half of 1956 was twice the amount for the same period last year. "We are receiving many more applications than last year and more companies with good credit standing are applying to us because of difficulties in getting bank loans," one SBA regional manager explained. ●

How to find CAPITAL

SMALL ELECTRONICS FIRMS are often unable to tap the public securities markets or large institutional lenders.

In addition, small companies share with all companies the difficulty in retaining sufficient earnings after taxes to finance expansion out of profits. Nevertheless many firms in this fix have found the answer through a variety of methods.

Electronics holds special attractions for venture capital groups. These groups are usually financed by individuals already in the highest individual income tax brackets who are particularly interested in growth industries because of capital gains tax advantages.

SHARES and PRICES

INCREASED DEFENSE Department emphasis on guided missiles helps make the common stocks of analog computer manufacturers interesting at this time. Defense expenditures for analog computers in the coming fiscal year are expected to increase largely because of increased interest in guided missiles and other advanced weapons systems.

Analog computers are also used in automatic gun-fire control systems, in airframe and jet-engine design

and by petroleum companies, atomic-energy plants and development laboratories.

In addition, this type computer has a tremendous new-user potential. Industrial process control, automobile design, air, highway and rail traffic control are some of the uses under development.

Accurate estimates of analog computer sales for 1957 are not available. But, it is believed that the present guided-missiles push will lift sales well above the \$8 million estimated for 1956.

Some 50 companies manufacture analog computers. A few analog manufacturers with publicly traded securities are shown on the table below.

Analog Computer Manufacturers	1956 Price Range	Recent Price	12 Mos Div	Yield percent	Earned per Share 1956	1955	Traded
Beckman Instruments.....	25½-40½	37½	³	—	1.36 (yr)	1.06	NYSE
Daystrom.....	22-29¾	29¾	1.20	4.1	2.01 (yr)	2.61	NYSE
Dynamics Corp. of Amer....	5¾- 7¾	6	0.40 ¹	6.7	0.28 ¹ (9 mo)	0.61	ASE
Electronic Associates.....	32-65	58	0.25 ^{1, 2}	0.4	2.75 (9 mo)	1.83	OTC
Magnavox.....	32½-41	34	1.50 ²	4.4	3.54 (yr)	3.05	NYSE
Servo Corp. of Amer.....	5¾- 7¾	5¾	0.20 ¹	3.4	0.21 (6 mo)	0.55	ASE
Servomechanisms.....	8¾-13½	12¾	0.40	3.2	0.63 (9 mo)	0.42	ASE

¹ indicated, ² plus stock dividend, ³ stock dividend, ⁴ estimated

Rockefeller Bros. Inc. in New York, American Research & Development Corp. in Boston and T. Mellon & Sons in Pittsburgh are a few examples.

These groups commonly take a significant equity interest in companies they finance but usually do not strive for control. Airborne Instruments Laboratory, Tracerlab and Aircraft Radio are a few companies in which venture capital groups have invested.

Closely related to the venture capital groups as a source of capital are the investment bankers. They are often the intermediary between a company seeking capital and investment groups.

The investment banker may invest for his own account or may form a syndicate for this purpose. Litton Industries, in which Lehman Brothers has an interest, is an example of investment banker financing. However, the most likely sources for direct investment banking financing are the smaller firms outside of New York City.

A source of capital often overlooked is investment by other corporations. Such investments do not have

to mean purchase of present ownership interest. There are instances where corporations have purchased minority interests in other companies.

Behind such investments are the desire to acquire development patterns in a field of interest, find profitable outlets for excess capital, customer and supplier interests. A recent example is Loew's Inc. which last summer purchased a 25 percent interest in station KTTV.

The current shortage of capital has improved chances for obtaining capital from the Small Business Administration. SBA is forbidden to lend money unless the desired credit is not available through commercial financing channels. "The present tight money market has been an important factor in the 100 percent increase in loans made by SBA in the past year," explained Arthur F. Long, regional director for New York.

The agency can make loans up to \$250,000 and for as long as 10 years. Its average loan is under \$50,000. ●

MERGERS, ACQUISITIONS and FINANCE

Midwestern Instruments and Magnecord, both of Chicago, will merge. This has been approved by Directors of both companies. After exchange of Magnecord's three series of notes into common stock, Magnecord stockholders will receive 149,511 shares of Midwestern Instruments on the basis of about five shares to one.

Ling Electronics, Los Angeles, plans to issue \$1 million of 10-year 6 percent convertible debentures and 183,333 shares of 50-cent par value common stock. The common shares will be offered to Ling's stockholders on the basis of one share for each share held. Perkins & Co. will head the underwriting group.

Eastern Industries, Hamden, Conn. has registered 125,000 shares of \$10 par convertible preferred stock with the SEC. The company plans to offer the shares to the public through Blair & Co. and Winslow, Colm and Stetson. Proceeds of the stock sale along with \$750,000 of borrowings from the State Mu-

tual Life of Worcester will be used for construction and to finance an increase in inventories.

Dittmer Gear & Mfg stockholders have approved offer of purchase by **Borg-Warner** for more than \$1,000,000.

U. S. Time has waived its right to option 303,000 shares of **Electronic Specialty's** authorized but unissued common.

Douglas Aircraft plans to raise about \$25 million by marketing an issue of convertible subordinated debentures. The securities will be offered to the public this month through an underwriting group headed by Merrill Lynch, Pierce, Fenner & Beane and Kuhn, Loeb & Co. Proceeds from the sale of the debentures will be used partly to put the DC-8 jet airliners into production and to finance outlays for plant and facilities expansion.

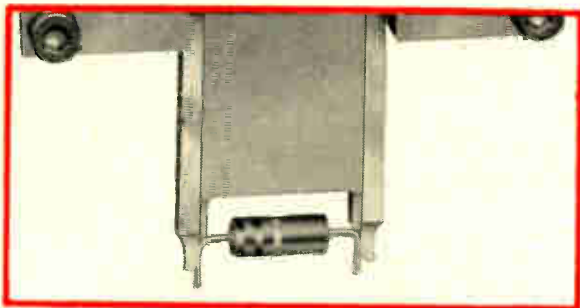
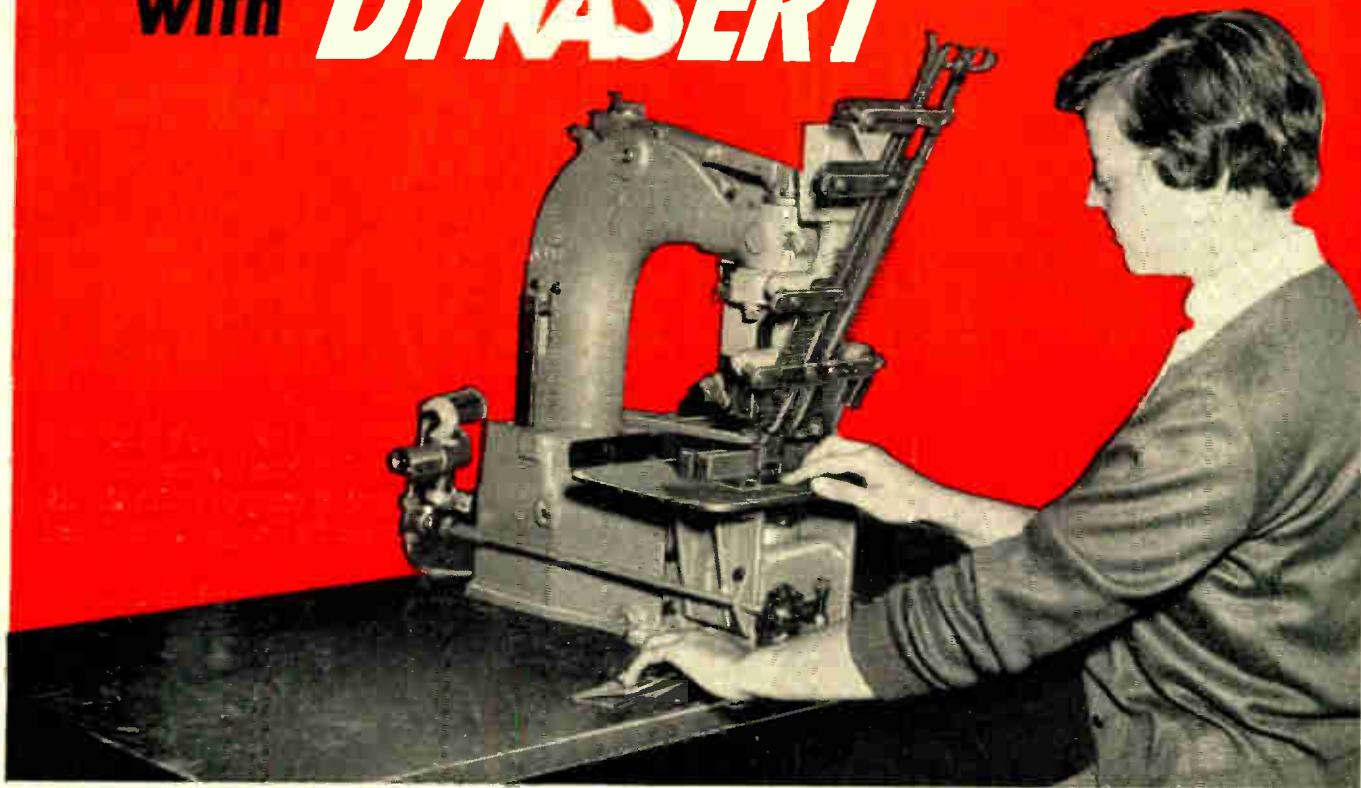
GE has announced sale of part of its interest in the manufacture of alkyd resins to **Archer-Daniels-**

Midland. Finished goods, equipment, formulations and manufacturing specifications related to GE's former production of Glyptal alkyd resins at Schenectady, N. Y. were included in the transaction. The operation of GE's resin business at Anaheim, Calif. and Toronto were not affected.

Burroughs has registered \$30,154,700 of convertible subordinated debentures with the SEC. The company plans to offer the issue to stockholders on the basis of \$100 in debentures for each 20 shares of common stock held on November 30, 1956. About \$12 million of the proceeds will be used for the partial retirement of short-term bank loans and the remaining \$18 million would be available for similar 1957 expenditures.

Philco has bought **Sierra Electronics**, San Carlos, Calif. research and instrument manufacturer. The purchase price was not disclosed. Philco reports plans to increase the size of Sierra's engineering staff and its instrument-making capacity.

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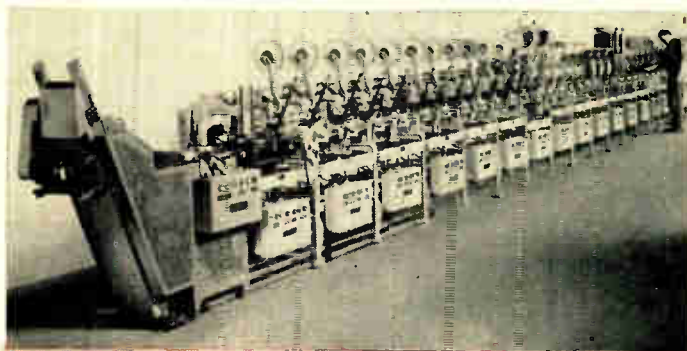
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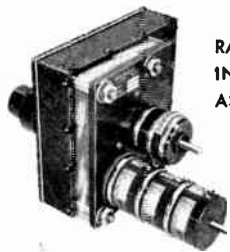


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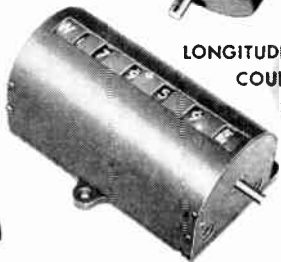
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8

WASHINGTON

MILITARY ELECTRONICS producers for a long time to come will feel the impact of Defense Secretary Wilson's directive, issued to clarify military roles and missions. The directive was aimed to settle interservice squabbling over control of guided missiles and to halt competing weapon development projects. It provides:

- Army is restricted to antiaircraft missiles with 100-mile ranges and ballistic bombardment missiles with ranges under 200 miles.
- Air Force now has operational responsibility for longer-range antiaircraft missiles and land-based ballistic missiles with over 200-mile ranges.
- Navy programs remain unaffected.

Included with operational control of a missile is budget responsibility for research and development. This means that starting July 1 the Army will be financing the Air Force's land-based Talos missile under development by McDonnell Aircraft, Bendix, Philco, RCA and others. This project competes with the Army's own Nike Hercules (Western Electric and Douglas Aircraft).

The Air Force will take over responsibility for the Army's land-based Jupiter IRBM under development by Chrysler, North American Aviation, Ford Instrument and others. This project competes with the Air Force's own Thor IRBM under development by Douglas Aircraft and others.

Eventually a decision will be made to slow down and perhaps halt work on one of each of the competing projects. Betting is that the Air Force and Army will try to stick with their own projects. Cutbacks in existing production contracts seem unlikely. But there'll be a sharp drop in new contract awards for some firms, adjustments in R&D contracts for others.

TACTICAL air command cutback

Another Wilson decision is to cut the number of the Tactical Air Command planes. This means future orders for planes like North American's F-100 fighter-bomber and their vast electronic systems will be smaller.

Pentagon wants to clamp down on advertising expenses allowed in cost-reimbursement defense contracts. The issue of government-subsidized help-wanted advertising costs came into the spotlight at a recent congressional manpower investigation. Rep. Davis (D., Ga.), chairman of a House Civil-Service subcommittee, charged that defense contractors are luring engineers from one another.

Now contractors can include as allowable expenses personnel recruiting and institutional advertising. The proposed limitations haven't been spelled out yet.

Congressional committees most interested in television problems are to be headed by the same men as during the last Congress. Senate Interstate and Foreign Commerce committee will be headed by re-elected Warren Magnuson (D., Wash.); network critic Senator John Bricker (R., Ohio) remains top minority man.

This is the committee that dug into uhf problems.

House Antitrust subcommittee is still headed by Rep. Emanuel Celler (D., N. Y.).

Defense Dept. is sponsoring personnel research projects to speed up selection and training of enlisted electronics maintenance men. Air Force is upset that the reenlistment rate for electronics specialists is running only 10 percent, claims it needs a reenlistment rate of at least 33 percent.



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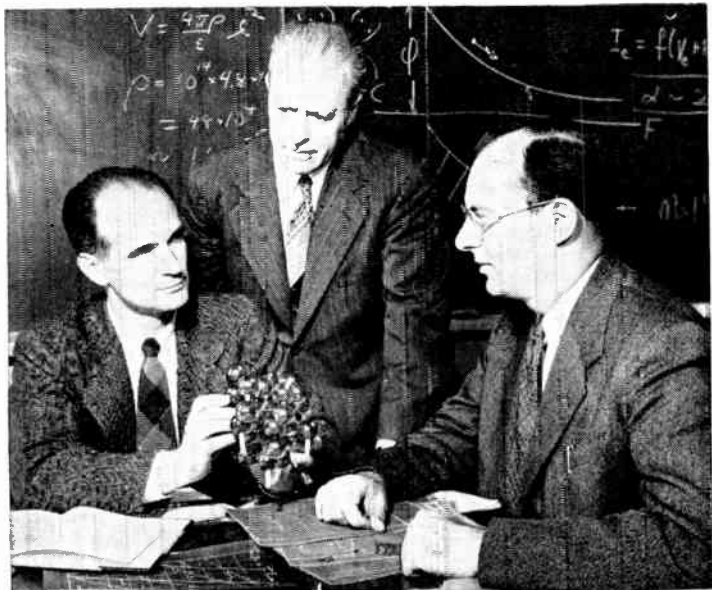
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ADDRESS

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ATTENTION

EXECUTIVES in the news



WILLIAM SHOCKLEY (left) with Brattain and Bardeen

ON DECEMBER 10, William Shockley, former director of transistor research for Bell Laboratories, was presented with the 1956 Nobel Prize for Physics. Sharing the award with him were co-inventors Walter Brattain and John Bardeen, the former still with Mother Bell, the latter now a university professor.

