

MAY 30, 1958

electronics

business edition

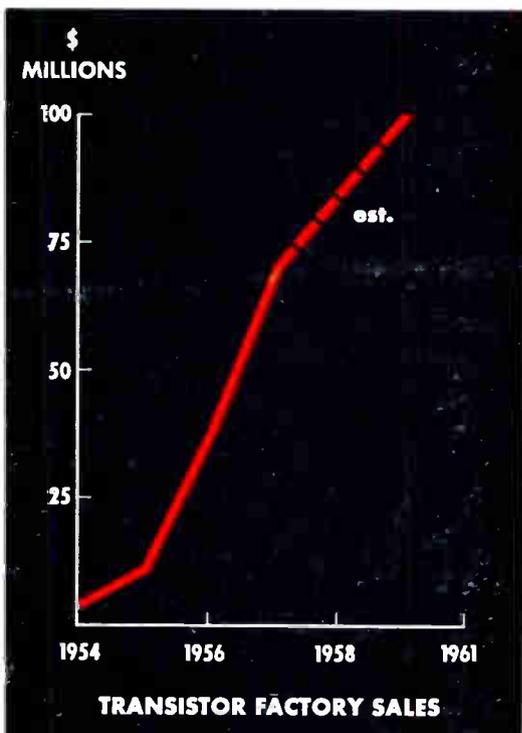
A MCGRAW-HILL PUBLICATION

VOL. 31, NO. 23

PRICE FIFTY CENTS

Drone Systems: A New Market

Unmanned surveillance aircraft need
guidance and telemetry gear p 13

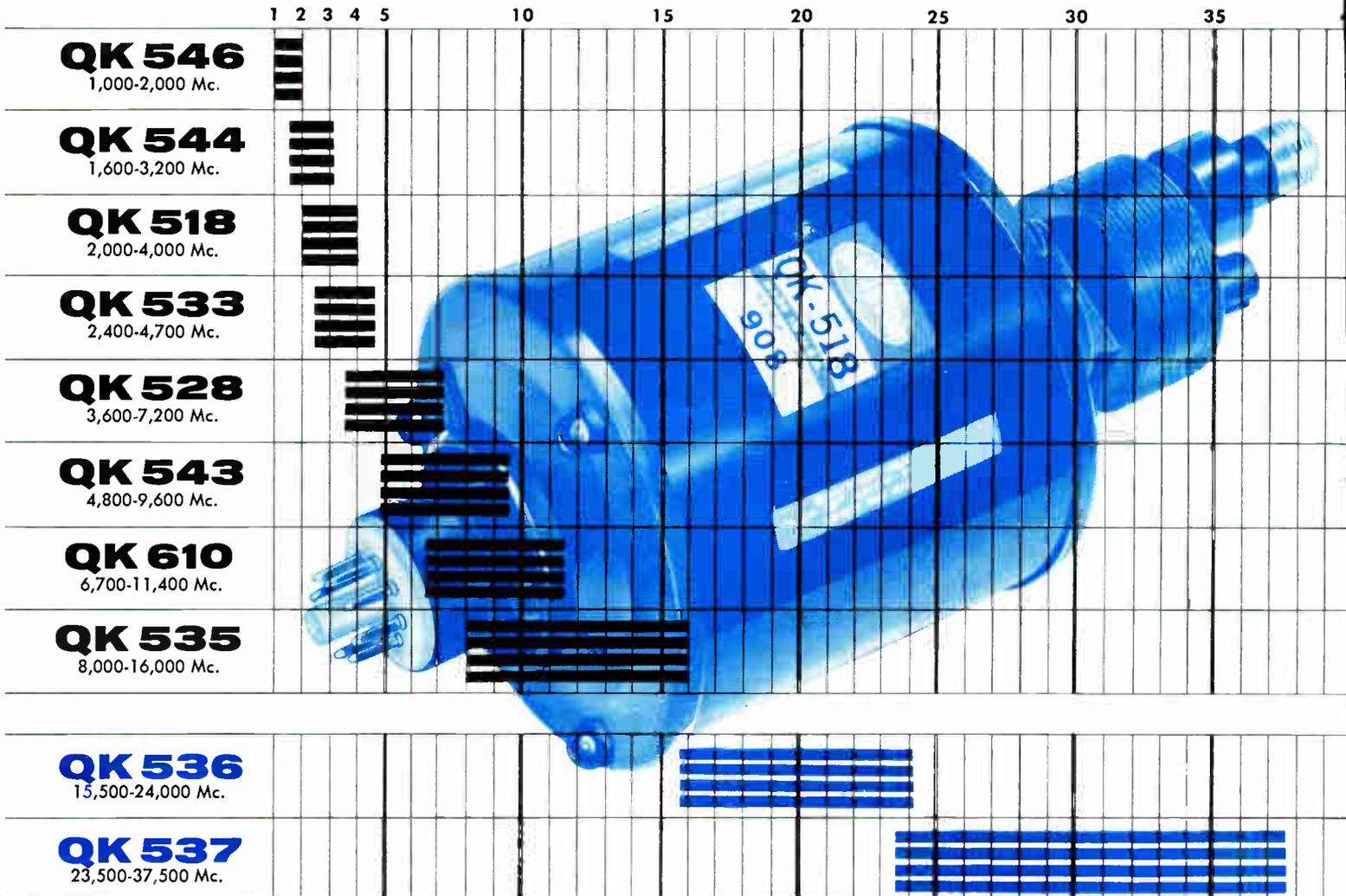


Transistor Sales Near \$100 Million

Technological progress during first
10 years multiplies uses p 15

VOLTAGE TUNABLE

In Thousands—Mc.



**NOW — 2 New Raytheon Backward Wave Oscillators
DOUBLE FREQUENCY COVERAGE**



Specifications — QK518. Frequency: 2,000-4,000 Mc. Rapid electronic tuning by varying delay line voltage from 150-1,500 v. Power output: 0.1 to 1 w. Complete with compact permanent magnet. Approximate maximum dimensions: 10" long, 4 3/8" high, 4 7/8" wide.

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Raytheon Backward Wave Oscillators are gaining wide acceptance in micro-

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Excellence in Electronics

Shoptalk . . .

SURVEILLANCE DRONES. Need to scout enemy territory, monitor hostile radar and radio frequencies and inspect hazardous radiation areas has caused the Army to push development of advanced surveillance drones.

The sensing devices that go in these unmanned planes are reaching new heights in sophistication. Guidance, controls, telemetry and data reduction—both airborne and on the ground—are just a few of the electronic systems involved.

Associate Editor Mason talked with Army officials who are buying the equipment as well as companies heavily engaged in its design and development. His article begins on p 18.

TRANSISTOR DECENNIAL. Ten years ago, on June 30, 1948, Bell Labs announced the invention of a radically different electronic component, the transistor. The invention brought a new dimension to our industry. That much is history, but it is only a fraction of the transistor story.

Transistor makers know that there is much more to come in the next ten years. Annual sales can increase from under \$100 million today to \$500 million as the average price of transistors drops to 50 cents. Some equipment heat-dissipation problems may be solved with built-in semiconductor refrigeration units.

The outline of transistor prospects prepared by Associate Editor Sideris with the help of ELECTRONICS field editors and McGraw-Hill news bureaus distills the thinking of engineers and businessmen who know transistors best. Their story begins on p 15.

RUSSIANS TALK UP SPACE. They are stating the problems they expect to solve within the next decade by electronics and other technologies. And they are doing it articulately for maximum psychological effect at home and abroad.

What the Soviet scientists are saying about both past and future studies of space further confirms the sober realization that only our best civilian effort can win this event in the marathon for men's minds.

Associate Editor Janis has kept up with an increasing tide of information and reports since Sputnik I from McGraw-Hill World News correspondents abroad and sources here at home. His timely digest of Soviet space activities appears on p 17.

SPLITTING CHANNELS. This year's FCC action creating new split-channel requirements for mobile radio bands will shape up as a good thing for the electronics industry. So said representatives of equipment manufacturers and large users of mobile radio queried recently by Associate Editor Emma. See p 18.

Coming In our June 6 Issue . . .

Coming In Our June 6 Issue

● **Compatible Stereo.** Perfection of a stereo disk that could be played monaurally on a monaural phonograph without sacrificing performance or damaging the disk was the aim of J. B. Minter of Components Corporation and J. H. McConnell of ElectroSonic Labs.

In their system a 25-kc carrier, frequency-modulated by the differential output signal from two stereophonically placed microphones, is superimposed on a monaural signal derived from the sum of the outputs. The composite signal is recorded conventionally on a disk with a lateral cutter. For stereophonic playback, an auxiliary preamplifier limits and detects the difference signal and combines it with the sum.

● **Radio Telescope.** The free world's most powerful radio telescope, which helped track the Russian Sputniks, is described by C. N. Kington of Husband and Co. in Sheffield, England. The giant radiation detector locates, identifies and tracks astral bodies that emit low-energy radio waves. It can also measure geometric properties of solar bodies.

An analog computer solves equations describing antenna attitude required to track radiating source. The generated command signal is compared to antenna repeat-back signals, and the resulting error signal actuates the main servo drive thereby correcting antenna attitude. High gain and resolution from 10-cm to 20-meter wavelengths are obtained.

● **Welding Control.** Some of the difficulties encountered in small component assembly-line welding may be eliminated by a weld-energy control system. Author A. V. Rainis of Raytheon points out that five control functions—low heat, weld heat, up-slope time, weld time and down-slope time—cover most welding problems in making special-purpose tubes.

● **Simulated Targets.** The need for simulating targets in training radar personnel has been a pressing one. A promising solution is suggested by J. I. Leskinen of the United States Naval Training Device Center in Port Washington, New York.

Realistic target patterns are displayed on radar screens by gating delayed pulses that simulate azimuth, elevation and range. A course generator simulates target speeds up to 2,400 knots.

● **Ergmeter.** A meter that can measure bursts of energy has been designed by L. A. Rosenthal of Rutgers University. The instrument employs a bolometer bridge which converts the input signal to heat by integrating input power with respect to time. Heat upsets the bridge balance and produces an output signal that is amplified and applied to a peak holding voltmeter.

electronics business edition

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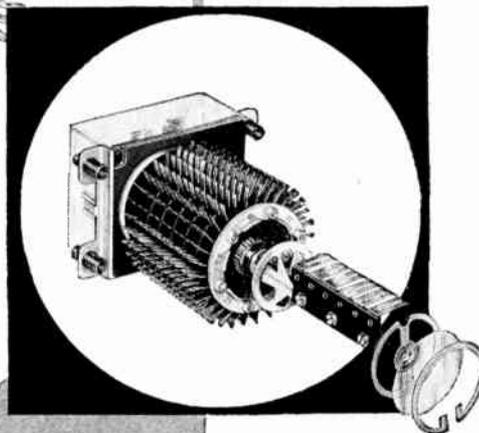
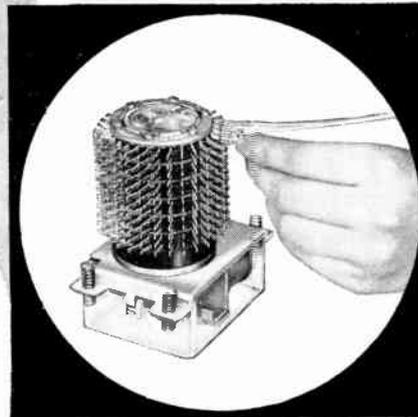
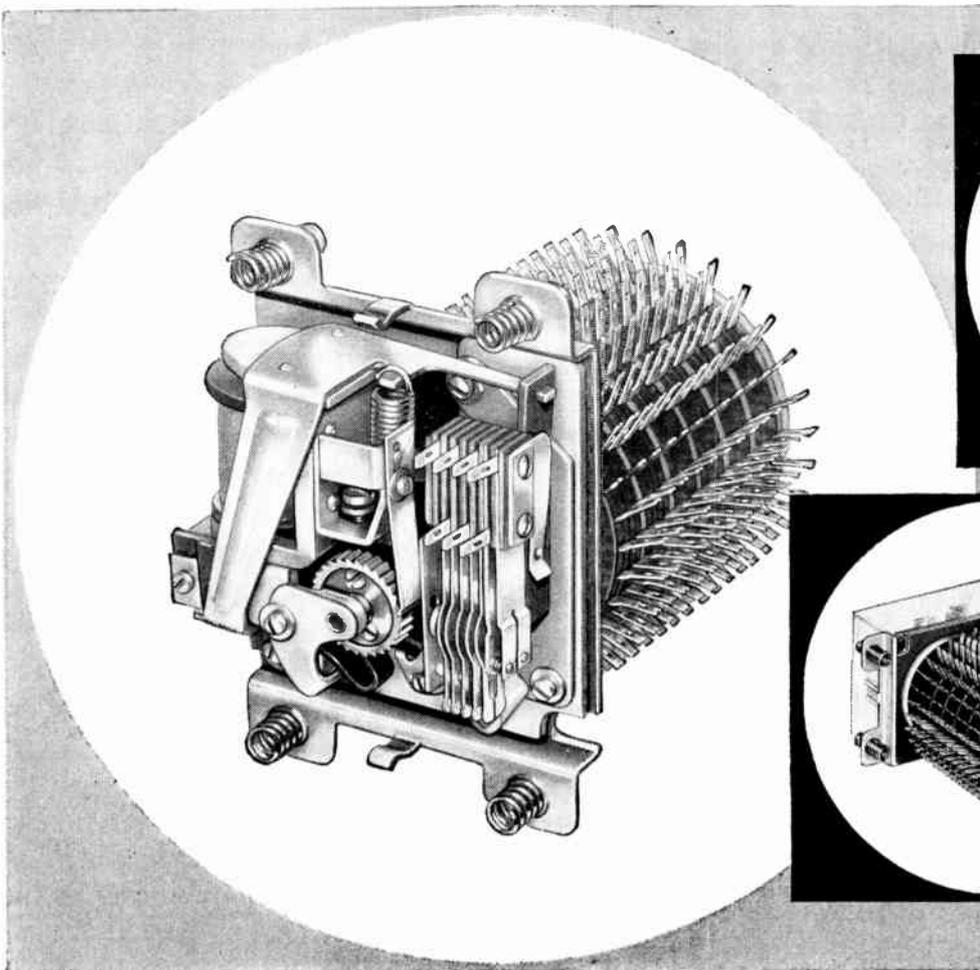
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Issue at a Glance

