

NOVEMBER 28, 1958

electronics

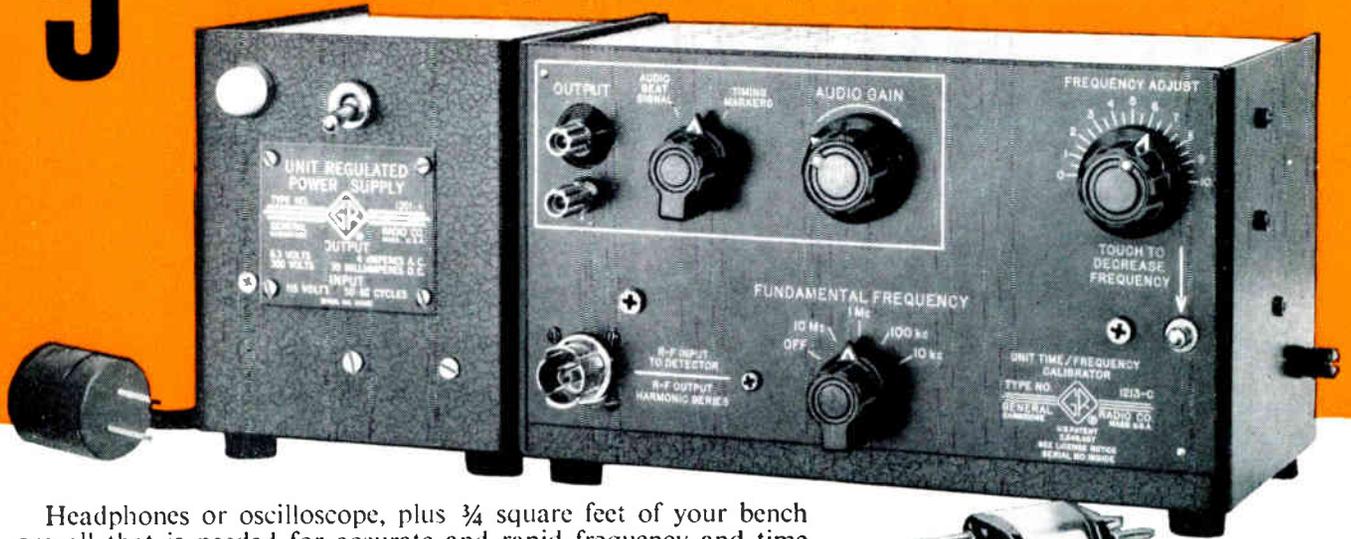
business issue

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The Missile Market ... page 13

5-1b. Frequency Standard



Headphones or oscilloscope, plus $\frac{3}{4}$ square feet of your bench are all that is needed for accurate and rapid frequency and time calibration with this G-R secondary standard of frequency. But don't let the small size fool you — this miniature standard contains all that's necessary for the precise calibration of oscillators, receivers, frequency meters, delay lines, and signal and pulse generators to frequencies above 1000 Mc. In addition, sweep-time standardization of oscilloscopes is easily performed at intervals from 0.1 μ sec to 100 μ sec.

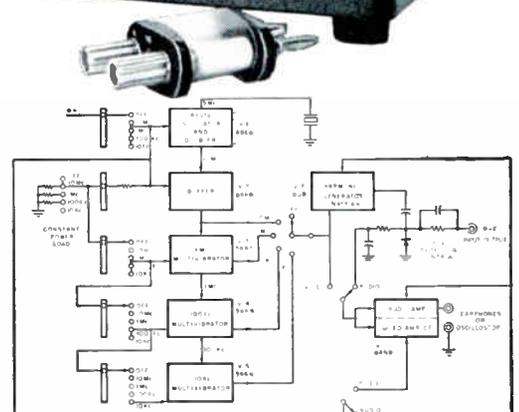
This one instrument provides:

- ★ Accurate 10-kc, 100-kc, 1-Mc, and 10-Mc fundamentals . . . plus harmonics to above 1000 Mc.
- ★ An improved crystal mixer that combines performance with compactness, and protection for the crystal diode against surges.
- ★ Audio and video amplifier stages . . . to amplify beats from the mixer for frequency calibration, and to amplify the crystal-controlled multi-vibrator square waves for time calibration.

The instrument's square-wave output, husky enough to trigger most pulse generators, can be converted to time markers for time calibration, by means of the G-R Type 1213-P1 Differentiator (supplied).

The Calibrator's crystal oscillator can easily be set to zero beat with an external standard such as WWV for accuracy much greater than required in most applications. A touch-button frequency deviator on the panel, which reduces frequency, permits you to determine quickly whether the crystal oscillator frequency is above or below WWV (or an unknown frequency to be measured).

By simply feeding an interpolation frequency into the Calibrator's mixer, along with the unknown signal, you do not restrict yourself to measurements at harmonics of the calibrator's fundamentals. Measurement or standardization at *any* frequency from 10 kc to above 1000 Mc becomes possible, including, for example, the setting of any television transmitter to its assigned frequency to within ± 100 cycles or better. To illustrate: for an assigned frequency of 567,250 kc (Channel 30, visual), the interpolation frequency is 7,250 kc; or 2,750 kc, i.e., 560 + 7.250 Mc, or 570 — 2.750 Mc. By this simple interpolation technique, a broadcast station on *any* channel can perform its own frequency checks on visual, aural and color-sub-carrier frequencies, as well as performance checks on all equipment including monitors.



SPECIFICATIONS

- OUTPUT FREQUENCIES:** 10 kc, 100 kc, 1 Mc and 10 Mc; harmonics usable to 10 Mc, 100 Mc, 500 Mc and 1000 Mc respectively.
 - NARROW-RANGE FREQUENCY ADJUSTMENT:** 2.5 ppm variation (25 cycles at 10 Mc). For standardizing crystal oscillator against external signals.
 - TOUCH-BUTTON FREQUENCY DEVIATOR:** introduces a momentary 1.8 ppm frequency decrease for establishing "sense" in indications near zero-beat.
 - OUTPUT AMPLITUDES:** 10v peak-to-peak on 10-Mc output from pulse amplifier; 30v p-to-p at lower frequencies.
 - OUTPUT IMPEDANCES:** 300 Ω : from video cathode follower; capacitively coupled r-f output from crystal-diode harmonic generator.
 - STABILITY:** 1 ppm/ $^{\circ}$ C after one hour warm-up with Type 1201 Regulated Power Supply.
 - SENSITIVITY:** usable beat notes produced with 50-mv signal input to mixer.
- Type 1213-C Unit Time/Frequency Calibrator, supplied with Type 1213-P1 Differentiator.....\$260
- Type 1201-B Unit Regulated Power Supply.....\$85
- Type 480-P403 Relay Rack Panel, for mounting both Calibrator and Power Supply.....\$10.85

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WE SELL DIRECT. Our District Sales Offices are staffed by engineers especially trained to help you in the selection of instruments and measuring systems best suited to your needs. We welcome your inquiries — will help solve your problems.

Shoptalk . . .

One Best Bet in 1959

Beginning in January, **ELECTRONICS** will have the same editorial format each week.

Technical articles that have distinguished the magazine since 1930 as the leading publication in its field will be increased in number and will be joined by business articles we now know have wide appeal and usefulness.

We learned in 1957 that there was a need for this additional material; we learned in 1958 that it was needed weekly. So our planned standardization of issues should better serve readers in research, design, production and management. And we hope it will make **ELECTRONICS** compulsory reading for many others.

Subscribers gained 400 additional editorial pages in 1957, more than 550 in 1958. They will benefit again in the year just ahead, both in quantity and in quality, as we further broaden our scope and coverage without taking our eye off the engineering ball.

Thus **ELECTRONICS** keeps pace with its growth industry. If it's about electronics, read it in **ELECTRONICS**—repackaged as a straight weekly.



Publisher

About Our Current Operations . . .

In This Issue . . .

THE MISSILE MARKET. Today, to many manufacturers, "military electronics" means "guided missiles." During fiscal 1959 the armed forces will spend nearly \$3 billion on electronic equipment to be used in and with guided missiles.

This week, **ELECTRONICS** presents a special report that tells you what to sell and where to sell it in the guided missile marketplace.

Associate Editor Mason started digging out this information more than two years ago and kept at it in day-to-day contacts with a score of Defense Dept. agencies and more than 40 guided-missile manufacturers. He contacted hundreds of subcontractors and suppliers and pored over several thousand pages of testimony before Congressional committees. Mason received assistance in depth from our field editors and from the McGraw-Hill Washington Bureau and our other news bureaus.

His report breaks down the market by missile type, enumerates the electronic hardware used in missiles and tells where to sell specific items. "The Missile Market" begins on p 13

Coming In Our December 5 Issue . . .

STEREO AMPLIFIER. The introduction of stereo disks into the high-fidelity market has spurred equipment manufacturers to seek economical circuitry for the reproduction of stereophonic effects and compatibility with conventional recordings.

Associate Editor Manoogian picked up the thread of one story in New York, followed it to RCA's plant in Cherry Hill, near Camden. Impressed with the way engineers had connected the output transformer to reduce unwanted feedback, Manoogian invited Engineer Roy S. Fine to prepare an article for us. You can read it next week in **ELECTRONICS**.

The amplifier can be converted to stereo by addition of only one loudspeaker. The amplifier operates in push-pull for monophonic reproduction, but separates into two independent single-ended channels for stereo at the flick of a switch.

DIGITAL WIND TUNNEL. Conventional methods of digitizing, displaying and recording force and pressure data from wind-tunnel model tests suffer from inherent human errors and wear problems associated with moving mechanical parts.

To eliminate these shortcomings, R. C. MacArthur and W. J. Ungar of the Cornell Aeronautical Lab in Buffalo have devised a technique wherein four million air loads on the wind tunnel model are recorded as three decimal digits on punched cards for use with a digital computer.

OSCILLATOR DESIGN. A comparatively simple technique of designing transistor oscillators by graphical methods is described in an article by W. R. McSpadden and E. Eberhard of Motorola in Phoenix, Arizona.

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SPECIAL REPORT

The Missile Market. Our industry's share of the 1959 missile business will approach \$3 billion. Fiscal 1959 is ushering in mass production but R&D will always represent a large portion of the program

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Tv Radar Attracts Buyers. New approach to weather reporting promises a healthy market for radar gear to track local storms. More than 12 broadcasters have invested this Fall, and manufacturers are eyeing new prospects	p 17
Profits Come Back A-Running. Third-quarter net profits of many electronics firms are ahead of high 1957 third-quarter earnings—and well in front of this year's second period. As for the fourth-quarter outlook, one word: good	p 18

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electronics

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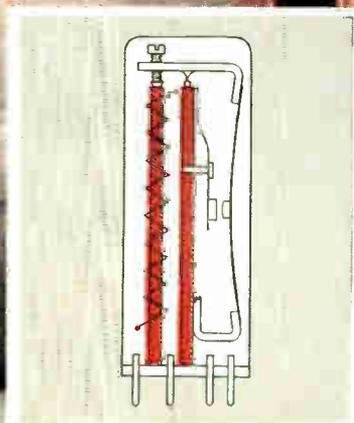
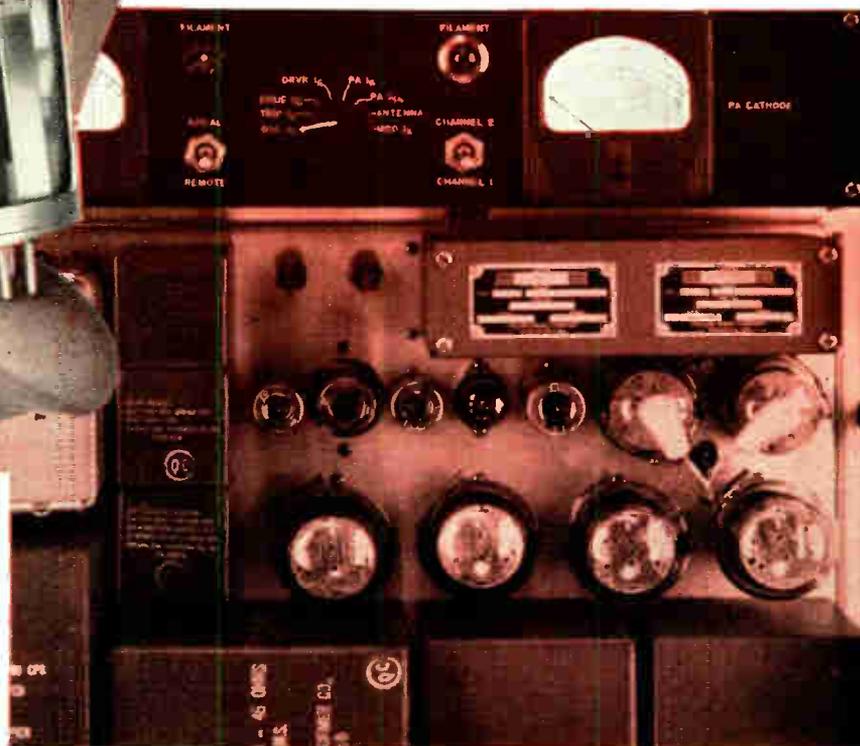
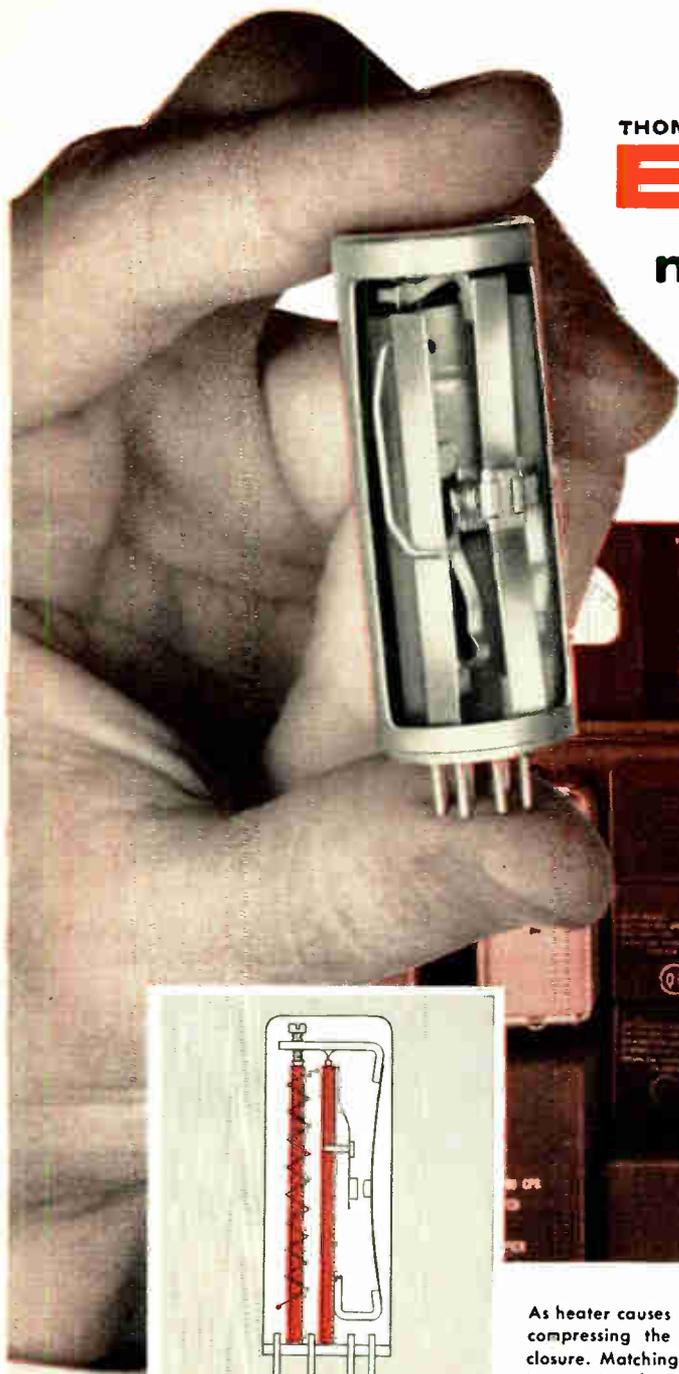


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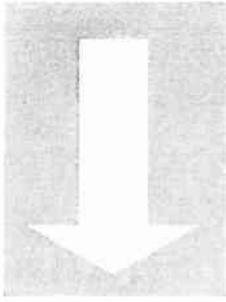
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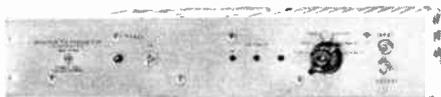
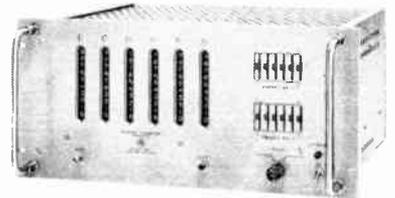
Many different systems can be assembled from these and other standard Dymec instruments. Dymec offers the instruments separately, as sub-systems, or as completely engineered, ready-to-use systems.

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DY-2500 COMPUTING DIGITAL INDICATOR, variable gate time electronic counter permitting normalized direct reading with minimum controls, automatic setability. Measures frequency, period. Displays degrees/hr, gpm, RPM, etc.; also shows ratios of unlike variables. \$1,330.00 to \$1,425.00.

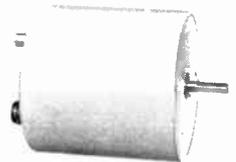
DY-2507 DUAL PRESET COUNTER, multi-purpose precision counter producing an output signal when either of two preset numbers is reached. Instrument is ideal for industrial control, sorting, packing, Go/No Go testing; control of coil winding, machine limits. \$700.00 to \$895.00.



