

JUNE 27, 1958

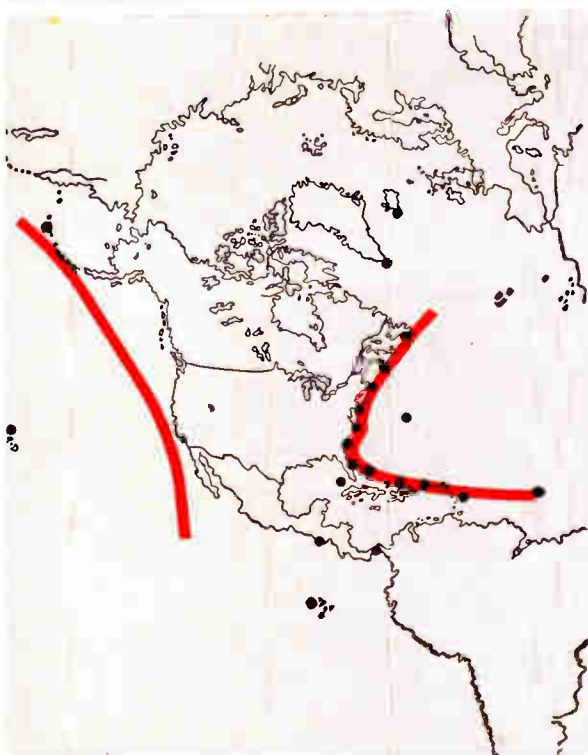
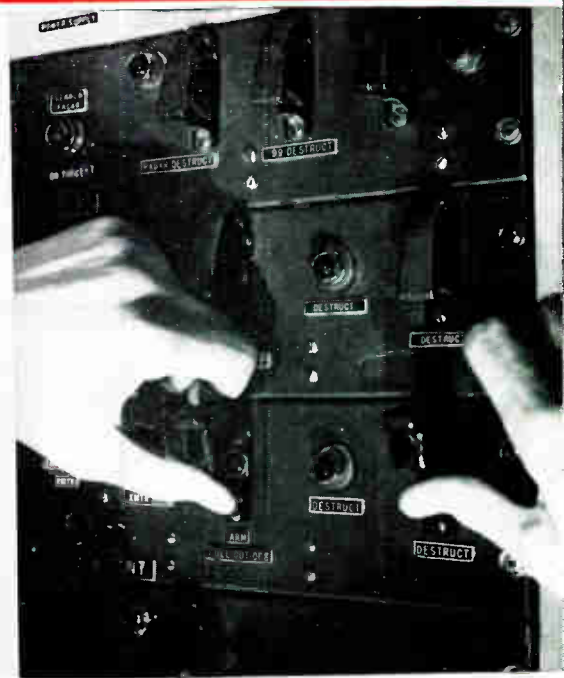
electronics

business edition

A MCGRAW-HILL PUBLICATION • VOL. 31, NO. 26 • PRICE FIFTY CENTS

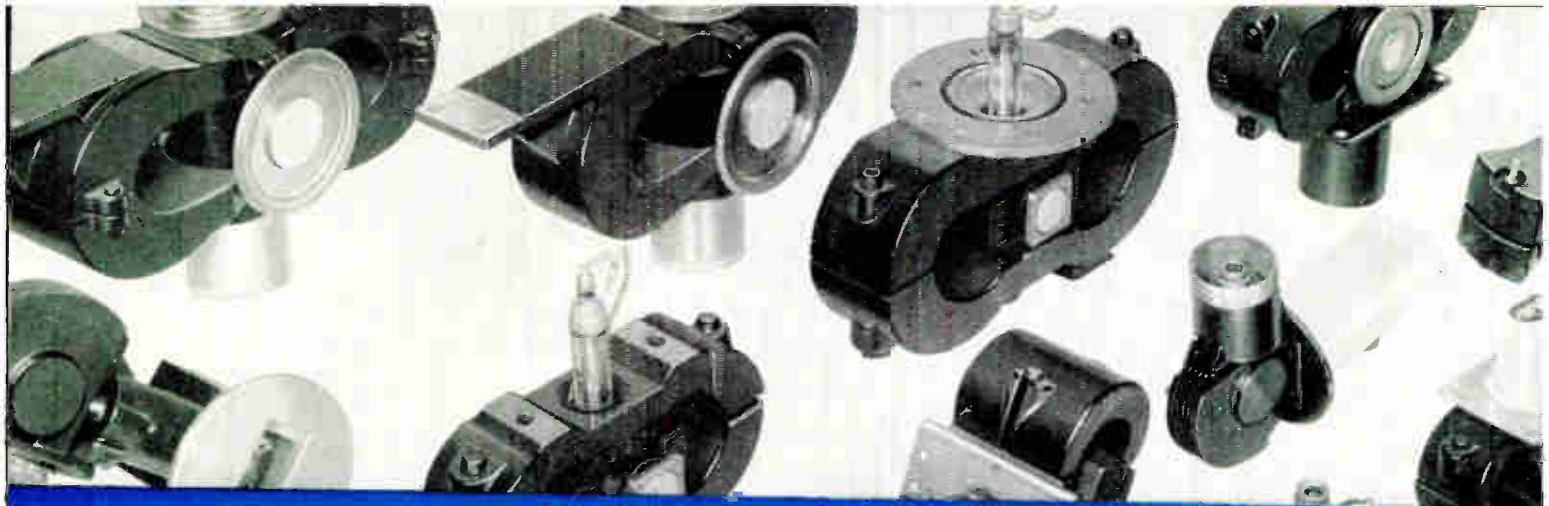
Missiles Tighten Telemetry Specs

New high-performance missiles require updating telemetering equipment p 13

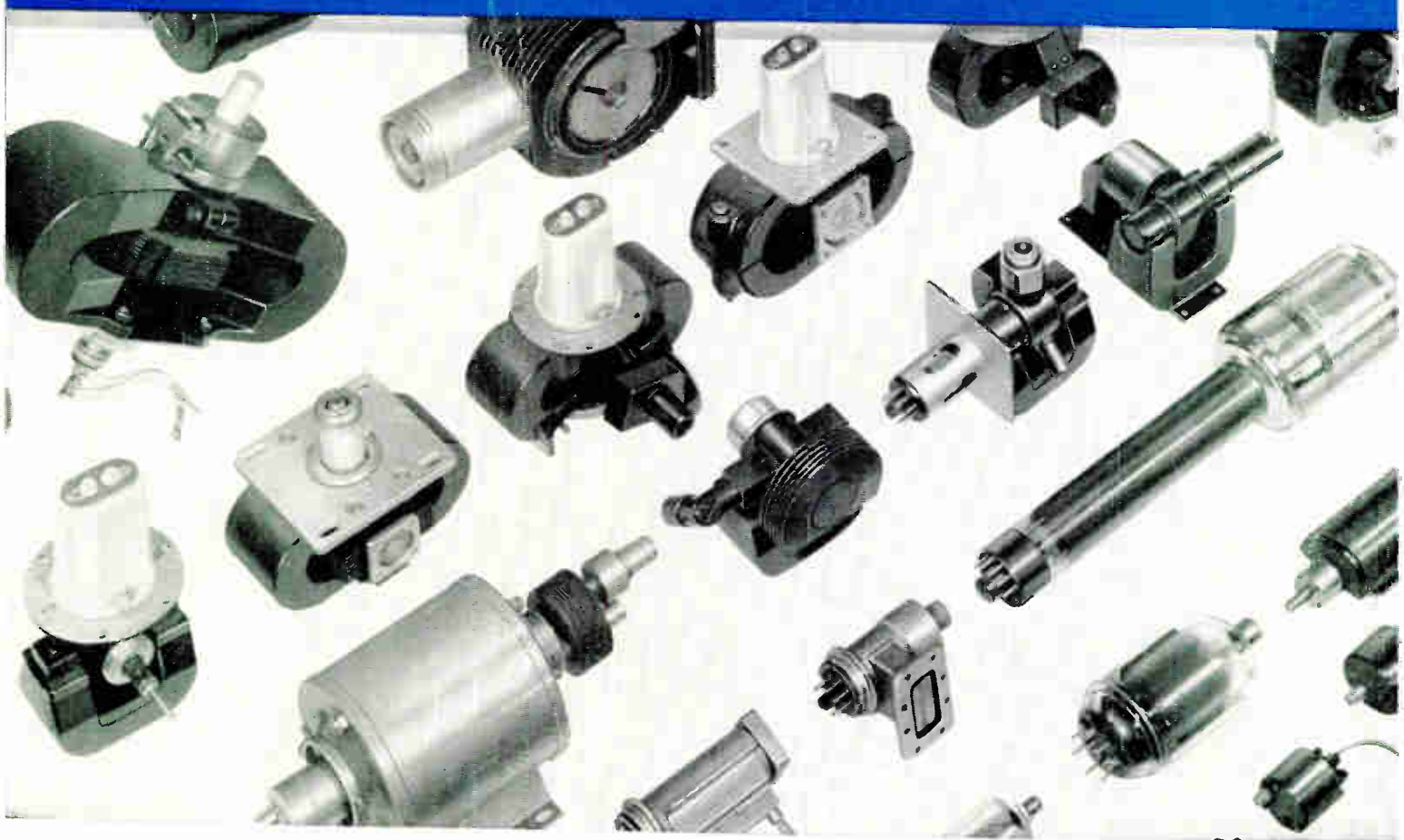


Sonar Gives Navy Edge in Sub Race

"Caesar" fixed stations plus shipborne gear tell Navy all that happens underwater . p 15



Raytheon — World's Largest Manufacturer of Magnetrons and Klystrons



FULL LINE DEPTH

Magnetrons from 1 to 5,000,000 Watts — Klystrons from 600 to 60,000 Mc — Backward Wave Oscillators from 1,000 to 15,000 Mc. Plus, a broad line of special tubes including storage tubes, rectifiers, square law and traveling wave tubes. Write for complete data booklet on the most complete line in the industry.

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

Microwave and Power Tube Operations, Section PT-36, Waltham 54, Mass.



Regional Sales Offices: 9501 W. Grand Avenue, Franklin Park, Illinois; 5236 Santa Monica Blvd., Los Angeles 29, California

Shoptalk . . .

PROJECT CAESAR. First line of defense against the powerful Soviet submarine fleet is sonar, carried by both killer subs and surface subhunters. Sonar advances have been so sweeping in recent years that a couple of years ago Navy found it necessary to screw the lid tight on news about sound ranging.

Now information is beginning to leak out. Eastern half of the Caesar network (cover) of submarine-detecting sonar bases is in; the western curtain is being lowered now. More and more heavily, the Navy is relying on sonar in both its nuclear and diesel-fueled subs.

To get an idea of the extent of Navy's interest in sound-ranging, Associate Editor Leary called on the Underwater Sound Laboratory, the Bureau of Ships, the Office of Naval Research, talked also with manufacturers and design engineers. His story begins on p 15.

LIVE . . . FROM THE MOON. To get a tv picture back to earth from the far side of the moon would require a power source in a moon-orbiting rocket of about 208,000 watts, using present state-of-the-art equipment.

Rockets, missiles, earth-orbiting satellites and fixed-position satellites for tv relay stations have all necessitated a rewrite in military telemetry specs. An entirely new approach may eventually be the answer.

Constant-level weather balloons that move across wide areas can not be utilized until telemetry equipment is improved. Surveillance drones are limited in range, not by fuel but by telemetry range.

Present capabilities of existing telemetering hardware are examined alongside present and future military needs in Associate Editor Mason's article that begins on p 13.

THIS STEREO BUSINESS. The breakthrough in stereophonic sound has come to home entertainment. People in the audio business credit this to development of compatible cartridge/stylus systems that will protect existing record collections from obsolescence.

Number of record manufacturers going stereo is estimated currently to be about 40 percent with predictions that the next two years may see 100 percent. A big thing in stereo tape seems to be the cartridge concept which provides taped selections in sealed packs that plug into the tape recorder. Special recorders are needed to use the cartridges.

Manufacturers say that stereo will be a big boost for the home-entertainment equipment industry. Some predictors say that f-m broadcasters may soon provide stereo programs on a regular basis. Associate Editor Emma's roundup of the stereo business appears on p 17.

Coming In our July 4 Issue . . .

Coming In our July 4 Issue . . .

● **Transducers.** Missile, rocket and satellite engineers can now measure nonelectrical quantities that only yesterday were unknowns. These measurements, of course, require the precise use of tiny mechanical transducers. Since most electronics engineers and physicists do not design transducers, they must carefully select the proper ones for their needs from among hundreds of similarly performing devices.

In an effort to aid engineers in making their selection, Associate Editor Ron Jurgen has prepared a special report on transducers. With it engineers can acquaint themselves with the many types of available transducers, find why they might use one kind and not another, and find which are most suitable for given applications. Jurgen reports that the use of new materials in transducer construction holds much promise.

To keep our readers well informed in all phases of their industry, ELECTRONICS' editors periodically prepare such comprehensive special reports on important topics not adequately covered elsewhere. Complimentary letters from readers in our recent Comment columns attest to the unique and fine quality of Associate Editor Micheal Tomaino's report on environmental testing in an earlier issue. We're confident you'll score Jurgen's report on transducers as another ELECTRONICS' first.

● **Rocket Telemetering Transmitter.** We've been fortunate to present the technical and circuit details of the U.S. satellite program written by the men who actually designed and worked with the equipment. In another of these articles, N. Raskhodoff of the U.S. Naval Research Labs describes a telemetering transmitter for a Vanguard rocket.

Engine performance data for the Vanguard rocket are relayed to earth with the transmitter. Voltage variations that represent performance are picked up with a commutator and converted to pulse width modulated signals by a keyer. The duration of pulse width shifts frequency of crystal-controlled oscillator producing pwm/f-m signal which is frequency multiplied, amplified and fed to a telemetering antenna. The power supply is completely transistorized.

● **Missile Checkout.** Designed for testing the Bomarc missile, a functional checkout set programs a series of 140 test steps during which over 350 individual measurements are made. Authors G. A. Harter and F. A. Buuck point out that the first 41 steps are for self checking; the remaining 99 are for missile checkout. The entire sequence takes only 20 minutes, and a go-no-go decision is automatically made for each step. Work was done at Farnsworth Electronics.

H. W. MATEER, *Publisher*

W. W. MacDONALD, *Editor*

Managing Editor, John M. Carroll.

Feature Editor, John Markus.

Associate Editors: John M. Kinn, Jr., Frank Leary, Michael F. Tomaino, Howard K. Janis, Sylvester P. Carter, Haig A. Manoogian, Roland J. Charest, William P. O'Brien, George Sideris, Edward DeJongh, John F. Mason, Barry Miller, William E. Bushor, Ronald K. Jurgen, Thomas Emma, Patrick J. Lahey, Samuel Weber.

Pacific Coast Editor (Los Angeles) Harold C. Hood; *Midwestern Editor* (Chicago) Harold Harris; *New England Editor* (Boston) Thomas Maguire

Art Director, Harry Phillips, Roy Thompsen.

Production Editor, John C. Wright, Jr., Bernice Duffy, Jean L. Motin.

Editorial Assistants: Gloria J. Filippone, Arlene Schilp, Noreen Hennessy, Potricio Londers, Catherine McDermott.

JAMES GIRDWOOD, *Advertising Sales Manager*. R. S. Quint, *Assistant Advertising Sales Manager and Buyer's Guide Manager*. Fred Stewart, *Promotion Manager*. Frank H. Ward, *Business Manager*. George E. Pomeroy, *Classified Manager*. Jean Heiges, *Research*.

New York: Donald H. Miller, Henry M. Shaw, Martin J. Gallay. *Boston*: Wm. S. Hodgkinson. *Philadelphia*: James T. Hauptli. *Chicago*: Bruce Winner. *Cleveland*: Warren H. Gardner. *San Francisco*: T. H. Carmody, R. C. Alcorn. *Los Angeles*: Carl W. Dysinger, D. A. McMillan. *Denver*: J. Patten. *Atlanta*: M. Miller. *Dallas*: Gordon L. Jones. *London*: Herbert Logler. *Frankfurt*: Michael R. Zeynel.

Issue at a Glance

- Funds Eye Military.** Investment groups pay increasing attention to rising military spending. Interest in electronics industry grows. p 5
- Shares and Prices.** Hi-fi, phono and equipment manufacturers. p 5
- Mergers, Acquisitions and Finance.** p 6
- Figures of the Week.** p 6
- Washington Outlook** p 8
- Executives in the News.** Ryan of Cutler-Hammer. p 10
- Comment** p 10
- Missiles Challenge Telemetry.** As test vehicles probe outer space, as operational missiles and manned aircraft become more complex, updating of telemetry equipment is now a must. p 13
- Sonar: Key to Sub War.** Undersea warfare is today the U.S. Navy's most important area of defense. Here's how fixed stations and mobile gear fit into the plan. p 15
- Production and Sales.** Hi-fi retail sales head for \$-billion level. p 16
- Stereo Boosts Hi-Fi Market.** Audio-business expects sales increase as stereophonic disks, tapes and players head for dealers' counters. Both package units and building-block components loom as major market item. . . p 17
- Tv in Atomic Power Plant.** After big doors close, reactor operators use tv cameras to monitor instrument in reactor enclosure. p 17

DIGEST CONTINUED ON NEXT PAGE

Published weekly, with alternating engineering and business editions, and with a BUYERS' GUIDE issue in mid-June, by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948) Founder.

Executive, Editorial, Circulation and Advertising Offices: McGraw-Hill Building, 330 W. 42 St., New York 36, N. Y. Longacre 4-3000.

Publication Office 99-129 North Broadway, Albany 1, N. Y. See panel below for directions regarding subscription or change of address. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice-President; L. Keith Goodrich, Vice-President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Joseph H. Allen, Vice-President and Director of Advertising Sales; A. R. Venezian, Vice-President and Circulation Coordinator.

Single copies \$1.00 for Engineering Edition and 50¢ for Business Edition in United States and possessions, and Canada; \$2.00 and \$1.00 for all other foreign countries. Buyers' Guide \$3.00. Subscription rates—United States and possessions, \$6.00 a year; \$9.00 for two years; \$12.00 for three years. Canada, \$10.00 a year; \$16 for two years; \$20.00 for three years. All other countries \$20.00 a year; \$30.00 for two years; \$40.00 for three years. Second class mail privileges authorized at Albany, N. Y. Printed in U.S.A. Copyright 1958 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Title registered in U. S. Patent Office. BRANCH OFFICES: 520 North Michigan Avenue, Chicago 11; 68 Post Street, San Francisco 4; McGraw-Hill House, London E. C. 4; 15, Landgrat-Wilhelm, Frankfurt/Main; National Press Bldg., Washington 4, D. C.; Six Penn Center Plaza, Philadelphia 3; 1111 Henry W. Oliver Bldg., Pittsburgh 22; 55 Public Square, Cleveland 13; 856 Penobscot Bldg., Detroit 26; 3615 Olive St., St. Louis 8; 350 Park Square Bldg., Boston 16; 1321 Rhodes Haverly Bldg., Atlanta 3; 1125 West Sixth St., Los Angeles 17; 1740 Broadway, Denver 2. ELECTRONICS is indexed regularly in The Engineering Index.