- Plant Charge-Offs.** Higher depreciation allowances may be a key to more plant spending and industrial electronics sales. p 5
- Shares and Prices.** Transistor Manufacturers. p 5
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- Figures of the Week.** p 6
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- Executives in the News.** Gavin of A. D. Little. p 10
- Comment** p 10
- Drone Market Expanding Fast.** Complex sensing, guidance, telemetry and data-reduction equipment now help the military see behind enemy lines, create a new and growing business for electronics manufacturers. . . p 13
- Production and Sales.** Relay Sales to Rise 18 Percent. p 14
- Transistors Push \$100 Million.** Sales register 88-percent gain in early 1958. Manufacturers predict a 400-million-unit annual market by 1965. . . p 15
- U.S.—Russian Joint Earth Satellite?** A Soviet scientist describes a dream of launching three tv-equipped earth satellites to scan the earth's surface. And he hints the U.S. might be asked to join in. p 16
- USSR Talks Up Space Plans.** Instrumentation plays vital role in Soviet research rockets as a space race for men's minds shapes up. Pravda chides 'microscopic' satellites, boasts of new data from tons of instruments sent to record heights. p 17

DIGEST CONTINUED ON NEXT PAGE



FIND THE PIVOT PIN IN THE STEPPING MECHANISM OF THIS NORTH RVF ROTARY SWITCH

The RVF Rotary Switch can be furnished with 2, 4, or 6 levels, 30 points, each with single wiper. With double wipers, the same switches become 4, 8, or 12 level units respectively with 15 points per level. Bank contact ratings: 1 amp. at rest; 2 amp. resistive when stepping. Off normal contact ratings .4 amp. resistive. Switch may be driven self-stepping or externally. Gold plated bank contacts and wipers are available for low level switching. Available with 12, 24, 48, 110 V. D.C. coils. Built-in spark suppression on 24 and 48 volt switches. Mounting dimensions: 1.968" x 3.661" O.C. Overall height: 4 3/4" height above mounting, 3 1/2" (max. dimensions for 6 level switch). Weight: 1.32 lbs.

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Result: North's high speed RVF Rotary Switch has no pivot pin — *no wear point to change critical dimensions of any part of the stepping mechanism* — reliable, accurate stepping for the life of the switch!

The North RVF Rotary Switch allows maximum flexibility in circuit approach — no longer is the engineer limited to one input per bank level — *any combination up to 30 inputs and/or outputs per bank level affords a flexibility hitherto unknown.* North's RVF Rotary

Switch is being used for programming, sequence control, routining test equipment, as an impulse counter, memory device, and for tallying and counting in production control.

The bank terminals on the North RVF Rotary Switch are designed for use with either soldered connections or solderless connectors.

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For the most versatile, flexible, reliable Rotary Switch on the market — **NORTH RVF ROTARY SWITCH.**

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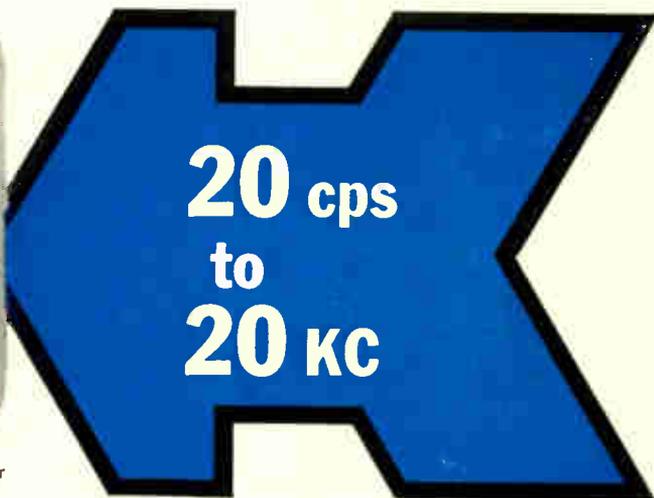
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-hp- 330B/C/D Distortion Analyzer



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- Measure noise on voltages as small as 100 μ v
- High sensitivity, high stability
- Wide band 20 db gain amplifier
- Oscilloscope terminals; built-in VTVM

-hp- 330B Distortion Analyzer is a basic instrument universally used to measure total audio distortion, voltage level, power output, gain, total AM carrier distortion, noise and hum level and audio signal frequencies.

Model 330B consists of a frequency selective amplifier, a regulated power supply and a VTVM. The amplifier operates with a resistance-tuned circuit to provide almost infinite attenuation of the fundamental while passing harmonic frequencies at normal gain. Negative feedback minimizes distortion and insures uniform response and stability. The VTVM is used to set the load and measure the value of harmonic voltages, thus providing a direct reading of total distortion. The VTVM may also be used separately.

For FM broadcasters, -hp- 330C is offered. Similar to 330B, this instrument has a meter with VU ballistic characteristics meeting F.C.C. requirements and a VTVM frequency range of 10 cps to 60 KC.

For FM-AM broadcasters, -hp- 330D is available. This instrument is similar to -hp- 330C except for addition of an AM detector covering 500 KC to 60 MC.

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SPECIFICATIONS

Distortion Measurement: 20 cps to 20 KC.

Dial Calibration Accuracy: $\pm 2\%$ full range.

Elimination Characteristics: Reduces fundamental frequency more than 99.9%.

Accuracy: $\pm 3\%$ full scale at distortion levels of 0.5%.

Sensitivity: Distortion levels of 0.3% are measured full scale. Accurate readings on 0.1% levels.

Input Impedance: 200,000 ohms, 40 μ mf shunt.

Required Input: 1 v RMS.

Voltmeter: Nine 10 db ranges, 0.03 to 300 v. Full scale sensitivity all ranges.

Noise Measurement: 300 μ v full scale. Coverage 10 cps to 20 KC.

Oscilloscope Terminals: 75 db max. gain from AF input to terminals.

Price: -hp- 330B, \$410.00 (cabinet), -hp- 330C, \$440.00 (cabinet), -hp- 330D, \$455.00 (cabinet), (Rack models \$15.00 less).

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



now has a 200 KC 'scope for \$435! Seen it?

Plant Charge-Offs

Higher depreciation allowances expected to stimulate plant spending and industrial electronics sales

PROPOSED CHANGES in depreciation allowances, now being considered by Washington, would put more butter on the bread of electronics firms.

These changes would increase the amount of depreciation deductible from income and other taxes.

The new liberalized depreciation allowances Congress is expected to pass this year would be an important help in maintaining demand for new plants and equipment, reports the McGraw-Hill Department of Economics. Industrial electronics sales, which amounted to \$1.3 billion last year, are heavily

dependent on plant and equipment spending.

Moreover, the electronics industry itself is one of the leading spenders on plants and equipment.

Here's how liberalized depreciation allowances would stimulate capital spending: They would give the investor a better chance of making a profit and getting his money back.

With present depreciation allowances, the investor has frequently found at the end of the depreciable life of his investment, that the total of his depreciation charge-off is less than half the cost of replacement.

All new depreciation allowance plans now being given serious consideration would allow depreciation to be charged over a shorter life. For instance, new plants now being charged off over 20 to 40 years, would be charged off in 10 to 20 years. Heavy machinery, now charged off in 15 to 20 years, would be charged off in 8 to 10 years.

SHARES and PRICES

TRANSISTOR sales of \$20.3 million in the first quarter of this year were 39 percent ahead of first quarter sales in 1957. More than 5,125,000 transistors were sold last quarter, a unit increase of 76 percent.

Sales for all of 1957 totaled \$69.8 million and 28,738,000 units, an 87-percent dollar increase and a 124-percent unit increase over the record sales of 1956. Since 1954 transistor dollar sales have multiplied about 15 times and unit sales have multiplied more than

20 times in the same period.

The phenomenal growth of transistor sales volume has attracted an increasing number of manufacturers. Some 45 U. S. firms have been licensed to manufacture the solid-state devices. About half of this number are publicly owned.

Typical Transistor Manufacturers	Recent Price	Indicated Dividend Rate	Percent Yield	Earned per Common			Traded	1958 Price Range
				1958	Period	1957		
Beckman Instruments.....	19½	2.00	...	d-0.06	(6 mos) ⁴	0.55	NYSE	19 -25¾
Bendix Aviation.....	47¾	2.40	5.0	0.97	(3 mos) ⁴	1.25	NYSE	44½-53
Bogue Electric.....	1¾ ¹	...	...	0.13	(6 mos) ³	d-0.21	OTC	.....
Clevite.....	16¾	1.00	6.1	0.28	(3 mos)	0.88	NYSE	15¾-18¾
Columbia Broadcasting..... (CBS-Hytron)	29¾	1.00 ³	3.3	2.82	(year) ⁴	2.13	NYSE	24½-30½
Fairchild Camera..... (Fairchild Semiconductor)	24¾	...	...	d-0.44	(3 mos)	d-0.07	ASE	19½-31½
General Electric.....	59¾	2.00	3.4	0.56	(3 mos)	0.73	NYSE	57 -64¼
General Motors (Delco Radio).....	39¾	2.00	5.1	0.65	(3 mos)	0.93	NYSE	33¾-39¼
General Transistor.....	20¾	...	...	1.13	(year) ⁴	0.64	ASE	17¼-24¾
Globe-Union (Centralab).....	15½	0.80	5.2	1.62	(year) ⁴	1.42	ASE	14½-17¼
Hoffman Electronics.....	26¾	1.00	3.7	0.59	(3 mos)	0.70	NYSE	21 -26¾
Mallory.....	25¼	1.40 ³	5.5	0.27	(3 mos)	0.67	NYSE	25¾-28¾
Minneapolis-Honeywell.....	87½	1.75	2.0	0.61	(3 mos)	0.75	NYSE	76 -88¾
Motorola.....	36¾	1.50	4.1	0.35	(3 mos)	1.10	NYSE	35 -42¼
Philco.....	14¾	...	...	d-0.28	(3 mos)	0.20	NYSE	12¾-17½
RCA.....	33¾	1.50	4.5	0.59	(3 mos)	0.87	NYSE	30¼-35
Raytheon.....	26¾	2.00	...	0.58	(3 mos) ⁴	0.40	NYSE	21½-27¼
Sperry Rand.....	18¾	0.80	4.3	0.91	(9 mos) ⁴	1.22	NYSE	17¼-20¾
Sprague Electric.....	26¾ ¹	1.20	4.5	1.78	(year) ⁴	1.75	OTC	.....
Sylvania.....	36	2.00	5.6	0.30	(3 mos)	0.84	NYSE	31½-37½
Texas Instruments.....	36¾	...	...	0.34	(3 mos)	0.25	NYSE	26¾-37¾
Tung-Sol Electric.....	24¾	1.40 ³	5.7	.....	.....	.....	NYSE	23¼-26¾
Westinghouse Electric.....	59	2.00	3.4	0.73	(3 mos)	0.82	NYSE	57¼-65½

d-deficit

¹ bid

² stock

³ plus stock

⁴ ending Dec. 31

⁵ ending Aug. 28

MERGERS, ACQUISITIONS and FINANCE

• **Additional aid to small business**, including much of the electronics industry, will be enacted by Congress this year, predicts Senator Edward J. Thye (R. Minn.), a leading member of the Senate Small Business Committee. A number of bills now in the congressional hopper would provide tax relief and make credit and equity capital more available to the small business man, he told an American Management Association group. Tax relief measures would allow deductions for earnings plowed back into the business; extend period allowed for payment of estate taxes to 10 years and give small corporations option of paying income taxes at lower partnership rates. Easier credit and equity capital changes would extend the maximum period of Small Business Administration loans up to 15 years; set up a small business investment association for lending equity capital and reduce costs of registering and selling securities by

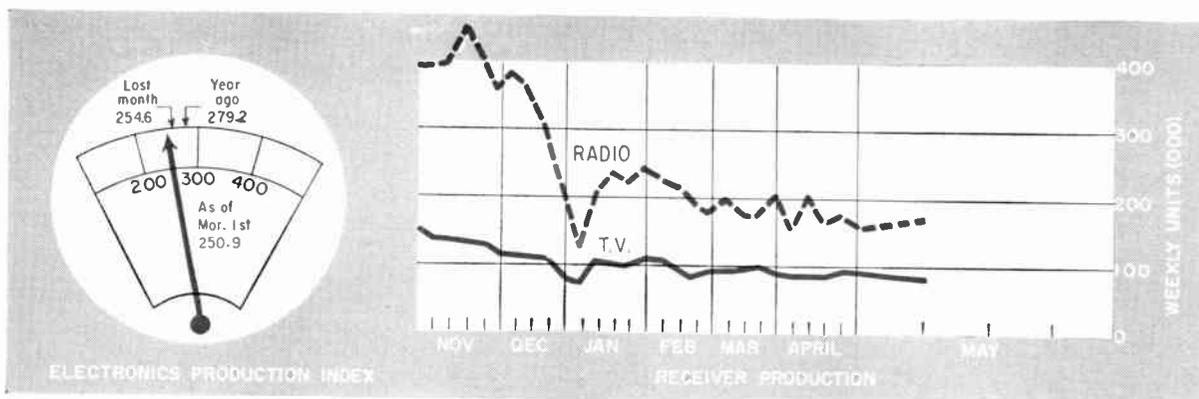
loosening Securities and Exchange Commission registration requirements.