The \$38,633 prize was the latest in a long series of honors accruing to Shockley & Company for work with semiconductors which is busily revolutionizing electronics. Besides a batch of awards and two honorary degrees, Shockley in 1955 copped the job of heading Beckman Instruments' Semiconductor Laboratory.

Bachelor Shockley, whose Caltech and MIT degrees fool people into thinking him a native, was born in London in 1910. Even today he retains some of the English manner. He's fond of quiet, sly humor, drives only MG's and Jaguars if he can help it. His driving is characteristic of a blithe spirit; it's said that Mother Bell once was forced to forbid him and another key research man from riding together in the same car if Shockley was driving.

Since his arrival in the west, Shockley has threatened to take up skin-diving. More seriously, he is now working out a cooperative plan to let Stanford grads use his Mountain View labs to work out problems in transistor applications and manufacture.

Strictly PERSONAL

Gentlemen:

For the business community as a whole, perhaps the most important field is the elimination of paperwork drudgery. "Mechanical brains" already have freed mankind from endless hours of tedious hand computation. Much more can be expected by this remarkable application of electronics.

The automotive industry of the future will look most importantly to electronics as a means of minimizing or eliminating human errors in driving, and thus greatly improve traffic safety. Warning devices on instrument panels will inform motorists when danger looms. Electronic mechanisms—within cars, or perhaps on the highways—will re-

duce the many accidents now caused by driver carelessness or misjudgment.

CHARLES W. THOMAS
FORD MOTOR CO.
DEARBORN, MICH.

Dear Sir:

I have been a subscriber and reader of your publication for many years, and find it, as so many people do, the outstanding publication in its field.

I am very pleased to hear that you are increasing the value of the publication by breaking it up into three issues. As usual I shall be very much interested in all phases of the three editions. . . .

W. F. SATFERTHWAITTE
HAVERTON, PA.

Gentlemen:

We feel that your new publishing idea is an excellent one, and that the three monthly issues should be of considerable benefit to the majority of your subscribers. We are looking forward to receiving the first of these new issues.

L. A. GARTEN
GARTEN & ASSOCIATES
WEST ORANGE, N. J.

Gentlemen:

I would think that the largest single problem requiring solution (by the electronics industry) through development would be a low-cost large-capacity memory that would provide fast random access. Computers have been moving toward larger memories and toward smaller computational capacity, but this trend has not gone far enough. We need much larger storage and much faster access.

I think we need fast transmission of large masses of data over long distances. It seems to me that the communications companies are way behind in developing the answer to this need.

R. S. BROOKE
SEARS ROEBUCK & CO.
CHICAGO

Dead Pigeon!

Infrared Missile System Stalks Target for a Sure Kill

A missile's success in destroying a target hinges on the capabilities of its terminal phase guidance system.

Passive infrared systems for terminal phase guidance enable a missile to seek out and destroy its target without danger of jamming by the enemy.

Servo Corporation of America solved the problem of miniaturizing these systems for missile requirements, and is a major producer of infrared systems for our Armed Forces. Infrared guidance systems are just part of the more than 20 passive infrared weapons systems produced by Servo Corporation of America.

Passive infrared detection systems are now establishing a new direction in military instrumentation. To learn more about the application of infrared detection to military weapons systems, please request "IR-9902-56" on your company letterhead.



20-20 Jericho Turnpike
New Hyde Park, L.I., N.Y.



from
UNITED ELECTRONICS

NEW TUBES for HIGH POWER RADAR

Graphite Anode Rectifier-Diodes

For their size, these new tubes have greater power handling capacity than any other high vacuum convection cooled types, when used either as power supply rectifiers, clipper, hold-off or charging diodes.



Custom designed, they can supply the main basic diode needs for efficient tube performance in the functional as well as protective areas of new heavy radar circuitry.

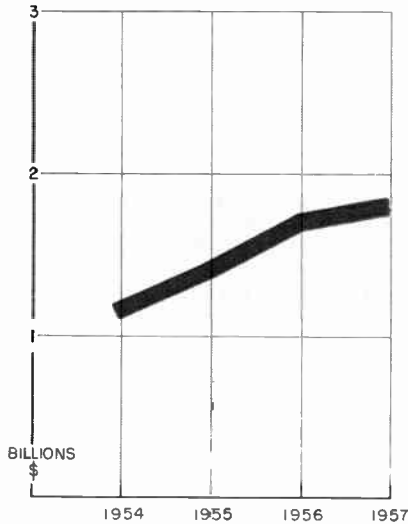
Type	Code	Filament		epx kv	Anode ib a	Ib Adc	Maximum Dimensions	
		Vac	Aac				Length Inches	Diameter Inches
561	A	11.5	15.5	30	2.7	.860	9.750	3.630
	B			30	80	.075		
X-80	A	11.5	15.5	40	2.5	.800	9.750	3.630
	B			40	80	.075		
X-65	A	5.0	11.5	65	1.0	.250	9.750	3.630

CODE: A) Rectifier B) Clipper Diode

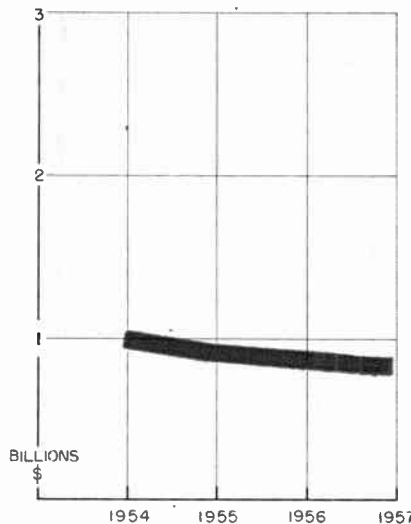
ALSO UNDER DEVELOPMENT

Several additional high vacuum diodes are being designed by UNITED ELECTRONICS which will extend the new MAJOR series with tubes of much higher power stature. If you will advise us of your rectifier-diode needs for equipment you are now designing we may be able to be of great help to you.

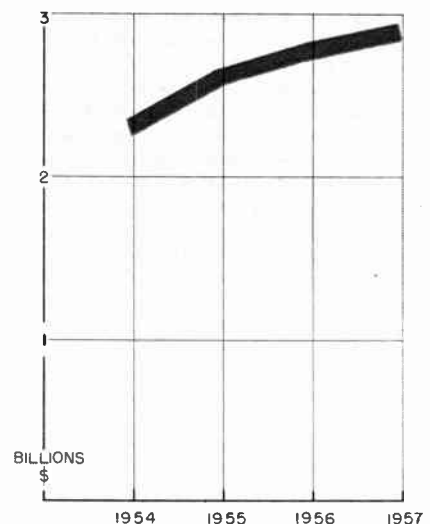
UNITED  **ELECTRONICS, 42 Spring Street, Newark 4, N. J.**



STRONG industrial sales . . .



DECLINING tv-set gross . . .



STABLE defense budget . . .

Our MARKET for 1957

Microwave applications lead industrial boom

Consumer market will firm by midyear

Competition stiffens for \$12-billion plum

THE ELECTRONICS INDUSTRY is going to make more money in 1957. One of the fastest growing of all major industries, its sales and service gross was \$11.5 billion in 1956, will exceed \$12 billion during the coming year and will probably reach \$17 billion within five years.

With investment increasing at the rate of over \$600 million yearly, and employment adding more than 125,000 people a year to the industry payroll, the end of 1957 will see electronics with a factory investment of close to \$10 billion, employing 2.4 million people and paying them over \$9 billion annually.

Industry feels that 1957's market will be more selective. Intense competition in consumer products will continue "for a long time to come," according to Sylvania's Don Mitchell. Philco president Skinner believes profits will start an upturn about midyear.

The American home will continue to be the biggest commercial market for electronics goods and

services. Consumers plunked down an estimated \$4.9 billion in 1956 and will probably spend \$5 billion in 1957. About \$2.4 billion of this will be spent for new entertainment equipment. Another billion will pay for having the equipment installed and serviced. The remaining \$1.5 billion will buy replacement parts.

About 7.4 million tv sets will be sold in 1957 for \$933 million. Color set sales will account for over \$80 million, up 60 percent over 1956. Of the almost 7.5 million sets sold during 1956, less than a quarter million were color sets.

The tv-set market became watery early in 1956, when several manufacturers discontinued their tv lines and flooded the market with inventories. Distributors and retail outlets cut prices to unload the sets. Increased sales of portables was a bright spot, although profit margins were slimmer.

As a result of general softness, a realignment is taking place in the consumer-goods area of the in-

dustry. Several large manufacturers are backing their radio-tv line with white goods. Many are beginning to pay closer attention to what Don Mitchell calls "the critical area of distribution." Says Mitchell, "without proper distribution, you have nothing."

The current shakedown in the tv market should mean that earnings will stabilize and start an upward climb during the third quarter. Other consumer items—radios, phonographs, hi-fi and auto radios, will bring in nearly half a billion dollars this year. Distributors of consumer goods will gross almost a billion dollars.

Spending for defense electronics during 1957 will be about \$3 billion, up slightly from 1956. About a quarter billion of this will be for research and development. Defense business is one of the many areas in which it is difficult to say where electronics begins and leaves off. Industry feels its actual return from government spending will be greater than the official figure.

Competition for government business is stiffening. "Fly-by-night" companies," says Litton Industries president Tex Thornton, "will find that getting government R & D contracts will be a much tougher proposition than heretofore."

Revenue from broadcasting will peak over \$2 billion for the first time next year. The relatively stable income from a-m and f-m radio, coupled with booming tv gross, drives the broadcasting revenue figure higher each year. Prosperity is reflected in orders for broadcasting equipment, which should in 1957 approach \$100 million.

The rest of the business community is rapidly becoming a bigger consumer of electronics equipment and services. A. O. Beckman of Beckman Instruments feels that the "most significant growth in the electronics industry" in the productive Los Angeles area "will be in the field of industrial applications."

Industrial and commercial production of electronic equipment had a factory-door value of just under a billion dollars in 1956, will jump slightly over the billion-dollar mark this year. Distributors of industrial electronic gear will take in about \$700 million. This adds up to almost \$2 billion gross sales for industrial electronic equipment.

Laboratory and service equipment and test instruments will continue steady growth. In Boston, General Radio's C. C. Carey reports a pattern of increasing business by 50 percent yearly. "We expect to maintain that level," he says. Hewlett-Packard regards 1957 as a \$200-million year for test instruments.

The demand for communications equipment of all kinds will increase its rate of growth.

Control systems, growing like Topsy and borrowing freely from a host of related fields, will earn about \$150 million all by themselves. But along with them go instrumentation and sensing devices, computing and interpreting mechanisms, and transmission systems. When all the parts are added up, the sum will be closer to \$200 million.

In the active world of digital data-processing and information handling, anybody's guess is good. Conservative estimates say it'll be a \$100-million business this year. Blue sky dreams run to half a billion. Industry best-guesses split the difference.

The threat of softness in the consumer market, coupled with only a moderate increase in government spending, means the industry will give more attention to industrial electronics. Tight money, a tight labor market and stiffening competition all pose challenges to executives.

Strong management will mean the difference between success and failure. Says Packard-Bell president Robert Bell: "The coming year will be a competitive challenge, but the basic foundation is present for a good year." ●

COMPONENT firms bullish

OPTIMISM about 1957 is widespread in the components industry.

Tube makers should sell 15 million picture tubes this year, and 500 million receiving-type tubes for new equipment and replacements.

The renewal tube business will mean almost \$300 million in factory-door value. With new tubes and other parts added in, components manufacturers will take in close to \$950 million in 1957, up \$100 million from 1956 and more than double 1952. Distributors of parts will add over \$600 million to industry income.

One dark spot in the tube picture is the rebuilt tube business. Over a third of the picture tube renewals in 1956 were rebuilt tubes, selling for 25-30 percent less than new at the distributor level. Manufacturers hope the stigma of "used goods" will keep this growing threat in bounds.

About half of the auto radios, and almost all portables, will use transistors this year. Some 30 million transistors will show up in equipment to be sold in 1957.

The growth of printed and packaged circuitry means more money for manufacturers of production equipment, especially semiautomatic bench machinery. Transistors and specially designed components make machine fabrication easier. More circuits will be assembled this way during the current year. ●

Your stake in COLOR-TV

Set makers view color market with guarded optimism

Increased color programming is big factor in future sales

Heavy color tube experimentation and development continues

COLOR TELEVISION is undeniably a big piece of future tv set business. The crystal ball, however, is cloudy about timing. And it is timing which has the industry puzzled.

RCA says that the time is now, the public wants color. This company is in mass production. Zenith, on the other hand, believes that color-tube development has not reached the stage which warrants marketing.

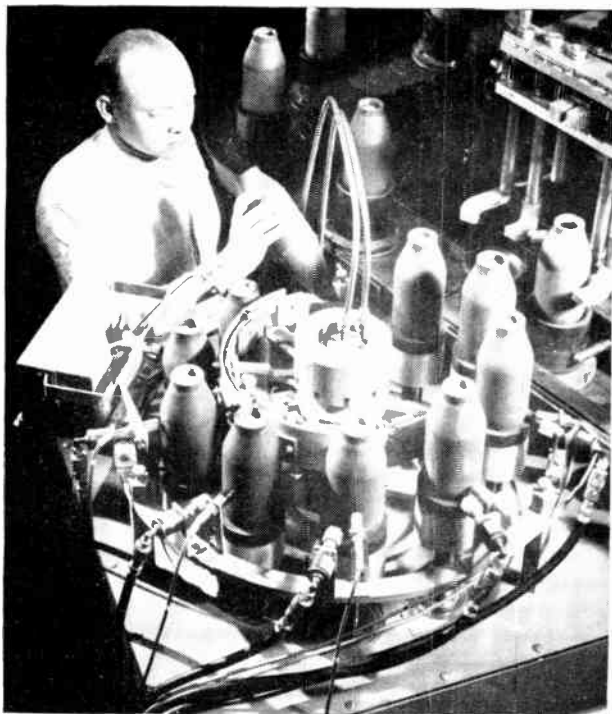
General Sarnoff says, "RCA alone will produce and sell 500,000 color television sets in 1957." Zenith's president Commander McDonald counters this optimism. He says, "The public will demand color tv only when there is enough improvement in

picture quality over black and white to justify a major investment."

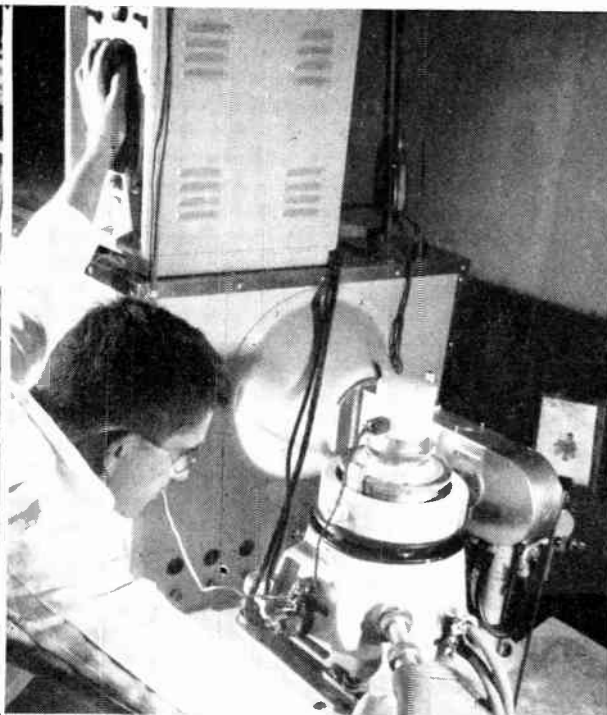
The majority of set producers see a gradual color market appearing. Neither as optimistic nor as pessimistic as RCA or Zenith, they expect a realistic climb in color sales. They feel that black and white set sales should not be sacrificed to a hope that there will be a startling, sudden public clamor for color television sets.