Components and Materials.....p 18
Circuits Micro-Sized Magnesium Plate is Electroless
Model Phosphor Samples Available
Engineering Reportp 19
Self-Rectifying A-C Generator for Cars? Technical Digest
Ignition Uses Transistors Meetings Ahead
New System Guides Missiles. New equipment reads maps automatically
to guide low-flying Mace missile.....p 21
Military Electronicsp 21
Contracts Awardedp 21
New Productsp 24
Literature of the Week.....p 27
Foreign Aid Electronic Up. More electronic items appear in ICA allocations,
already total an estimated \$36 million.....p 28
Developments Abroadp 28
Exports and Imports.....p 28
Plants and People.....p 30
News of Reps.....p 32
Index to Advertisers.....p 32

Subscriptions: Address correspondence to: Fulfillment Manager, Electronics, 330 W. 42nd St., New York 36, N. Y. Allow one month for changes of address, stating old as well as new address. Subscriptions are solicited only from persons engaged in theory, research, design, production, management, maintenance and use of electronics and industrial control components, parts and products. Position and company connection must be indicated on subscription orders.

Postmaster: please send form 3579 to Electronics, 330 W. 42nd St., New York 36, N. Y.



Member ABP and ABC

NORTH RVF ROTARY SWITCH GIVES YOU

GREATER APPLICATION FLEXIBILITY

30 INPUTS AND 30 OUTPUTS PER LEVEL give you a flexibility in circuit approach unmatched by any other stepping switch! For application to programming, sequence control, routing, impulse counting, tallying, or as a memory device, the completely dust enclosed North RVF Switch is the most versatile, flexible, reliable Stepping Switch on the market!

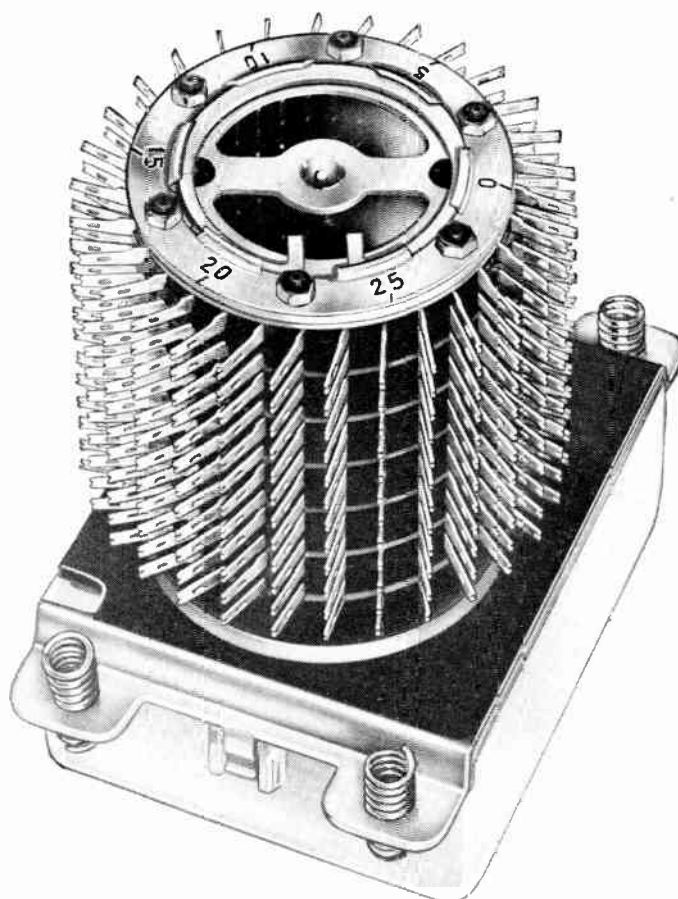
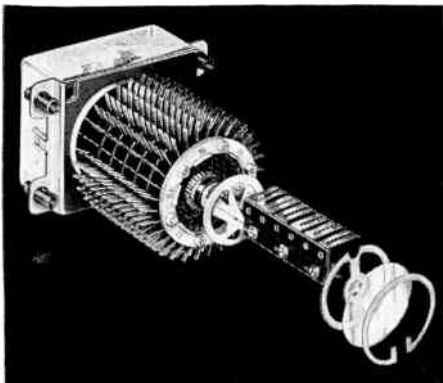
INDUSTRIAL DIVISION

NORTH ELECTRIC COMPANY

846 SOUTH MARKET STREET • GALION, OHIO



Available in Canada through Ericsson Telephone Sales of Canada, Ltd., Montreal 8, P. Q.



For circuit applications requiring up to 30 points per level, the switch is provided in 2, 4 or 6 levels with single rotor. For circuit applications requiring up to 12 levels with 15 points per level, the switch is furnished with a dual rotor. Bank contact ratings: 1 amp at rest; .2 amp. resistive when stepping. Off normal contact ratings .4 amp. resistive. Switch may be driven self-stepping or externally. Gold plated bank contacts and wipers are available for low level switching. Available with 12, 24, 48, 110 V. D.C. coils. Built-in spark suppression on 24 and 48 volt switches. Mounting dimensions: 1.968" x 3.661" O.C. Overall height: 4 $\frac{3}{4}$ " height above mounting, 3 $\frac{1}{2}$ " (max. dimensions for 6 level switch). Weight: 1.32 lbs.



New! Low cost! Fresh design approach!

Direct-Reading FREQUENCY METERS 8.2 to 40.0 KMC

A completely new engineering approach enables the new *hp*-532A series Frequency Meters to provide you with low cost, direct-reading convenience and dependability not previously available in a microwave frequency meter.

These new general-purpose test instruments avoid the out-moded and error-prone sliding contact design. Instead, the 532A series employs a high Q resonant cavity (TE₁₁₁ mode) tuned by a choke plunger. The cavity is mounted on a special wave-guide section designed so that a very small amount of power is reflected at resonance, while the major portion is transmitted. Reaction at resonance is virtually constant full range; there are no spurious modes or resonances; resonance is indicated by a dip of approximately 1.5 db in output. Scale divisions 5 MC apart insure a high order of resolution. Tuning is by a precision lead screw springloaded to eliminate backlash. Four separate models covering the X, P, K and R bands (see table) are offered.

HEWLETT-PACKARD COMPANY

4871A PAGE MILL ROAD • PALO ALTO, CALIFORNIA, U.S.A.
CABLE "HEWPACK" • DAVENPORT 5-4451
FIELD REPRESENTATIVES IN ALL PRINCIPAL AREAS

SPECIFICATIONS

	X532A	P532A	K532A	R532A
Accuracy:	0.08%	0.1%	0.1%	0.2%
Frequency range, KMC:	8.2 to 12.4	12.4 to 18.0	18.0 to 26.5	26.5 to 40.0
Waveguide size, inches:	1" x 1/2"	0.702" x 0.391"	0.5" x 0.25"	0.36" x 0.22"
Resetability:	0.01%	0.01%	0.01%	0.01%
SWR at resonance (approximate):	1.3:1	1.3:1	1.3:1	1.3:1
Price:	\$150.00	\$210.00	\$230.00	\$250.00

Data subject to change without notice. Prices f.o.b. factory



offers complete coverage in microwave measuring equipment

Funds Eye Military

Mutual funds pay increasing attention to rising military spending. Interest in electronics grows

INVESTMENT POLICY MAKERS of electronics-oriented mutual funds are increasingly concerned with currently bright prospects for military electronics.

Television Electronics Fund, for instance, states in its recently issued semiannual report that investment changes over the past six months reflect continuing emphasis on firms expected to benefit from higher military spending in 1958 and 1959. The fund, with assets of \$155.4 million, estimates that electronics expenditures by the military will reach \$4 billion in the 1959 fiscal year, compared with about \$3.6 billion in fiscal 1958.

Principal electronics common stock purchases by this fund between March and May included: American Bosch Arma, AT&T, Douglas Aircraft, General Dynamics, General Precision, Robertshaw-Fulton, Sprague Electric, American Electronics and Foxboro.

Managers of the \$15-million Keystone S-4 Fund, one of the Keystone Custodian Funds, are also happy about rising military electronics spending. In anticipation of higher military outlays, Keystone in recent months has upped its investments in sev-

eral military-based firms and added several others to its portfolio. The fund's electronics specialists cite larger holdings in Ampex, Litton Industries and Raytheon; and new investments in Statham Instruments, Electronic Associates and Varian Associates.

Attitude of managers of National Growth Series is that heavy military electronics spending is here to stay. This fund is part of the National Securities group and has assets of \$33 million, about 30 percent invested in electronics firms.

Because of steadily growing importance of military spending to the electronics industry, National Growth finds itself adding more firms with a large proportion of military business to its investment list. Several years ago it considered investments in firms of this type risky.

Nevertheless, the fund still looks closely at the nature of military business of firms in which it invests. It particularly looks for evidence of what it terms balanced military business.

A balanced firm, it says, has both R&D and production contracts and a fair share of its business in advanced fields.

Recent portfolio purchases cited by fund's leaders include Hewlett Packard, Machlett Labs, Raytheon, Texas Instruments and RCA.

Fund leaders strongly endorsed electronic industry growth prospects. Several funds significantly increased the percentage of electronic to total investments in the past year.

SHARES and PRICES

RECENT DEVELOPMENTS in stereophonic recording and playback equipment give hi-fi listeners re-

production with depth as well as range. Such developments are adding to growth of already fast-growing hi-fi sales (see p 17). As a result, interest has been generated

in securities of hi-fi manufacturers and securities of large, diversified firms whose high fidelity business is an important part of overall sales.

Typical Hi-Fi Phono & Equipment Manufacturers	Recent Price	Indicated Dividend Rate	Percent Yield	Earned Per Common Share			Traded	1958 Price Range
				1958	Period	1957		
Admiral	9¾	.....	...	d-0.04	(3 mos)	0.24	NYSE	7 - 10½
Dictograph Products	4¼	.....	...	d-1.49	(year) ³	d-0.13	OTC	3¾ - 4¼
DuMont Labs	4¼	.....	...	d-0.41	(3 mos)	d-0.16	ASE	3 - 5½
Emerson Radio	6¾	.....	...	0.15	(3 mos) ⁴	0.10	NYSE	4½ - 7
Hoffman Electronics	27¾	1.00	3.6	0.59	(3 mos)	0.70	NYSE	21 - 28¾
F. L. Jacobs (Symphonic El.)	6¾	.....	...	0.34	(6 mos) ⁵	d-0.97	NYSE	4¾ - 7½
Magnavox	35¾	1.50 ²	4.2	3.34	(9 mos) ⁶	3.53	NYSE	30¼ - 37
Packard Bell	11½ ¹	0.50	4.4	0.60	(6 mos) ⁶	0.59	OTC	10½ - 11¾
RCA	34¾	1.50	4.3	0.59	(3 mos)	0.87	NYSE	30¼ - 35
Siegler (Olympic)	13½	0.80	5.9	0.64	(9 mos) ⁶	1.00	NYSE	13¼ - 16½
Trav-Ler Radio	1¾	.....	...	d-0.14	(6 mos) ⁷	d-0.06	MWSE	1 - 1½
Webcor	9¾	0.25	2.5	0.23	(3 mos)	0.54	MWSE	9½ - 14¼
Zenith	79	.....	...	2.07	(3 mos)	1.175	NYSE	67½ - 80½

d—deficit ¹ bid ² plus stock ³ ending Dec. 31 ⁴ ending Feb. 1 ⁵ ending Jan. 31
⁶ ending Mar. 31 ⁷ ending Oct. 31 ⁸ adjusted for 1958 stock split

MERGERS, ACQUISITIONS and FINANCE

• **Cohu Electronics**, diversified manufacturer in San Diego, Calif., acquires **Massa Labs**, Boston, Mass., for \$1.5 million in cash and stock. Massa is now being operated as a Cohu division under former president Frank Massa, now a Cohu vice-president. The Boston firm makes underwater sound equipment, sonar devices and ultrasonic gear for military and industrial customers. Anticipated sales of \$2 million in 1958 from the new division are expected to increase Cohu's sales 20 percent.

• **Texas Instruments** withdraws from the panel instrument business and sells its manufacturing facilities and product line to **Sun Electric** of Chicago for an undisclosed sum. TI felt it could use the space and energies required for panel instrument manufacture to better advantage in developing other phases of its electronic business. Under terms of the transaction, Sun Electric will provide service to all

former TI panel instrument customers. Sun Electric is a manufacturer of indicating instruments. Addition of TI's production facilities and product line enables SE to offer a complete and diversified engineering-production facility to meet panel requirements made by customers.

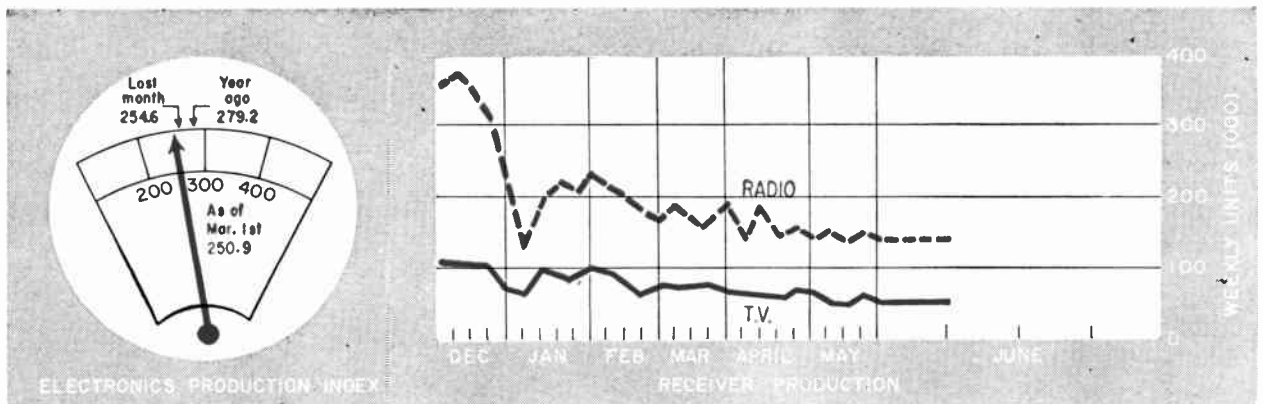
• **Dayton Aviation Radio & Equipment** of Dayton, Ohio, plans to issue 500,000 shares of common stock at \$1 per share. The firm designs and manufactures communication and navigational equipment and related components, and repairs and modifies electronic equipment for USAF. Plan for use of proceeds includes: \$100,000 for inventories needed for new commercial products; \$126,000 cash reserve to facilitate the obtaining and performance of government contracts; \$44,000 for additional equipment; \$55,000 for a new transformer manufacturing department; \$35,000 for additional test equipment

and \$40,000 for physical facilities at its Troy plant. McDonald & Holman & Co. of New York will underwrite the issue on a "best efforts" basis.

Underwriter will receive a 12 percent commission and option to purchase 90,000 shares at \$1 for five years.

• **Smith-Corona** and **Marchant Calculators** receive consent of Metropolitan Life and Prudential Insurance to their proposed merger, required under terms of loan agreements. When merger becomes effective, following stockholder approval, interest rate on Met loan to Smith-Corona will be increased from 4.30 to 4.75 percent; two Pru loans to Marchant will be replaced by a \$6½ million, 5.75 percent unsecured loan.

• **Elsin Electronics**, Brooklyn, N. Y., issues 265,266 shares of common stock at \$1.12½ per share (ELECTRONICS, p 16, June 6).



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	June 6, '58	May 30, '58	June 7, '57
Television sets, total	69,290	64,957	90,655
Radio sets, total	156,899	147,506	237,106
Auto sets	48,892	43,099	96,523

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	June 11, '58	June 4, '58	June 12, '57
Radio-tv & electronics	47.54	47.79	52.19
Radio broadcasters	62.08	63.52	67.04

FIGURES OF THE YEAR

	1958	Totals for first three months	
		1957	Percent Change
Receiving tube sales	84,990,000	125,041,000	-32.0
Transistor production	9,038,798	5,125,000	+76.4
Cathode-ray tube sales	1,812,825	2,322,480	-21.9
Television set production	1,221,299	1,474,729	-17.2
Radio set production	2,834,759	3,959,367	-28.4

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

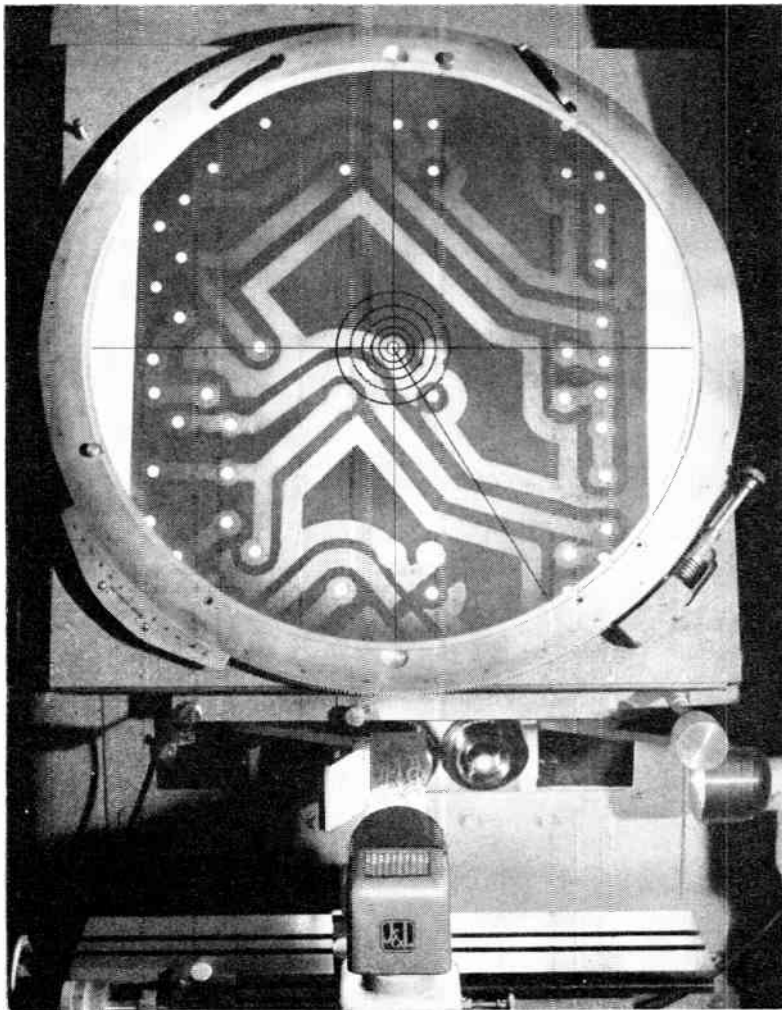
(Source: Bur. Labor Statistics)	Mar. '58	Feb. '58	Mar. '57
Prod. workers, comm. equip.	343,500	350,800	393,300
Av. wkly. earnings, comm.	\$80.16	\$79.95	\$80.19
Av. wkly. earnings, radio	\$79.39	\$78.98	\$76.80
Av. wkly. hours, comm.	39.1	39.0	40.5
Av. wkly. hours, radio	39.3	39.1	40.0

TRANSISTOR SALES

(Source: EIA)	Mar. '58	Feb. '58	Mar. '57
Unit sales	2,976,843	3,106,708	1,904,000
Value	\$6,795,427	\$6,806,562	\$5,321,000

TUBE SALES

(Source: EIA)	Mar. '58	Feb. '58	Mar. '57
Receiving tubes, units	28,524,000	29,661,000	43,010,000
Receiving tubes, value	\$25,697,000	\$25,650,000	\$37,007,000
Picture tubes, units	634,779	556,136	833,257
Picture tubes, value	\$12,643,404	\$11,210,527	\$14,850,847



J & L Comparators are ideally suited for inspection of printed circuits — because they provide coordinate measuring facilities corresponding to the method by which circuits are dimensioned.