• **Victoreen Instrument**, Cleveland, Ohio, acquires **Kolux Corp.**, Kokomo, Ind., for an undisclosed cash sum. Kolux manufactures indoor and outdoor electric signs. Victoreen makes radiation instruments, reactor monitoring instruments and electrical and electronic components. Many of the components it makes are used in the manufacture of Kolux signs. Sales of Kolux last year were \$2 million while Victoreen sales were slightly over \$3 million.

• **F. L. Jacobs**, Michigan automobile parts and accessories manufacturer, acquires control of **Symphonic Electronics Corp.** of Lowell, Mass. and New Brunswick, N. J. Payment was part cash and part long-term notes, but price was not revealed. Estimated sales of the

combined operation for 1958 should be about \$50 million, comments an F. L. Jacobs spokesman. Acquisition gives Jacobs opportunity to share in phono and hi-fi sales of Symphonic, \$30 million expected in 1958 compared with \$20 million last year. Also, earnings of Symphonic will be offset for several years by F. L. Jacobs large tax-loss carryover. Symphonic will continue under present management, but as a division of Jacobs Co.

DIVIDENDS: **International Resistance**, declares usual five-cent quarterly payable June 2; **Tung-Sol Electric**, regular quarterly of 35 cents on common and 62½ cents on cumulative preferred, both payable June 2; **Siegler Corp.**, regular 20¢ quarterly payable June 2. **Hamilton Watch**, reduces quarterly dividend payment from 25 cents to 15 cents per share. In March, the firm reduced its quarterly dividend from 35 cents to 25 cents.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	May 9, '58	May 2, '58	May 10, '57
Television sets, total	68,125	77,344	80,949
Radio sets, total	159,967	149,604	251,249
Auto sets	46,215	39,754	102,111

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	May 14, '58	May 7, '58	May 15, '57
Radio-tv & electronics	45.70	46.24	52.43
Radio broadcasters	60.11	61.21	70.84

FIGURES OF THE YEAR

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

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

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

TRANSISTOR SALES

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

TUBE SALES

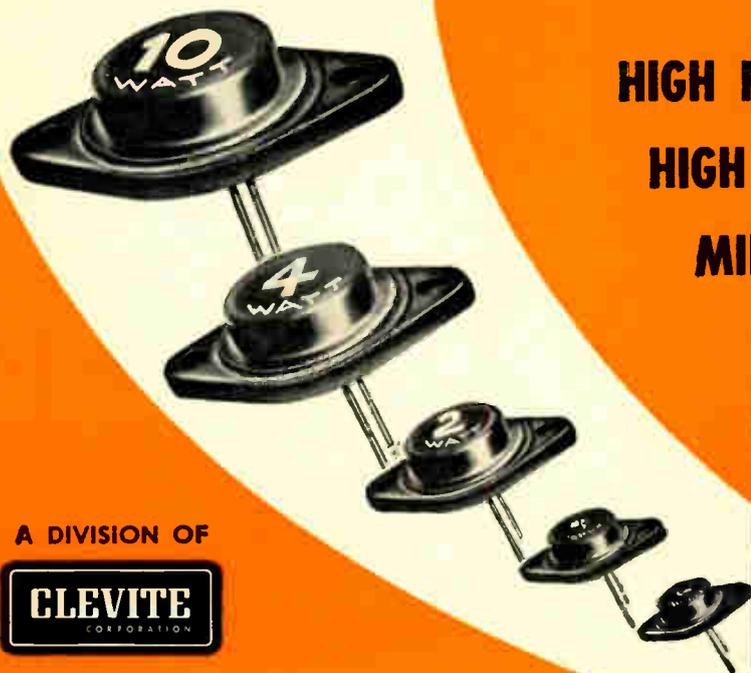
(Source: EIA)	Mar. '58	Feb. '58	Mar. '57
Receiving tubes, units	28,524,000	29,661,000	43,010,000
Receiving tubes, value	\$25,697,000	\$25,650,000	\$37,007,000
Picture tubes, units	634,779	556,136	833,257
Picture tubes, value	\$12,643,404	\$11,210,527	\$14,850,847

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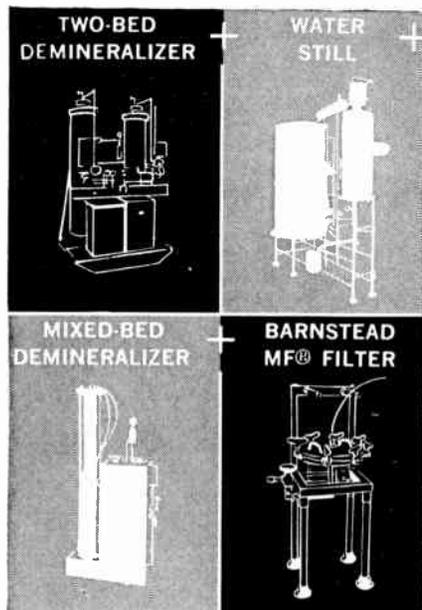
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NEW: TRANSISTOR WASHER

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



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CHICAGO MUIberry 5-8180	PHILADELPHIA LOcust 8-1796	LOS ANGELES RYan 1-9373
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WASHINGTON OUTLOOK

THE DEFENSE DEPT. has earmarked \$13 million in extra funds to be spent for research and development on electron tubes and electronic parts over the next two years. The money comes from the Pentagon's fiscal-year 1958 R&D emergency fund and represents an increase of about 50 percent in the overall program.

Roughly 45 percent of the extra funds will go to the Army's Signal Engineering Laboratories, Ft. Monmouth, N. J. About 30 percent will go to the Navy's Bureau of Ships; Bureau of Aeronautics; and Office of Naval Research. The remainder will go to the Air Force's Wright Air Development Center, Dayton, Ohio; Cambridge (Mass.) Electronics Research Directorate; and Rome (N. Y.) Air Development Center.

Well over 100 individual research projects and several contractors will be awarded the extra funds. In many cases, the new money will be used to extend or speed up existing contracts. In others, the funds will be used to start projects which previously lacked high priority or a weapon system end-item on which to tie.

The \$13 million will be spent for both basic research and technical development in electronics. James M. Bridges, the Defense Dept.'s Director of Electronic Research & Engineering, describes the latter as experimental development required to prove the feasibility of applying to a general class of military devices the new materials, concepts or techniques that accrue from fundamental research. It does not include the systems or product engineering necessary to apply these to a specific equipment, weapon or system.

- Here's how the extra funds will be spent in tube research: to increase the life of magnetron cathodes; to improve efficiency, tunability, weight, ruggedness and life of microwave tubes; to boost power handling capacity of hydrogen thyratrons, work on vacuum technology, cathodes, infrared, high-temperature materials and semiconductors.

In electronic parts, the new effort will break down this way: research on components operating in extreme environments; investigation of the dielectric and physical characteristics of polymeric materials; studies of other new concepts of devices, materials and techniques.

Allocation of extra money for electronic components and tube R&D represents major victory for Bridges and other Pentagon and industry electronics experts who have long clamored for a major step-up in military-supported basic research and technical development in electronic components. They complain that such expenditures have added up to only about three percent of the total for development of electronic end-item hardware. Research spending should be closer to 10 or 15 percent of the development total, they say.

- Impetus for the Pentagon's latest action came from a wide-ranging review of the military electronic R&D program made last year by two industry advisory committees. One group, headed by GI's E. D. McArthur and Prof. H. J. Reich of Yale, studied the electron-tube field. The other group, headed by Bell Telephone Laboratories' Paul S. Darnell, reviewed electronic parts. Both committees came up with detailed proposals for increasing the research programs. The recommendations made by the two groups will be substantially carried out with the new money.

A COMPLETELY NEW *Concept* IN

BOBBINLESS RESISTORS *

New Subminiature Precision Wirewound Bobbinless Resistors feature exceptional stability, reliability and performance

General Transistor has developed a new concept for precision bobbinless resistors incorporating these exclusive features . . . the bobbinless construction eliminates wire stress and strain . . . a special viscous medium is used providing extreme shock and vibration resistance . . . welded case for positive hermetic sealing . . . the temperature coefficient of resistance of the finished resistor is the same as the wire and is not affected by the container. This insures repeatability and minimum hysteresis of resistance characteristics with temperature cycling.

These positive hermetically sealed units are designed for printed circuit boards and subminiature assemblies for airborne and missile applications.

The quality of materials and production superiority of these resistors is the same that has made General Transistor the Fastest Growing Name in Transistors.

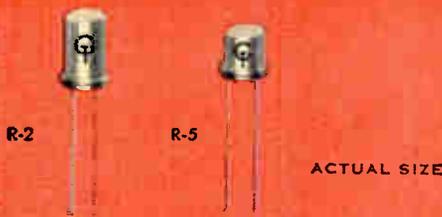
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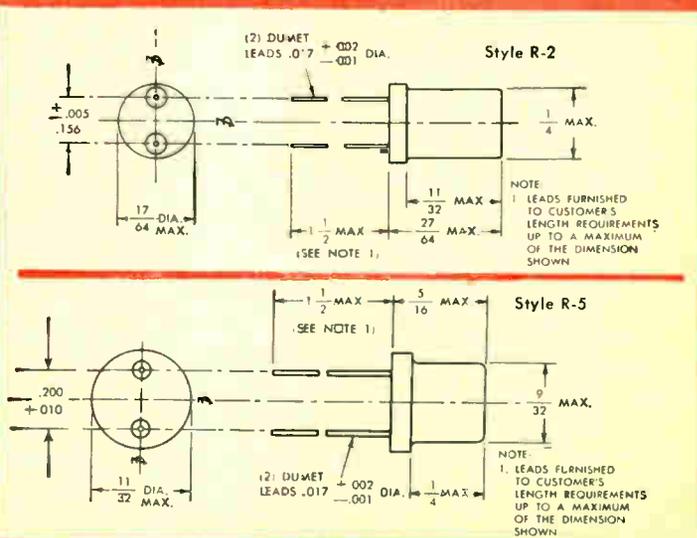
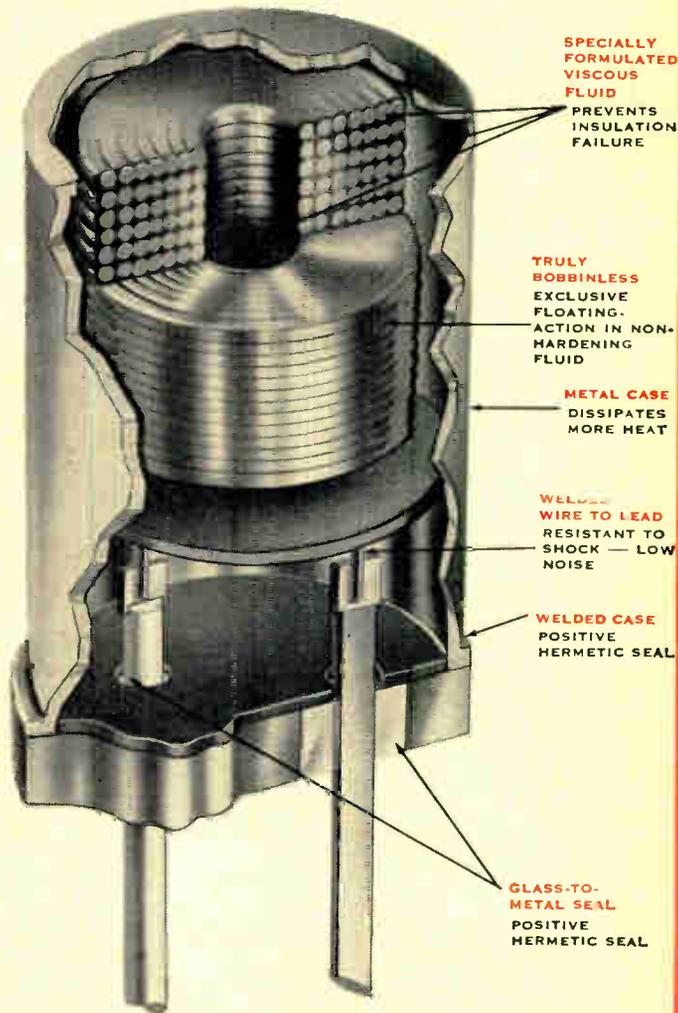
S P E C I F I C A T I O N S

	Style R-2	Style R-5
Resistance Range	0.1Ω to 750KΩ	0.1Ω to 750KΩ
Resistance Tolerance	±0.05% min. at 25°C	±0.05% min. at 25°C
Power Rating	1/4 watt continuous in free air (increased dissipation possible with heat sink)	1/3 watt continuous in free air (increased dissipation possible with heat sink)
Temperature Range	-65°C to +125°C	-65°C to +125°C
Maximum Operating Voltage	250V, DC	500V, DC
Temperature Coefficient of Resistance	±20 parts per million/°C	±20 parts per million/°C
Dielectric Strength	500V rms, winding to case	1000V rms, winding to case

Construction - Terminations: - Welded



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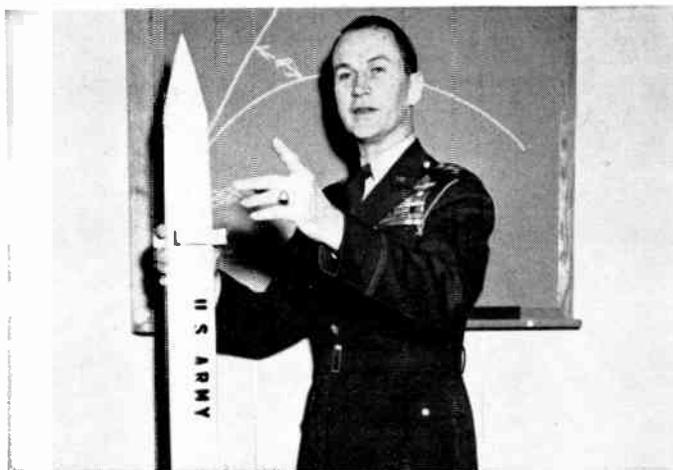
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EXECUTIVES IN THE NEWS



Gavin: tomorrow's world

NEXT Monday, James M. Gavin takes office as a v-p and director of Cambridge, Mass., research firm A. D. Little. In doing so, Slim Jim Gavin turns his back resolutely on a 30-year yesterday to pursue his "long interest in the possibilities of tomorrow's world."