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DY-2533 DIGITAL DISPLAYS. Luminous, one-line indicator panels visually presenting multi-digit numeric data. Clear, high contrast, easy-to-read numerals. Five models, 3 to 7 digits. \$140.00 to \$300.00.

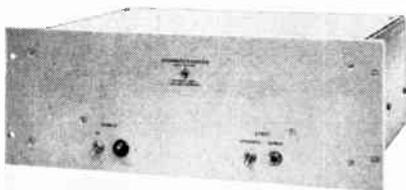


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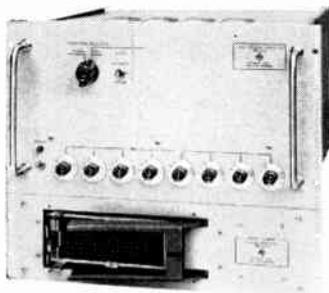
Data Systems



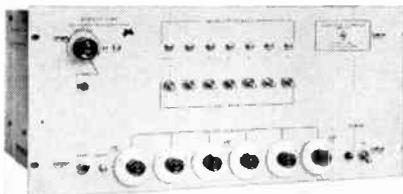
DY-2538 PROGRAMMED DIGITAL COMPARATOR. Unique, error-free comparison, no drift or calibration; visual and electrical output; use with Go/No Go systems. Preset high and low tolerance limits selected electrically. Also manual-selection models. \$950.00.



DY-2540 SCANNER COUPLER transfers electronic counter data to serial entry machines such as tape perforators, electric typewriters. Multiple inputs, multiple outputs. Also high-speed model, DY-2542, for rates to 80 characters/second. DY-2540, \$890.00.



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More Big Mergers?

Here's a backstage look at proposed Sylvania-General Tel. merger and why it's in the works

ANNOUNCEMENT this month of plans to merge Sylvania into General Telephone—to be named General Telephone & Electronics Corp.—leaves industry leaders buzzing with speculation today on possible industry impact and reasons behind merger.

Already these leaders are assessing the corporate marriage prospects of many other firms.

A major factor behind the GT-Sylvania merger, according to informed sources, is Sylvania's desire to better its ability to compete with other giants of the industry for electronics business of tomorrow, "particularly industrial."

Also, the union will help solve problem of the huge sum of money that will be required.

Combined sales of the two firms in 1957 totalled \$832 million, a figure exceeded by only six others—GE, Western Electric, Westinghouse, RCA, IBM and Sperry Rand.

In addition to common interests in the broad field of industrial electronics, GT and Sylvania have a specific mutual interest in electronic telephone communications.

Following description of their current activities and future plans spotlights these areas of common interest.

Sylvania makes radio and television sets and tubes for entertainment products, industrial and other special purpose tubes, electronic systems for defense, semiconductors, radar and tube components and tube accessory equipment and materials. Major non-electronic items are lighting products, cameras, flashbulbs and other accessories. In R&D it is active in defense, atomic energy and industrial work.

Current important R&D projects include electroluminescence, guided missiles and countermeas-

ure equipment, transistors and diodes, traveling-wave tubes and other microwave devices, radar equipment, color television, computers and controls. Firm spends 6 percent of each nondefense sales dollar on research, development and engineering.

Its 1957 sales of \$344 million were divided as follows: tubes, 40 percent; lighting, 25 percent; defense systems, 12 percent; others, 23 percent.

General Telephone is the largest independent telephone system operator in the U. S. It has 3,300,000 telephone installations, or 36 percent of all independent telephones in use. It is also the nation's largest manufacturer of telephone equipment for independent phone companies.

Primarily interested in telephone communications, GT is already quite active in the electronics industry through its manufacturing subsidiaries.

Largest manufacturer in system is Automatic Electric Corp. of Northlake, Ill., with 6,742 employees. It makes telephone equipment, guided missile testing components, automatic railroad signal devices, automatic pin spotters and oil well drilling equipment.

A smaller subsidiary, Electronic Secretaries of Waukesha, Wis., makes phone-answering gear.

Leich Electric, with 590 employees in Genoa, Ill., makes central telephone office equipment. Three foreign manufacturing subsidiaries in Canada, Belgium and Italy employ about 2,600 people.

General Telephone Labs, also situated at Northlake, is GT's research and development subsidiary. It is currently knee-deep in efforts to join the telephone with electronics.

Future major role of Automatic and Leich will be to make electronic telephone equipment.

Merged firm will be led by presidents of the participants, with Sylvania's Don G. Mitchell president and GT's Donald C. Power board chairman.

Donald C. Power, GT president, foresees the day when U. S. will be linked by a nationwide telephone system directed by electronic switches. Machines of the future will have many controls regulated by telephone facilities, Power predicts.

SHARES and PRICES

PLANNED Sylvania-General Telephone merger spotlights the grow-

ing importance of electronics in the telephone business and the stock of firms with interest in this area. Electronics, already vital in

telephone communications, will play an even bigger role in 10 to 15 years when electronic switching comes into wider use.

Electronics Firms With Interests in Telephone Business	Recent Price	Latest 12 Mos. Dividend	Percent Yield	Earnings 1958	Per Common Share Period	1957	Traded	1958 Price Range
American Tel. & Tel.	196½	9.00	4.6	10.96	(12 mos) ²	10.58	NYSE	167½-196½
General Telephone	55½	2.00	3.6	3.12	(9 mos)	3.15	NYSE	40¾-57¼
International Tel. & Tel.	53	1.80	3.4	1.72	(6 mos)	1.81	NYSE	29¼-53¼
Sylvania	53½	2.00	3.6	1.72	(9 mos)	2.37	NYSE	31½-54¾
Western Electric	124 ¹	3.60	2.9	—	(12 mos)	5.54	OTC	—

¹ Bid ² ended Sept.

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MERGERS, ACQUISITIONS and FINANCE

• **Amphenol Electronics** of Chicago and **George W. Borg Corp.**, Delavan, Wis., agree on general principles for merger of the two companies into a new firm to be known as **Amphenol-Borg Electronics Corporation**. Agreement is subject to approval of stockholders who will vote Dec. 30. Borg stockholders will receive one and a third shares of new A-BE stock for each share held; Amphenol shareholders will get one for one. New firm will be headed by Arthur J. Schmitt, present Amphenol president. New company's total assets will exceed \$57 million and it anticipates sales of \$50 million plus. Amphenol makes a broad line of electronic hardware and components. Borg makes auto clocks, potentiometers and other electronic equipment.

• **Martin Co.** issues \$20 million of 5½-percent sinking fund debentures with warrants attached. New

money will be used for working capital and general purposes. The aircraft firm originally filed plan for the debenture issue with the SEC back in June. Offering was postponed several months because of bond market conditions. In the interim, original plan for \$25-million debenture offering was scaled down \$5 million.

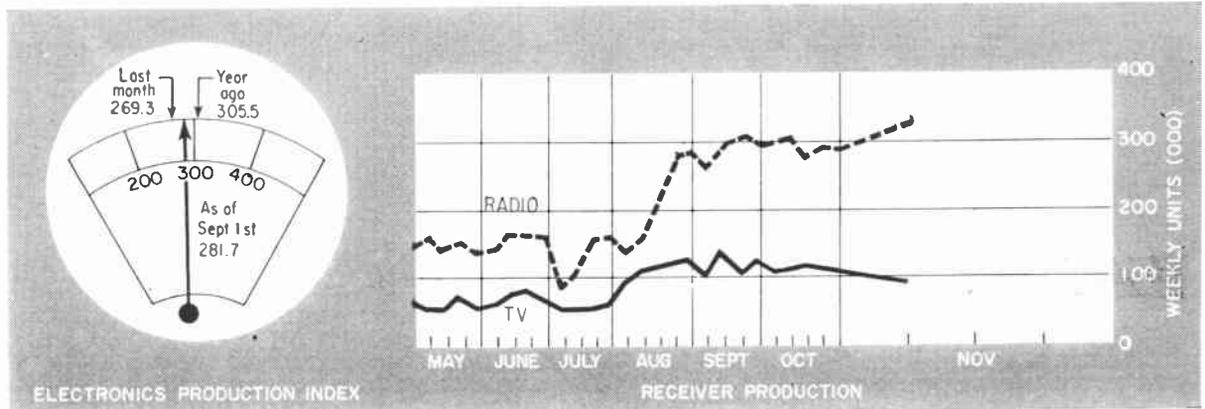
• **Geophysics Corp. of America** has recently been formed in Boston, Mass. New firm's initial efforts will be to provide government with R&D services in the field of environmental physics. New corporation was launched through financing by **Laurance Rockefeller & Associates** and assistance from **Itek Corp.** of Boston, Mass., in form of technical and administrative services.

• **Electronics Communications**, St. Petersburg, Fla., issues 100,000 shares of common stock at 18½

through **Laird & Co.** of N. Y. St. Pete firm produces electronic communications, detection, navigation and control equipment, primarily for the armed forces.

• **Coleman Engineering**, Torrance, Calif., plans to issue \$1 million of 6-percent debentures due in 1973, with warrants. Each \$500 principal amount of debentures will carry warrants to purchase 30 common shares without additional payment. Debentures will be offered at face value. Firm makes converters, data recording equipment and digitizers.

• **Ling Electronics** obtains \$2.2 million through placement of 5½-percent convertible debentures with institutional and private investors. Money will be used to retire bank loans and for general corporate purposes. **White, Weld & Co.** of New York and **W. R. Staats & Co.** of L. A. did financing.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	Nov. 7, '58	Oct. 31, '58	Nov. 8, '57
Television sets, total	111,554	121,465	138,831
Radio sets, total	344,204	306,977	390,435
Auto sets	117,585	56,071	120,234

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	Nov. 12, '58	Nov. 5, '58	Nov. 13, '57
Radio-tv & electronics	68.84	66.41	41.73
Radio broadcasters	76.88	77.48	50.82

FIGURES OF THE YEAR

	1958	1957	Percent Change
Receiving tube sales	291,718,000	341,663,000	-14.6
Transistor sales	30,387,277	18,842,300	+61.3
Cathode-ray tube sales	5,844,665	7,308,552	-20.0
Television set production	3,572,189	4,589,164	-22.2
Radio set production	8,178,821	10,764,454	-24.0

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

(Source: Bur. Labor Statistics)	Sept. '58	Aug. '58	Sept. '57
Prod. workers, comm. equip...	\$67,200	354,900	417,900
Av. wkly. earnings, comm....	\$83.62	\$82.59	\$78.40
Av. wkly. earnings, radio....	\$83.03	\$81.40	\$76.02
Av. wkly. hours, comm.....	40.2	39.9	40.0
Av. wkly. hours, radio.....	40.5	40.1	39.8

TRANSISTOR SALES

(Source: EIA)	Sept. '58	Aug. '58	Sept. '57
Unit sales	5,076,443	4,226,616	3,231,000
Value	\$10,811,412	\$9,975,935	\$6,993,000

TUBE SALES

(Source: EIA)	Sept. '58	Aug. '58	Sept. '57
Receiving tubes, units	40,061,000	30,456,000	44,382,000
Receiving tubes, value	\$33,951,000	\$25,442,000	\$35,545,000
Picture tubes, units	891,803	713,458	1,071,662
Picture tubes, value	\$17,704,289	\$14,190,878	\$20,819,036

WASHINGTON OUTLOOK

LONG-SMOLDERING private resentment against Air Force management of missile development and procurement has erupted officially. At issue is a recent report by the Air Force Inspector General which discloses criticism of Air Force ballistic missile management.

Since the report has become known, the General Accounting Office has asked for a copy as part of its own investigation. So has Rep. John Moss's House Government Operations subcommittee, which makes a speciality of probing such matters.

With White House backing, the Air Force has refused to release the full report. But under Moss's pressure, the Air Force has made public a 35-page summary of the Inspector General's report. The summary, which has failed to satisfy Moss so far, nevertheless contains some of the simmering charges.

It dwells at length on the history of the Air Force's ballistic missile management and speaks of the "extraordinary growth" of one company. Gobs of statistics on assets, sales, and Air Force-paid fees are presented. So are critical statements from some ballistic missile contractors.

Summary indicates that there has been considerable industry resentment over alleged favoritism. The report airs charges that there was interference by an Assistant Air Force Secretary with the award of a subcontract to design and fabricate data-processing equipment for one ballistic missile guidance system. The Inspector General's report quotes missile contractors as alleging that there was interference with "contractor performance." There are also quoted complaints against management personnel.

The report summary severely criticizes the purchasing operations of major contractors, claims many companies have failed to give purchasing "sufficient status," on a par with manufacturing and engineering operations.

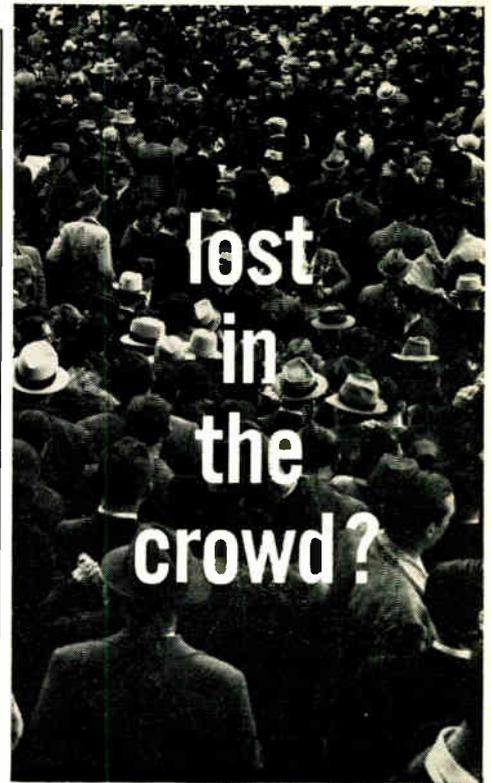
As a result of downgrading the purchasing function, the report indicates, there have been faulty procurement practices. In some cases, the contractors' engineering departments have subcontracted work directly, maintaining little coordination with their own purchasing departments. Some subcontractors became "delinquent" in performing the work because of the primes' failure to "follow up and control."

In other cases, the report says, primes have been forced into "premium costs" for material by manufacturing in their own plants instead of allowing their purchasing departments to try to buy on the outside at lower prices.

There has also been criticism that prime missile contractors have repeatedly violated military procurement regulations by awarding cost-plus-fixed-fee subcontracts without prior Air Force approval.

- The Pentagon has decided to hold production of the Air Force's land-based IRBM's at the current low volume rather than increase output next year. The current schedule calls for about 10 overseas squadrons—no more than three of them Jupiter-equipped. At the same time, production of the Atlas ICBM will be substantially boosted.

Defense Secy. McElroy's thinking on the issue runs like this: "We might not have the requirements for the number of (Thors or Jupiters) or both of them combined that we have been thinking about up to this point. The further you go down the road toward an operational capability of the ICBM, the less interesting it is for us to deploy additional . . . IRBM's—and we are coming closer to the time of operational capability of the Atlas".



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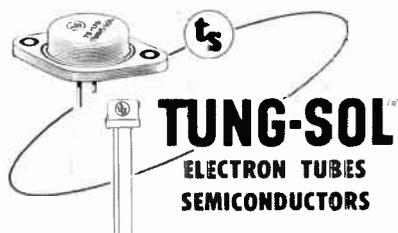
Zone _____ State _____

ACCEPTED SYMBOLS

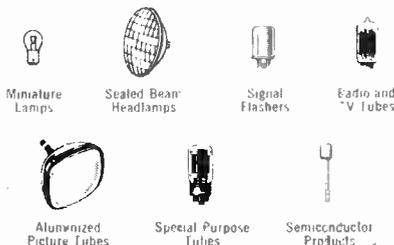


Symbol for germanium . . . element basic to the new physics of semiconductor materials.

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



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



CIRCLE 5 READERS SERVICE CARD

EXECUTIVES IN THE NEWS



Cordiner: logic and plans

THIS YEAR'S James H. McGraw Award for "personal contributions of merit" to the electrical industry was presented at the National Electrical Manufacturers Association meeting two weeks ago to General Electric board chairman Ralph J. Cordiner. The award, established in 1926 by the founder of the McGraw-Hill Publishing Co., went to Cordiner in recognition of the benefits that accrued to the entire industry from the Live Better Electrically program.

The tall, dignified Cordiner, chief architect of GE's future since he became assistant to then-president Charles E. Wilson in 1943, is a thorough and thoughtful executive with a large capacity for work and a deep respect for the power of the mind. He was born on a 1,300-acre ranch near Walla Walla, Wash., in the spring of 1900, grew up as a ranch hand, went into the Navy on his 18th birthday. Six months later he left the service to resume his education at Whitman College. He majored in economics, specialized in logic.

While in school, he sold washing machines for a Washington utility, became a commercial manager for the firm after his graduation in 1922. A year later he joined a GE affiliate, the Edison General Electric Appliance Co. In the ensuing 25 years he trained under the greats of GE's past, men whose names ring as profoundly in management's halls of fame as Steinmetz and Langmuir do in science's: Gerard Swope, Owen Young and Charles E. Wilson.

GE's explosive wartime expansion thrust him to the top, and his natural talent for long-haul planning kept him there. He became executive vice president in 1949 and president when Wilson retired at yearend 1950. Planning for the business generation—15 to 20 years ahead—is, he believes, the first function of corporate management. He delights in pointing out that three quarters of his attention is devoted to planning for things that will happen after his retirement.

