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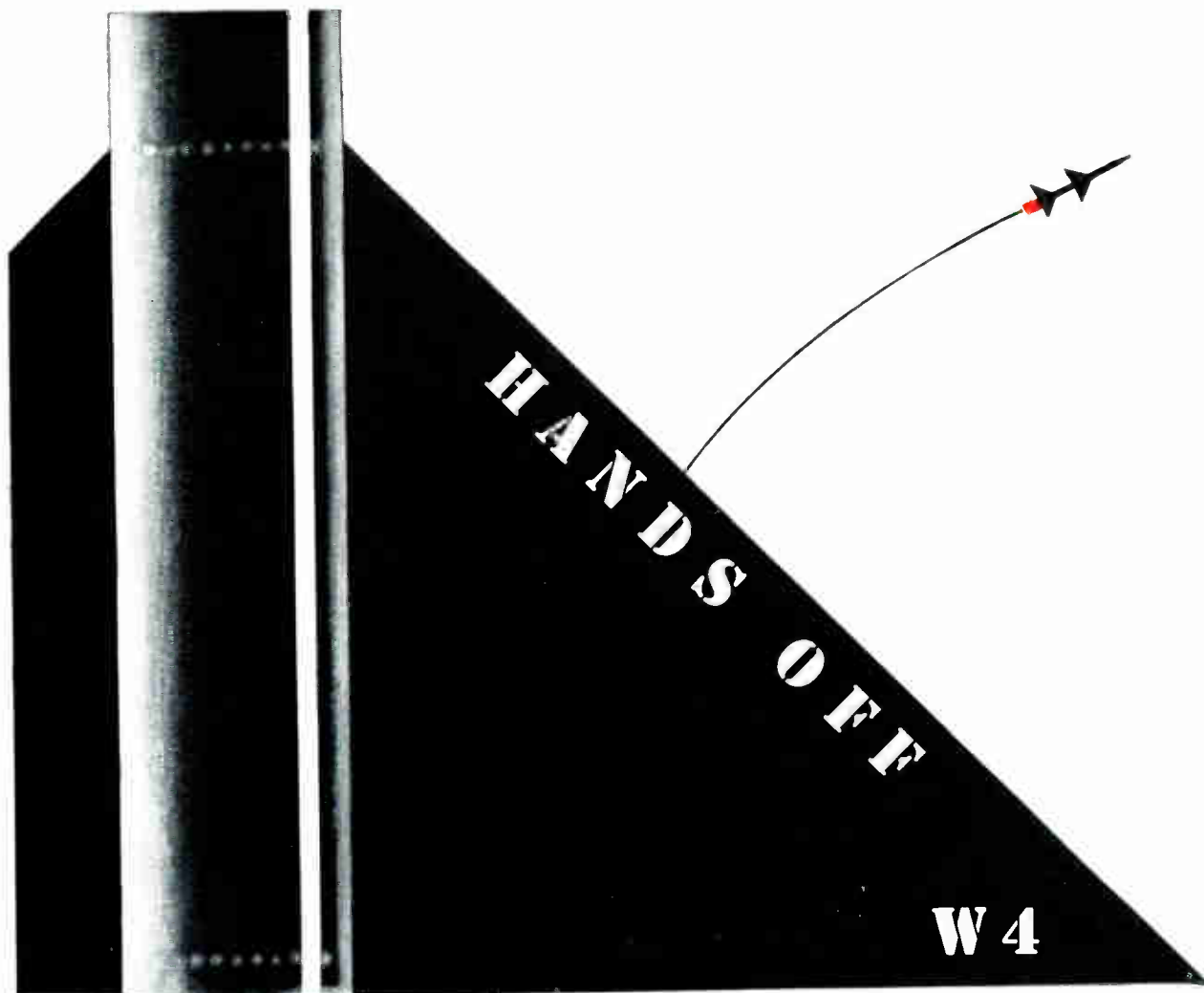
The Big Shift to Guided Missiles

What does it really mean to
the electronics business? p 13



Doctors Ask More Electronics

Closer ties with medical profession
may unlock vast new markets . . p 20



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Missiles: The Big Shift. In defense work today, the big money is in missiles, not aircraft. Some companies will be hurt by the shift to missiles, but most electronics producers will profit. p 13

Numerical Control Scores. The Air Force would like to see computer-directed machine tools replace much of America's aging machine-tool inventory. It could mean big business for electronics firms. p 15

Patent Backlog Grows Again. Electronics patent applications are piling up again despite crash program by Patent Office. Both electrical and mechanical fields are using more electronics. p 17

Liaison Engineers Wanted. He's the general practitioner of the electronic art. Explaining specialists' jargon can earn him \$18,000 a year. p 19

Medical Uses Increase. Electronics engineers and physicians are getting together. Upshot may be big gains in diagnosis and treatment of disease. p 20

Capital Spending Plans Up. Our industry continues to build up plant capacity even as other industries taper off. High level of spending will hold for at least four years. p 22

\$43 Million for VORTAC. The CAA is running out of money for electronic navigation gear. But Congress says the CAA must get the rest from the Air Force. p 24

Solion In Production. Hartford, Conn. firm reveals it is making solions for Navy. Solion is new liquid-state transducer/amplifier to supplement the electron tube and transistor. p 27

Soviets Push Microwave. Russian electronics engineers tell of 6,210-mi. radio-relay system in exclusive interview with ELECTRONICS. p 40

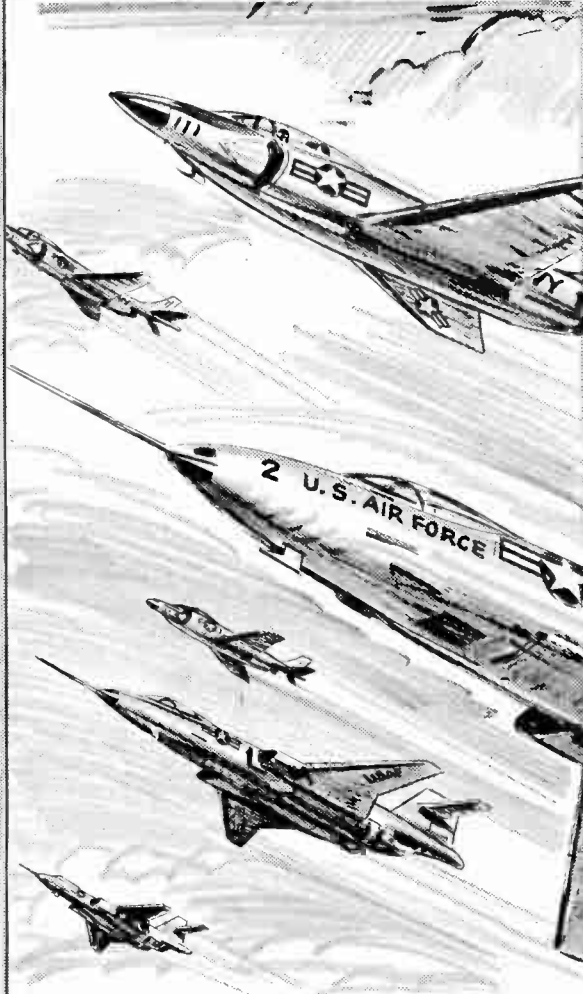
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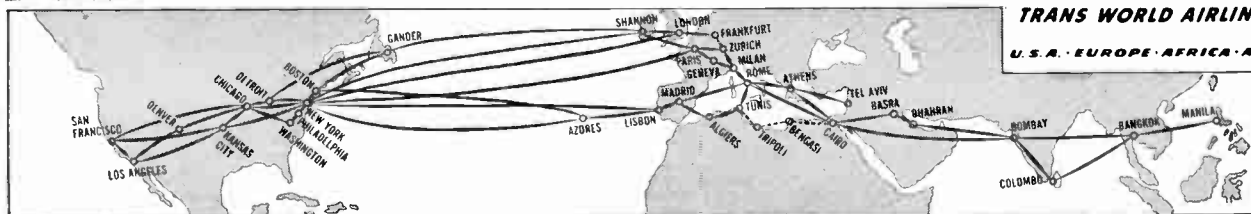
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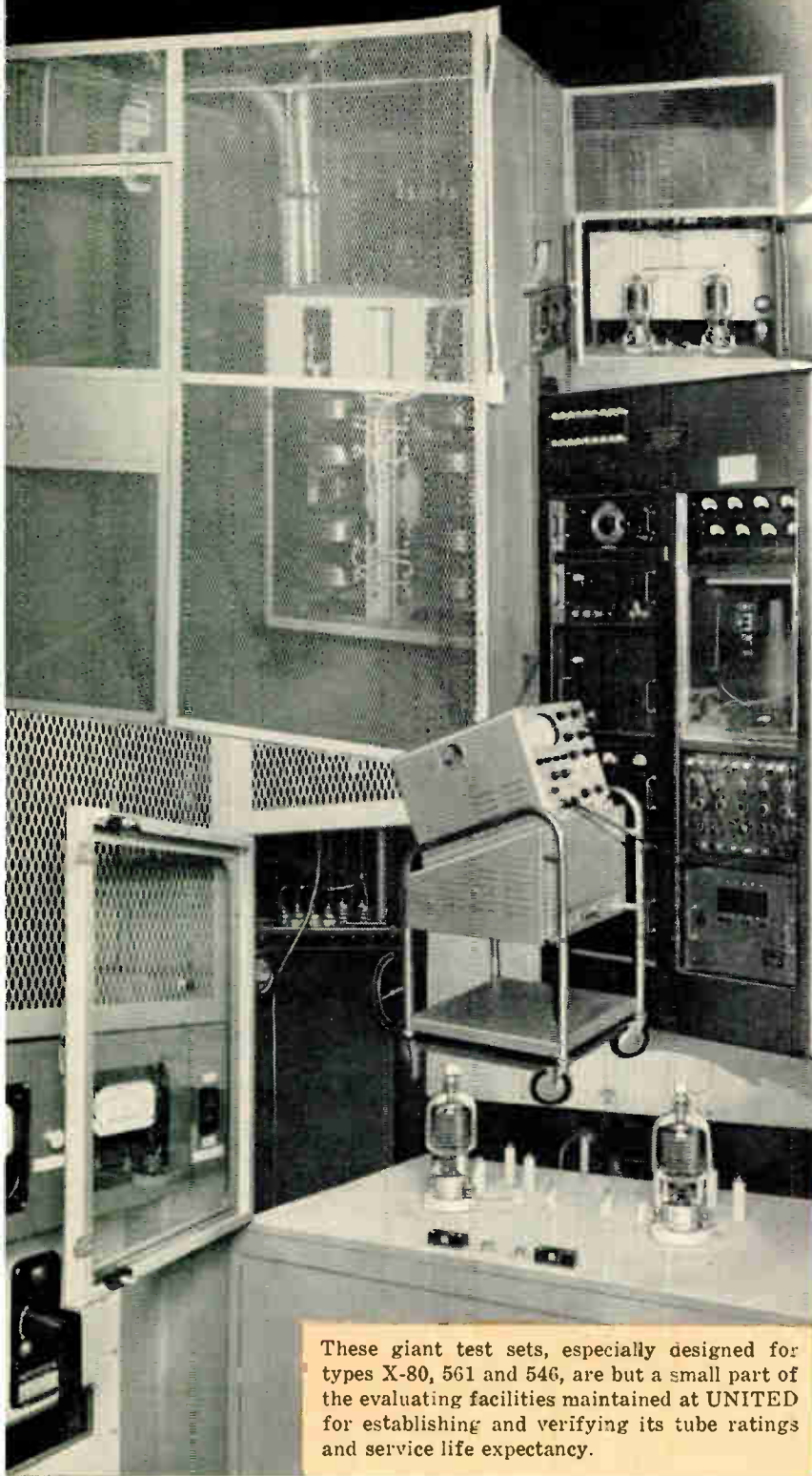


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These giant test sets, especially designed for types X-80, 561 and 546, are but a small part of the evaluating facilities maintained at UNITED for establishing and verifying its tube ratings and service life expectancy.