In mating the printed circuit with other components, it is necessary that the terminal points be located accurately. Also — to assure a uniform flow of current through the connectors, the drilled holes at the terminals must be centralized within the circuitry.

A Comparator, equipped with a surface illuminator, projects a reflected image to a chart having radii and lines. By comparing the image of the drilled holes to the radii on the chart the size and location of the holes may be determined.

True precision like this never comes cheap!

Of all the possible areas in which to economize, quality inspection is the least promising. Why?

Simply because the kind of intensive research, painstaking engineering and top-quality manufacture it takes to produce precision inspection equipment like the J&L Comparator just CAN'T be offered at bargain-basement prices. On the other hand, cheap equipment doesn't belong in the same league with a J&L Comparator when it comes to accuracy, speed, versatility and all-round dependability. When it comes to true precision of inspection, a cheap comparator can prove to be *terribly* expensive.

J&L Comparators come in 11 models, both bench and pedestal type.

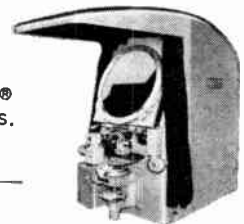
— — — — — "The originator of machine tool standards in optical inspection" — — — — —

JONES & LAMSON



JONES & LAMSON MACHINE COMPANY, Dept. 710, 539 Clinton Street, Springfield, Vt., U.S.A.

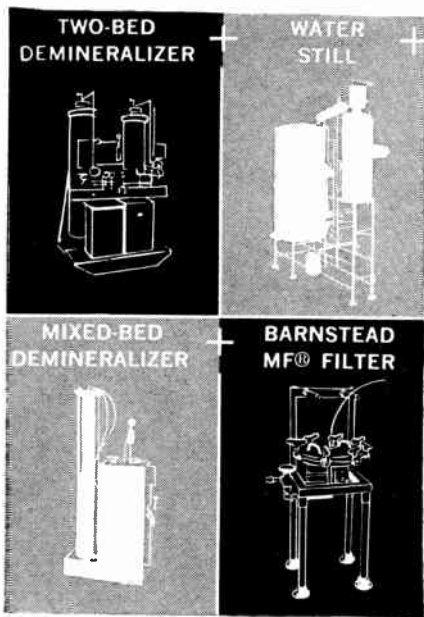
Please send me Comparator Catalog 5700, which describes the complete line of J&L Optical Comparators.



Model FC-30

name _____ title _____ street _____
 company _____ city _____ zone _____ state _____

**FOR ULTRA PURE WATER
IN ELECTRONICS WORK
BARNSTEAD MAKES BOTH
WATER STILLS AND
WATER DEMINERALIZERS**

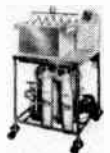


**THIS BARNSTEAD EQUIPMENT
EMPLOYING DEMINERALIZA-
TION, DISTILLATION AND SUB-
MICRON FILTRATION PRODUCES
PUREST WATER—HON ABSOLUTE
IN PRODUCTION QUANTITIES**

The above combination of Water Demineralizers, Water Still, and Barnstead MF Filter, operated in series, will produce 15,000,000 OHM Water in production quantities . . . free of bacteria, organics and submicroscopic particles. Write for Catalog 127, and Bulletin 141.

NEW: TRANSISTOR WASHER

This apparatus washes and rinses transistors and other small electrical parts in hot distilled, demineralized water. New repurification process conserves thousands of gallons of demineralized water each day.



WRITE FOR BULLETIN #146



BOSTON Jamaica 4-3100	NEW YORK Kingsbridge 8-1557	CLEVELAND ACademy 6-6622
CHICAGO MULberry 5-8180	PHILADELPHIA LOcust 8-1796	LOS ANGELES RYan 1-9373
JOHNSON CITY 3113	SAN FRANCISCO TEmplebar 2-5391	CHATTANOOGA 6-5863

84 Lanesville Terrace, Boston 31, Mass.

FIRST IN PURE WATER SINCE 1878

CIRCLE 4 READERS SERVICE CARD

WASHINGTON OUTLOOK

INCREASED use of electronic aids will be relied upon to make the nation's airways safer. The move in Washington to create a new Federal Aviation Agency will stimulate swifter modernization to air controls.

Pres. Eisenhower wants Congress to vote legislation this year under which the Federal Aviation Agency will take over all functions of the Civil Aeronautics Administration and the Airways Modernization Board, as well as the rule-making functions of the Civil Aeronautics Board. It would exercise air traffic control over both civil and military aircraft within the U. S. The CAA is one of the larger users of electronics equipment among nonmilitary government agencies.

Since key Democrats have been pushing a bill of their own to accomplish the same thing, there's a chance the legislation will be enacted before Congress goes home in August. If not, it will be passed next year.

The proposed setup would have two big advantages: as an independent agency, FAA could make its budget requests directly to the Budget Bureau, or even Congress, without being pruned first by Commerce Dept. budget officers. Also, by bringing military and civil representatives together under one roof, the kind of bickering which surrounded the adoption of Tacan or VOR-DME distance-measuring equipment should be avoided.

The FAA might be able to accelerate CAA's billion-dollar five-year program for installation of new radar, navigation and communications equipment. And it would be in a better position to push the development of new automatic data display systems built around electronic computers.

There will be a period of confusion as the big reorganization job is carried out. But this should be temporary.

- Congress has served notice on the President that it will give him most, but not all of the power he wants to reorganize the military. The legislators are standing firm in spite of an all out push by the White House for unbridled authority to rearrange the Pentagon. The House of Representatives recently approved 16 of the 19 points the administration asked for.

The three points the House wouldn't okay are: power to strip the individual services of the right to go to Congress on their own initiative; more subordination of each service to the Secy. of Defense; and presidential power to alter traditional service functions without congressional approval.

One of the most important Pentagon reorganization measures approved by the House calls for the establishment of a new Director of Research & Engineering that would direct all Department of Defense R&D with full power to write contracts. It would be the most powerful research office yet created in the Pentagon. And a key buyer of electronic goods and services. The new office would override the Advanced Research Projects Agency in authority.

The Senate is now tackling the reorganization bill. But, indications are that it won't bend to White House pressure on the three controversial points either. Basically, the legislators just aren't willing to grant this much power over the military to the President.

Observers expect the Senate to approve a reorganization bill pretty much along the same lines as voted by the House.



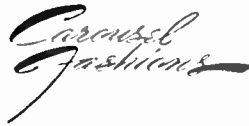
Glace Engineering Corporation



GALLAGHER COTTON MILLS



GENERAL NUCLEAR ENGINEERING CORPORATION



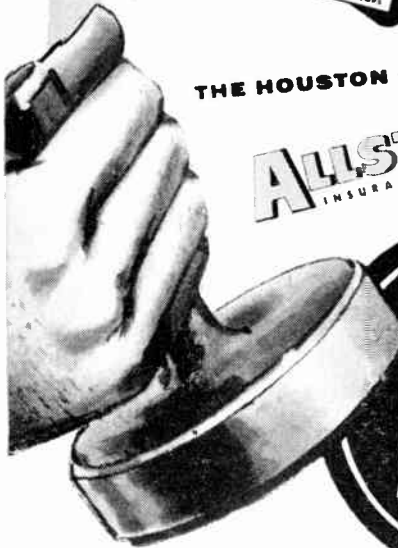
Metal Industries, Inc.



THE HOUSTON CORPORATION



"TAPECO"



MAKE YOUR MARK

in greater St. Petersburg

Where work and play are combined—profitably! This fast-growing electronics, nucleonics and mechanical engineering and research center of Florida invites you to join these major business firms who have located in this area. Available skilled workers, excellent schools, fine transportation make an ideal community in which to live, work and play where most people dream of retiring. Write on your letterhead today for informative literature.

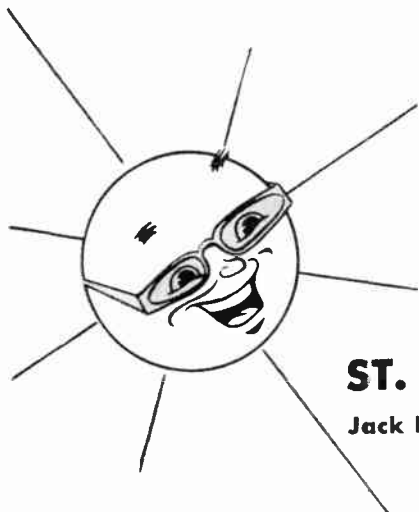
Note: Persons seeking positions with St. Petersburg industries, please write Florida State Employment Service, 1004 First Avenue North.

ST. PETERSBURG CHAMBER OF COMMERCE

Jack Bryan, Industrial Director

Dept. E

St. Petersburg, Florida



need high vacuum components?



The Stokes McLeod type High Vacuum Gage is the only McLeod type gage that combines absolute standards of accuracy and precision with convenience and rugged construction for practical laboratory or industrial service. Four models are available with ranges of .01-5000; .1-500; 1-5000 microns and .01-50 millimeters Hg.

STOKES makes a complete line of vacuum components . . . advance-designed and engineered to help make your vacuum systems more productive. Each unit reflects Stokes' unparalleled experience, pioneering leadership and wealth of basic vacuum technology.

The product list includes: Diffusion Pumps, Vapor Booster Pumps, Mechanical Pumps, Mechanical Booster Pumps, Vacuum Gages, and Valves.

Send for technical data on any or all . . . without obligation.

High Vacuum Division
F. J. STOKES CORP.
5562 Tabor Road, Phila. 20, Pa.

STOKES

CIRCLE 6 READERS SERVICE CARD

10

EXECUTIVES IN THE NEWS



Ryan: take a little time

NEW EXECUTIVE to the electronics industry is Philip Ryan, president of Cutler-Hammer, Inc., which recently acquired Airborne Instruments Laboratories. The merger made it possible for the 66-year-old controls company to branch into electronics without going through the agonies of building up its own division.

Ryan, the man behind the merger, is a quiet, deliberate Westerner, born 61 years ago in the heart of Montana's copper country. He's been working for C-H ever since he took his B.S. in mechanical engineering at Cornell in 1920. After moving up in the engineering department ("he's still a good engineer," comments an associate), he went briefly into purchasing, moved east in 1931 to manage the firm's New York works. In 1934, C-H brought him home as Milwaukee works manager, a post he held through the late depression years and World War II. At war's end he became vice president for manufacturing. Six years later he moved up to executive v-p, and on Jan. 1, 1956, he took over as president.

His 38-year career with Cutler-Hammer taught him that sturdy growth is a slow process: he's likely to point out that it's the "healthy roots of the past" that bear fruit for the future. Of his venture into electronics, he figures "it will take a little time" to fit AIL and his own organization together. With Ryan, "taking a little time" to do the thing right is a natural way to operate.

Meticulous in planning, he asks for outside help when he needs it, assembles all the facts, then moves swiftly. He looked at 100 electronics firms in shopping around, first thought AIL was too big, finally decided it wasn't and moved in.

Ryan for years plowed most of his time into his career, found the time to get married five years ago. The job and related professional activities still take a lot of the hours in his day, but he takes a quiet pleasure in shifting his center of interest these days from office to home.

COMMENT

Antisubmarine War

Recently I picked up some information that the government is

considering, or has a plan underway, for the installation of sonar devices to protect the entire coastline of the United States from submarine attack. They would consist of sonar equipment, powered

possibly by atomic fuel, and would be enclosed in some sort of capsule which could be submerged. Located under water, they would be spaced at regular intervals along the entire U.S. coastline.

... I wonder if ELECTRONICS has ... any material on the subject ...

NORM WIEBUSCH

CLEVELAND, O.

This project—on which the U.S. is cooperating with other NATO nations—kinda fascinated us too. It's discussed on p 15 of this issue.

A-m, f-m and clear channels

You report (FCC Actions, May 16, p 52) that "FCC proposes to open 12 a-m clear channels to additional unlimited-time stations. Comment must be filed by July 15."

There are already too many a-m stations. In this locality at least, they are cluttering up the air with programs of local (if any) interest, and obscuring the so-called clear-channel stations. Letters from your readers to the FCC might help this situation.

There are 100 f-m channels available, very few of which are in use in any locality. There are only five in use in the entire state of Arizona. Delaware has two, and even populous Michigan has only twenty of over 500 watts erp.

If all stations of 1 kw or less were changed to f-m, there would be better reception for all, and more places for would-be broadcasters.

E. M. HOSKINSON

TUCSON, ARIZ.

Of course, there might be one or two problems incident to such a drastic overhaul of spectrum policy ...

Antiklystron

Re your "Antiklystron Causes Stir" article (Apr. 25, p. 8), please check one:

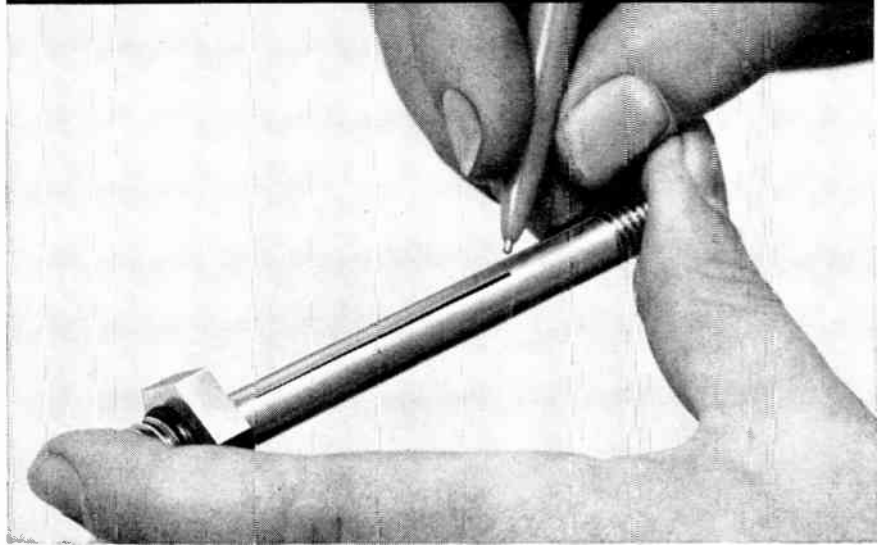
- (1) Tongue in check
- (2) Straight scoop.

L. E. SAMPLE

DENVER, COLO.

Straight scoop.

FREE ANALYSIS OF YOUR DIFFICULT MACHINING PROBLEMS



PAVES WAY FOR NEW FLOW METER DESIGN

PROBLEM: find a way to cut a precise, tapered orifice in a stainless steel tube, needed for a new type flow meter to measure accurately pressures up to 15,000 psi. **SOLUTION:** A Raytheon Ultrasonic Impact Grinding Analyst suggested impact grinding it with a tool .0005" under the final size of the orifice. **RESULT:** a precise, uniform tapered orifice held to .0002" tolerance, elimination of slow, costly milling and filing... and a COMPLETELY NEW flow meter design which does not require a bulky, expensive tapered tube. The meter is manufactured by the C-Mar Corp., Manasquan, N. J.

HOW YOU CAN BENEFIT

Whatever your difficult cutting, slicing, drilling or shaping problem—in hard or brittle material, your Raytheon Impact Grinding Analyst can help you solve it. For full details, fill out the enclosed coupon and send it in. No cost or obligation.



Excellence in Electronics

A-2100

**MAIL THIS
COUPON
FOR FREE
ANALYSIS
—without
cost or
obligation.**

TO RAYTHEON MANUFACTURING COMPANY
COMMERCIAL EQUIPMENT DIVISION
INDUSTRIAL PRODUCTS DEPT. EM6
WALTHAM 54, MASS.

- Please send me literature on Raytheon Impact Grinders.
 Please have a Raytheon Impact Grinding Analyst contact me.

My problem is: (describe metals or non-metals involved, tolerances, etc.)