These set makers at their most optimistic foresee 750,000 color sets sold in 1957. The black and white market will taper off to 6.8-million. This estimate presupposes the price of color sets will go down by

X-RAYS inspect ammo, metal crystals



PASSING through 3.5-in. rocket warheads into cadmium selenide crystals, x-rays automatically detect voids in explosive, at Army's Cornhusker Ordnance Plant (left). Prototype by GE, built around 250,000-volt machine, cost \$125,000 and uses eight digital computers and 250 vacuum tubes. At right, Westing-



house shows crystallographic x-ray machine that can photograph changing magnetic arrangements in metals during temperature variations. Brilliant energy source allows short exposure time. Beam can be focused to hair's breadth for crystal investigation. Photos were made at -300 and $5,000$ F.

the end of 1957 and that color programming will continue to increase.

In 1960, when the color set will probably cost about \$350, the public should buy 2.8 million sets. Monochrome sales will be 5.5 million. Color will outsell black and white in 1962, 4.6 million to 4.4 million, or so most manufacturers think.

The networks will boost their program output in 1957. NBC, by the fall, will double its color shows to three major shows a night. CBS will go up to six hours a week. In February, ABC will announce its color plans. The net will most likely begin color-casting. It has already put aside several million dollars for investment in color equipment.

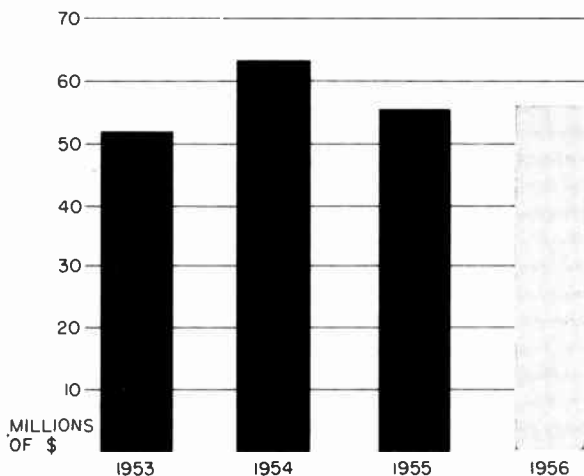
The hot issue in color is the picture tube. The three-gun tube works, but opinions vary as to its effectiveness. Every major television company is engaged in research on a color tube. Efforts are

directed to either simplifying the three-gun tube or developing a commercially acceptable one-gun substitute. A flat color cathode-ray tube is purportedly ready for production developmental work.

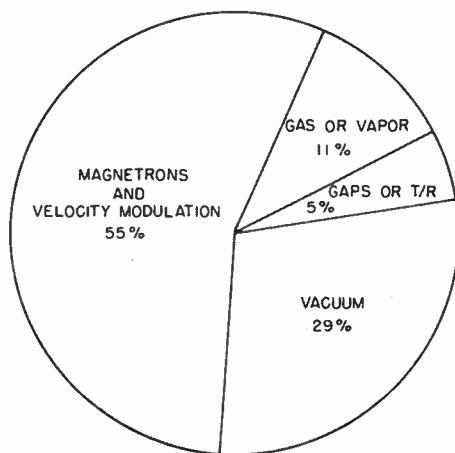
Two companies, the National Research Development Corp. in Great Britain and the Kaiser Aircraft & Electronics Co. in the U. S., have set up a licensing arrangement for a flat tube. This tube is reputed to be more complicated than a conventional cone-shaped monochrome tv tube, but simpler to make than any color tube now known.

Service training on the color set is also in a state of expansion. Such companies as RCA and Sylvania have begun setting up school facilities at an increasing rate. Sylvania runs a color school in Batavia, N. Y. for 10 men each week. Each man is expected by the company to instruct other servicemen on returning home. ●

PRODUCTION and SALES statistics



FIRST HALF SALES
SOURCE: NEMA



SALES BY MAJOR CATEGORIES
(FIRST SIX MONTHS 1956)

INDUSTRIAL TUBE SALES

Industrial tube sales in the first six months of 1956 inched up to \$56,896,000, about one percent above sales of \$56,264,000 in the first half of 1955. This small increase reflects the industry's ability to use smaller and less costly tubes in its products. While industrial equipment sales jumped 100 percent between 1953 and 1955 industrial tube sales increased a mere three percent.

Magnetrons and velocity modulation tubes, which have accounted for about half of all industrial tube

sales since 1954, represented 55 percent of the total in the first six months of 1956, up six percent from the same period in 1955. Vacuum types, which have played second fiddle to magnetrons for several years, continued to get a declining share of the total market, 29 percent compared with 33 percent in the same period last year.

Television sets totaling 4,590,000 were shipped to dealers in the first 9 months of 1956 compared with shipments of 5,174,000 in the same period of 1955, reports RETMA.

Varian Associates chalked up one of biggest annual sales increases among medium-sized companies in the industry in the past year. Varian sales for 1956 calendar year, ended Sept. 30, were \$11,000,000, an increase of 54 percent of 1955 sales of \$7,162,000.

Electronic Engineering Company is another sales leader. Consolidated sales for the first nine months of 1956 totalled \$2,581,000, an increase of 66 percent over sales of \$1,558,000 in the same period of 1955. ●

**SPECIAL
MARKET
REPORT**

TRANSISTOR

SALES POTENTIALS

Unit sales have doubled each succeeding year since 1954
Sales for 1957 are expected to exceed \$50 million
Next big breakthrough will be in the computer business

FEW MAJOR INVENTIONS have enjoyed the immediate and widespread acceptance accorded the transistor. Discovered less than nine years ago, this tiny semiconductor crystal amplifier is today responsible for annual sales in excess of thirty million dollars.

Moreover, the transistor has caused a virtual revolution in circuit design. Extremely small electronic units not heretofore considered possible are today commonplace. Production of miniaturized electronic components to work with the transistor is now a business of major proportions. The transistor component business may double in dollar volume that of the transistor business itself. So far about 200 transformer models, 500 capacitors and 100 cells and batteries are on the market.

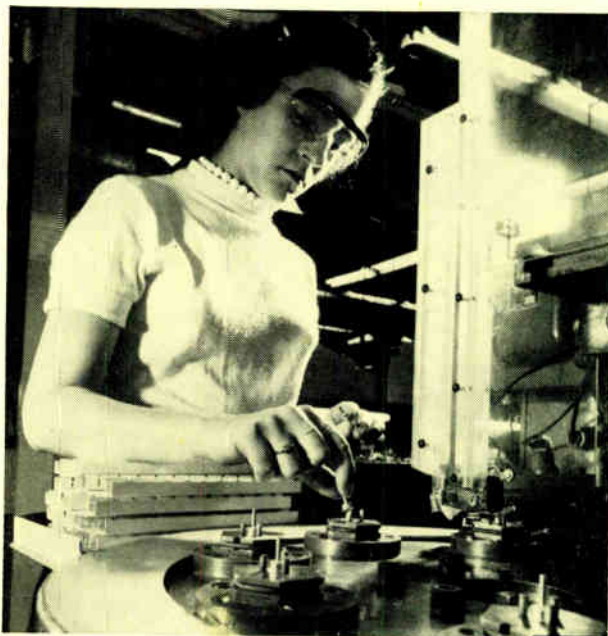
ACCEPTANCE—Basically, the transistor does the work of an electron tube. This is not saying, however, that transistors will replace the half-billion electron tubes used annually. There are some things a transistor can do better than a tube and, conversely, some things a tube does better than a transistor.

One of the first commercial applications of the transistor was in hearing-aid amplifiers. Small size and low power requirements proved to be a boon to the hard of hearing. Bulky batteries were eliminated and small hearing-aids capable of being worn in the ear itself or built into spectacle frames became possible.

STATUS TODAY—The hearing-aid business is no longer the major application of transistors, but it will

continue to be an important field. During 1957 an estimated 1.4 million transistors will go into hearing-aids. An estimated 4 million Americans not now owning them could benefit from a hearing-aid. Each hearing-aid requires from 3 to 5 transistors.

Development of high-frequency transistors useful in i-f and r-f stages of radio broadcast receivers sparked the development of transistorized personal portables. In 1955, 25 percent of portable radio production was transistorized. By 1958 manufacturers of transistors feel that not only will all per-



ELECTRIC WELDER at GE's Syracuse plant caps 800 entertainment-type transistors an hour to exclude contaminating air from cases

sonal portables be transistorized, but nearly all broadcast receivers will use transistors.

A transistorized radio requires from 2 to 8 transistors. The radios range in size from vest-pocket units to sets about the size of a small overnight bag. During 1957, home and portable radios will use about 8 million transistors. About three-fifths of these will be high-frequency types, with the rest audio-frequency units.

Transistor manufacturers have found a bonanza in the auto-radio business. Several sets developed for use with new ignition systems use 12-volt electron tubes with a transistor in the output stage of the set. The transistors are generally audio-frequency power units ranging up to 1.5 watts in power-handling capability.

During 1957 an estimated 5.5 million transistors will go into auto radios. It is reported that Ford cars will use transistor sets and that transistor radios will be optional on Chrysler models. By the end of 1956 about one third of auto-radio production used transistors.

Transistors may make their appearance in tv sets in 1957 with a possible 100,000 used, probably in the last quarter. The first transistor television sets will probably be personal portables of the 8-inch screen variety. Transistors may be useful in power output stages and in horizontal and vertical scanning circuits of console sets. They may also find application in decoding circuits of color sets.

During 1957 about 300,000 transistors will be sold by distributors to amateurs, experimenters and radio servicemen. Use of transistors in electronic phonographs will be a factor as will their use in items such as cordless electric clocks.

APPLICATIONS—Probably the greatest growth potential exists in the industrial and military business. Home-entertainment applications by-and-large involve replacing an electron tube with a transistor. Many military and industrial uses represent completely new business for the electronics industry. Telephone switching and data-handling systems will also use a great many transistors.

Electronic computers are becoming so complex that their sheer bulk would make some new units impracticable to build with electron tubes. During 1957 about 3.5 million transistors will go into computers. Use of transistors for industrial control equipment may give factory automation a boost.

Transistorized control equipment offers excellent reliability and convenient packaging for on-line maintenance. During 1957 about 2 million transistors may go into industrial control equipment, especially servo amplifiers.

The armed services are large users of transistors—almost exclusive users of very-high-frequency and

	1956	1960
Consumer -		
Home Radios	38%	17%
TV Sets		16%
Auto Radios	12%	10%
Clocks, etc		4%
Hearing Aids	9%	1%
Distributor Sales	2%	1%
Commercial		
Computers	11%	9%
Industrial Controls	8%	24%
Military	20%	18%
	100%	100%

silicon high-temperature units. When electronic control equipment must be packed into tight quarters in missiles, transistors are one answer. Transistors are useful also in a wide range battery-operated military equipment including two-way radios and telephone amplifiers.

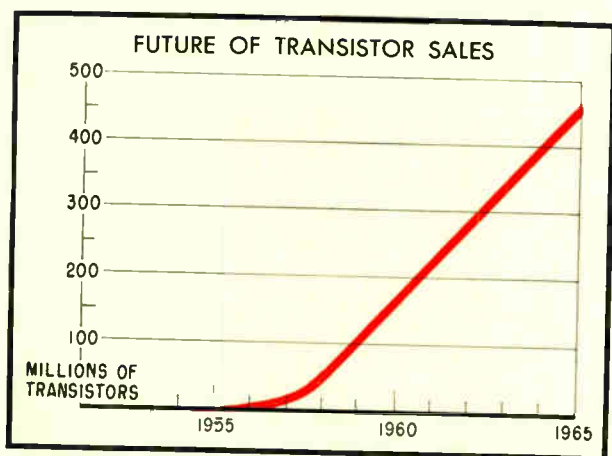
DOLLAR VOLUME—The question of whether to use a tube or a transistor is often an economic one. A few years ago a transistor might cost from ten to twenty times as much as equivalent electron tube. Recently, however, prices have come down. GE reports a 3-to-1 price reduction on one transistor over a 2½ year period. In another instance, the price dropped from \$2.90 to \$2.04 in ten months.

Nevertheless, transistors are not easy to manufacture. One problem is expensive equipment and research talent for continuing new-product development. Another problem is the relatively high reject rate and high degree of hand assembly work required in some instances. Mechanization of transistor production lines, introduction of new processes such as rate growing, diffusion and melt-quench, more rigid standards of cleanliness and development of more efficient etching solutions will contribute to lower unit cost.

Manufacturers are cautious about giving cost breakdowns of their transistor prices. It is questionable whether anyone is today enjoying a really high rate of returns from transistor manufacturing.

One manufacturer breaks his unit cost down thus: 35 percent labor, 25 percent materials, 20 percent engineering and 20 percent overhead and profit. Another breakdown is: direct labor 17 percent, materials 26 percent, factory burden 6 percent, administration and sales 17 percent, interest and amortization 10 percent and profit 24 percent.

Factory sales of transistors during 1954 were \$5,122,266. For 1955 the figure was \$12,252,741. According to one leading manufacturer 1956 sales will reach \$34 million, going to \$55 million for 1957. The firm sees 1960 sales reaching the \$150 million level.



BY 1960—The pattern of transistor utilization may change in the next three years. Tube replacement uses may be surpassed somewhat by uses of transistors where tubes were never seriously considered. Penetration of the automotive industry is already heralded by a transistorized fuel injection system.

By 1960, automotive uses may include radio-frequency ignition systems, voltage regulators and electronically controlled automatic transmissions, power seats and windows. The automotive business often sets a pattern for civil aircraft and pleasure boats.

Another transistor application that indicates future promise is a flasher for a highway emergency beacon. The transistor is actually replacing a bimetallic strip.

If a 50¢ transistor arrives by 1960, transistors may be used in neon signs, store window displays and even toys. Other large nontube-replacement uses

may include street-light controls, cordless electric watches and clocks, unlosable golf balls, amplifiers and tone generators for telephone hand sets.

In 1960, the nonentertainment market should include 42 million industrial, 15 million computer and 30 million government and military units. On the home-entertainment side one manufacturer foresees 30 million units going into home radios, 18 million into automobile radios and at least 28 million into television sets.

Relative importance of the home-entertainment business will depend upon the extent to which transistors are used in television sets. With the advent of mural-type television screens the use of transistors in television sets could exceed many times use of electron tubes into sets today.

BY 1965—Estimates of the overall transistor market for 1965 predict upwards of 450 million units sold. Estimates on the split between entertainment and nonentertainment applications range from 60-40 to half and half. A deeper penetration of the television field will mean proportionally more transistors for entertainment.

By 1965, if not before, many of the bugs that plague some manufacturers of silicon transistors will have been dispelled and silicon units will enjoy wide use in military, industrial and computing equipment where temperatures up to about 200 C are encountered. For extremely high-temperature operations such as in ballistic missiles where temperatures of 800 C and more may be encountered, transistors using materials such as silicon carbide or various intermetallics will be used.

TRANSISTOR MAKERS include

Amperex Electric Corp., Hicksville, New York. Beckman Instruments Inc., Schockley Semiconductor Laboratory, Mountain View, California. Bendix Aviation Corp., Eatontown, New Jersey. Bogue Electric Manufacturing Co., Paterson, New Jersey. British Thompson-Houston Export Co., Rugby, England. Clevite Transistor Products, Inc., Waltham, Massachusetts. Columbia Broadcasting System, Inc., CBS-Hytron Division, Danvers, Massachusetts. General Electric Co., Electronics Division, Syracuse, New York. General Electric Co., Ltd., London, England. General Motors Corp., Delco Radio Division, Kokomo, Indiana. General Transistor

Corp., Jamaica, New York. Germanium Products Corp., Jersey City, N. J. Hoffman Electronics Corp., Hoffman Semiconductor Division, Evanston, Illinois. Hughes Aircraft Co., Hughes Products Division, Los Angeles, California. P. R. Mallory & Co., Indianapolis, Indiana. Minneapolis-Honeywell Regulator Corp., Aeronautical Division, Minneapolis, Minnesota. Motorola Inc., Chicago, Illinois. National Aircraft Corp., Burbank, Cal. Nucleonics Products Co., Los Angeles, Cal. Pacific Semiconductors Inc., Culver City, California. Philco Corp., Lansdale Tube Co., Lansdale, Pennsylvania. Pye Industrial Electronics, Ltd., Cambridge,

England. Radio Corporation of America, New York, New York. Raytheon Manufacturing Co., Receiving and Cathode Ray Tube Operations, Newton, Massachusetts. Sarks Tarzian Inc., Bloomington, Indiana. Sprague Electric Co., North Adams, Massachusetts. Standard Telephones & Cables, Ltd., London, England. Sylvania Electric Products Inc., New York, New York. Texas Instruments Inc., Dallas, Texas. Tokyo Tsushin Kogyo, Ltd., Tokyo, Japan. Transistor Electronic Corp., Wakefield, Mass. Tung-Sol Electric Inc., Newark, N. J. Western Electric Co., New York, N. Y. Westinghouse Electric Co., Pittsburgh, Pa.