Type	Code	Filament		epx kv	Anode ib	Ib A	Maximum	
		Vac	Aac				Length"	Diam."
X-80	A	11.5	15.25	40	2.5	.700dc	9 1/4"	3 1/2"
	B	12.2	15.5	33	50	1.25ac		
546	A	11.5	63.0	35	8.1	2.6dc	12 3/4"	6 1/2"
	B	12.2	65.0	35	150	5.2ac		
561	A	11.5	15.25	33	2.7	860dc	9 3/4"	3 3/4"
	B	11.5	15.25	33	50	1.25ac		

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The enormous power these high vacuum diodes deliver is explained in part by the superior combination of graphite anode and bonded thoria emitter techniques. Only UNITED ELECTRONICS because of its singular mastery of these related processes, has accomplished in high vacuum the mionic tubes the high peak energy in small sizes such as represented by these paragons of our Major Series.

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Timetable for Growth

Five-year look ahead may be needed when companies plan heavy money outlays

LONG-RANGE planning is one of the hottest subjects in management discussions today. It has been high on the hit parade at management meetings for many months.

Electronic industry leaders are in the forefront of these discussions. Long-range planning is of crucial significance to research and development based industries. They must plan where they are going years ahead of time, points out management consultant Warren B. Riley of William E. Hill & Company.

Leading influences behind the interest in LRP are:

- Need to prepare for increasing competition and expectations of a return to more average levels of business activity.

- Protection of huge research commitments, particularly in electronics, aircraft and chemical fields. As payoff is years away, careful planning is needed to come out on top.

What is long-range planning? It sets long-term goals for a firm and formulates specific plans for attaining these goals, says Harvard Business School professor, H. Edward Wrapp. Its most highly de-

veloped form includes planning for all of the functioning areas—marketing, manufacturing and finance—plus a master company plan.

Opinions vary on how long is long range. However, five years is generally regarded as the minimum. Ralph J. Cordiner, president of General Electric, says, "More and more we should be planning 15 or 20 years ahead." Robert C. Tait, president of Stromberg Carlson, says that five-year planning is a minimum but that 10 years is too long.

LRP hopes to avoid complacent drifting or unobserved slipping. When management sees bad past performance, it develops alibis, comments one observer. When management foresees bad performance in the future, it scrambles for action.

Large companies have led the way. But both large and small companies are in a position to benefit. The William E. Hill organization has worked to develop long-range plans with companies with sales volumes as low as \$3 million.

One of the leaders in long range planning for small business is Jerrold Electronics. Working out a plan for carrying on present business and planning ahead is a must for small business, president Milton J. Shapp recently told American Management Association members.

However, even its advocates caution against its dangers. Don G. Mitchell, president and chairman of Sylvania Electric Products, says: "It can help a company or it can get the entire organization so snarled in red tape that you spend all of your time planning and none of your time doing."

Other electronic firms actively interested in long-range planning include: Litton Industries, General Dynamics, Hoffman Electronics, Varian Associates and Consolidated Electrodynamics.

SHARES and PRICES

STOCKS OF SUPPLIERS of materials to the electronics industry are less publicized and glamorized than stocks of equipment manufacturers.

However, yields are often higher.

Supplier sales increase as our industry grows.

Manufacturers of magnet wire are an important group of suppliers. Used wherever a coil is used, mag-

net wire has a place in most electronic equipment.

In 1954 sales totaled about \$175 million. This compares with \$140 million in 1947.

Typical Magnet Wire Manufacturers	Recent Price	1956 Dividends	Percent Yield	Earned per Share		Traded	1957 Price Range
				1956	1955		
Acme Wire.....	25½ ¹	2.00	7.8	2.01	3.28	ASE	25-30
Anaconda Wire & Cable.....	75	5.00	6.7	11.40	8.31	NYSE	67-81
Belden Manufacturing.....	35¾	2.00	5.7	4.63	4.09	MWSE	33½-36¼
Electric Auto-Lite.....	36½	2.00	5.5	1.46	6.31	NYSE	30¼-40¾
General Cable.....	46¼	1.80	3.9	4.21	2.73	NYSE	34¾-46¾
Rome Cable.....	28¾	1.40 ²	4.9	4.04	3.82	ASE	26-29¾
Sprague Electric.....	32¾ ¹	1.20	3.7	1.75	2.42	OTC

¹ bid, ² plus stock

Older Men Welcomed

Stavid Engineering has open door employment policy for men over 45

LAST year Stavid Engineering of Plainfield, N. J. ran one small newspaper ad indicating interest in hiring engineers over 45. Out of 49 replies it found 13 top-notch candidates and hired eight new engineering employees. Since then word of mouth and other publicity has supplied a steady stream of qualified older applicants.

Open door policy for mature engineers and other employees has paid off for Stavid. In the past 10 years its sales have doubled every two years. Unlike many other growth companies, its expansion has not been hampered by general shortage of engineering personnel.

Stavid not only welcomes job-hunters past 45, but also those past normal retirement age of 65.

Twenty-five of its 250-man engineering force are over 50. All but one were over 45 when they were hired and ten were over 60.

Only obstacle to older employees at Stavid is that they must be in good health and pass a physical examination required of all employees.

Policy is not a company social-welfare experiment, "We just get more for our dollar," says vice president Frank J. Reynolds.

A number of nationally known scientists have been obtained from organizations with provisions for automatic retirement at 65.

Absences of employees over 45 average one and a half days per year, compared with five and a half days for all employees. There is practically no turnover problem. Moreover, experience of older engineers rubs off on younger ones.

Policy has been in existence almost since the company began business in 1945. Two of its staunchest supporters are vice president Reynolds and personnel manager Eugene Kelly.

Company's pension plan makes its unique personnel policy possible. Not only is plan optional but it does not include new employees over 55. These provisions save the company the prohibitive costs of adding older new employees to the plan.

MERGERS, ACQUISITIONS and FINANCE

• **Waltham Watch** plans to split itself into two corporations. Present corporation, Waltham Watch Co. of Massachusetts, will change its name to Waltham Precision Instrument Co. It will make gyroscopes, timing devices, aircraft clocks, mechanical and electronic components. It will also manufacture some watches. Waltham Watch Co. of Delaware will be formed to concentrate on manufacturing and marketing watches. Stockholders are expected to get one share of new watch company for every five shares of Waltham they now own. Instrument concern will remain in Waltham, Mass., and new watch company will be located in New York City. Company officials expect earnings of both divisions to improve as a result of the switch to independent operations. Waltham earned \$70,000 last year.

• **Digitronics Corp.**, Albertson, N. Y., makes direct offering of 10-cent par class A stock at \$1.00 a share. Stock will be traded over the counter. This recently formed company is led and largely staffed

by former members of Underwood's discontinued Elecom division.

• **Haydu Electronic Products**, Plainfield, N. J., plans issue of 100,000 shares of 10-cent par common stock at \$1 a share. Proceeds are to be used for working capital.

• **Siegler Corp.** plans to acquire **Unitronics Corp.**, Long Island City, N. Y. and **Hufford Corp.**, El Segundo, Calif. Unitronics, formerly Olympic Radio & Television, manufactures radio, tv and hi-fi sets and is also in military electronics. Hufford is a large manufacturer of stretch forming equipment for aircraft and guided missile industries. Siegler will acquire both companies through exchange of stock and will be sole surviving corporation. Siegler president, John C. Brooks, expects merged companies will have sales volume of over \$75 million. Over \$50 million of projected sales is in electronics, half military and half commercial.

• **Microwave Associates**, Burlington, Mass. plans issue of 50,000

shares of \$1 par common stock. Firm produces radar system components. Lehman Brothers is underwriting the issue. The investment banking concern paid \$5,000 for option to purchase up to 20,000 shares of company's stock at \$7 a share. Proceeds will be used to discharge indebtedness of \$250,000 to banks and for additional working capital.

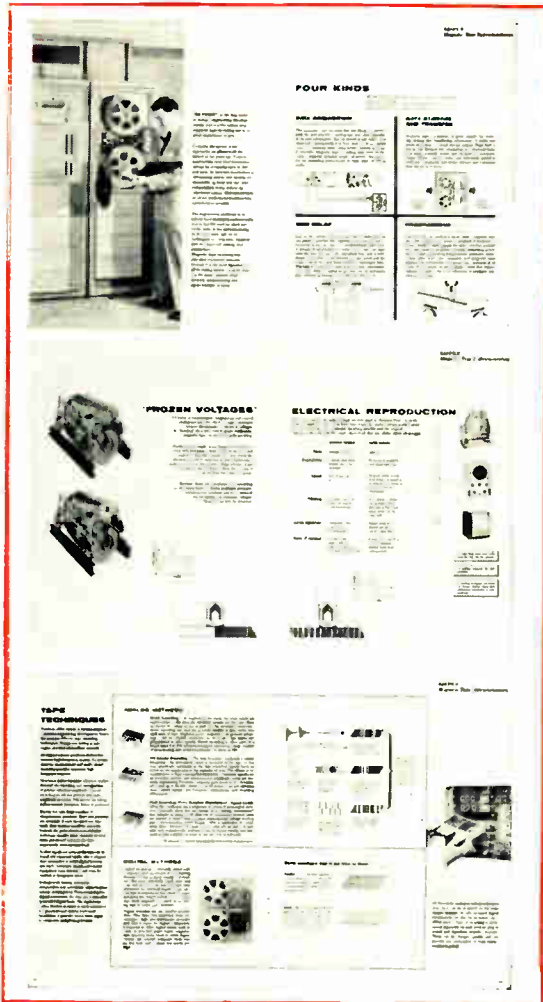
• **KayLab**, San Diego, Calif., revises corporate structure. Shareholders vote exchange of all KayLab shares for all shares of **Cohu Electronics**. KayLab will become Kin Tel division of new company. Cohu Electronics is considering acquisition of a number of other electronic companies on the East and the West Coasts.

• **Ampex Corp.**, Redwood City, Calif., manufacturer of magnetic recording equipment, privately places \$5½ million of 15-year 5 percent debentures. Placement is being made through Blyth & Co. with approximately 12 eastern institutional investors. Proceeds are to be used for working capital.

How to be a magnetic tape recording expert

Introducing a useful new brochure on tape in instrumentation

Tape is the stuff of which memories are made — the versatile data memories for a jet propelled age of electronic miracles. If you are one who keeps up with times and techniques, it is a field well worth knowing. This new brochure gives a wide-angle view of the whole subject.