NAME _____

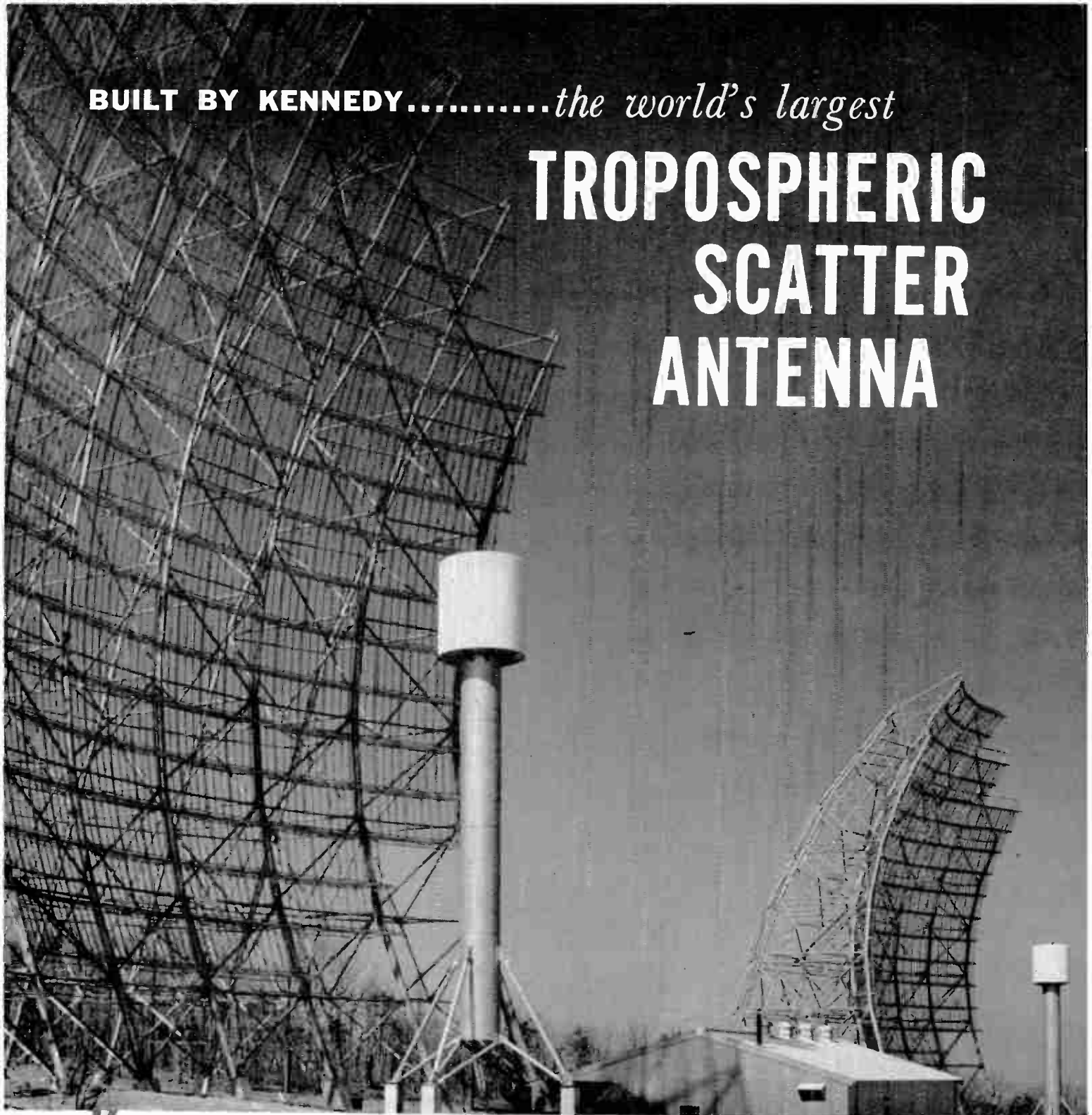
COMPANY _____

ADDRESS _____

CITY _____ STATE _____

BUILT BY KENNEDY.....*the world's largest*

TROPOSPHERIC SCATTER ANTENNA



KENNEDY's new 120 foot Trans-Horizon[®] Antenna represents today's most advanced concept in tropospheric scatter antenna systems.

This huge reflector is supported by a galvanized steel frame. The feed horn is mounted separately atop a 55-foot steel tower. Wave guides, as well as a ladder for all-weather adjusting, are accommodated within the tower. The "Trans-Horizon 120" can operate in winds up to 180 M.P.H. with 12 inches of ice. Also available: Moderate duty model for winds up to 110 M.P.H.

Here is still another instance of the ability of Kennedy engineers to design and build any antenna within the realm of creative engineering imagination. Can this unmatched know-how be put to work for you?

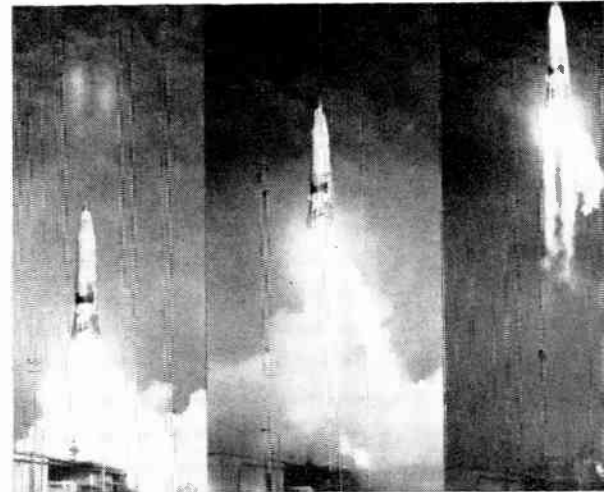
ANTENNA EQUIPMENT

D. S. KENNEDY & CO.

Route 3A, Cohasset, Mass. EVergreen 3-1200

*Down-To-Earth SOLUTIONS to
Out-Of-This-World PROBLEMS*

Tracking Antennas
Radio Telescopes
Radar Antennas
"Trans-Horizon" Antennas
Tropospheric Scatter
Ionospheric Scatter



Telemetry technician monitors pitch-angle meter at Cape Canaveral as an Atlas leaves pad

Missiles Challenge Telemetry

Information-seeking vehicles are now getting out farther into space, deeper into the sea, and in and over forbidding areas of the earth. This puts heavier demands on telemetry equipment. Meanwhile, the telemetry market is expected to double

FIRING a rocket to or around the moon has recently been seen as a possibility late this summer. But the project would be worthless if the vehicle could not send data back to earth. Likewise, a silent satellite orbiting around the earth can for all practical purposes—except for an occasional visual position report by telescope—be written off the records.

Even manned vehicles require telemetry. Their performance and complexity, have gone beyond man's ability to observe what's taking place. Receipt of information from test flights of North American's research rocket plane, X-15, will depend on telemetry.

Routine rocket and missile launchings record the reasons for their successes and failures by telemetering equipment. Conventional aircraft on routine test flights are monitored from nose to tail by transducers that measure and collect needed information. This, in turn, is converted to electrical signals, transmitted to a collection station on the ground, and

reconverted to a form suitable for monitoring or further analysis.

Military users of telemetry equipment are vast and still growing:

- Air Force's Air Research and Development Command buys millions of dollars of telemetering gear every year for eight of its nine major R&D centers: Missile Test Center at Cape Canaveral, Fla.; Air Development Center, Holloman AFB, N. M.; Cambridge Research Center, Mass.; Flight Test Center, Edwards AFB, Calif.; Wright Air Development Center, Ohio; Rome Air Development Center, N. Y.; Proving Grounds Center, Eglin Field, Fla.; and the Special Weapons Center, Kirtland AFB, N. M. USAF's Air Weather Service Command, Scott AFB, Ill., is also a large telemetry user.

- Navy has large telemetry installations at the Naval Air Missile Test Center at Point Mugu, Calif.; Naval Air Test Center, Patuxent, Md.; and the Naval Air Test Facility, Lakehurst, N. J. A new

range extending from Edwards AFB, Calif., to Dugway, Utah, is currently being set up.

- Army centers of telemetering activity include White Sands Proving Grounds, N. M.; Electronic Proving Grounds, Fort Huachuca, Ariz. (*ELECTRONICS*, p 13, May 30); and the Army Ballistic Missile Agency, Huntsville, Ala.

- National Advisory Committee for Aeronautics uses telemetry at its Pilotless Aircraft Research Station, Wallops Island, Va.; and NACA High Speed Flight Station, Edwards AFB, Calif.

Electronics companies supplying Air Force, Navy, Army and NACA centers currently number more than 400.

Although technical advances in telemetry have been rapid, the military needs a number of specific improvements: greater range, immunity to countermeasures, resistance to interference, increased volume of data and increased power and more miniaturization.

- Army: Besides getting tv pictures back from rockets orbiting the moon, the Army needs telemetering gear for several less spectacular but important projects.

Automatic weather stations to be placed in remote unguarded locations need telemetering gear that does not require maintenance, can operate in-

definitely and that is also expendable.

Also, Army needs constant level balloons that move across wide areas at predetermined heights to shoot the weather horizontally instead of vertically. "But right now we can't do it," Brig. Gen. E. F. Cook, Chief, R&D Div., Office of the Chief Signal Officer, says. "Our telemetering signals from present gear simply aren't strong enough to cover the wide sweeps our equipment would make into enemy territory. If we attempted it by sheer output power with our present gear, the combine becomes far too heavy to carry. We need a wholly new approach. Maybe a totally new system. We may be off on the wrong track."

"With JPL's microlock receiver system which works well on Explorer I," Cook said, "we'd need some seven watts to get a signal back from a moon-vehicle just about landing. We'd need 78 watts to get it back from Venus and 270 from Mars."

"To send a tv picture back from the moon would require 208,000 watts with present state of the art equipment. Wanted: A new concept of conveying mass data and pictures across space," says Gen. Cook.

Two more important applications for telemetering gear with long range capabilities cited by the general are: surveillance drones and fixed-position satellites for relaying television as well as other line-of-sight signals.

- Navy: Besides the needs cited by the Army which are common to all three services, Navy is particularly interested in greater data capacity in a single telemetering set. Because of present data-volume limitations, Regulus II must carry four transmitters and four antennas.

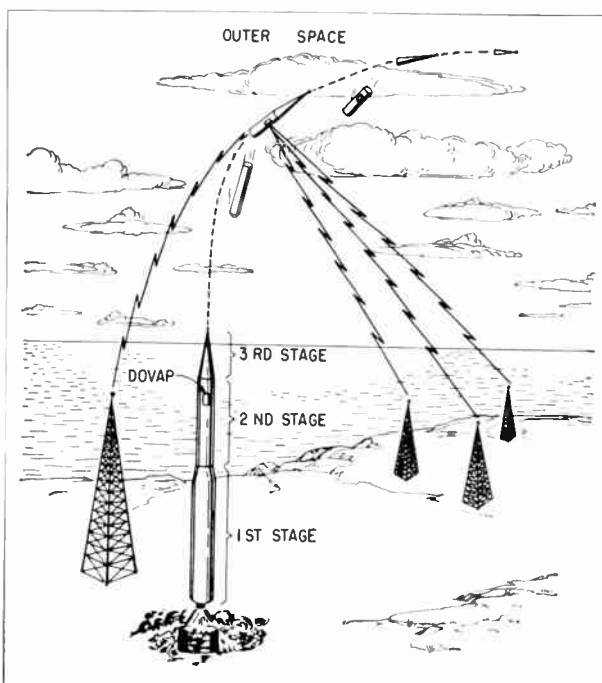
Also, Navy urges work on transducers, some of which are now inaccurate to 35 percent.

Telemetering needs for the next ten years are currently being tackled by Aeronutronics Systems, Inc., Pasadena, Calif. Initiated in 1957 by the Army Signal Corps, the project rapidly became a triservice effort.

Several agencies are looking into the possibility of moving the telemetering band. The present telemetry band is being squeezed too tight for some users' comfort. For example, a new high-power radar is moving in at 225 mc.

The Navy is looking at S band and has already incorporated in RCA's C-band radar tracking unit, AN/FPS-16, an S-band receiver for telemetering signals.

Another problem Aeronutronics is studying is the means of transmission. Most of the services are now using f-m/f-m. Other means, such as pulse-length and pulse-code modulation, are also possibilities.



DOVAP (Doppler, velocity and position) is IT&T's 10-lb radio that sent back data from the first two stages of Navy's Vanguard satellite rocket, such as continuous trajectory, velocity, fuel consumption, electrical power and atmospheric conditions

Sonar: Key to Sub War

"Undersea warfare is today the U. S. Navy's most important area of defense . . ."

So says John M. Ide, chief scientist of Navy's Underwater Sound Laboratory in New London, Conn. Admiral Arleigh Burke adds that it is the "most difficult technical problem which confronts the Navy."

The bulk of Navy's \$10-billion-plus budget for fiscal 1959 is pointed toward antisubmarine warfare. The House even gave the Administration more funds than it had requested to fight the Soviet sub menace. And the key to the whole antisubmarine defense is the detection of subsurface craft—by sonar.

Most ambitious—and hush-hush—of the antisubmarine developments is the Caesar project (map cover). Caesar will drop a curtain of fixed sonar stations along both our coasts. The East Coast leg is already in; construction of the northern terminus of the West Coast leg in the Aleutians began last summer and the rest of the chain is going in now.

The sonar listening posts are encapsulated in a plastic that is transparent to sound, dropped below surface turbulence, connected by cable to shore control stations. Western Electric is prime contractor for Caesar, is also handling maintenance until Navy can take over.

Industry estimates of annual sonar business exclusive of Caesar vary upward from \$35 million. Bureau of Ships won't say how much it buys. The Navy, in a generally successful attempt to keep the size and shape of the sonar business under its own brass hat, frequently buys pieces and bits and assembles its own systems.

Navy uses two kinds of sound ranging, active and passive. Active systems send out milliseconds-long bursts of ultrasonic energy, can derive both bearing and range data from returned echos. Passive systems are essentially sensitive receivers for whatever sound happens to be present. They provide only bearing data, have the distinct advantage of being undetectable themselves.

The modern submarine—nuclear or otherwise—carries passive sonar gear that can find ships as far away as a hundred miles. Surface craft carry both passive and active sonar. Active systems are more useful on the surface, since the racket made by the ship itself drowns out more distant noise.

Airborne sub-hunters carry sonobuoys and sonoballs. Sonobuoys contain hydrophones and radio relay equipment which transmits sonar data to recon-



Caesar curtain is main coastal defense line against submarine attack

nnaissance aircraft. Blimps and helicopters carry sonoballs, which are lowered from the craft by cable and do not contain the radio relay.

Nature of sound is the greatest challenge that sonarmen have had to meet. Sound travels slowly, about 10/11 of a mile a second in sea water. Attenuation in water increases rapidly with increase in frequency. Salinity, pressure and temperature variations in the medium cause sound waves to bend. The sea itself makes noise, more in the lower frequencies than in the higher. And sea life makes additional honks, barks and squeaks.

Passive systems have to take in all the ambient noise. Active systems can be more selective, since they listen only for the sound of their own echos. But they may be listening for a sound one-billionth as intense as the acoustic energy sent out. Frequencies on which most active systems operate—in the 20-25 kc range—are severely attenuated in sea water.

Nonetheless, sonar is working well for the Navy. Better hydrophone arrays give sonarmen more acute directional discrimination. The high frequencies of echo-ranging systems make for better resolution. Ultrasensitive receivers on silent subsurface platforms pull in sounds from many miles away.

A Navy officer who told *ELECTRONICS* that nuclear

marines carry passive sonar that can reach "three times radar range," was frankly understating the case. Surface radar range is horizon distance, on the order of 20 miles or so; sonar range for passive systems aboard our subs is certainly in the 100-mi neighborhood. Caesar's stations undoubtedly reach much farther out.

Development of information-recovery techniques has pushed sonar effectiveness rapidly forward, made the Caesar project possible. These techniques can find a signal lower in amplitude than surrounding noise, pull it "out of the mud" by taking advantage of the fact that intelligence occurs in a pattern while noise is random.

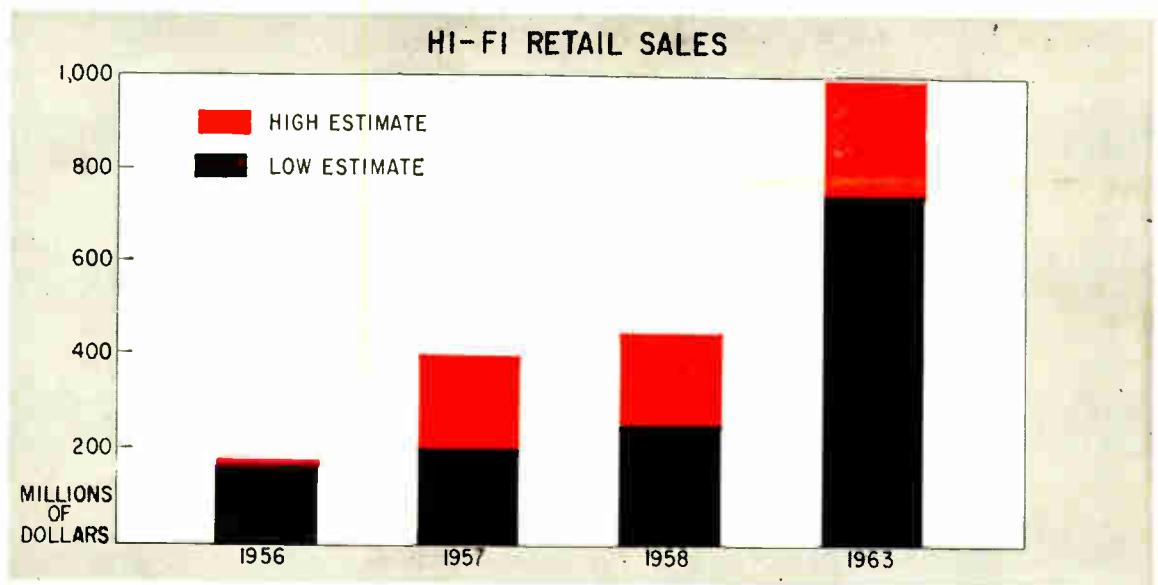
- **Autocorrelators** make use of input signals only, multiply two samples of input to cancel out noise and detect weak signals. Sometimes these samples are selected serially, sometimes in parallel. The latter method uses two independent receiver channels, multiplies i-f outputs, then smooths the product in a low-pass filter.

- **Crosscorrelators** use locally generated reference signals matched to one or more frequency components in the input signal. In some cases the r-f input is modulated with sine-wave or square-wave signals; if the modulation remains after the detector stage, input intelligence is present. Subtractive correlators use a d-c voltage equal to the no-signal output at the second detector, which is fed subtractively to the second detector; the difference is applied to a sensitive indicating device.

Woods Hole Oceanographic Institute has developed computer techniques for correcting sonar bearing and distance data for temperature, salinity and pressure gradients. Sonar-men today use a bathythermograph to find out what the water is doing, figure out transmission characteristics of the medium, get almost perfect fixes on target every time.

Sound ranging has come a long way since da Vinci noted in 1490: "... place the head of a long tube in the water and place the other extremity to your ear; you will hear ships at a great distance from you."

PRODUCTION and SALES



Hi-Fi Retail Sales Head for \$ Billion Level

HI-FI INDUSTRY SALES will be between three quarters and one billion dollars per year at retail value by the early 60's, according to estimates made last month by two industry leaders.

Ross D. Siragusa, president of Admiral Corp., predicts sales of \$750 million in 1963, while an RCA source predicts sales of \$1 billion for the same year.

As for past years, varying defi-

nitions of what constitutes hi-fi prevent compilation of exact sales figures. For 1956, Admiral estimates that sales totaled \$166 million, which compares closely to an RCA estimate of \$175 million.

However, for 1957 and 1958 RCA estimates sales of \$400 million and \$450 million, respectively. Admiral estimates sales totaled \$200 million last year and will total \$250 million this year.

In defining hi-fi, RCA takes in all phonos selling for over \$100 retail. Admiral's definition: an instrument capable of reproducing with all fidelity of the original.