In 1925, Cordiner married his college sweetheart Gwyneth Lewis. The Cordiners have four daughters, all graduates of Northwestern, all married.

COMMENT

Plant Modernization

It was a pleasure to see your magazine devoted in entire issue

to the problems of plant modernization (Special Issue "Plan '59," Oct. 24). Most economists are predicting an explosive rate of growth for American industry during the next decade, and certainly

the nation's foremost growth industry—electronics—ought to lead the way.

Yet the industry, as you point out, is not ready for this dynamic upsurge. So many concerns doing business in electronics do not seem to realize that there are better ways to put things together than by hand. If the industry doesn't heed its own advice, how can it expect to sell industrial control equipment?

Furthermore, the whole "bits-and-pieces" philosophy of electronic apparatus could profitably be replaced by research leading to new concepts on the component level.

What's needed is honest thought, not limited by preconception or by the rutted channels of habit. We're all guilty; we all need to think.

J. S. CARBERRY

PROVIDENCE, R. I.

. . . The plant modernization issue of Oct. 24 was an outstanding job. . .

DAVID S. KIRBY

L. C. COLE CO.
SAN FRANCISCO

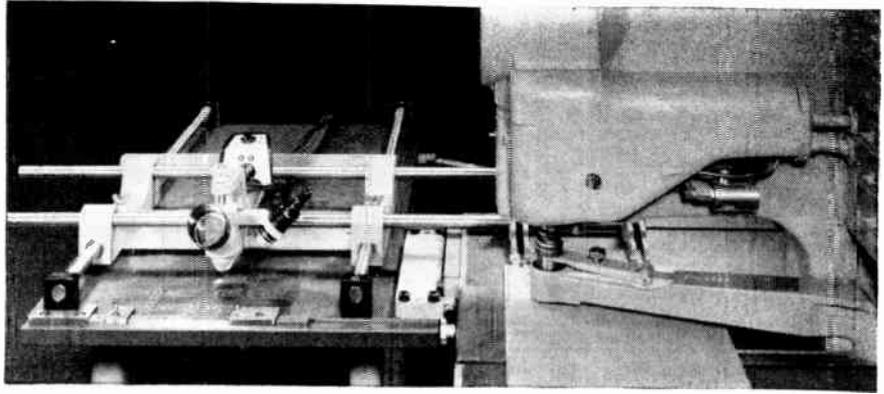
. . . You mention ("Economics Slows Updating Abroad," p 12, Oct. 24) the European production picture, and state that "neither Western Europe, Japan nor the Soviet Union come close to the degree of mechanization found in the U.S. electronics industry." You go on to say that most engineers "singled out West Germany for special comment."

I was surprised not to find any mention of the new tube-production facility opened recently by Philips G.L.P. in Eindhoven, Netherlands. This plant is supposed to be the most modern of its kind anywhere. . . .

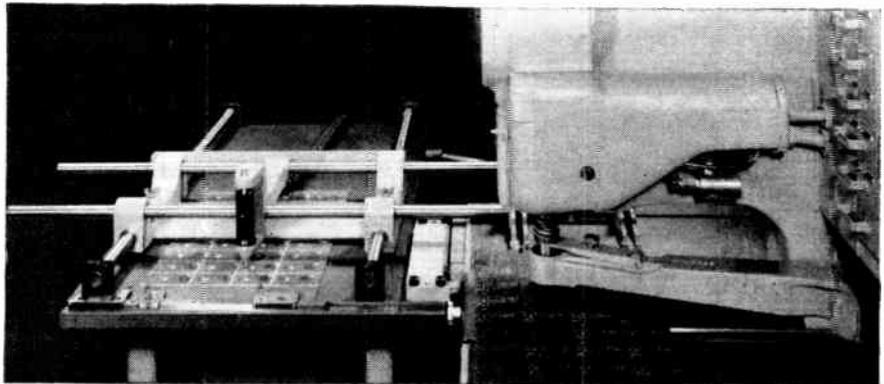
P. L. BYCK

WHEELING, W. VA.

Historically, componentmakers have led the way in mechanized production, for good and sufficient economic reasons. The Philips plant is certainly a notable accomplishment.



a faster way to **cold-punch** printed circuits



The DUPL-O-SCOPE

Firms punching and notching printed circuit boards—or any sheets up to ¼" mild steel—know how profitable it is with a Strippit Fabricator-Duplicator. Now, it's even faster with the new Dupl-O-Scope, which eliminates the template drilling and layout step!

Readily mounted in the Duplicator stylus bracket, this precision optical pickup device quickly translates a drawing, layout or printed circuit sample into a punched metal template—ready for rapid-fire cold punching and notching on the Fabricator-Duplicator using standard interchangeable tools or "specials" made up to your requirements.

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CIRCLE 6 READERS SERVICE CARD

Do You Have Critical Filter Problems?

Sangamo Electric Company has been designing and building specialty filters since 1927. These filters have been used in a wide variety of metering, telephone and military equipment produced by Sangamo, and by a limited group of electrical and electronic manufacturers. Sangamo's thirty years of filter design and manufacturing experience is now available to the industry.

SANGAMO
MAY HAVE THE
ANSWER TO YOUR
PROBLEM

Here's a Typical Example: The filter illustrated was required for use in a circuit which was designed to amplify extremely small signals in the range of 25 KC to 26 KC.



BASIC OPERATIONAL AND DESIGN SPECIFICATIONS:

Meet applicable requirements for military apparatus.

Operate in a plate circuit of an amplifier presenting an effective generator impedance of 47,000 ohms and to drive the grid circuit of the following amplifier stage.

Operate at signal level as low as 10 microvolts.

Must be well shielded against external fields.

Passband ripple not to exceed 1 db. from 25 KC to 26 KC.

Minimum rejection shall be 35 db. at 28 KC and 40 db. at 23 KC.

The phase shift, from one production filter to another, shall not vary more than 5° at any point in the 25 KC to 26 KC bandpass.

The phase shift and attenuation

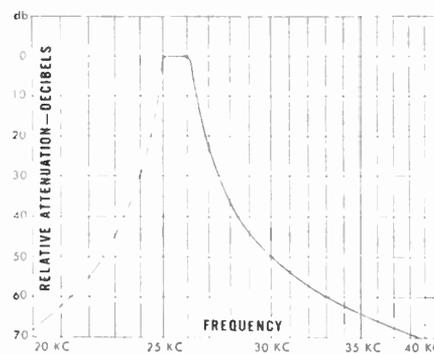
characteristics must be reproducible over a long period of years to insure properly functioning spare parts.

Temperature range 0° to 85°C.

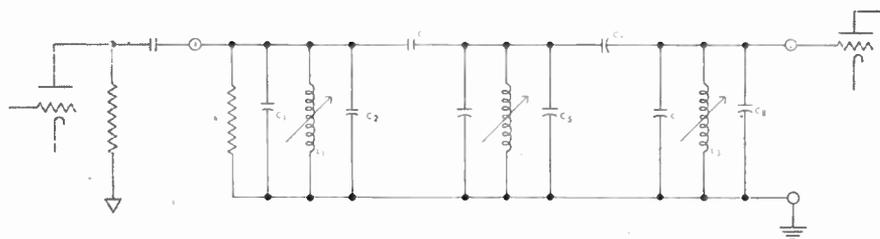
SANGAMO SOLUTION TO PROBLEM

The above requirements were met by using three parallel tuned circuits properly coupled by capacitors. Selection of the L-C ratios, coupling, and circuit Qs were made in order to fulfill the overall response requirements and at the same time present the proper load to the driving amplifier stage. Stability requirements were obtained by using Sangamo silvered mica capacitors. Negative temperature coefficient capacitors were inserted in parallel with the tuned circuits to correct for the positive temperature coefficient of the inductors. A phase shift variation of 2.5° maximum from 25 KC to 26 KC has been consistently maintained during eight years of production on these units. The

universal wound coils are enclosed in powdered iron cups with moveable slugs for precise adjustment of the response and the phase shift. These inductors manufactured by Sangamo have uniform distributed capacity and Q. The cup-enclosed inductance coils are in turn housed in a die-cast aluminum enclosure. This housing lends physical rigidity to the coupled structure and assists in minimizing magnetic interaction between the enclosed inductors. The entire filter assembly is enclosed in a hermetically sealed drawn steel case. The terminals are of the extremely rugged compression glass type.



Relative response curve of this Sangamo bandpass filter.



C₁, C₄, C₆—Temperature Compensators
C₂, C₃, C₅, C₇, C₈—Sangamo Silvered Mica Capacitors



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SPRINGFIELD, ILLINOIS

Write us today for an engineering analysis of your specialized filter applications. Sangamo's engineers are ready to help you.

The Missile Market

- **Electronics' share of the 1959 missile market will approach \$3 billion**
- **Fiscal year 1959 is ushering in mass production but R&D will always represent a large portion of the program**

By **John F. Mason**, Associate Editor

SIZE OF NEW BUSINESS—Large-scale production of operational missiles will be an important element of the missile program for fiscal year 1959.

Experienced missile and missile-component producers will get many of the orders. But other firms, with missile hardware capabilities, will be able to get into the missile field for the first time.

ELECTRONICS' SHARE—Nobody has figures on electronics' share of the overall guided-missile budget. The electronics part of a missile's cost can, however, be estimated for each type of missile. It ranges from 25 percent for ballistic missiles through 35 percent for long-range, nonballistic missiles to 50 percent for all other missile types.

The best overall estimate seems to be 40 percent as electronics' share of the total missile budget. Figuring this way, the armed services will have \$1,951.1 million in new funds to write contracts against in fiscal '59 (p 16, top left). This does not include funds for R&D and for certain ground gear entered in the Budget Bureau's "Electronics and Communications" category.

These new funds for 1959 do not represent all the money available for obligation for procurement and production in 1959, however. Funds authorized for obligation prior to 1959 that were never committed are carried forward and made available for obligation in 1959. Some \$959.05 million in unused obligational authority will be carried forward into fiscal 1959. Therefore, electronics' share of total obligational authority for 1959, new funds plus carry-over, will be about \$2,910.15 million.

EXPENDITURES—Obligational authority results in new contracts and this is what makes smoke go up factory chimneys, new plants rise, employment increase and new equipment sales build up. However,

government expenditures, that is, actual payments for completed work, are on the rise also.

Expenditures in fiscal 1959 for electronic gear for missiles, most it contracted for in prior years, are estimated at \$1,349.2 million (p 16, top right). This does not include expenditures for R&D or for some ground gear carried under other categories in the federal budget.

NEW BUSINESS BY MISSILE CATEGORY—Electronics' \$2,910.15 million share of the money available for new contracts in fiscal 1959 breaks down as follows: 32 percent (\$942.65 million) for surface-to-surface missiles and 68 percent (\$1,967.5 million) for all other categories—air-to-air, air-to-surface and surface-to-air (p 16, lower left).

Of the \$942.5 million for surface-to-surface missiles, 63 percent (\$594 million) will go into ballistic missiles—IRBM and ICBM. Long-range, nonballistic missiles—like Snark, Mace, Regulus II, and Goose—will get 5½ percent (\$52.15 million). Short range surface-to-surface missiles—such as antisubmarine rockets and torpedos, Lacrosse, Sergeant and Redstone—will get 31½ percent (\$296.5 million) (p 16, lower right).

Though the Department of Defense will not reveal any further breakdown of fiscal 1959 obligational authority for missiles, the following breakdown has been obtained from Congressional subcommittee hearings and other sources:

Surface-to-air: USAF's Bomarc A and B—\$814.6 million (\$407.3 million for electronics); Army's Nike-Ajax, Nike-Hercules, Hawk and Talos—\$430 million (\$215 million for electronics); Army's Nike-Zeus—\$262.7 million (\$131.3 million for electronics); and Navy's Talos, Terrier (see cover photo) and Tartar—\$371.9 million (\$185.8 million for electronics). Total

for surface-to-air missile electronics: \$939.4 million plus amount obligated for USAF's Goose.

Air-to-surface: USAF's Hound Dog will get \$140.1 million (\$70 million for electronics).

This leaves about \$958 million for the electronic portions of the remaining missiles: all air-to-surface missiles except Hound Dog; and all air-to-air missiles.

WHERE TO SELL—Although some electronic gear is sold directly to government missile buying agencies for delivery to primes as government furnished equipment (gfe), by far the largest missile market is the prime and/or subcontractors of a missile system. In many cases the majority of money paid out to a prime goes to subcontractors and vendors.

Here is the way each military service contracts:

USAF: R&D contracts for new guided-missile systems: Weapons Systems Office of Air Research and Development Command, Wright-Patterson AFB, Ohio, and the Ballistic Missile Center of Air Materiel Command (AMC), Inglewood, Calif.

Contracts are of two types: The weapons systems manager contract in which one prime has responsibility for entire system, subcontracting subsystems to other companies; and, the contractor team approach in which several companies jointly accept responsibility for development of a system.

Production contracts for guided missiles: AMC, Wright-Patterson AFB, Ohio.

AMC uses the weapons system manager approach. Twenty percent of the dollar value of the electronic gear going into guided missiles is bought directly from industry by AMC and delivered as gfe to the prime. This gear consists of large complete systems or subsystems.

Sale of small electronic components, such as resistors, switches, capacitors, tubes and transformers: Dayton AF Depot, Gentile AF Station, Dayton, Ohio: These components are replacements for already operational missiles—after AMC is no longer buying them as gfe. The depot spends \$100 million a year on components for aircraft, missiles.

R&D contracts for ballistic missiles: Ballistic Missile Center of AMC, Inglewood, Calif.

Each ballistic missile has four prime contractors: guidance, airframe, nose cone and propulsion. Coordination is provided by BMC with technical supervision by Thompson Ramo Wooldridge Corp.

R&D contracts for ground communication and radar tracking equipment for missile sites: Rome Air Development Center, Griffiss AFB, Rome, N. Y.

Production contracts, amounting to \$100 million a year, for missile site gear: Rome AF Depot.

NAVY—Bureau of Aeronautics, Washington, D. C.:

(Continued on p 16)

ELECTRONIC DEVICES IN GUIDED MISSILE SYSTEMS

ACTIVE RADAR HOMING: Missileborne: Radome, antenna, free-space reference gyros, Radar transmitter, radar receiver, tracking servo system (to position antenna).

Fuzing system: Safety and arming device (accelerometer, relay interlock), triggering device (contact fuze, proximity fuze).

Control unit: Missile motion reference (rate gyro, integrating gyro, accelerometer), control surface positioning device (hydraulic actuator, hot-gas actuator, servo motor), control surface position indicator (potentiometer, synchros, resolver, induction pickoff).

Power supply: Generator, battery, transformer, rectifier, inverter, voltage regulators.

Ground and/or interceptor: acquisition and tracking radars, computer, tracking servo systems, antennas.

SEMIACTIVE AND PASSIVE RADAR HOMING: Essentially the same as Active Radar Homing minus radar transmitter.

BEAM RIDER: Missileborne: Radar receiver, control amplifiers, gyros (rate, free), accelerometers, servo amplifiers, fuzing devices.

Launcher: Guidance radar, launch zone analog computer, reference system (inertial gyros), launching pylon with connectors and control panel for monitoring and firing including umbilical connector (squib).

Shipboard: Three radars, analog computer, central target control console, remote display, combat information center, communications equipment between stations. Servo amplifiers and actuators to train missile in prelaunch direction, reference system.

RADIO COMMAND: Missileborne: Communications link receiver, antennas (parabolic, dipole, lens, slots, horns, traveling wave), gyros, pulse transponders, c-w transponders, electronic servo systems, electronic detonation system, analog computer, command decoder.

Surface system: Analog computers, digital computer, data encoder, pulse radar, c-w radar, short-base-line radar, long-base-line radar using microwave interferometers.

INFRARED: Missileborne: Infrared dome, infrared telescope, free-space reference (gyros: free, rate), positioning device (clutches, servo motors, actuators), position indicator (potentiometer, synchros, resolvers, induction pick-offs), focusing device (mirrors, lens), spectral filter, scanning device, detector cell, detector cooler.

Fuzing device, control unit and electrical power supply are same as for Semiactive Radar Homing.

INERTIAL: Missileborne: Gyros (free, rate, integrating), precision amplifiers, accelerometers (gyro, drag cup, other forced feedback), servo amplifiers, synchros, analog computers, digital computers, operational amplifiers, function generators, instrument servo amplifiers (for tachometers, potentiometer drives), master voltage reference apparatus, power supplies, crystal oscillators, amplifiers, antennas (flush, vane, slot), infrared components, radiobeacons, recovery aids, arming switch, telemetry subcarrier oscillators, telemetry transmitter, tape recorders, sensors.

Ground and/or mother vehicle: Signal simulators, meters, optical alignment devices, telemetry, receivers and recorders, analog computer, digital computers, star trackers, theodolite, target information computer, temperature control unit, check out, launcher control equipment, automatic checkout equipment, programming devices.

STELLAR-INERTIAL: Same as for inertial plus: star tracking telescopes, photocell amplifiers, servo amplifiers and controllers for driving telescope gimbals, gyro torque generators including amplifiers for converting stellar signals into corrective torques for gyros, star catalog and selector (usually part of digital computer), erection amplifiers, analog computers, digital computers, correction computers, astro tracker.