Typical pages

What kinds of applications do you think of when magnetic tape recording is mentioned? Sound recording, of course, and telemetering, if you are in that business. But what about simulating a rough road to test truck axles, controlling a milling machine to cut an aircraft wing section out of a solid billet, monitoring for a sudden occurrence that may happen only once in a year or two, recording data that can be reduced to graphs and tabulations without ever being touched by

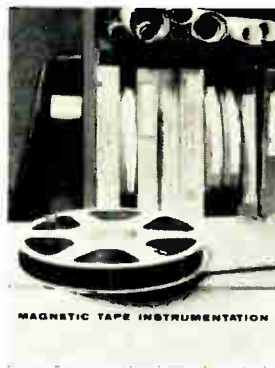
human hands? These and many more are described.

How significant is the fact that magnetic tape recording reproduces data in the same electrical form in which it was recorded? Enormously important, when you realize all the things the reproduced data can do that couldn't be done with the original signals or with the common forms of visual recording. For example the data can be slowed down to look at fast transients. It can be speeded up for wave analysis. It can be read out in any form. A tabular comparison between original signals and taped signals gives the full story. And a step-by-step pictorial demonstration of magnetic tape recording and reproduction puts the electrical-data idea into tangible, easily visualized form.

What does the data on magnetic tape look like? You can't see it, but the brochure will give you an idea of what it would be like if you could. And incidentally this may help to clarify the differences between various magnetic-tape-recording techniques.

Do you talk in tape's language? When is a tape recorder not a recorder? What is the difference between a channel and a track? What is a servo speed control? A much needed glossary gives the consensus of our views on terms.

For whom did we write this booklet... the expert, or the man for whom the whole subject is new? Both. It is written and illustrated so that any engineer or technically trained person can readily grasp the concepts and gain a broad understanding of the subject. If you are one of those who has already worked extensively with tape, you will find some new twists in the way the subject is explained, and perhaps ideas on new areas you hadn't explored. And incidentally, a copy of this brochure in some handy file will give you a good start in indoctrinating that new man in the department.



For your copy, write us today on your company's letterhead. Address your request to Department E-5

MAGNETIC TAPE APPLICATIONS BY AMPEX

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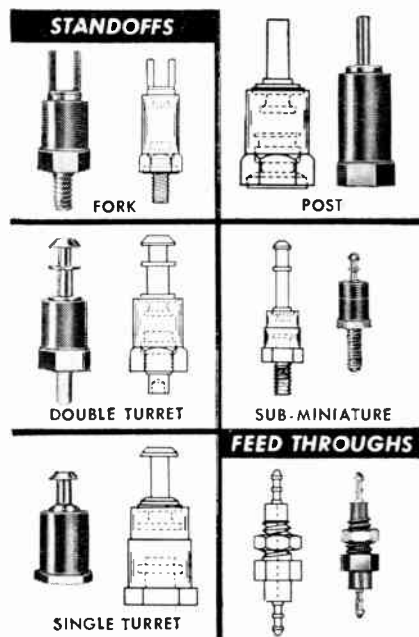
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WASHINGTON report

NEARLY \$800 million worth of Air Force electronics and communications procurement will likely be cut this year under the administration's new drive to hold down military spending, according to top Air Force brass. That's out of an estimated \$2.3 billion worth of Air Force electronics contracting now scheduled.

The cut is part of an overall shakeup now underway for the fiscal 1958 military budget. It involves setting firm ceilings on expenditures by each military service. Staying within these limits will mean cancellation or indefinite postponement of billions of dollars worth of procurement.

Behind the decision to set a spending ceiling is this situation: Military spending, mainly Air Force, is skyrocketing to unanticipated levels. It threatens to wipe out the slim federal budget surplus and break through the legal debt limit. Here are the reasons why:

Cash outlays for contracts let within the past two years are being made earlier than planned because of reduced lead times in aircraft and electronics development.

Ballistic missiles crash program is taking growing sums from production funds.

Industrial price and wage boosts are being passed on by contractors.

Air Force has been starting production projects before enough authorized funds have been allocated to back them up to the end. Pentagon sources call this "partial funding."

Pentagon budget experts say the last factor is most responsible for current expenditures being so far over initial budget estimates (the total is now at least \$2.5 billion more than anticipated)—that payments on partially funded aircraft and electronics contracts are coming due far in advance of Defense Dept. expectations.

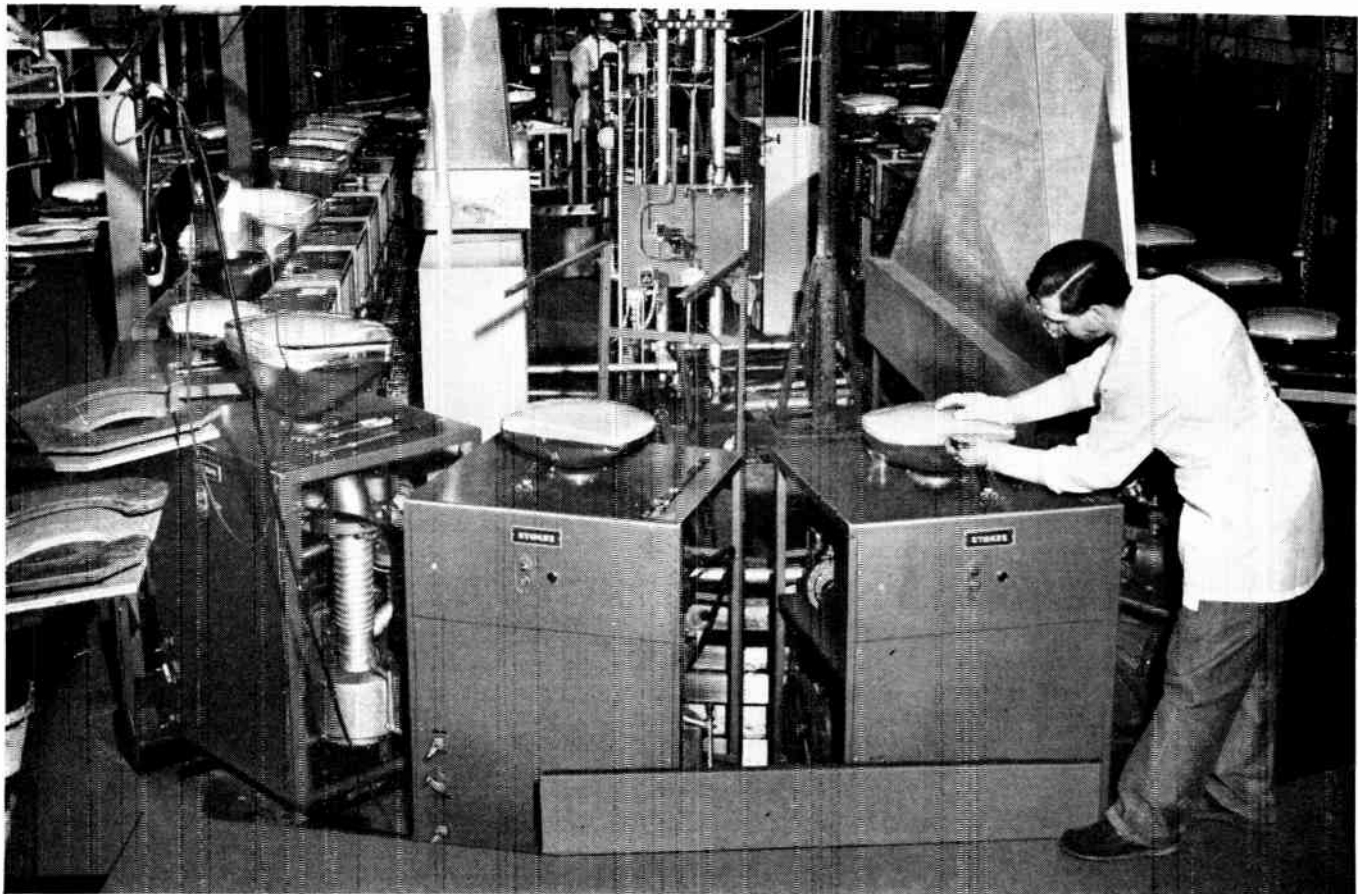
The Pentagon has already put a ban on partially-funded procurement. But it plans to apply the policy more liberally than originally determined. Exceptions will be allowed for most long lead-time items.

Still the situation is serious for Air Force suppliers. New Air Force Secy. Douglas warns industry that "we have been in a period in which we could do almost everything in development and procurement that was desirable. In the future we must be more highly selective. . ."

The warning is out that aircraft producers will be pinched hard by cancelled contracts, stretchouts of existing projects and deferrals of new projects. But insiders say the ax will fall most sharply on airframe and engine manufacturers, much less on electronics suppliers.

- The Pentagon has extended its month-old restriction on military contractor overtime to research and development contracts. The restriction originally applied only to production projects. Overtime pay on R&D contracts will be allowed only on top-priority projects, for continuous-type laboratory testing and to make up for schedule delays beyond the contractor's control. In each case, the Pentagon will have to approve the overtime payment in advance.

- Tighter personnel security clearances on military contracts are recommended in a top-level proposal to overhaul the government's security program. One major proposal is to allow for preemployment clearances. Right now the policy is to conduct security investigations only after a man is hired.



Sylvania "Silver Screen 85" TV picture tubes get Brighter Film . . . with Stokes In-Line Aluminizing System

A new Stokes In-Line Aluminizing System is making news in TV tube production by putting an aluminized reflector on Sylvania Electric Products' popular "Silver Screen 85" picture tube. This automatic equipment—now in operation at Sylvania's Seneca Falls, New York, plant—assures maximum control in the application of aluminum film to TV picture tubes.

The new system provides a bright and uniform film . . . operates at greater speeds than previous aluminizing equipment . . . provides the needed vacuum in the shortest possible time . . . requires a minimum of maintenance.

Here are other ways it can boost production and lower costs:

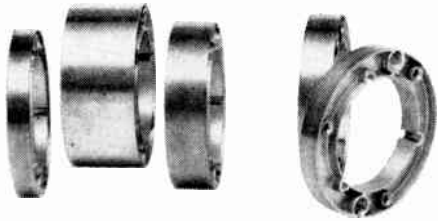
- versatile . . . adaptable to any size black and white tube, including the new 110° design . . . can meet changes in production rates.

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- saves time . . . makes possible the processing of maximum number of tubes in minimum amount of time.
- compact . . . single or twin tube units can be mounted singly, in banks, or adapted to in-line system—circular or straight line.

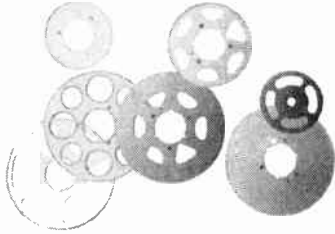
A Stokes engineer will be glad to talk about how this new system can be integrated into your production line . . . and about your specific tube production needs. He can help you apply Stokes 30 years of experience in high vacuum engineering and automatic production technology. For a consultation, or for informative literature, write to Stokes today.