Electronics Industries Association reports that between 1956 and 1957 unit sales of hi-fi phonos increased from 50,000 to 225,000, a jump of 350 percent. Radio-phono console sales rose from 100,000 to 350,000 units, up 250 percent.

Stereo Boosts Hi-Fi Market

Audio business expects sales increase as stereophonic disks, tapes and players head for dealers' counters. Both package units and building-block components loom as major market items

STEREOPHONIC SOUND is just now emerging from the audio specialist's laboratory to join hi-fi in the family living room (see p 5).

Stereo records, tapes, and the equipment to play them are becoming available in increasing numbers.

Disk manufacturers credit the breakthrough to development of phonograph cartridge systems compatible with present monaural record inventories.

To insure compatibility, standards for stereo record grooves have been agreed to by manufacturers.

The stereo record groove in cross-section is a 45-degree V with a soundtrack inscribed on each wall in response to two sets of signals. One record maker compares the groove to a spiral bobsled-run, with bumps.

Stereo cartridges operating on such a configuration must respond to horizontal and vertical motion. Monaural cartridges need only react to motion in one plane.

This dual motion of the stereo cartridge provides the two separate sound channels which when amplified are heard as stereophonic sound.

Audio sales managers say the stereo cartridge will probably be the "hook that brings in the customer." Basic cartridge types are ceramic or crystal, and magnetic.

Magnetic cartridges are subdivided into moving coil, variable reluctance, and moving magnet types. All systems rely on stylus movement to produce changes in current.

Stereo equipment, like hi-fi, is being made available in package units and do-it-yourself components.

A stereo manufacturer in the New York area predicts that newly attracted stereophiles will probably buy packaged equipment, while die-hard hi-fi fans will be customers for building-block units to add to their monaural rigs.

Disk manufacturers are anticipating an almost complete switch to stereo by record buyers. One sales executive says stereo sales will go up at about the same rate that monaural sales decline. Initial cost of stereo records will be slightly higher than monaural disks, but industry predictions are that a leveling off will come about as sales increase.

Current estimates are that about 40 percent of record manufacturers are making stereo platters.

Regarding future trends, one manufacturer hazarded that "by next year, companies that don't go to stereo will risk being knocked out of business".

One major company predicts sales as high as a billion dollars a year for records and players combined.

The tape recording industry is looking to stereo for increased sales from much the same point of view as disk manufacturers.

Most record companies have substantial stereo tape libraries from which to cut disks.

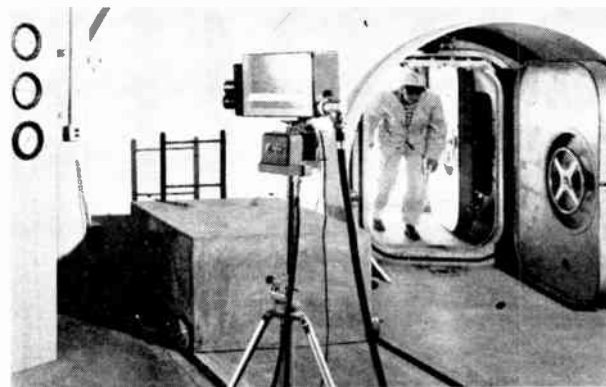
A new concept in tape playing is a plastic magazine about the size of a paperback pocket book. It simply clips into a specially designed tape recorder. It requires no threading through reels or rewinding after being played on both sides.

The magazine tapes have two stereo channels. Moving at three and three-quarter in. per sec they provide about an hour of recorded music. They list at \$4.95 to \$8.45, compared to regular stereo tape prices of \$8.95 to \$18.95.

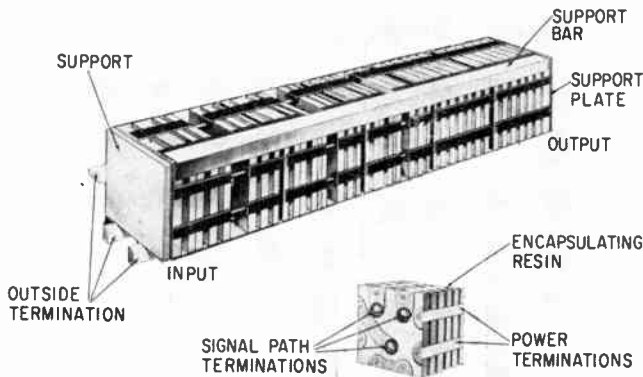
Among predictions being made for stereo is that as the number of stereo sets in use increases, f-m radio stations will be more likely to provide stereo broadcasts.

Successful stereo radio transmissions have been made. Compatibility with existing monaural f-m receivers is possible. Adapters have been designed. A unit which sorts out the scrambled stereo signal may be included in tomorrow's stereo setup.

Tv in Atomic Power Plant



When those big doors are shut, reactor operators at GE's Vallecitos plant use tv cameras to monitor instrument in reactor enclosure



Here's how micromodules are formed from components made on ceramic wafers

Circuits Micro-Sized

Army hopes to pack a million parts per cubic foot into mobile electronic equipment

OBJECTIVE of the Army's micro-module program is a 10 to 1 reduction in electronic equipment size within three to five years. The goal is component densities of 500,000 to one million components per cubic foot.

Army Signal Engineering Laboratories hopes to achieve this without any new research breakthroughs. Its program is to exploit in a coordinated fashion known microminiaturization techniques now scattered through the industry.

A plea for industry-wide participation was made this month by Vincent Kublin and Stan Danko, of USASEL, Fort Monmouth, who spoke at the IRE-PCPT's National Conference on Production Techniques in New York. RCA is leader-contractor of the program, under a \$5-million contract.

Program director Danko said micromodules may lead to acceptance of the throwaway repair concept.

Micromodule components are formed by printing, evaporation or similar methods on ceramic wafers 300 mils square and 10 mils thick. The ceramic is a functional material, rather than component carrier. It serves as transistor housing, resistor substrate and so on.

Demonstration equipment such

as a five-transistor radio, have been made with series of wafers interconnected by risers, and potted. These prototypes have been made in, the Army says, commercial quality, not military quality.

As an example of the urgency of further electronic equipment size reduction, the Army cites plans for manned surveillance aircraft. There is room only for navigation, communication, tv, infrared, forward radar and photographic equipment at today's component densities. Army wants planes also to carry side-looking radar, nuclear detection, radio relay and jamming gear.

Hand-wired equipment yields 8,000 parts per cubic foot (pcf), stacked wafer modules with miniature tubes, 10,000 pcf; transistor and printed wiring modules, somewhat over 50,000 pcf. A helmet radio has 64,000 pcf.

Higher part densities have been achieved in some instances by commercially produced modules. Army cites a module with 3 resistors, one capacitor, one transistor whose density is 700,000 pcf; a four-transistor amplifier with 500,000 pcf.

Environmental specs for a 50-part module call for a reliability of 15,000 hours mean time to failure in ground, vehicular and satellite equipment and 8,000 hours in

missile and projectile equipment. The former is expected to be raised to 100,000 hours.

Present failure rate requirements for resistors, capacitors and semiconductors is 0.133 percent per 1,000 hours. Future needs will be 0.02 percent per 1,000 hours.

Model Phosphor Samples Available

REFERENCE SAMPLES of 14 phosphors are available from Standard Sample Section, National Bureau of Standards. Selected in cooperation with the Electrochemical Society, samples are intended to aid in development of phosphors for radar and tv screens, radioactivity counters, detectors.

Physical properties of the samples have not yet been measured. However, they generally represent the optimum efficiency of phosphors currently produced. An investigation of their basic properties is planned to simplify commercial production of phosphors which conform to specifications.

Magnesium Plate Is Electroless

AN ELECTROLESS nickel-plating process that can be used to plate magnesium, recently coming into wider use by the electronics industry, has been developed by Dow Chemical Co.

Unlike electroplating, electroless plating requires no electric current to transfer plating metal from plating solution to part to be plated.

The new process yields a nickel alloy which contains seven to nine percent phosphorus and gets harder as it ages. Thickness depends on immersion time. The coating fills surface imperfections in the magnesium by catalytic action.

Tin, silver, chromium, zinc, gold and cadmium can be plated over the nickel. Acid core solder may be used directly on the plate and rosin core solder may be used if the nickel is tin-plated. For peak corrosion protection, zinc immersion and copper strike is also used

Self-Rectifying A-C Generator for Cars?

TRANSISTOR REGULATOR and self-rectifying a-c generator using silicon diodes are understood to have been developed by GM's Delco-Remy division. Units are not yet for sale. The 31-pound, 5½-in. a-c generator is believed to put out 26 amps at idle, 60 amps maximum and to operate safely up to 12,000 rpm; six silicon rectifiers built into the slip-ring end frame reportedly eliminate the need for external rectifiers and extra wiring; design also eliminates need for a current regulator. Companion all-transistor voltage regulator has no moving mechanical parts; it's said to be a vibrating type voltage-sensing unit which provides long-lasting settings and needs no servicing. Contacts handle only low, noninductive current in the emitter-base circuit of the transistor. Thus, arcing is virtually eliminated and contact life extended.

RUSSIAN METERS, gages, potentiometers and gas analyzers were seen this month in New York at the Fourth Annual International Automation Exposition. Instrumentation specialists noted that the equipment incorporated many features similar to comparable U. S. gear. Consensus is that they look like models of 1938 U. S. controls, or like model shop equipment, with many exposed heavy hinges. Rugged design indicates they are geared for heavy duty. Remarked one American engineer about some of the gear: "It looks too rugged for its function."

MISS DETECTION and cone erosion of missiles were discussed this month in Los Angeles at an instrument test session of the American Rocket Society. It was reported that by placing a small amount of radioactive material in test missiles, and Geiger counter gear at the target, miss distances may be accurately determined. Erosion rate of missile cone can be calculated by applying radioactive material to the outside of the cone and telemetering back to earth the rate at which this substance wears away. In a discussion of magnetohydrodynamics it was said that the ionized layer surrounding reentering rockets could be controlled by electrical current to prevent excessive friction.

REMOTE CONTROLS for manufacturing processes are just a matter of time in view of advances already made in the handling of atomic materials. So says Walter J. Bollard of Westinghouse Electric's atomic power department apropos of this month's \$5 million display of 6,000 products at the National Materials Handling Exposition in Cleveland. He says adaptation of nuclear industry "must" methods to the automatic factory is inevitable. Bollard cites a remotely controlled device that cuts out a piece of corroded, radioactive piping, replaces it with fresh piping, welds it into place, televises the welding operation so that it may be inspected while it goes on, and tests it by ultrasonic waves.

TECHNICAL DIGEST

- **Flash tube** for use in coal mines having firedamp hazards uses conventional vibrator-type electronic flash circuit mounted in cylindrical flameproof housing, with control pushbutton sealed in by rubber membrane. Explosion hazards are minimized by using limiting resistance to protect lamp fuse and using metalized paper capacitor across 4-v power supply battery to absorb extra loads due to vibrator. Satisfactory photographs of rock structure have been taken at up to 30 feet in French National Collieries.

- **Erasing** of persistent signals from screen of dark-trace radar cathode-ray tube is achieved by reducing tube voltages to give intensified

defocused beam, while applying sinusoidal sweep voltage to bombard screen with electrons. Heat is simultaneously applied to screen, in clean-up technique described in government-owned patent 2,561,702, now available for licensing.

- **Arrays of filaments** drawn from plastic phosphors serve both as nuclear radiation detectors and light pipes in new scintillation track chambers under development at Princeton University. Design permits reconstruction of nuclear events in three dimensions, thereby removing depth-of-focus restrictions.

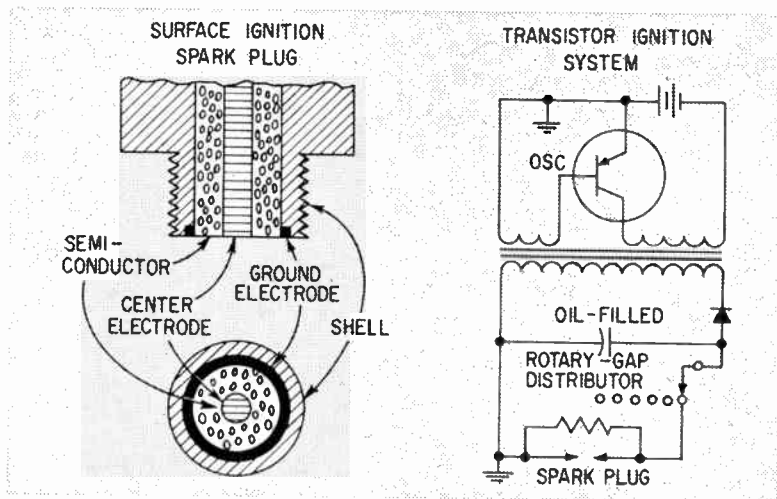
- **Barium getter film** effectiveness depends in complicated way

on manner in which film is formed, according to research by Philips in Holland. Cold tube envelope is best.

Heating of getter should be such as to get largest possible fraction of available barium to evaporate in short time, with least variation from tube to tube.

- **Emulsion** used for recording nuclear tracks usually shrinks to half its thickness during processing, introducing errors in many types of critical measurements. Soaking processed Ilford C-2 emulsions for 1 hour in alcohol solution of 35 grams rosin powder per 100 cc at room temperature restored thickness in AEC-sponsored research.

MEETINGS AHEAD



Ignition Uses Transistors

SITTING in the parking lot of Electric Auto-Lite Co.'s Toledo research laboratories this week are four recent model automobiles, ordinary in every respect except that under their hoods are 12 to 1 compression-ratio engines with transistorized ignition systems.

The cars, and their ignition systems have been tested for thousands of miles and have been found to perform reliably. Auto-Lite says its transistorized ignition extends sparkplug life to 30,000 miles. In mass production, the firm says, price increase over conventional ignition systems would be moderate.

The program also included development of transistor applications in other automotive electrical components where the operation of mechanical contacts are potential weak points: such as generator-regulators, relays and switches.

However, the auto industry doesn't need completely transistorized ignition systems just yet, even at the moderate cost. Present-day engines with compression ratios averaging a little over 10 to 1, maintain efficiency with the latest conventional ignition systems, particularly when they are used with fuels containing antifouling additives. But the gap between fouling and preignition ranges is getting narrower. Should there be a move to higher horsepower engines, it is felt the gap could close down over the capabilities of existing ignition systems.

A similar requirement could be

generated by a swing to smaller engines that combine power and economy through high reciprocating speeds and compression ratios. The Auto-Lite system will most likely make its first appearance on military combat vehicles.

The present system consists of a transistorized oscillator specially designed to incorporate circuits providing stability of operation and instantaneous starting; a step-up transformer; a high-peak, inverse voltage rectifier; an oil-filled discharge capacitor; a rotary-gap distributor with rare-metal contact points; and specially designed sparkplugs, with surface discharge through a semiconductor. Basic timing is fixed mechanically in the conventional manner.

Auto-Lite claims that its surface-discharge sparkplug is economical, good at both low and high speeds. Spark from the center electrode arcs along a semiconductor (which ionizes the gap) to the circular ground electrode. Normally, the spark path is random, giving even erosion. Should it stay fixed over a period of time, erosion will force it to a new channel of less resistance.

Such low-voltage, 500 to 5,000 v, systems permit the special sparkplugs to have a universal heat range. When such systems come into widespread use, sparkplug inventory problems will be minimized. Only a single heat range in a few different thread sizes will be needed to fit all vehicles.

July 16-18: Forestry, Conservation Communications Assoc. (FCCA), Ninth Annual Conf., Parker House, Boston, Mass.

Aug. 6-8: Special Tech. Conf. on Non-linear Magnetics and Magnetic Amplifiers, AIEE, Hotel Statler, Los Angeles.

Aug. 13-15: Conf. on Electronics Standards and Measurements, AIEE, IRE, NBC, National Bureau of Standards Labs., Boulder, Colorado.

Aug. 13-15: Seventh Annual Conf. on Industrial Applications of X-ray Analysis, Denver, Colo.

Aug. 19-22: Western Electronic Show and Convention, Los Angeles, Calif., WESCON, IRE, WCEMA, Pan Pacific Auditorium, Ambassador Hotel, L. A.

Aug. 26-Sept. 6: British National Radio Show, Radio Industry Council, Earls Court, London.

Sept. 3-5: Application of Electrical Insulation, First National Conf., AIEE NEMA, Cleveland, Ohio.

Sept. 12-13: Communications Conf., IRE, Sheraton Monrosc Hotel, Cedar Rapids, Iowa.

Sept. 15-19: Thirteenth Annual Instrument-Automation Conf. and Exhibit, ISA, Philadelphia Convention Hall, Pennsylvania.

Sept. 22-24: National Symposium on Telemetry, Americana Hotel, Miami Beach, and Patrick Air Force Base (Sept. 25).

Sept. 24-25: Seventh Annual Symposium on Industrial Electronics, Rackham Memorial Auditorium, Detroit, Michigan.

Oct. 1-2: Radio-Interference Reduction, U. S. Army Signal Research & Devel. Labs., IRE, Armour Research Foundation, Chicago, Ill.

Oct. 6-7: Symposium on Extended Range and Space Communications, IRE and George Washington Univ., Lisner Auditorium, Wash., D. C.

Oct. 8-10: IRE Canadian Convention and Exposition, Electronics and Nuclears, Exhibition Park, Toronto, Canada.

Oct. 13-15: National Electronics Conf., 14th Annual, Hotel Sherman, Chicago.

Oct. 20-21: Acro Communications Symposium, Fourth National, Hotel Utica, Utica, N. Y.

Oct. 27-28: Radio Fall Meeting, Electronics Industries Assoc., Sheraton Hotel, Rochester, N. Y.

New System Guides Missiles

Electronic devices update old map reading method, direct low-flying surface-to-surface missile Mace

GUIDANCE SYSTEM for Martin's surface-to-surface winged bomber missile, the Mace, is based on the oldest known means of aerial navigation—map reading or pilotage.

Substituting for the pilot who spots a railroad on the ground, compares it to his map and then corrects his course, is a series of electronic devices. An airborne radar watches the terrain, an electronic box called a comparator matches up key landmarks with those on a constantly unwinding radar strip map. A computer takes the course deviation from the comparator, computes a corrected heading and kicks off servomechanisms to actuate a change in the gyro-stabilized controls.

System is known as Atran (Automatic Terrain Recognition and Navigation). Producer Goodyear Aircraft believes system has a potential for military and commercial aircraft, as well as missiles.

Though actual details are classified, it is assumed the strip map is, in some cases, synthetic, compiled from reconnaissance radar scope photos and other intelligence media. When the Mace travels at low altitudes, covering ground at speeds of 10 miles a minute, the actual terrain-scanning radar scope becomes a fast-moving picture strip. The radar map strip in the comparator probably presents only clearly distinctive landmarks that show up on a radar scope, and at no more frequent intervals than 20 mi.