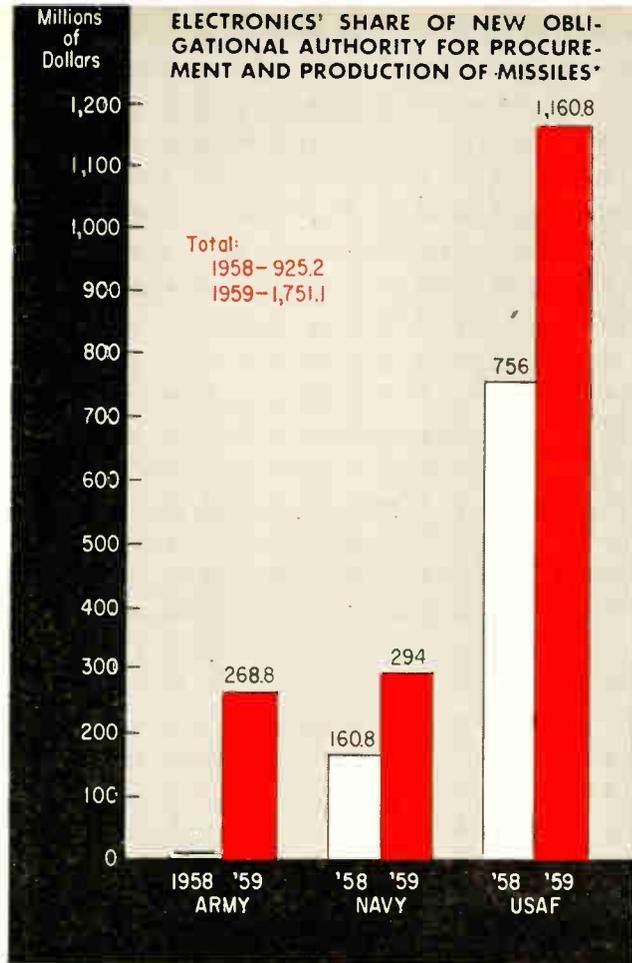
ACOUSTIC HOMING: Torpedoborne: Transducers, rate gyro, oscillograph, batteries (sea water, nickel cadmium, silver zinc), relays (d-c, standard and miniaturized), relays (d-c, sensitive, polarized), switches, contact protectors, power supplies.

Shipborne: Echo simulators, vacuum-tube voltmeters, oscilloscopes, remote indicator, scanning switches, receiver, video and audio amplifiers.

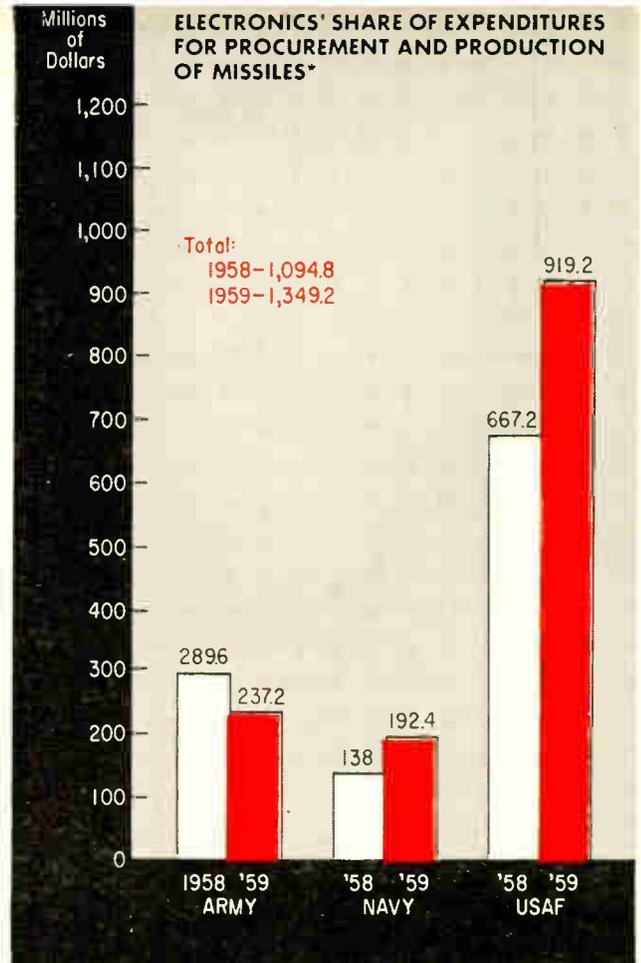
MISSILES

MISSILE	CATEGORY	SERVICE	RANGE (Mi)	PRIME CON-TRACTOR	GUIDANCE CON-TRACTOR	AIRFRAME CON-TRACTOR
ACTIVE RADAR HOMING						
Sparrow III	air-to-air	BuAer		Raytheon	Raytheon	Raytheon
SEMIACTIVE RADAR HOMING						
Falcon						
GAR-1-D	air-to-air	USAF		Hughes	Hughes	Hughes
Falcon						
GAR-3	air-to-air	USAF		Hughes	Hughes	Hughes
Falcon						
GAR-9	air-to-air	USAF		Hughes	Hughes	Hughes
Hawk	surf-to-air	Army/Marines	22	Raytheon	Raytheon	Northrop
Tartar	surf-to-air	BuOrd	10	Convair	Raytheon	Convair
PASSIVE RADAR HOMING						
Corvus	air-to-surf	BuAer	75	Temco	TI/Maxson	Temco
BEAM RIDER						
Sparrow I	air-to-air	BuAer		Sperry	Sperry	Douglas
Terrier	surf-to-air	BuOrd	10	Convair	Sperry	Convair
BEAM RIDER PLUS ACTIVE RADAR HOMING						
Talos	surf-to-air	BuOrd	65	Bendix	Sperry/Bendix	McDonnell
BEAM RIDER PLUS SEMIACTIVE RADAR HOMING						
Talos	surf-to-air	Army	65	Bendix	RCA/Bendix	McDonnell
RADIO COMMAND						
Bullpup	air-to-surf	BuAer		Martin	Martin	Martin
Corporal	surf-to-surf	Army	75	Firestone	Gilfillan	Firestone
Lacrosse	surf-to-surf	Army	15	Martin	FTL	Martin
Lacrosse						
ABC	surf-to-surf	Army	15	Cornell		
Nike-Ajax	surf-to-air	Army	50	West. Elec.	West. Elec.	Douglas
Nike-						
Hercules	surf-to-air	Army	100	West. Elec.	West. Elec.	Douglas
Rascal	air-to-surf	USAF	100	Bell A/C	Texas Inst.	Bell A/C
Regulus I	surf-to-surf	BuAer	500	Chance	Stavid	Chance
				Vought		Vought
Terrier	surf-to-air	Marines	10	Convair	West Elec.	Convair
RADIO COMMAND PLUS ACTIVE RADAR HOMING						
Bomarc A	surf-to-air	USAF	200	Boeing	Westinghouse	Boeing
Bomarc B	surf-to-air	USAF	400	Boeing	Westinghouse	Boeing
RADIO COMMAND PLUS SHANICLE (hyperbolic)						
Matador	surf-to-surf	USAF	500	Martin	Martin	Martin
RADIO COMMAND PLUS UNKNOWN						
Nike-Zeus	anti-ICBM	Army		West. Elec.	West. Elec.	Douglas
Plato	anti-BM	Army		Sylvania		Douglas

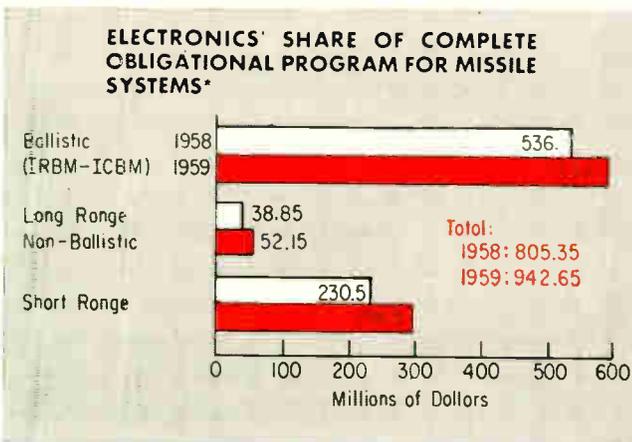
MISSILE	CATEGORY	SERVICE	RANGE (Mi)	PRIME CON-TRACTOR	GUIDANCE CON-TRACTOR	AIRFRAME CON-TRACTOR
INFRARED HOMING						
Falcon						
GAR-2-A	air-to-air	USAF		Hughes	Hughes	Hughes
Sidewinder	air-to-air	BuOrd/USAF	2	Philco/GE	Philco/GE	Hughes Hunter-Douglas
AUTOPILOT						
Goose	surf-to-surf	USAF		ICM	Fairchild	Fairchild
Quail	air-to-surf	USAF		McDonnell	McDonnell	McDonnell
INERTIAL						
Atlas	surf-to-surf	USAF	6,300	Convair	Arma	Convair
Hound Dog	air-to-surf	USAF	300	No. Amer.	No. Amer.	No. Amer.
Jupiter	surf-to-surf	Army	1,500	Chrysler	Ford Inst.	Chrysler
Mace	surf-to-surf	USAF	650	Martin	AC Spark Plug	
Minuteman	surf-to-surf	USAF	5,500	Boeing	No. Amer.	
Pershing	surf-to-surf	Army	500	Martin	Bendix	Martin
Polaris	surf-to-surf	Navy	1,500	Lockheed	GE/MIT	Lockheed
Redstone	surf-to-surf	Army	250	Chrysler	Ford Instr.	Reynolds
Regulus II	surf-to-surf	BuAer	1,000	Ch. Vought	AC Spark Plug	Ch. Vought
Sergeant	surf-to-surf	Army	200	JPL/Sperry	Sperry	Sperry
Thor	surf-to-surf	USAF	1,500	Douglas	AC Spark Plug	Douglas
Titan	surf-to-surf	USAF	5,500	Martin	Arma	Martin
Wagtail	air-to-surf	USAF		Minn-Honey	Minn-Honey	
STELLAR-INERTIAL						
Snark	surf-to-surf	USAF	5,000	Northrop	Northrop	Northrop
RADIO-INERTIAL						
Atlas	surf-to-surf	USAF	6,300	Convair	GE/Burroughs	Convair
Titan	surf-to-surf	USAF	5,500	Martin	BTL/Rem Rand	Martin
TV-INERTIAL						
White		USAF/				
Lance	air-to-surf	Navy		Martin		
ATRAN						
(Automatic Terrain Recognition and Navigation)						
Mace	surf-to-surf	USAF	650	Martin	Goodyear A, C	Martin
Regulus II	surf-to-surf	BuAer	1,000	Ch. Vought		Ch. Vought
ACOUSTIC HOMING						
Mark 43	antisub	BuOrd		Clevite		Clevite/
Rat	antisub	BuOrd		NOTS	Librascope/BuOrd	Alleg Bal
Subroc	antisub	BuOrd		Goodyear	Librascope/Kearfott	Goodyear
WIRE COMMAND						
Mark 39	antisub			Vitro Labs	Vitro Labs	Philco
UNKNOWN						
Asroc	antisub	Navy		Minn-Honey		
Astor	antisub	Navy		Minn-Honey		
Eagle	air-to-air	Navy	30			



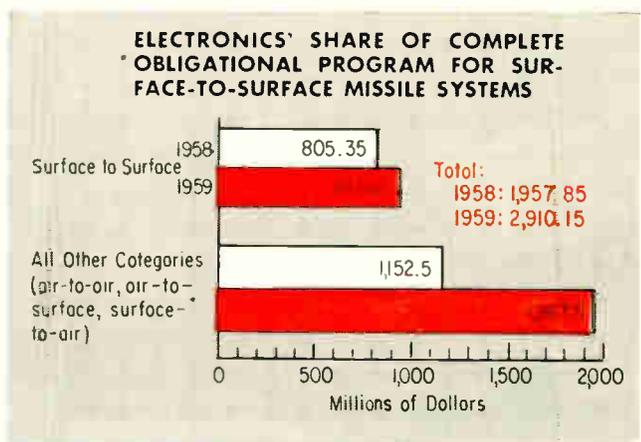
*Not included: R&D and missile money from budget category entitled "Electronics & Communications."



*Not included: R&D and missile money from budget category entitled "Electronics and Communications."



*Includes all new obligational funds plus unobligated funds brought forward from prior years for missile systems.



R&D and production contracts for complete missile systems. Uses weapons systems concept primarily. Buys 13 percent of electronic gear direct.

Bureau of Ordnance, Washington, D. C.:

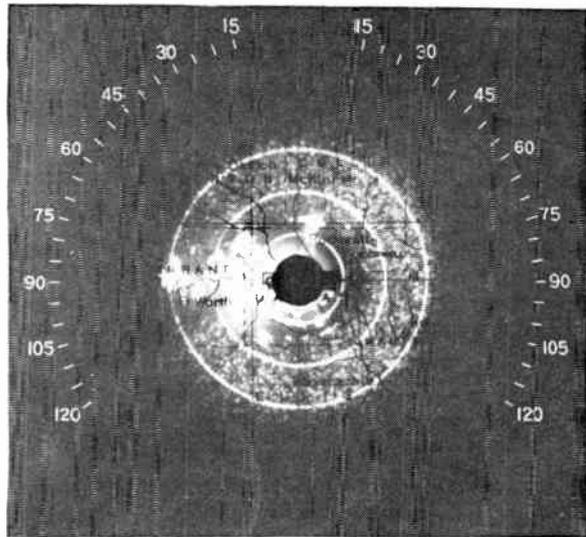
R&D and production contracts for missile systems. Production contract type depends on the particular missile—some are weapons systems management and others are contracted by major component directly by BuOrd. BuOrd buys direct: Telemetry systems, combined tracking and missile guidance radar.

Bureau of Ships, Washington, D. C.: Buys surface and air search radars, navigational computers, fire control systems, com and missile magazines.

ARMY—Army Ordnance Missile Command, Huntsville, Ala.:

R&D and production contracts. Contract approaches range from weapons systems management to complete "in house" development and production. Eighty to 90 percent of the dollar value of contracts is with civilian concerns.

MISSILE HARDWARE—Since guidance type determines to a large degree the particular hardware used, the hardware list (p 14) and the missile chart (p 15) are grouped by guidance type.



Weather radar installation (left) enables tv station to show pictures of actual storm conditions

Tv Radar Attracts Buyers

New approach to weather reporting promises a healthy market for radar gear to track local storms. More than 12 broadcasters have invested this Fall, and manufacturers are eyeing new prospects

TELEVISION BROADCASTERS in more than eight states have purchased radar equipment to track storms and lend new impetus to their weather reports.

Latest count this week reveals more than 12 stations have bought weather radar, with several more planning to follow suit. One estimate foresees a market potential approaching \$5½ million, plus considerable additional expenditure for studio gear, cameras, waveguides, cabling, antenna housings, and platforms. One station has invested \$11,165 on weather radar, not including fittings.

In Chicago, WBKB has installed its search antenna on an outrigger built on the station's 567-ft tower. A 47-ft length of waveguide connects the rotating antenna to the receiver-transmitter unit. The weather antenna is a 30-in. paraboloidal type moving at 15 rpm. Design of the basic unit is predicated on standard aircraft weather radar and can be made to track at ranges of 20, 50 and 150 nautical miles. The radar, which operates at 5,400 mc, picks up Great Lakes vessels and aircraft as well.

The radar set's plan position indicator is scanned by a vidicon camera using a slow-persistence tube. A slide projector superimposes a map of the area over the ppi display. Maps are changed to match scanning range.

This installation in general typifies equipment used by other stations. Some of these are: WBRZ, Baton Rouge; WMT, Cedar Rapids; WWL, Ft. Lauderdale; WFAA, Dallas; WLWT, Cincinnati.

Station managers say there is not much difficulty in maintenance of their new equipment. They do agree, however, that training is necessary to permit proper interpretation of the scope display.

Collins Radio, which has so far equipped nine stations, estimates that six weeks are required to become proficient in interpreting scope displays. A spokesman for the company says interest in weather radar seems to be highest in Midwest where tornadoes are a frequent menace, and in Gulf coast regions where tropical hurricanes often threaten. One company official says increasing interest is expected in coastal regions, where harbor shipping is of importance to the viewing audience.

Although most tv weather radar is being operated at 5,400 mc, one station, WBAL in Baltimore, will use 9,375 mc. The WBAL equipment has been provided to the station by Bendix Aviation.

One feature being planned by Bendix is a 12-in. sweep on the ppi display. Installations are in progress in Baltimore and at WCCO, Minneapolis. At the Baltimore and Minneapolis stations, the search antennas will be enclosed in aircraft radomes.

Plastic radomes are used in RCA's weather radar equipment designed for tv stations. These radomes will enclose 35-in. paraboloidal antennas. Equipment will operate in the C band, at 5.5 cm. Company unit was displayed at the Weather Radar Conference in Miami, Fla., last week.

Profits Come Back A-Running

Third-quarter net profits of many electronics firms are ahead of high 1957 third-quarter earnings—and well in front of this year's second period. As for the fourth-quarter outlook, one word: good

ELECTRONICS INDUSTRY profits are on the way up. Recently issued third-quarter reports of 35 industry firms back up this conclusion.

Net profits in the third quarter for more than half the group, 18 out of 35, exceeded those of the third quarter in 1957. Profit increases over last year were sizable for 12 of the 18 firms—20 percent or over.

In a number of cases where profits dropped below last year's, economic doldrums in nonelectronic areas—like the automobile industry—were largely responsible.

A study of corporate third-quarter earnings by the First National City Bank of New York reveals that average profits of 27 electrical-electronic equipment and set manufacturers surpassed averages for 525 firms in all areas of manufacturing. Score was: net profits up three percent for our side, down six percent for all manufacturing.