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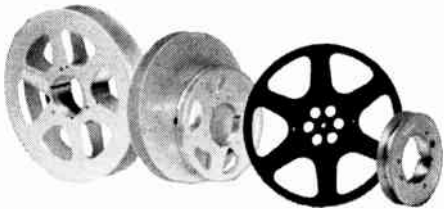
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10

EXECS in the news



Salesman Mitchell: science and people

NATIONAL Sales Executives' 1957 Management Award goes to 52-year-old Don G. Mitchell, chairman and president of Sylvania Electric Products. Peripatetic, voluble salesman Mitchell, was no dark horse for the prize. He has been an arch-proponent of scientific management most of his life.

Born in Bayonne, N. J., Mitchell specialized in mechanical engineering at University of Cincinnati, in mathematics at University of Florida. He taught math at alma mater Montclair (N. J.) High, then sold advertising space for McGraw-Hill. Prior to Sylvania, he sold "electric power, retail goods, milk containers and Pepsi-Cola." He became Sylvania's sales v-p in 1942, president in 1946, board chairman seven years later.

Mitchell believes good salesmen look to scientific methods to help them succeed. He was able to persuade milk companies to use paper containers by analyzing differences between home delivery ("big factor is time") and bulk traffic in stores ("weight and space are the factors").

Basic key to Mitchell's charm and his enormous drive is that he just plain likes people. Talking with him, one can easily believe that the word extrovert was invented to describe him. Deep thinking he does alone—working in his garden, relaxing after supper, sailing.

He has great faith in electronics, says his favorite use would be to close windows on cold mornings or during thunderstorms. He reads a lot, thinks sometimes it's too much—"you gradually develop a broad beam and weak eyes," he says ruefully.

Strictly PERSONAL

Electronics and Common Market

... No question that there are problems involved in exporting instruments from the United States to Europe. . .

Initial proceedings for European integration are well on their way. There may be some doubts as to the time this enormous project will take, but there can hardly be any doubt that it will come. . .

July 10, 1957 — ELECTRONICS business edition

It is clear that (close trade co-operation) can only be introduced in gradual steps. It is planned to have the integration completed in 12 to 15 years. Among the measures planned for the integration are gradual reduction of tariffs within the Common Market, common tariffs by Market countries toward outsiders, complete liberalization of capital and labor. . . .

Once this trade cooperation is working it will create an economic bloc which can be well compared in importance with the U. S. or Soviet bloc. The outlook for the American exporter will become more and more difficult. Now he competes in one country at a time with importers from other countries. When the free trade zone is created, importers from cooperating countries will enjoy economic benefits which will give them an even chance with domestic manufacturers. Nonmember importers will face increased difficulties in licensing and tariffs.

One way to overcome this obstacle is to manufacture in Europe. This is being done by American instrument companies for several years already. (In the future) the difficult decision of where to build the factory can be viewed from a different angle. It is no longer the market of a single country that counts, but . . . the complete Western European zone. . . .

KURT H. MEISSNER

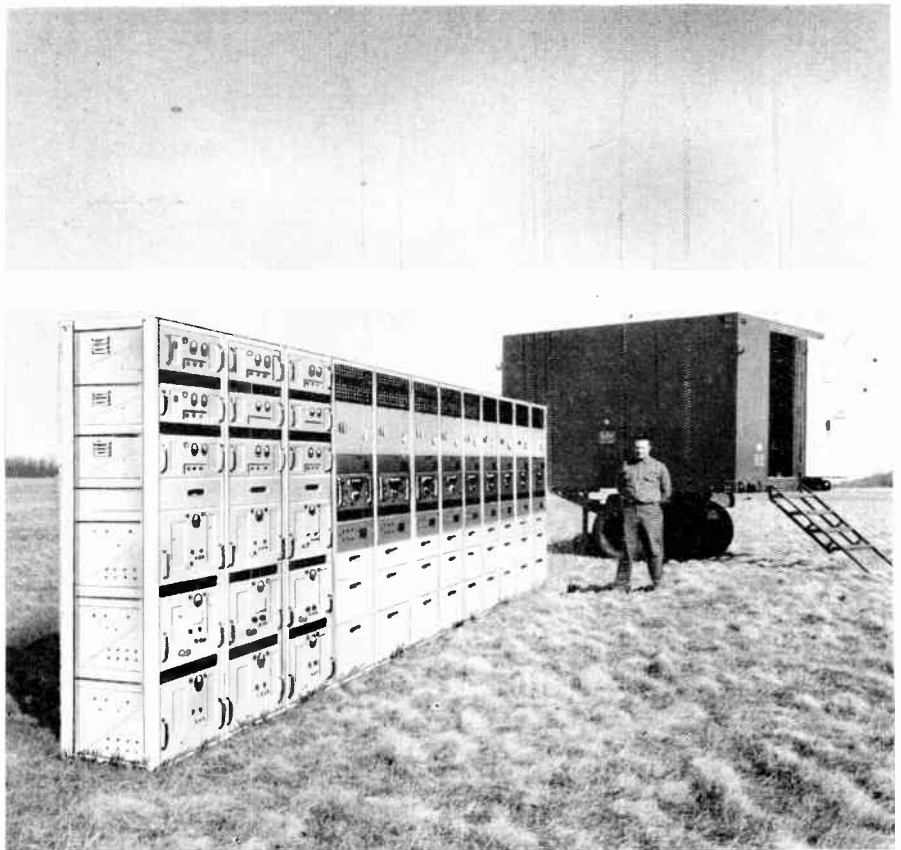
CONSOLIDATED ELECTRODYNAMICS
ZURICH, SWITZ.

Taking out the Buzz

We were pleased to find a photo of one of our products ("Taking out the Buzz," May 10, p 22). However, it was not so pleasing to find someone else's name attached to it.

The photo of the setup in the Westinghouse test center shows our NM-10A radio interference-field intensity meter. This unit will measure the intensity of propagated or conducted signals from 14 kc to 250 kc.

A. T. PARKER
STODDART AIRCRAFT RADIO CO.
HOLLYWOOD, CALIF.



New VAN TRAILER by Craig houses all this equipment . . . with room to spare!

There's plenty of room inside the new insulated Craig Van Trailer LM-105! With its big 5,000 pound payload and roomy 575 cubic foot interior, this rugged van trailer can house 12 standard 6-foot racks, fully loaded with electronic equipment — and still allow ample space for operation and maintenance.

Whatever the load — a complete electronic system, test equipment, mobile maintenance shop, or you-name it — your equipment arrives quickly and safely in the LM-105. This versatile van trailer meets Government specifications for world-wide, all-weather use.

Quick facts about the LM-105:

WEIGHT: Approximately 4,000 pounds including dolly.

PAYLOAD: 5,000 pounds.

DIMENSIONS: (Inside) 140 inches long; 90 inches wide, 79 inches high.

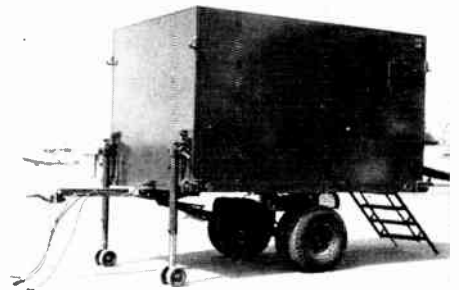
INSULATION: overall shelter has U-Factor of 0.30.

FEATURES INCLUDE: aluminum-faced honeycomb panel construction; lighting system; power distribution box; cable entry ports; stairs; jacks for levelling; and a quickly detachable dolly with coil spring and torsion bar suspension, air-over-hydraulic brakes, and single beam towing tongue.

ACCESSORY EQUIPMENT AVAILABLE: includes air conditioner, heater, workbench, racks, cabinets, spare parts containers, etc.

AIR TRANSPORTABLE: By C-119 or larger cargo aircraft.

ELECTRONIC INSTALLATION: Craig provides complete layout and installation of equipment including wiring and component check-out.



Van Trailer LM-105, front view,
with jacks in position.

For further information, write Craig today!

Craig SYSTEMS, INC. Dept. R-6, Danvers, Mass. Tel.: SPring 4-1870.

WESTERN DIVISION: 6214 West Manchester Avenue, Los Angeles, 45, California ORegon 8-0025.

OTHER CRAIG PRODUCTS . . . transportable and mobile electronic systems, shelters, trailers, vans, mobile control towers, missile carriers, re-usable containers, antenna towers and masts.

averaged \$6.3 billion annually for the past three years, are now slated to drop.

A startling factor is this: though missile deliveries will rise from \$1.5 billion this year to \$2 billion in fiscal 1958, only 10 different missiles, many of them relatively primitive, are now in the hands of service units ready for use should war break out tomorrow.

The more complex and costly missiles—like long-range ballistic missiles—are still in the development stage. Only selected subsystems and prototype models are being turned out. The era of pushbutton warfare is a long way off. Military men stress that missiles are still in their infancy.

Even so, guided missiles have taken over many tactical and air defense missions from manned aircraft—and even more from artillery. Air Force is dropping three manned fighter-bomber wings, one light-bomber wing from its tactical air command because of increasing missile capability. Army is replacing conventional antiaircraft guns with missiles, is setting up missile-armed atomic support commands for long-range artillery fire. Navy now has 18 missile-equipped carriers, cruisers and submarines at sea, is rapidly converting and building other vessels.

With more missile money around, changes in how the government will spend it are on the way.

Under the weapons-system concept of procurement, the airframe maker—and other prime contractors—have become more free-wheeling. In the old days, the airframe maker was somewhat of an assembler—putting together the engine, bombing and navigation system, fire control, and the like, which the government supplied.

Now he's a weapon-system contractor responsible for designing and developing specially tailored components and subsystems. No longer can such products be developed by others, taken off the shelf and cranked into a new end-item. As a result, the prime contractor now keeps more work in his own shop, subcontracts less to other companies.

A big shakeup is underway in the roster of leading military contractors. For the most part, established giants of airframe making lead the pack in missile production. But they do so mainly because they've diversified into electronics and propulsion systems. New blue-chip electronics firms are developing.

North American, Convair, Lockheed, Northrop, Fairchild and others have diversified into missile electronics, competing with established electronics producers like Sperry Rand, RCA, Westinghouse, Raytheon, Hughes, Philco, General Electric and Western Electric.

Scores of new electronics firms have blossomed forth as important money-makers—Ramo-Wool-

dridge, Servomechanisms, Inc., Kearfott, Topp Industries and the like.

Many established producers in metalworking and other industries have moved into electronics—Rheem Mfg., American Machine & Foundry, GM's AC Sparkplug div., Goodyear, ACF Industries.

But the big jolt of the missile shift is still to come. In a recent Washington speech, Air Force's Maj. Gen. David Baker, procurement and production director for Air Materiel Command warns there will be fewer weapon systems and fewer prime contractors in the cards. He stressed that:

- Not many strategic missiles will be needed because of the destructive power of nuclear explosives. Needed will be a few missiles that give top performance.

- At present, need for combat airplanes is dropping off. It may pick up, however, if someone makes a plane that can do things a missile can't.

As total volume of work drops off, prime contractor will tend to do more of their own work. Right now, 30 percent of airframe and missile frame production is subcontracted. The big shift may hurt subcontractors and vendors, too.

Open Ears Get Men

Chance to air 'gripes' helps one company's recruiting

THERE'S a personnel office in New York, with no name on the door. It has no physical connection with any other office. It's called a "gripe room."

In hopes of eventually saving half its engineer recruiting costs, North American Philips is trying something different.

