JULY 25, 1958

electronics

business edition

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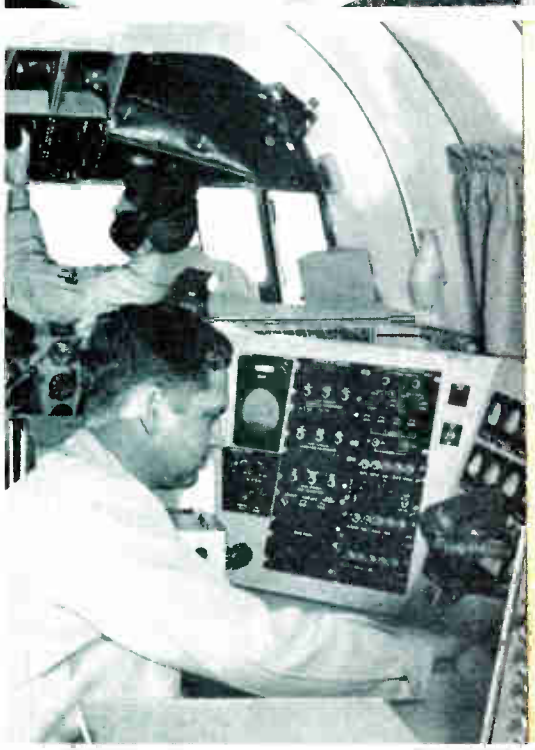
Electronics Gains in Process Plants

New instruments foretell full electronic control of chemical plants this decade . . p 15



Airways Control: Plans for 1962

Here's the role industry will play in updating air-safety networks . . . . . p 13

Raytheon — World's Largest Manufacturer of Magnetrons and Klystrons

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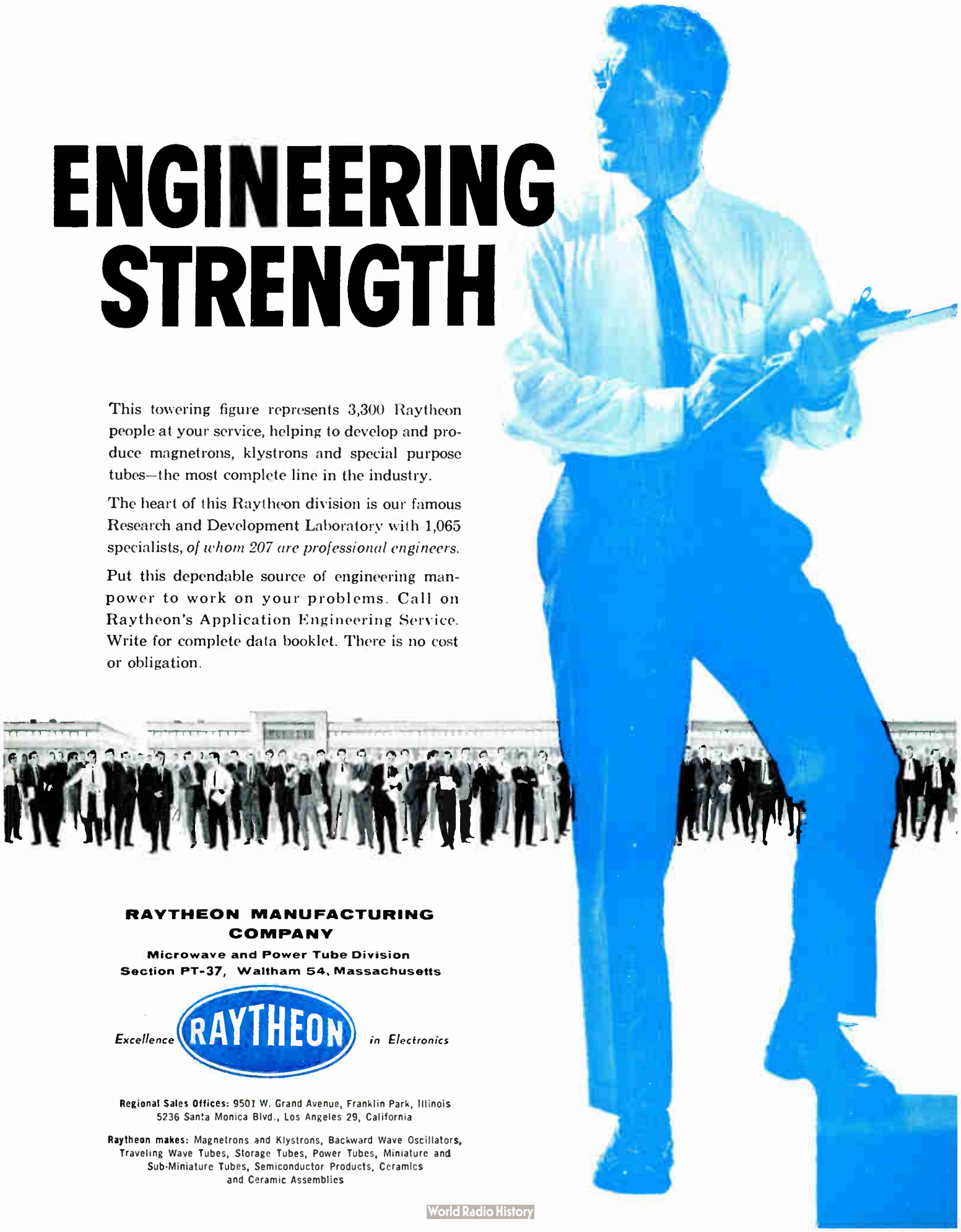

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Shoptalk . . .

BY THE BEAUTIFUL SEA—Half a hundred of the country's leading engineers and scientists are settling into new quarters near Atlantic City, N. J. But they're not on a vacation. They're starting the deadly serious job of testing the bits and pieces of the nation's air traffic control system.

The old Naval Air Station at Atlantic City, decommissioned last month, became the National Aviation Facilities Experimental Center on the same day that the Senate Interstate Commerce Committee approved the bill creating the Federal Aviation Agency. This all-kinds-of-weather facility is ideal for testing components that will become air controls for the jet age.

The picture of this system as it will take shape within the next five years is now beginning to emerge. To piece the picture together, Associate Editor Leary visited the new facility on the seaside, called on Airways Modernization Board officials in Washington, checked with AMB's contractors. His story begins on p 13.

NEW BUSINESS. Some of the country's top instrument engineers foresee a brightening future for electronics manufacturers in making indicators and controls for the process industries. They predict that by 1968 most chemical process plants will have electronic controls for most functions.

To get the latest news on developments in the chemical process industry, Midwestern Editor Harris visited the sprawling Dow Chemical Co. plant at Midland, Michigan. Some 600 chemical products are made there, with most of them originating from brine.

Dow, it turns out, is a builder as well as a user of electronic instruments and controls. Engineers in the instrumentation department and elsewhere constantly design and rework equipment. See p 15.

REPORT WRITING. An Engineer's time represents a lot of money today. In his article on Practical Report Writing (p 18), Frank Rockett shows how much an engineering report costs in engineering, clerical and supervisory time.

Nub of the article is a graph showing probable time required to write engineering reports ranging from 1 to 30 pages in length. You may want to clip and save it for future reference.

Frank is a former ELECTRONICS editor who is now with the McGraw-Hill *Encyclopedia of Science and Technology*.

CUTTING COSTS. How can you cut costs in highly technical, broadly diversified operation? Texas Instruments takes a new approach to the problem of work simplification.

The firm enlists the aid of both supervisory personnel and production workers. They work with industrial engineering experts in training sessions. Thus the workers and supervisors bring in their own problems and actively participate in solving them.

Kemp Anderson, McGraw-Hill's Dallas Bureau chief takes you inside to see this new approach to work simplification. His story appears on p 17.

Coming In Our August 1 Issue . . .

Coming In Our August 1 Issue . . .

● **Transistorized Tuner.** An f-m tuner that features four newly developed type 2N623 diffused-base transistors is discussed by Harry Cooke of Texas Instruments. A single diffused-base transistor converter has only one variable tuning element in the band-pass circuit.

The last of three transistor i-f stages is reflexed as an emitter-follower amplifier which provides audio gain and low output impedance. A ratio detector with a 700-kc peak separation provides low-distortion output and high a-m rejection.

● **Light Modulation.** A light modulator that can be used for recording airborne radar displays has been developed at Fairchild Camera and Instrument Corporation. Author Leo Levi describes the unit designed around an ultrasonic cell through which exceptional resolution and dynamic ranges are achieved.

For applications in video recording and radar strip-mapping, resolution of the device is 1 limited only by the optical system and the photographic material. Additional data can be displayed in color by using the diffraction grating effect of the cell.

● **Aircraft Armor.** Excessive dispersion of 20-mm shells caused by vibration of gun mounts on aircraft was problem recently tackled by Ballistic Research Labs at Aberdeen Proving Grounds.

Accuracy was improved by adjusting firing rate to minimize dispersion according to author Morris Halio. Phase-shift-oscillator firing circuit permits operation of guns through 600 to 900 round-per-minute range.

Elimination of the explosion hazards of non-electronic firing sources caused by high potential and sparking in firing-pin mechanism is an added advantage of circuit.

● **Fallout Time Check.** An arrival time indicator for radioactive fallout has been designed by Ross W. Farmer and Oscar Reiner Jr., both of the School of Medicine at the University of California in West Los Angeles.

When fallout exceeds 2 milliroentgens per hour, a Geiger-counter detection circuit blows the power-supply fuse of an electric automobile clock. The clock stops abruptly with its hands indicating precise time of fallout arrival. The instrument can operate for about four weeks on self-contained batteries and regulated transistor high-voltage supply.

● **WESCON Program and Show Guide.** For engineers attending this year's Western Electronic Show and Convention in Los Angeles, Pacific Coast Editor Hood has assembled a complete list of technical papers to be presented as well as a list of exhibitors together with their booth locations. Hood will be on the spot throughout the show, bringing you all the latest business and technical developments.

electronics business edition

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Issue at a Glance

DIGEST CONTINUED ON NEXT PAGE

DIGEST continued

electronics

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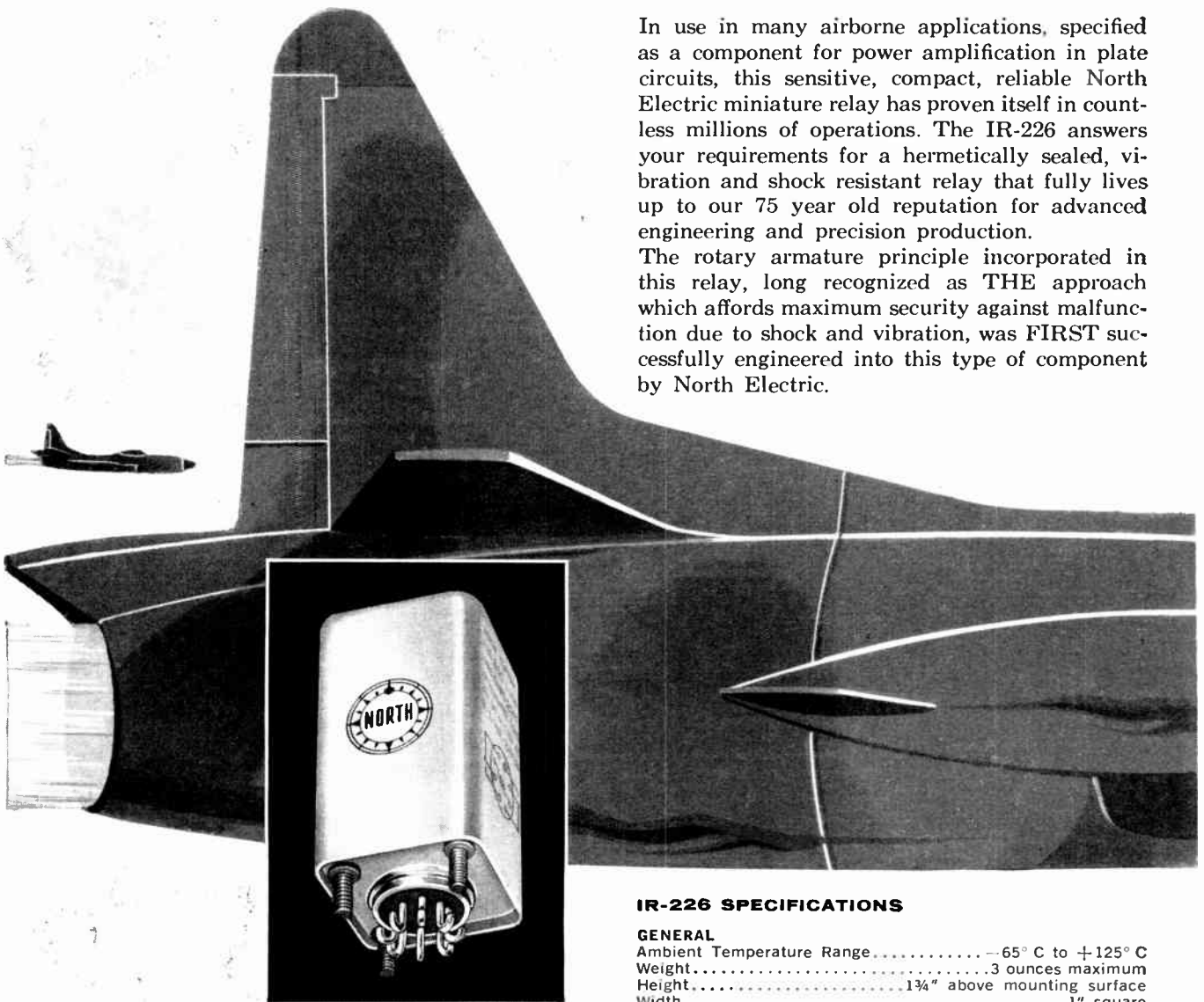

IR-226 SPECIFICATIONS

GENERAL

Ambient Temperature Range	−65° C to +125° C
Weight	3 ounces maximum
Height	1¾" above mounting surface
Width	1" square
Enclosure	Hermetically sealed

CONTACTS

Arrangement	Double Pole Double Throw (DPDT)*
Rating	2 amps—30 volts D.C. resistive
SHOCK TEST	50 Gs
VIBRATION TEST	10—500 cps—at 10 Gs

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FREQUENCY, TACHOMETRY INSTRUMENTS

-*hp*- 500B Electronic Frequency Meter

Model 500B is a rugged, precision instrument widely used for direct-reading laboratory or production line measurements of ac frequency from 3 cps to 100 KC. With -*hp*- 508A-D Tachometer Generators or -*hp*- 506A Optical Tachometer Pickup, the 500B also provides direct tachometry readings.

Typical applications include rf signal beat frequency comparisons, crystal frequency deviations, audio frequency and FM measurements, oscillator stability, machinery rotational speed, average frequency of random events, checking vibration or torsion in gear trains, etc.

Model 500B has an expanded scale feature permitting any 10% or 30% of selected range to be viewed full scale. It also offers a pulse output synchronous with an input pulse for measuring FM components of input signals or syncing a stroboscope or oscilloscope. Readings are independent of line voltage, input signal or vacuum tube variations. $285.00.

-*hp*- 500C Electronic Tachometer Indicator

Model 500C is identical to 500B except for meter calibration which is in rpm for greater convenience in tachometry measurements. With appropriate -*hp*- transducers (506A or 508A-D series), -*hp*- 500C will measure rpm from 15 to 6,000,000 rpm in 9 ranges. $285.00.

-*hp*- Rotational Speed Transducers

NO MECHANICAL CONNECTION

-hp- 506A Optical Tachometer Pickup measures speeds 300 to 300,000 rpm of moving parts which have small energy or can not be connected mechanically to measuring devices. Employing a phototube and operated by reflected-light interruptions from light and dark areas on a shaft, -*hp*- 506A may be used with -*hp*- 500B Electronic Frequency Meter, -*hp*- 500C Electronic Tachometer Indicator, -*hp*- 521A or 521C Electronic Counters, and similar instruments. Output voltage is 1 volt rms minimum into 1 megohm; light source is a 21 candlepower, 6 volt automotive bulb; phototube is Type 1P41. $125.00.