How the system copes with long periods of bleak terrain, radar-picture-wise, during which the missile might stray completely off its strip map and get lost, is not revealed. A preset guidance course, however, may preclude this happening.

USAF considers the system invulnerable to presently-known jamming techniques. During six Atran flights as many as six jammers were turned on the Mace without any appreciable confusion.

Besides Goodyear's Atran system, another version of the Martin Mace will use A.C. Spark Plug's inertial guidance system.

MILITARY ELECTRONICS

• **Extensive field tests** of electronic elements of Army's antimissile missile system, Plato (ELECTRONICS, p 49, Feb. 21), will begin soon at prime contractor Sylvania's electronic test site now under development at Fort Devens, Mass. Specially-designed antennas are already at the site. The site will not be used for firing the modified Nike-Zeus missile to be used in the Plato system.

• **"Submarine" target practice** for acoustic-homing torpedos is being accomplished at great savings by using a simple electronic device hung over the side of a target boat, instead of firing at an actual, and costly, submarine.

Developed by General Electric, the system works as follows: Two transducers are swung to the proper depth over the side of a target boat. One transducer receives the ping (impulse) from the torpedo. The signal is then properly strengthened

and sent out via the other transducer. The torpedo receives this echo and is fooled into believing it is attacking a target the size of a submarine. A torpedo making a successful attack on an echo-repeater target usually passes within a few feet of the target, at times smashes right into it. Even when targets are wrecked, the method is still cheaper than using a sub.

• **Martin and Boeing** head up two development teams for Dynasoar, the rocket-powered, manned vehicle, capable of orbiting the earth and landing. With Martin will be Bell Aircraft, Bendix Aviation, American Machine & Foundry, Goodyear Aircraft and Minneapolis Honeywell. With Boeing are Aerojet-General, Chance Vought, North American's Missile div. and Autonetics, GE and Ramo-Woolridge.

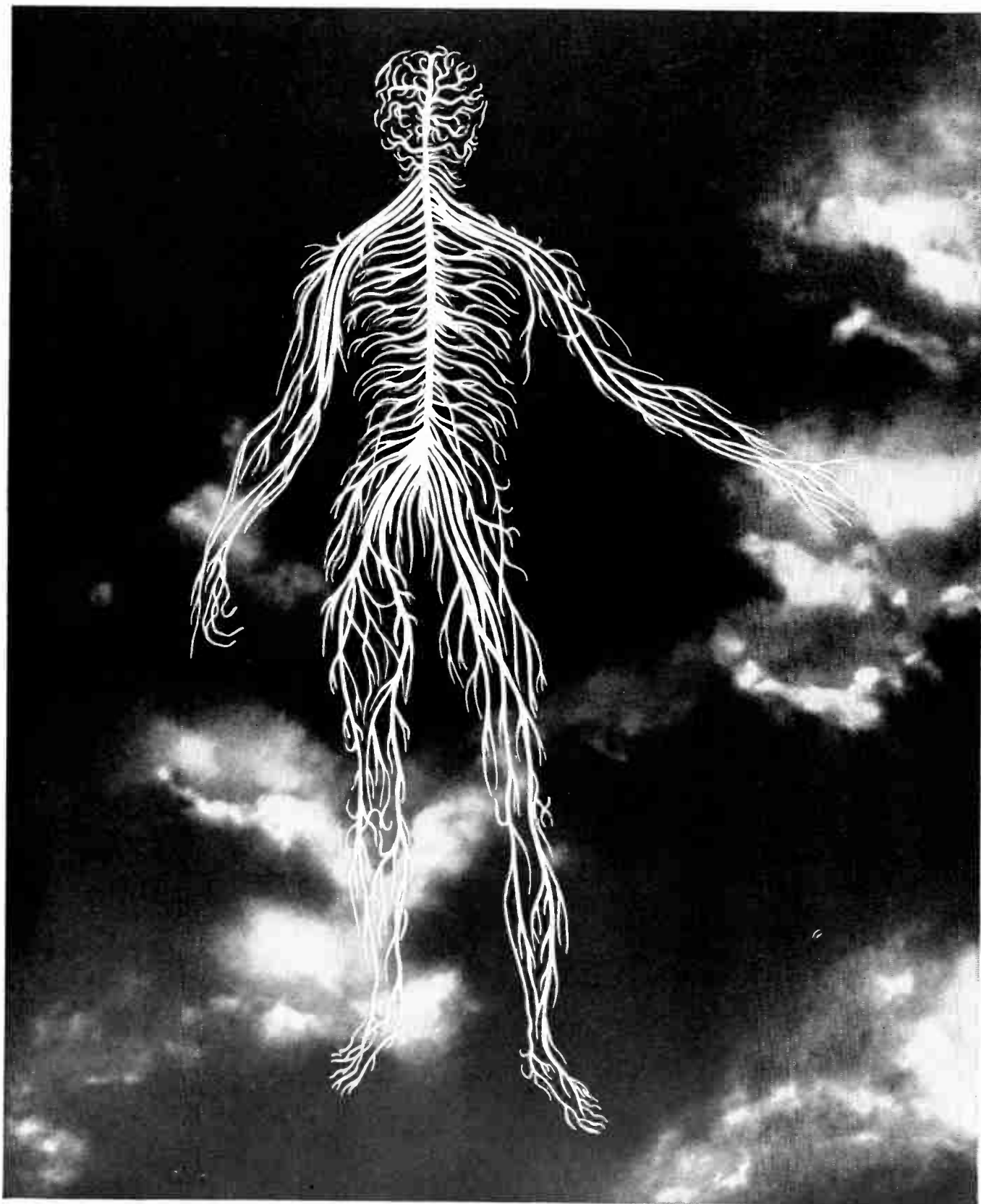
NACA will be a full partner with USAF in managing the project.

CONTRACTS AWARDED

Westinghouse receives a \$10 million contract to develop and test an advanced ground control system to guide Boeing's Bomarc ground-to-air interceptor missile. The system, to be installed at missile launching sites, will track and select approaching targets and decide when to fire. It will also handle the mid-course guidance functions. When close enough to the target, the built-in terminal guidance system will take over and guide the missile on a collision course.

Raytheon gets a \$6.34 million contract with BuOrd for development and production of radar equipment, AN/SPG-51, and associated items that pinpoint enemy sky raiders and help direct the Tartar surface-to-air guided missile to low flying and medium altitude targets.

Sperry is awarded a \$13.8 million contract with BuOrd for radar sys-



WHAT IS "TOTAL ELECTRONICS"?

The picture suggests the answer.

In the new world of missiles and space systems to come, it's the *total* complex of control, guidance and communication—the whole interrelated nervous system correlating the eye, the hand, the head and the heart of the missile to that of man himself.

And in the company producing that missile, it's the *total electronics capability* necessary to specify, design, create and test this central nervous system as an integral part of the whole machine—from its conception, through delivery to the customer, to the final completion of its mission.

In the period of a dozen years since the word "electronics" first gained common currency in our industry, Martin has been systematically building toward just such a total electronics capability.

As a result of the rapid evolution in advanced electronics development, today one-third of all Martin engineering manpower is devoted to the electronics requirements of our customers' present and future products. And a major part of Martin's investment is in the special facilities necessary to this new concept of total electronics.

We believe that this capability is essential to our increasingly important function as a prime contractor to all branches of the military.

MARTIN

BALTIMORE • DENVER • ORLANDO

tem modification kits that will extend the operation range of Talos missile radar systems. Talos became operational with commissioning of light cruiser USS Galveston last month (ELECTRONICS, p 14, June 6). Sperry also gets a \$3 million contract with BuAer for all-attitude flight control systems for Navy's F8U-3 interceptor, now under development by Chance Vought.

Hamilton Watch wins an additional \$5½ million contract with Hughes for quantity production of airborne signal data recorder equipment to be used testing Falcon guided missile. This new contract supplements original \$2¼ million contract awarded last Nov.

Ampex gets a \$1,238,000 contract with BuAer for airborne magnetic recorders and spare parts.

Beckman Instruments will deliver next month a series of electronic instruments designed to guard against the build-up of moisture and explosive vapors in ARDC's Arnold Engineering Development Center's wind tunnel. Built under a \$211,000 subcontract with Wilson Electric for the Army Engineering District, Tullahoma, Tenn., the system will include 17 infrared analyzers and two electrolytic hygrometers.

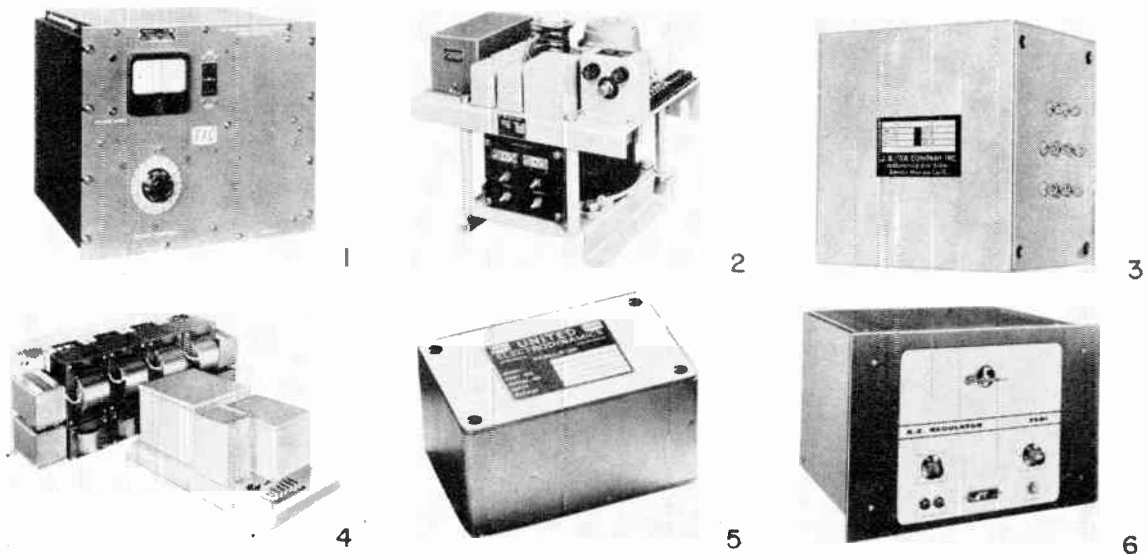
Topp Industries wins a \$1.1 million contract with Navy's Aviation Supply Office for angle of attack detectors, indicators, computers and other related units.

Eitel-McCullough is awarded a \$1.3 million contract by Sperry for production of ceramic-metal traveling wave tubes intended for application in transmitting large amounts of information simultaneously at microwave frequencies.

GE gets a \$3,999,291 contract with Rome Air Force Depot for radar course directing group AN GPA-73.

Radioplane div. of Northrop gets a \$13,901,727 contract with USAF for R&D of target drones.

Feature Voltage Regulators



(1) Tel-Instrument, high-power output unit. (2) Superior Electric, filament voltage regulator. (3) J. B. Rea Co., magnetic amplifier type. (4) NJE Corp., line voltage regulators. (5) United Electrodynamic, transistorized unit. (6) Sorensen & Co., a-c regulator

All electronic and electrical equipment attain optimum performance and reliability only when operated at the rated voltage. Voltage regulators have many industrial and laboratory applications.

Model 605 automatic voltage regulator is announced by Tel-Instrument Electronics Corp., 728 Garden St., Carlstadt, N. J., (75). It is capable of absorbing high overload surges while delivering undistorted $\frac{1}{4}$ percent true rms voltage regulation. The unit is capable of stabilizing line voltage variations over a ± 10 or ± 20 percent range.

The Superior Electric Co., Bristol, Conn., (76) offers type EMT 25136U automatic filament voltage regulator. Input voltage range is 108 to 132 v on 120 v service and 216 to 256 v on 240 v service. Output voltage is adjustable from 9 to 24 v with sensitivity within a 1.0 v band.

Now available from J. B. Rea Co., Inc., Santa Monica, Calif., (77) are two magnetic amplifier type line voltage regulators in a minimum package size. Model LVR51 is specifically designed as a filament supply for systems where input voltage and frequency changes may not be allowable.

NJE Corp., 345 Carnegie Ave., Kenilworth, N. J., (78) reports a series of 60-cps line voltage regulators specifically designed to meet applicable military specifications. Eight standard models range from 500 va to 2,000 va, in two grades of MIL-T-27A.

In production at United Electrodynamic, 1200 S. Marengo Ave., Pasadena, Calif., (79) is the model PR-10 completely transistorized dual d-c voltage regulator. Capable of operation under wide extremes of shock and vibration, the unit is sealed against fungus and humidity.

Sorensen & Co., Inc., Richards Ave., South Norwalk, Conn., (80) manufactures the model 2501 a-c line voltage regulator. Regulation accuracy is specified at ± 0.01 percent. The unit offers three types of operation at the turn of a selector switch—normal, stabilized and with external sensing at the load.



Reed Gage 8 sensing elements

ENGDahl ENTERPRISES, 226 San Antonio Road, Arcadia, Calif. This multiple recording accelerometer (miniature reed gage) was developed specifically for obtaining the response spectrum (peak acceleration vs frequency) of a structure subjected to high acceleration loads. The self-contained unit has eight sensing elements, each with a single degree of freedom along the same axis. Each element has a different natural frequency and is capable of sensing and recording the acceleration to which it is subjected. Frequency range of the model 440 is 950-2,000 cps. It can record from 100 to 10,000 g. Circle 81 on Reader Service Card.

For more information use READER SERVICE Card

Relay Sockets high reliability

ARMEL ELECTRONICS, INC., 840 Fifth Ave., Brooklyn 32, N. Y. The Hi-Reli series of relay sockets are designed for use where high reliability is essential and the application requires a plug-in type hermeti-



cally sealed relay. Featured are gold plated over silver plate, free floating screw machine contacts in a molded body of MIL-M-14E type insulation. Contacts are available with solder cup, turret or cyclet terminations. **Circle 82 on Reader Service Card.**

Linear Motion Pot self-aligning

BOURNS LABORATORIES, INC., P.O. Box 2112, Riverside, Calif. Model 157 Align-O-Pot features a self-aligning shaft in an extremely compact design. It is designed for missile applications where perfect

alignment with an actuator may be impossible and where very high vibration is a problem. The unit will operate reliably at 40 g up to 2,000 cps with error less than $\frac{1}{2}$ percent. Electrical noise during vibration does not exceed 0.1 percent of the total variable resistance or 100 ohms, whichever is greater.



per NAS-710. **Circle 83 on Reader Service Card.**

Power Supply voltage regulated

KEPCO LABORATORIES, INC., 131-38 Sanford Ave., Flushing 55, N.Y. The KM-257 tubeless magnetic voltage regulated power supply delivers in two ranges—250 to 325 v, 0 to 0.75 ampere, and 325 to 400



v, 0 to 0.6 ampere. Regulation for line or load is less than ± 1 per-

cent. Ripple is less than 0.02 percent. Other features include high conversion efficiency 75 percent at full load, a control for optimizing regulation at any given output voltage, excellent resolution, short circuit and overload protection, excellent line transient response. **Circle 84 on Reader Service Card.**

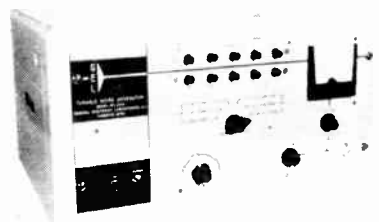
Power Supplies transistorized

VALOR INSTRUMENTS, INC., 13214 Crenshaw, Gardena, Calif. Feature of a new line of solid state power supplies designed for transistor applications is availability of dual supplies in a compact package featuring low voltage regulated units. Both variable and fixed voltage

units are available in either single or dual configuration. The output of the dual units float and may be connected in series. These supplies incorporate silicon diffused junction rectifiers, transistorized regulators and silicon zener references, and meet the requirements of development engineers working with transistor circuitry. **Circle 85 on Reader Service Card.**

Noise Generator tunable unit

GENERAL ELECTRONIC LABORATORIES, INC., 195 Massachusetts Ave., Cambridge, Mass., announces a new tunable noise generator. It will be useful in many applications throughout the communication



field, where the measurements of the effects of high level noise are desirable, since it offers a tunable frequency range of 500 kc to 55 mc. The generator will also be useful in noise figure measurement, since it also features attenuation up to 80 db. **Circle 86 on Reader Service Card.**

Indicator hermetically sealed

MARION ELECTRICAL INSTRUMENT Co., Grenier Field, Manchester,

N. H. A new miniature core magnet moving coil indicator can be incorporated within other meters to indicate such information as alarm, position or malfunction. Model



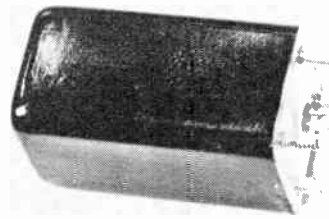
HCM 1/8 is a compact rugged hermetically sealed indicator designed to withstand extreme vibration. Di-

mensions are 1/8 in. in diameter and 1/8 in. long, weight is 1/2 oz. It is available with either flag or pointer

display, and in a wide variety of electrical sensitivities and functions. Circle 87 on Reader Service Card.

Twin-T Filters in sealed cans

TT ELECTRONICS, Inc., P.O. Box 180, Culver City, Calif., has available twin-T filters constructed in hermetically sealed cans and protected by encapsulation. Precision resistors and temperature compensating capacitors are used to main-



tain attenuation over the widest temperature range. Small size and

light weight are features of these precision tuned networks. Guaranteed mill attenuation is 60 db or better. Twin-T filters have application in control and instrumentation systems. These networks are used to reject power-line hum and hum harmonics to improve the signal-to-noise ratio. Circle 88 on Reader Service Card.

Pulse Transformers have four windings

BERKSHIRE LABORATORIES, 506 Bank Village, Greenville, N.H. Pulse transformers, types PT-82 and PT-91 are miniature encapsulated units designed to plug into standard noval sockets. They are light in weight, small in size and

convenient to use. These transformers may be used for isolation, coupling or blocking oscillator circuits. The windings may be connected in various ways for impedance matching. The transformers are embedded in epoxy, with aluminum outer shells. They are resistant to humidity, shock and vibration and other environmental



conditions. Circle 89 on Reader Service Card.

Miniature Knob thermoplastic

RAYTHEON MFG. Co., 100 River St., Waltham 54, Mass., has added a thermoplastic miniature knob—the 50 series—to its line of standard



control knobs. Approximately 1/2 in. in diameter, they are available in

three styles: unskirted, plain skirted and dial skirted round. Both mirror and nonreflective matte finishes are available. The 50 series was specifically designed for miniature controls with a 1/8 in. shaft. Circle 90 on Reader Service Card.