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January 10, 1957 — ELECTRONICS business edition

Wanted in electronics: 10,000 GRADS

Industry will face deficit
of 6,000 new engineers

Firms double college
recruiting visits

Find money isn't quite
everything to young men



BELL LABS recruiter interviews electronics engineering graduate. Most sought by recruiter: potential for growth. Most sought by graduate: chance to advance on merit

THIS YEAR, the electronics industry would like to hire 10,000 graduates of engineering and scientific college curriculums. However, only 4,000 new graduates qualified in electronics will be available.

Electronics firms can find some comfort, however, in the fact that the industry is not alone in its misery. Industry and government on the whole need about 80,000 engineers, including 58,000 bachelor-degree graduates. This year there will be about 56,000 available, including some 34,000 BS men.

The Engineering Manpower Commission of the Engineers Joint Council indicates that in the year 1956-57 the 34,000 BS engineering graduates will include: 7,750 in electrical and electronic engineering, 350 in engineering physics, 3,300 in chemical and 750 in metallurgical engineering.

The National Science Foundation estimates that there will be an increase of 50,000 new engineering jobs in each of the next five years, plus replacement requirements of 12,000 to 15,000 a year. This would mean a required U. S. engineer population of more than 800,000 in 1962, compared with about 560,000 now employed.

Average pay for new graduate engineers jumped from \$390 a month last year to \$450 a month this year. However, pay varies depending upon the branch of engineering the man chooses and the school he graduates from.

Electrical and chemical engineers stand at the top of the class salary-wise. The median salary received last year by BS graduates of the Massachusetts Institute of Technology was \$427 a month.

Companies generally have increased their formal recruiting visits from one to two a year. Last year MIT had 800 visits from company representatives seeking BS graduates. More are expected this year.

Requests being made at Lehigh University's placement center for June '57 graduates are becoming so numerous that a sign reading **NO MORE** may be hung out as early as March. During the Fall semester, 375 companies interviewed.

Here are some ground rules that electronics recruiters are following:

- Be in a competitive position in offering salaries.
- Make it clear to graduates what type of work they may expect to do. While this may seem elementary, many firms feel this cannot be stressed too much. Morale and turnover problems can be a big price to pay for too rapid hiring.
- Show applicants the stability of a research and engineering program. Some companies cite a "balance" of civilian and military work as evidence of corporate stability.

An organization of high technical prestige attracts the most scientists and engineers with good growth potential. Thus many firms are carefully cultivating a reputation for technical excellence via heavy institutional advertising and strong encouragement of staffers to write technical articles. A professional type of working environment also helps.

What the electronics industry is concerned with as much as the number of graduates available is their ability to develop along with technological progress in the industry and to understand the demanding problems of technical management. ●

FIRST silicon transistors meeting NAVY SPECS



For reliability under extreme conditions . . . design with TI's military silicon transistors . . . built to give you high gain in small signal applications at temperatures up to 150°C. Made to the stringent requirements of MIL-T-19112A (SHIPS) and MIL-T-19502 (SHIPS), these welded case, grown junction devices furnish the tremendous savings in weight, space and power you expect from transistorization . . . plus close parameter control

that permits you to design your circuits with confidence.

All 19 Texas Instruments silicon transistor types have proved themselves in military use. First and largest producer of silicon transistors, TI is the country's major supplier of high temperature transistors to industry for use in military and commercial equipment.

degradation rate tests for TI's USN-2N117 and USN-2N118 silicon transistors

test	condition	duration	end point at 25°C
lead fatigue	three 90-degree arcs	—	no broken leads $I_{CO} = 2\mu A$ maximum at 5V $h_{ob} = 2\mu mhos$ maximum $h_{fb} = -0.88$ minimum for 2N117 $h_{fb} = -0.94$ minimum for 2N118
vibration	100 to 1000 cps at 10 G	3 cycles, each x, y, and z plane	
vibration fatigue	60 cps at 10 G	32 hours, each x, y, and z plane	
shock	40 G, 11 milliseconds	3 shocks, each x, y, and z plane	
temperature cycle	-55°C to +150°C	10 cycles	
moisture resistance	MIL-STD-202	240 hours	
life, intermittent operation	$P_c = 150$ mW, $V_c = 30$ V	1000 hours, accumulated operating time	
life, storage	150° C, ambient	1000 hours	no mechanical defects interfering with operation
salt spray	MIL-STD-202	50 hours	

LOOK TO TI FOR: SILICON HF, MEDIUM POWER, POWER, AND SMALL SIGNAL TRANSISTORS
SILICON DIODES AND RECTIFIERS • GERMANIUM VHF, POWER, RADIO, AND GENERAL PURPOSE TRANSISTORS

**pioneer producer of
silicon transistors**



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More MERGERS on the way

Merger wave continues to swell

Electronic companies considered prize prospects

Diversification mergers predominate

PRACTICALLY EVERY business worth \$1 million or more had received at least one merger proposition in recent years. Electronics companies receive more than the average because of the industry's sudden rise to prominence and growth potential.

The financial manuals reported 525 mergers in 1955 and an average of 347 per year from 1950-1955. The National Industrial Conference Board reports that mergers occurred at the rate of 96 a month in 1956.

The current wave of mergers seems to be sparked by a desire for diversification, rather than market control or for mass-production efficiency. Diversification mergers unite companies producing unrelated products to give the merged company greater security from cyclical, seasonal and other economic changes.

This type of merger is called a conglomerate merger.

New industries and markets which blossomed in the post-war period have been among the chief forces which spurred the present merger surge. Alert companies recognize the necessity of keeping up with the economic parade to enjoy continued business health.

Many feel the quickest and easiest way of catching up is by merger. "A company can save years in achieving an established position in new and growing fields like electronics and nucleonics through merger", pointed out management consultant William E. Hill at the recent American Management Association conference on mergers.

Elgin Watch, now a diversified firm as a result of a number of mergers, has long-term merger plans calling for concentration in the electronics field. "The electronics industry has been growing at a rate of 50 percent per year for some time; likewise the pretax return on investment of the major companies in the business was close to 50 percent," stated Elgin president, James G. Shennan in a recent AMA study.

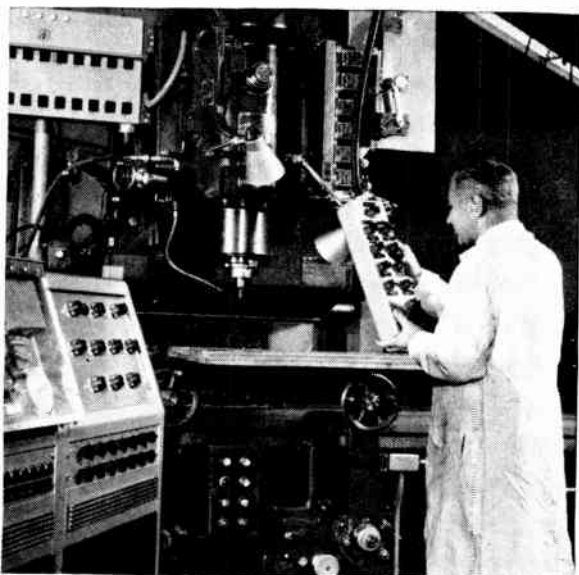
Companies selling out often have been strongly influenced by their inability to provide for growth as a result of the present tax structure. And they are too small to obtain capital by public sale of securities.

Companies active in acquiring companies through merger often employ full-time merger specialists as well as specialists in taxes, insurance, production and marketing to go over the prospective company with a fine-tooth comb before making a final decision. The selling company likewise should consider the buyer's business position, earning capacity, selling organization, management and personnel policies—and what he has done with past acquisitions.

Most of today's mergers are by purchase of assets rather than through stock exchange. Thus the surviving corporation has absolute control. T. E. Evans, president of H. K. Porter, stressed the significance of this merger meeting at the AMA merger conference.

"One of the reasons we strive for purchase of assets rather than stock exchange is in order to protect ourselves in case we make a mistake," Porter said. "Unwinding a mistake can be very difficult if the stock transfer method is used." ●

Transistorized MILLING



NUMILL machine control system developed by Autonetics division of North American Aviation provides a shortcut between blueprints and finished tools and parts. Outlines are recorded mathematically on tape by a digital computer. Transistorized console guides machine by pulse trains



EASTERN AIRLINES men listen as Univac expert explains some of the changes involved when management starts . . .

Putting COMPUTERS to work

Electronic problem-solvers bring their own problems

Management girds for new challenges in office techniques

Systems replace seat-of-pants judgment

MEN in the management picture are facing a new problem. Those in the picture above are all Eastern Airlines men, charged with the responsibility of making Eastern's new computing system work to the best advantage of the business. They've gone back to school, unlearned some things they thought were gospel, absorbed a lot of new techniques.

The same story is being told all around the country. From banks to warehouses, business and industry are making more and more use of computers. Each new application brings the problem of tailoring system to computer or vice-versa.

Big electronic data-processors can solve the most complex manufacturing and distribution problems confronting today's executive. They can do much of the clerical work. But someone must tell them how.

Computer manufacturers feel that there will be upwards of 10,000 large-scale general-purpose data-processors in use in this country by the end of 1966. Some 200,000 professionals will be needed to keep them running. These men will have to know business organization and the flow of information within a commercial or industrial structure. They will need

to know how decisions are made, how a computer can make them.

Originally, the computer makers tried to supply their customers with systems analysts and programmers. This bled the manufacturers white on manpower. Training programs, helped ease the strain.

The major hurdle was getting customer men to wrap themselves around computer techniques. More and more middle-management people understand the need for systematization. But few of these were prepared for the impact of electronic systems.

GE's major appliance division installed a computer in 1954, to do the payroll. This was one of the first big business uses of a giant computer. The depth to which they were forced to systematize paperwork procedures surprised even the Univac experts who put it in.

Franklin Life's vice president A. C. Vanselow has many times reiterated a statement that seems almost too pat. "It's easier," he says, "to teach an insurance man computer methods than to teach a computer man the insurance business." This remark, despite its patness, has been proved true time and again.

Scientists were the first to use computers. The impression lingered that a scientist was needed to run a data-processor. But programming for a computer involves first and foremost an understanding of the specific problem to be solved.

Management, aided by the computer builders, is now learning enough about computers to be able to work with them. The universities are beginning to help. MIT and UCLA have recently announced courses in electronic management. Wayne and Louisiana State have taught computer courses for years. Other schools and research institutes are joining in the effort.

The electronics conferences held by such groups as the American Management Association and the Systems and Procedures Association have greatly aided middle and top level executives. The shirt-sleeve sessions which AMA conducts in New York have provided many managers with new insights into their problems. Talking out their own headaches with other executives, they can learn a lot about making computers work for them. ●

More OFFICE business

MANUFACTURERS of electronic equipment for office automation have quietly won a strong position in the office-equipment market. Annual sales of office equipment total \$4 billion.

At the last National Business Show in New York nearly three-quarters of the exhibitors offered one or more electronic items. The big and dramatic electronic exhibits drew the biggest crowds and the most attentive interest of visitors.

Increased penetration of the office-equipment market is spurred on by new products capable of doing jobs not done before by electronics and new variations of old products designed to enable more offices to take advantage of electronic equipment.

New equipment designed to meet the needs of intermediate sized businesses indicates a trend in data-processing. Two such items are Sperry Rand's Univac File Computer and Underwood's Elecom 125. The potential market for intermediate-sized computers is estimated at \$2.5 billion. IBM anticipates yearly sales of \$100 million by 1958 for the Rmac 305, a 5-million digit data file for use with the model 650 medium-sized computer and other equipment. ●

TECHNICAL DIGEST

Thin perforated plate of ceramic ferromagnetic material may make possible memorizing billions of individual bits of information. Called the aperture-plate memory, it is made by RCA using printed-circuit techniques and said to be easier to manufacture than the magnetic cores now used in many digital computers.

S-band (2,000-4,000 mc) magnetron whose frequency is a linear function of anode voltage may provide added flexibility in design of radar, countermeasures and communications equipment where rapid frequency changes are needed. Developed by GE for the Signal Corps, the tube uses stacked metal-ceramic construction and can deliver 10 watts c-w.

Failure of either the picture or sound carrier of a tv broadcast station is immediately indicated by a single alarm system used at KSL-TV. By combining the two signals in a receiver, a difference signal is produced. If one signal fails, the absence of the difference signal triggers the alarm which then can operate a time-recording device for the carrier-failure record required by the FCC.

Vertical velocity of vertical-takeoff aircraft, such as Convair's Pogo Stick, can be indicated by an instrument using the doppler principle. The difference in frequency between the transmitted continuous-wave signal and its reflection from the ground is said to provide a quicker and more accurate indication of vertical velocity than a barometric rate-of-climb meter.

CIVILIAN sales widely sought

For big orders, there's no business like defense business

Civilian sales mean stiffer competition

But market balance is worth the price

NONMILITARY SALES of electronic equipment and components in 1957 are expected to keep pace proportionately and, in some cases, surpass sales of military items.

GE's vice-president and consultant, W. R. G. Baker points out that GE's electronics division feeds three different markets: military, consumer goods and industrial.

One-third of electronics production in the Syracuse area is military. There is short term stability in this market, Baker said. Orders take up to two years to fill. A longer view reveals uncertainty.

The consumer goods market, he said, is more

competitive than the military. This results from the large number of finished products set before the customer and the emotional nature of his selection.

Hughes Aircraft is counting on the transistor to alter its market picture. Although management expects no change in its electronic division's 90 to 95 percent military business for 1957, it hopes that by 1958 its silicon diodes and power rectifiers will lead the company well into the civilian field.

Joseph S. O'Maherty, manager of Hughes semiconductor division, forecasts a \$300-million semiconductor business for the industry by 1960. He predicted that, barring war, 85 percent of this would go into industrial and consumer equipment.

Airborne Instruments Lab, sells 90 percent to government and 10 percent to commercial markets. Half of this 10 percent, however, finally ends up in military products, making the company 95 percent dependent on the government.

However, today, Airborne's president, Hector R. Skifter, is looking to the civilian market for 50 percent of total business.

Bendix Aviation's defense sales accounted for 69 percent of 1955 production. Management's thinking however is directed toward civilian electronics and automation.

Western Electric's government work increased 24 percent in 1955 over that of 1954. Although 1956 showed an increase in defense contracts, civilian business shot past government increases.

Sperry Rand's civilian sales as of July 1956 were greater than its military, 62 percent to 38 percent. The Sperry Gyroscope and Ford Instrument divisions do much of Sperry Rand's government business. The Remington Rand divisions are 97 percent civilian.

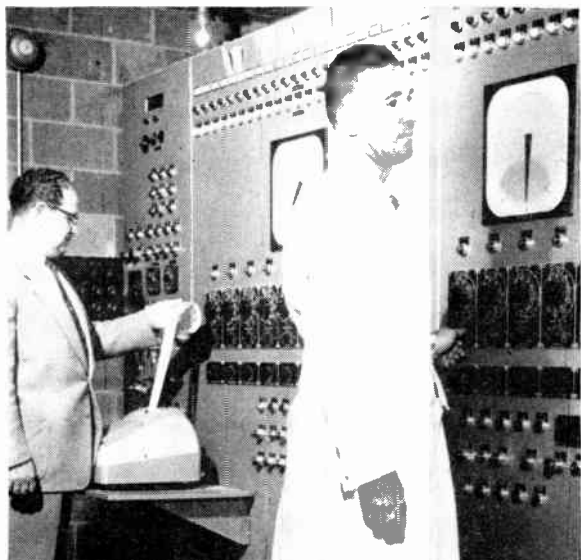
Sylvania's balance is 75 percent on the civilian side. Management foresees no change for 1957.