MECHANICAL CONNECTION

-hp- 508A/B/C/D Tachometer Generators are for use with electronic counters or frequency meters in rpm measurements from 15 to 40,000 rpm where direct mechanical connection can be made to the rotating part under measurement. -*hp*- 508A produces 60 output pulses per shaft revolution. When connected to an indicating instrument calibrated in rps, it permits direct readings in rpm. Relationship between output voltage and shaft speed is virtually linear to 5,000 pps, simplifying oscilloscope presentation of shaft speed as a function of time for analyzing clutches, brakes and acceleration rates.
-hp- 508B, C and D are identical to -*hp*- 508A except output is 100, 120 and 360 pulses per revolution respectively, and output voltage peaks at successively slower shaft speeds. -*hp*- 508A, B, C or D, $100.00.

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Puerto Rico Profits

Survey finds net profit margins of 15 and 30 percent among Puerto Rican electronics firms

Puerto Rico's electronics manufacturers are continuing to turn in outstanding profits and sales records.

Last year value of electronic and electrical products shipped to the mainland increased 30 percent, from $27 million to $35 million.

Figures are not yet available on 1957 profits. But, the island's Economic Development Administration just recently reported that the average ratio of profit to sales in 1956 for manufacturers of communications equipment was 15.1 percent. Included in this group are manufacturers of electronic systems, capacitors, oscillators, antennas, printed circuits, tuning devices, ferrite cores, transducers and other electronic-radio-tv hardware and components.

A second category of island firms, classified under industrial electrical apparatus manufacturers, including makers of terminals, connectors, rectifiers and diodes, enjoyed a 30.4-percent margin of profit on sales in 1956.

These figures compare with an average margin of profit of 4.8 percent after taxes earned by 40 U.S. mainland electronics manufacturers in 1956 (Electronics, p 22, April 10, 1957).

Difference between rate of earnings of island and mainland manufacturers is partially due to tax advantages currently available in Puerto Rico.

To encourage industrial development the Commonwealth grants 100-percent exemption for a ten-year period from its own income tax laws to most new firms. In addition, if a U.S. firm sets up a subsidiary in Puerto Rico, the subsidiary's earnings are not subject to U.S. income taxes.

Profits can be withdrawn from Puerto Rico without incurring U.S. tax liability or at the capital gains tax rate of 25 percent. Degree of tax exemption depends on whether investment is made through medium of a domestic corporation which derives at least 80 percent of its revenue from a U.S. possession or directly through a subsidiary in Puerto Rico. However, to get full tax benefits the parent firm may first have to liquidate its Puerto Rico investment.

Comparatively low labor rates prevailing on the island have also helped Puerto Rican manufacturers to earn record profits.

A survey last April showed wages paid by electronics manufacturers in Puerto Rico varied from 85¢ to 99¢ per hour. This compares with wages paid on the mainland varying from $1.94 to $2.20, according to EDA. The development administration also claims that after one year on the job productivity per worker averages 90 to 95 percent of U.S. standards.

Good transportation facilities play an important part in the excellent profits of island manufacturers. Low cost ocean transportation connects Puerto Rico with East, West, Gulf Coast and South American markets. San Juan, its capital city, is the busiest air center in the Caribbean. It handles an average of 77 flights daily.

SHARES and PRICES

For many electronics industry investors, large diversified firms provide the answer to a major investment problem—acquiring securities in a growth situation while at the same time limiting degree of risk.

Few anticipate anything like a tenfold sales increase in a few years by any of the firms listed below. But all have annual sales in excess of half a billion dollars. Their great financial resources, diversified product lines, mixed military and civilian business and top-quality management groups enable them better to weather economic storms such as tight money, military cutbacks, recession or sudden shifts in customer demand.

Similar limited-risk investment opportunities are available among many slightly smaller firms.

Large Electronics Firms	Recent Price	Indicated Dividend Rate	Percent Yield	Earnings Per Common Share 1958	Period	1957	Traded	1958 Price Range
General Electric	60⅜	2.00	3.3	0.56	(3 mos)	0.73	NYSE	57 -64¼
Westinghouse Electric	58	2.00	3.4	0.73	(3 mos)	0.82	NYSE	55½ -65½
RCA	35½	1.50	4.1	0.59	(3 mos)	0.87	NYSE	30¼ -36⅜
General Dynamics	58	2.00	3.4	1.01	(3 mos)	1.05	NYSE	55 -65¾
Sperry Rand	18¾	0.80	4.3	0.96	(year)[1]	1.74	NYSE	17¼ -20⅝
IBM	370	2.60	0.7	1.98	(3 mos)	3.57[2]	NYSE	300 -374
Bendix Aviation	54½	2.40	4.4	1.73	(6 mos)[1]	2.57	NYSE	44½ -55⅛
IT&T	38⅝	1.80	4.6	0.84	(3 mos)	0.82	NYSE	29¼ -38⅝

[1] Period ending March 31 [2] Stock split 2 for 1 in 1958

MERGERS, ACQUISITIONS and FINANCE

• **Emerson Radio & Phonograph** agrees to purchase the Consumer Products Division of **Allen B. DuMont Laboratories.** The purchase includes DuMont's line of television receivers, phonographs and hi-fi and stereo instruments; and tools, dies and other manufacturing equipment. Emerson will also receive right to the "DuMont" trade mark for home entertainment instruments and a royalty-free license under DuMont patents. The new line acquired by Emerson will be handled by a new wholly-owned Emerson subsidiary. It will be called the **DuMont Television & Radio Corporation.**

DuMont's East Paterson, N. J. plant is not included in the sale. Emerson's new line will be produced at its Jersey City, N.J., plant. In East Paterson DuMont will continue to make scientific instruments, industrial and military equipment, and tubes for set makers and the replacement market. It will also continue with plans to develop a color tv set using the Lawrence tube and to manufacture the tube.

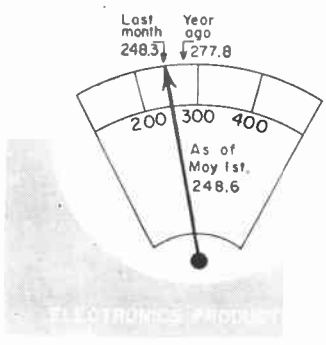
Payment was made in cash. Reports are that the sum was about $6 million. Money received from sale will be used to replenish DuMont resources, drained in recent years by a series of deficits.

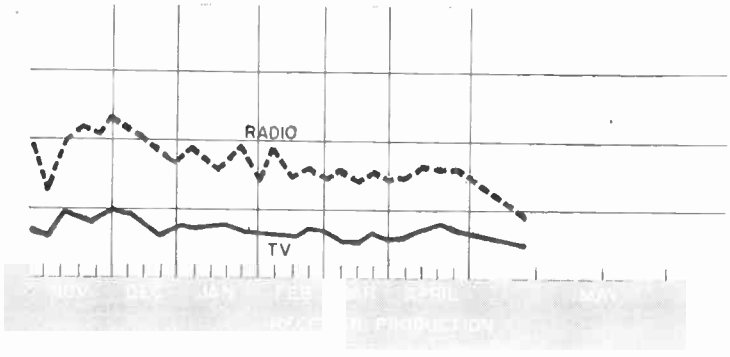
• **McGraw-Edison** acquires **National Electric Coil** of Columbus, Ohio, supplier of copper wire and insulating materials to the electronic and electrical industries. Proposed agreement calls for all business and assets of the Ohio firm to be exchanged for 420,000 shares of McGraw-Edison common stock, worth about $14.2 million at current market prices. National Electric stockholders are voting on the acquisition plan.

• **Miniature Precision Bearings,** Keene, N.H., supplier of miniature bearings to the electronics industry, issues its first annual report. Sales for the year ending March 31 totaled $5.5 million, compared to $3.9 million in 1957. Net profits were $297,000. In 1957 they were $242,000. Public participation is limited to 100 stockholders as the N.H. firm has never had a public stock issue. However, the firm's president, Horace D. Gilbert, says the report is being released to inform customers, suppliers and present and prospective employees, and because of its publicity value.

• **Raytheon** receives increase in V-loan revolving credit limit from $35 million to $75 million. Eleven of the nation's largest banks are participating in the new loan agreement.

• **Martin Co.,** which planned to issue $25 million of sinking fund debentures July 2, postponed the offering. However, the issue has not been withdrawn from registration with the Securities and Exchange Commission.





FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	July 4, '58	June 27, '58	July 5, '57
Television sets, total	55,884	77,290	63,785
Radio sets, total	97,205	161,764	76,832
Auto sets	19,741	57,928	35,714

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	July 9, '58	July 2, '58	July 10, '57
Radio-tv & electronics	49.14	49.26	52.41
Radio broadcasters	62.58	62.62	65.48

FIGURES OF THE YEAR

	1958	1957	Totals for first five months Percent Change
Receiving tube sales	154,136,000	185,847,000	—17.1
Transistor production	14,894,230	8,954,000	+66.3
Cathode-ray tube sales	2,963,741	3,710,646	—20.1
Television set production	1,790,840	2,178,361	—17.8
Radio set production	4,186,869	6,098,951	—31.4

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

(Source: Bur. Labor Statistics)	May, '58	Apr., '58	May, '57
Prod. workers, comm. equip.	337,100	338,700	384,600
Av. wkly. earnings, comm.	$80.75	$80.94	$79.00
Av. wkly. earnings, radio	$79.78	$79.78	$76.21
Av. wkly. hours, comm.	39.2	39.1	40.1
Av. wkly. hours, radio	39.3	39.3	39.9

TRANSISTOR SALES

(Source: EIA)	May, '58	Apr., '58	May, '57
Unit sales	2,999,198	2,856,234	2,055,000
Value	$7,250,824	$7,025,547	$5,636,000

TUBE SALES

(Source: EIA)	May, '58	Apr., '58	May, '57
Receiving tubes, units	36,540,000	32,582,000	32,836,000
Receiving tubes, value	$31,406,000	$28,788,000	$28,955,000
Picture tubes, units	560,559	590,357	758,328
Picture tubes, value	$11,237,147	$11,591,733	$14,031,519

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WASHINGTON OUTLOOK

THE PENTAGON is postponing construction of a third Ballistic Missile Early Warning System (BMEWS) site at Preswick (near Glasgow), Scotland.

The future of the Preswick installation is very much up in the air right now. One Defense Dept. informant says categorically plans for the third BMEWS site have been dropped. But other officials state that construction of the Preswick installation is "still under consideration" and has not been "finally, completely, and irrevocably knocked out."

It's clear, however, that construction of the two BMEWS sites at Thule, Greenland, and near Fairbanks, Alaska, is getting under way this year while no work is scheduled for the proposed Preswick installation during fiscal 1959.

While Defense Dept. officials are advancing no hard and fast reasons for the scaling-down of BMEWS—for the present, at least—the most obvious factor seems to be cost. And related to the cost angle seems to be the feeling that the long-range radar sites in Alaska and Greenland should provide adequate coverage.

Total cost of the two-site Ballistic Missile Early Warning System, which is now scheduled to go into operation in 1960, is estimated at $800 million. Of this sum, roughly $500 million will go for production and installation of electronic equipment; the remainder is earmarked for site construction work.

By comparison, the Distant Early Warning (DEW) Line, which went into operation last summer after 32 months of construction work, cost about $600 million. Only about $200 million of this amount went for electronic equipment; the remaining funds were spent on construction of the 58 radar outposts comprising the warning line.

The first official reference to a three-site Ballistic Missile Early Warning System was in the administration's $1.3-billion supplemental appropriation request for fiscal 1958, submitted to Congress in January prior to the submission of the fiscal 1959 military budget. Request referred to "three tentatively located" BMEWS sites, and had $329-million to start project.

RCA holds a prime AF contract as system manager for BMEWS. Major subcontractors are GE, Sylvania, Western Electric, Goodyear Aircraft.

- **The House Appropriations Committee** has begun a full-scale study of the reliability of modern weapons, particularly ballistic missiles. A distinguished group of scientists and industrialists is consulting with the Committee's staff on the project. The group includes C. C. Furnas, former Asst. Secy. of Defense for R&D, now University of Buffalo chancellor; Julian West, Bell Labs; Harry Goode, University of Michigan; Joseph A. Chambers, Motorola; Gen. Leslie L. Simon, retired Chief of Army Ordnance Research; K. T. Keller, former head of Chrysler; and W. A. Wildhack of the National Bureau of Standards.

- **An important overhaul** of Air Force research and development policies has been recommended by a special scientific advisory committee headed by H. G. Stever, the Air Force's former chief scientist, now MIT's Associate Dean for Engineering. The group calls for an end to "excessive administrative controls" over R&D projects and the "concentration of authority and responsibility at the working level"; a big step-up in funds and a streamlining of R&D budget procedures; greater incentives in R&D contracts; greater authority for civilian personnel and "increased opportunities . . . for raising technical qualifications" of Air Force R&D personnel.

THE ELECTRICAL CONNECTOR THAT "WASN'T FOR SALE" BECAME A MAJOR PRODUCT

This is a success story in the true American tradition. It started during World War II. Engineers here at Scintilla Division of Bendix Aviation Corporation had a problem. The supply of electrical connectors for the aircraft ignition systems we were building was irregular and undependable. Nor were we satisfied with the performance when we *could* get them.

Our engineers set out to design the finest electrical connectors available anywhere. We produced them and used them solely as component parts in our own systems throughout the war. Then, we decided to make them available to anyone in industry who could use them.

In the ensuing years the electrical connector became a major part of our business. The tremendous demand for this product has resulted in the largest plant expansion in our history, to be devoted to the production of more and better electrical connectors.

We are grateful for the recognition of quality which is implicit in your acceptance of Bendix electrical connectors. We are happy to assure you that, while our new facilities will mean even larger connector production in the future, we shall continue to place greater emphasis on quality than on quantity.

We hope you are already familiar with Bendix electrical connectors. If you're not, may we offer our assistance in solving any connector problem. SCINTILLA DIVISION OF BENDIX AVIATION CORP., SIDNEY, N. Y.

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Hickernell: at AIEE's helm

New president of American Institute of Electrical Engineers is Latimer F. Hickernell, engineering vice president of Anaconda Wire & Cable, who formally takes office next week. Although his professional career has been in the power field, he has "kept an eye" on electronics ever since he was in college. "It's my avocation rather than my vocation," he says, "but it's closely related to my work and close to my interests."

Working with the engineering institute is nothing new for him. Always generous with his time, and courteous to the bone, he's been devoting his energies to it since 1926. "In the last ten years," he will tell you, "it's taken progressively more and more time. My wife hasn't liked it, although she's looking forward to this year coming up. She likes to travel, and we'll be doing a lot of that."

Hickernell, an energetic 59, was born in Middletown, Pa. "Dad was a musician," he recounts, "and we lived all over the east, finally went to Iowa." He took a B.A in math at Grinnell College in Iowa, followed it with a BSEE at MIT, worked for a year at GE's plant in Lynn, Mass. He went back to Iowa for a year to teach at the State College, and then wound up in Jackson, Mich., as an engineer for a public utility.

After eight years the firm, part of giant Commonwealth & Southern, was dissolved. The newly married Hickernell (he'd met his wife in Jackson) decided on "a whirl in manufacturing" and went to Anaconda. He became its chief engineer two years later, moved up to engineering v-p last year. He's just finished a new high-voltage lab that looks like a mad scientist's dream, built to test cable and materials at 3 million volts.

At home, Hickernell keeps a workshop which started when he inherited a carpenter's chest from his grandfather. "No monumental project" has ever come out of the shop, he says. Among his unmonumental projects: a radio control for the garage door, intercom for the house, and his own tv set, which he built in 1947. "Something went wrong with it last year," he says; "I haven't had a chance yet to find out what."