Voltmeter Inverter priced at \$94

MICRODYNE, 300 W. Washington St., Chicago 6, Ill. Type D-100 voltmeter inverter is a precision instrument for inversion of low level d-c to a-c, converting a standard rms reading a-c vtvm to measure d-c down to 100 μ v at high im-

pedance. Range is 100 μ v to 100 v. A calibrating signal source and output level adjustment are provided so that the a-c voltmeter may be used to read d-c voltage directly. No tubes or transistors are used. The D-100 employs a passive system built around precision instrument choppers. Circle 91 on Reader Service Card.

Trimmer Pots miniaturized

FAIRCHILD CONTROLS CORP., 225 Park Ave., Hicksville, N. Y. Two new miniature trimmer pots, the Trim-Tite and Trim-Tite Jr. (illustrated) are 1/2 in. and 3/8 in. in diameter respectively. The former has a 3-percent linearity over a resistance



range extending up to 50K; the latter, the same linearity with a

resistance range up to 25K. Designed for missile, aircraft and other applications requiring small size and light weight, these units will retain their setting over a wide range of severe environmental conditions. Standard temperature units are rated to 85 C and high temperature units to 150 C. Circle 92 on Reader Service Card.

Literature of the Week

MATERIALS

New Resin. The Polymer Corp. of Penna., 2140 Fairmont Ave., Reading, Pa. A four-page bulletin describes Fluorosint TFE resin, a polytetrafluorethylene base composition now available. Circle 93 on Reader Service Card.

Vinyl Glass. Resin Industries, Santa Barbara, Calif. A recent bulletin describes Resinite vinyl coated fibrous glass electrical insulation sleeving. The vinyl glass described can withstand creasing, pounding, twisting and bending without cracking, crazing or loss of dielectric strength. Circle 94 on Reader Service Card.

COMPONENTS

Tape Reels. Ampex Corp., 934 Charter St., Redwood City, Calif. A single-sheet bulletin fully describes a line of precision tape reels for sure accuracy and protection of magnetic tapes. Circle 95 on Reader Service Card.

Transformer Catalog. Freed Transformer Co., Inc., 1788 Weirfield St., Brooklyn 27, N. Y. The 48-page catalog No. 581 illustrates and describes complete lines of audio transformers, discriminators, filters, high Q reactors, magnetic amplifiers, power components, pulse transformers and ultrasonic components. Circle 96 on Reader Service Card.

Turret Attenuator. Stoddard Aircraft Radio Co., Inc., 6644 Santa Monica Blvd., Hollywood 38, Calif. A new bulletin describes the company's 10-position turret precision attenuator (d-c to 3,000 mc) which features pull-turn-push detent action, very small size and rugged construction. Circle 97 on Reader Service Card.

Mylar Capacitors. Pyramid Electric Co., 1445 Hudson Blvd., N. Bergen, N. J. A four-page bulletin

contains engineering data and electrical characteristics for the company's Mylar capacitors, a new type of nonhygroscopic polyester film capacitor. Circle 98 on Reader Service Card.

EQUIPMENT

CCTV Camera. General Electric Co., Syracuse, N. Y. Bulletin ECL-65 illustrates and describes the TE-6-A closed circuit tv camera. By combining the camera discussed with a suitable lens, a monitor or standard tv receiver, and the required length of cable, a user can purchase a complete, simple working cctv system for as little as \$1,395. Circle 99 on Reader Service Card.

Power Supply Catalog. Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif. Catalog E-58 illustrates and describes a complete line of d-c power supplies, a-c line regulators, and static inverters. Get copies by addressing requests on company letterhead.

Precision Power Oscillators. Electronics International Co., 145 W. Magnolia Blvd., Burbank, Calif. The latest technical information brochure on the company's precision power oscillators introduces an ultra-stable voltage source for use in a wide variety of electronic systems. Circle 100 on Reader Service Card.

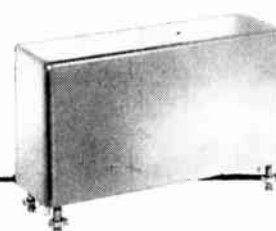
FACILITIES

Cabinet Construction System. Alfred Imhof Ltd., 112 New Oxford St., London W. C. 1, England, has published a four-page folder on its cabinet construction system which is known as Imlok. The system discussed was especially designed for the quick and easy manufacture of prototype, small or large batch productions of metal fabrications of all kinds, at economical cost. Circle 101 on Reader Service Card.



CRYSTALS FILTERS

Compact, rugged, hermetically-sealed and stable, JK Crystal Filters (band pass filters) have a Frequency Range: 20 kc to 17.5 mc., and are available for special filtering purposes to 150 mc. Band Width at 6 db: 0.01% to 4% of nominal on most frequencies, up to 12% for certain frequencies. Write for complete data.

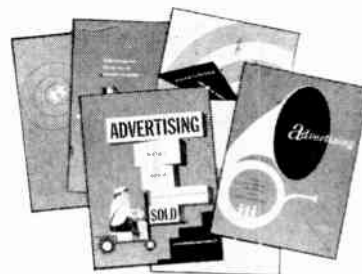


The
JAMES KNIGHTS COMPANY
Sandwich 1,
Illinois

CIRCLE 10 READERS SERVICE CARD

Here's how you can MERCHANDISE YOUR ADVERTISING

with these handy 9" by 12" folders



Keep your sales, management and distribution people informed on your advertising. Circulate pre-prints, reprints, schedules and other material in these folders, and make your advertising dollars work over and over for you.

Write for illustrated folder and price list

Promotion Dept., Room 2700
McGraw-Hill Publishing Co., Inc.
330 West 42nd Street, New York 36, N. Y.

Foreign Aid Electronics Up

More electronic items appear in ICA allocations. Total hits estimated \$36 million

FOREIGN AID allocations for electronics projects under the International Cooperation Administration are expected to swell as the fiscal year ends this month and to run at a higher rate in fiscal 1959. So far, \$18.7 million has been obligated by ICA for telecommunications, radio broadcasting and air navigation and communications projects.

Electronics portions of about 100 other programs such as power projects may double that figure. The projects include defense support assistance, economic aid and technical cooperation outside of NATO and other direct military aid programs.

Survey for a Baghdad Pact telecommunications system, for which \$8,370,000 has already been obligated, has just been completed in Iraq and Pakistan. When surveying is completed in the fall in Iran and Turkey, bids will be asked for design, materials and construction contracts.

Electronics projects, which include power control communications, air navigation, radar and meteorological installations, are high priority with ICA. But the agency does not have a complete itemization of electronics costs exclusively.

In the Far East, most new money is now going into Southeast Asia, rather than to the Republic of Korea and Taiwan where many projects are well on their way to completion. Latin America has few

projects now, but conceivably may get more attention in the new fiscal year.

Technical assistance, including educational projects, is an important part of the ICA program. For example, three U.S. engineers are completing a one-year task of establishing an electronics school in the College of Engineering of the University of the Philippines. An electronics laboratory was also set up there.

Termination this month of a contract to survey the telecommunications needs of three Southeast Asia countries points up a few of the problems in foreign aid. ICA is terminating six months early the two-year, \$1.8-million contract to carry out a telecommunications survey in Thailand, Laos and South Vietnam.

Needs of such underdeveloped nations are tremendous. When the three-nation survey went from top priority to second priority project potential, ICA discovered it did not have sufficient funds to follow up with a full-scale program. Top priority: a basic, three-state telecommunications link which may cost about \$15 million; half of the money will probably be put up by ICA and half by the three countries.

Secondary projects out of the question right now: lateral communications within each country to supplement the basic link. If taken up later, these could push telecommunications spending in Thailand, Laos and South Vietnam to above \$60 million. Present practice is to determine highest priority needs in all parts of the world and go ahead with limited programs to provide first things first.

DEVELOPMENTS ABROAD

- In Stresa, Italy, an IBM European conference recently heard announcement of the IBM 628, a magnetic-core computer that adds or subtracts in 180 millionths of a second and multiplies or divides in 8 thousandths of a second. Ferrite core receives or transmits memorized data in 10 millionths of a second. Machine is slated to be produced in France.

- In a Basel, Switzerland, parking garage, electronic controls select parking spaces for 374 cars according to their size. Automatic garaging works this way: When a car

drives in, human controller records date and time and assigns it to one of nine ramps. Photoelectric scanner determines whether car needs a large or small space. Basement control system in the eight-story garage picks parking locker of appropriate size nearest to the ramp assigned to the car. Driver gets receipt, drives car to selected ramp, steps out and pushes a button. Car is automatically hauled into elevator and taken to assigned spot. Parking rate is three cars a minute; discharge takes 30 seconds at pre-selected exit ramp. Siemens & Halske made controls.

EXPORTS and IMPORTS

Japan's new Electronic Equipment Exports Promotion Association says it will open a New York information center this summer for its 68 radio, parts and tv firm members. Office will conduct market research, service importers and promote export of Japanese portable radios and parts.

Venezuela has ordered 200 devices for air-ground communications worth more than \$500,000 from National Electronics Laboratories, subsidiary of Thiokol Chemical Corp. An initial shipment may be

made late this year, with the order completed in 1959.

In Milan CEA, Costruzione Eletttroniche e Automatismi, has signed a licensing agreement with Bailey Meter Co. of Cleveland to produce and distribute throughout Europe Bailey's component line. CEA recently signed a similar agreement with Belock Instruments.

French firm Nord-Aviation Co. has reportedly received a large U.S. Army order for its SS.10 antitank missiles.

West Germany's University of Stuttgart has purchased a \$140,000 Ferranti Pegasus computer for research in nuclear physics, aerodynamics and design of precision instruments.

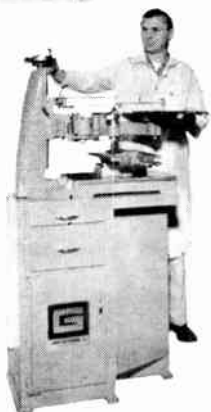
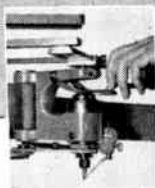
In Rome a new firm, Ler, has been formed to specialize in military electronics. Behind it are government-owned firms San Giorgio of Genoa and Microlambda of Naples, and optics maker Galileo of Florence.

Australia reports some success in efforts to stimulate electronics exports. Burma and Southern Rhodesia have placed orders for one-man radio pack sets from Amalgamated Wireless; Britain has bought \$700,000 worth of similar gear. Same firm reports a second New Zealand order for four multi-channel vhf radio links.

In West Germany Consolidated Electrodynamics Corporation, GmbH, has been formed to serve as CEC's sales and service facility for Western Europe and the United Kingdom.

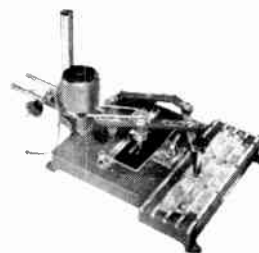
Italian firm Societa per Azioni Geloso is now offering communications equipment to the American ham market through American Geloso Electronics, its North American subsidiary.

Belgian Congo has ordered control consoles for seven airport traffic control towers from International Aeradio Ltd. of London.



MODEL 106 PORTABLE BENCH MODEL-2- OR 3-DIMENSIONAL

- 40 pounds of unbeatable speed and accuracy at a reasonable price
- Perfect for all machining applications within its range
- Ball bearing spindle has three speeds up to 14,000 rpm
- 5 positive, accurate pantograph ratios
- One copy carrier (supplied) accept all master sizes
- Height of pantograph and position cutter are continuously adjustable
- Work up to 10" by any width
- Taper shank cutters



GREEN ENGRAVERS
are fast!

- Spindle speeds up to 26,000 rpm to engrave or for machining modern materials
- Fastest possible copy set-up
- Greatest ease and speed of adjustments
- Cutter grinders, rotary tables, master letters, compound slides, name plate blanks and all required accessories

MODEL D2 HEAVY-DUTY 2-DIMENSIONAL

- 575 pounds-rigid, sturdy, precise
- Vertical adjustment of copy table automatic with Pantograph
- Unobstructed on three sides to take large work
- Vertical range over 10 inches
- Micrometer adjustment for depth of cut
- Ball bearing construction throughout — super precision ball bearings in spindle
- Ratios 2 to 1 to infinity — master copy area 26" x 10"



GREEN INSTRUMENT CO., INC.

363A Putnam Avenue

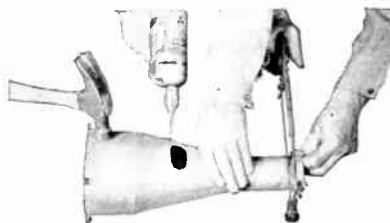
Cambridge, Mass.

CIRCLE 11 READERS SERVICE CARD

**NETIC CO-NETIC
MAGNETIC SHIELDING**

Non-Shock Sensitive, Non-Retentive, No Periodic Annealing, Shaped to Your Application

Permanently unaffected by shock or vibration from usage, drilling, cutting, punching, bending, etc. For maximum effectiveness, all possible joints are heliarc welded. Sheds magnetic forces like a duck's back sheds water. Will not become magnetized.



Permanently non-retentive — negligible residual magnetism. No periodic annealing required.

Provides simultaneous high and low intensity shielding as well as high and low frequency shielding or any one of them. Aids miniaturization by making possible placing components close together, even mounted on the shield itself. Can be furnished tinned, ready for soldering—without affecting shielding qualities. Available as raw material if desired for fabricating parts in your own plant.

Typical applications include tape container shields to protect broadcasting, military and automation tapes, cathode ray tube shields, photomultiplier tube shields, transformer shields, magnetron shielding, 7 & 9 pin tube shields, portable measuring chambers for simulated pressure, vacuum, altitude and non-pressurized testing of delicate instruments in laboratory or field, shields for motors, tape heads, submin. encap. uses.

MAGNETIC SHIELD DIVISION PERFECTION MICA CO.
1322 No. Elston Avenue • Chicago 22, Illinois

NOW! Wrappable Foil 15" wide (Co-Netic) and 19 3/8" wide (Netic) simply, quickly shaped to enclose any component, insuring immunity from any interfering magnetic fields. Also aids miniaturization, increases your market.

SEARCHLIGHT SECTION

(Classified Advertising)

"OPPORTUNITIES"

EMPLOYMENT

BUSINESS

—RATES—
DISPLAYED

The advertising rate is \$21.75 per inch for all advertising except Employment.
Employment Opportunities—\$28.67 per inch, subject to Agency Commission.

UNDISPLAYED

\$2.10 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Positions Wanted take one-half of above rate.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

POSITION VACANT

The National Bureau of Standards, Central Radio Propagation Laboratory at Boulder, Colorado would like to receive applications from qualified persons who are interested in operating upper atmosphere scientific recording equipment at one of five Antarctic stations during 1959. Application on Standard Form 57, obtainable at local post offices, should be submitted immediately to section 82.10, National Bureau of Standards, Boulder, Colorado. Applicants should have a degree in Electrical Engineering or Physics, with two or more years practical experience in electronics—OR—two years technical education leading to an Engineering or Physics degree, plus four years practical experience in electronics. The practical experience can include active amateur radio experience. Appointments will be made in Grades GS-9 to GS-12, salary range from \$6,250 to \$8,645 per annum, plus 25% ice differential. Training will commence during July 1958. Personnel will leave for Antarctica during October or November 1958 and return to the U. S. in January or February 1960. Travel will be paid from home to Boulder for training, to Antarctica and return to home in U. S.



General Radio Expanding

GENERAL RADIO COMPANY of Cambridge, Mass., manufacturer of electronic instruments, test equipment and laboratory standards, this week announced plans to build another addition to its nearby Concord plant (photo).

GR, which recently occupied a new wing of its Concord facility, will complete relocation from Cambridge to Concord in June of 1959. The firm employs 750.

Cambridge building will be sold to Epsco, Inc., Boston manufacturer of electronic components and systems. Meanwhile, 40,000 square feet of GR's Cambridge headquarters has been leased to the Polaroid Corp., and Epsco will pick up this lease when papers are signed next week.

Upon completion of the Concord building, GR will have about 280,000 square feet of administrative, engineering and manufacturing operations in a "campus atmosphere" 15 miles from Boston.

"In choosing the Concord site, we had in mind a maximum country outlook," says Charles C. Carey, 52-year-old GR president who started with the firm 31 years ago as a winder of transformer coils.

Geared now to an annual production volume of \$12-13 million, GR has always resisted spectacular expansion as a matter of policy. The firm believes in plateau-type growth, geared to the electronic industry and its expanding markets. But it avoids boom and bust. Company boasts that no employe has been laid off for lack of work since 1929.

Founded in 1915 by Melville Eastham, now retired, GR is owned by 100 of its professional and administrative employes. All workers are eligible for semiannual bonuses, profit-sharing and other benefits. Since 1945, company has operated on a 35-hour work week. It started a 40-hour week back in 1919.

Characterizing itself as "an engineer's company," GR concentrates on pioneer development of new instruments and maintenance of quality, striving for diversification of products and markets. It can claim more than 40 'firsts' in electrical measurements field. Since 1945, GR has placed on market more than 150 new products.

TI Dedicates \$5 Million Plant

A PREDETERMINED "beep" signal from satellite Vanguard cut the traditional ribbon recently at dedication ceremonies for Texas Instruments, Inc.'s, new 310,000 square foot plant for transistor and semiconductor production.

James R. Killian, chairman of the President's Advisory Committee On Science, was "button pusher" at the 300 acre TI site. A symposium was held at the plant, with the theme "A Decade Of Semiconductors: An Appraisal And Projection".

The new plant represents an expansion and houses the semiconductor components division. It's the first of a number of buildings

MANUFACTURERS' REPRESENTATIVES
IN THE ELECTRONIC INDUSTRY
CONTRACT RATES GIVEN ON REQUEST. WRITE
ELECTRONICS

SAMUEL K. MACDONALD, INC.
manufacturers representatives over 25 years
1531 SPRUCE STREET, PHILA. 2, PA.
Territory: Pennsylvania • New Jersey
Delaware • Maryland
Virginia • West Virginia
District of Columbia
Other Offices: Pittsburgh
Baltimore
Washington, D.C.