The idea is to attract dissatisfied engineers instead of trying to lure engineers with compatible jobs from other electronics firms. Engineers do not give their names until hiring talks begin.

Engineers entering the den are briefed on what Philips' twelve establishments are doing. An average of one person a day came in for consultation during the first month. Six were referred to Philips divisions.

Only advertising for the "gripe room" is by word-of-mouth. Regular advertising will still be used for specialists who are not likely to just walk in, but the firm hopes to avoid expensive general recruiting.

Another purpose of the room: to help Philips keep its own engineers. It's a place for them to talk out their problems in confidence. An engineer dissatisfied in one Philips division might find a better-fitting niche in another.

Numerical Control Scores

- \$30 million in Air Force contracts for airframe and missile milling machines lift computer-directed machines into production
- Aircraft makers find numerical control halves machining time, allows production of "impossible" parts. Other industry waits

"NUMERICALLY controlled milling begins a new manufacturing era—when additional equipment is required, thoughts must turn to automatic control."

So said one aircraft and missile maker recently after its first tape-run miller cut a part's tooling time from 210 to 118 hours, reduced machining time from 5.5 to 2 hours.

Some airframe parts are so complex and closely toleranced that only computers can figure out the cutting motions required. Added are the cost and production problems of short and broken-run industry.

Air Force Air Materiel Command has contracted for \$27 million of newly designed numerically controlled profile and contour millers for use in defense plants. Another \$3.5 million is being spent for conversion of existing millers.

About a fourth of this goes to electronics. Each

group of machines will need a computer director to prepare coded instructions on tape or cards. Each machine will need controls to translate instructions into cutting motions.

One machine's computer director costs \$200,000, the machine itself, \$500,000. Each of the millers will get a control console costing up to \$65,000, depending on number of cutting directions handled.

A few million dollars worth of prototype machines were operating in 1956. Volume production comes this year. One source thinks spending on numerically controlled machine tools will total \$100 million in next few years.

There's no way of telling how much civil aircraft makers and other industry will spend. An Aircraft Industries Association committee recommends plane makers buy only numerically controlled millers.

Air Force, which sponsored R&D dating back to



Taking a Picture of Radio Noise

R-F spectroscope operator watches interference on cathode-ray oscilloscope as flight engineer switches from one electronic system to another. Developed by

Republic, built by Applied Research, device is offered as noise-interference and spectrum analyzer, counter-measures and monitoring receiver.

1949, has been driving force. Other service branches may join. Government owns \$6 billion worth of machine tools, much of it outmoded. Department of Defense wants 2 to 5 percent replaced annually, starting in fiscal 1958.

Industry owns \$24 billion, half at least 10 years old. Business and Defense Services Administration official says national inventory is in worse shape than at start of World War II or the Korean war. New machines needed: \$2 billion-plus.

Machine tool makers this year looked for a peacetime record. But orders are still running below last year's \$900 million. One spokesman feels new machines with electronic controls could boost sales.

Control makers are confident the big airframe millers will exceed expectations. The generally cautious machine tool industry wants proof numerical controls are so good no major machine tool should be without one.

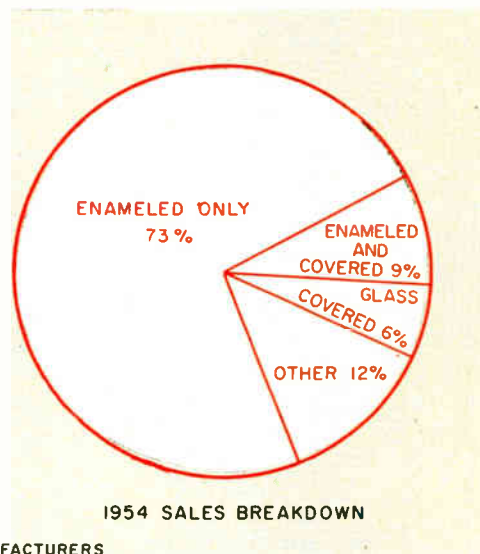
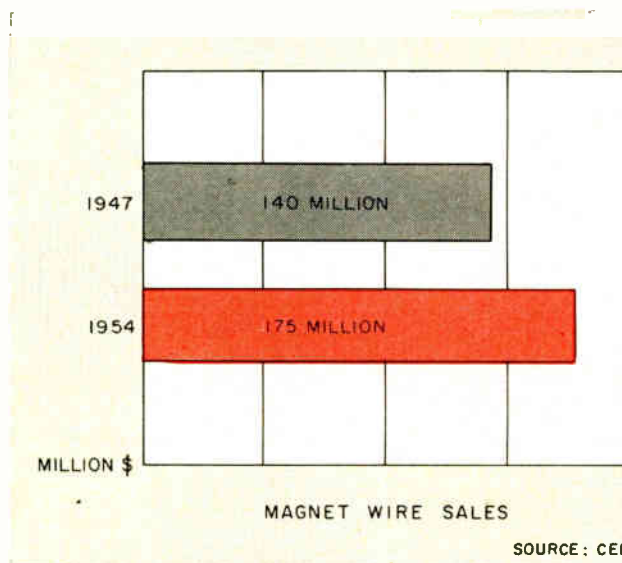
Of 325 machine tool makers, only a fistful of the biggest have teamed with electronics firms to design controlled machines. There's been no concerted attack on job shops, the backbone of a \$125-billion metalworking industry.

Several companies are making numerical controls designed for converting existing machines. Costs, including less complex tape preparation unit, run about \$25,000. Few are now sold outside AF.

Control makers feel they are about five years ahead of the machine tool industry; applications are still rudimentary. Some predictions of ultimate use:

- Air Force parts depot: machine tools to produce any machined part at the turn of a knob.
 - Computer-oriented machine tools, which fed specifications and materials, will calculate optimum design and turn out the parts.
- So far firms in numerical control are willing to trade profits for a passport.

PRODUCTION and SALES



Magnet Wire Gains 25 Per Cent

LATEST Census data shows magnet wire sales increased 25 percent in eight years. Sales totaled about \$140 million in 1947, compared with nearly \$175 million in 1954.

Enameled-only type accounted for \$126.5 million or 73 percent of total 1954 sales. Remainder was divided among enameled and covered, \$16.6 million or nine percent; glass covered \$10.8 million or six percent and other types, \$20.3 million or 12 percent.

As magnet wire is used wherever a coil is used, it has applications in almost all types of electronic equipment. Major users are: radio, television, aircraft, radar, sonar, loran, small motors and transformers.

• **Military** electronics spending in first three quarters of fiscal year 1957 was about \$2.5 billion, RETMA reports. Record figure is 25 percent over the \$2.0 billion spent for military electronics during

first three quarters of fiscal 1956.

If present levels continue military electronics spending this year should set a new annual record, near \$3.5 billion. Total spending in fiscal 1956 was \$2.8 billion, 25 percent less than the 1957 forecast. Guided missile spending passed aircraft for first time in third quarter of fiscal 1957. Out of total of \$952 million spent in third quarter, missiles received \$311 million compared with \$258 million for aircraft.

Patent Backlog Grows Again

- **34,200 electrical-electronic applications wait in Patent Office; electronics trend up in '57**
- **Trend is for more electronics patent application in electrical field; more use electronics in mechanical devices also**

PATENT OFFICE in 1957 is like a turtle going uphill on crutches. It's courageously tackling the backlog of applications but the going gets pretty rough.

More than 212,000 applications are awaiting processing, including 34,200 in the 10 electrical divisions where most electronic applications go—up from 25,000 in 1955.

Last year the annual rate of electrical applications fell off by about 2,000, the first drop in years. The Patent Office saw a possible leveling off at about 10,000 a year. But then came a flood, indicating a probable rise rather than a leveling off.

New electrical applications may total 12,000 this year. About one-third of those on hand are electronic. And the trend is towards more electronic applications than ever in the electrical divisions.

An increasing number of mechanical applications include electronic controls as part of a machine.

There is talk of establishing two or three new divisions of the Patent Office to handle automation applications. These would cover electronic and other machine controls.

The personnel situation is brighter in the electrical divisions than last year—there are 134 assistant examiners compared to 108. But recruiting is a constant battle against defections.

Sad fact of Patent Office life is the low Civil Service salary scale—about \$4,500 to start and about \$5,000 after three months for engineering graduates. Young assistant examiners are sometimes hired away by industry or government agencies, often within a year after joining the Patent Office.

Some assistant examiners have accepted higher salaries with the Department of Defense as patent application processors for the technical staffs of the military services. Others take jobs in the patent departments of corporations.

Last year 40 assistant examiners were recruited by the 10 electrical divisions; about 25 left. This year 40 to 50 June graduates are being sought. Eventual goal is 180 examiners, 46 more than present staff.

Recruiting is accomplished largely by examiners

who must leave their duties to visit schools in an effort to ferret out candidates. Industry's pay scale is rough competition.

Men with electronic training are also being recruited for the mechanical divisions to help handle applications that include electronic machine controls.

Electronic computers and punched-card machines are being brought into play. A unit handling certain chemical applications is in use.

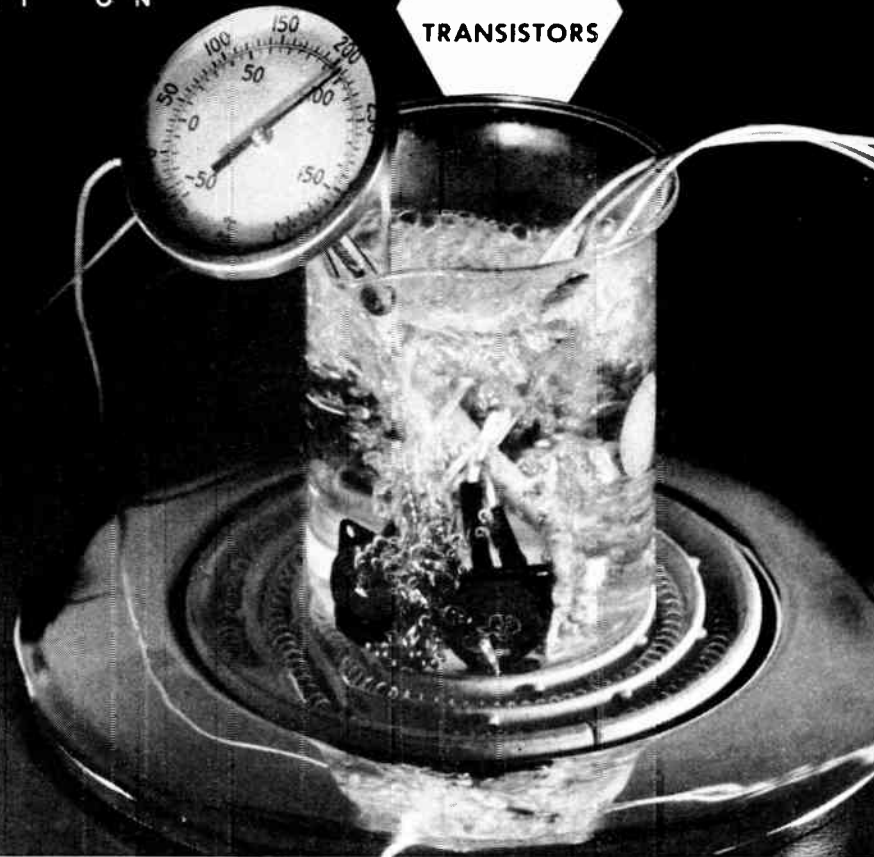
Chemical elements can be broken down into a code for processing. Doing the same for an electronic patent application is now considered unlikely.