Lean, scholarly paratrooper Gavin began burning his Army career behind him on Friday the 13th of last December, about a month after he was given permission to try a satellite launching with his Jupiter-C rocket. On that cold Friday, he told a Senate committee that the U.S. was trailing the Russians in overall war strength, that the Joint Chiefs system should be abolished, and that he could not condone the steady "deterioration" of the Army's strength and prestige.

Gavin, born in Brooklyn 51 years ago last March 22, enlisted in the Army at 17. After 14 months in the ranks he went to West Point, graduating in 1929. When war broke out in Europe ten years later he was an infantry captain. Within a year after U.S. entry in the war he was a colonel commanding the 505th paratrooper RCT, jumped with his command into Sicily and Salerno. Later as a general he became assistant to 82d Airborne Div commander Matt Ridgway, jumped into Normandy on June 6, 1944.

After the war he became the sparkplug of Army R&D, got the Nike into the field, covered for Redstone Arsenal while it developed the Jupiter C (which it had been forbidden to do).

A serious student, he also has a reputation for being short of patience. He had "pressed in vain for support of projects . . . essential to the nation's safety." Finally his patience snapped: "When I cannot obey . . . I cannot continue in service," he told Congress. Later he added "I haven't been able to get much done, the system being what it is. I feel I can do more for our country's defense effort out of uniform than in."

Married for the second time in 1948, he has five daughters, has spent his two month vacation with family, doing some fishing, "thinking things out," and working on a book.

COMMENT

Radar Angels

I have just finished reading with extreme interest the article "At-

mospheric Angels Mimic Radar Echoes" (Mar. 14, p 140).

During the eight years I have been associated with the electronics field I have seen many spurious indications on radar screens. I

have also received numerous reports as chief of the radar division from organizations of this command. We have been continually plagued by the appearance of high-speed tracks that cannot be explained.

This article is of great interest to all radar personnel of this command . . .

CAPT. JOHN C. SQUIRES
Hq. 316TH AIR DIVISION
U. S. AIR FORCE, APO 118, N. Y.

. . . considerable interest has been expressed in the article "Atmospheric Angels Mimic Radar Echoes . . ."

J. B. HAYDEN

BENDIX RADIO
BALTIMORE, MD.

. . . The article . . . reminded me of the time my radar crew spent a fruitless half-hour tracking an angel across the clear sky over Ft. Sill, Okla., just after an electrical storm. It shook us all up a bit.

W. R. HINCHMAN
SALT LAKE CITY, UTAH

Author V. G. Plank of USAF's Cambridge Research Center and the editors of this magazine are mighty proud of the way the article on radar angels took hold. It's the sort of thing we enjoy doing for our readers.

Computers Shuffled

The story concerning electronic exhibits at the Brussels World Fair ("Electronics Stars at Fair," Apr. 18, p 13) states that the 305 RAMAC electronic history book is housed in the IBM pavilion. The RAMAC is contained in the United States pavilion at the invitation of the State Department.

The IBM pavilion contains a model of the 705-III data-processing equipment and other company products. The mezzanine floor is devoted to a "World of Numbers" display depicting computing techniques through the ages. The 705-III is part of this display . . .

ROBERT BLAKESLEE
IBM WORLD TRADE
NEW YORK, N. Y.



TV tube manufacturers depend on Stokes aluminizers

Stokes twin-tube aluminizers are fully automatic . . . offer high production rates for black and white screens or color plate processing . . . service any type tube, including the 110° bulb and special C.R.T.'s.

These are some of the users of Stokes aluminizing equipment. Call on the Stokes Advisory Service for application information, or write for data and specifications sheet.

American Standard TV Tube
Jamaica 33, N. Y.

Pan-American Electronics Inc.
Miami, Fla.

Arcadia Development Company, Inc.
St. Louis, Mo.

Pioneer Electronics Corporation
West Los Angeles 64, Calif.

B & L Electronics Industries Limited
Montreal, Quebec, Canada

Progressive Electronics Company
Yonkers, N. Y.

Budco, Incorporated
Louisville 8, Ky.

Radio Corporation of America
Lancaster, Pa. and Marion, Ind.

Claremont Tube Corporation
Long Island City, N. Y.

Sylvania Electric Products Co., Inc.
Seneca Falls, N. Y.

Continental Electronics
Philadelphia, Pa.

Theta Electronics, Inc.
Greensburg, Pa.

Durobeam Electronics Compony
Independence, Mo.

Thomas Electronics, Inc.
Passaic, N. J.

Electronic Tube Corporation
Philadelphia 18, Pa.

Tung Sol Electric Co.
East Orange, N. J.

National Video Corporation
Chicago 32, Ill.

Vacuum Equipment Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

STOKES

system for an undisclosed Army surveillance drone.

A device that measures the magnetic character of targets is being developed by Texas Instruments. Such a sensor could tell home base about camouflaged tanks, mines or artillery and submarines.

Five electronically triggered camera models represent a \$3-million business in R&D contracts for Fairchild Camera and Instrument.

TI's sidelooking AN/APQ-55 radar, already tested in Army light planes, will soon be evaluated at Fort Huachuca in drones.

Radioplane is developing the SD-1 which will later be replaced by the SD-2 and SD-3. Forerunner of the SD-1 is the RP-71 (see photo, p 13) which attains a 3,000-ft altitude and a speed of 200 mph. Sensory devices are radar, camera and infrared. At night, 300,000 candle power flares are released for the photographic camera.

The SD-1 is a short endurance reciprocating engine type drone.

Rheem will deliver its SD-2 drone to Fort Huachuca for testing in July. Initial development contract totals \$1.7 million.

Republic is currently developing two drones under contracts amounting to \$4.7 million. The SD-3, a

propeller-driven drone intended to replace the SD-1, has three interchangeable nose units to accommodate photography, radar and infrared.

Although radar and cameras are government furnished, Republic designed and is assembling the electronic systems. About thirty electronics suppliers contributed to the SD-3. Three suppliers, according to Republic, are Minneapolis-Honeywell, Giannini and Sperry.

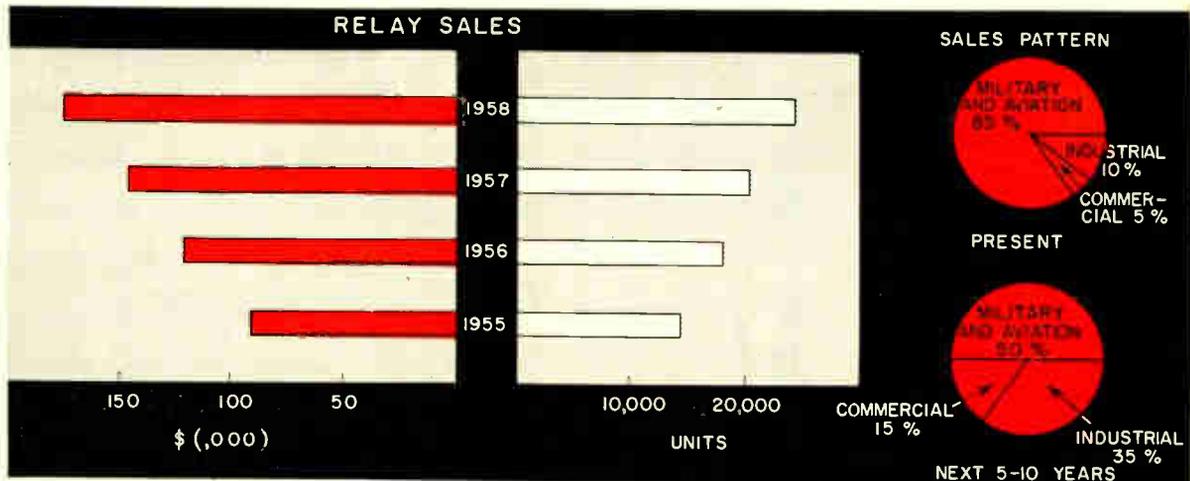
The SD-3 will be ready for testing at Fort Huachuca in July. Current contract of \$1.7 million covers design and initial test units.

Republic is also under a \$3 million contract for a more advanced, jet powered, drone of the intermediate endurance category called the Swallow.

Fairchild Aircraft Div. of Fairchild Engine and Airplane is developing a long endurance jet drone (as yet unnamed) under a \$12-million R&D contract.

Included in the Army Signal Corps' list of major subsystem contractors, not already mentioned above, are: Hallamore, Dumont, Motorola, GE, Belock, Baird-Atomic, Hycon, Polaroid and Haller, Raymond and Brown.

PRODUCTION and SALES



Relay Sales to Rise 18 Percent

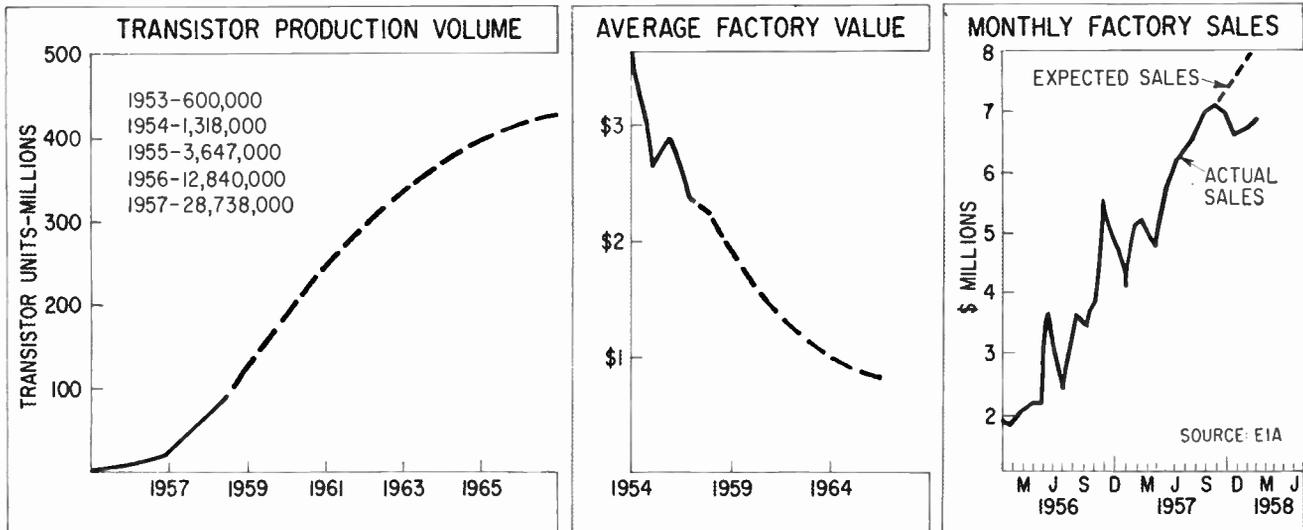
RELAY SALES in 1958 should total about \$175,000, comprising 24,500 relay units, relay manufacturers recently advised *ELECTRONICS*. Predicted 1958 relay sales represent an 18 percent hike over 1957. Relay manufacturers increased from 96 in 1951 to 180 in 1956.

Average price of relays has jumped from less than \$6 to well over \$7 between 1955 and 1957. Current prices of some military types run as high as \$15.

At present 85 percent of total relay sales are for military and aviation use. Remaining 15 percent is

split by industrial users, 10 percent, and commercial users, five percent.

During the next five to 10 years proportion of military and aviation sales is expected to decline to 50 percent. Industrial and commercial sales should climb to 35 and 15 percent, respectively.



Transistors Push \$100 Million

Sales register 88 percent gain in early 1958. Manufacturers predict a 400-million-unit annual market by 1965. Foresee new markets in home appliances, industrial controls and toys

TRANSISTOR SALES will probably rise from \$70 million in 1957 to better than \$100 million in 1958, proving what the electronics industry already knows: the first 10 years were only the beginning.

Statistical summaries for early 1958 show transistor production up 88 percent over early 1957. And the sales charts have not yet caught up with the tremendous changes transistors are making in electronic circuit design and applications. Many new markets are still being probed.

Quantity production began only five years ago, with about 600,000 transistors a year. There's still room to grow; less than one-fifth of today's electronic products employ transistors. The proportion is expected to swell to four-fifths in 10 years.

Transistors are not only building their own markets, but creating entirely new markets for electronics in such varied fields as home appliances, industrial controls and toys.

An example is given at Bell Labs, where the transistor was invented in June, 1948. The Bell System is a major outlet for transistors—10 million will be used in all communication equipment this year.

But Bell spokesmen point out that telephone equipment transistorization to date is modest compared with the changes to be made in a few years. And the widest changes are being made in the system's electromechanical equipment. Automatic

dialing, for example, will be controlled by transistor memory devices.

Transistor manufacturers are still digesting the production technology acquired since 1948. Some feel that the snowballing of transistor types will slow down during the next few years while the potentials of new types are exploited.

But no manufacturer expects any respite from the tremendous market buildup of the past few years. Representative comments include:

Booming, despite the recession—Hoffman.

The average annual increase in production will be 40 million transistors a year for eight or nine years—General Electric.