Aircraft companies, now heavy in electronics, are also heavy in government work. Republic's \$400-million backlog is more than 99 percent military. Grumman reports 98 percent for defense.

Some aircraft firms, however, are actively seeking nonmilitary work. Paradoxically, heavy civilian business might take aircraft firms out of electronics.

Many firms in the electronics business feel that a three-way split: military, industrial and consumer, hedges a business ideally against changing economic and political conditions. ●

SERVOS mix feed



HEART of Nutrena Mills new feed plant in Peoria, Ill., is this electronic control panel built by Richardson Scale. Potentiometers in weight selection dials transmit up to 78 formulas to pots in hopper controls through servo circuits

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ELECTRONICS business edition — January 10, 1957

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ACCEPTED SYMBOLS

12

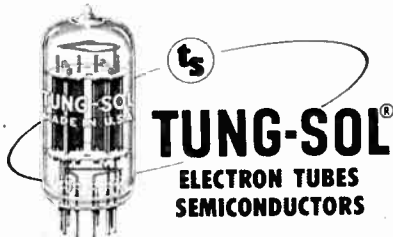
24 · 32

Mg

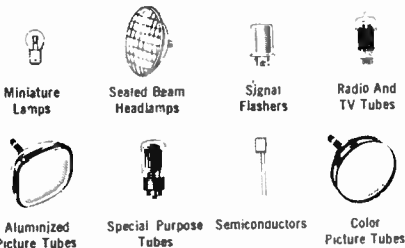


Symbol for the element magnesium whose oxide is used to coat mica spacing discs and thus reduce electrical leakage in electron tubes.

Just as engineers readily recognize Mg as the symbol for magnesium, so do they associate the name Tung-Sol with quality production of electron tubes in volume. This unanimous acceptance has made Tung-Sol America's largest independent electron tube manufacturer.



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Communications JAM looms

**FCC takes action on one front
Demands for space continue to grow
Industrial research has answers**

SOME 900,000 TRANSMITTERS are operating in about 60 different kinds of radio service. All of these are jostling for space in the radio spectrum. The way the FCC puts it, there is "a serious 'housing' shortage." A radio engineer expressed it less delicately. He called it "a hell of a mess."

The FCC loosened up the mess slightly when it recently split some of the channels in two-way radio—specifically the 152 to 174-megacycle band. However, this will take several years to complete. Obsolescence of present-day equipment is being allowed to take its own good time. New material must meet the new requirements.

In the meantime, the rate of those seeking licenses in this area of the spectrum increases by 30 percent a year. Though Commission action has doubled available space, the demand will keep this part of the spectrum jammed up.

Industry research has some solutions to offer the Commission as the burgeoning demand in other areas of the spectrum threatens its tranquility.

- Perfection of tighter frequency control to prevent slop-over into adjacent channels and reduce the spectrum space now reserved as a margin for error.
- Methods of using time in the channel more effectively. This means storing of information so that the channel is in use a full 24 hours each day.
- Use of modulation methods, such as single-sideband, that reduce the channel bandwidth to a minimum and still permit it to pass all needed information. ●

MOBILE radio for rent

MOBILE RADIO is a roaring youngster with growing pains. In 1949, there were only 8,000 licenses. The total number of stations extant now in just the industrial and land transportation services is near 65,000.

The Chicago & Eastern Illinois Railroad is setting up an entire network for train-to-train, train-to-station, and station-to-station communications. The price is more than \$250,000. The traffic along Massachusetts' new east-west turnpike will be controlled by \$500,000 worth of equipment.

The small fellow uses it too. The Davis Canning Co. checks in with its purchasing agents in the field



PART OF Chicago & Eastern Illinois \$4 million mobile radio setup

by mobile radio. It tells them what prices to offer farmers for tomatoes, peaches, and apricots.

Most equipment manufacturers

are glowing with long-range if not short-range optimism. It was a \$85-million business in 1956. General Electric thinks it may triple by 1965.

Rental outfits are springing up. A company not wishing to own and service its equipment can now find organizations which will rent the whole shebang. For about 12 trucks with mobile units to transmit 15 miles, the renter would pay an installation charge of \$25 per unit and \$250 a month.

Telephone companies have entered the area of rental on a per-call basis. ●

GARBLES hold up computer nets

TWO TOP FIRMS, one of them an electronics manufacturer, have presented the communications experts with a problem.

Both companies are largely decentralized. They've installed high-speed computers for centralizing their paperwork. Now they need a way to get decentralized data sources feeding at peak speed into a centralized computing system.

Ordinary transmission can stand a greater probability of error than can messages to be fed to a computer. The predictability of the language makes up for many machine or line faults. But an accountant dealing with numbers can't make up for line failures this way and has to be able to trust the machine.

Although communications lines commonly allow a residue of error of 1 in 20,000 and many are far more faithful, computer users find even the best lines inadequate.

Communications people are working closely on the problem with the computer makers. Extra insurance is being designed into data-transmission systems. The form of the data will be checked by code counts, and by retransmission of certain control information.

The worst bugs should be ironed out by midyear, producers report. Much more reliable equipment may appear on the market before year's end. ●

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- Line-at-a-Time Printers
- Record-Playback Amplifiers
- Record-Playback Head Assemblies
- Magnistors
- Magnetic Core Memory Systems
- Magnistor Storage Arrays
- Translation Systems
- Random Access Memory
- Magnetic Shift Registers

High-Speed Counters, Timers, Controllers

- General Purpose Interval Timers
- Preset Interval and Delay Generators
- Predetermined Electronic Counters
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- Frequency-Time Counters
- Totalizing Counters and Scalers
- Plug-In Counter Decades
- Photoelectric Count Detectors
- Photoelectric Screen Detectors
- Translators and Printers

Special Systems

- Multiple-Channel Recording Systems
- Doppler Data Translators
- Militarized Counters and Timers
- High-Speed Printing Chronographs
- Other Data-Processing Systems

You can buy Potter with complete assurance of reliability. As specialists in digital data-handling equipment, Potter engineers welcome an opportunity to study your requirements and to make recommendations for solving your data-handling problems.

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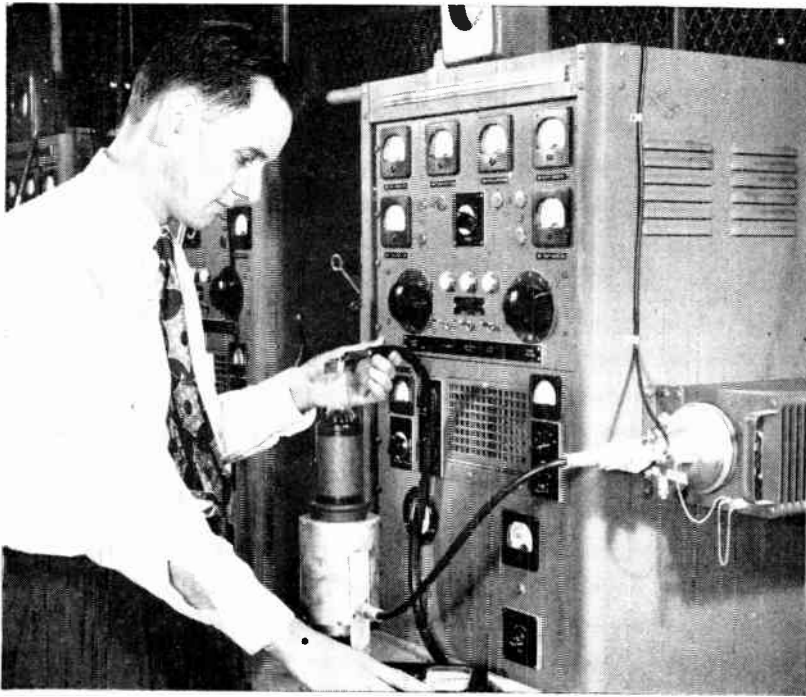
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CHARACTERISTICS

TYPE	Forward Current at +1V (ma. Min.)	Inverse Current at Specified V (µa. Max.)	Continuous Inverse Operating Voltage	DESCRIPTION
CTP-301	40	25 @ -50V	50	Inverse recovery time meas. 1.0 µ sec
CTP-307	300	20 @ -30V	40	Inverse recovery time meas. 1.0 µ sec
CTP-309	300	20 @ -6V	20	Forward recovery time 0.1 µ sec
CTP-318	50	500K between -10V & -50V	60	Inverse recovery time 0.3 µ sec Forward 0.1 µ sec
CTP-319	150	500K between -20V & -90V	90	Inverse recovery time 0.3 µ sec
CTP-320	5	50 @ -50V	80	Inverse recovery time 0.3 µ sec
CTP-328	7.5	500K between -10V & -60V	60	Inverse recovery time 0.3 µ sec
1N34A	8.5	30 @ -10V 50µ @ -50V	60	General Purpose
1N279	100	20µ @ -20V	30	General Purpose
1N116	5	100 @ -50V	60	General Purpose

Clevite Divisions: Brush Electronics Co. • Cleveland Graphite Bronze Co. • Clevite Harris Products Inc. • Clevite Research Center • Clevite Ltd.



ENGINEER checking air flow through Amperex transmitter tube ensures reliable performance on the job. Resulting customer good will is one way that . . .

QUALITY control pays off

- More tube firms spot check
- Find separate department essential
- Expect several benefits

PRODUCERS of electron tubes believe added spending for product reliability is a sound investment. Amperex Electronic Corp., manufacturers of transmitter-type electron tubes and magnetrons, is currently reorganizing its quality-control setup and spending \$100,000 for new test equipment.

With only 300 employees, Amperex has, in the past, depended on in-line checking. Each department tested its own product. To insure impartial checking, this company has set up a separate quality-control department that will answer directly to top management.

Anton Electronic Labs., Inc., with under 100 employees; Chatham Electronics Div. of Gera Corp., with a staff of 1,050; and Electrons, Inc., with 200 employees, all have separate quality-control departments. The system has meant good business for them.

Besides the obvious value of unprejudiced and more thorough testing, Amperex officials expect the new system to write off added production costs by increased sales that result from improved performance and dependability, better advertising copy derived from more comprehensive tests and the creation of a central source of information from which all departments can draw.

Statistical data on the characteristics of parts or materials used in various tube types and tested under varying conditions will be accumulated by the central unit. This system is expected to provide better control over the quality and suitability of parts and materials. ●



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New mines ease COPPER

Rhodesian copper belt production up
Price drops 35 percent from 1956 high
Chilean mines end labor bickering

GOOD NEWS for wire and cable makers, who devour more than half the nation's copper output, is that the red metal is now relatively cheap and plentiful. Barring a national emergency, the price should remain within the 30-36¢ per pound range.

From short supply in early 1956, copper has now become surplus. The fourth-quarter 1956 scrap export quota was increased by 50 percent, reflecting lower domestic demand and an increase in new production.

Until mid-1956 the copper producers were riding high. Copper was in demand and cautious users were stockpiling. Labor troubles in Chilean and Rhodesian mines had cut off part of the rich foreign supply. With controls off, the price went up. The sensitive London exchange recorded a high of 55 cents a pound in March.

Toward the end of June, long-term contracts were signed in many of the world's mines. This assured the copper users of continuing supplies. Simultaneously, the demand for copper decreased, partly due to an end to government and industrial stockpiling.

The London price skidded down to 33¢ on July 3. U. S. producers cut their prices in three big steps, settling at 36¢ in October. The spot market has fluctuated around 35¢ since that time. Most copper men regard this price range as healthy, reflecting the demand for the red metal.

The U. S. produces about a third of the free world's copper, uses about half. Its refinery capacity is great enough for any emergency, but its production is not enough even for current consumption.

U. S. imports exceed exports by about 30,000 tons monthly. Annual consumption is about 1.5 million tons, production just over 1 million. The country's major foreign sources of copper are the Rhodesian copperbelt and the South American mines. These and the Australian mines may add about 200,000 tons to free world production by 1959. ●

TAX relief for small firms?

MANY SMALL, young companies in the electronics industry have had difficulty retaining sufficient earnings to finance growth expenditures. They may get some help through tax relief in 1957.

Although the prospects for general corporate tax relief are dim both parties are expected to push measures to lighten the small business man's tax load.

The normal tax rate on companies earning less than \$25,000 a

year may be reduced from 30 percent to 20 percent. Small business may also get the right to take advantage of rapid depreciation clauses for second-hand machinery purchases.

If small companies win the right to use accelerated depreciation on used machinery it will remove a disadvantage in competing with larger companies that usually buy only new machinery. It will also make it easier for many individuals to start

their own electronics business as they will be able to foresee more quickly the prospects of future earnings.

The hoped for 10-percent reduction in the normal tax rate will be particularly helpful to those companies which have made their first big step and have become going and profitable concerns. This type of firm faces heavy growth expenditures, but because of its size must rely largely on retained earnings for new capital.

T. M. Evans, president of H. K. Porter Company recently recommended these administration-proposed tax relief items before an American Management Association conference, but urged a better definition of small business. Evans said, that the government's definition of small business as one earning less than \$25,000 a year was ridiculous. He urged a more realistic definition which would include companies with sales of less than \$25,000,000 and earnings before taxes of less than \$2,500,000. ●

GEMS up production

GOVERNMENT SECURITY cloaks General Electric's progress in synthesizing industrial diamonds, but progress is apparent in reports of limited production at a pilot plant in Detroit.

Diamonds play an enormous role in American industry. M. V. Marcus, president of Tetrad Company, says there are few electronic parts not dependent directly or indirectly on diamonds in their production.

Diamonds are needed for grinding tool carbides, slicing quartz and germanium crystals and in wire-drawing dies. Many are used as styli and pivots. Marcus estimates 20,000 carats are used yearly for styli—but 100,000 carats are needed to shape the styli.

Inexpensive industrial diamond synthesis could get the U. S. out of a strategic hole. We produce none and import 14 million carats a year, for \$50 million. A cheaper source would broaden use four-fold. ●

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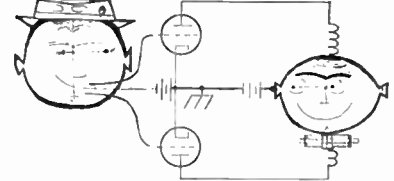
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MILITARY contracts UP 15%

Aircraft and missiles lead

Ship and ground radio cut

See 20-percent rise in 1958

A POSTWAR RECORD volume of new military electronics business will be set this year. About \$4.1-billion worth of production contracts will be awarded—at least 15 percent over the 1956 total.

Behind the big boost:

- Production of guided missiles increasing 20 percent. Electronics makes up over one-third of total expenditure.

- The growing role of electronics in piloted aircraft—now representing almost 25 percent of total expenditures compared to 10 percent five years ago.

Actual expenditures, which reflect most of the volume of shipments, will continue to lag behind new contract awards. For fiscal 1957 military spending for electronics will be about \$3.1 billion—roughly \$1.7 billion for piloted aircraft, \$458 million for guided missiles and \$945 million for ground radar and other equipment.

This is at least \$100 million over fiscal 1956 military expenditures for electronics. It represents more than one-fourth of total military hardware procurement and slightly less than half of total electronics industry output.

During 1958, electronics expenditures may rise 20 percent over this year's level while the total volume of new contract awards remains about the same.

Cutbacks are on the way in ground and ship communications but increases are predicted for just about

all other types of military electronics—notably, missile controls and guidance, ground controlled approach and tactical navigation equipment for airplanes, ground-based early-warning radar, airborne radar and electronic computers.

In components, the trend will mean more miniaturization and more stringent requirements for components capable of withstanding high temperatures and intense vibration—notably transistors and tantalum capacitors.

Here are detailed estimates on this year's military contracts:

- Ground communications—Army, \$127 million; Navy, \$2 million; Air Force, \$73 million; Marine Corps, \$20 million.

- Ground radar—Army, \$63 million; Navy, \$10 million; Air Force, \$250 million; Marine Corps, \$13 million.