Hickernell used to play the French horn, still listens to music a lot, reads as much as he can. He prefers historical biography to ease off from his professional diet, reads a lot of American history.

COMMENT

A-M, F-M and Clear Channels

Mr. Hoskinson's letter (Comment, p 11, June 27) suggesting that all stations of one kilowatt or less should be changed to f-m shows a blithe unconcern for either the commercial organizations that support broadcast radio, the public

that buys radio sets and listens to the radio, or the people who make radio sets.

Commercial sponsors want to buy as much coverage as they can get. Consequently they want a-m, with its longer range. The public has invested in a-m radio; Mr. Hoskinson's suggestion would make their investment valueless.

F-m has not caught on simply because it hasn't competed effectively. It can't deliver up to a commercial sponsor the coverage that an equivalent a-m station does.

As for Mr. Hoskinson's contention that a-m stations "are cluttering up the air . . . and obscuring so-called clear channel stations," the first is a matter of taste. If everyone had Mr. Hoskinson's taste, then the stations would have to change their programs. The second is absurd. When a station is on clear channel it can be heard across half the continent.

W. R. Hinchman
Salt Lake City, Utah

Defense Contracts

It's good to see that the Air Force is backing off from its policy of letting weapons systems prime contractors run their own shows without close USAF supervision (Washington Outlook, p 8, July 11).

Progress in the sciences would move faster if we got government out of basic research. But actual weapons systems have got to be developed to serve military needs directly. Defense Department should leave the one area alone and concentrate its energy in supervising the other. It would also probably mean large savings in tax dollars.

Stewart Fabrega
Philadelphia, Penna.

Sonar

Happy to see something in print at last about the nation's antisubmarine defenses ("Sonar: Key to Sub War," p 15, June 27).

Strange that it was Electronics that broke the news.

Gene C. Goodman
Providence, R. I.

We don't think it strange.

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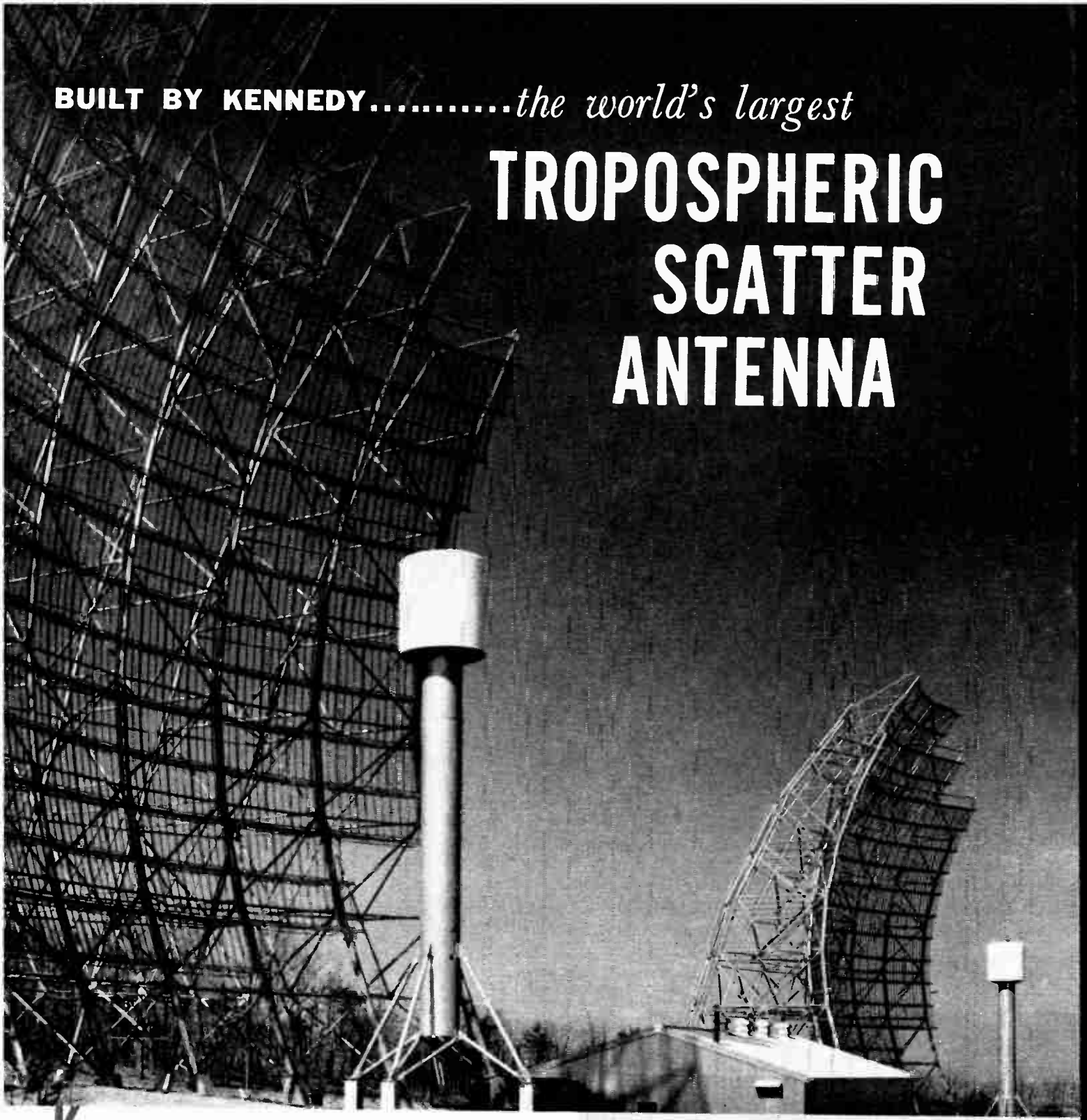

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electronics
business edition

JULY 25, 1958

COMMITTED AS OF JULY 1958—AIR MODERNIZATION BOARD FUNDS—

General Precision Laboratories	$4,272,484	**DESIGN** and build enroute portion of data-processing system for New York air route area
	3,971,963	**DESIGN** and build transition and terminal portion of data-processing system for Idlewild Airport
Aircraft Armaments Inc.	1,877,453	**DESIGN** and build traffic control simulator to exercise GPL's system
Airborne Instruments Laboratory	148,000	**STUDY** traffic in New York terminal area
Franklin Institute Laboratories	59,000	**STUDY** traffic in New York air route area (outside 50-mi radius to Pittsburgh)
International Business Machines	57,543	**STUDY** and analyze data from AIL and FIL studies to determine data-processing requirements
Airborne Instruments Laboratory	163,000	**STUDY** and evaluate Bendix-Decca navigation system for helicopter use
New York Airways, Inc	82,000	
Bendix Pacific	175,000	
Bell Helicopter	48,205	
University of California	67,000	**STUDY** optimum configuration for high-speed taxiways
Radio Corporation of America	not disclosed	**DESIGN** and build automatic air-ground-air communication system for New York area

Source: Airways Modernization Board.

Airways Blueprint for 1962

Key projects in federal plan for air traffic control are in the works (table); more are coming. Shape of the system to come emerges

Airways Modernization Board's far-reaching plan to overhaul the nation's air traffic control system is now beginning to shape up.

AMB's immediate program is scheduled to be completed by year end 1962. The fast moving agency (created only a year ago) received $15.1 million in funds transferred from Defense and Commerce Departments during fiscal 1958, of which $10.9 million had been committed by the first of this month (table).

Congress has budgeted $35 million for AMB in fiscal 1959, and two big pieces of that are already committed. The board will spend $12 million to rehabilitate and equip the National Aviation Facilities Experimental Center now setting up shop on the site of the old Pomona Naval Air Station near Atlantic City, N. J. The amount of RCA's contract to build an automatic communications system has not yet been disclosed.

Major areas of interest for AMB are mostly electronic:

• Navigation: System will rely on an airborne device to provide continuous indication of position, plus steering information to get to any selected point. This means not only a navigation system, but also some sort of memory and computing device.

• Ground position determination: Self-contained airborne devices of required accuracy would be prohibitively costly. AMB hopes to combine reasonably simple and efficient airborne navigation units with ground based aids to correct their errors. VORTAC, radio beacons, Loran-C and similar aids answer some of the requirements.

(Civil Aeronautics Administration is starting a project to determine accuracy of ground aid stations. Five new CAA planes equipped with precision automatic tape-recording equipment will fly the air routes and record VORTAC and other beacon signals. Airborne Instruments Labs signed a $2.9-million contract on July 10 to develop and build the recorders; interim equipment shown on the cover will do the job until AIL's gear is ready.)

• **Communications:** Routine communications will be made more automatic. Controllers will query aircraft, use transponded signal to derive position data. Use of voice channels will be limited to emergency situations.

• **Data-processing:** Enroute control centers and some dense terminal areas will use data-processing gear to keep track of controlled airspace and help the controller fit traffic into it.

AMB is also trying to figure out how to simplify aircraft instrument panels; how best to light runways and approach paths; whether bright paints and lights will help craft see and be seen.

Right now the board is looking at proposals for another key link in the chain: an automatic system for coordinating taxiing and other ground activities. The system, dubbed TRACE, will detect and track vehicles from touchdown to parking to takeoff, display the ground situation for the controllers, program airport movements and visually direct taxiing pilots.

Navigation

Nub of the complex air picture is that no one knows where planes are except when they're on the ground or over a fix. Without position data, controllers can't fit planes into properly spaced routes or landing patterns.

"If the pilot and controller could reach some sort of advance mutual understanding," comments AMB's Hans Giesecke, "and if the pilot could stick to the agreement, it'd cut communications by quite a factor."

"Our aim," adds Giesecke, "is to keep precision electronics out of the airplane." AMB researchers hope to see industry come up with many possible designs for the airborne parts of the navigation and communication picture, will give inexpensive and simple devices the greatest possible attention.

Airborne devices could be dead reckoners, Doppler systems, even inertial guidance. The system will be able to work with any and all of them. Coupled with the navigation unit will be a memory or storage device and an elementary computer. Object of the airborne equipment is to tell the pilot not only where he is but also what his bearing and velocity should be to get him where he's going at the time he's supposed to arrive. Data would be corrected either by the controller or by reference to VORTAC or beacons.

Communications

The automatic air-ground-air communications system, (AGACS) now being developed by RCA will take the burden of routine communication out of the pilot's hands.

A controller fitting a plane into his sector will dial the plane's number. All planes will be multiplexed onto a common channel. Airborne transponder equipment will automatically reply with the plane's code or identification, and with position, bearing, altitude, possibly air speed, any other data preset into the system. Ground-based radio direction-finders will zero on the signal while the plane answers, provide a check on bearing and range. The pilot will not even know he's being interrogated.

Data derived from automatic communication links will go directly to a computer, eventually will go back to the pilot from the controller as correction data if needed. If the pilot has to answer, the controller will tell him what frequency to use for the response.

Ground based equipment will be designed on the no-more-complex-than-necessary idea. Radio direction-finders are accurate enough for a large portion of the airlines; with automatic communications providing positive identification, d-f's will be able to locate and identify craft for the controller. Where greater precision is needed, radar can be added, possibly 3-D radar or complex systems based on monopulse tracking radars where these become necessary.

Radar alone cannot provide adequate identifying information. IFF-type radar beacons would increase the complexity of airborne gear, load down some types of display. AMB is trying to steer clear of IFF's, figuring that rdf and radar can work well together since d-f's can see through weather that blinds most radar.

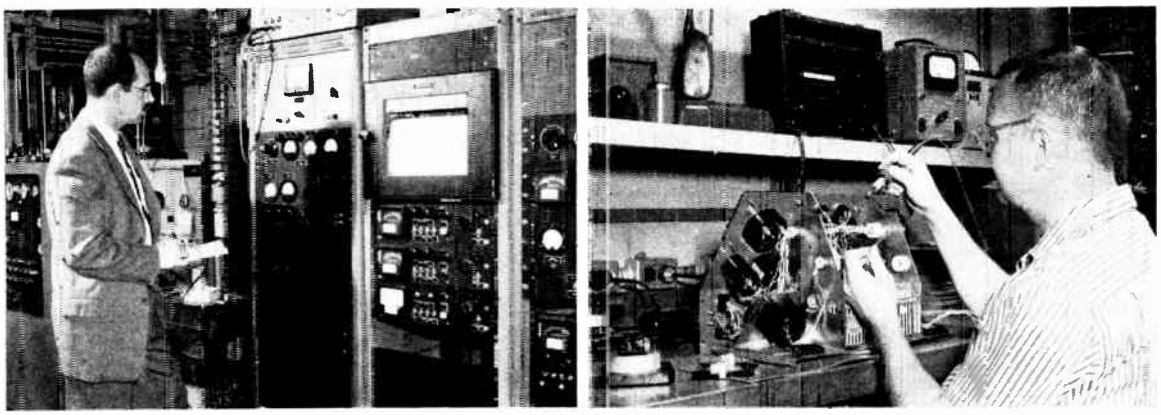
Data-Processing

General Precision Laboratories has a total of $8.2-million in contracts to build enroute and terminal data-processing centrals for New York enroute control and Idlewild Airport.

The enroute portion will be able to process 400 flight plans an hour, receive change data from craft in flight, continually monitor available airspace and provide the controller with plans for fitting traffic safely into it. The terminal portion will program landing sequences and takeoffs to keep holds and delays over the terminal at a minimum.

Data from the enroute center will be automatically forwarded by microwave or telephone link to SAGE and Air Defense Command centers to help them identify what's in the air. SAGE hookups will also help the centrals direct scrambling interceptors through civil traffic.

GPL's computer and RCA's AGACS will both be tested during 1959 and installed in the New York traffic area during 1960. New York is being used as a test area because its large volume of instrument traffic and prevailing weather make it a number one candidate for the Area Most Likely to Overload.



Electronic units in thermal laboratory (left) and automatic recording polarograph are examples of. . . .

New Business in Chemicals

The future looks bright as instrument engineers predict widespread use of electronic controls in chemical plants this decade. More and more engineers are now searching for new instrument systems to fulfill growing requirements of process plants

MIDLAND, MICH.—Many instrument engineers believe that within this decade many chemical process plants will be almost entirely electronically controlled.

The Dow Chemical Company's instrument men, although reserving judgment on this issue, are constantly seeking new ways of using instrumentation in their plant here and at other facilities. They revise, rework and design new circuits for equipment they use.

A few of their specialities include use of digital techniques in spectrophotometry and multicomponent infrared analysis. The plant here makes some 600 chemical products, most originating with a brine base.

Ninety-one engineers and technicians work in the instrument department handling hundreds of thousands of dollars worth of instruments. A recent instrument cost survey on production-sized chemical process plants shows instrumentation takes 25 to 30 percent of total direct cost. Here are a few examples of the part electronics plays at this moment in the chemical industry:

One instrument designed by company engineers is an infrared spectrometer used in the spectroscopy laboratory. It maintains constant servo-loop gain through changes in reference beam energy over a range of 20 to 1.

Also in the spectroscopy laboratory, a mass spectrometer is used for analysis of research-type samples of chemicals and plastics (see cover). Company engineers have provided the mass spectrometer tube with a heated inlet, regulated power supplies and an electrometer amplifier and recorder for recording mass spectrums.

The unit records spectrums over a mass range of 12 to 300. This involves recording ion currents of from 10^{-14} to 10^{-10} ampere.

In the monomer and resin section of the plant's plastics department, a heat-distortion tester was modified at a total cost of some $4,000. Four specimens of a resin can be tested at one time. Purpose is to check the deflection under a specified load over a temperature range of 25 C to 270 C. The load on each specimen is 264 psi. The test requires a 2 degree C rise per minute.

Important part of deflection is the first 0.01 in. Engineers are also interested in the shape of the entire deflection curve up to 0.1 in. Dial micrometers have been replaced by linear differential transformers whose input is fed to a modified four-point recorder driven in step with the temperature increase. The modification enables laboratory men to complete a test run even after working hours, with no one in attendance.