A reasonable production figure for 1965 is 400 million transistors—RCA.

It will be 10 years before transistor growth lines up with the gross national products curve—Deleo.

The percentage increase will decline after 1959, but the rise will last until 1963-65—Solid State Products.

Opinions on the dollar value of transistors 10 years from now vary: \$250 million is considered a minimum, \$500 million (in 1957 dollars) is believed likely by some.

Few transistor production men doubt that the price of some germanium transistor types made today will fall to 50 cents on the average. Some think the 50-cent level will be reached by 1960. Some

transistors for radio broadcast receivers can be had for \$1 or less today.

However, the continued addition of new types of transistors, a rising percentage of military and silicon units, the added expense of building in higher frequency and power are all expected to level out the average cost near \$1.

Entertainment types command most of today's market. In 1957, the proportions were: entertainment, 68 percent; industrial-commercial, 22 percent and military, 10 percent.

In 1962, RCA predicts, the mix will be 35-40-25, respectively. GE sees a 45-35-20 market breakdown, with 24 percent silicon units. General Transistor expects silicon units shortly to command half the military market and industrial silicon types to make up 15 percent of the total market.

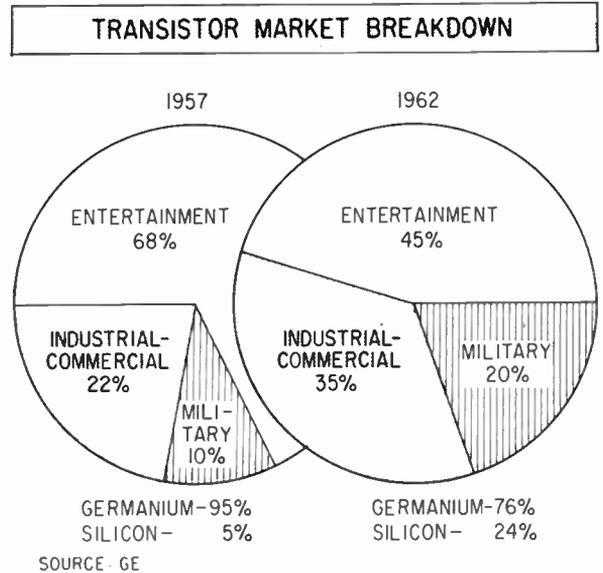
A key factor in forecasts, particularly of price, is mechanization or automation of transistor production lines. This depends on emergence of high volume transistor types with fixed design features.

Mechanization of final assembly is being made more general by package standardization. Continued change in internal design, however, makes fully automatic production unwarranted, manufacturers agree.

"It would take millions of dollars to automate this field properly," comments a Minneapolis-Honeywell engineer. New processes cause a continual state of obsolescence now, Bendix reports, but the investment could be worthwhile for a type sure to remain standard for a few years.

One place where automation is well along is semiconductor materials preparation. There is special emphasis on production of *pnp* fusion alloy, now conventional material, according to Raytheon.

Most manufacturers feel that diffused base tran-



sistors and *pnpn* control devices show great promise. They are driving new wedges into high-frequency and industrial-control fields.

Higher frequency is the prime aim in transistor development. Higher power and higher temperature resistance are considered important.

Lab models have gone beyond 1,000 mc. Next step, Sylvania says, is getting these into production while the labs try to break through to a higher level.

Looking ahead 10 years, scientists see semiconductor ferrite memory devices, thermoelectric devices maintaining transistor temperatures at optimum levels, compound semiconductors solving some of the knottier heat and frequency problems. Texas Instruments foresees a major use of semiconductor devices in the power field, including electric power distribution. Nothing, however, is expected to shake the dominance of germanium and silicon within 10 years.

U.S.-Russian Joint Earth Satellites?

A SOVIET scientist this month described a realistic dream of launching three tv-equipped earth satellites to scan the whole surface of the earth and hinted that the U. S. might be invited to participate in a joint project.

Nikolai A. Varvarov said the satellites, placed in orbits equidistant from one another over the equator, would have automatic receiving and transmitting antennas pointed towards earthbound transmitters. In a Moscow home broadcast, Varvarov said: "There is no doubt that if the great powers were to embark jointly upon its implementation today, the problems of world television broadcasting would be solved within the next few years."

The proposal of the Russian scientist also suggests the possibility of joint aerial inspection of the earth via satellite-borne tv and other instrumentation. Right now, the U. S. is planning the Pied Piper military reconnaissance tv-satellite. The Soviets probably have similar projects underway.

Varvarov said signals from ground transmitters would be received by one satellite, relayed to the next and back to earth on another continent, or from earth to satellite and back to the same continent. He said the satellites would require small, light-weight instruments powered by atomic or solar batteries and special stabilizing gear. They could also be used in air and sea navigation, he added.

USSR Talks Up Space Plans

Instrumentation plays vital role in Soviet research rockets as a space race for men's minds shapes up. Pravda chides 'microscopic' satellites, boasts of new data from tons of instruments sent to record heights. Instruments to test Einstein's theories reported

RUSSIAN scientists are emphasizing the importance of instruments for space exploration in frequent statements aimed at Soviet and European laymen. They say data telemetered to earth is providing knowledge necessary in planning interplanetary spacships.

Only by launching artificial satellites of great weight can an early solution be found to the problem of interplanetary travel, they say. Chiding the U.S. recently, Pravda declared, "This problem can in no way be solved with the help of artificial satellites of microscopic dimensions, whose use for scientific research is limited."

Such statements underscore the psychological and propaganda value attached by the Russians to peaceful uses of space technology.

One scientific race is shaping up between the U.S. and Russia in the testing of Einstein's theories of relativity. Scientists of each nation are planning to put an "atomic clock" aboard an earth satellite to measure time in outer space. American scientists at a symposium this month sponsored by the Army Signal Engineering Laboratories discussed several other satellite experiments that could be performed to test Einstein's theories.

But the Russians, with their mathematical tradition and early, calculated start on space problems may beat us with such satellite-borne instrumentation.

Soviet Professor and Academy of Sciences member V. L. Ginsburg recently said that a Russian sputnik might soon carry an atomic clock.

Three other Soviet scientists, writing in a popular Soviet magazine, say a fully instrumented rocket to the moon can be expected "in the next few years," adding: "Manned trips on a circular orbit and to the moon are also problems for the next decades. This requires only the solution of the problem of return from an artificial satellite. Flights to neighboring planets will be realized as soon as an atomic rocket has been constructed."

An interplanetary ship, they say, will have a nuclear engine, power plant using solar energy, a dependable means of radio communication and radar

gear, and automatic controls. Recently, another Russian was quoted as saying the USSR would launch a five-stage, 250-ton rocket to Venus between 1962 and 1967.

Speaking recently of the possibility of a photon rocket, the journal *Trud* said: "Substantial progress in the field of designing the rockets depends on the development of a low-weight, continuously operating reactor."

I. I. Drakin, of the Moscow Aviation Institute, in describing the flight and landing of a photon rocket, explained: "The detection of meteors can be effected by radar. A battery of rocket motors must be provided inside the rocket to deflect its course from meteors. Communication with the rocket and tracking will be done by radio."

The Russians, despite their sputniks and sputnik talk have long been putting considerable investment into geophysical and animal-carrying rockets. A Russian research rocket was first fired in 1933, Pravda claimed recently.

By 1949, "large scale" investigation of the upper atmosphere's effects on animals was being made. Dog flights that year ranged from 62 to 130 mi high. Instrumentation in a number of rockets of that class weighed about 275 lb. In some cases, Pravda says, up to five compartments containing animals and apparatus were successfully landed by parachute.

In May, 1957, about 4,859-lb of instrumentation and animals rocketed to a 132-mi height and safely parachuted to earth. This year, on Feb. 21, a single-stage geophysical rocket zoomed to 294 mi carrying about 3,350 lb of instrumentation (*ELECTRONICS*, p 19, May 2). "If one considers that . . . new stages could be added," said Academician Blagonravov recently, "then one can imagine what further attainments could be achieved, both as regards weight load and height."

Meanwhile, based on Sputnik I data, reports Tass, "it is now possible to make a far-reaching assumption that the state of the outer ionosphere does not depend—or hardly depends—on the time of day or night, or the year, on neither longitude nor latitude. It maintains the same properties under different conditions."

FCC Weighs Business Radio

Many manufacturers of mobile radio equipment say count-down time is here for FCC's green light on setting up a Business Radio Service band. Prospective customers and equipment makers are starting to check price lists, delivery schedules

INDICATIONS this week are that the long-sought Business Radio Service is about due to be approved by FCC within the next 30 days.

For some time businessmen have been asking for a portion of the spectrum in the mobile band to be allocated to "anyone engaged in a legitimate business".

Manufacturers of mobile equipment and their "new customers" have already been getting together to discuss price and delivery. Average price is about \$1,200 for a transmitter and one mobile unit plus antennas and accessories; about \$525 for each additional mobile unit.

Some of the business groups looking these prices over are department stores, appliance dealers, and local delivery companies. Other users are expected to include sales organizations, contractors, and service organizations.

Anticipated approval of the Business Service is in part attributed to FCC's recent decision to convert the 25 to 50 and 152 to 163 mc portions of the spectrum to narrow-band.

The action in brief cuts width of allocated slots from 40 to 20 kc, effectively doubling the amount of available space.

A good many users of the Business Service are expected to find homes in the new narrow-band slots, once approval is granted in Washington.

Some manufacturers have anticipated this switch to narrow-band for some time. Their designs for mobile transmitters with narrow-band changeover in mind will in many cases pave the way for users to alter their equipment easily. Not-so-easy aspects of the situation, however, do exist, according to some sources.

A spokesman for IRE's professional group on vehicular communications says achieving high quality frequency stability in some cases is going to be more difficult than might be supposed. Further research in filtering and crystal usage may be needed in some makes of transmitters.

Some operators feel a stumbling block may prove to be a scarcity of adequate test equipment in the

field. Some narrow-band operators fear they may often find their equipment jamming the "guy next door."

However at least one firm queried this week says it has kept its work on test equipment development in step with split-channel research and can put measuring devices in the field in adequate quantities to serve all its customers.

Still another company feels the specially designed filters that form a major building block in its change-over kits will meet the most rigid requirements when used with the proper crystals.

Many manufacturers are tapering off on production of broadband equipment, stressing narrow-band. Users applying since April have to go to narrow-band. Older operations have until 1963 except in cases where interference problems arise. Most firms say they are prepared to give off-the-shelf delivery on narrow-band units.

FCC notes unofficially that changeovers are on the rise in spite of the five-year grace period. Operators seem to want "to get it over with" now while they can choose the circumstances.

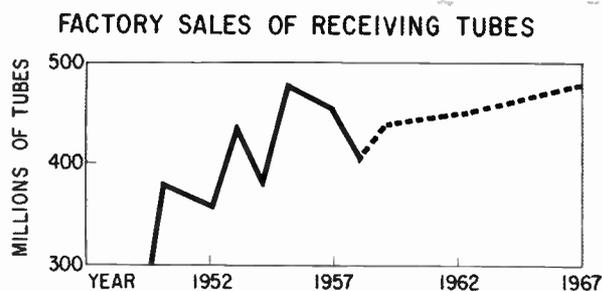
The split-channel action is seen by manufacturers as a good thing for business in spite of the inconveniences some users will feel at first.

At a recent meeting in Detroit, the past president of the National Mobile Radio System summed up industry sentiment by saying, "The trend to mobile communication is fantastic. Service trends will be extended to all safety fields such as fire, police, and medical. We hope to service everyone and everything."

In speaking of the mobile radio system in general, one speaker said, "For the first 10 years, the attitude of the customer towards mobile radio was one of discouraging skepticism. In future years, the attitude will be one of necessity."

This feeling of growth expressed at the Detroit meeting is seen by some as affecting even the auto industry.

Car makers were commended for "their cooperative efforts to provide adequate and proper spacing for future mobile units, and for easier and more efficient installation of transmitters, cables, accessories and antennas."



Receiving tube volume is down from 1955's record peak, but industry's view, long range, is . . .

Tube Outlook Good

Receiving tube prospects for 1958 are rosier than first quarter indicates

RECEIVING TUBE sales are expected to turn up in the final six months of 1958, bringing total volume for this year within about 90 percent of 1957. First quarter sales have been some 30 percent below the early 1957 level.

A forecast issued this month by Irvine Daniels, manager of General Electric's receiving tube department also predicts a turnaround in a three-year downtrend.

Tube volume, he feels, will recapture in 1959 much of the ground lost in 1958. By 1967, volume would be more than 475 million tubes—equaling the record sales peak of 1955.

Renewal tubes: Sales to distributors were down a third in the first quarter of 1958. The year 1958 should end with total sales slightly under 185 million tubes. Renewal sales will go over 190 million tubes in 1959 and rise to 225 million by 1962.

Entertainment equipment: Monochrome television set production is expected to be 5.5 million in 1958 compared with 6.4 million sets in 1957. Radio production will be under 13 million compared with 15.4 million in 1957. Phonograph production will be up slightly from 1957 figures.

The decline in the entertainment market has been aggravated by in-

ventory reductions in set manufacturing plants. The current low inventory position, however, presages more favorable sales during the remainder of 1958.

By 1962, tv set production is expected to rise to 7.5 million sets, requiring over 100 million receiving tubes. Radios will take about 42 million receiving tubes in 1962.

Military equipment: The effects of 1957 stretchouts and cancellations are still apparent. New contracts, however, will cause component requirements to rebound substantially during 1959. Although the use of transistors will increase rapidly in military equipment, receiving tube volume should remain constant over the next five years.

Industrial equipment: Record levels of tube sales to makers of industrial and commercial equipment should be reached in 1959. Tube usage should expand 25 percent in five years, including a 70 percent increase in tubes for data-processing equipment.