The current profit picture in the electronics industry is much more favorable than this third-quarter comparison indicates. The comparison sets a quarter at the tail end of a recession against a quarter which was near the final peak of a boom.

Compare third-quarter 1958 net income with that of the preceding second quarter and the industry profit upturn shines through bright and clear.

Third-quarter profits bested second-quarter results for 20 of 26 firms in the group. For remaining nine firms, in the table on right, data for the second calendar quarter was not available.

The FNCB study also shows electrical-electronic set manufacturers' group beating the record of all manufacturing concerns. Average profit gain for electrical-electronic group was 26 percent, for general manufacturing, 17 percent.

Differences in seasonal pattern of business activity in no way weakens this third-to-second-quarter comparison. Rather, the seasonal pattern makes the profit improvement even stronger than figures indicate. Third-quarter is the period of summer slowdown and plant vacation shutdown in which business activity declines seven percent on average.

There is little doubt that the fourth quarter will bring still better profits to our industry, as the following company comments indicate:

Sylvania: "Outlook for remainder of year is promising."

Sperry Rand: "Full fiscal year earnings will exceed prior year."

Clevite: "Electronics and other business outlook for remainder of year is encouraging."

Smith-Corona: "Earnings improved in Sept. and continued in Oct."

General Instruments: "Improved sales and profits expected in quarters ending Nov. and Feb."

Hoffman: "Full-year earnings should equal or exceed last year's."

ANNUAL SALES OVER \$100 MILLION	Net Income Third Qtr. 1958	Percent Change From	
		Third Qtr. 1957	Second Qtr. 1958
Admiral	\$ 1,354,000	+205	+ ¹
Am. Bosch Arma	780,000	- 41	+ 4
Burroughs	1,621,000	+ 85	+ 8
General Electric	58,589,000	+ 6	+ 8
Minneapolis-Honeywell	5,848,000	+ 44	+ 25
Motorola	1,739,000	- 9	+117
Philco	1,794,000	+ 21	+ ¹
RCA	6,254,000	- 22	+ 38
Raytheon	2,491,000	+159	+ 15
Sperry Rand	6,973,000	- 11	+ 78
Sylvania	3,799,000	- 1	+168
Thompson Products	1,504,000	- 33	- 17
Westinghouse Air Brake ..	1,364,000	- 59	- 48
Westinghouse Electric	19,038,000	+ 3	+ 12
Zenith	3,548,000	+ 43	+272
ANNUAL SALES \$50-\$100 MILLION			
Clevite	\$ 931,000	+ 23	+ 4
Cutler-Hammer	840,000	- 46	N.A.
Daystrom	210,000	- 62	+ 32
Magnavox	722,000	- 22	N.A.
Robertshaw-Fulton	948,000	+ 20	+ 24
Siegler	534,000	+ 98	N.A.
Smith-Corona Marchant ...	340,000	- 63	N.A.
Standard Coil	188,000	- 27	- 36
Tung-Sol	789,000	+ 27	+ 78
ANNUAL SALES BELOW \$50 MILLION			
Avien, Inc.	\$ 77,000	+ 67	N.A.
Beckman	620,000	+113	N.A.
Fairchild Camera	196,000	- 8	+ 87
Fansteel Metallurgical	107,000	- 83	- 57
Gabriel	136,000	- 42	- 3
General Instruments ²	267,000	+ 5	+204
Hoffman	369,000	+ 5	N.A.
Leeds & Northrup ²	136,000	- 31	N.A.
Monogram Precision	137,000	- 57	N.A.
Neptune Meter	797,000	+ 20	- 1
Tracerlab-Keleket	7,000	+ ¹	+ ¹

¹Gain cannot be calculated due to deficit in base period. ²Quarter ends Aug. 31. N.A.-Not available.

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OFFER UNSURPASSED
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HIGH POWER
APPLICATIONS**



TYPICAL CHARACTERISTICS AT 25°C

	DT100	DT80	2N174A	2N174
Maximum Collector Current	15	15	15	15 amps
Maximum Collector Voltage (Emitter Open)	100	80	80	80 volts
Saturation Resistance	.02	.02	.02	.02 ohms
Thermal Gradient (Junction to Mounting Base)	.8	.8	.8	.8 °C/watt
Nominal Base Current I_b ($V_{Ec}=2$ volts, $I_c=5$ amps)	135	100	135	135 ma
Collector to Emitter Voltage (Min.) Shorted Base ($I_c=.3$ amps)	80	70	70	70 volts
Collector to Emitter Voltage Open Base ($I_c=.3$ amps)	70	60	60	60 volts

*Designed to meet MIL-T-19500/13A (Jan) 8 January 1958

**HERE IS A LINE OF TRANSISTORS SPECIALLY
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Tel: Mitchell 2-6165

Santa Monica, California
726 Santa Monica Boulevard
Tel: Exbrook 3-1465

ANNOUNCING TWO

SPACE TECHNOLOGY LABORATORIES, INC.

Space Technology Laboratories, Inc., previously a division of The Ramo-Wooldridge Corporation, became a separate company on October 31, 1958. Space Technology Laboratories will be directed by Lieut. Gen. James H. Doolittle, Chairman of the Board (after January 1, 1959); Dr. Louis G. Dunn, President; and Dr. Ruben F. Mettler, Executive Vice President. The other members of the Board of Directors are Robert F. Bacher, Head of the Division of Physics, Mathematics and Astronomy at the California Institute of Technology; James T. Brown, Vice President of the Mellon National Bank, Pittsburgh, Pennsylvania; and Samuel E. Gates, Attorney with the New York firm of Debevoise, Plimpton and McLean.

Space Technology Laboratories has the largest professional scientific and engineering staff in the nation devoted exclusively to Ballistic Missile and Space programs. STL is responsible for the systems engineering and technical direction of the Air Force THOR, ATLAS, TITAN, and MINUTEMAN ballistic missile programs. While it does not engage in production, STL performs experimental and analytical research projects in advanced space technology, including the fabrication and assembly of special equipment and the conduct of test programs. A recent example is the lunar probe project assigned to STL by the Air Force and the National Aeronautics and Space Administration.

Space Technology Laboratories, Inc., plans to maintain a combination of technical competence and organizational strength appropriate to its special and continuing role in the important national program of space weapons development.

SPACE TECHNOLOGY LABORATORIES, INC.

5730 Arbor Vitae Street
Los Angeles 45, California

NEW CORPORATIONS

Thompson Ramo Wooldridge Inc.

On October 31, 1958, **Thompson Ramo Wooldridge Inc.** was formed by the merger of *Thompson Products, Inc.*, and *The Ramo-Wooldridge Corporation*.

Thompson Ramo Wooldridge will be directed by J. D. Wright, Chairman of the Board; Dean E. Wooldridge, President; Simon Ramo, Executive Vice President; and F. C. Crawford, Chairman of the Executive Committee. The other members of the Board of Directors are B. W. Chidlaw, A. T. Colwell, J. H. Coolidge, H. L. George, R. P. Johnson, and H. A. Shepard. Each is a Vice President of the merged company.

Thompson Products, Inc., has been for many years a large manufacturer of components and accessories for the automotive and aircraft industries. In recent years, it has also been active in the fields of Missiles, Electronics, and Nuclear Energy. Thompson has concentrated on products which require a high level of competence in engineering and precision manufacturing.

The Ramo-Wooldridge Corporation was organized five years ago to conduct research, development, and manufacturing operations in the field of electronic and missile systems having a high content of scientific and engineering newness. In addition to the work performed by Space Technology Laboratories, Inc., Ramo-Wooldridge has been engaged in major systems work in such areas as digital computers and control systems, communications and navigation systems, infrared systems, and electronic countermeasures.

The merger of the two companies into **Thompson Ramo Wooldridge Inc.** is intended to provide an integrated team having strong capabilities for scientific research, engineering development, and precision manufacturing.

Thompson Ramo Wooldridge Inc.

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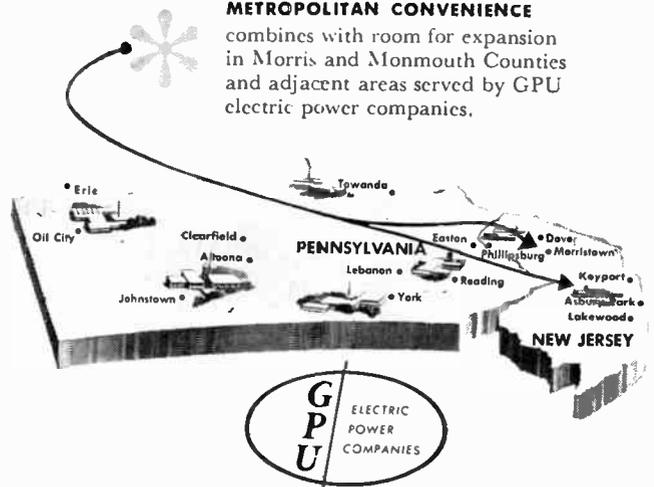
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Shorter Depreciation Spans Coming?

LESS TAX, MORE CASII is probably in store for many electronics firms with modernization programs. That could be the effect of a soon-to-be-released Treasury Department bulletin if it provides shorter-lived depreciation for electronics plants as expected. New Bulletin F, the schedule of recommended lifetimes to be used in estimating annual depreciation charges, is already approved by Treasury officials. Big policy change expected: Agents will be told to use the bulletin more as a guide, less as a bible. Also, there will be more leeway in cases where a firm presents a depreciation schedule which differs from bulletin recommendations.

ELECTROCHEMICAL FUEL CELL with many possibilities for space electronics is reported in a stage of advanced development. That's the word from Lockheed Missile Systems division, which claims its scientists have "repeatedly achieved in laboratory experiments almost 100 percent of 'fuel' utilization and energy conversion efficiencies of 70 percent or better." It's said the cell, related to the ordinary auto storage battery, could be developed within five years to a 300-watt-hour per pound yield. Already being developed is a 100-watt-hour unit. Says a Lockheed scientist: "Even a 150-watt-hour per pound cell would produce

enough energy to power every type of aircraft or spacecraft and to provide power for communication in satellites and space vehicles."

SECRET SEMINAR was held early this month in Pasadena, Calif., on advanced energy sources and conversion techniques. Chemical, thermal, solar, nuclear and electrical and mechanical devices that could be used to power electronic gear were discussed. Seminar was sponsored by the Defense Department in cooperation with California Institute of Technology and University of California at Los Angeles, under the auspices of the Army Signal Corps.

PIN-SIZED MAGNETIC DEVICE just announced can switch states in 4 millimicroseconds, has operated at 5-mc rep rate without adverse heat effects. Developer National Cash Register says the device will increase "thinking" speed of future computers 10 to 20 times, will be usable in missile-space technology because it can operate reliably at 300 F. New NCR device consists of a glass rod on which a conducting layer and then a magnetic coating are deposited. Input and sensing coils are wound over top magnetic layer. Array of rods the size of a cigarette pack can store 8,000 bits, NCR says.

TECHNICAL DIGEST

- Radar-type scanner for scintillation counter gives radioactivity, azimuth and distance to radioactive source on cathode-ray display. Counter is mounted in bottom of drilled hole in heavy lead shield mounted on scanner that is swept back and forth along radius at 360 cps while rotating to scan volume at 60 deg per second. Equipment was developed in Japan for radiological surveys.

- **Evaporative cooling** is used by Marconi for tubes in 100-kw short-wave transmitters as result of miniaturizing techniques that overcame bulkiness of earlier designs. Steam generated in water surrounding tubes travels by convection to air-

cooled condenser, and water returns by gravity.

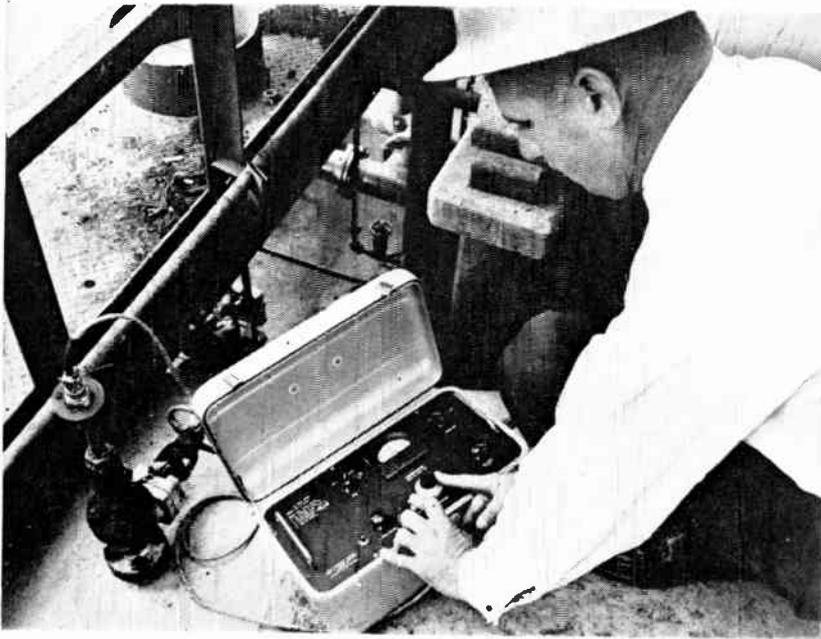
- **Electrodes** required for restoring normal heartbeat in cases of heart block can now be installed without opening chest. Long hollow needle is passed through chest to wall of heart, wire is threaded through length of needle and pushed into heart muscle by sudden quick thrust, then connected to appropriate electronic stimulator. Technique, developed by surgeons at University of Minnesota, is used also in open-heart surgery.

- **Cadmium-sulfide photorectifier** developed by Lincoln Labs has voltage-current characteristics of diode when illuminated, but acts

only as high value of resistance in the dark. Photoconductive layer consists of sintered powdered CdS activated with copper and chlorine. When negative electrode is illuminated, light-to-dark current ratios above 10^3 , approaching performance of single crystals, have been achieved.

- **Over 225 types** of electron tubes contain radioactive isotopes that can be radiological hazards if breakage occurs. The isotopes most used are cobalt-60, radium-226, carbon-14, nickel-63 and cesium-137, intentionally added to produce a continuous supply of ionized particles in tr and atr tubes for radar and guided missile equipment.

Electronic Unit Meters Corrosion



Internal corrosion of as little as one millionth of an inch can be detected to determine effectiveness and required amount of chemical inhibitors in process plants

ELECTRONIC measuring technique has been developed that promises to sharply reduce cost of controlling internal corrosion in process equipment and pipe lines. That is the conclusion of engineers studying results of field trials on equipment manufactured by Crest Instrument division of Magna Products Company.

The corrosion-measuring instrument uses probes consisting of two elements made from the same type of metal used on the processing equipment. One is exposed to the corrosive environment, the other protected by plastic or ceramic.

As the exposed element corrodes, its resistance increases. Measuring the resistance ratio of the exposed element to the protected element produces a direct indication of corrosion. (Since both elements are at the same temperature, there is no chance that temperature variations will affect the results.)

Internal corrosion is generally controlled by the addition of inhibitor chemicals. Exact amount of inhibitor to do the job has been difficult to determine, however. Usual method has been to measure weight loss of small metal coupons after they have been exposed to the corrosive atmosphere for several

days, weeks or months. The amount of inhibitor is varied to find a safe corrosion level.

The new technique provides a daily or even an hourly record of corrosion attack. As little as a millionth of an inch of corrosion can be detected with the instrument. The method gives process engineers a way of judging the effect on corrosion, almost immediately, of even small changes in process conditions or inhibitor concentrations. Within days they can determine optimum conditions.

In one field test, addition of an inhibitor reduced corrosion rate 75 percent within a day and a half. The curve then flattened out, however, and engineers suspected that the specified dosage was not actually entering the system.

An inspection revealed that the pump metering the inhibitor into the system was at fault. When this was corrected, corrosion-rate curve resumed its drop, stopping at 5 percent of initial rate.

The new measuring technique also allows plant engineers to run rapid comparison tests between competitive inhibitors, permitting them to choose the compound that will provide maximum protection at minimum cost.