- Ground-to-air communications—Army, \$21 million; Navy, \$10 million; Air Force, \$80 million; Marine Corps, \$10 million.

- Countermeasures and cryptographic equipment—Air Force, \$13 million.

- Shipborne communications and radar—Navy, \$131 million.

- Guided-missile electronics—Army, \$334.3 million; Navy Ordnance, \$127 million; Navy Air, \$139.3 million; Air Force, \$554.6 million. Marine estimates are lumped with Navy.

- Airborne radar and communications—Army, \$24.8 million; Navy and Marines, \$540 million; Air Force, \$1,339.8 million.

- Converting conventional warships for guided-missile work—Navy \$306.3 million. ●

MILITARY electronics

A gunnery monitoring device which will enable an instructor to advise students immediately of their errors has been devised by North American Aviation's Columbus division.

Called NAGIM, North American Gunnery Instruction Monitor, the system uses a transistorized television circuit by which the instructor can see the student pilot's gunsight reticle and target on a 3-inch cathode-ray tube while gunnery passes are made.

General Electric missile expert R. P. Haviland told the American Rocket Society in New York that guided missiles having a minimum reliability of 4,999 in 5,000 must be developed and mass produced.

"The electronics industry will soon be asked to design and build electronics for space exploration," Henry F. Prew of Sperry Gyroscope told the American Astronautical Society in New York. The great challenge is instrumentation and Earth-based control facilities for unmanned space-research vehicles.

CONTRACTS

Three orders for electron tubes, totaling more than \$1.8 million, have been placed by Dayton Air Force Depot, Gentile Air Force Station, Ohio. Raytheon and Westinghouse will supply magnetrons, amounting to \$1,425,600 and \$348,300 respectively. A \$47,000 order for transmitting tetrodes went to Penta Laboratories, Santa Barbara, Calif.

Bendix was awarded a \$1,121,203 contract for its type TA-20A transmitter by the Navy Purchasing Office, Washington.

Raytheon was awarded a \$9-million contract by CAA to design and

build 23 air-route surveillance radars. These radars, which use 40-foot antennas and cover more than 125,000 square miles, will be part of a coast-to-coast traffic control network of more than 70 civil and military radar installations.

Out of a total of \$75 million appropriated for the new system, \$47 million will be spent for hardware and \$28 million for construction and installation. Approximately \$30 million has been written off for contracts already awarded.

Other CAA contracts awarded are: I-T-E Circuit Breaker, \$79,860 for airport surveillance radar antenna modification kits; Collins Radio, \$92,366 for airborne electronic equipment; Kaar Engineering, Palo Alto, Calif., \$409,667.62 for vhf transmitters and spare parts; Gruen Watch, \$318,955.45 for 1,545 vhf aircraft communication receivers and spare parts; Daystrom, \$128,054 for vhf radio receivers; and Graybar, \$122,022 for electronic remote control equipment.

Air Materiel Command, Wright Patterson Air Force Base, Ohio, has announced the awards of more than \$16 million in contracts. Among these were: Temco Aircraft Corp., Greenville, Texas, \$2,937,675 for inspection and repair work as necessary and for descaling, re-sealing and electronic modification of fuel tanks; Bendix Radio, \$2,067,032 for technical services; Collins Radio, \$1,299,098 for flight systems components.

Ultrasonic Corp., Cambridge, Mass., announced a multimillion-dollar contract with Convair to manufacture one of the subsystems for the Air Force B-58 Hustler bomber.

Craig Systems, Inc., Danvers, Mass., has been awarded a U. S. Air Force contract totaling \$2,198,271 for air traffic control equipment and communications facilities. The equipment is composed of a series of integrated mobile electronic units housed in air transportable vans. As a complete system, it will provide the Air Force with extended air traffic control facilities on a world-wide basis.

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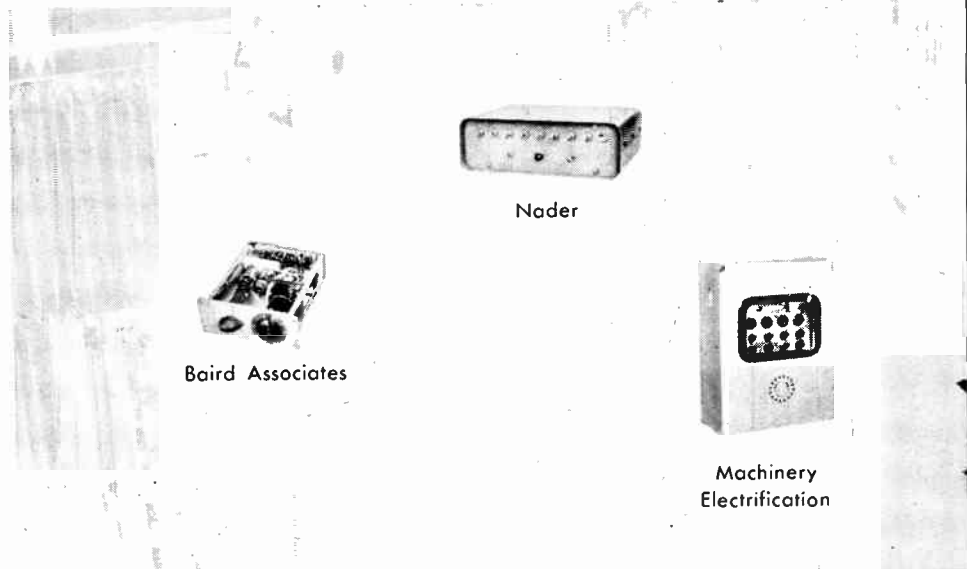
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NEW PRODUCTS run



ELECTRONIC instruments speed factory processes

ELECTRONIC INSTRUMENTS are helping to make automatic factories a reality. New electronic batch counters made by Baird Associates (P1), Nader (P2) and Machinery Electrification (P3) can make faster stack, sheet and cutting counts, as well as high speed measurements of distance, angles and rotations. Production-line weighing is simplified by Photobell's (P4) r-f package inspector.

Interconnection with electrical cables, rather than hydraulic or pneumatic tubes, is possible with Indikon's (P5) pressure and temperature measuring and controlling systems for pipeline and chemical processes. Fenwal's (P6) use of thermistors in its temperature controllers provides greater accuracy and stability. Provisions for telemetering to remote recorders are provided on Consolidated Electrodynamics' (P7) portable moisture detector for gaseous mixtures.

RCA (P8) announces a 7-ounce electromechanical filter designed primarily for highly selective single-sideband applications. . . . A new thermocuring adhesive developed by Goodyear (P9) for high-temperature use is expected to have many applications in the electronics industry. . . . Sonobrazo by Aero-projects (P10) uses high-frequency vibrations instead of fluxes to break down oxidized surface films of brazing materials.

A klystron more than 10 feet long developed by Eitel-McCul-

ough (P11) can generate more than 1 million watts peak pulsed power and is expected to have applications in the food, plastics and petroleum industries, as well as in radar and television. . . . Clarostat (P12) believes its square-bodied miniature power resistors will facilitate certain assembly and wiring operations.

A permanent-magnet type rotary servo actuator developed by White-Rodgers (P13) offers high power-to-weight ratio for airborne applications. . . . A 21-inch color tv

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January 10, 1957 — ELECTRONICS business edition

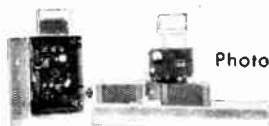
to instruments



Indikon



Consolidated
Electro Dynamics



Photobell



Fenwal

monitor announced by Conrac (P14) operates from either NTSC encoded video or from simultaneous red, blue and green signals. . . . Two capacitor dielectric materials, called Isomica and Samica, have been produced by Mica Insulator (P15) as replacements for hard-to-get natural mica film dielectric.

Sylvania (P16) has two cold-cathode gas-filled miniature tubes: the type 5651 is a voltage reference tube designed for application in regulated power supplies and the 5823 is designed as a relay-control tube. . . . A 400-cycle hysteresis synchronous gear motor, designed for such airborne applications as strip-chart recorders, has been announced by Holtzer-Cabot (P17).

A d-c power supply offered by Dressen-Barnes (P18) has continuously variable outputs from 400 to 4,000 volts regulated to within 0.1 percent above 2,000 volts from no-load to full-load operation. . . . Continental Carbon (P19) has a line of ceramic-encased, carbon-film resistors provided at a standard tolerance of 1 percent and rated at $\frac{1}{4}$, 1 and 2 watts. . . . A linear-scale a-c ammeter developed by Beckman-Hellipot (P20) has a range

of 0 to 150 amperes with an accuracy of 2 percent.

The VA 161 miniature backward-wave oscillator announced by Varian (P21) features all electronic tuning and is expected to have applications in radar and in range-and height-finder equipment. . . . Hewlett-Packard (P22) has supplemented its existing waveguide instrumentation with a line of test components extending through the K and R bands. . . . The Dynamic Micromiker by Kay Lab (P23), permitting measurement of operating capacitances between 0.1 and 1,000 μmf , can also be used for measuring the small capacitances that exist between junctions and contacts of transistors.

The DSP Mark III Junior, developed by Dryscreen Process (P24), is designed for laboratory printing of prototype printed circuits ready for etching. . . . Texas Instruments (P25) claims to have built for the first time silicon transistors, the USN-2N117 and USN-2N118 npn devices, in accordance with Navy specifications. . . . Air-conditioned prefabricated booths designed to meet the requirements of MIL-STD-120 for environmental testing are available

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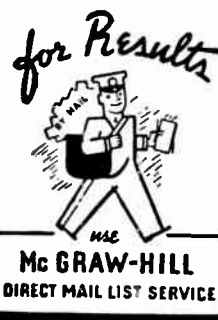
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McGraw-Hill PUBLICATIONS

from Agnew-Higgins (P26).

The Model 802 frequency meter offered by Narda (P27) covers a range of 2,350 to 10,500 mc and features a digital indicator. . . . Elgin National Watch (P28) has developed a light-weight relay capable of withstanding vibrations of 15 g at 55 to 2,000 cps and shock of 100 g. . . . A size 18 low-speed high-torque gear motor available from Avionics (P29) is only 2.8 inches long and delivers 25 ounce-inches torque at 1.7 revolutions per minute.

RESE Engineering's (P30) Model 1080 precision voltage calibrator provides a wide-range highly accurate standard for amplitude measurement and calibration. . . . The 2N269 junction transistor announced by RCA (P31) is a germanium *pip* type designed primarily for such switching applications as flip-flop and gating circuits. . . . Pye Telecommunications (P32) expects to have its vhf mobile radio equipment available shortly.

Westinghouse (P33) has developed a television picture-tube gun which is claimed to provide 17 percent more contrast than conventional black and white tubes and to require only about 110 volts on grid 2, making it particularly suitable for portable tv sets. . . . Jennings Radio (P34) announces the Type JGF-RE2 vacuum relay for antenna transfer applications in high-altitude aircraft.

Application of nameplates to instrument dials and electronic apparatus should be facilitated by Furane's (P35) adhesive. Resin XV. . . . Dilectrix has added an extra-heavy 4-mil cast Teflon film to its line of layered dielectric films. . . . Copper tape only 0.00015 inch thick, developed by American Silver (P36), offers space and weight savings in such products as coils, transformers and relays.

Carter (P37) has a 750-watt d-c to a-c converter for use in marine radar installations, depth sounders, direction finders, and ship-to-shore radios. . . . Excellent shock, vibration and moisture resistance is claimed for the GE (P38) molded PVZ capacitors. . . . A high-speed bobbin coil winder announced by George Stevens Mfg. (P39) fea-

tures a pitch selector, rather than gear changes, thus reducing change-over time.

The automatic light compensator by Blonder-Tongue (P40) eliminates the need for manual or remote resetting of tv camera lens iris or control generator for variations in illumination. . . . A transistorized impedance-matching pre-amplifier designed by Madison Fielding (P41) permits use of low-impedance, low-gain cartridges and microphones with high-impedance tape recorders and amplifiers.

Sylvania (P42) announces a video detector crystal for military applications that will operate at temperatures up to 150 C over a wide range of frequencies. . . . The 2N206 germanium *pip* alloy type junction transistor announced by RCA (P43) for audio-frequency amplifiers is designed to meet military requirements. . . . Textolite, a paper phenolic laminate produced by GE (P44) for printed circuit applications, is resistant to common degreasing solvents.

Mass production methods are used by Assembly Products (P45) to produce a low-cost panel microammeter that is claimed to be both rugged and sensitive. . . . RCA (P46) announces fifteen television receiver tubes designed for use in 45-milliamperce series-heater strings. . . . A line of expanded-scale voltmeters offered by Beckman-Heli-pot (P47) provides high accuracy and readability and provides true rms readings on a-c voltmeters.

A test set, which is suitable for field, bench and production-line testing of capacitance type aircraft fuel gages, is being produced by Telectro Industries (P48). . . . The plates of eight receiving tubes released by Sylvania (P49) can be operated directly from 12-volt automobile storage batteries. . . . Norden-Ketay (P50) offers size 23 synchros which fulfill the requirements of military specifications and provide 3-minute accuracy.

The MEK-5050 electronic proximity control designed by Machinery Electrification (P51) can be used as a limit switch, liquid-level control or interference control between two dissimilar fluids. . . . Sylvania (P52) has released a miniature beam-power pentode type

25C5, designed for a-c/d-c television receivers. . . . Wedglock (P53) announces Yates Industrial Handy Clamps, a series of four types, which promise many applications in electronics manufacture for holding materials in position during assembly or processing.

A synchronous motor developed by Lux Clock (P54) for timer applications uses a novel pivot bearing design which requires no lubrication. . . . The Knight Kit sweep generator released by Allied Radio (P55) provides a range of 300 kc to 250 mc and features an electro-mechanical wobblator system claimed to provide extreme sweep linearity. . . . RESE Engineering (P56) announces their Model 1070 current pulse amplifier for laboratory and production-line testing.

RCA's (P57) type 5725 sharp-cutoff pentode is designed for use in gated amplifiers, delay circuits, gain-controlled amplifiers and mixers. . . . A low-cost chopper designed by James Vibrapower (P58) is claimed to provide dependability and good performance. . . . Miniature airborne temperature measurement systems designed by Arnoux (P59) can operate as many as 20 channels directly into telemetering or magnetic tape systems.

Tipp-Tronics (P60) miniature plug-in control pack provides all the basic circuitry needed for use with contact meter-relays. . . . The threaded actuator plunger guide sleeve of Haydon's (P61) hermetically sealed switches permit mounting the button flush or extending it any distance up to $\frac{7}{8}$ inch from the mounting panel. . . . Acepots, the miniature wire-wound precision potentiometers made by Ace Electronics (P62), are available in a range of 10 ohms to 250,000 ohms.

Two portable wide-band sweep generators by Jerrold Electronics (P63) for laboratory, shop and field use permit testing r-f circuits in the range of 22 to 216 mc. . . . The Datakor DK202 pulse generator employing only solid-state components was designed by Airtronics (P64) to drive as many as ten of their DK101 magnetic shift register units at speeds up to 50 kc.

Eastern Hycon's (P65) miniature 20-mc crystal filter provides

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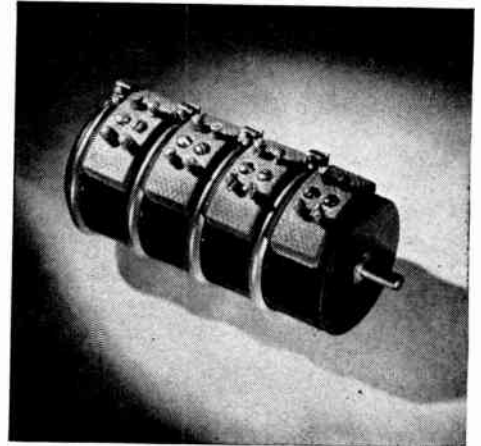
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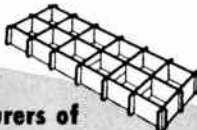
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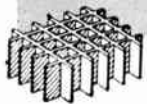
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single conversion directly from vhf and ulf to audio frequencies. . . . Detroit Controls' (P66) system for precision stacking of its Tyni-switches makes possible a single actuator switch capable of switching several independent circuits with a saving in space. . . . A 600-ohm open-line transmission wire is offered by Saxton Products (P67) for airline transmitters, color tv installations and ship-to-shore communications.