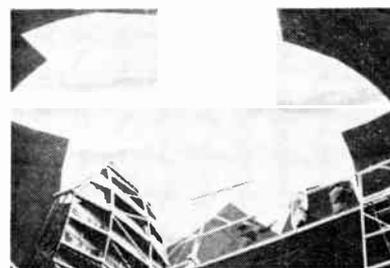
A large growth in electronics markets for the next five years is seen in industrial equipment and replacement parts. Population will rise faster than the labor force, requiring improved productivity, a factor favorable to use of electronic equipment.

Air Force Gets Prefab Radome

PORTABLE RADOMES up to 200 feet in diameter may now be constructed of laminated plastic sections without a supporting frame.

A prototype, 55 feet in diameter, was recently erected near Ottawa, Canada, by Long Sault Woodcraft Co., of Canada, for the U. S. Air Force. Initial electrical and structural tests are favorable.

Knocked down, the prototype can be shipped in one cargo plane. It weighs 9,000 pounds and is made up of 156 panels, the largest weighing 100 pounds. Six men can erect it in 1.5 working days.



Frameless radome is built with 156 laminated plastic panels

The panels are attached to each other with 1,500 cam-actuated locks closed by a 3/4 turn. The surface is spherical. Joints run at 45 degree angles to avoid interference with search or height finder radar sets.

Each panel is one-inch paper honeycomb sandwich covered by a sheet of Dynel fabric. The sandwich skins are made of two plies of glass cloth reinforced with Epon 828 resin.

Other radomes of the same size are being built. Long Sault engineers say the stressed skin type of construction is feasible for radomes of 100 or even 200 feet in diameter.

Silicon Cheaper

REDUCTION in prices of semiconductor-grade silicon was made this month by du Pont.

Prices fell from \$160 to \$360 a pound to \$130 to \$355 a pound. Solar grade silicon was reduced from \$100 a pound to \$90 a pound.

Reveals Missile Money Facts

Air Force says \$2.17 billion already obligated for its ballistic missiles. Half goes to electronics

LATEST BREAKDOWN of USAF's ballistic missiles program, recently announced by Maj. Gen. Ben I. Funk, Ballistic Missiles Manager for Air Materiel Command, shows obligated funds for the seven guidance contractors currently pegged at more than \$450 million. A total of 10,000 employees are engaged in guidance work for Atlas, Titan and Thor in these seven firms (GE, Burroughs, AC Spark Plug, Bell Labs, Arma, Sperry and Remington-Rand).

Total obligated funds for the 15 prime contractors (employing 45,000 people for ballistic missile work) and 80 secondary primes, amount to \$2.17 billion, to be expended at a rate of \$1.3 billion a year. Half of these obligated funds—\$1.08 billion—will go for

electronic engineering and equipment since nose cone, propulsion and airframe contractors are all heavy users of electronic gear.

The \$1.08 billion, to be expended over the next several years to the electronics industry, will be steadily increased as new contracts for Atlas, Titan, Thor and Pied Piper (WS-117-L reconnaissance satellite) are signed. Fifty-five percent of Lockheed's work on Pied Piper is subcontracted.

Further obligations will result from new missile projects. Minuteman, the solid propellant ICBM, will be under contract to several companies by the end of summer, Funk said. An air-launched MRBM (Medium Range Ballistic Missile) to be carried by the B-70 is already being studied by several companies, according to Gen. Irvine (ELECTRONICS, p 8, May 23) and should bring forth guidance contracts and orders for electronic support and test equipment soon.

MILITARY ELECTRONICS

- Although not officially announced by press time, it is believed two companies have already been selected to compete on design studies of Dynasoar, the vehicle that will put a man into orbit and bring him safely back. Competition between the two selected companies is expected to continue at least a year.

- A SAGE site is planned for Albuquerque, New Mexico. Funds for the site are dependent upon congressional approval of the fiscal year 1959 budget now before Congress. The budget contains an item of \$6,832 million for the new facility.

- An air-to-air passive ranging system that determines target position, motion and radiation characteristics without creating similar radiations has been developed by Fairchild Engine and Airplane.

Called Padar, the system provides this information by time domain processing of the received signal

complex. Selection and interference reduction features are also incorporated. While the principle of the system is currently classified, details may be disclosed next month.

- Scientists at JPL and Cambridge Research Center believe the transmitters in Explorer III may have been damaged by collision with micrometeoritic particles from Halley's comet.

Current status: the high-power command transmitter and the telemetered portion of the low-power transmitter are off the air. Tracking beacon signal of the low-power transmitter is erratic.

- To replace the present 28 wings of B-47's with B-58's (and in turn KC-97 tankers with KC-135's) would cost over \$6 billion for electronic gear alone. Total cost of aircraft: \$20 to \$25 billion; 41 percent of the B-58's cost is for electronics; 15 to 20 percent of the KC-135's.

CONTRACTS AWARDED

Sperry gets a \$27.5 million contract with BuOrd for production of Tartar missile radar sets and associated equipment. This contract is in addition to the recently announced contracts totaling \$75 million for production of Talos and Terrier guided missile radar systems (ELECTRONICS, p 26, May 2).

Sylvania has announced receipt (as predicted by ELECTRONICS, p 14, Feb. 28) of a \$5.6 million contract with prime contractor Sperry for development of a major subsystem of the electronic countermeasures system for the Boeing B-52.

Sperry has also awarded \$8.4 million in subcontracts for the B-52 system to seven other companies: Federal Telecommunications Labs, GE, Hallicrafters, RCA, Farnsworth Electronic, Ryan Industries and Eitel-McCullough. Sperry officials say 45 percent of the total ECM work will be subcontracted.

Laboratory for Electronics has a

new \$2.8 million contract with Air Materiel Command for production of six AN/APN-105 Doppler radar navigation sets to be used in F-105 interceptors. The system is designed for operation from ground level up to 70,000 ft.

Ampex sells tape recorders, AN/UNH-6, to BuAer under a \$1,238,000 contract.

Sparton gets a \$1,213,750 contract with BuAer for listening sonobuoys, AN/SSQ-2D.

F-R Machine Works wins a \$500,000 subcontract with Sperry for line type modulators on the FPS-35 radar system.

Hallamore Electronics div. of Siegler gets a \$3-million contract boost from Martin for instrumentation and field test equipment work on the ICBM Titan. This brings Hallamore's total for work on Titan to \$12 million. Hallamore says it will buy supplies from more than 100 other firms.

Link Aviation will supply Air Materiel Command with one electronic prototype simulator for the B-58 Hustler. Contract: \$1 million.

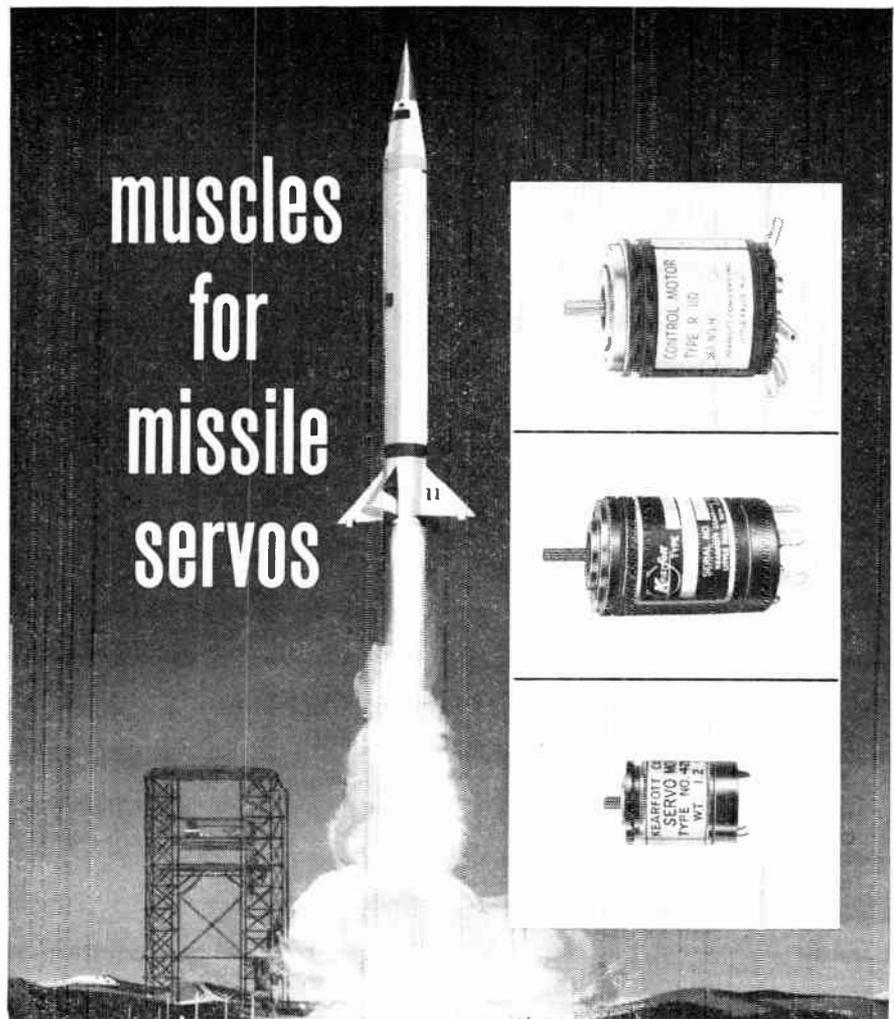
Electro Instruments receives a \$300,000 contract with Hughes for multimeters to be used in field servicing the Hughes armament control system used in interceptors.

Servomechanisms sells a new lightweight, completely transistorized, true airspeed computer to Douglas for use in the A4D-2N, a new version of the A4D Skyhawk. The order amounts to \$465,727.

Kleinschmidt wins a \$2.7 million contract with the Signal Corps for tom-tape relay teletypewriter sets and spare components.

Loral Electronics sells SA-13 navigational computer equipment to BuAer under a \$2,608,902 contract.

Globe Industries gets a \$642,566 contract with the Naval Avionics Facility, Indianapolis, for transmitter-receiver equipment.



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R-124-5	10	.28	6500	26/40V	A3105
R-119-5	11	.60	6200	115/40V	A3106
R-110-5	15	1.45	5000	115/40V	A3106
R-111-5	18	2.4	4800	115/40V	A3104
R-112-5	18	2.8	9800	115/40V	A3104
60 cps					
R-160-5	18	3.5	3400	115/40V	A3300

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West Coast Office: 253 N. Vinado Avenue, Pasadena, Calif.

Russians Aim for Satellite Recovery

SOVIET SCIENTISTS lately have not matched the boastfulness of Nikita Khrushchev in statements apropos sputniks. They have been saying: (1) the problem of bringing a satellite back to earth intact has not yet been solved by Soviet scientists; (2) though Sputnik III is big enough to hold a man and supplies, "this type of experiment would be premature" without more knowledge of the conditions of man's existence in space. Earlier Russian statements suggest: (1) they may have failed to launch an even more spectacular satellite of 5 to 6 tons carrying tv gear; (2) Sputnik III may have been intended to circle both earth and moon and may have lacked sufficient thrust.

RECOVERY OF 20 NOSE CONES for ballistic missiles disclosed by the Air Force two weeks ago underscores the vital role played by electronics in solving space technology problems. During brief flights the telemetering system aboard each of more than 20 Lockheed X-17 missiles transmitted data on speeds, temperature, pressures and other measurements, almost to the point of impact. The nose cone recoveries, though just announced, followed firings that occurred more than a year ago when more than \$2 million worth of f-m/f-m telemetry was shot away (*ELECTRONICS*, p 15, June 20, 1957). By last week there was

more reassuring missile news: The Army announced that a full-scale Jupiter nose cone had just been recovered.

RADAR EXPERTS are studying a new traveling wave tube that operates at one megawatt peak pulse power on 2.7 to 3.0 mc. Last week Varian Associates announced that the tube, VA-125, was commercially available. It's the first of a series of wide band amplifiers planned, and was patterned after a design by Stanford University's Marvin Chodorow. Useful bandwidth is 375 mc, power gain 28 db; pulse beam voltage is 110 kv, pulse beam current, 60 amp. It can be operated at a duty cycle of 0.002.

ANTICOLLISION EQUIPMENT for aircraft will get the green light only when the Airways Modernization Board makes a number of operational decisions. Harold Goldberg, Emerson Research Laboratories v-p, told this month's National Conference on Aeronautical Electronics in Dayton there was some question about the status of the private flyer, whose ranks will grow and is "even now a potentially large market for anticollision devices." Goldberg feels private flyers eventually will have to submit to control and will have to carry more electronics equipment than at present, with all pilots checked out on instrument ratings.

TECHNICAL DIGEST

- **Multiple-beam vacuum tube** passes signals only when all of a number of different potentials are applied. Beams from cathode are projected in various directions, each through an electrode normally biased to cutoff, in new IT&T development. Unless proper positive potentials are applied to all of the interacting control electrodes simultaneously, little beam energy reaches common anode.

- **Converter** using two double-triodes in pulse-position modulator changes 21-inch tv set into oscilloscope. Circuit described by Southworth uses 12AU7 with input loosely coupled to horizontal output stage of set, to generate pulses at horizontal scan rate of 15,750 pps. Resulting saw tooth is fed

to two-stage 12AT7 clipper along with audio signal to be examined. Converter output is fed to grid or cathode of picture tube. This gives vertical 60-cps sweep trace modulated horizontally by signal being examined.

- **Twin-deck single-sided printed circuit boards** give advantages of plated-through holes in two-sided boards at less cost, in Canadian plant of Allied Circuit Techniques, Ltd. Boards are half usual thickness. Circuit pattern is conventionally etched on underside of each board. Components are inserted from top of first board, with leads a bit longer than usual. After dip-soldering, this board is dropped in position over second board, holes of which have been countersunk to

receive solder fillets. Second dip-soldering completes job.