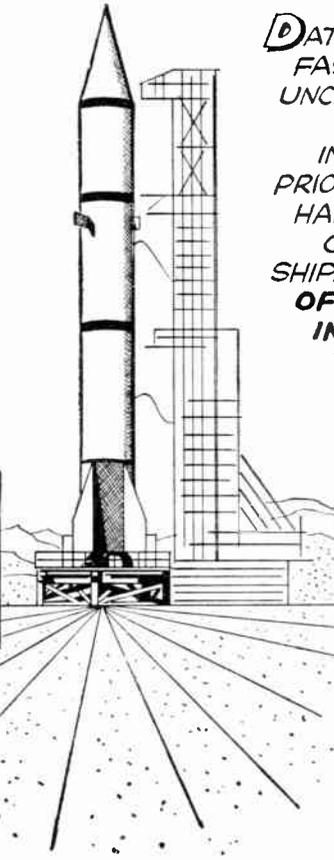
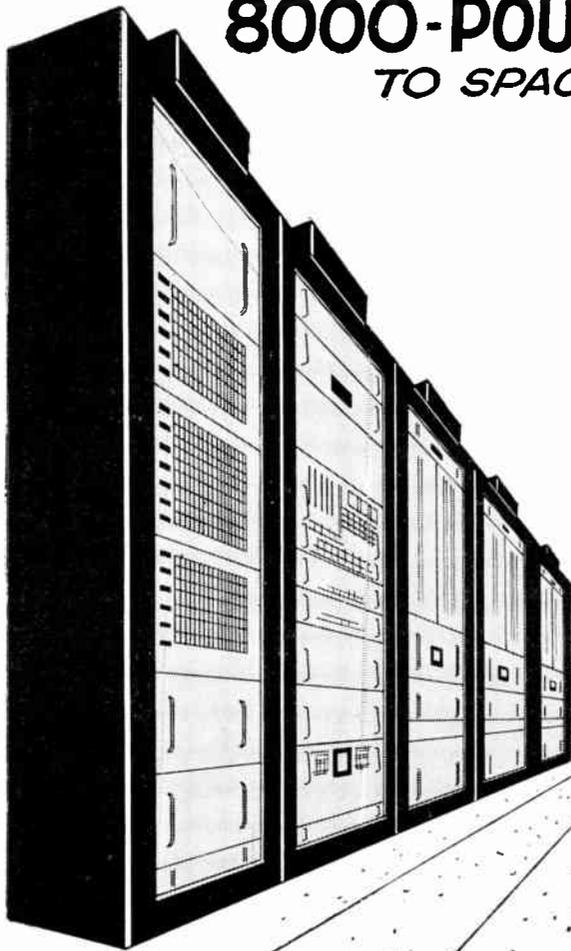
MEETINGS AHEAD

- Dec. 2-4: Reliable Electrical Connections, EIA, Statler-Hilton Hotel, Dallas.
- Dec. 2-4: Airlines Electronic Engineering Committee, Winter Meeting, AEEC, Hotel Statler, Washington, D. C.
- Dec. 3: Electronic Guidance Devices for The Blind, PGME of IRE, Univ. of Penn., Philadelphia.
- Dec. 3-5: Global Communications, AIEE, PGCS of IRE, Colonial Inn-Desert Ranch, St. Petersburg, Florida.
- Dec. 3-5: Eastern Joint Computer Conf., AIEE, ACM, IRE, Bellevue-Stratford Hotel, Philadelphia.
- Dec. 4-5: Vehicular Communications, Annual Meeting, PGVC of IRE, Hotel Sherman, Chicago.
- Dec. 9-11: Mid-America Electronic Convention, MAECON, Municipal Auditorium, Kansas City, Mo.
- Jan. 12-14: Reliability and Quality Control, Nat. Symp., PGRQC of IRE, ASQC, EIA, Bellevue-Stratford Hotel, Philadelphia.
- Jan. 21-23: Southwest Electronic Exhibit, Arizona State Fairgrounds, Phoenix, Ariz.
- Jan. 29-30: Long Distance Transmission by Waveguides, Institution of Electrical Engineers, London, England.
- Feb. 1-6: American Institute of Electrical Engineers, Winter General Meeting, Statler Hotel, N. Y. C.
- Feb. 12-13: Transistor & Solid-State Circuit Conf., AIEE, PGCT of IRE, Univ. of Penn., Philadelphia.
- Mar. 3-5: Western Joint Computer Conf., AIEE, ACM, IRE, Fairmont Hotel, San Francisco.
- Mar. 23-26: Institute of Radio Engineers, IRE National Convention, Coliseum & Waldorf-Astoria Hotel, New York City.
- Mar. 26: Quality Control Clinic, ASQC, Univ. of Rochester, N. Y.
- Mar. 31-Apr. 2: Millimeter Waves, Symposium, Polytechnic Inst. of Brooklyn, USAF, ONR, IRE, USA Signal Research, Engineering Societies Bldg, N. Y. C.
- Apr. 5-10: Nuclear Congress, sponsored by over 25 major engineering and scientific societies, Public Auditorium, Cleveland.

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TWA

8000-POUND "BRAIN" FLIES TWA TO SPACE RESEARCH PROJECT



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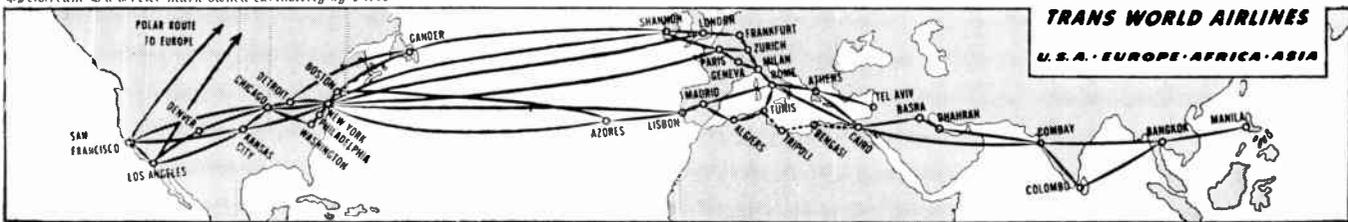
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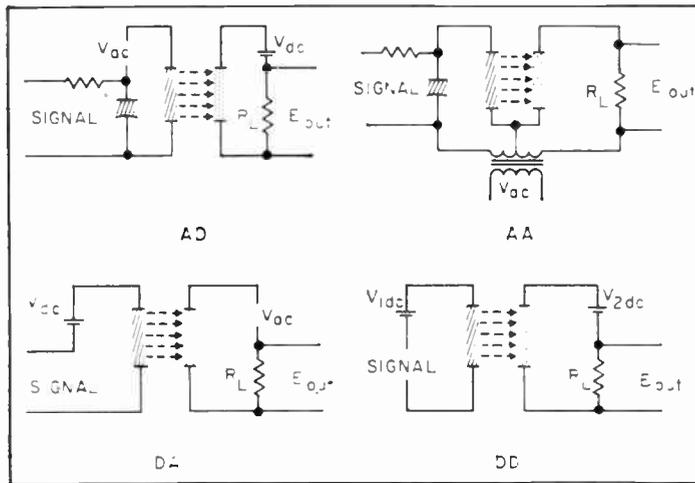
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Lumistor amplifier and modulator schematics show potential use of. . .

Phosphors as Amplifiers

Electroluminescent and photoconductive films may be combined as new solid-state components

ELECTROLUMINESCENCE research has been paying off recently with development and marketing of special-purpose lamps, image amplifiers, readouts and similar auxiliary devices for electronic equipment.

Direct use of electroluminescent devices in circuits is considered practical by some researchers. One resume of possible circuit applications was given last month at the National Electronics Conference by Charles F. Spitzer, manager of solid-state electronics research, Lockheed missile-systems division.

Suitable arrangements of electroluminescent and photoconductive films can be used, he says, as amplifiers and other active circuit elements. Tests of experimental amplifiers made with lumistors—as he calls the elements—yield power gains over 40 db. One, made with a ZnS phosphor and CdS photoconductor, gained 48 db with a load of 0.4 megohm.

The basic amplifier circuits have their counterparts in lumistor circuits, Spitzer reports. The illustration shows lumistors resulting from alternative use of d-c and a-c at inputs and outputs. The *DD* circuit, for example, represents a d-c phosphor and d-c photocon-

ductor and is a general-purpose, low-frequency amplifier.

Gains of the devices can be controlled by adjusting an optical filter between the phosphor and the photoconductor, shifting the position of the elements or by varying the exciting voltage.

Other researchers have suggested alternate designs which would enable such devices to be used as multipole relays, logic circuits, linear capacitors and digital-to-analog converters. Spitzer also suggests arrangements for voltage regulators and combinations of lumistors for electronic clocks, self-indicating counters and shift registers. The elements are arranged so that successive input pulses trigger one element after another.

Spitzer says lumistors would be relatively inexpensive. Material cost is low and mechanical assembly would be practical, he feels. Cost would be two cents a watt at a rating of one watt per square inch.

A major practical drawback, however, has been the difficulty of obtaining suitable materials. D-c responsive phosphors, phosphors which respond more quickly and photoconductors with lower resistances are needed.

Industrial Glue Sets in Seconds

AFTER A YEAR of market tryouts, Eastman Chemical Products has decided upon commercial production of its 910 adhesive. Two strain-gage manufacturers will also distribute the glue which allows transducers to be fastened to metal and used within five minutes.

The adhesive, methyl 2-cyanoacrylate, polymerizes almost instantly when pressed into a flat film. It will bond practically all materials without heat, pressure or catalysts and sets rapidly enough for production line use, according to tests reported by the company.

At a press demonstration, two drops were used to fasten a rubber strap to an automobile battery.

Aluminum to aluminum bonds will set in two to four minutes and reach a shear strength of 2,400 psi after 24 hours cure at room temperature. Use at temperatures beyond 200 F is not recommended.

Airport Antenna Goes in Runway

INSTRUMENT LANDING antenna which can be flush-mounted in airport runways has been developed by Ohio State University Antenna Laboratory and is being tested by CAA. Good results are reported.

The design is seen as a solution to glide slope signal distortions which result when the radiating antenna is mounted above and alongside runways.

A traveling wave type of antenna, it consists of a probe in a dielectric-filled cavity. The antennas would be used in pairs or paired arrays. No modifications of airborne glide-slope receivers would be required.

Solid-State Lamps Now on Market

ELECTROLUMINESCENT cells are being test-marketed as home safety lamps by Westinghouse Electric. They are phosphor-coated glass panels, about six square inches in area, which plug in flush to the wall and operate on house current. The lamps are rated at 1/200 watt.

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 Specify Engineering Report No. 327

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ELECTRONIC SEMICONDUCTORS

Just Published. A rigorous and systematic introduction to semiconductor physics, developing the subject logically from simple concepts and giving clear pictures of the conduction mechanism of electronic semiconductors within the framework of the *band model*. Among the book's outstanding features are the treatment of acceleration of electrons, the Zener effect, etc. Book is a translation of the 2nd German edition of *Elektronische Halbleiter* by Eberhard Spenke. Translated by D. Jenny, H. Kroemer, E. G. Ramberg, and A. H. Sommer, RCA Laboratories. 430 pp., 163 illus., \$11.00

RANDOM SIGNALS AND NOISE

Just Published. An introduction to the statistical theory underlying the study of signals and noises in communications systems. Contains an introduction to probability theory and statistics, a discussion of the statistical properties of the Gaussian random process, a study of the results of passing random signals and noises through linear and nonlinear systems, and an introduction to the statistical theory of the detection of signals in presence of noise. By William B. Davenport, Jr., and William L. Root, Lincoln Laboratory, M.I.T. 393 pp., illus., \$10.00

NUMERICAL ANALYSIS

Just Published. Covers the topics most directly needed for a clear understanding of methods used in numerical solution of differential equations, both ordinary and partial, and in the solution of integral equations. Clearly explains the use of finite-difference methods in obtaining numerical solutions to problems—emphasizing procedures which can be most readily programmed for an electronic digital computer. Many helpful techniques such as the use of lozenge diagrams for numerical differentiation and integration are supplied. By Kaiser S. Kunz, Ridgefield Research Lab. 381 pp., 40 illus., \$8.00



ELECTRON TUBE CIRCUITS

New 2nd Edition Just Published. Discusses and evaluates the fundamental properties of electron tubes and their circuit operations—analyzes tuned and untuned amplifiers—and takes up in detail circuits essential to modern electronic systems such as voltage, video, and power amplifiers; waveform generators; oscillators; modulators, etc. Scores of practical examples show you best applications of theory. By Samuel Seely, Case Inst. of Technology. 2nd Ed. 695 pp., 739 illus., \$10.50

BASIC FEEDBACK CONTROL SYSTEM DESIGN

Just Published. Bases the study of feedback control system design on complex frequency plane analysis—the root-locus. A wide range of servo transducers and components are covered. Recent advances covered include a section of gyroscopes and force-balance transducers, inertial navigation; analysis of nonlinear systems such as the describing function technique and phase plane analysis. Frequency methods, such as Nyquist and Bode, are included. By C. C. Savant, U. of Southern Cal. 418 pp., illus., \$9.50

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Industry Is Filling New Role

Electronics leaders occupy "board of directors" seat in new Air Defense Systems Integration Division

IMPACT of frequency-diversity problems on Air Defense mission was thrashed out in Boston this week by more than 400 military and industrial experts from the U. S. and Canada.

Meeting underscored electronics industry's new "board of directors" role in air defense.

Sponsor of the conference was ADSID (Air Defense Systems Integration Division), the tri-command unit formed for top-level air defense management. The division has high-ranking reps from Air Research and Development Command, Air Defense Command and Air Materiel Command.

ADSID's herculean task is to achieve overall Air Defense mission compatibility, technical and operational, from components through systems.

Boston parley was classified secret, but it was no secret that frequency interference problems led to scrubbing of a lot of dirty linen.

This week's conference was second major huddle of Air Force, Army, Navy and industry representatives looking toward completion of ADSID's master systems description.

Principal systems advisor to ADSID is the Mitre Corp., a nonprofit organization having as an initial nucleus Lincoln Lab personnel who helped develop Sage system. President of Mitre is C. W. Halligan, former director of military engineering at Bell Labs.

Mitre will be the industry component of ADSID, a joint military-industry management team, coordinating air defense activities from initial research to end product "to insure an effective, properly time-phased and technically compatible" integrated air defense mission system. ADSID will integrate all weapons, electronic environment and support systems, providing managerial guidance and specifications.

Mitre's board of trustees will comprise leaders from educational institutions and nondefense industry, who will serve "without profit."

ADSID team presently includes people from a dozen industrial firms, principally electronics and aircraft. Agency's budget for this year is estimated between \$6 and \$9 million. Air defense systems it manages and integrates represent costs that run into billions. At present, ADSID has a staff of about 500, military and industrial. Computer programming is being done by Systems Development Corp.

ADSID is an Air Force agency, but Army's Nike installations and Navy's picket ships tie in with air defense complexity managed by ADSID. Goal of overall mission is to integrate—under Sage control—such systems as Distant Early Warning line, Airborne Early Warning, Ballistic Missile Early Warning System, Texas Towers, Missile Masters, long-range radar, the Bomarc, Talos and Nike series of missiles, and Century series of interceptors. North American Air Defense Command provides link with Canadian military capabilities in western hemisphere defense plan.

MILITARY ELECTRONICS

- USAF may soon release preliminary information on the Long John Silver project, ARDC's attempt to adapt single sideband techniques for digital data transmission.

- One hundred percent improvement in infrared detection and guidance system capabilities is forecast by Air Materiel Command as a result of Texas Instrument's 18-month study of silicon crystals as "windows" for infrared systems.

Purpose of the study was to find a practical, commercially feasible process for producing silicon crys-

tals of specified sizes, shapes and i-r transmitting properties. Key specs are less than one part impurity in 50 million parts and ability to transmit better than 90 percent of the infrared signal in the four-to-five micron range with a coating on the crystal.

From the study, USAF has received 10 plates and three domes of diameters up to six inches and thicknesses up to $\frac{3}{8}$ in.

Using the new silicon domes, i-r systems will be able to detect heat across a broader band of the wave spectrum than was possible before. AMC reports.

CONTRACTS AWARDED

Burrhoughs gets a \$22,817,000 contract with Air Materiel Command for 32 data-processing systems for the Sage continental air defense program.

Hughes is awarded a \$16,238,469 contract with AMC for production of F-106 aircraft and weapons control systems. Included in the contract is production of 34 of the MA-1 electronic systems.

Massachusetts Institute of Technology gets a \$4.5-million contract with AF Cambridge Research Cen-

ter. ARDC, for research services related to reentry physics and instrumentation radar.

ITT is awarded a \$600,000 contract with Rome AF Depot for SAC control system.

Motorola receives a \$714,636 contract with Boeing for continuance of its Bomarc guidance beacon program. Motorola is also working on an improved guidance beacon for the new Bomarc B.

Telecomputing also gets a Boeing contract for Bomarc: \$738,000 for floated rate gyros.

Consolidated Controls is awarded an \$800,000 contract from Westinghouse for instrumentation for nuclear-powered submarines.

Servomechanisms gets a \$507,909 order from RCA for production of barometric altitude controllers.

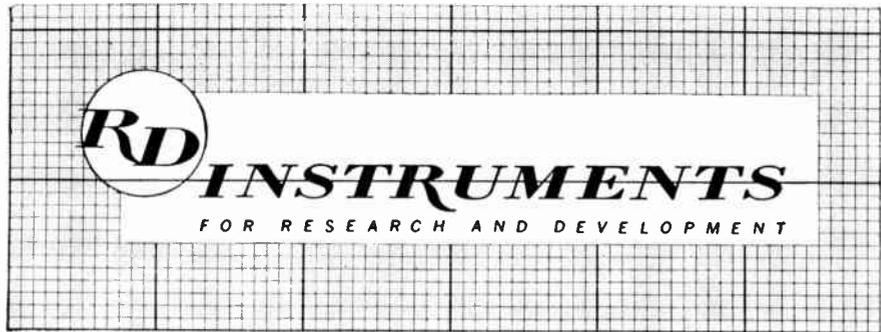
Adler Electronics will design and manufacture single-sideband communications systems for Army Signal Supply Agency under a \$983,000 contract.

Telectronics Laboratory, Inc., receives contracts for oscilloscopes, receivers and transmitters totaling \$828,741 from Signal Corps and BuShips.

Lavoie Labs gets a \$1,318,470 contract with Dayton AF Depot for analyzer spectrum set, AN UPM-84.

GPL is awarded a \$1,155,351 letter contract for components of the AN/APN-81 airborne navigation system for use in B-52, KC-135 and RB-66 aircraft. Contract, when finalized, is expected to reach \$2.64 million.

Sperry receives a \$1,340,000 contract with AMC for AN/TPW-1 microwave command guidance equipment, range and tracking sets, radar sets to be used in development of the XQ-4A drone; also from AMC, a \$432,693 contract for APN-69 components. With Rome AF Depot, Sperry gets a \$550,000 contract for equipment and spare parts for AN/TPS-35.