A magnetic shield for color tv tubes manufactured by Perfection Mica (P68) using rotary extrusion methods is expected to reduce the manufacturer's cost of a color tv set from \$10 to \$25. . . . Film Capacitors' (P69) Type U line has been developed specifically for ultrasonic applications. . . . The Klixon snap-action, disk-type thermostat designed by Spencer Thermostat (P70) is expected to have a wide range of applications in electronic equipment.

Miller Dial and Nameplate (P71) announces the Triactivator, a high-speed machine for attaching nameplates as thin as 0.002 inch. . . . Traffic Master (P72) has developed a device utilizing a photoelectric cell which removes remaining time from parking meters when the parked car leaves. . . . A current transformer test set manufactured by Eastern Specialty (P73) is especially designed for the testing of small low-capacity current transformers.

Airpax, (P74) miniature circuit breaker now has greater vibration resistance, and the trip level has been extended to 135 percent of rated load current. . . . A component oven by Williamson Development (P75) operates on 115 volts and can be used for hermetic sealing. . . . Telematic Industries' (P76) redesigned Telecheck provides a quick means for bench and production-line testing of cathode-ray tubes and yokes.

An ultrasonic soldering iron which eliminates the need for fluxes in the soldering of aluminum is being distributed by Acoustica (P77). . . . Anchor Plastics (P78) has produced a plastic channel with an integral shock-absorbing spring that is being used for mounting television safety glass panels.

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More rely on local business

Congress probes ownership limit

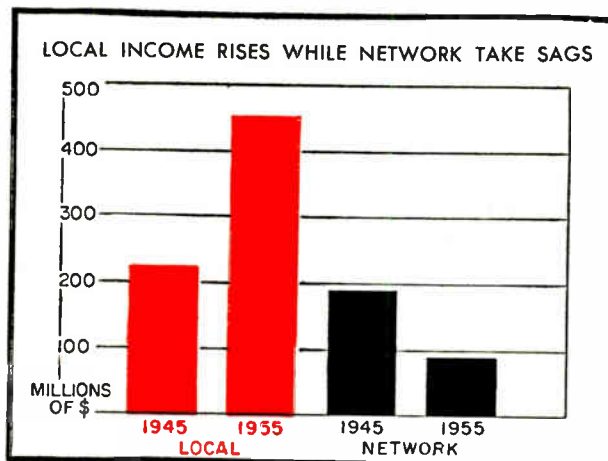
RADIO BROADCASTING is back in the money. Stations are earning more profit and a seller's market has developed for a-m stations.

Many a-m operators panicked when television first became a commercial reality. Revenue from network sources slumped. Lee Wailes, executive vice president of Storer Broadcasting, says, "It was still a good business, but only a few people realized it."

Then business boomed for the local station as it learned to depend less on the network and more on its own aggressiveness. Local station earnings shot from \$226-million in 1945 to \$455-million in 1955. Radio network income during this same period slipped from \$190-million to \$90-million.

Radio stations are now riding a seller's market that looks like it will last. Station brokers believe that the market is realistic and not overinflated. A rough rule for pricing is to ask 150 percent of the gross station earnings.

"Even conservative banks are looking into a-m stations as possibilities for financing," states one



broker. Some publishing companies have gone into broadcasting in a big way.

Last November Westinghouse paid a record \$5.3-million for WIND in Chicago. WNEW in New York City, prior to this, got the record top sale price of \$4.1 million in 1955. In the past two years transfers jumped from 473 to 525.

House and Senate bills are now pending which could give the small station owner a still more active market in which to sell. The bills propose to set limits on station ownership by networks based on percent of the nation's population. ●

CLOSED TV may reach \$75 million

CLOSED-CIRCUIT television today is at the budding stage. Full flowering is just ahead. Its position resembles that of two-way radio just after the war. The number of uses unfolding staggers the imagination.

Equipment manufacturing was a \$6-million business in 1956. In ten years manufacturers think it will grow to \$75-million. Of the four big uses, industrial is expected to be the leader, followed by military, education and medical.

It is being used by the military for such things as dismantling World War II bombs. It permits handling of hot materials in atomic research. Chief of New York City's fire department Thomas P. O'Brien is investigating it for fire fighting. He is already planning to use closed-circuit tv in the department's training program. ●

FCC actions

For the first time the FCC has waived its rules governing minimum mileage separations between tv stations. In granting Peoples Broadcasting Co.'s application for channel 21 in Lancaster, Pa., it is permitting the transmitter site to be one mile short of the 60-mile separation normally required to minimize interference.

Commissioner Hyde decried the action. He thinks that it might set a precedent, suspects that it will open the flood gates for further attempts to reduce the distance between transmitters.

Commission feelings about the number of stations it thinks any ownership group ought to control are now somewhat clearer. It likes its own arbitrary limit of seven a-m and seven tv stations. It does not like the limitations proposed by Congress. This would allow multiple ownership of as many stations as would add up in audience reached to 25 percent of the nation's population.

Industries anxious to operate their own microwave and other facilities which lie in the frequency channels of 890 mc and up will soon have their first chance in 12 years to be in on the reexamination of those allocations. The Commission expects a major battle to shape up at the oral hearings between these industries and common carriers which sell this type of service to industry.

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STATION moves and plans

Crowell-Collier has withdrawn its offer to pay \$15 million for seven radio and television stations. It had planned to acquire Consolidated Television & Radio Broadcasters, Inc. The fly in the ointment was the changing money market. Developing costs and terms "made it impractical."

Last August Crowell-Collier dropped its efforts to buy two Honolulu stations because the seller was unsuccessful in clearing its stock for sale. The publishing company is still intent on expanding into broadcasting.

Radio Milwaukee has purchased WRIT, Milwaukee, from McClelland Investment Corp. The price was \$455,000. Radio Milwaukee already owns interests in three uhf television stations.

WAAA, Winston-Salem, N. C. was bought by Lairy Associates from Camel City Broadcasting. \$150,000 was the sales price.

WHLL, Hempstead, N. Y., has asked for an increase in power. The station wants to go from 250 to 10,000 watts. It also is planning to move to a new \$250,000 radio center.

Joining CBS-tv network as affiliates are KICA-TV, Clovis, N. M. and KGEZ-TV, Kalispell, Mont.

New television tower for Boston, Mass., nears completion. Being built by Westinghouse station WBZ-TV, it will increase the station's service radius from 50 to 70 miles. The tower is available for all vhf stations in Boston.

Capitol Broadcasting sold KFNF, Chenandoah, Iowa, to a group of investors headed by William A. Martin. The price was \$61,050.

WSLA-TV, Selma, Alabama wants to get in the act. It has applied to the FCC for a skyscraping 1,993-foot tower. There are now some 43 tv towers throughout the country that are over 1,000 feet.



WORKERS at Chatham Electronics new plant prove that . . .

HELP makes or breaks

Electronics firms moving to New Jersey
 Find workers with adaptable skills
 Raid state's existing industries

MANUFACTURERS in the burgeoning electronics industry face the problem of locating new plants where there is an adequate supply of skilled manpower. The problem is doubly difficult today because of peak employment throughout most of the nation.

An answer is locating in areas where skilled workers can be weaned away from other industries. A machinist is as useful in an electronics plant as in a tool-making plant.

New Jersey is such an area. Electronics manufacturers asked why they are there all had one answer, the supply of personnel skilled in electronics or with adaptable skills. There were, of course, such other considerations as closeness to customers and corporate offices. Most new plants are being built in suburban areas where room is available for growth and living environments are attractive to employees. As a Curtiss-Wright electronics division executive said in his Carlstadt office: "A good supply of qualified people within easy commuting distance means plant expansion with a minimum of difficulty."

Examples: Kearfott Company, of Little Falls, moved from New York in 1951 with 400 employees. In 1956, it had 4,200. It was not until last fall that Kearfott had to step up its training program to overcome shortages of draftsmen, machinists and some types of precision assemblers.

Federal Telecommunications Laboratories moved to Nutley, in 1946 with 750 employees. In 1956, it employed more than 2,000 and expects 2,700 in 1958. An 80,000-square-foot addition is planned.

The New Jersey Chamber of Commerce reports that the state leads the nation in manpower density. It has 103 factory workers per square mile. The 1954 Census of Manufactures showed the state had 538 of the nation's 5,280 electrical and electronic plants. State Department of Labor figures for March 1956 show the electrical and electronics industry to be the state's leading employer, with 121,157 employees. ●

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The PATENT game

Patents are like kids' marbles

You must have some to play

Big portfolios mean protection

PATENTS in the electronics industry are like children's marbles. A corporation that doesn't have a bagfull to start is handicapped in the game.

Today every big corporate laboratory has a staff of patent attorneys with many technical specialties. For example, the Princeton, N. J., laboratory of RCA is the center of the firm's patent activities. Bell Telephone Laboratories, research and development unit for the American Telephone and Telegraph Co., has a patent department that handles 75 percent of the Bell System's total patent applications and nearly all Bell's electronics patents.

Commercial secrecy as a substitute for a patent does not afford the protection in electronics that it does in such industries as the oil business. A gallon of gas cannot reveal much about the process by which it was made. However, any engineer can trace the circuit of a tv set.

Most big electronics firms regard patents as necessary, not entirely for the rights involved, but for their trading value. Unless a company has a portfolio of patents to exchange, it sometimes cannot use the patents of others. So extensive is this trading that many electronics concerns are licensed by others under application agreements to receive rights when, as and if patents are issued.

Yet in the overall business picture there is a growing feeling among the large electronics manufacturers that patents are really the "tail on the dog." Business considerations rather than patents determine whether a company goes ahead with new products.

To use its own patent in an end product it is often necessary for a company to use the patents of others. Sometimes a company will "invent around" a patent obstruction either to avoid paying royalties, or because it is unable to get a license.

But there is another good argument for the large companies to keep filing their patent applications diligently. They have always been vulnerable to "itinerant inventors" who claim as their own ideas used by the big companies. Often these claims are based on "suggestions" made in unsolicited letters that were written long after the company began working on the same idea.

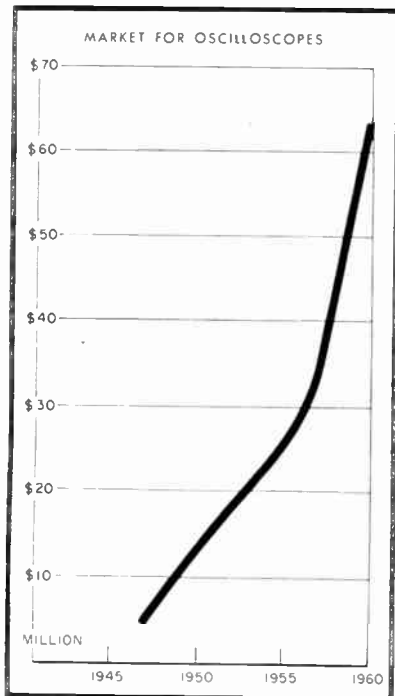
Said one research director: "It is necessary to file for patents to prevent the company from being milked by itinerant inventors and small companies."

Large sums have been paid by electronics firms to "crackpots" and conniving fortune-seekers. These are generally out-of-court settlements, which turn out to be cheaper for the corporation than lengthy legal procedures.

The cost of applying for a patent and getting it processed has gone up as has the research behind it. There is a tendency for small electronics firms to avoid filing patent applications. ●

INDUSTRIAL uses boost scope sales

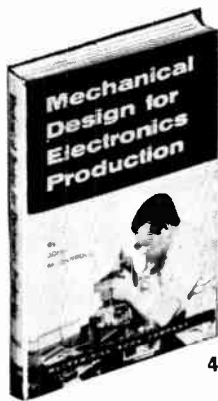
INDUSTRIAL USE has multiplied oscilloscope sales. Today's market is \$30 to \$40 million annually, estimates E. G. Nichols, DuMont instrument production manager. He sees \$60 to \$70 million sales by 1960. Census figures showed a \$5 to \$23.5 million growth between 1947 and 1954.



Nichols says 60 percent of the growth is in industry, the rest in research. Test oscilloscopes are used with radar, missile-guidance systems, computers and atomic-energy installations.

They are used in design of electronic circuits and for study of heart beats. The instruments also help check the performance of motors, valves, gears and structural parts. Prices for commercial models range from \$50 to \$7,000.

Some types retain traces for long periods of time. Others have high-speed cameras attached to give photographs of scope patterns. A typical scope contains a graph-faced cathode-ray tube, power supply, time-base generator, vertical and horizontal amplifiers. Input transducers for industrial scopes include microphones, strain gages, vibration and pressure pickups. ●



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By John M. CARROLL

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Must sell skills**

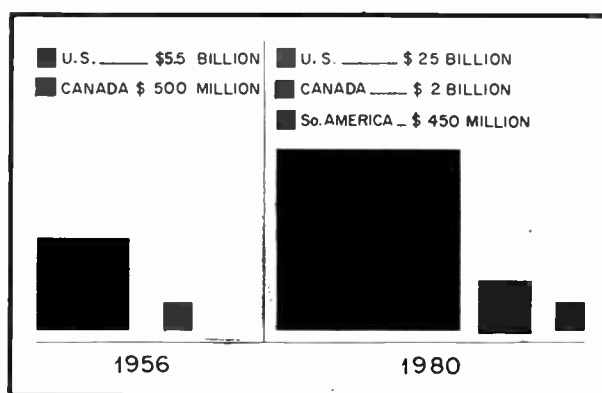
CANADIAN electronics manufacturers are optimistic that their expanding industry can produce a base on which Canada can develop an export market.

Exporting experience has shown Canadian manufacturers that even a comparatively small share of the world electronics market can surpass their business at home, although exports now represent only a fraction of Canada's electronics business. This optimism is the result of early success in exporting instruments to more than 40 countries.

Canada's greatest opportunity for improving her economy in the future is apparently in the export of skills. Many Canadians who criticize their nation's economy as one which is based chiefly on export of natural resources point to electronics as the most promising field for broadening the country's industrial base. A parallel is drawn between

Canada's electronics potential and the Swiss watch industry.

If Canada's electronics industry continues to grow, a substantial part of the inevitably expanding export market may be open to her. Canadian manufacturers are particularly eyeing the markets in South America, Africa and Asia. They believe that even in underdeveloped nations the amount per capita spent on electronic products will rise. In general, Canadian production volume lags five years behind the U.S. and the South American countries about 10 years behind Canada. ●



Developments ABROAD

In London, F. E. Jones, a director of Mullard, Ltd. and former deputy director of the Royal Aircraft Establishment, told the Radar Association recently that individual engines of enemy aircraft can now be distinguished at distances up to five miles by means of infrared detection equipment.

Dr. Jones said the detector was based on a German war-time development, but that modern lead sulphide infrared detectors were at least 10, if not 100, times more sensitive than the German cells, and that even better types of infrared detection cells are now available.

The new cells were said to respond so rapidly that the British Fairey Delta II traveling at 1,132 mph would move only two inches during the response interval.

Dr. Jones said fast response made it possible for detector units working at wavelengths of from three

to 100 thousandths of a millimeter to detect very small temperature changes and to build up a complete heat picture of areas up to several miles distant from the scanning units.

It was reported that while today's eight millimeter radar unit with a one foot diameter scanner can separate two aircraft at five miles range if they are one-quarter of a mile apart, the infrared receiver could resolve the separate engines on a single aircraft at the same range.

In Caracas, a new electronic surveying device is expected to reduce the time and costs of surveying Venezuela's Lake Maracaibo oilfields. Cia. Shell de Venezuela, subsidiary of Royal Dutch Shell, has reported good test results with the Geodimeter, developed by Erik Bergstrand of Sweden. The device operates at night and meas-

ures distances by determining the elapsed time of a light beam reflected from a mirror mounted at a survey point up to 12 miles away.