In the thermal laboratory (see photo at left, above)

scientists have streamlined electronic equipment used to make measurements of low temperatures and purity of materials.

An adiabatic calorimeter was designed for use from 5 to 330 K. It will operate by itself around the clock and produce a record of all pertinent data. Its measuring circuits include a platinum resistance thermometer calibrated from 10 to 350 K by comparison at 43 points with a platinum resistance thermometer calibrated by the NBS.

Thermal laboratory instrument men also designed and built an automatic recorder for resistance thermometry, incorporating a completely automatic Wheatstone bridge. It is built into a conventional recorder, contains decade coils operated by a Geneva gear mechanism, and increases the range of the machine 100 times.

With it, a continuous record of resistance vs time is made covering a range of 0 to 100 ohms that may be read to 0.001 ohm ± 0.001 ohm. Used with a 25-ohm platinum resistance thermometer, a temperature range of —190 to 550 C can be covered with a precision of 0.01 degree ±0.01 degree.

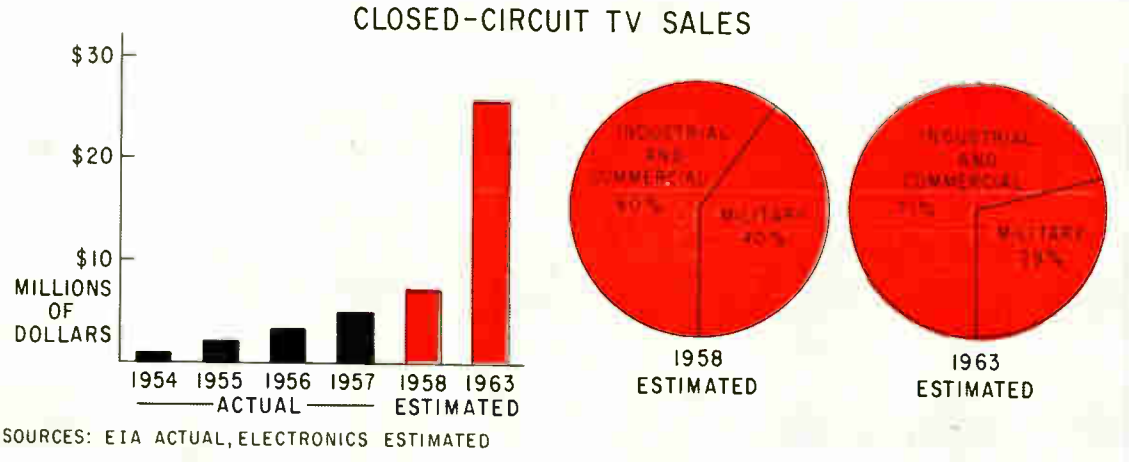
Plant engineers have also built polarographs (such as shown at the right, p 15) that automatically record current-voltage curves of chemical solutions.

The curves are obtained by placing solutions in a container or cell having a mercury anode at the bottom and having a dropping-mercury cathode. Current measurements are made while a direct voltage is applied to the electrodes and gradually increased. Fast visual interpretation can be achieved by using an oscilloscope with a polarograph.

These developments indicate the interest of the chemical and other process industries in electronic instrumentation and control—and they foretell a vast new market in the not-too-distant future.

They also present a challenge to the electronics manufacturers to become familiar with the needs of the chemist and develop means for solving them.

PRODUCTION and SALES



SOURCES: EIA ACTUAL, ELECTRONICS ESTIMATED

Closed-Circuit Tv Sales to Rise

Closed-circuit tv sales may be in for a substantial increase this year, a recent Electronics survey indicates.

Composite opinion of several sales executives in the closed-circuit tv field is that sales will total $7.3 million this year and $25.8 million by 1963. The more confident forecasters look for sales of $11 million in 1958 and $48 million five years hence. The more conservative ones anticipate sales of $5.5 million this year and $13.5 million in five years.

The survey also shows that the composition of closed-circuit sales is expected to change, with industrial and commercial users accounting for an increasing share of the total. It is thought that sales currently are split 60-40 between industrial-commercial users and military users. By 1963 the industrial-commercial portion is expected to increase to 71 percent, while military declines to 29 percent.

Last year sales totaled $5 million, according to the latest figures from the Electronic Industries Association. Sales were $1 million in 1954.

The yearly percent sales increase has ranged between 50 and 100 percent in the years from 1954 to 1957.

Simpler Work Saves Money

About $750,000 was saved last year by one firm carrying out an extensive work simplification program. Employees respond by pitching in and following program motto: "Work Smarter Not Harder"

DALLAS—A WORK SIMPLIFICATION PROGRAM here saved one firm about three-quarters of a million dollars last year, it's now learned.

According to company officials, Texas Instruments achieved these results in three steps: securing full support of top management, carrying the program to all employees, and getting top-flight people to execute the program.

Apparatus Vice President W. F. Joyce says, "The program extends from design to the assembly lines. Thus we get an awareness of cost control throughout the plant without having to use the prosaic

Work simplification class in session. Bulletin board shows projects, approximate savings on each

expression, 'Let's reduce costs.' In the long run, program helps by not letting costs inch up in the first place."

Work simplification courses are the backbone of the program. Two types of courses are held, one for supervisory and technical personnel, the other for production workers. The course for the supervisory people runs 24 hours, with a two-hour class held once a week. The production classes cover 14 hours.

The training course includes philosophy, tools and techniques.

The philosophy is explained as a state of mind which requires a questioning attitude on the part of all personnel and acceptance of change without loss of motion or creation of organizational friction.

Tools and techniques involve methods of the industrial engineer, such as the flow process chart, right and left-hand chart and multiple-activity chart.

The company has work simplification branches in the Industrial Engineering Departments of two divisions—Apparatus and Semiconductor-Components. Each branch has three men trained in work simplification.

As initial training, work simplification personnel attend a conference held each summer at Lake Placid by Allan H. Mogenson, consulting industrial engineer.

Classes at the plant are conducted in a conference room equipped with sound projector, opaque projector, cork boards and other educational aids. Each class usually consists of 16 employees. Members are picked by supervisors of different departments. Each department has its quota.

Emphasis is on individual participation. Each member is asked to bring several problems from his own work area. The goal is for each person to successfully complete one project before the course is finished.

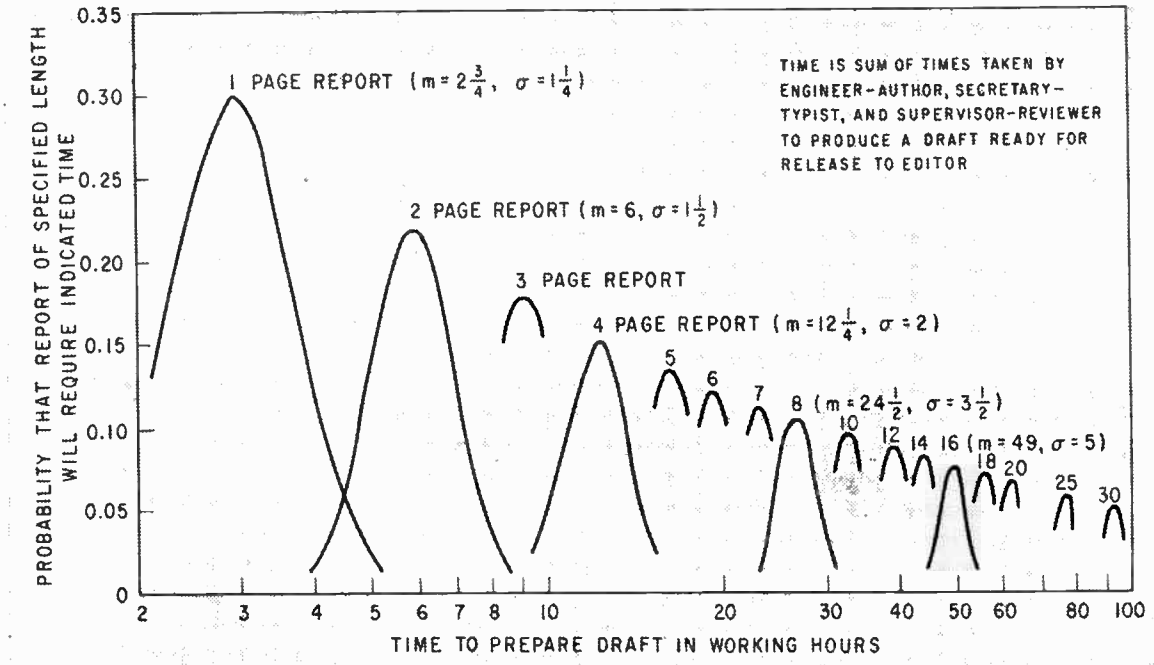
Cecil Dotson, operations manager of the Semiconductor-Components division, says, "There is no financial remuneration under the program because it isn't necessary. The company feels employees interested in their jobs will accept the challenge of improving if given the opportunity."

"This is in line with the motto of the program, which is "Work Smarter Not Harder."

An integral part of the program is a graduation banquet where recognition is given each employee who has completed the course. Also, accomplishments of each employee are detailed.

Dotson says, "Main benefits are that long-range program creates an atmosphere favorable to change and investigation of new ideas. This attitude makes cost reduction possible."

Movie making is part of job in work simplifying. Films give employees recognition, provide training aids, keep management informed



Guide for Writing Reports

ENGINEERS TODAY DEVOTE about 10 percent of their time to writing, a new survey shows. But most engineers feel only a quarter of this time is productive.

An engineering-writing job boils down into two parts: getting the data on paper, then polishing it.

Only the engineer can do the first part. The content of a report comes from him: his work, his ideas, his conclusions.

The chart, above, shows the lengths of time required by typical engineers to prepare first drafts for technical reports of various lengths. Report lengths are expressed in pages: 500 words of text or an illustration that occupies 70 square inches, or any combination. About a third of each report consists of illustrations. The times do not include hours spent polishing drafts. The working times do allow for usual daily interruptions.

Since no two people work at exactly the same pace nor are any two writing jobs alike, results shown in chart are expressed as probability distributions.

The chart has two uses. It solves a report-writing problem in either working hours or pages. If the first draft of a report is due in a week, the engineering manager should plan on about 12 pages. Approaching the problem from the other side, if the engineering manager outlines a report and estimates that the material will fill eight pages, he should allow about 25 working hours to produce the approved draft.

Here is one common complication, however. When the author starts to describe his work in words and diagrams, he often finds his information is incomplete. So it's back to the laboratory to get more data. This is one of the great values of report writing. It separates facts from assumptions, conclusions from hunches. For reports over six pages, added engineering accounts for much writing time.

Before an engineer starts writing, he would often do well to talk with an experienced writer or editor. The editor can help organize his material.

There is no universal rule either that "every engineer should be his own writer" or that he should "turn the writing over to a specialist". Some portions of any new report can only be written by the engineer who did the work. Other parts can frequently be added later to advantage by a writer or editor.

Here is why an outline is essential: It can show who is to write each part of the report, where or from whom he is to get the information, and how long each part of the report is to be.

An outline is a technique for assuring that a report says what it is intended to say.

But with even the best outline, the author still may have to rearrange the sequence of parts of the report. A simple technique is to start each part on a new sheet of paper. Then later, the author can insert, delete and rearrange by simply shuffling the sheets.

When writing the first draft forget so-called rules, such as "use short sentences". After the draft is complete, the author can polish sentence structure, vocabulary and punctuation. Better still, a technical editor can do it. In either case, by using these writing aids, the author or groups of authors can save time and produce an effective report on schedule.

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For additional information on specific applications and processes, write Merck & Co., Inc., Electronic Chemicals Division, Dept. ES-2, Rahway, N.J.

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Rare Earth Ferrites

Intensive research has paved way for early use of yttrium-iron garnets in microwave

MANUFACTURERS of low-frequency microwave isolators and rotators are now reported nearly ready for commercial production of components made of rare earth ferrites, perhaps by the end of this year. A number of firms and labs are using them experimentally.

Evidence of the garnets' lower frequency microwave value has been amassed by researchers since the characteristics were first outlined in 1956. Even in polycrystalline form, they provide extremely high resolution, low transmission losses and low power requirements.

"These materials virtually eliminate the theoretical low-frequency limit on nonreciprocal microwave devices," states a Gordon McKay Lab report, and "may make practical new devices based on nonlinear effects heretofore observed in ferrites at high power levels."

Use of ferrites at low microwave frequencies has been restricted by large resonance line widths. At the International Solid State Physics Congress in Belgium last month, Diamond Ordnance Fuze Labs reported that yttrium-iron garnets have the narrowest ferromagnetic line width of any known material.

Working with single crystal spheres, Diamond Ordnance Fuze Labs got line widths of 520 millioersteds at 9.3 kmc and 600 millioersteds at 3 kmc. A commercial producer of polycrystalline material, reports line widths of 55 and 30 oersteds at the same frequencies.

Saturation magnetization is also low, varying from under 100 gauss to 2,000 gauss at room temperature. This, and line width, can be varied over a wide span by varying the rare earth or blend of rare earths used, or by replacing the iron in the crystal with other metals.

A number of low-noise ferromagnetic oscillator-amplifiers have been made, or proposed, using single crystals. The high density and diamond-like hardness of the polycrystalline material also indicates they would be valuable as magnetic recording heads.

Regular crystal structure and transparency of the ferrites are helping researchers learn more about magnetic phenomena. The rare earths also show attractive cryogenic and semiconducting characteristics.

Polycrystalline material can be produced with consistent quality. The materials are mixed as liquids, rather than solids. Single crystals are also grown from solutions.

Rare earth ferrites are not expected to compete for applications adequately served by other magnetic materials. Costs of the rare earths are high, due to limited use.

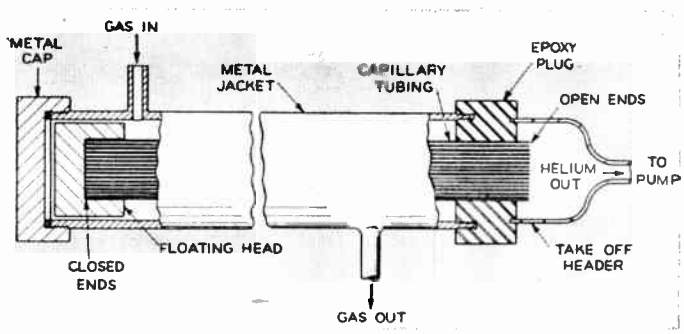
However, Battelle Memorial Institute reports, costs have been slashed considerably in recent years: yttrium oxide from $2.50 to 35 cents a gram; samarium, from $3 to 25 cents a gram. Gadolinium, which was not offered 10 years ago, is $350 a pound. A number of other industries are also interested in using rare earths.

Domestic supply is plentiful. Consumption is 1,500 tons a year, while the processing capacity in the United States is around 10,000 tons. Tube manufacturers use small quantities as electron tube emitters and getters.

Silica Strains Helium From Natural Gas

TECHNICAL DETAILS of Bell Labs' new helium recovery technique were discussed this month at a symposium attended by representatives of 36 natural gas suppliers and equipment manufacturers.

The process—basically, straining the helium from natural gas with silica capillary tubing—could solve the United States' helium supply problem (ELECTRONICS, p 27, March 20, 1957).



This three-foot-long helium separation tube will recover 200 cubic feet of helium a day from natural gas

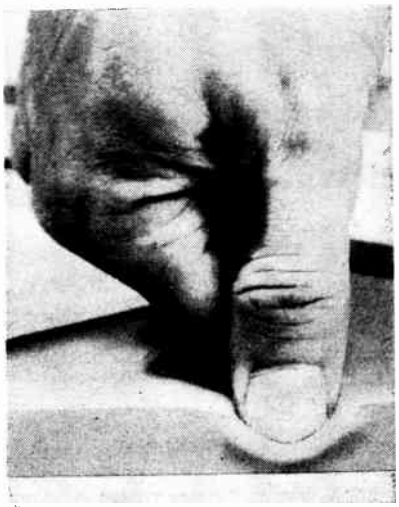
Diffusion units could be placed directly in gas pipelines or on natural gas distribution tanks to recover helium that is now lost. The lab models used in research work would probably supply enough to fill small quantities needed for experimental purposes.