FOR ADDITIONAL INFORMATION
About Classified Advertising
Contact The McGraw-Hill Office Nearest You

ATLANTA, 3—1301 Rhodes-Haverty Bldg. JACKSON 3-6951	M. H. MILLER Hubbard 2-7160
BOSTON 16—350 Park Square J. D. WARTH CHICAGO, 11—520 No. Michigan Ave. MOHAWK 4-5800	W. J. HIGGINS SEYMOUR 4-5800
CINCINNATI, 37—2005 Seymour Ave. ELMHURST 1-4150	F. X. ROBERTS ILLUMINATING BLDG. CLEVELAND, 13—1161 Illuminating Bldg. SUPERIOR 1-7000
DALLAS, 1—1712 Commerce St., Vaughn Bldg. RIVERSIDE 7-5117	W. B. SULLIVAN VAUGHN BLDG.
DETROIT, 26—856 Penobscot Bldg. WOODWARD 2-1793	GORDON JONES WOODWARD 2-1793
LOS ANGELES, 17—1125 W. 6 St. MADISON 6-9351	J. G. GRANT MADISON 6-9351
NEW YORK, 63—500 Fifth Ave. OXFORD 5-5959	R. L. YOCOM OXFORD 5-5959
PHILADELPHIA, 3—Six Penn Center Plaza LOCUST 8-4330	R. W. OBENOUR—D. T. COSTER R. P. LAWLESS LOCUST 8-4330
SAN FRANCISCO, 4—68 Post St. DOUGLAS 2-4600	H. W. BOZARTH—R. J. EDSELL JEFFERSON 5-4867
	F. E. HOLLAND JEFFERSON 5-4867
	R. C. ALCORN DOUGLAS 2-4600

planned for the site to serve research, manufacturing, and administrative functions. The building, exclusive of equipment and site, represents an investment by TI of more than \$5 million.

Its most revolutionary design features are a nine foot space frame between the two floors and a roof of thin-shell concrete and hyperbolic-paraboloid-shaped units. Within the space frame are utility and servicing facilities. They are fed directly to the point of need on either the second-floor manufacturing area or first-floor engineering and administrative area through ceiling and floor apertures. The hollow supporting pillars, some 63 feet apart, provide broad uncluttered areas on both floors and carry air conditioned air from units in the space frame.

Westinghouse Has Defense HQ

ESTABLISHMENT of defense products headquarters in Washington, D. C., is announced by Westinghouse Electric Corp. The move was made "so that we will be better able to coordinate the company's full capabilities, in an integrated manner, with the nation's defense program." E. V. Huggins and Albert Boyd, vice presidents, joined in saying.



EIA Picks New Board Member

The president of Machlett Laboratories, Inc., W. E. Stevenson (picture), has been elected to member-

YOURS for the ASKING

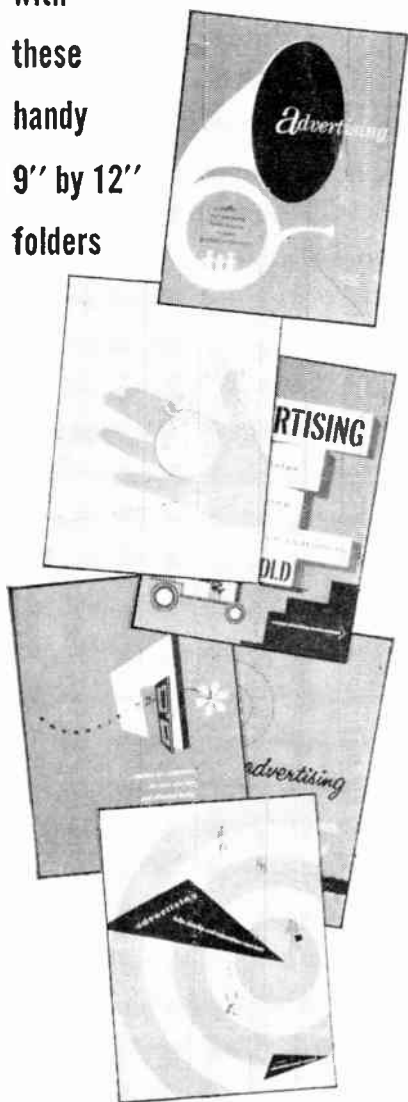


A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet."

McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N. Y.

Here's how you can **MERCHANDISE YOUR ADVERTISING**

with
these
handy
9" by 12"
folders



Keep your sales, management and distribution people informed on your advertising. Circulate preprints, reprints, schedules and other material in these folders, and make your advertising dollars work over and over for you.

Write for illustrated folder and price list
Promotion Dept. . . . Room 2700
McGraw-Hill Publishing Co., Inc.
330 West 42nd Street, New York 36, N. Y.

ship on the board of directors of the Electronic Industries Association. He was selected from a group of executives representing manufacturers in the tube and semiconductor division of the association.

News of Reps

UPSTATE New York area of Computer-Measurements Corp., N. Hollywood, Calif., manufacturer of counting, timing and frequency measuring equipment, is now represented by Snelling & Bogossian Company.

Northeastern Engineering, Inc., Manchester, N. Y., appoints H. L. Hoffman Co., Inc. as its representatives in the New England and upper New York State area.

Sigma Instruments, Inc., South Braintree, Mass., names three sales reps to handle its sensitive relays and related products in the central states:

James W. Murray, for southern Ohio and northern Kentucky; Thomas Engineering Co. for northern Ohio; Leslie DeVoe Co. for the territory including Indiana and western Kentucky.

Hills-McCanna, Foundry Division, Chicago, Ill., producers of complex castings in all magnesium alloys, has appointed the F. O. Hoyt Co. of Princeton, N. J., to be manufacturers reps for the industrial eastern seaboard.

Three newly named reps will handle 325 types of RCA subminiature relays for missile, airborne applications, and industrial uses. Reps are:

R. L. Pflieger Co., covering northern California and Nevada; John H. Feder, Jr., for Maryland, Delaware, northern Virginia and D. C.; Arthur H. Lynch and Associates, Inc., covering Florida.

Burt C. Porter, head of the Burt C. Porter Co., Seattle, Wash., was recently elected president of "The Representatives" of Electronic Products Manufacturers, Inc., Chicago, Ill.

INDEX TO ADVERTISERS

Barnstead Still & Sterilizer Co.	8
Green Instrument Co., Inc.	29
Hewlett-Packard Co.	4
Jones & Lamson Machine Co.	7
Kennedy & Co., D. S.	12
Knight Company, James	27
MacDonald Inc., Samuel K.	30
Martin Co.	22, 23
North Electric Co.	3
Perfection Mica Co.	29
Radio Corporation of America	14th Cover
Raytheon Manufacturing Co.	11, 2nd Cover
Stokes Corp., F. J.	10
St. Petersburg Chamber of Commerce	9
Tektronix Inc.	3rd Cover

MANUFACTURERS	
REPRESENTATIVES	30

CLASSIFIED ADVERTISING
F. J. Elerle, Business Mgr.

EMPLOYMENT OPPORTUNITIES	30
------------------------------------	----

Here's how you can **MERCHANDISE YOUR ADVERTISING**

with these handy 9" by 12" folders



Keep your sales, management and distribution people informed on your advertising. Circulate preprints, reprints, schedules and other material in these folders, and make your advertising dollars work over and over for you.

Write for illustrated folder and price list

Promotion Dept. . . . Room 2700
McGraw-Hill Publishing Co., Inc.
330 West 42nd Street, New York 36, N. Y.

Get out your pencil and . . .

Help yourself to electronics' READER SERVICE

it's free—it's easy—it's for your convenience

NOW!

All Advertisements and New Products are numbered for your convenience.

Each Advertisement and New Product item is numbered.

For More information, simply . . .

- (1) Circle number on postpaid card below that corresponds to number at the bottom of Advertisement, or New Product item.
- (2) Print your name, title, address, and firm name carefully. It is impossible to process cards that are not readable.

Additional postage MUST be added to cards for all FOREIGN MAILINGS

Some Advertisements which cannot be numbered for the READER SERVICE Card due to lack of space, must be indicated by writing the Advertiser's name in the space provided at the bottom of the card . . .



Some Advertisements which cannot be numbered for the READER SERVICE Card due to lack of space, must be indicated by writing the Advertiser's name in the space provided at the bottom of the card . . .



JUNE
27 · 58
CARD
EXPIRES
AUG · 27TH

• **electronics** •
BUSINESS EDITION

READER SERVICE CARD

Please Print Carefully

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CIRCLE THESE NUMBERS ONLY WHEN YOU ARE INTERESTED IN ALL ITEMS SHOWN OR DESCRIBED

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99

Inside Front Cover

Inside Back Cover

USE THIS SPACE ONLY WHEN YOU ARE INTERESTED IN SPECIFIC ITEM(S) IN AD.

For Advertisements that have several products shown, please indicate below the circle number of ad and product(s) on which you require additional information.

Circle No. _____

Product _____

JUNE
27 · 58
CARD
EXPIRES
AUG · 27TH

• **electronics** •
BUSINESS EDITION

READER SERVICE CARD

Please Print Carefully

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CIRCLE THESE NUMBERS ONLY WHEN YOU ARE INTERESTED IN ALL ITEMS SHOWN OR DESCRIBED

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99

Inside Front Cover

Inside Back Cover

USE THIS SPACE ONLY WHEN YOU ARE INTERESTED IN SPECIFIC ITEM(S) IN AD.

For Advertisements that have several products shown, please indicate below the circle number of ad and product(s) on which you require additional information.

Circle No. _____

Product _____

YOU WILL RECEIVE 53 ISSUES IN 1958

alternate
engineering
and business
editions
plus . . .
the
buyers' guide

electronics  

A MCGRAW-HILL PUBLICATION
330 WEST 42ND STREET, NEW YORK 36, N. Y.

CHART OF PUBLISHING CYCLES

electronics engineering edition	electronics business edition	electronics engineering edition	electronics business edition
CYCLE A	CYCLE B	CYCLE C	CYCLE D
JAN. 3	JAN. 10	JAN. 17	JAN. 24
JAN. 31	FEB. 7	FEB. 14	FEB. 21
FEB. 28	MAR. 7	MAR. 14	MAR. 21
MAR. 28	APR. 4	APR. 11	APR. 18
APR. 25	MAY 2	MAY 9	MAY 16
MAY 23	MAY 30	JUNE 6	JUNE 13
JUNE 20	JUNE 27	JULY 4	JULY 11
JULY 18	JULY 25	AUG. 1	AUG. 8
AUG. 15	AUG. 22	AUG. 29	SEPT. 5
SEPT. 12	SEPT. 19	SEPT. 26	OCT. 3
OCT. 10	OCT. 17	OCT. 24	OCT. 31
NOV. 7	NOV. 14	NOV. 21	NOV. 28
DEC. 5	DEC. 12	DEC. 19	DEC. 26

BUYERS' GUIDE ISSUE — JUNE 15

FIRST CLASS
PERMIT NO. 64
(SEC. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y.

FIRST CLASS
PERMIT NO. 64
(SEC. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y.

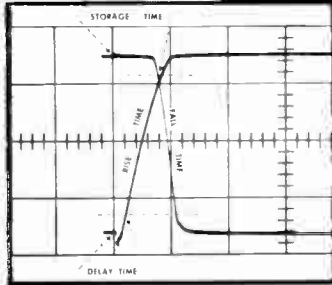
NEW



PLUG-IN UNIT

for Measuring Transistor High-Frequency Characteristics by the Pulse-Response Method

The Type 53/54R Unit can trigger the Oscilloscope sweep either on the start of the test pulse only, or on both the start and finish to display delay, rise, storage, and fall times simultaneously.



The Type 53/54R Unit and your Tektronix Oscilloscope with the Plug-In Feature equip you to measure transistor delay, rise, storage, and fall times. No other equipment is needed. Just plug in the Type 53/54R Unit and you're ready to go.

C H A R A C T E R I S T I C S

Collector Supply

1 to 15 v continuously variable, positive or negative. Current Capability, 400 ma.

Mercury-Switch Pulse Generator

Risetime less than 0.005 μ sec. Overall risetimes with the oscilloscopes are as follows:

Types 541, 543, 545—0.012 μ sec

Type 551—0.014 μ sec

Type 533—0.023 sec

Types 531, 535, 536—0.035 μ sec

Type 532—0.07 μ sec (The Type 532 and Type 536 have an additional limitation in the lack of signal delay in the main vertical amplifier).

Amplitude—0.02 v to 10 v, continuously adjustable, across 50 ohms. Eight calibrated steps—0.05, 0.1, 0.2, 0.5, 1, 2, 5, and 10 v.

Bias Supply

—0.5 v to +0.5 v and —5 v to +5 v, continuously variable. Current Capability— \pm 100 ma.

Calibrated Vertical Deflection

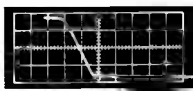
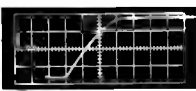
0.5, 1, 2, 5, 10, 20, 50, and 100 ma/cm collector current,

Price—\$300 f.o.b. factory

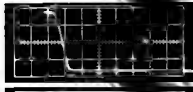
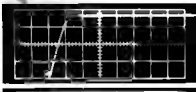
High-frequency characteristics of a transistor under five different conditions of drive. In each pair, the photograph at left shows delay time and rise time, the start of the driving pulse coinciding with the 2-cm graticule line. The second photograph of each pair shows storage time and fall time, the end of the pulse coinciding with the 2-cm line. The Type 53/54R Unit plugged into a Tektronix Type 543 Oscilloscope—3.5-v collector supply, 500-ohm collector load, 2-ma div vertical calibration, 0.5- μ sec div sweep rate. Driving conditions at left of each pair.

Low-frequency characteristics of the same transistor under driving conditions paralleling those of the first three pairs at left. Family of curves photographed on a Tektronix Type 575 Transistor-Curve Tracer—0.5-v div horizontal calibration, 1-ma div vertical calibration, 500-ohm load line. Driving conditions at right of each photograph.

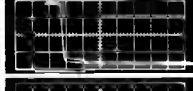
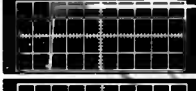
Drive voltage: 10 v through 20 kilohms.



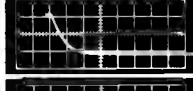
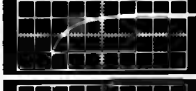
Drive voltage: 2 v through 1 kilohm.



Drive voltage: 0.5 v through 50 ohms.



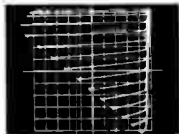
Class A drive: 0.05 v through 50 ohms.



Class A drive: 0.1 v through 1 kilohm.



Drive voltage: 0.2 v step through 20 kilohms.



Drive voltage: 0.05 v step through 1 kilohm.



Drive voltage: 0.02 v step through 50 ohms.



Tektronix, Inc.

P. O. Box 831 • Portland 7, Oregon

Phone CYpress 2-2611 • TWX-PD 311 • Cable: TEKTRONIX

TEKTRONIX FIELD OFFICES: Albertson, L.I., N.Y. • Albuquerque • Bronxville, N.Y. • Buffalo • Cleveland • Dallas • Dayton • Elmwood Park, Ill. • Englewood, N.Y. • Houston • Lathrup Village, Mich. • East Los Angeles • West Los Angeles • Minneapolis • Mission, Kansas • Newlinville, Mass. • Palo Alto, Calif. • Philadelphia • Phoenix • San Diego • Syracuse • Towson, Md. • Union, N.J. • Willowdale, Ont.

TEKTRONIX ENGINEERING REPRESENTATIVES: Arthur Lynch & Assoc., Ft. Myers, Fla.; Gainesville, Fla.; Bivins & Caldwell, Atlanta, Ga.; High Point, N.C.; Hawthorne Electronics, Portland, Ore.; Seattle, Wash.; Hytronic Measurements, Denver, Colo.

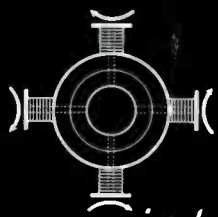
Tektronix is represented in 20 overseas countries by qualified engineering organizations.

Please call your Tektronix Field Engineer or Representative for complete specifications and, if desired, to arrange for a demonstration at your convenience.

ENGINEERS—interested in furthering the advancement of the oscilloscope? We have openings for men with creative design ability. Please write Richard Ropiequet, Vice President, Engineering.

RCA TUNABLE MAGNETRONS...

DECLASSIFIED



*a new
concept
in tuning
reliability*

You are looking at the first published picture of the tuned-coupled cavities of an RCA Tunable Magnetron. In development for several years, this unit is setting a new standard of reliable magnetron performance—because it provides an effective tuning system *outside the high electrical field region of the anode*. Here are a few of the advantages: RCA's coupled-cavity tuning (1) does away with tuner arcing, and galling, or jamming—(2) provides a rugged mechanical tuning system thus minimizing vibration-induced frequency modulation—(3) offers improved mode stability at high rates of rise of voltage pulse—(4) permits uniform power output across the tuning range of the magnetron—(5) lends itself to "customized" tube designs for virtually any magnetron frequency and power requirement.

Designed for superior performance throughout long life, RCA New-Concept Tunable Magnetrons are now offered in a wide choice

of designs for either hand- or servo-drive tuning. And note this: *They have been thoroughly proved for operating reliability and long life in microwave systems under the most adverse conditions of military field environment.*

For information on RCA Tunable Magnetrons—and how RCA's Coupled-Cavity tuning concept can help solve your problems involving the application of tuned magnetrons—call the RCA Field Office nearest you.

GOVERNMENT SALES

415 South Fifth St., Harrison, N. J. • HUmboldt 5-3900
224 N. Wilkinson St., Dayton 7, Ohio • BAldwin 6-2366
1625 "K" St., N.W., Washington 6, D.C. • DIstrict 7-1260

INDUSTRIAL PRODUCTS SALES

744 Broad St., Newark 2, N. J. • HUmboldt 5-3900
Suite 1154, Merchandise Mart Plaza
Chicago 54, Illinois • WHitehall 4-2900
6355 E. Washington Blvd., Los Angeles 22, Calif.
RAYmond 3-8361

What You "Need To Know"

Oscillating frequency is determined by the electrical dimensions of mechanically actuated tuning lines (external to tube anode). Cavities store RF energy through electrical coupling to the anode—resulting in vastly improved mode stability. Unlike other tuning methods, new RCA Coupled-Cavity tuning assures optimum mechanical and electrical tube performance—because tuner and anode structures can be designed independently!

RCA Tunable Magnetrons For Pulsed Oscillator Service

Type No.	Frequency Range (Mc)	Tuning System	Peak Power Output (kw)	Duty Cycle	RRV kv/μsec.
7009	8500-9600	Servo-tunable	230	0.001	225
7110	8500-9600	hand-tunable	220	0.001	225
7112	8500-9600	remote-tunable	220	0.001	200
7111	8500-9600	hand-tunable	220	0.001	200
A 1127	8500-9600	hand-tunable	280	0.001	200
6365-A	8750-9600	hand-tunable	220	0.001	180
A-1086-G	8750-9600	hand-tunable	240	0.001	160




RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.

World Radio History

A Milestone  — RCA's 2,000,000,000 Tube Year

New RCA Microwave Tube folder (ICE-180). A handy listing of RCA Magnetron and Traveling-Wave Tubes and their salient characteristics. Free—from RCA Commercial Engineering, Section F-18-Q-4 Harrison, N. J.