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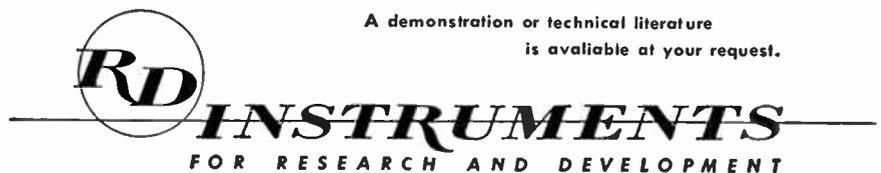
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NEW PRODUCTS

Braked Servo Motor rugged unit

KEARFOTT Co., Inc., 1500 Main Ave., Clifton, N. J., has developed a rugged, shock-and-vibration resistant Size 10 braked servo motor which is ideally suited to missile and high speed aircraft applications having high shock and vibration

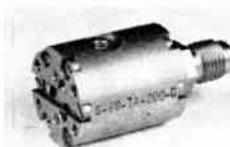
requirements. Despite such an environment, this new component maintains a constant reference position in a servo system, and consists of a standard Kearfott R12+1 servo motor integral with a friction brake controlled by an electromagnet. In operation, the brake effectively stops and holds the motor and shaft at any desired position,



preventing rotor creep. **Circle 50 on Reader Service Card.**

Transducer diaphragm type

ULTRADYNE, INC., P.O. Box 3308, Albuquerque, N. M. A miniature, single coil, variable reluctance, diaphragm-type transducer to be used as the variable inductor in commercially available inductance



and reactance controlled f-m/f-m subcarrier oscillator systems is announced. Differential, gage and

absolute models are offered with a wide selection of pressure ranges between 0-10 psi and 0-5,000 psi. Called the S-60, the unit combines very low sensitivity to shock, vibration and acceleration with a rise time of 75 to 150 μ sec. Basic size is $\frac{3}{8}$ in. diameter by $\frac{1}{2}$ in. long. **Circle 51 on Reader Service Card.**

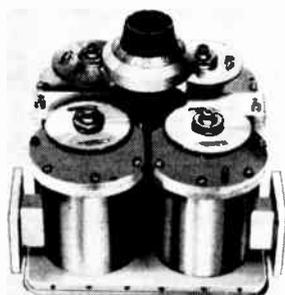
Mounting Flange versatile device

GABRIEL ELECTRONICS DIVISION, Needham Heights, Mass. In order to adjust polarization during installation or for alignment of center-fed, 7,000 mc, series B parabolic antennas, a new mounting flange

has been developed. It has as its features 360 deg adjustable flange feed: (1) insertable from rear; (2) fits standard GED feed mounting bolts; (3) closely machined tolerances permit accurate seating and positive clamping action when fastening nuts; (4) after installation, can be adjusted without



removing nuts or bolts; (5) no loss in rigidity over standard mounting flanges. **Circle 52 on Reader Service Card.**



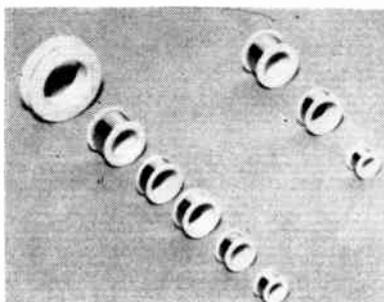
Preselector Filter gang-tuned

AIRTRON, INC., 1096 W. Elizabeth Ave., Linden, N. J., has introduced another new multi-element single-knob tunable filter for interference reduction and spectrum control in radar systems. It offers high selectivity and precise gang-tuning of its four sections. The maximally flat

design utilizes quarter-wave aperture couplings between cylindrical Invar cavities. These cavities are operated in the low-loss circular TE_{011} mode, with non-contacting choke-type plungers as tuning elements. Although suited to low power use, the design can be modified to handle high peak powers as a spectrum limiting filter. **Circle 53 on Reader Service Card.**

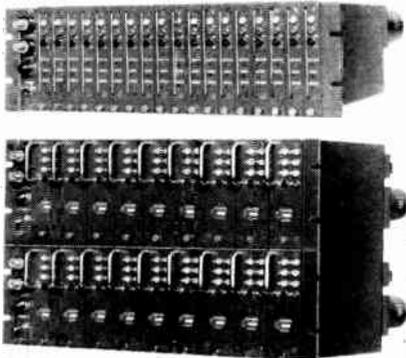
Bobbin Cores standard flux ratings

DYNACOR, INC., 10431 Metropolitan Ave., Kensington, Md. A new line of bobbin cores features standard flux ratings selected on the basis of the same EIA preferred numbers used for capacitors and resistors. The cores are made



available to designers of magnetic shift registers and other digital computer components which permit the same type of systematic circuit design that has been used by electronic engineers since the introduction of the EIA preferred number series. The new cores have guaranteed switching times to simplify design problems still further.

Full details are given in engineering bulletin DN-1003, available on letterhead request.



Keyer/Converter compact design

NORTHERN RADIO CO., INC., 147-49 W. 22nd St., New York 11, N. Y., has achieved, by transistorized circuitry and concomitant compact design, 18 channels of frequency shift tone telegraph keying equipment in panel space only 19 in. wide by 5 1/4 in. high by 18 in. deep, and 18 channels of frequency shift tone telegraph converter equipment in panel space only 19 in. wide by 20 1/2 in. high by 18 in. deep. Versatility and stability are claimed to be extremely high. Circle 54 on Reader Service Card.



Transformer explosion-proof

SCHAEVITZ ENGINEERING, Route 130 & Schaevitz Blvd., Pennsauken, N. J. An explosion-proof linear variable differential transformer is suitable for use in corrosive and flammable liquids or gases under high ambient pressure and temperature. Completely enclosed in a welded stainless steel housing, the unit can operate safely in a hazardous atmosphere without further enclosure. Sensing element provides

stepless output voltage that is a precise linear function of core displacement within the specified operating range. Transformer may be used for ambient temperatures from -65 F to 450 F and pressures to 5,000 psi. Circle 55 on Reader Service Card.

Digital Voltmeter no moving parts

KIN TRU, a division of Cohu Electronics, Inc., Box 623, San Diego 12, Calif. Model 801 is a portable, all-electronic digital voltmeter that measures d-c voltages to an accuracy of 0.1 percent and presents them on an in-line readout every 1/10th of a second. It is ideal for production line testing and calibration, general laboratory measurements, and instrument calibration. Price is \$960. Circle 56 on Reader Service Card.



Teflon Terminal with slotted lug

SEAELECTRO CORP., 610 Fayette Ave., Mamaroneck, N. Y. Type FT-SM-65 SL subminiature Press-Fit feedthrough terminal features a heat-treated beryllium-copper insert. This means greater resistance to bending and breaking. With a bushing o-d of only 0.125 in., and an overall height of 0.294 in., the terminal is especially suitable for ultracompact electronic assemblies. Circle 57 on Reader Service Card.

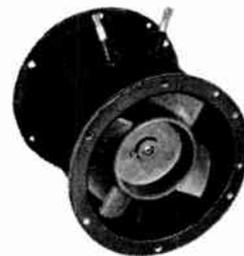
Digital VOM mercury relay type

NON-LINEAR SYSTEMS, INC., Del Mar Airport, Del Mar, Calif. Series 20 digital volt-ohmmeter has been designed specifically for missile and weapons system check-out. It is a

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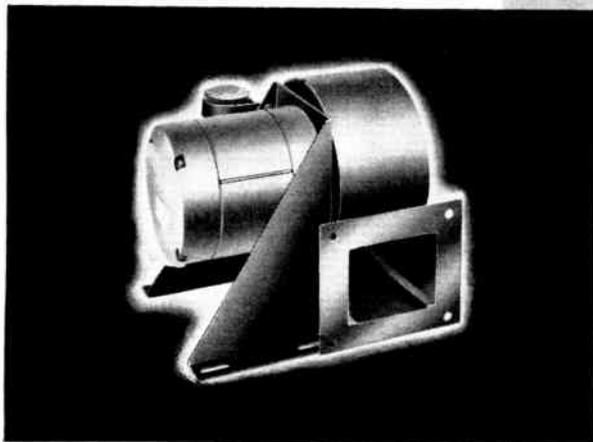
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Missile launching equipment manufacturers must be positive of every component in their vital equipment. For this reason, Air-Marine blowers are specified equipment in many of the launching beds built today. The blower shown here is currently being used in the Army's NIKE Hercules Program. Interested manufacturers are urged to look into the proven reliability of Air-Marine's complete line of sub-fractional H.P. Motors, Blowers and Fans.



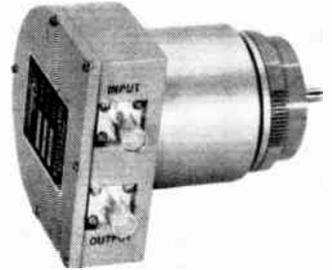
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multifunction digital instrument (3 meters in one) that automatically and continuously measures and displays d-c voltage, voltage ratio and resistance. It makes three readings per sec with accuracy to 0.01 percent. Circle 58 on Reader Service Card.



Phase Shifter high accuracy

REEVES INSTRUMENT CORP., Roosevelt Field, Garden City, N. Y., has available a high accuracy phase shifter designed especially for precision radar applications. Designed to operate on the standard frequency of 81.95 kc (equivalent to 2,000 yards), the phase shifter maintains accuracies of better than ± 20 minutes over an ambient temperature range of 0 C to 50 C. Phase shifter operation is accomplished without the use of slip rings, thereby assuring long life and noise-free operation. Output phase shift of 720 deg is provided for each 360 deg of input shaft rotation. Circle 59 on Reader Service Card.



Power Resistors silicone sealed

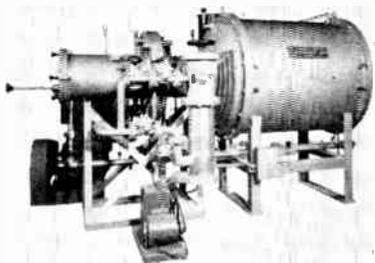
TECH-OILM RESISTOR CORP., 36-11 33rd St., Long Island City, N. Y., has a new line of Powerpack silicone sealed miniature power resistors, enclosed in a black anodized radiator finned aluminum housing. Maximum heat dissipation is pro-

vided by mounting on a sub-panel. Resistors are available in 5, 10, 25, and 50 w sizes with complete welded construction from terminal to terminal manufactured to MIL-R-18546B specifications. Tolerances are available in 0.05, 0.1, 0.25, 0.5, 1, 3 and 5 percent. Circle 60 on Reader Service Card.



Voltage Regulators silicon type

INTERNATIONAL RECTIFIER CORP., 1521 E. Grand Ave., El Segundo, Calif. A series of 5-w rated (without heat sink) silicon voltage regulators now available enable the design engineer to specify any zener voltage for his exacting circuit requirements in the range from 24 to 160 v. Style HZ silicon regulators are designed to provide substantially lower dynamic resistance than comparable tube types over a broad temperature range from -65°C to $+165^{\circ}\text{C}$. Circle 61 on Reader Service Card.

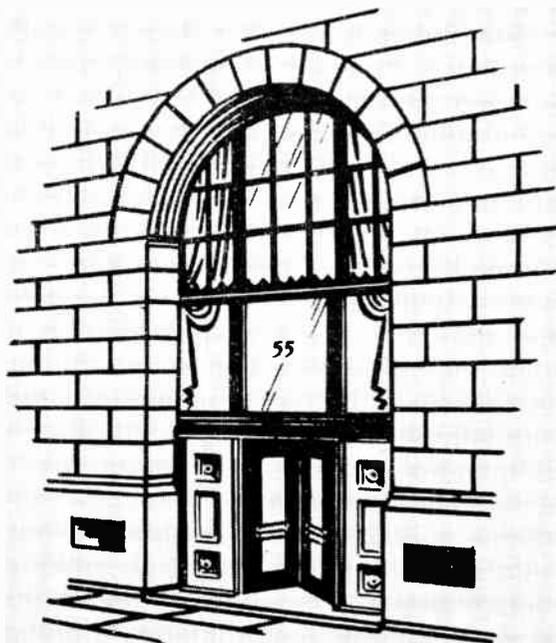


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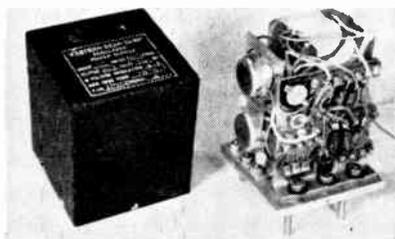
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announces a new horizontal production (12 by 18 in. even-heated zone) furnace, capable of operating up to 3,000 F at a vacuum of 5×10^{-5} mm Hg. Furnace is designed for heat-treating, annealing, brazing and sintering. Circle 62 on Reader Service Card.



Power Supply transistorized

WESTERN GEAR CORP., P. O. Box 182, Lynwood, Calif., announces model 7PVR20 miniature transistorized power supply. Input voltage is $115 \text{ v} \pm 10$ percent at 400 cycles. Output voltage is 100 v d-c at 40 ma. For current variation of 0 to 40 ma, the output voltage varies ± 0.03 percent. With a ± 10 percent input voltage variation, the output voltage variation is ± 0.03 percent. Under a temperature variation of -40 F to 165 F , the output voltage variation is ± 0.5 percent. Circle 63 on Reader Service Card.



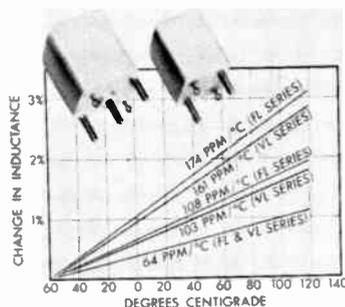
Phase Generator passive components

THETA INSTRUMENT CORP., 48 Pine St., East Paterson, N. J. A new phase generator will operate into loads which vary between open circuit and zero ohms without affecting its phase accuracy. This has been accomplished with purely passive components. The

device produces a constant output voltage which is phase variable through 360 deg. With load, the output voltage is reduced in level, but operation is otherwise normal. Circle 64 on Reader Service Card.

Selenium Rectifier Grain Oriented

VICKERS INC., 1815 Locust St., St. Louis, Mo. In the new Grain Oriented selenium rectifier, the company has developed a polycrystalline selenium layer with grains oriented in parallel fashion, rather than the disoriented pattern found in conventional selenium layers. This design provides increase in the rectifier's current ratings without corresponding increase in cell size, and, it is claimed, gives more watts of output per dollar invested. The Grain Oriented selenium rectifier is available in cell ratings of 18 to 36 v. Circle 65 on Reader Service Card.



Linear Inductors adjustable and fixed

PULSE ENGINEERING, INC., Redwood City, Calif., announces a new line of adjustable and fixed linear resistors. They are designed to replace toroids in wave filters, resonant circuits, impedance choke applications, and resonant transformer applications. Variation of inductance is absolutely linear from -55 C to $\pm 125 \text{ C}$. Temperature coefficients of 55 ppm to 161 ppm are available. The new inductors are self-compensating with polystyrene foil capacitors in resonant meshes. They have a higher Q over a wider range, typically, 500 at 50 kc. Circle 66 on Reader Service Card.

Literature of

MATERIALS

Epoxy Resins. Minnesota Mining and Mfg. Co., 900 Bush St., St. Paul 6, Minn. A guide to selecting epoxy insulating resins, listing physical and electrical properties, and other application data pertaining to Scotchcast brand electrical insulating epoxy resins, was recently made available. Circle 67 on Reader Service Card.

COMPONENTS

Gears. Geartronics Corp., 50 Nashua St., Woburn, Mass., offers a brochure announcing the availability of a wide variety of gears, power transmission components, precision machined parts and engineering help. Circle 68 on Reader Service Card.

Terminal Blocks. DeJUR-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y. An illustrated 6-page brochure gives specifications, outline dimensions and general information on terminal blocks for computer applications. Circle 69 on Reader Service Card.

Sealed Relays. General Electric Co., Schenectady 5, N. Y. Bulletin GEA-6628, 24 pages, offers up-to-date information on hermetically sealed relays for military and general purpose industrial applications. Circle 70 on Reader Service Card.

Precision Resistors. General Transistor Corp., 91-27 138th Place, Jamaica 35, N. Y. Bulletin GR-20 contains technical specifications and basic engineering theory on bobbinless precision wire wound resistors. Circle 71 on Reader Service Card.

EQUIPMENT

Power Supplies. Empire Devices Products Corp., Amsterdam, N. Y. Engineering bulletin VP-858 is a two-page illustrated description of the VP-410 and VP-1000 variable

the Week

frequency power supplies. It contains operating features and engineering data on performance characteristics. Circle 72 on Reader Service Card.

Voltage Supply. Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill., has released an eight-page circular on the AC Solavolt, an adjustable a-c harmonic-free voltage supply. Circle 73 on Reader Service Card.

Current Pulse Amplifiers. Rese Engineering, Inc., 731 Arch St., Philadelphia 6, Pa. Bulletin 57-A covers models 1070 and 1070A current pulse amplifiers which were designed to deliver high amplitude current pulses from a high impedance source. Specifications are included. Circle 74 on Reader Service Card.

Precision Power Supplies. Electric Regulator Corp., Pearl St., Norwalk, Conn. A new catalog sheet covers the series 2,050 Regohm-controlled precision power supplies. It contains specifications, schematic diagram, typical performance curves, and ordering information. Circle 75 on Reader Service Card.