Helium is important to electronics: in cryostats, as a leak detecting tracer gas in component production, as an inert atmosphere in some production operations and as a carrier gas in analytical equipment.

The experimental diffuser is about three feet long and about 1.5 inches in diameter. A similar cell, with about two cubic yards of capillary tubes could pass nearly 1,000 cubic feet a day of helium at room

temperature. Raising the temperature to 400 C would yield 100,000 cubic feet of helium a day if helium concentration in the gas supply is maintained at one percent. Helium made is 99.991 percent pure.

At present, Bureau of Mines plants recover helium from helium-rich natural gas wells. The general method is to separate the gases and helium by liquifying them. This requires large plants.



Silicone rubber forms high-temperature vibration damper

New Gasket Material Made

RESILIENT SILICONE rubber sealing and gasketing compound recently developed by Connecticut Hard Rubber Co. approximates the compression-deflection characteristics of firm sponge while retaining mechanical, chemical and dielectric properties of silicone rubber.

Usable temperature range is −100 F to 500 F. Its tensile strength is 800 to 1,000 psi; elongation, 600 to 800 percent; tear strength, 120 pounds per inch, and typical compression set, 30 percent of a 50 percent deflection after 70 hours at 300 F, according to the firm's report.

The company also produces a conductive gasketing made of aluminum alloy wire cloth impregnated with neoprene rubber. Its electronic uses include waveguide shielding.

Circuits May Duplicate Some Brain Functions

HUMAN RECOGNITION PROCESSES will be duplicated by data-handling system under development for the Navy at Cornell Aeronautical Labs. Called the Perceptron, the new system will use a 400-photocell mosaic to receive visual input and a 1,000-cell associative unit to recognize what it sees. Feasibility was tested this month with a conventional IBM 704 computer. The Perceptron will have applications in autopilots, automatic landing systems, library research and data-gathering systems. Its developers claim that it can be designed to accept aural as well as visual inputs.

TWO GUIDED MISSILES, each with an atomic warhead, will furnish the Sunday punch of a chemically fueled manned interceptor now under development. Propulsion system of the new F-108 will be similar to that of the chemically fueled B-70 bomber. Both airplanes are being developed by North American. Same development-production technique already used by the Air Force for missiles is planned for the F-108 and B-70. Groundwork for actual production is already being laid although the first F-108 test flight may be two years away.

NEW TRANSISTOR COMPUTER presently under construction for the Navy will make use of more than 7,000 printed-circuit building blocks, each measuring 2⅜ by 2½ in. Computer will be used for advanced warfare studies at Navy's Post Graduate School, Monterey, Calif. Known as the CDC 1604 high-speed scientific computer, the unit is being made by Control Data of Minneapolis. Work on a second CDC 1604 for the Navy is scheduled to begin right away.

TOOLS FOR SPACE STUDY recently disclosed by GE include plasma jet generator, shock tunnel, solar furnace and arc-discharge hypersonic gun. The plasma jet generator will simulate high temperatures of atmospheric reentry from outer space. The air-stabilized arc occupies a 1½ by 3 ft chamber and consumes 15,000 kw. The six in. by 120 ft shock tunnel blasts specimens with air at speeds of Mach 15 to 25. The solar furnace tracks the sun automatically, can subject specimen to 3,000 C by focusing sun's rays on it. Hypersonic gun uses arcs struck between evenly spaced electrodes to heat helium which expands to drive a projectile down a tube at speeds of 60,000 feet per second or more.

HIGH-ALTITUDE BALLOON launched this month by Convair carried small radio transmitter to permit tracking, ion collector and pressure-measuring device. Sixty-ft plastic tetrahedron rose to heights of 120,000 ft. Later models are expected to reach 140,000 ft and carry more elaborate instruments to study ion density, free electrons, cosmic dust, winds aloft, pressures, temperatures, cosmic and solar radiation.

TECHNICAL DIGEST

• **Temperature** of small rotating print-drying drum is controlled by induction heating in National Research Development Corp. system in England. Spun copper drum is single-turn shorted secondary of transformer. Induced current of 2,500 amperes brings drum to 120 C working temperature in 90 seconds and increases its resistance. Resulting drop in primary current actuates null-balance comparator circuit, amplifier, rectifier and relay to give on-off control.

• **Transistors** dissipate heat best into vertical metal surfaces. Rectangular fins with the short dimension vertical proved most effective in Motorola tests. For same weight, magnesium dissipated heat better than aluminum and copper.

• **Strophotron microwave oscillator**, developed in England, uses combination of magnetic and electric fields in resonant cavity to make emitted electrons move in zig-zag path from cathode to collector. The longer that electrons stay in their spiraling zig-zag path, the greater is the microwave energy picked up by output coupling loop in cavity.

• **Unexplained** rises in signal strength at about 900 miles during ground-to-air scatter transmission at 220 mc are now under investigation by Air Force Cambridge Research Center.

• **Miss distances** as great as 300 feet between missile and target drone are accurately measured by using radioactive source of about 1 curie in tiny machine screw inserted in missile. Scintillation-type detector and recording or telemetering equipment are installed in drone. Detector output can also be used to fire flare when missile reaches predetermined kill distance.

• **Precision** miniature metal-film resistors withstanding 250 C continuously can be made with values up to 10 megohms, according to Battelle. Various combinations of chromium and silicon are evaporated in vacuum and condensed onto smooth heated Pyrex base having preapplied electrodes. Temperature coefficient can be positive or negative, and is near zero for film thickness corresponding to about 30 ohms per square.

Three-Track Tv Tape System

BRITISH viewers are seeing tv programs that have been recorded on standard half-inch magnetic tape. B.B.C. is using the tape in a system called VERA for Vision Electronic Recording Apparatus.

A 15-minute program can be accommodated on a 20½-inch spool. It is recorded at 200 in./sec using two tracks for video, one for sound.

The incoming 3-mc video signal is split into two frequency bands of zero to 100 kc and 100 kc to 3 mc. The high-frequency band is recorded directly, but the low band is used to frequency modulate a one-mc carrier. The frequency deviations are carried in the second track. Modulation is only in one direction, so that one mc corresponds to minimum video amplitude. Four hundred kc corresponds to peak white.

This f-m carrier system has been adopted mainly to avoid the effects of tape imperfections and spurious amplitude modulation, which is more noticeable in the low-frequency components of the picture. It also avoids the fall off in low-frequency response which occurs during playback as a result of the slower rate-of-change of flux and the increase of wavelength at the high tape speed. A limiter is used just as in f-m receivers.

Unwanted amplitude variations also occur in the 100-kc to 3-mc video band, but these do not noticeably degrade the picture.

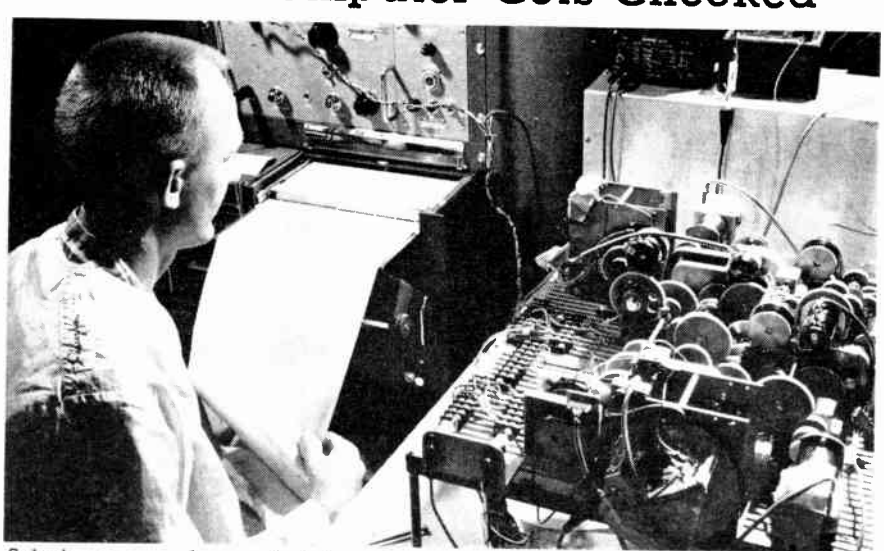
An f-m carrier is again used in the third track to record the sound.

Extreme precautions have been taken to maintain constant tape speed. Very small fluctuations in speed can cause noticeable horizontal displacements in the reproduced picture similar to line tearing. The initial tape drive is on the spools themselves, with automatic adjustment for the amount of tape they carry. The final drive is from a capstan that operates inside a loop of tape, providing drive for both oppositely moving sides of the loop at once. This system effectively isolates the tape loop from speed fluctuations in the spool drive.

During recording, the capstan drive is synchronized with the 50-cps power source. On playback, speed is controlled by a servo system that compares the reproduced sync pulses with the station sync pulses and applies appropriate correction signals. A tape speed accuracy of 0.04 percent is said to be obtained.

Equipment frequency response is flat to 2 mc and falls 3 db at 2.5 mc.

Air-Data Computer Gets Checked



Spinning gears and maze of wiring and electronic components is breadboard model of a new central air-data computer being evaluated at Minneapolis-Honeywell's Aeronautical division. Engineer is using electronic recorder to check operation. Computer will be used to register and integrate all factors that may be affecting the flight of an aircraft in which it is mounted

MEETINGS AHEAD

Aug. 1-3: Texas Electronic Clinic and Fair, Statler-Hilton Hotel, Dallas, Texas.

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

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

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

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

Aug. 19-22: Pacific General Meeting, AIEE, Senator Hotel, Sacramento, Calif.

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

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

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

Sept. 18-19: National Assoc. of Broadcasters, Fall Conf., Buena Vista Hotel, Biloxi, Miss.

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

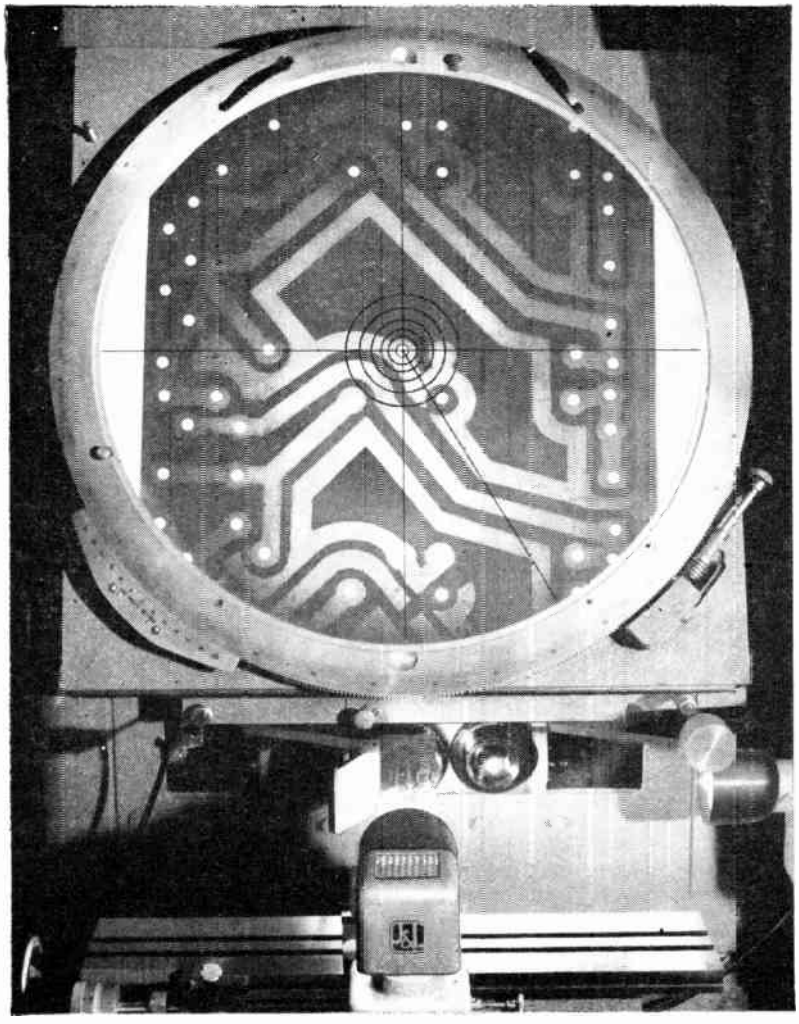
Oct. 1-2: Radio Interference Reduction, U. S. Army Signal Research & Devel. Labs., IRE, Armour-Research Foundation, Chicago, Ill.

Oct. 6-8: 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 Nucleonics, Exhibition Park, Toronto, Canada.

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

Oct. 13-15: International Systems Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa.



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.

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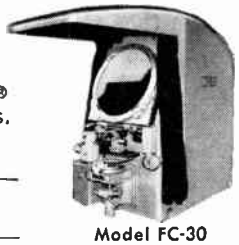


Model FC-30

Army Shows Missile Trends

Demonstration at White Sands Missile Range reveals Army's special design requirements

WHITE SANDS, NEW MEX.: Besides putting on a spectacular demonstration for 123 U. S. generals, NATO brass, industry officials and the public, Army vividly demonstrated to missile makers during its recent two-day show here, what it needs and what it is buying. Particular emphasis was on electronic ground handling and test gear.

Recurring theme of Project AMMO (Army Mobile Missile Orientation) was Army's special requirements in mobility, portability, speed of assembly, maintenance, compactness and simplicity of ground handling gear, and self-contained, nonjammable guidance.

As for the demonstration, eye-openers that went off with split second timing were: Honest John, equipped with nuclear warhead, liberating a nearby mountain top; Nike-Hercules streaking up from its pad and putting an end to a target drone's placid flight; and Hawk, Dart, Lacross, Talos, Corporal and Nike-Ajax all going through their paces.

Though not fired publicly, the solid-fueled Sergeant—described by an Army general as "America's first truly second generation surface-to-surface tactical weapon"—was successfully fired on June 30. Because of evident progress on the system and Army's need for the weapon, the Sergeant program is to be accelerated by at least a year, Lt. Gen. Arthur G. Trudeau, Army Chief of R&D, was heard to comment.

Design features incorporated in the JPL/Sperry Sergeant that Army likes provide a good idea of future missile trends. Sergeant is smaller than its predecessor Corporal (Sergeant is 32 ft long, 31 inches in diameter). The bird itself can be broken down and shipped in four reusable containers. Entire system is built around the plug-in replacement concept. All test equipment is go/no-go, housed in a single Army truck. Besides the truck, the erector launcher is the only piece of equipment needed in the launching area. Guidance is inertial and therefore self-contained and nonjammable.

An unexpected, and highly dramatic, highlight of the show revealed Army's increasing interest in the use of armed helicopters.

Demonstrating the helicopter's talent for surprise attack under the worst terrain conditions possible for surprising anyone, eight small Bell helicopters appeared suddenly from nowhere—though probably from out of gullies—and sprayed the field with cannon, machine gun and rocket fire. Another wave of larger helicopters followed, further demolishing the simulated enemy personnel and machine gun posts. Hot on the tail of this second onslaught, troops moved on to a relatively tranquilized situation and took control.

MILITARY ELECTRONICS

• **ARDC's third balloon** ascent, called Man High III, is scheduled to carry a heavily transducerized man in a 9-ft by 3-ft capsule to 100,000 ft altitude late next month. Purpose of the project is to gather psychological and physiological reactions of the occupant. An elaborate telemetering system will automatically transmit back to earth data sensed by the transducers, including heart beat, respiration, body temperature, temperature inside the capsule and on the skin. Occupant will have two-way communication with the ground on h-f and vhf radios. A portable tape recorder inside the capsule will store other information.

• **In the field of** guided missiles, electronics are contributing heavily to unreliability, according to Robert Lusser, R&D div., Ordnance Missiles Laboratories, Redstone Arsenal.