French Stenographer

Typewriter operates when operator touches stiletto-like writing instrument to copper contact studs labeled with shorthand symbols. Frenchman Albert Ducroc devised 57-tube prototype machine, called Electrostyl, capable of storing 16 sentences in its memory and typing at speed of spoken word

**SILICON
POWER
TRANSISTORS**



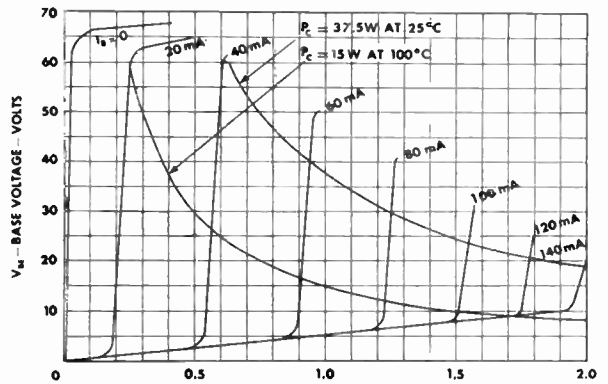
now you can get

15 watts at 100°C



NEW silicon high power transistor

For your audio servo uses — and many other applications, you can reach new transistor highs — in power, temperature and gain with low distortion and the stability and reliability you expect from silicon transistors. In Class B operation, the new TI Type 2N389 silicon diffused junction transistor provides 15 W power output at 100°C... with distortion of less than 10% and typical beta cutoff frequency of 300 kcps. This new transistor is the first high power silicon transistor and the latest addition to the TI silicon line... widest in the industry.



BASE VOLTAGE VS. COLLECTOR CURRENT — COMMON EMITTER

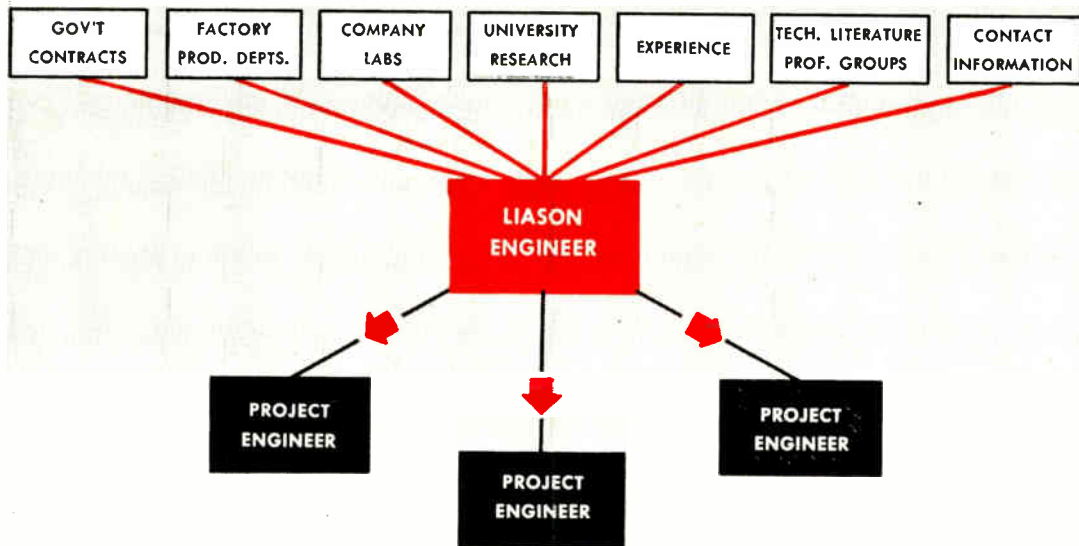
absolute maximum ratings

Power Dissipation at 100°C	15	Watts
25°C	37.5	Watts
Collector to Emitter Voltage	+60	Volts
Base to Emitter Voltage	-2	Volts
Collector Current	2	Amperes
Saturation Resistance	6	Ohms
Base Current	0.5	Ampere
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Now! 37 TI silicon transistor types — your widest choice



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Liaison Engineers Wanted

- The liaison engineer is in great demand. He needs a wide range of experience to explain specialist to specialist
- He's genial, gregarious, rare and can earn anywhere from \$7,500 to \$18,000

IN THE last 18 months GE found and hired more than 20 liaison engineers. Men filling that classification are as rare as hen's teeth. And they're in great demand.

To some a technician with a rather peculiar background, the liaison engineer is a generalist in electronics.

He is at home in fields of communications, radar, sonar, infrared, computers. You name it, he knows a lot about it. Talking everybody's language, he has as his job explaining specialist to specialist.

John B. Berkley, GE's consultant for laboratory coordination and liaison in light military electronic equipment department, says liaison engineering grew from "the growing tendency of each specialized group to create an aura of methodology and terminology around itself."

Liaison engineers today fill a potful of jobs. Some join in on product planning. They hold planning within the limits of practical engineering. They may recommend areas for development.

They keep contact with customers, aiding in product applications, learning his needs.

They relay latest technical information to the specialists.

They troubleshoot in all technical phases of the

company. They may not be able to solve the problem; but they know who can.

They coordinate when a problem is divided among more than one project group.

Liaison engineers, to succeed in their jobs, are usually genial and gregarious.

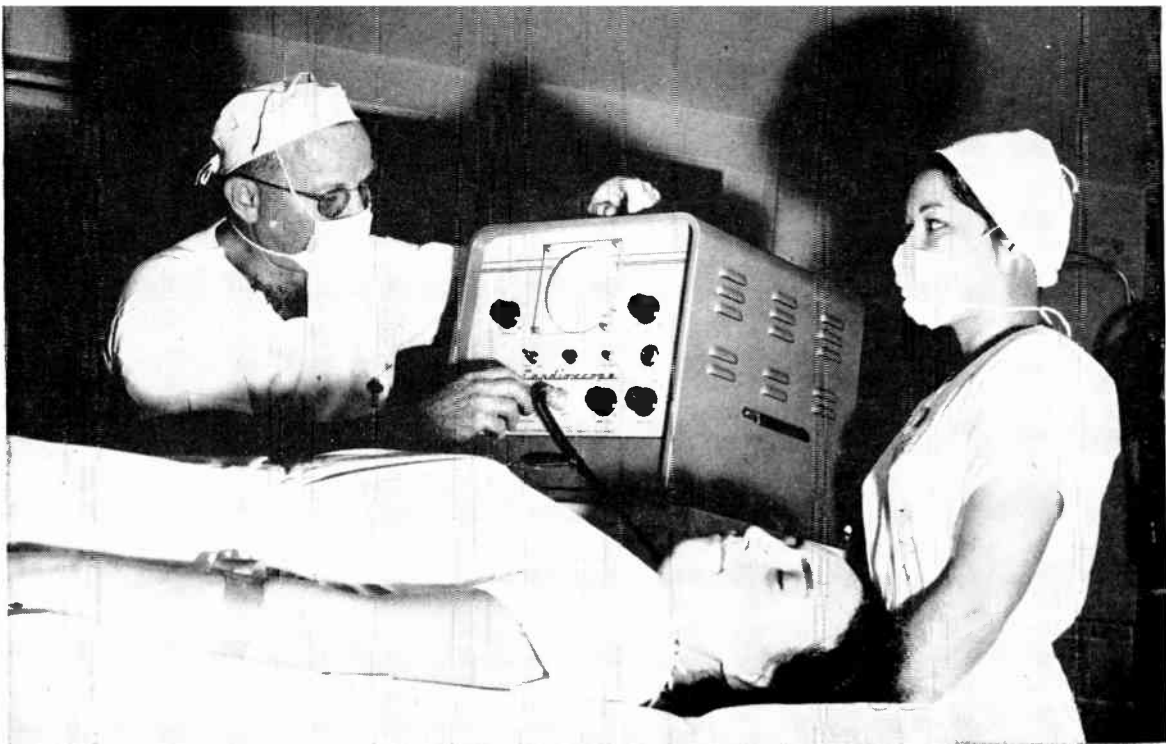
The liaison engineer ideally has a master's degree, some 5-7 years of work experience with 2 or 3 companies. He has, by choice, ranged into many areas of electronics.

He can usually get for a starting salary \$7,500 a year. If he asks for less, he may not get the job. He can climb up to \$18,000.

He gets information by "pumping" contacts:

- He is alert to all developments taking place in his own company.
- He is aware of developments and theory in universities and their labs. "Too often the self-effacing scientist becomes neglected," says one firm.
- He sops up the latest information from technical literature and engineering societies.
- He is conscious of work done by competitors.

Many liaison engineers have Army, Navy, Air Force backgrounds. They are frequently in the know about R&D contract procedures.



Electronics checks patient's heartbeat as . . .

Medical Uses Increase

Many physicians say electronics could spark a major breakthrough in diagnosis and treatment of disease. But much closer cooperation is needed between engineers and medical men. Present medical market is \$150 million annually—more than half of which is for x-ray gear

OUT of a doctor's black bag come a stethoscope, blood pressure gadget, tongue depressor, eye-examining mirror and reflex hammer. Watching these objects being placed on a table one day last month were some of the nation's leaders in medical electronics engineering.

"Primitive" is how Dr. John H. Heller, director of The New England Institute for Medical Research, described the black bag instruments in comparison to modern industrial and military instrumentation techniques.

The institute, in conjunction with The Foundation for Instrumentation Education and Research, thus opened its "Conceptual Clinic for New Instrumentation for Medicine and Biology."

Physicians need help from electronics to put their measuring techniques on a par with other medical knowledge and skills. That's why there were present some 70 representatives of industrial management and medical electronics research, including several electronics executives.

The black bag-carrying doctor is an excellent and predictable market for instruments, the electronics men heard. But other medical electronics demands are also great.

Estimates place medical electronics national gross at \$150 million. X-ray and other radiological equipment accounts for half. Remainder is split almost equally between therapeutic and diagnostic devices.

"Ten years from now," predicts Dr. Oscar Dallons, "electronics will supplement many current surgical practices and medical therapies." Dr. Dallons, head of the Los Angeles medical electronics labs bearing his name, regards closer cooperation between M.D.'s and electronics people as paramount.

Dallons practices what he preaches. His close friend, Dr. Petter Lindstrom, has performed 26 prefrontal lobotomies using Dallons' ultrasonic generators. UCLA's Dr. W. E. Stern has had good results with diathermy equipment. He uses it for heating localized areas of the brain in the fight against cerebral disorders.

USC's Dr. Leslie Kacburn points to the transistor as catalyzing medical electronics growth. "Miniaturization will permit widespread use by general practitioners. Equipment formerly has been too bulky and unwieldy for use in crowded offices."

Dr. Kacburn has developed several electronic devices to aid specialists in many fields. His latest, the elastometer, is used for examining artery harden-

ing and deterioration as functions of aging and pathological processes.

Attesting to the potential for medical electronics, Cecil Birtcher points to his Los Angeles firm's success. It has shipped 15,000 ultrasonic units to 70 countries during the past 4 years. Company gross averages \$3,500,000 annually. "A vast new field in the area of ultrasonic destruction of kidney, bladder and gall stones is being probed," states Birtcher.