- **Automatic time averaging** improves accuracy of radio direction finders in 1.5 to 30-mc band by offsetting deviation of waves up to 90 deg from direct path during multipath ionospheric propagation. Solution by Radio Research Station, Slough, England, involves use of automatically nulling goniometer, position of which is read by 360-segment phonic wheel and p-n junction photocell every 0.72 second. Output pulses actuate Dekatron counter bank to totalize degrees of deviation from north, while number of bearings taken is displayed on second bank of counters. Dividing first reading by second gives average bearing.

MEETINGS AHEAD

June 5-6: Second Natl. Conf. on Production Techniques, IRE, PGTT, Hotel New Yorker, N.Y.C.

June 9-13: Automation Seminar, Fourth Annual, Penn State Univ., Pa.

June 16-18: Electrical Contact Seminar Div., Penn State Univ., Pa.

June 16-18: Military Electronics Second National Convention, Sheraton Park Hotel, Washington, D.C.

June 17-27: Two-Week Special Summer Program in Switching Circuits, MIT, Cambridge, Mass.

June 18-20: Radio Wave Propagation Statistical Methods, Univ. of Calif. Engineering Extension, L.A.

July 6-18: Underwater Missile Engineering, Graduate Course, Penn State Univ., Pa.

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

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

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

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

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

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

Sept. 1-9: Second International Days of Analog Calculation, Strasburg France, contact F.D. Raymond, 138 Boulevard de Verdun, Courbevois (Seine) France.

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

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

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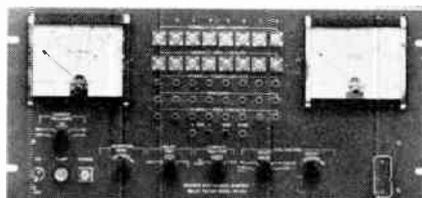
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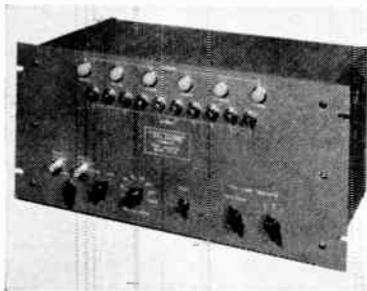
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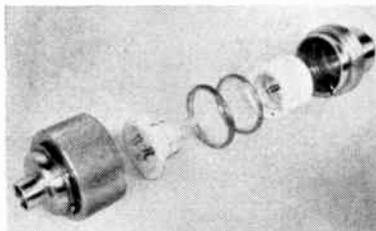
Time Analyzer 20-channel unit

TULLAMORE ELECTRONICS LABORATORY, 6055 South Ashland Ave., Chicago 36, Ill. Model TA-20, a 20-channel time analyzer, is designed for neutron lifetime studies. It is suited for the measurement of Rossi alpha constants, thermal cross

sections, prompt reactor kinetics, and pulsed neutron decays. Channel width is continuously variable from $10\mu\text{sec}$ to $\frac{1}{10}$ of a sec with a calibration accuracy of ± 2 percent. The unit is provided with a choice of single or dual inputs so that the starting and storing functions may be separated. **Circle 57 on Reader Service Card.**

Cable Connector nonpolarizing

AMP Inc., Harrisburg, Pa., has announced a nonpolarizing connector for 3 No. 8 Awg wire metal jacketed and mineral insulated cable. It should be of special value when it may be necessary to frequently and to quickly connect and disconnect large conductor size



metal jacketed cable. The connector encompasses a concentric

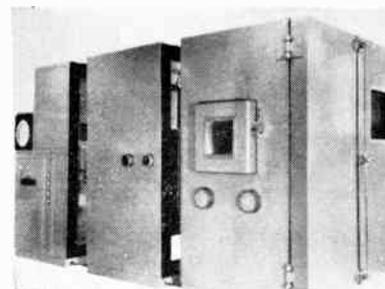
ring design feature which eliminates the problem of proper orientation of contacts where heavy, relatively inflexible cable is employed. It has met rigid tests for reliable operation in environmental conditions of 1,000 F, 100,000 ft plus altitudes, 560 v corona starting voltage and 960 v flashover voltage. **Circle 58 on Reader Service Card.**

Walk-In Facility for temperature test

CONRAD, INC., 141 Jefferson St., Holland, Mich. Model WB-288-705-705 sectional portable walk-in temperature test facility is available. Range is 350 F to -100 F. Test space size is 6 ft wide, 6 ft 8 in. high, 8 ft long. Center section

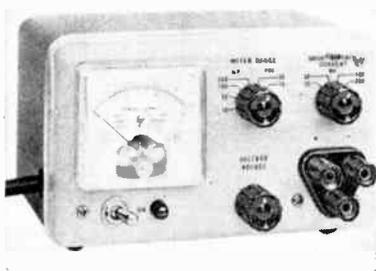
contains accessory openings and the end section is equipped with a reach-in service door and 2 arm-holes. Full end-opening is provided by 2 vertical half doors.

The equipment is useful in testing aircraft and missile components as well as electronic equipment for military and commercial use. **Circle 59 on Reader Service Card.**



D-C Power Supply transistorized

HEWLETT-PACKARD Co., 275 Page Mill Rd., Palo Alto, Calif. Model 721A is a compact, completely transistorized power supply with an output of 0 to 30 v, continuously variable. Regulation, no load to full load, is 0.3% or 30 mv, which-



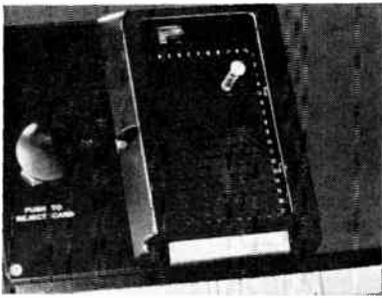
ever is greater. This high regulation insures that the fixed parameters remain stable during tests regardless of line or load variations. This feature, plus the low ripple voltage (less than $130\mu\text{v}$), assures high accuracy of experimental results achieved with the new power supply. Price is \$145. **Circle 60 on Reader Service Card.**



Wire Joints one-piece bronze

THE THOMAS & BETTS Co., 36 Butler St., Elizabeth, N. J., has developed a new Sta-Kon wire joint designed for a maximum of four No. 10 wires, and an enlarged joint for four No. 12 wires. It features

a flared entrance opening to protect wires from nicking and breaking, and an open end to allow quick inspection for proper assembly. Installation consists of twisting wires, inserting them in the wire joint and staking them with the proper T&B Sta-Kon hand tool. Wires may be trimmed after installation. **Circle 61 on Reader Service Card.**



Multiple Switch automatic type

THE HICKOK ELECTRICAL INSTRUMENT Co., 10514 Dupont Ave., Cleveland 8, Ohio. The Cardmatic is a code card type automatic switch that permits manual operation. It is a self-actuating type mechanism built around 187 self-

cleaning, wiping type switches. The design has been life tested to over 100,000 operations without failure. A selected pre-punched code card is inserted into the unit to operate a momentary control solenoid trip mechanism to actuate all desired contacts simultaneously. Price is \$1.25. Circle 62 on Reader Service Card.

Multi-Gun CRT for radar use

SYLVANIA ELECTRIC PRODUCTS, Inc., 1740 Broadway, New York 19, N. Y. The 6DP7 triple-gun crt employs electrostatic focus and

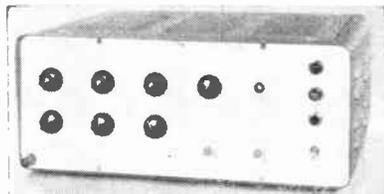


electrostatic deflection.

High brightness and excellent resolution are assured through the use of post-deflection acceleration and an aluminized screen. Circle 63 on Reader Service Card.

Pulse Generator five decade ranges

ELECTRO-PULSE, Inc., 11861 Teale St., Culver City, Calif. Model 3450B megacycle pulse generator is useful in high speed computer development, nuclear research, transistor circuit design, resolving



time studies and clock pulse generation.

Repetition rates continuously variable from 200 cps to 2 mc are provided in 5 calibrated decade ranges. Secondary emission tubes and extremely fast recovery time circuitry provide 0.1 to 100 μ sec continuously variable control of pulse delay and duration. Circle 64 on Reader Service Card.

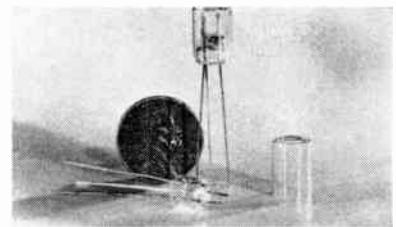
Transistor Case all-glass

CORNING GLASS WORKS, Corning, N. Y., announces an all-glass transistor enclosure. Production of the two-piece transistor case was made possible by the development of a new, close control electric sealing process. The base and envelope are hermetically sealed at

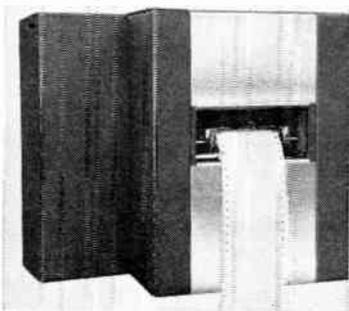
1,000 C while temperature near the semiconductor, less than $\frac{1}{4}$ in. away, is kept below 150 C. Sealing is done in approximately 10 sec.

Both base and envelope of the 200 mil lead circle-enclosure are made of strong, thin-walled, precision glass tubing of high purity.

Current production of the transistor case is limited to the 200 mil lead circle type for low power units.



Other sizes will be available in the near future. Circle 65 on Reader Service Card.



Digital Printer alphanumeric

POTTER INSTRUMENT Co., Inc., Sunnyside Blvd., Plainview, L. I., N. Y. Model 3260 is a high speed, alphanumeric, digital printer featuring reliability, compactness and versatility. Its completely transistorized circuit modules are housed in a compact package with

the print mechanism, suitable for desk or rack mounting.

The unit can print more than 400 digits or characters per sec. It can be supplied with as many as 40 columns of numeric or alphanumeric characters and is able to print at speeds as high as 20 lines per sec for alphanumeric applications. Circle 66 on Reader Service Card.

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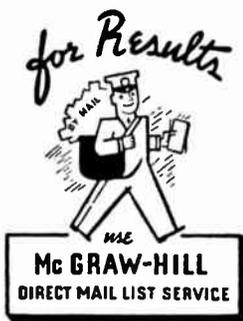
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Literature of the Week

MATERIALS

Ceramics. The United States Stoneware Co., Alite Div., 60 E. 42nd St., New York 17, N. Y., has available descriptive bulletins on high alumina ceramics, high temperature metallizing, and vacuum tight ceramic to metal seal assemblies, as well as its standard line of high voltage terminal bushings. The company offers complete facilities for the manufacture of standard or special components. **Circle 70 on Reader Service Card.**

COMPONENTS

Bobbin Cores. G-L Electronics, 2921 Admiral Wilson Blvd., Camden 5, N. J. Bulletin TB-103 deals with precision made bobbin cores which have many applications in digital processing systems requiring the combined properties of binary information storage and rapid access to the stored information. Tabular information on popular sizes is included. **Circle 71 on Reader Service Card.**

Magnetic Components. Varo Mfg. Co., Inc., 2201 Walnut St., Garland, Texas, has assembled data on many standard models of transformers, magnetic amplifiers, reactors and filters in a brochure for handy reference. **Circle 72 on Reader Service Card.**

Non-Overload Amplifiers. Hammer Electronics Co., Inc., P. O. Box 531, Princeton, N. J. A 4-page folder covers the N-300 series of high-gain, non-overloading amplifiers for scintillation spectroscopy, radiation monitoring and proportional counter analysis. **Circle 73 on Reader Service Card.**

EQUIPMENT

Digital Computer. Bendix Computer Division, 5630 Arbor Vitae St., Los Angeles 45, Calif., has

available an illustrated bulletin on the G-15 general purpose digital computer. Featured is a full description of the simplified programming of the low-cost machine, which is said to place it among the easiest computers to use. **Circle 74 on Reader Service Card.**

Power Supplies. NJE Corp., 345 Carnegie Ave., Kenilworth, N. J. A 16-page catalog covers more than 900 diversified power supply models, over half of which have been completely redesigned. The catalog is complete with a list of the company's representatives throughout the U.S. and Canada. **Circle 75 on Reader Service Card.**

Voltage and Current Calibrator. Electro-Pulse, Inc., 11861 Teale St., Culver City, Calif. Bulletin a/ch gives complete specifications for the model 6020 B voltage and current calibrator which provides a ready means of accurately measuring complex waveform amplitudes and d-c levels. Illustrations and applications are included. **Circle 76 on Reader Service Card.**

FACILITIES

Laminated Plastics. Formica Corp., 4572 Spring Grove Ave., Cincinnati 32, Ohio. A 4-page folder covers the Streamliner program which improves laminated plastics service four ways. Included are 2-day shipment of standard grades; "treated materials" inventories; "special purpose" grades; and special grade development facilities. **Circle 77 on Reader Service Card.**

Printed Circuit Prototypes. Techniques, Inc., 52 Jackson Ave., Hackensack, N. J. New and improved processing equipment enable the company to offer 24-hr "turn-around" service on printed circuit prototypes. Literature is available giving features of the service and a price schedule. **Circle 78 on Reader Service Card.**

Hearings Due on Tv Tests

Tv broadcasters look to June 13 for start of action to standardize broadcast test signals and keyers

TWO WEEKS from today is deadline time for broadcasters to file comment with FCC on the adoption of a standard test signal to be transmitted by tv broadcast stations.