"Recently," Lusser says, "all failures of a guided-missile type were traced to their ultimate causes: none was caused by airframe components, three percent were caused by hydraulics, seven percent by booster components, 30 percent by propulsion components, and 60 percent by electronic components."

CONTRACTS AWARDED

Lewyt gets $2.5 million contract with USAF for transistorized indicators, known as Coordinate Data Monitor OA-1163, to be used with SAGE. Also, a $1,224,769 contract with Army Signal Corps for manufacture of high speed communication equipment.

Collins gets a $4,277,800 contract with Army Signal Supply Agency for 600 radio sets, AN/VRC-24, 600 radio control sets, C-1439, and 600 special purpose cable assemblies. Also, a $4,906,759 contract for 45 radio sets, AN/FRT and 45 modulator-oscillators, AN/GRA-32.

RCA wins a $1,541,130 contract with Army Signal Supply Agency for service test of area communication system and application.

Columbus Electronics, Yonkers, N. Y., gets a $360,000 contract with BuShips for high power filters for radio transmitters and frequency meters.

Texas Instruments gets a $5,928,000 contract with CAA for 19 airport surveillance radar units, bringing the number of radar units on order from TI to 35. Designated the ASR-5, the equipment will be identical to the ASR-4 now on order. Altitude coverage will be up to 27,000 ft. Each unit will have four 16-in. indicators, three for operational use and one for standby.

Martin gets an $8,727,000 contract with the Army for R&D on the solid-fueled Pershing missile.

Magnetic Amplifiers, Inc., New York, gets an additional production order from Martin for autopilots for the Mace missile. Total contracts for Matador and Mace missiles to date: $1 million.

Western Electric receives a $15,069,489 contract with the Army for Nike-Ajax and Hercules equipment.

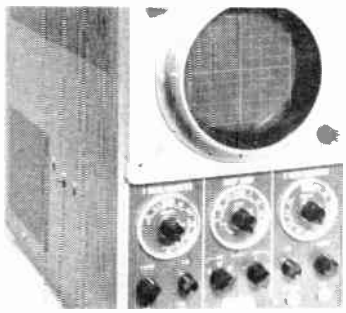
Chrysler is awarded a $6,089,000 contract with Army for work on Redstone missile components.

Packard-Bell gets a $7.3 million contract boost for ground support equipment for IRBM Thor, bringing the total to $14 million.

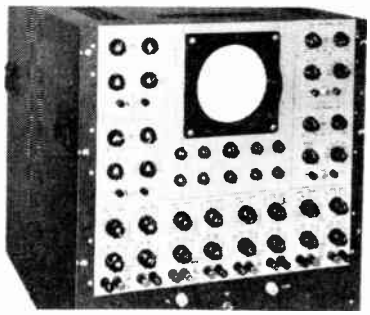
Ramo-Wooldridge is awarded a $13½ million contract with the Army for installation and operation of an automatic data processing system at Army Electronic Proving Ground, Fort Huachuca, Ariz.

Belock Instrument receives a $2 million Army contract for production of a new gun data computing system for control of artillery fire power for the 105-mm and 155-mm howitzers.

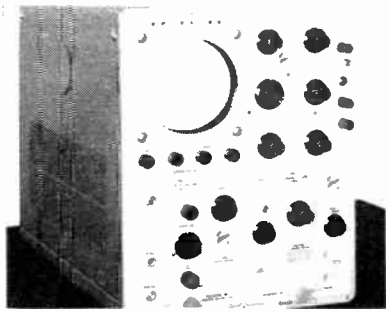
Highlight Oscilloscopes



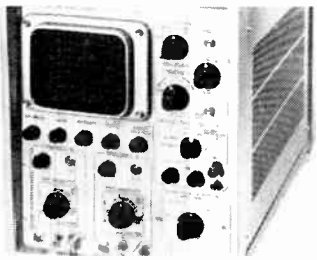
Electronic Tube Corp.
two-channel unit



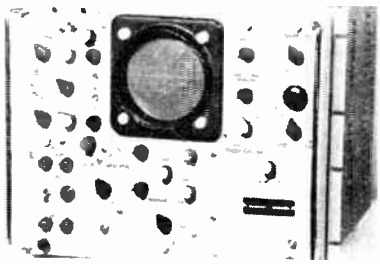
Lavoie Laboratories, Inc.
vertical preamplifier design



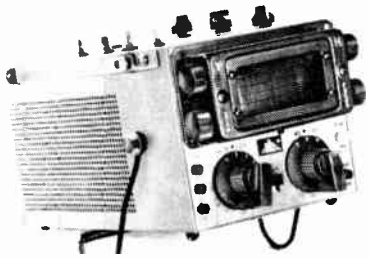
Waterman Products Co., Inc.
portable oscilloscope



Allen B. DuMont Labs, Inc.
general purpose oscilloscope



Advanced Electronic Mfg. Corp.
5-in. 4-gun scope



Tektronix, Inc.
plug-in type

THE EXACTING specifications required in missile research and testing have set new standards of accuracy and reliability. These are reflected in the design of new and improved oscilloscopes recently announced.

Allen B. DuMont Laboratories, Inc., 750 Bloomfield Ave., Clifton, N. J., (50) comes out with the 401-A general purpose l-f oscilloscope. It has controls for calibration setting or switching from automatic to driven sweep; metric calibration and readout; a triggered shutter for beam brightening; and continuous use of X- and Y-amplifier controls.

Now available at **Advanced Electronic Mfg. Corp.**, 2116 S. Sepulveda Blvd., Los Angeles 25, Calif. (51) is a 5-in. 4-gun scope incorporating interchangeable amplifier and sweep generator modules. Eight independently-controlled modules are combined in the 200-D.

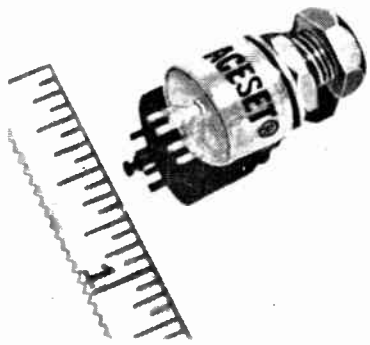
Tektronix, Inc., P.O. Box 831, Portland 7, Ore. (52) has the type 551, a d-c to 25 mc dual-beam plug-in oscilloscope. All type 53/54 plug-in units can be used in both vertical channels, providing a high degree of signal-handling versatility.

A two-channel oscilloscope (K-260) is reported by **Electronic Tube Corp.**, 1200 E. Mermaid Lane, Philadelphia 18, Pa., (53). It features identical, high-stability vertical amplifiers covering bandwidths from d-c to 500 kc with sensitivities as high as 200 μv per cm.

Lavoie Laboratories, Inc., Matawan-Freehold Rd., Morganville, N. J., (54) manufactures ths LA260 oscilloscope which has a plug-in single or dual trace vertical preamplifier design. This provides a super-regulated power supply for all voltages including d-c filament supply.

Portable oscilloscope (direct reading Pocketscope high-gain model S-17-A) may now be had from **Waterman Products Co., Inc.**, 2445 Emerald St., Philadelphia 25, Pa., (55). It weighs less than 8 lb. is 4¾ in. high, 5½ in. wide and 10 in. deep.

For more information use READER SERVICE Card

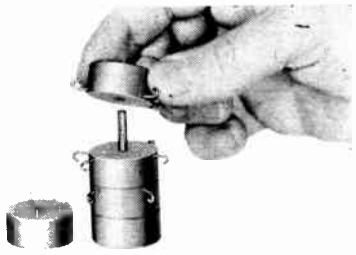


Microminiature Pot new resistances

ACE ELECTRONICS ASSOCIATES, INC., 99 Dover St., Somerville, Mass., has added 50 ohm, 15 K, 50 K and 100 K resistance values for Aceset microminiature, precision, wirewound potentiometers. High temperature cycling stability is made possible through the use of 20 ppm temperature coefficient wire. Electrical specifications feature: heat dissipation, 2 w at 60 C; voltage breakdown, 1,000 v d-c; electrical angle, 325 deg nominal; resistance tolerance, ±10 percent; linearity, ±5 percent. Circle 56 on Reader Service Card.

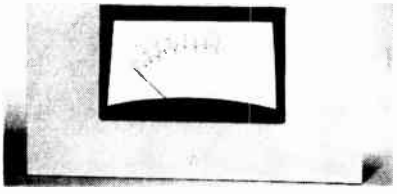
Toroidal Inductors in miniature size

Arnold Magnetics Corp., 4613 W. Jefferson Blvd., Los Angeles 16, Calif. Miniature toroidal inductors are announced. Inductances range from 1 mh to 7 henries, in a useful frequency range of 100 cps to 80 kc. Maximum Q for a typical 50-mh inductor operating at 11 kc is 130. Fully encapsulated and hermetically sealed, they meet MIL-E-5272A and MIL-T-27A specs. The series 781 line is designed for p-c boards or stacking on a single screw for chassis mounting. **Circle 57 on Reader Service Card.**



V-U Meters takes less space

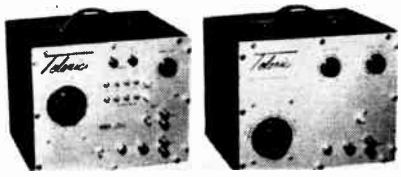
Assembly Products Inc., 75 Wilson Mills Road, Chesterland, Ohio, offers v-u meters that meet American Standard C16.5-1954, but occupy at least 15 percent less panel space than comparable units. They



are supplied in the new model 561 housing that exposes only the indicating area. The remaining 30 percent of the meter is mounted behind the panel. The new meter has a response time for a step change of 0.3 sec ± 10 percent. Overshoot is 1 to 1.5 percent. **Circle 58 on Reader Service Card.**

Tv Sweep Generator for vhf and uhf

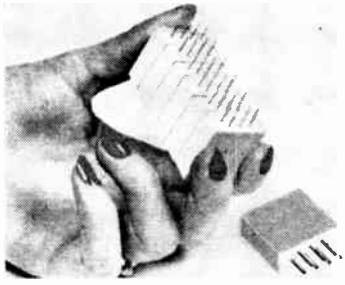
Telonic Industries, Beech Grove, Ind. A new tv sweep generator series is available in two types, for both vhf and uhf tv use. The vhf units feature electronic sweep, high output (1 v), and wide sweep width (25 mc). They cover channels 2-13 mc and i-f, and have crystal controller markers on each channel. The uhf type units cover a frequency range of 460-910 mc, with a sweep width of 0-50 mc. Output is 1 v into 50 ohms. Both types



are flat within 5 percent. **Circle 59 on Reader Service Card.**

Frequency Divider highly stable

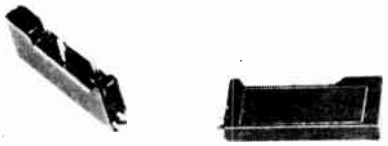
Rixon Electronics, Inc., 2414 Reedie Drive, Silver Spring, Md. A new series of binary dividers, employing a combination of two magnetic memory cores and a single transistor, can be cascaded to produce a division ratio of 2 to the "n" power where "n" is equal to the number of dividers in the chain.



Simple feedback circuits are employed to alter the ratio of any group of dividers and thus provide a means for obtaining any required division of less than 2". Typical of its uses is an arrangement of dividers for obtaining a 1,000 cycle pulse output from a 100 kc sine wave frequency standard. A 1,000 to 1 division from a 1 mc standard is also possible. Each binary divider is mounted on a p-c board and solidly encapsulated in epoxy resin. **Circle 60 on Reader Service Card.**

P-C Trimmer subminiature

Technology Instrument Corp., 531 Main St., Acton, Mass. Type TPC is a trim, slim trimmer for printed circuit assemblies. Performance is excellent and dependable in applications where operation ranges from − 55 C to + 225 C. Resist-



ance ranges are available from 100 to 30 K ohms. Power rating is 1.0 w at 75 C derated to zero at 225 C. The high temperature-resistant plastic housing is virtually hermetically sealed for moisture-proof operation. A 37 turn lead-screw adjustment permits fine trimming. Pretinned leads accommodate hot-tin dipping techniques. Spacing of leads are in multiples of 0.1 in. in accordance with standard p-c separations. **Circle 61 on Reader Service Card.**

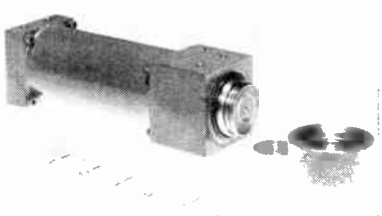
Linear Motion Pot tubular type

Bourns Laboratories, Inc., P.O. Box 2112, Riverside, Calif. Model 158 linear motion pot features compact, tubular configuration which permits installation inside an actuator. The miniature position transducer is noise-free at 25 g vibration

levels. It operates at 20-2000 cps without electrical discontinuity or error greater than ½ percent. Independent linearity determined by continuous plot is ± 0.5 percent for models with travels under 1 in. and ± 0.3 percent for units exceeding 1 in. travels. Standard travel ranges are 1, 2, 3 and 4 in., with the body lengths of 3, 4, 5 and 6 in., respectively. Resolution ranges from 0.001 to 0.004 in., depending on length of travel and resistance. **Circle 62 on Reader Service Card.**

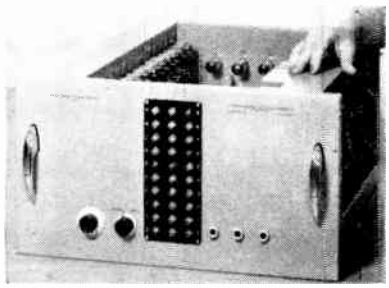
Analog Computer desktop size

DONNER SCIENTIFIC CO., Concord, Calif. Model 3400 analog computer with full complement of 10 chopper-stabilized printed circuit amplifiers, built-in null voltmeter, cyclic reset generator, all power supplies and problem board sells for $2,285. **Circle 63 on Reader Service Card.**



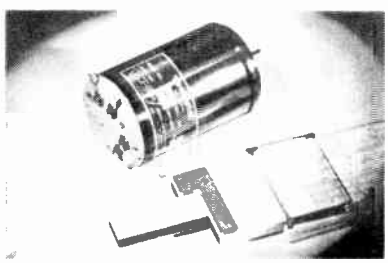
Event Recorder for —40 to + 200 F

AEROPHYSICS DEVELOPMENT CORP., P.O. Box 689, Santa Barbara, Calif. A recoverable pulse event recorder which monitors accurately whether or not an event occurs has been developed for use in missiles, sleds and other test vehicles. Designed to withstand high impact forces, it has a self-contained electrical system. In operation, a given signal fires a flash tube, which is recorded on a frame of photosensitive film secured in the armored, light-proof cap. Weight of the recorder is 1 lb. **Circle 64 on Reader Service Card.**



Commutator high-speed device

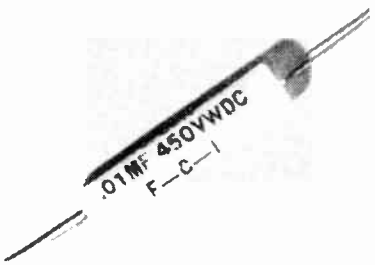
CONSOLIDATED ELECTRODYNAMICS CORP., 300 N. Sierra Madre Villa, Pasadena, Calif. Type 33-514 high-speed commutator provides a means for sequentially sampling, one at a time, a multiplicity of voltages. Up to 100 inputs may be sampled and these inputs can be accepted into the MilliSadic data-processing system at a rate of up to 1,200 samples per sec. Up to now the MilliSadic has been limited to 400 samples per sec. **Circle 65 on Reader Service Card.**