UCLA's Dr. S. D. Larks is conducting extensive studies of the electrical activity of the uterus in pregnancy and labor. "Development of an electrodiagnostic device, similar to the electrocardiograph for the heart and the electroencephalograph for the brain, is just around the corner," he claims.

Ultimate goal of project—reduction of birth injuries, lessening of pain and saving of lives. "Electronics firms can help by supplying multichannel recording oscillographs with more stability and linearity," says Larks.

Medical people are betting high on computers. Says Dr. Robert Tschirgi, also of UCLA: "I have no difficulty in foreseeing times when the majority of medical diagnoses will be performed by appropriate analyzers coupled with computers.

"The ultimate system would be one into which blood and urine samples, ckg and x-ray records, blood pressure readings and other information could be fed. Chemical analyses and computation of probable diagnosis would be automatically performed."

Tschirgi's current research project deals with the

function of the brain as related to its surrounding fluids.

Dr. Travis Winsor, who has programmed medical problems on Lockheed missile division's computers, states: "I visualize electronic computing centers to which various wave forms can be sent for detailed analysis. Reports would be returned to the doctor assisting him in the interpretation of difficult tracings."

Winsor invites electronics engineers to develop:

- Better ways of recording the electrocardiogram.
- An improved ballistocardiograph (for recording output of blood from the heart).
- A device for detailed analysis of breath sounds.

Levinthal Electronic Products, Inc., of Palo Alto, is counting on a high demand for its new defibrillator-pacemaker. Combination electronic unit is designed to eliminate thoracotomy (opening of the chest) in case of cardiac arrest or ventricular fibrillation during surgery. Company describes it as a complete cardiac-resuscitation package.

Varian Associates say the electron linear accelerator is proving to be a powerful tool for cancer therapy.

Accelerator produces either high-energy electrons or x-ray which penetrate deep into the body to destroy malignant growth with minimal damage to body's outer layers. "This product shows promise of becoming a standard hospital machine for routine cancer therapy," Varian states.

Technical DIGEST

• **Evaporation** of aluminum onto milled slots in germanium wafers through masks is new Westinghouse technique for forming emitter and collector junctions. Process makes possible production of junction transistors approaching the kilowatt range and controlling up to 10 amperes. Current gains over 100 are easily achieved.

• **To combat fading** in radio communication, intermittent transmission is proposed by NBS. Message is automatically stored at transmitter during fades, and transmitted automatically at higher-than-normal speed during intervals when signal-to-noise ratio is adequate. Method gives theoretical gain of 40 db or more over continuous fixed-bandwidth operation.

• **In studies** of slip motion at sea, Bell Aircraft Corp. uses an Ampex magnetic tape recorder at its lowest speed of 1½ inches per second. It records ocean-wave frequencies down to 1/10 cps, then plays the tape back at 60 ips. Recopying once with the same two speeds gives a total speedup of 1,024 times, so that 1/10 cps becomes about 100 cps, a frequency which can conveniently be handled by electronic wave analyzers.

• **Conductive wax** by Burgess becomes liquid at 170 F for easy application to zinc and sheet carbon electrodes of flat or wafer-type dry cells. It gives good series connections automatically when cells are stacked. Finely divided silver powder is mixed with wax in critical ratio. Similarly, wax adheres to many other materials to give good electrical joints.

• **Use of computer** as an oscillator has solved the problem of obtaining a precisely symmetrical low-frequency waveform. The signal was required for testing an auto-stabilizer on a servo-driven rocking table at Short Bros. & Harland in England. Three linear function units were set up to solve a single second-order differential equation with no damping term. A discontinuous function unit provided automatic amplitude control.

• **Sensitive diathermy** machine developed by Ford Instrument will be tested next winter. It will be used in operations on a detached retina of the eye. Key features are control of frequency, duration and magnitude of power applied to patient. It will be used for cutting or coagulation, will get the retina back in position and irritate the eyeball to get it to stick.

Capital Spending Plans Up

- **Electronic and electrical equipment manufacturers plan to spend \$712 million for capital goods in 1957**
- **Our industry will maintain high level of capital spending for four years despite tapering off in other industries**

ELECTRONIC and electrical machinery manufacturers plan to maintain a high level of capital spending in the next four years. This conclusion is indicated by final figures of the recently completed tenth annual McGraw-Hill survey of Business Plans for New Plants and Equipment.

The industry plans to spend \$712 million in 1957 on new plant and equipment. Capital spending will level off in the following two years with \$705 million planned for 1958 and \$712 million for 1959. A sharp jump in capital spending will occur in 1960 when expenditures of \$762 million are scheduled.

Actual expenditures for 1958-1960 may turn out even higher than these preliminary estimates.

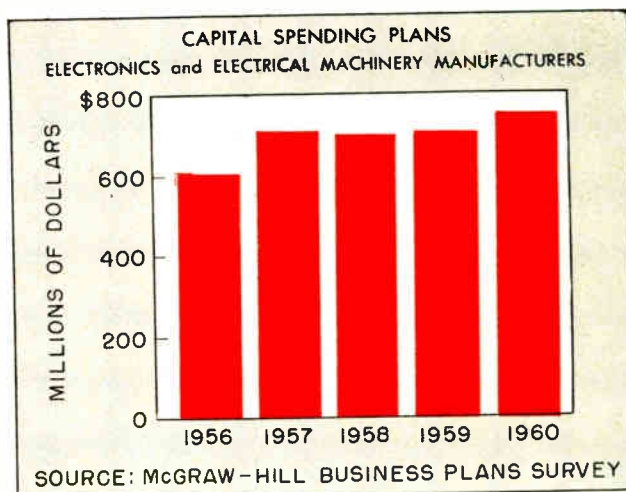
Planned capital spending in 1957 by the electronic and electrical industry is 18 percent above the \$603 million actually spent last year. All manufacturing plans to spend \$14.5 billion, up only 14 percent from 1956. All businesses plan to spend \$41.0 billion in 1957, an even smaller 12 percent above 1956.

Spending plans of the radio and tv segment are less than early opinions indicated. Appliance, radio and tv manufacturers plan to decrease capital spending by seven percent in 1957. Preliminary survey returns indicate nine-percent increase in capital spending this year.

However, appliance, radio and tv capital spending is scheduled to increase 33 percent from 1958-1960.

Survey also uncovered capital spending plans of electronics-related and electronics customer industries:

- Office machinery spending is up 30 percent in 1957, down 27 percent in 1958-1960 period.
- Aircraft spending is up sharply 71 percent in 1957, off 52 percent in following three years.
- Instruments and controls spending rises three percent in 1957 and 19 percent for 1958-1960.
- Machinery spending is \$1.1 billion in 1957, five percent above 1956.
- Autos, trucks and parts spending totals \$1.2 billion in 1957, down 29 percent from 1956.
- Petroleum refining spending will be \$924 million in 1957, up 30 percent from 1956.



Change in way money is spent is evident from survey, although electronics and electrical machinery industry is an exception. New capacity plans are tapering off and industry as a whole is turning more to modernization.

Electronics and electrical machinery will use 39 percent of its capital expenditures for modernization in 1957 and in the following three-year period.

Forty-eight percent of expenditures of all industry will go for modernization in 1957. In the 1958-1960 period, this will be upped to 53 percent.

Survey shows that expectation of higher sales supports these large expenditures. Electronics and electrical manufacturers' sales forecasts predict a 13-percent increase in 1957 and a 22-percent increase for 1958-1960. Electronic and electrical machinery, other machinery and transportation equipment are among those with the highest sales forecasts. This group of industries expects sales increases by 1960 of 30 to 36 percent, compared with 26 percent for manufacturing as a whole.

Of interest to electronics, every industry reporting in the McGraw-Hill survey is increasing its research and development expenditures in 1957. Part of this will be in and for electronics.

Largest is in aircraft, which plans to spend \$2.3 billion in 1957 and \$3.2 billion in 1960. Second largest is electronic and electrical equipment, which plans expenditures of \$1.3 billion in 1957 and \$1.6 billion in 1960.

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the WEST*



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*with the
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\$43 Million for VORTAC

Congress says an extra \$21.5 million, needed by CAA to complete air traffic system, must come from Air Force appropriations

CONGRESS is giving CAA \$43 million, out of a requested \$64.5 million, for updating the nation's air traffic control system with VORTAC (electronic system of short range navigation for civil and military flying).

Nearly ten of the \$43 million will go to Stromberg-Carlson for 263 sets of Tactical Air Navigation (TACAN) test, monitor and control equipment, which integrated with VOR (vhf omnidirectional radio ranges) comprises VORTAC. Target date for commissioning these VORTAC stations is July 1, 1959.

Ten more of the forty-three million will go to repay Navy for transponder equipment that TACAN will monitor.

Remaining \$23 million is slated for building, installation and testing related to the 263 TACAN sets.

The withheld \$21.5 million CAA needs to complete the VORTAC system will have to come, Congress says, from USAF funds. Whether a budget-cut Air Force will part with this amount has not yet been determined. If it does, CAA will buy 124 more TACAN sets.

Even if USAF comes to the rescue to complete VORTAC, CAA will still be short about \$29.5 million out of the total \$175 million originally requested for fiscal 1958.

In spite of the cut, plans still stand for going through with CAA's \$810-million, five-year program, approved in April 1957 by both House and Senate Appropriations Committees.

Whether the cut will be restored gradually during the last four years of the program, 1959-1962, is speculative. Congress approved the program, not a specific \$810 million.

Other equipment called for in the five-year program and approved by Congress includes:

- 73 long-range air-route surveillance radars (ARSR), 23 of which have already been purchased.

- 115 airport surveillance radars (ASR) for control around terminal areas. Of the 115 ASR's, a total of 47 are operating or planned with current funds.

- 43 precision-approach radars (PAR), 23 of which have already been planned.

- 74 airport surface detection equipment (ASDE) radars for use in controlling traffic on the ground at major terminals.

- 1,230 VORTAC's which will be incorporated by 1962.

- 30 additional instrument landing systems (ILS), to be added during fiscal year 1958 to the 170 now in operation. All 200 of these ILS's will be equipped with the distance-measuring feature of VORTAC by 1962.

- Installation of another 89 ILS's, combined with the distance-measuring VORTAC component, to begin in fiscal 1959.

- 231 air-traffic control radar beacons, also called secondary radar.

- 77 new airport traffic-control towers to make a total of 271.

Researchers Test Signal Theory

WORK going on at Stanford University suggests a new picture of the ionosphere. Instead of the common concept of a 200-mile-thick electrical shell of charged particles surrounding the earth, Stanford scientists see the greatest density of particles at the 50-mile-high floor of the ionosphere. The particles gradually thin out for thousands of miles into space.

The experiment confirms a theory advanced recently by a Canadian scientist to explain radio's curious whistler sounds from outer space.

The Canadian, L. R. O. Storey, suggested that whistlers are lightning-generated radio signals that penetrate the denser layers of the ionosphere and escape into space.

Escaping whistler signals, Storey surmises, are guided back toward earth by the earth's magnetic field. His idea implies that quantities of ionized particles exist far beyond the limits of the ionosphere.

Investigating these assumptions are Robert A. Helliwell and associates at Stanford's Radio Propagation Laboratory.