High Intensity Driver. Transducers, Inc., 2957 Honolulu Ave., La Crescenta, Calif. A new model 150-II high intensity driver featuring low harmonic distortion is described in an illustrated engineering data sheet, TI-2. Voice coil diameter, power input, nominal impedance and other specifications are presented. Circle 76 on Reader Service Card.

FACILITIES

Plastic Producing. Madan Plastics, Inc., 370 North Ave., Cranford, N. J. New plastic producing facilities are illustrated and discussed in a colorful brochure. A pictorial tour of the company's new temperature-controlled plant is included. Circle 77 on Reader Service Card.

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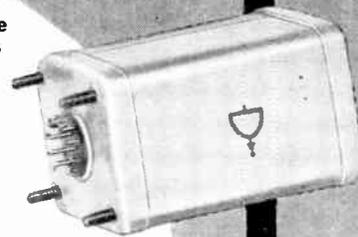
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Color Tv Patent Pool Studied

Manufacturers are evaluating possible impact on color tv of RCA/Justice Dept. settlement

LAST MONTH'S settlement between Justice Department and RCA will not have much effect on color television. So say many industry spokesmen.

Key provision of the settlement establishes a patent pool based on a selection of 100 RCA color tv patents. In the wording of the settlement, "All persons engaged in the manufacture of radio purpose equipment" may have access to the patents by contributing one or more patents to the pool. Patents added in this way become available to all pool members at no charge.

To date, manufacturers say it is too soon to comment on whether or not they will join the pool. In more than one case, pending litigation with RCA is influencing opinion heavily.

In such cases, firms feel that a thorough survey of the entire settlement must be made before decisions regarding the color pool can be reached. As a spokesman from Zenith puts it: "We know what the words say, but the implications have yet to be determined."

Comment from General Electric indicates company feeling that existing patents aren't the main stumbling block for color tv. New ways to handle color transmission and reception will still be studied,

said the firm, when queried recently.

Similar sentiments were expressed by a New Jersey manufacturer who feels that many firms will not join the patent pool if it means setting aside research and development efforts aimed at working around the original patent situation.

Feeling at Sylvania is that color's problems won't be solved by manipulating patents. The company says there must be a great increase in color tv programming and in merchandising of receivers before the balance tips. On the matter of joining the patent pool, a company official says more time must elapse before a sound evaluation can be made.

Because of pending suits with RCA, Philco feels that thirty days is not enough time for formulation of plans regarding the pool. Comment is also being withheld on the overall terms of the settlement.

A company official at Motorola says, "Licensing has never been a major factor in consumer acceptance of color tv." His company feels that the patent pool will not have any immediate observable effect on the color situation. No comment has been made as to company plans regarding the patent pool.

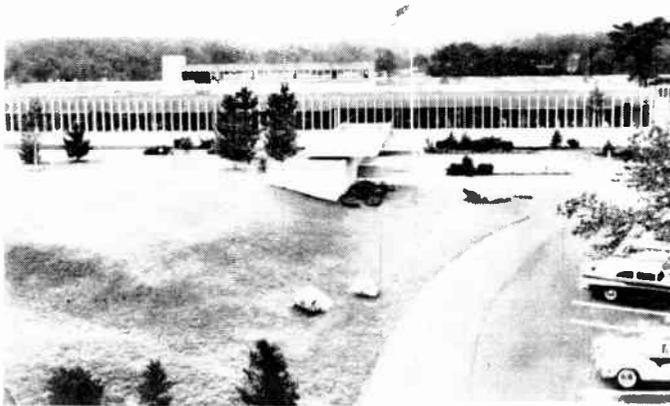
A brief statement from RCA regarding the settlement does not discuss the color pool at great length. It refers to the color field as "promising," and points out that those who do not join the pool may acquire use of the patents by paying reasonable royalty rates.

FCC ACTIONS

- Notes petition for rule-making filed by Associated Public Communication Officers, San Jose, Calif., requesting immediate availability of certain unassigned split-channel frequencies between existing police and fire allocations.
- Files application from American Hospital Association requesting amendment to establish specific eligibility standards and reserve frequencies for hospitals meeting such standards.
- Grants temporary authority to KALA, Wailuku, Hawaii, to operate on channel 7 until Jan. 30, 1959.
- Extends completion date for station WYZZ, Wilkes Barre, Pa., to Jan. 20, 1959.
- Issues license to Radio Station KGEI, Inc., Belmont, Calif., for an International Broadcast station.
- Allows WPRA, Mayaguez, P.R., 90 days special authority to operate 250 w day and night, using wire on roof poles of studio and office building as antenna.
- Grants c-p to South Arkansas Television Co., El Dorado, Ark., for a new tv stl station.
- Extends authority of WCKR-FM, Miami, Fla., to remain silent until Feb. 15, 1959.

STATION MOVES and PLANS

- WSIZ, Douglas, Ga., receives license for a-m station.
- WTNZ, Tampa, Fla., is granted modification of c-p to make changes in antenna system, and change type transmitter.
- KPAM, Portland, Ore., plans increase in power and installation of new transmitter.
- WNIK, Arecibo, P.R., obtains c-p to install new transmitter as alternate main transmitter, operate by remote control.
- WSID, Baltimore, Md., is granted extension of completion date to May 19, 1959.



RCA Opens Major N.E. Plant

COMPLETION at Burlington, Mass., of the Radio Corporation of America's first major plant facility in New England was recently announced. Home of the newly-created Missile Electronics and Controls Dept. of RCA's Defense Electronic Products, it is situated 17 miles from Boston.

The H-shaped, ultra-modern, one-story building houses an integrated operation for the research, development and manufacture of complex sensing communications and control devices for missiles and space vehicles.

Of the building's 135,000 sq ft of floor space, some 100,000 are occupied by laboratories, engineering and other facilities. These include a modern machine and fabrication shop, a gyro engineering laboratory, large scale analog and digital computers, a flight simulation laboratory and other facilities essential to the development of future airborne and space systems. The remaining 35,000 sq ft are occupied by administration, testing and utility areas.

The former Boston Airborne Systems Laboratory of RCA becomes a part of the new Missile Electronics and Controls Department. Laboratory personnel and operations have already been transferred to Burlington from temporary quarters at Waltham.

The Burlington plant currently

employs some 500 people, a large percentage of them highly trained engineers and technicians. It is anticipated this number will rise considerably in the years to come.

W. B. Kirkpatrick, who headed the Airborne Systems Dept. of RCA Defense Electronic Products at Camden, N. J., manages the new plant.

R. C. Seamans, Jr., former manager and chief systems engineer of the Boston Airborne Systems Laboratory, becomes chief engineer of the new department.



Norman Fyler Joins Litton

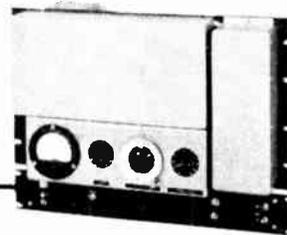
APPOINTMENT of Norman F. Fyler as the new manager of the Litton Industries' Electronic Display Lab-



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oratory at Emeryville, Calif., is announced. He comes to Litton from CBS where he was manager of the advanced development laboratory of their Hytron division.

While at CBS Fyler directed activities leading to development of the Colortron and also managed a group responsible for an advanced crt with very high definition capabilities. He will continue this work with Litton.



Bell Aircraft Hires Shaw

ACTIVE in the field of communications for more than 20 years, Hubert R. Shaw has joined Bell Aircraft Corp., Buffalo, N. Y., as associate director of engineering for the airplane company's Avionics Division.

For the past three years Shaw has been vice president and director of engineering for Teledynamics, Inc., of Philadelphia, Pa.

He previously served in such capacities as supervisor of advanced development for RCA in Camden, N. J.; chief engineer for Sylvania in Buffalo, N. Y.; director of engineering for Hoffman Electronics, Inc., Los Angeles, Calif.; and chief engineer in the product engineering section of North American Aviation Corp., Downey, Calif.

News of Reps

Polytechnic Research & Development Co., Inc., Brooklyn, N. Y., has appointed sales reps for its complete line of precision micro-

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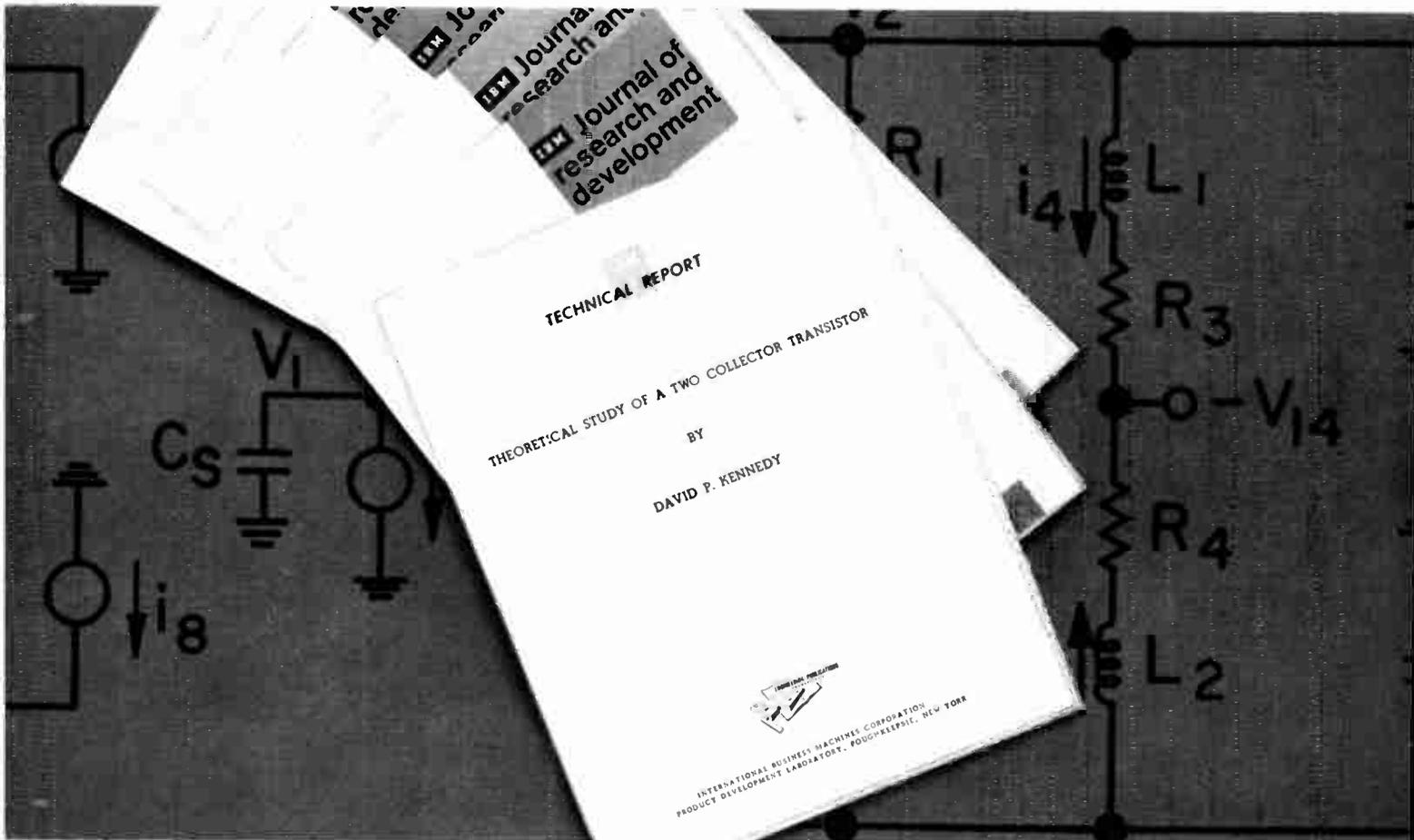
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wave and electronic test equipment and components.

Barnhill Associates of Denver, Col., will represent PRD in Idaho, Montana, Colorado, New Mexico, Utah and Wyoming.

Ault Associates of Menlo Park, Calif., will cover the territories of northern California and northern Nevada.

A-F Associates have been named to represent the Electronics Division of Iron Fireman Mfg. Co., Portland, Ore., in the southern California area.

Raymond Stuart Stata recently joined the staff of field engineers at Yewell Associates, Inc., Burlington, Mass., manufacturers' rep organization.

Samco Mfg., Inc., Orange, N. J., appoints Benjamin B. Cravens of Lynnfield, Mass., as its rep for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York, except Long Island.

Baume Electronic Sales Co. of Hicksville, N. Y., has been appointed rep for Simon Mfg. Co. and All State Plastic Mfg. Co. Both companies are in Chicago, Ill. Baume will cover the Metropolitan New York area.

P. J. Engineering Sales Co. of Watertown, Mass., is the new components rep in the New England territory for EpSCO, Inc. of Boston.

Landis Associates is a manufacturers rep organization recently established in Los Angeles by Richard Landis. Firm is handling electronics accounts in southern California.

Mel Schwartz of Fair Lawn, N. J., now represents Paramount Paper Tube Corp., Ft. Wayne, Ind., in metropolitan New York and New Jersey.

Precision aircraft and missile instruments of Statham Instruments, Inc., Los Angeles, Calif., are now being handled in the Chicago area by Pivan Engineering Co.

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How Radar Got Its Name

Before Columbus, radar had no name. It was called "the thing with no name."

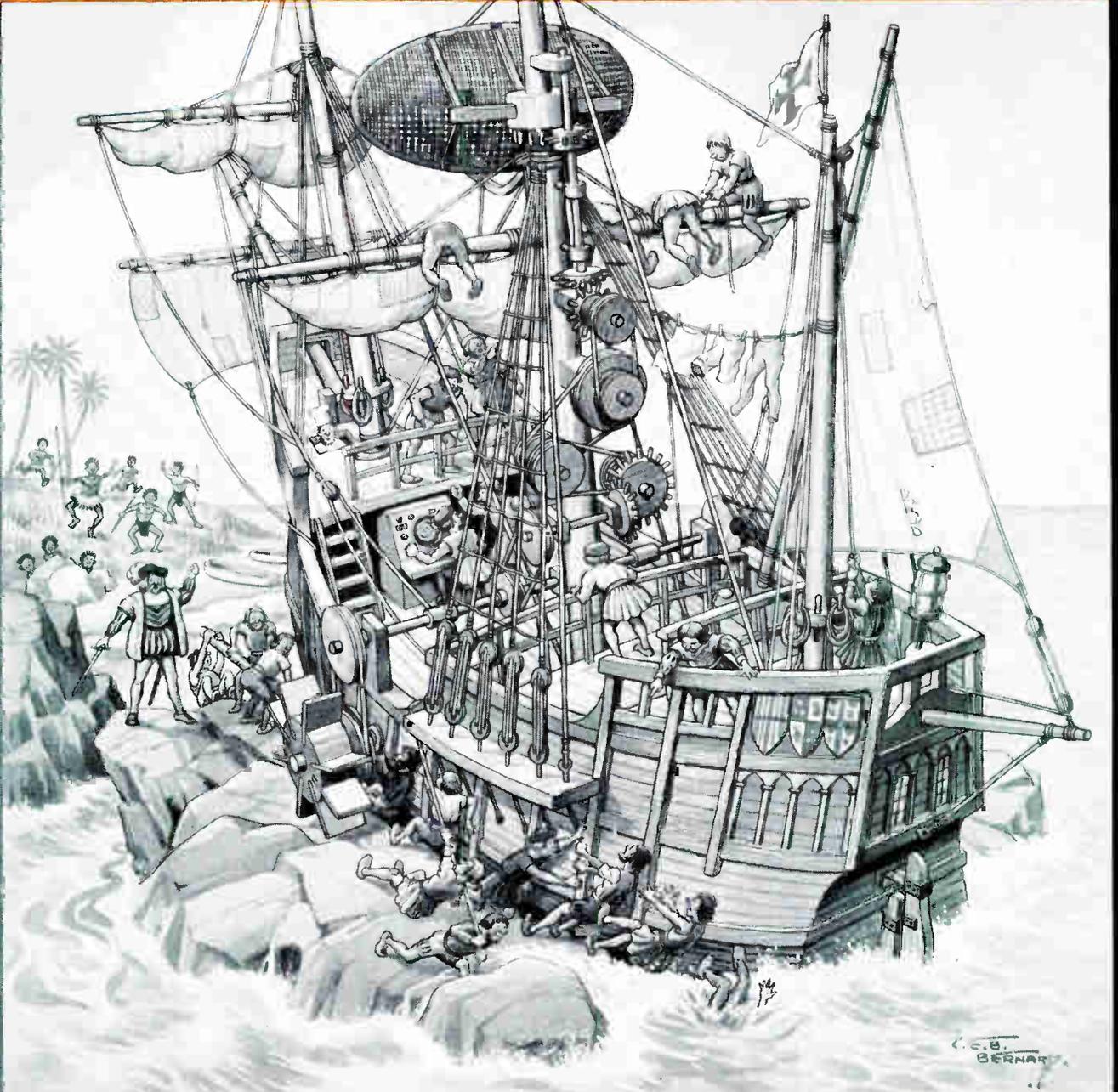
Aboard the Santa Maria, however, "the thing with no name" behaved in a most startling manner. No matter which way the antenna was pointed, the scope, like a rear view mirror, showed only where the ship had been — not where it was going. This phenomenon was most unnerving to all hands, since it necessitated the ship's going backwards much of the time . . . a condition

that gave rise, among other things, to a peculiar kind of mariner's nausea that came to be known as "throwing down".

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