Precision Pot saves size, weight

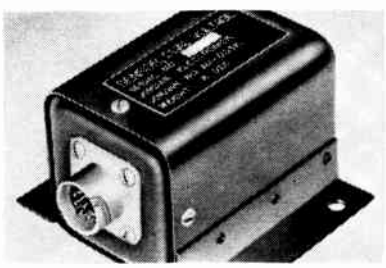
PERKIN-ELMER CORP., Norwalk, Conn. The Vernistat precision a-c potentiometer is a highly linear voltage dividing device which can also be made to conform to any mathematical or empirical function, even those which contain multiple slope reversals. It combines an autotransformer with an interpolating resistance to relate a me-

chanical shaft rotation to an electrical voltage. The Vernistat is finding wide application in servo systems and special purpose computers. It is used in missile and aircraft ground test gear as well as in control and guidance systems. **Circle 66 on Reader Service Card.**



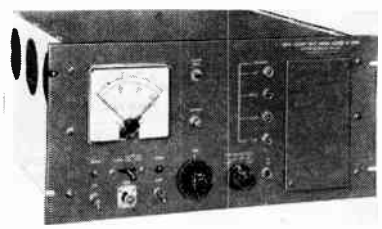
Capacitors for filter networks

Film Capacitors, Inc., 3400 Park Ave., New York 56, N.Y. A line of low cost capacitors for use in filter networks featuring close tolerance and high stability has been announced. The miniaturized units have been designed to achieve a tolerance of 1 percent, and a temperature coefficient as low as 100 parts per million. For maximum flexibility, the capacitors are available in polystyrene, Mylar and silicone-paper dielectric. **Circle 67 on Reader Service Card.**



Sensors voltage, frequency

Jordan Electronics, Division of The Victoreen Instrument Co., 3025 W. Mission Rd., Alhambra, Calif. Voltage and frequency Sensors that switch in a step function from full-on to full-off have been developed. They are available in either the magnetic amplifier or transistor amplifier types for monitoring undervoltage, overvoltage, or voltage band, and sensing under frequency, overfrequency, or frequency band. Nominal voltages range upwards from 18 v a-c, or d-c with accuracy of ± 1 percent. Frequencies nominally are 300 cps a-c, or higher, with accuracy of ± 2 percent. Small dimensions of the Sensors open new areas of application in aircraft safety and warning devices, signal circuit condition indicators, missile telemetering circuits and remote indicator panels. **Circle 68 on Reader Service Card.**



Pulse Counter four-range meter

Hamner Electronics Co., Inc., P. O. Box 531, Princeton, N. J. The N-701B logarithmic count rate meter is designed specifically for direct counting of pulses resulting from nuclear disintegrations. There is a maximum-count limit switch that may be used to activate an alarm system or other external device that will signal the presence of excessive radiation. **Circle 69 on Reader Service Card.**

Magnetic Clutches and clutch brakes

PIC Design Corp., 477 Atlantic Ave., East Rockaway, L. I., N. Y., offers a complete variety of newly designed magnetic clutches and clutch brakes in Mark 14 or Size 11 frame diameters. They feature output torques to 16 oz in.; power consumption, 3 w. **Circle 70 on Reader Service Card.**

Literature of

MATERIALS

Copper-Clad Laminates. National Vulcanized Fibre Co., 1058 Beach St., Wilmington 99, Del. Describing the company's line of copper-clad Phenolite, a 6-page folder charts performance and illustrates 11 grades of copper-clad materials for printed-circuit applications. It also lists typical uses for these materials. **Circle 71 on Reader Service Card.**

COMPONENTS

Ceramic Capacitors. Mucon Corp., 9 St. Francis St., Newark 5, N. J. Bulletin 11-1 describes a complete line of subminiature ceramic capacitors in a four-page brochure. Axial leads, stand-off units, ribbon leads, multiple units and various terminal arrangements are shown. **Circle 72 on Reader Service Card.**

Hermetic Seal Connector. DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y. The illustrated Series 1400 bulletin gives specifications, outline dimensions and general information on a compact and rugged connector developed primarily for aircraft applications. **Circle 73 on Reader Service Card.**

Microwave Ferrite Devices. Cascade Research Division, Monogram Precision Industries, Inc., Los Gatos, Calif., has issued a new short-form catalog covering a line of ferrite components. Included are load isolators, modulators, circulators and circulator switches. **Circle 74 on Reader Service Card.**

Silicon Rectifiers. Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind. Data sheets No. 27 and 28 cover the J-1 and J-2 series silicon rectifiers. Electrical ratings, characteristics and output voltages are shown. **Circle 75 on Reader Service Card.**

Subminiature Filter. The Daven

the Week

Co., Livingston, N. J. A new 4-page brochure on the subminiature LC "Egg Crate" filter line is announced. The unit's basic theory and a representative list of possible applications are examined. Circle 76 on Reader Service Card.

EQUIPMENT

Automatic Voltage Regulators. The Superior Electric Co., Bristol, Conn. Complete standard line of Stabiline type EMT (Electro Mechanical Transistorized) automatic voltage regulator is described in 12-page bulletin S358EMT recently published. Circle 77 on Reader Service Card.

Microphone Calibration System. Transducers, Inc., 2957 Honolulu Ave., La Crescenta, Calif. A new high level microphone calibration system for sine wave operation is described in a free engineering specification sheet. Circle 78 on Reader Service Card.

Semiconductor Power Supply. Power Sources, Inc., South Ave., Burlington, Mass. Brochure ES-4000 describes the characteristics and performance data on the company's new PS-4000A transistorized power supply. Circle 79 on Reader Service Card.

FACILITIES

Capacitor Specifications. Vitramon, Inc., P.O. Box 544, Bridgeport, Conn., has published a bulletin showing the tests to which its fixed porcelain dielectric capacitors are subjected to assure meeting high reliability specification. Circle 80 on Reader Service Card.

Component Embedment. Plastronic Engineering Co., 721 Boston Post Road, Marlborough, Mass. A recent brochure announces availability to the electronic industry of a complete epoxy encapsulation service. Circle 81 on Reader Service Card.

Middle East Gets Computer

Oil company's office in Saudi Arabia sees assembly this month of 70 tons of electronic equipment

DHAHRAN—This Persian Gulf hub of the Middle East oil market is seeing a special sort of magic this month. It's the magic of 70 tons of electronic equipment that will centralize, simplify and speed the paper work involved in the functioning of an oil company.

When all 28 pieces of gear are assembled at the Arabian American Oil Company's general office building in this Saudi Arabian port city, the big data-processing installation will keep track of the supplies that Aramco acquires, stores and issues.

Supplies ranging from clinical thermometers to complete drilling rigs flow to Aramco from all over the world. Their purchase, payment and storage involves hundreds of agents, accountants, engineers, shipping men and other specialists in widely separated offices on five continents.

For each of the thousands of supply items that Aramco uses or intends to use there is a record on paper. Each record states physical description, source or manufacturer, cost, means of shipment to Saudi Arabia, present location, quantity in inventory, rate of consumption, anticipated reordering date and other vital information. This data, usually coded, is the basis of supply decisions and control.

Transfer of supply information from many scattered records to uniform data-processing cards was a monumental task. To build the master card file, based on complete Aramco material system catalog, a service bureau in New York City key punched more than 1,000,000 cards, weighing nearly two tons.

The cards are flying to Saudi Arabia in batches. When they are all there, the information on them will be transferred electronically to reels containing 34,000 ft of magnetic tape each, which one man can hold in his hands.

Says Aramco: The initial application for logistics is only the first of a series of programs planned for the data-processing installation in Saudi Arabia.

On another electronic front, Aramco has acquired two gamma ray radiography units for inspecting pipeline welding. The units use capsules of iridium 192 as energy sources. They promise speedier inspection than previous method of photographing welding with X-rays.

Controls for the units include: monitoring devices operating on the same principle as a Geiger counter, which measure the amount of radiation in the air; also, a highly sensitive, fountain pen-shaped dosimeter which tells the operator how much exposure he may be receiving at any given moment.

DEVELOPMENTS ABROAD

• **In Britain** eight trade associations with common data processing problems have set up the Electronic Forum for Industry (EFFI) to co-ordinate R&D and systems applications. EFFI will present management viewpoints, aims to "guide industry through the growing complexity of electronics" without impinging on the professional societies.

• **In Milan** recently Soviet Professor Constantinov, of the University of Moscow Physics Department, announced that Russia plans to build a 60-bev accelerator. Same announcement was made last year by a colleague and then hastily denied. Now, says Constantinov, building of a prototype 7-bev accelerator is already underway.

• **Edinburgh** firm Ferranti Ltd. announces some details of its new airborne interception radar and pilot's attack sight system (Airpass). It consists of a radar unit and a sighting system. Radar locks onto the target through a wide angle scanning system. Range and speed data are fed to the sighting unit. Computer figures pilot's best interception approach course. Automatic warning tells him to break off attack if he tends to overshoot target. Normal visual sighting methods may also be used, but system is designed primarily for interception attacks without visual contact.

EXPORTS and IMPORTS

Iraq's Development Board and Ministry of Development announce that bids will be invited later this year for supply of equipment for the proposed Baghdad international airport. Gear includes radio and telegraph communications equipment, air traffic control gear, radio aids to navigation and radio test gear. Applications for invitations to tender must be submitted before July 30 to London consulting engineers, Sir Alexander Gibb and Partners, Queen Anne's Lodge, Westminster, London S.W. 1.

British instrumentmaker Wayne Kerr Ltd. has just set up an American subsidiary in Philadelphia,

Wayne Kerr Corp., to handle distribution and service. For the time being, design and manufacture of the ratio-arm impedance-bridge instruments in which Wayne Kerr specializes will remain at the firm's Surrey headquarters.

Eastern Europe figures in a sales drive by British instrumentmaker Kelvin & Hughes Ltd. Firm's industrial division is sending a mobile unit to Poland, Czechoslovakia, Hungary, Rumania and Yugoslavia. Marine division caravan is going to Polish, West German and Belgian ports.

France's Thomson-Houston Co. has opened a new electronics center in the Paris suburb of Bagneux. The firm, whose electronics department now employs 5,000, believes the regrouping of facilities devoted to research, experiments, tests and creation of prototype equipment will bolster its competitive position.

In London, Ferranti reports its newest computer, Perseus, is nearing completion. First $900,000 unit will be installed this fall in Stockholm at the Trygg and Fylgia Insurance Co.

Finnish-British cooperation has produced a new industrial multichannel tracer scintillation spectrometer. When standard scintillation counters failed to meet the specifications of Finland's EKONO, Inc., Association for Power and Fuel Economy, the firm took its problems to Britain's Nuclear Enterprises (G.B.) Ltd. EKONO wanted a rugged, centralized recording instrument that would handle data from several points along a production line, and would stand up to vibration, humidity, dust and temperature changes. Resulting instrument meets these needs, recording data from points up to 1,000 ft away. For nucleonics work the instrument also contains a differential discriminator for screening out radiation at a given energy level; this makes it possible to work with more than one isotope simultaneously, depending on the energy spectrum.

One-Band Idea Stirs Tv Groups

Proposal calls for creating 25 tv channels in row, abolishing uhf slots. Plan goes to Senate for study

PLAN BEING STUDIED this week by Senate Commerce Committee is causing considerable stir in broadcast circles. If adopted it could simplify the tv spectrum considerably, also bring about changes in receiver design.

Advanced by FCC Commissioner T. A. M. Craven, the proposal calls for consolidating all tv channels in one continuous block from 174 to 324 mc. This would provide 25 channels in the upper end of the vhf spectrum.

Craven's plan is by his own admission "solely exploratory in nature," and does not constitute a firm proposal.

One group that would benefit from the plan are uhf broadcasters, many of whom are having trouble keeping up with vhf competitors. Of all uhf stations erected, 49 percent have gone off the air, compared with one percent for vhf. Under the new plan, there would be no vhf/uhf intermixture problem. The 420-mc uhf band would be entirely cleared of tv allocations.

Goal outlined in the Craven proposal is evolutionary, aimed at being in effect in seven to 10 years from now. As intermediate relief to uhf stations, Craven suggests pushing deintermixture to group uhf and vhf stations by market areas.

In commenting on this phase of relief for uhf broadcasters, American Broadcasting Company proposes that FCC switch allocations to set up vhf drop-in stations. ABC's plan is that these stations be low-power installations with directional antennas and other safeguards to prevent interference.

Other major network comment is being withheld until study of the proposal is completed. Another reason for delayed comment is industry expectation of the Television Allocation Study Organization report. It is anticipated the TASO findings will be a major factor in any reallocation plans. Final committee reports are expected to be in by the end of August, with the end of this year seen as target date for the complete wrapup and analysis.

Similar wait-and-see view is being taken by the military who, under the Craven plan, would get some 200 mc of uhf space in exchange for about 100 mc of space vacated by tv. The military space thus derived would be allocated by the President to various armed forces users.

FCC ACTIONS

• **Grants** transfer of control of KGEZ, Kalispell, Mont., from Copper City Radio Co. to Skyline Broadcasters, Inc. Consideration, $84,000.

• **Approves** assignment of license for KIST, Santa Barbara, Calif., from H. C. Butcher to Western States Radio for consideration of $197,000.

• **Issues** initial decision towards granting application of Williamsburg Broadcasting Co. for a new a-m station to operate on 740 kc, 500 watts daytime, in Williamsburg, Va.

• **Accepts** application from Interurban Broadcasting Corp., Laurel, Md., for a new standard broadcast station to be operated on 900 kc with power of 1 kw daytime, employing directional antenna.

• **Advises** of issuance of initial decision looking towards grant of application of New Hanover Broadcasting Co. for a new tv station to operate on channel 3 in Wilmington, N. C.

• **Grants** c-p to Pomona College, Claremont, Calif., to change frequency of noncommercial educational f-m station to 88.9 mc, increase erp to 600 watts.

• **Permits** KDKA-FM, Pittsburgh, Pa., to conduct relay service for a period of six months for the purpose of transmitting programs of a broadcast nature to other stations on a multiplex basis.

• **Grants** license to Cleveland Broadcasting Co. covering installation of new f-m antenna and increase in erp for WERE-FM.

STATION MOVES and PLANS

KOIL, Omaha, Neb., receives license covering installation of new main transmitter.

KWFM, Minneapolis, plans erp increase to 21 kw, antenna height to 150 ft, installation of new transmitter.

WBZ-TV, Boston, gets approval on request to use driver of old main transmitter as auxiliary.

WCLA, Claxton, Ga., receives approval to change antenna/transmitter and studio location; and install new transmitter.

KSEL, Lubbock, Tex., plans to change type of daytime transmitter.

WAUC, Wauchula, Fla., receives permission to sign off at 6 p.m.

local time, or sunset, whichever occurs earlier until Sept. 30.

WLPO, La Salle, Ill., receives license covering installation of former main transmitter as auxiliary at present transmitter site.

WGTO, Cypress Gardens, Fla. is granted extension of completion date to December 30.

KDWD (f-m), San Diego, Calif., plans to change transmitter type, decrease erp to 3.7 kw, raise antenna height, change antenna-transmitter location.

WMRI, Marion, Ind., is granted assignment of license to WMRI, Inc., from Chronicle Publishing Co. Transaction includes WMRI-FM, KD-5754 and KSG-263.

WDOV, Dover, Del., receives license covering use of new type transmitter and change in erp.

WEUP, Huntsville, Ala., gets approval of application for new a-m station.

KTBC, Austin, Tex., plans operation of main transmitter by remote control, day and night, using directional antenna for nighttime.

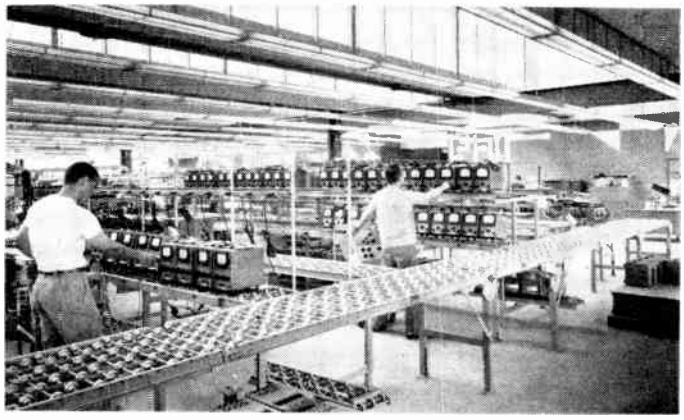
WBMX, West Point, Ga., receives modification in c-p to change studio location and transmitter type.