For over a year the three major networks have been experimenting with signal generators that insert test signals during the vertical blanking interval between tv picture frames. Indication test signals are being sent is imperceptible to most viewers.

Equipment now in use sends levels for such signal characteristics as: peak white, 50 percent peak white and black. For color, test signals have included multiburst, staircase with 3.58 mc bursts, sine-squared pulses and color bars.

These test signals are transmitted by special keying devices during the 1.25 millisecc interval when the tv broadcast is carrying no picture signal.

Feeling among users is that further progress in this method of signal transmission depends on having a set of industry-wide standards adopted.

It is anticipated that when FCC has reviewed collected data, the way will be paved for standards

to be determined. FCC reminded experimenters in January that "equipment employed under test authorization may become obsolete as a result of specifications finally adopted."

Among those interested in development of test signal standards are the telephone systems who carry network tv across the continent. Phone company engineers and broadcasters alike feel that wrangling among them will be avoided when it is possible to check transmitted signal characteristics during actual broadcasts.

Engineers who have worked with signal keyers say the transmission technique can be modified to fit many automatic station control developments coming into use in the broadcast industry.

Equipment is already available to automatically correct differential phase and gain errors and control signal level at remote points.

Among possible new developments are signals that will automatically detect and correct faulty frequency response. Another possibility is having signal pulses used to cue network stations to switch over to local programming. One engineer says it may even become possible to perform switching operations which will automatically send broadcast signals through alternate routes if common carrier lines become defective during network transmission.

FCC ACTIONS

- Advises that August will be observed as a recess period during which no hearings will be slated. Emergency and routine matters will be handled.

- Notes filing of petition from Georgia State Dept. of Education asking that channel 8 in Waycross be reserved for educational use.

- Publishes field engineering notes commending Cooperative Intelligence Committees for their aid in finding and solving interference problems.

- Amends allocation chart to split channels in Maritime Mobile and Land Transportation Radio services. Reallocates 161.6 mc from Land to Maritime.

- Invites comment by July 1 on proposal to specify 60-watt power limit for Land Transportation units in 220 to 500 mc band.

- Changes Domestic Public Radio Service rules to change time limit for consolidating and designating common carrier applications for hearing.

- Advises change in broadcast rules on remote control of a-m stations so that Conelrad operation power may be measured by Conelrad supervisors on case-to-case basis.

- Grants application to AT&T, Radio Corp. of Puerto Rico to land and operate twin submarine cables between east coast of Florida and north coast of Puerto Rico.

STATION MOVES and PLANS

WGBH, Boston, plans to start operations at 100 kw. Power increase is made possible by gift of 25-kw amplifier from WBZ-TV.

KARD-TV, Wichita, Kans., gets license for tv station, 1,000-ft antenna.

WACK, Newark, N. Y., receives license for a-m station.

KIXL, Dallas, Tex., plans installation of new transmitter.

KPAR-TV, Sweetwater, Tex., intends to change erp to 145 kw visual, 72 kw aural, antenna to 580 ft.

KBCO-FM, San Francisco, extends completion date to Nov. 19.



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PLANTS and PEOPLE



TI Reorganizes Division

DECENTRALIZATION of the expanding Semiconductor Components division, Texas Instruments, Inc., for the purpose of "improving products and customer services and effecting economies," was announced by Mark Shepherd, Jr., (pictured at left) TI divisional vice president.

Six new product departments, each with complete responsibility for a group of closely related products, have been formed to comprise the division's operations under Cecil Dotson (right), manager of operations. Organized vertically, each department has its own functions of production, product engineering, product marketing planning, production planning, and related activities.

The departments and their managers, with positions formerly held in the S-C division, are:

Silicon products—Harry Owens, former chief engineer; germanium products—James McDade, former chief industrial engineer; diodes and rectifiers—J. Rodney Reese, former field sales manager; special germanium devices—Robert Trent, former head of circuit development branch, design engineering dept.; resistors—Leonard Maguire, who continues in this position; capacitors—Z. W. Pique, former manager of marketing.

Servicing the product departments are eight staff departments. Managers, and positions they formerly held in the S-C division, are:

Industrial engineering—Norman Provost, who continues in this position; quality assurance—W. A. Wortham, formerly in charge of operations research branch in industrial engineering dept.; mechanization—Boyd Cornelison, former head of development engineering branch in design engineering dept.; product development—Willis Adcock, former head of device research dept. of TI's Research div.; personnel—William Spaller, who continues in this position; control—George Livings, who continues in the position of controller.

And, division services—Louis Germain, former manager of central plant and office services in TI's Control & Finance div.; marketing—James Carland, former manager of panel instruments dept.

Managers of staff departments report directly to vice president Shepherd.

W. H. Atkinson, former eastern region sales manager, is new division field sales manager. He succeeds J. Rodney Reese and will make his headquarters in Dallas. Succeeding Atkinson as eastern region sales manager is R. N. Himmel.

Weiss Joins ECS

New staff engineer at Electronic Control Systems division of Stromberg-Carlson, Los Angeles, Calif.,

is Leon Weiss. He is assigned to the data processing section.

Weiss was formerly a staff engineer with Litton Industries in the tactical systems department.



Venator Joins Nortronics

APPOINTMENT of Tom J. Venator (picture) as chief applications engineer of the electronic systems and equipment element of Nortronics is announced. Nortronics is a division of Northrop Aircraft, Inc., Hawthorne, Calif.

Venator was formerly west coast sales manager for the Air-Arm Division of the Westinghouse Corp.

Midwest Firm Adds New Plant

MICHIGAN MAGNETICS, INC., Vermontville, Mich., manufacturer of magnetic tape recording heads, has opened a second plant at Allegan, Mich. The new factory comprises 4,155 sq ft of production, engineering and office space. This will accommodate 50 to 60 additional production workers plus complete production engineering, quality control and plant management departments.

BDSA Award Bestowed

STUART A. PETTINGILL, industry analyst in the Electronics Division of the Business and Defense Serv-

ices Administration, U. S. Department of Commerce, recently received the Meritorious Service Award from Secretary Sinclair Weeks. The award was given, "For consistently excellent performance in the development and administration of programs of the BDSA on electronic components in the areas of mobilization readiness and market research."

Pettingill joined the Electronics Division in February, 1955. His previous government service included the following: chief of the Munitions Industries Section, Bureau of Labor Statistics; electronics engineer in the FCC; economist in the War Assets Administration; and commodity specialist on the radio industry in the Office of Price Administration.



Detwiler Moves Up at Lewyt

New manager of electronics engineering of the Lewyt Mfg. Corp., Long Island City, N.Y., is Sheldon Detwiler (picture). He has been in charge of data processing systems for Lewyt during the last two years. Prior to joining Lewyt, he was associated with Lincoln Laboratories at MIT.

Plant Briefs

Pesco Products Division, Borg-Warner Corp., Bedford, Ohio, announces formation of an Automatic

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Longacre 4-3000

Warehousing Branch which will specialize in the design and fabrication of automated systems for the aircraft industry.

Impact Extrusion Products, Inc., has expanded by moving from Glen Head to larger quarters at 39 Powerhouse Road, Roslyn Heights, New York.

News of Reps

NUCLEAR-ELECTRONICS CORP., Philadelphia, Pa., appoints the following sales reps to handle its nuclear instruments and test equipment:

Arnold Rosenberg Co., for Virginia, West Va., D-C, Maryland, and the state of Delaware, except New Castle County.

Vanguard Associates, Inc., for North and South Carolina, Tennessee, Alabama, Mississippi, Georgia and Florida.

Thomas P. Andrews Co., for Ohio, Indiana and Illinois.

D. B. Cole Co., for California.

Norvell Associates of Dallas, reps for Texas, Oklahoma, Arkansas and Louisiana, will carry the miniature pulse transformers, toroids and filters of **Pulse Engineering, Inc.**, Redwood City, Calif.

A new manufacturer's representative company, **Engstrom Associates, Inc.**, has been formed with offices at 1816 Maywood Road, Winter Park, Florida. The firm will cover the states of Georgia, Alabama and Florida.

Brocker Laboratories, Sunnyvale, Calif., a new manufacturer of microwave test equipment selects **Robert Pflieger**, San Carlos, Calif., as its northern California representative.

Micron Gear Mfg. Co., Westbury, N. Y., manufacturers of instrument gears for the aircraft and missile industry, announces nation-wide sales representation by **Aero Engineering Co.** of Mincola, N. Y., and **Air Supply Co.**, Beverly Hills, Calif., with 23 offices in major cities.

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Men on the Move

**Now available
in a new edition ...
with new figures.**

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JAN. 31	FEB. 7	FEB. 14	FEB. 21
FEB. 28	MAR. 7	MAR. 14	MAR. 21
MAR. 28	APR. 4	APR. 11	APR. 18
APR. 25	MAY 2	MAY 9	MAY 16
MAY 23	MAY 30	JUNE 6	JUNE 13
JUNE 20	JUNE 27	JULY 4	JULY 11
JULY 18	JULY 25	AUG. 1	AUG. 8
AUG. 15	AUG. 22	AUG. 29	SEPT. 5
SEPT. 12	SEPT. 19	SEPT. 26	OCT. 3
OCT. 10	OCT. 17	OCT. 24	OCT. 31
NOV. 7	NOV. 14	NOV. 21	NOV. 28
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BUYERS' GUIDE ISSUE — JUNE 15

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For digital-computer input/output

Ampex offers 45,000 to 90,000-character transfer rates

For high-speed computer input and output, magnetic tape is the answer—and Ampex offers the fastest equipment of all. Just for sport, this Ampex FR-300 could “read” or “write” the digitized equivalent of an average 500-page book in just 13 seconds. Or it could go through the equal of that whole man-sized stack in less than five minutes.

But the real point is that these fast input/output rates are needed. They set the pace that determines computer productivity. Incorporating Ampex Digital Tape Systems for these functions will speed up your whole digital-computer package. Spectacular? Impressive? Yes, but speed is also a tangible and conclusive advantage in the sale of *your* equipment.

TO GIVE YOU THIS GREATER SPEED

The Ampex FR-300 Tape Handler operates at 150 inches per second, a two-to-one advantage over previous standards. It packs 300 bits per inch onto the tape. And FR-300 handlers are available for one-inch tape affording the very practical possibility of putting two 6-bit alpha-numeric characters side by side across the greater width. To get high performance, Ampex has taken a systems approach, designing the tape handler, magnetic heads, amplifiers and the magnetic tape as an integrated whole.

Ampex transfer rates in characters per second

90,000	150 in./sec. tape speed; 300 bits/inch; two 6-bit characters side by side on 1-inch tape.
60,000	Same as above except 200 bits/inch.
45,000	150 in./sec. tape speed; 300 bits/inch; one 6-bit character across half-inch tape.
30,000	Same as above except 200 bits/inch.

Lower transfer rates are available from a wide range of slower tape speeds available on Ampex tape handlers.

DEPENDABILITY, TOO, PROVED IN 50-MILLION STARTS AND STOPS

Though the transfer rates accomplished by the Ampex Digital System are faster than any available before, our engineers have evolved mechanical and electrical design details that make this an easy pace. During development, the most critical of these parts were subjected to as many as 50-million start-stop cycles. This would be a normal year of heavy-duty operation. By drastically reducing downtime expectancy from tape-handler problems, Ampex has contributed still another factor toward increased computer work per day.

A TECHNICAL HEADSTART YOU CAN PUT ON YOUR SIDE

This is magnetic-tape equipment — our specialty. In buying from Ampex, you are “hiring” the very best existing experience and manpower in this field. Behind the Ampex 90,000-bit transfer rate, there are engineering skills and manufacturing techniques accumulated in ten years of specialized effort. This equipment is in production—ready today to give you a competitive advantage—so why divert your own best brains from other critical aspects of computer design?

For full description and specifications, write Dept. E-11.

DIGITAL-
TAPE-SYSTEM
PERFORMANCE

14

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A 40-Ampere* Thyratron

RCA-7086...Xenon
Thyratron Forced-Air-
Cooled, Negative-
Control Triode Type
(shown 1/2 actual size)

*Anode current averaged over any period of 15 seconds maximum

Again, RCA leads the way in industrial tube development—with a husky thyatron designed for applications in which high peak currents are required or in which high average or rms currents are demanded. Here are just a few of the big jobs the RCA-7086 can do:

- It can deliver a maximum peak anode current of 400 amperes in intermittent service or 160 amperes in continuous service.
- In a typical X-ray tube control circuit, two tubes can control a current of 280 amperes rms through the primary of the power transformer (supplying high voltage to the X-ray tube).
- In welding service utilizing a single-phase inverse-parallel circuit, two tubes can provide a maximum average ac output of 130 kva.
- In inverter equipment, two tubes can deliver up to 15 kva average power.
- In speed control of dc motors, two tubes will control 220-volt dc motors rated up to 20 horsepower.

The 7086 has a high commutation factor, a relatively short dionization time, and a negative-control characteristic that is essentially independent of ambient temperature over the wide range -55° to $+75^{\circ}\text{C}$ because of its xenon gas content.

RCA-7086 DATA

Filament volts	2.5
Filament Amperes	92
Air Flow (cfm)	60
Supply Frequency (cps)	25 to 60

	Continuous Service	Intermittent Service
Peak Anode Volts:		
Forward	650 max.	650 max.
Inverse	650 max.	650 max.
Anode Amperes:		
Peak	160 max.	400 max.
Average	40 max.**	7 max.**

*Averaged over any period of 15 sec. max.
**Averaged over any period of 36 sec. max.

Your RCA Field Representative will be glad to discuss application of this new thyatron with designers of power-control equipment. For a technical bulletin on the RCA-7086, write RCA Commercial Engineering, Section E-19-0-5 Harrison, New Jersey.



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