India has placed an order for a vhf radiotelephone system with Marconi's Wireless Telegraph Company Ltd. of England. This will be the first multichannel radio system to be installed in India and will be equipped initially to provide four circuits. The order was placed on behalf of Western Railways, Bombay.

Doctors at St. Thomas's Hospital in London are now being paged by means of a transistor receiver which clips to a pocket like a fountain pen. The personal paging system was developed by the Multitone Electric Company in collaboration with St. Thomas's. It eliminates loudspeakers, bells and flashing lights along hospital corridors.

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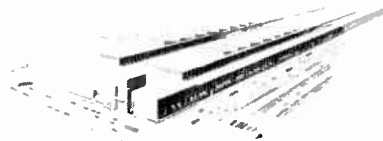


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Exports & Imports

Communications equipment manufacturers are watching events in the Middle East closely to see if Britain can retain her market position, or if she will lose ground to the United States, Germany or even the Communist countries.

Some British companies are reported to have suspended temporarily shipments of radio receivers to their Middle East distributors. But orders are still on hand for other communications equipment.

Until recently, German radio sets offered Britain the principal competition. But now the British are concerned about a flood of sets from Communist satellite states that are being dumped at low prices. A Hungarian Orion set was quoted recently at \$10.50 in Jordan while a competing British set cost \$18.20.

Mexico is a rapidly growing market for private radiotelephone systems which are conquering mountains and jungle as industry springs up in many isolated areas of the country. More than 50 companies are using their own f-m radiotelephones because they found existing wire facilities to be inadequate.

An example is the Gulf Sulphur Co., whose production operations are in a remote sector of Vera Cruz. The company's business offices are in Mexico City. Formerly, Gulf depended on a land-line 16 miles away to the production site. After placing a call there was often a five-hour wait. Since its Motorola system has been installed, Gulf spends six to eight hours a day conducting business by telephone. Mobile units using transistors are also finding wide use.

Maryland Electronics Manufacturing Corp. will supply spare parts for VOR and ILS equipment valued at \$50,028.60 to Spain.

West Germany's Siemens Co. has sold to Radio Receptor of Brooklyn, new equipment valued at about \$250,000 for the manufacture of selenium rectifiers by a vacuum deposit system. The new manufacturing technique is said to save one-half the selenium ordinarily used.

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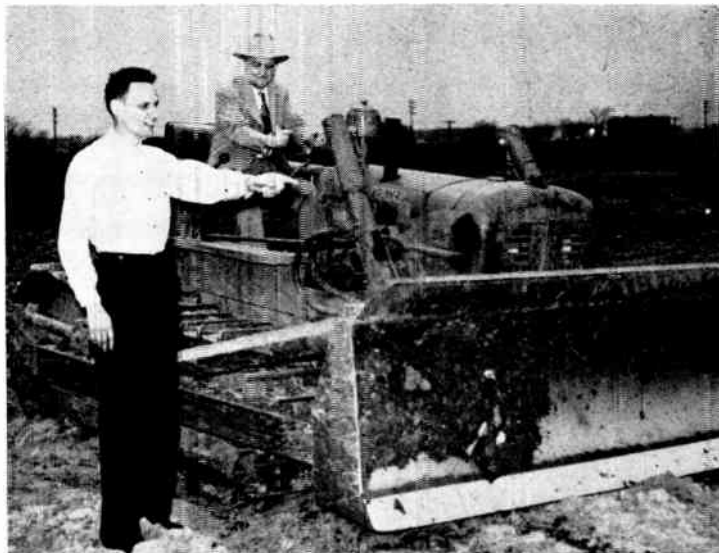
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PLANTS and PEOPLE



SON tells dad, where to go, as . . .

TRIPLETT goes West

TRIPLETT ELECTRICAL Instrument Company, manufacturer of electrical measuring and test equipment, is building new plant capacity in Oceanside, Calif. W. Ropp Triplett, president of the Ohio concern, is shown above directing the bulldozing activities of father Ray L. Triplett, board chairman, on the Oceanside site.

The 10,000 sq-ft plant, first production venture outside Ohio for the Triplett's, will house manufacturing facilities only. Sales and administrative offices will remain in Bluffton, Ohio. Triplett executives believe the new plant will enable them to serve the growing southern California market more efficiently.

NEW setup, plant at GPL

NEXT MONTH, General Precision Laboratory will move into a new 23,000 sq ft environmental testing laboratory in Pleasantville, N. Y. Soon after, a 21,000 sq ft annex to the existing engineering building will be completed. This new capacity will not only increase the research and development facilities of GPL, but also broaden its capabilities for system testing.

To prepare for its intensified R&D program, GPL president

H. G. Place created two new executive vice-presidencies for technical and general administration. Vice president Raymond L. Garman moves up to become technical director, and James W. Murray takes over as general manager, responsible for manufacturing and administration.

GPL manufacturing subsidiary, Pleasantville Instrument Corp., gets a new president in the same deal, as former v-p William P. Hilliard moves up.

Executive MEETINGS

Jan. 11: IRE Symposium on Engineering Management, 33 W. 39th St. N. Y.

Jan. 14-15: AMA Seminar: 980-4 "Management's Responsibility in Orientation, Placement and Training of Engineers," Sheraton-Astor, N. Y.

Feb. 25-27: AMA Electronics Conference, Statler Hotel, N. Y.

Feb. 26-28: Western Joint Computer Conference, Statler Hotel, L. A.

Mar. 18-21: IRE National Convention, Waldorf-Astoria, N. Y.

COMPUTER makers spreading out

BURROUGHS' ElectroData division has completed the second 40,000 sq-ft section of its Pasadena plant. The whole plant, comprising 230,000 sq ft of production, laboratory and office space, will be completed by March 1. It will house the engineering, production and sales facilities for the Datatron computer, and sales offices for the Burroughs Series E and G office machinery.

Remington Rand has bought the Savage Arms Corporation buildings in Utica, N. Y. The 730,000 sq-ft capacity will be used for the production of "an entirely new line of products for the . . . Univac division," according to Remington Rand manufacturing vice president B. F. Anderson.

Executive MOVES

NEWLY-ELECTED Packard-Bell board adds the word "Electronics" to the corporate name, moves founder Herbert A. Bell from president to board chairman, elects former general manager Robert S. Bell president.

Drug expert Raymond E. Lee, originator of the Toni home permanent, moves in to become president of TelAutograph.

Robert L. Shaw taking over as general sales manager of Sylvania's Radio and Television division appoints Harley T. Litteral manager of radio sales.

GE created a Communications Products department, put Harrison Van Aken in as general manager. At the same time, lawyer George V. Eltgroth moved from the patent-license office of GE's Electronics division to become patent counsel for the Industrial Electronics division.

In St. Charles, Ill., George R. Haase became president of the DuKane Corp., moving former president J. M. Stone to board chairman. Heir apparent J. M. Stone Jr. succeeds Haase in the executive v-p slot.

Ford executive James J. Welker becomes operations v-p of Clevite, responsible for all the corporation's operating divisions.

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Companies study REPS

WITH KEENER competition throughout the industry, and with smaller profit margins demanding more volume and tighter sales administration, manufacturers are paying more attention to their representatives.

The end of 1956 saw a large number of shuffles in representation around the country. Many manufacturers are broadening their distribution pattern.

Manufacturers are counting their distribution assets and liabilities, with one hand on the pruning shears. National Electronic Distributors Association president Joseph A. DeMambro told his group's New York chapter that reps who can't distinguish between economical and cheap distribution "injure the future health of the parts industry." Mr. DeMambro also remarked that lack of "mental capital" accounts for more business failures than lack of working capital.

Electrical Communications Inc., San Francisco manufacturer of communications switchgear, has announced open territories throughout the West and Midwest, hopes to find reps to merchandise its

wares to independent telephone companies, power utilities, pipeline operators and communications equipment manufacturers.

Cleveland rep M. P. Odell Co. has undertaken the distribution of the Spencer-Kennedy line of pulse components. The Boston manufacturer thus acquires outlets in the Dayton, Detroit, Pittsburgh and Cleveland areas.

Other DISTRIBUTION news

RCA's test apparatus is now being distributed through nine agencies coast to coast. Three recent additions making up the total are Pasadena's G. S. Marshall Co.; Burt C. Porter Co., Seattle; and Williams & Associates, Denver.

Sylvania has appointed Matthew J. Hughes as special sales representative for electronic products to major national accounts, and named the R & R Supply Co., Lubbock, Texas, as distributor for electronic tube products in Odessa, Tex.

INDEX TO ADVERTISERS

Ace Electronics Associates	55
Airpax Products Co.	38
Bowmar Instrument Corp.	8
Chicago Telephone Supply Corp.	2
Clevite Transistor Products	26
Commonwealth of Puerto Rico	38
Dumont Laboratories, Inc., Allen B.	4
First Six	9
General Radio Co.	3rd cover
Hollenbeck and Company	29
Kearfott Co., Inc.	31
Loral Electronics Corp.	23
McGraw-Hill Book Co.	28, 32, 41
Peter Partition Corp.	36
Potter Instrument Co.	25
Radio Corporation of America	4th Cover
Raytheon Mfg. Co.	2nd Cover
Sangamo Electric Co.	3
Schweber Electronics	10
Servo Corporation of America	11
Sodaro Co.	29
Standard Record Mfg. Co.	36
Texas Instruments, Inc.	18
Tung-Sol Electric, Inc.	24
United Electronics	12
United Shoe Machinery Corp.	7

PROFESSIONAL SERVICES 47

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 43, 44, 45, 47

SEARCHLIGHT SECTION ADVERTISER'S INDEX

Fidelity Personnel	43
General Electric Co., Utica, N. Y.	43, 47
National Carbon Co., Div. of Union Carbide & Carbon Co.	43
Stewart Warner Electronics	44
Sylvania Electric Products Inc.	45

About our TECHNICAL edition . . .

Observation of hazardous or inaccessible industrial operations, even where external power is not available is possible with the portable transistorized tv camera described in the Jan. 1, 1957 edition of *ELECTRONICS* by Flory, Gray, Morgan and Pike of RCA. The experimental unit for closed-circuit systems features light weight, high sensitivity and low power consumption and can be operated from either 110-volt a-c mains or from batteries.

Broken capacitor leads, tube failures and a number of other malfunctions can result when electronic equipment is subjected to vibration in aircraft and missiles. Mercurio and Belby of GE offer advice on selecting and mounting components to minimize effects of vibration and describe tests to evaluate equipment's vibration resistance.

Swinging-beam die-cutting machines are used to stamp tv escutcheon rims and other products out of leather, nylon cloth, felt and other materials. The conventional die-cutting machines follow-through of the beam reduces die life and shakes up the shop.

Now comes an electronic control that stops the beam short.

According to Bradley of United Shoe Machinery, the control ends the cutting stroke when the die completes the electrical circuit between the cutting surface and the beam striking plate.

Electronic control also protects the operator. Should the circuit between cutting surface and striking plate be completed by the operator's arm or hand, the beam stroke is immediately stopped to prevent serious injury.

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electronics READER SERVICE CARD

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On pages with no number such as bleed pages, count from the last numbered page to find the number. Inserts

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See Fractional Page Diagram on Other Side of This Page!

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7	10	18	25	29TR	35	38T	2nd Cover	

SECTION B

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P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

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P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

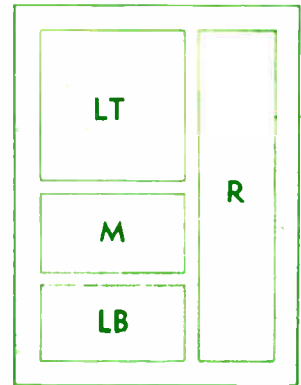
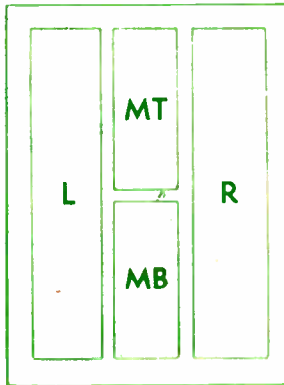
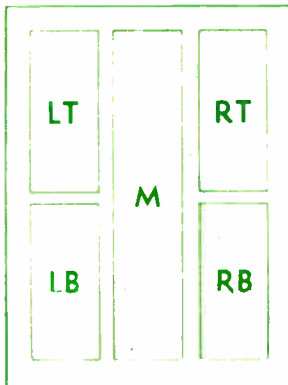
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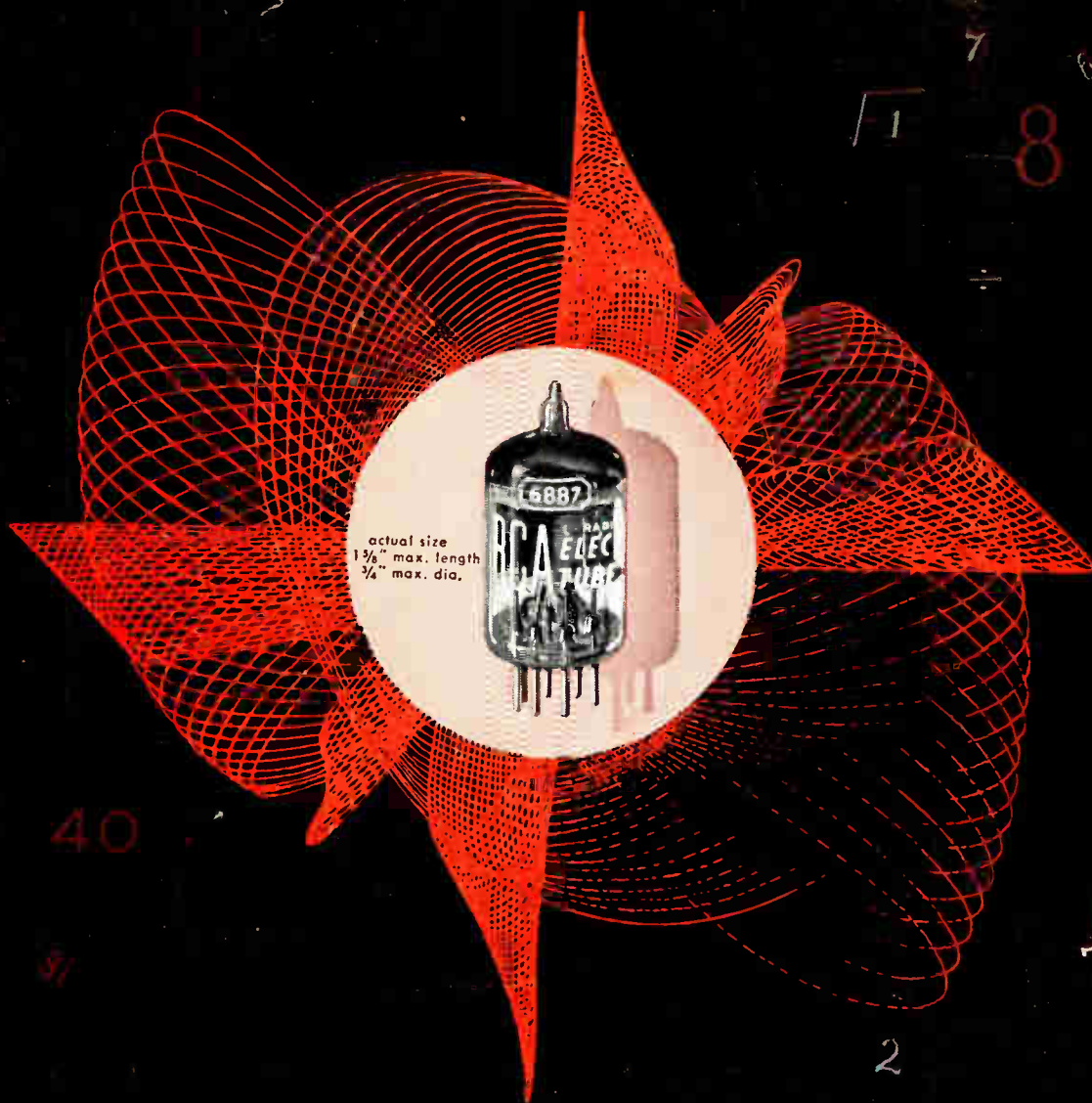
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