KAGT, Anacortes, Wash., is granted authority to sign off at 7 p.m. Monday through Saturday and at 2 p.m. Sunday until Sept.

WTMT, Louisville, Ky., receives permission to extend completion date to Oct. 6.

KMMJ, Grand Island, Neb., plans changes in antenna and ground system and deletion of remote control operations.

KVSO-TV, Ardmore, Okla., receives c-p modification to change transmitter location, change erp to 91.4 kw visual, 45.7 kw aural, raise antenna height to 846 ft.



Workers' Plans Pay Off

VISITORS to Hewlett-Packard Company's new plant facilities in Palo Alto, Calif., won't find a suggestion box anywhere on the premises.

The reason, according to H-P president David Packard, is simply that the company has never needed one. H-P's penchant for a free and easy exchange of ideas is no better illustrated than in the planning that went into the company's newly-opened plant facilities—two ultramodern buildings on a low hilltop overlooking Palo Alto and Stanford University. The structures provide an additional 170,000 square feet of space for the firm's expanding production and research activities.

"The idea," explains Stan Selby, plant manager, "was to get as many of our own people in on the planning as we logically could. One way was to organize about 12 employee groups and to give each group responsibility for a certain phase of the overall planning. Group discussions covered all phases of plant operations."

Decided early by the company's planners was which H-P instruments to produce at the new plant and which to continue manufacturing at the original plant in Palo Alto. It was decided the new plant would produce instruments requiring considerable assembly, such as voltmeters, audio oscillators, power supplies, frequency counters and oscilloscopes. The "old" plant (last addition was built in 1954) would continue to make units requiring more machined parts, such as signal generators, microwave and wave-guide instruments and digital recorders.

The number of production lines, the number of employees required on each line, the space between lines, the best utilization of lighting (see picture of instrument testing area with sawtooth ceilings)—these and countless other questions were resolved by the various planning groups.

"What really impressed us about this method was the amount of good hard thought that went into each recommendation," Selby says. "We also had a surprising number of cost-saving innovations suggested by our people. I doubt if a roomful of outside experts would have come up with half as many imaginative and practical ideas."

Hewlett-Packard counts several benefits from its unique planning program. Its employees are better informed. They have a keener, wider knowledge of production techniques and overall company operation. This increased knowledge has helped in the new plant's smooth start. The employees also have a greater sense of participation and company responsibility. As Selby puts it:

"This plant wasn't handed to our people. They planned it and built it. There's a big difference—and one that's quite apparent in the way they go about their work and in their pride in the company and its products."

TI Directors Elect Officers

AT A RECENT meeting of the board of directors of Texas Instruments, Inc., in Dallas, Texas, election of new officers was announced

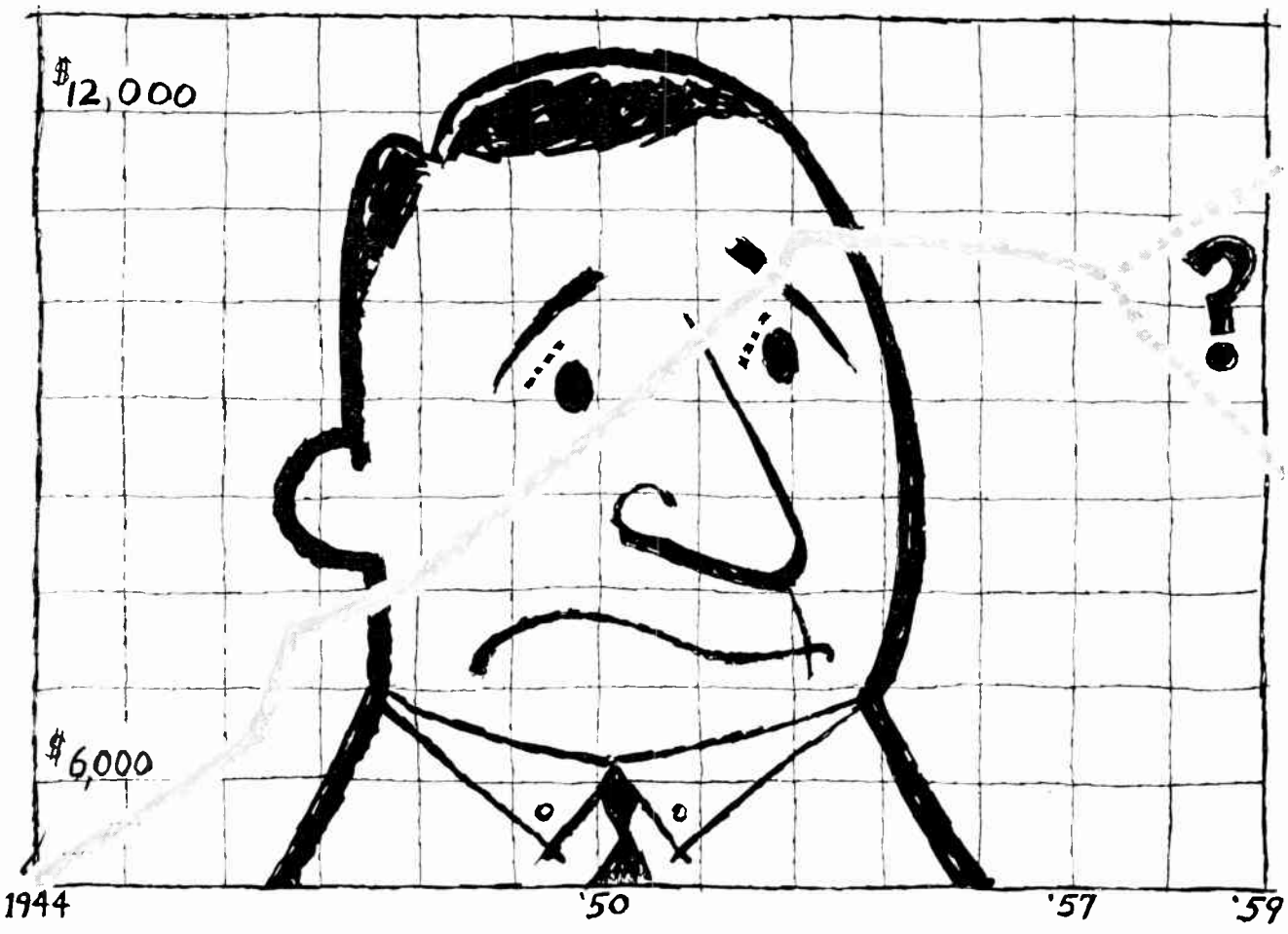
New chairman is J. E. Jonsson. Elected president is Patrick E. Haggerty. Eugene McDermott, a cofounder of the company and chairman of the board since 1948, continues as an officer and director, and was elected chairman of the executive committee.

IRC Appoints

INTERNATIONAL RESISTANCE CO., Philadelphia, Pa., has appointed Leo J. Jacobson (top photo) to head, engineering division, and John Bohrer (below) to head, research division.

Jacobson has been with IRC since 1949 as chief engineer of the Philadelphia plant, and manager, quality control.

Bohrer joined the company in 1950, and has held the positions



The "career-curve" of a man named Carter

Charlie Carter started out like a ball of fire. First ten years — terrific! Then he seemed to slow down. Other men — younger newcomers — passed him by. Why?

What happened to Charlie? Nothing. It's what has been happening to industry. Business has become so big and busy, it moves too fast for men who seem satisfied with the status quo. Never have management ranks been so wide open for "get-up-and-go" men.

Look ahead, read ahead, get ahead. Know your job inside out. Be an "authority". But don't stop here. Be a growing man . . . equally knowing on the cross-currents of other job functions within your company — well-informed on the working inter-relationship of all operations — the big picture.

How can you do this comfortably? With the business publication you have in your hand right now. Its editors know your field. They work in it — right at your side. They are your eyes and ears. They go to the places you would go if you had the time. They look, listen, question for you. They review, analyze, edit . . . deliver all that is important to you. They eliminate the non-essential and the time-wasting. They do this fast and accurately. And because they write about that which is as close to you as your own family — your future . . . you will find your favorite McGraw-Hill publication more and more a pleasure as well as a profit to read.

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of research chemist and assistant director of research.

Computer Outfit Relocates Div.

COMPUTER Control Co. of Wellesley, Mass. and Los Angeles, Calif., specialists in the fields of digital products, systems, and mathematical services, announce relocation of their western division to 2251 Barry Ave., Los Angeles, Calif. (picture).

G. G. Crissman is vice president in charge of the western division.

News of Reps

GENERAL PRECISION LABORATORY, Pleasantville, N. Y., has appointed two new sales reps for its closed-circuit television equipment.

Smith and Purdy Associates will handle GPL sales in the New England area. Covering Kansas, Missouri, and Nebraska is **Lee Mark Associates.**

The Systron Corp., Concord, Calif., announces the appointment of the **J-F Sales Co.,** as manufacturers' reps covering southern California.

Product lines of Intercontinental Missile & Electronics, Inc., Hawthorne, Calif., will be handled in California, Arizona and Nevada by the **J. S. Kempf Co.**

Kelby-Schumacher Associates, a new electronic component parts representative firm, recently established offices in the Philadelphia-Baltimore territory.

The Narda Microwave Corp., Mineola, N. Y., names **John Francis O'Halloran & Associates,** as exclusive reps for the state of California.

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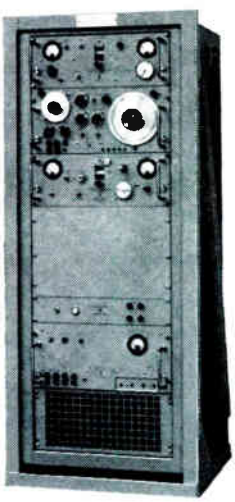

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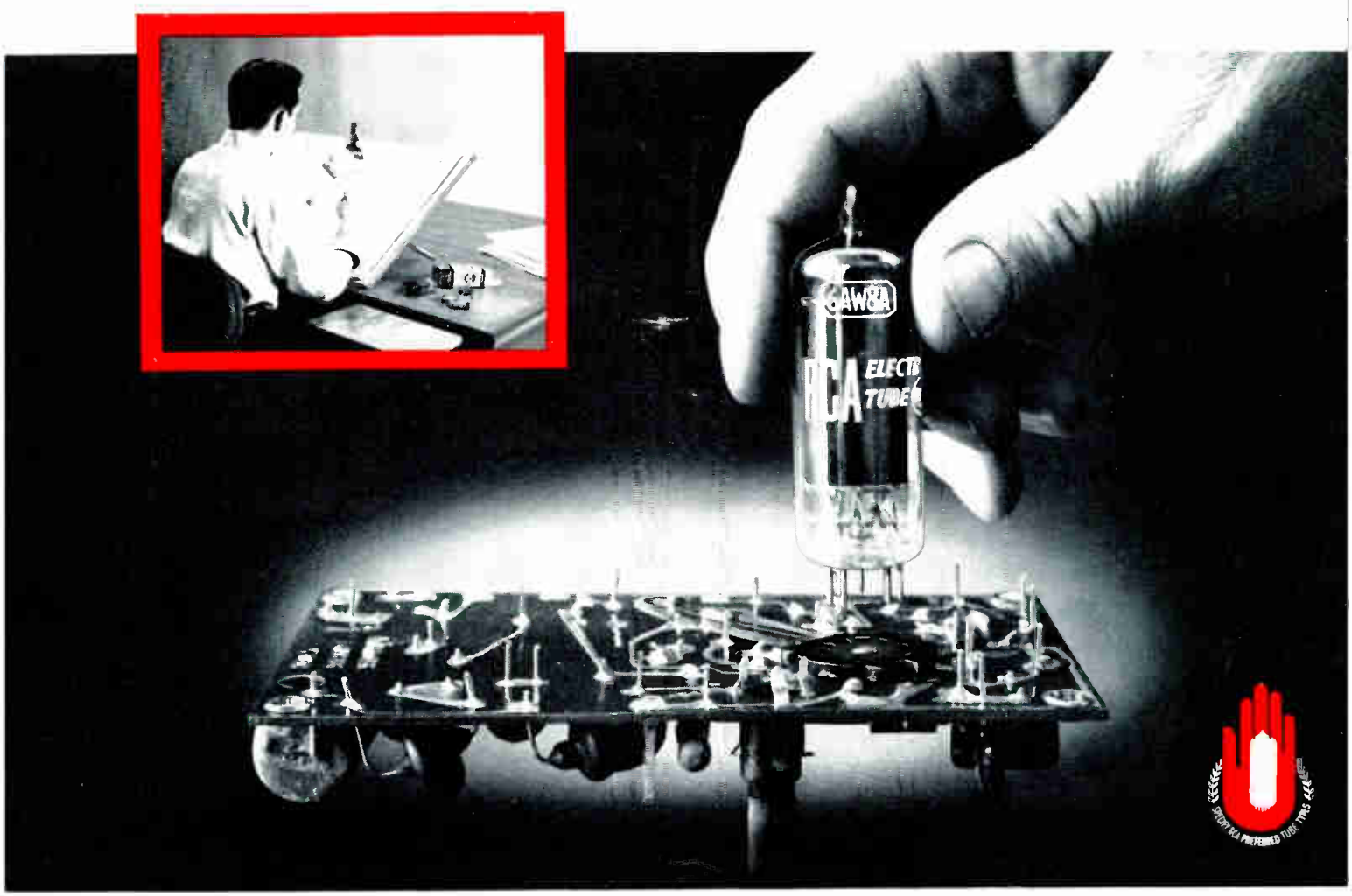
(formerly DYNAC, Inc.)

DYMEC, Incorporated
395 PAGE MILL ROAD, PALO ALTO, CALIFORNIA
TEL: DAVENPORT 6-1755

Custom-Engineered Instrumentation Systems

RCA-6AW8-A

–Preferred Tube Type– Offers You Extended Life, Improved Performance



The popular RCA-6AW8-A features highly improved performance and longer life in video-amplifier service —improvements resulting directly from RCA's Preferred Tube Types Program!

THESE IMPROVEMENTS WERE MADE TO THE RCA-6AW8-A

Precise control of heater coatings eliminates "thin spots"—assures durable heaters which minimize heater-cathode leakage and heater-cathode shorts. Special-alloy cathodes offer better cathode activation which reduces slump and assures stable operation. A new cathode design reduces the number of welds—minimizing handling and contamination.

Heat dissipation is improved by the use of heavier side rods on pentode grid #1. Pure nickel pins reduce pin-contact noise and facilitate insertion and removal of the tube. From tip to stem, the glass is controlled for stress and strain to assure durability under wide variations in temperatures. Final test procedures include cycled operational life tests to simulate "on-off" usage in the home.

Result: the highly reliable RCA-6AW8-A for superior video amplifier performance. By designing your circuits "around" proved-in-service Preferred Tube Types, such as the 6AW8-A, you take advantage of the benefits of lower tube costs, more uniform tube quality and better tube availability.

There's a Preferred Tube Type to meet virtually all of your TV, AM and FM receiver requirements. Ask your RCA Representative for the up-to-date list of 62 Preferred Types. Or, write Commercial Engineering, Section G-19-Q-4, Harrison, N. J.

FREE! SLIDE-GUIDE TO PREFERRED TUBE TYPES helps you quickly select the RCA Preferred Tube Type for a specific service. Gives base diagrams and characteristics. Call or write your RCA Field Office for your "Slide-Guide"

RCA Field Offices

East: 744 Broad Street
Newark 2, N. J. • HUmboldt 5-3900

Midwest: Suite 1154, Merchandise Mart Plaza
Chicago 54, Ill. • WHitehall 4-2900

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