With support from the Office of Naval Research, the Stanford group carried out an experiment to test Storey's theory.

Nine months ago, Helliwell sent Ernest Gehrels, a research assistant, to Cape Horn at the southernmost tip of South America. There Gehrels set up a radio listening post in a Chilean lighthouse on the Straits of Magellan.

This was as close as he could get to a point where he estimated a prearranged signal from the Navy's radio transmitter at Annapolis, guided by the earth's magnetic field, would return to earth after a looping, 20,000-mile trip through space.

It did, taking about three-fourths of a second for the journey.

Time delays averaging approximately seven-tenths of a second enabled Gehrels to distinguish between the regular ionosphere-reflected signals from Annapolis and those guided on the long path through space.

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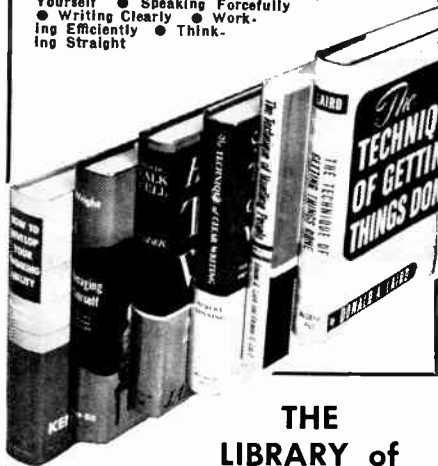


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1

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2

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Julian Pathe, Vice President

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3

A prototype has been developed, tested and customer approval received prior to full scale production. Here, inspector checks precision tube component during assembly.



4

Final assembly by skilled experienced assemblers keeps magnetrons flowing in volume toward production testing.



5

Final testing of production magnetrons. Every tube is tested for operating characteristics in accordance with customer and military specifications.

Solion In Production

Hartford, Conn. firm is in production of new electrochemical device which Naval Ordnance Lab sees as supplementing tubes and transistors

PRODUCTION of a new electronic device using the solion is now underway at Emhart Manufacturing, in Hartford, Conn. The unit functions as a navigational integrator for inertial guidance systems.

Such a device can be made largely error free. It can account for directional change and rotation of the earth. It is not subject to electromagnetic fields and can be made to resist high temperatures. Uses are seen in missiles and piloted aircraft.

Electronics now has a new technology called chemtronics. A project of the Naval Ordnance Laboratory, it has been under hush-hush development for the past ten years.

Last week chemtronics was the talk of the nation's scientists. The solion, the development that took the wraps off the project is an electrochemical device. Physicists at the Naval Ordnance Laboratory say it may supplant electron tubes and transistors in some uses. The term solion is short for "ions in solution."

Solion makes use of the natural laws governing the movement of electrons through a fluid, instead of through space as in an electron tube, or through a solid as in transistors.

The advantages of the solion, says NOL, is that it requires extremely low power; it has great sensitivity and accuracy; it is easy to manufacture at low cost, and is quickly adaptable to mass production.

Basically the solion, or electro-osmotic cell, consists of two nonreactive electrodes such as carbon or platinum immersed in a solution of potassium iodide (the electrolyte) and iodine in water, methyl alcohol or other solvent. This in itself constitutes an electrolytic cell.

However to get solion action, the iodine in solution is kept away from the cathode area by an osmotic diaphragm. Application of pressure to the cell releases iodine to the cathode area in controlled amounts. Thus the solion acts as a transducer. It can detect pressure (or acceleration) and provide an amplified output.

The so-called derry or derivative unit acts more like a transistor or electron-tube amplifier. It consists of two electrochemical devices. The input signal is applied to a unit called the driver where it is used to control fluid flow and provide a physical pressure as an output. This pressure in turn is applied to the amplifier which is a conventional electro-osmotic cell. The derivative unit has an input impedance of 30,000 to 40,000 ohms (about the impedance of some electron-tube amplifiers) and provides overall power gains of 3,000 to 250,000. The unit presently is useful only at frequencies below 10 cps.

Emhart Manufacturing calls its present production "a strictly hand operation. There are some very fine tolerances in there."

Others who have been part of the study include the Defense Research Laboratory at the University of Texas and Minneapolis-Honeywell Regulator.

Present production is expensive. Total output is for the military.

As to how well the solion works, one scientist said, "If you knew how much money was put into it, you'd damn well know it works beautifully."



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Chemical \$\$'s Climb

Electronics used \$23-million worth in 1956, largely germanium and silicon; grew from \$9 million in 1954. Chemical firms offer research aid

ELECTRONICS companies in 1956 bought and used some \$23-million worth of chemicals. Figure includes about 150 chemicals used by electronics firms. It includes ferrites, titanates, phosphors, reagents and semiconductors but excludes plastics, insulation, composition resistance material.

The size of the gulp grew from around \$9 million in 1954. An example of pound growth can be seen in selenium (used in rectifiers). From 250,000 pounds in 1954, electronics consumption rose to 500,000 pounds in 1956.

In 1954 big consumption was in phosphors for tv picture tubes (\$1.8 million), barium titanate for piezoelectric devices and capacitors (\$1.4 million), germanium dioxide for diode and transistor production (\$1.3 million), ferrites for magnetic cores and other parts for tv and radio (\$750,000), selenium (\$500,000), and silicon for diode and transistor production (\$430,000).

Big in 1956 terms are germanium (\$9.5 million) and silicon (\$5 million). Tv phosphors climbed to \$3 million.

Chemical companies are leery of projecting their estimates into the future. However, one saw total consumption of chemicals used in semiconductors up to \$32 million annually in 1965.

Another company expects germanium buying to go up to \$13 million in 1957, \$16 million in '58, drop to \$13 million in '59 and \$12 million in '60. Expected rise in use of silicon explains pattern. Silicon, company says, will be used to the tune of \$7.5 million in 1957, \$10 million in '58, \$15 million in '59 and \$15 million in '60.

Same company thinks color tv breakthrough will push up consumption of phosphors to \$3,750,000 in 1959, \$4.5 million in 1960.

Chemical companies supplying electronics firms want to help the state of the art, especially in semiconductors. Companies such as B & A Products have liaison men who work with electronics research firms. Others like Merck and Company are just beginning to do this.

Says Merck: "We can make what electronics wants if they'd evaluate what we do. What we lack is knowing how to make a useful electronic device. But we can make the chemicals for one."

Inco Firms Nickel Pricing

USERS of nickel, including much of the electronics industry, found a cheering note in a recent statement by International Nickel Company of Canada.

John F. Thompson, chairman, outlined Inco's intention to stabilize prices. Refinery prices rose 9.5 cents to 74 cents a pound last December.

Citing his company's large production and expansion program,

Thompson said Inco plans to create market growth by "reasonable and stable prices at which satisfactory profits can be realized, markets can be held and important consumers can be reassured that they can plan well ahead for the economic use of nickel."

New demand for nickel must be stimulated, he said, despite competition from other materials. Some potential users, Thompson

said, find the 74-cent price too high.

"The industry must in the years ahead be even more aggressive in striving to reduce costs and in preparing itself for the time when the upward trend of nickel prices is stopped or even turned back," Thompson said. "The price of nickel should at all times reflect not only short term, but long term considerations."

Civilian shortages are being eased, he said, by government stockpile diversions, supply increases and more efficient use. He did not say there would be adequate civilian supplies in the next year. Military requirements, however, are being met.

The supply situation can change from famine to feast in four years. Nickel industry plans to produce 650 million pounds in 1961, 50 percent over 1956. If military needs remain stable, civilian use will have to increase 75 percent to take up the slack, Thompson said in analyzing situation.

Inco's own production will be lifted from 286 million pounds in 1956 to 385 million pounds in 1961. New mines are being prepared in Manitoba.

Color Tv Test Facts, Comments

FACTS and figures are coming in on RCA's color tv set merchandising test in Milwaukee. Two things seem clear about the test. Cost of selling color tv sets is high. Dealers don't get enthusiastic easily.

According to Kurt Williams, general sales manager of Taylor Electric (RCA Milwaukee distributor), the \$100,000-\$150,000 promotional color push resulted in retail sales of 531 color sets over the 40-day period.

Here are two samples of dealer comments:

Says Herbert Wilk, v-p of the Samson store chain, "The timing of the program was wrong." Though having this misgiving, Wilk felt: "Regardless of the money spent in the initial shot, we feel it will come back in the fall."

Another dealer said sourly, "The weather was bad, sales generally were off."



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Pentagon Urges More R&D

Advantages to industry are patent rights, use of results in consumer products and more opportunity

INDUSTRY may have to pick up more of the tab for research and development costs as DOD's economy drive gains momentum.

Mounting defense costs, a tightening budget and curbs on installment buying have focused attention on cutting R&D spending as a partial escape valve.

Urgency of shifting more of this cost from government to industry was recently stressed by both Rear Adm. Rawson Bennett, Chief of Naval Research, and Lt. Gen. Thomas S. Power, ex-Commander of ARDC.

Advantages to industry of financing its own research are substantial. Research work done under a classified contract ties up all results. Final product can not be patented nor can unexpected developments be applied to consumer products.

Also, hardware developed with industry funds might, by chance, be superior to equipment developed under government contract.

Majority of Bell Labs' research projects are self sponsored. Reason Bell gives: to discover what the military does not yet know it wants or needs.

Disadvantage of industry R&D financing is problem of financing long-range projects.

Results of ARDC's efforts to help industry invest wisely are, according to Power, "gratifying." "Considerable number of industrial organizations are now using their own funds for research and development projects of Air Force interest," he says.

The Air Force is literally bringing industry into the advance planning room. Since the program began in late 1955, seven jointly held symposiums devoted to technical program areas have been attended by 612 companies.

Complementing these sessions is the release of Technical Program Planning Documents (TPPD's), spelling out in detail what is covered at the symposiums.

To provide preplanning data for weapons systems of the 1965-1975 period, ARDC provides such information in its System Requirement Release Program.

Precisely to what extent ARDC's symposiums are responsible for increased industry-financed research is hard to determine. Probably the greatest benefit is going to small and/or new companies and to new divisions of large companies. Large, established electronics firms have a long record of close government cooperation.

Reeves, a participant in the ARDC symposiums, has staked \$1 million in the future of floated gyros and computers.

RCA regards the symposiums as "a forward-looking program, extremely helpful to the service and to RCA."

MILITARY electronics

- Lockheed will begin preproduction work for Navy on new aerial picket ship to carry high-power search and tracking radar in giant saucer-shaped radome on top of the plane's fuselage.

- Program for electronics laden X-7 test vehicle will extend at least through mid-1958 because of new USAF \$14.5-million contract to continue Lockheed's ramjet engine flight-test program in which X-7 is used.

- Voice data link, announced by Fairchild, converts outputs from computer into verbal messages. Originally designed for SAGE, stored vocabulary contains words necessary to command aircraft or an intercept mission.

Word storage unit consists of magnetic drum rotating at two rps and a set of recording-playback heads. Additional application: stored vocabularies in several languages for use in NATO areas.

- New radar set for air traffic control will be developed by Bendix under \$2,223,751 AMC contract. Equipment will be installed at AF bases for surveillance of 100-mile-radius areas. Development will be monitored by ARDC's Rome Air Development Center.

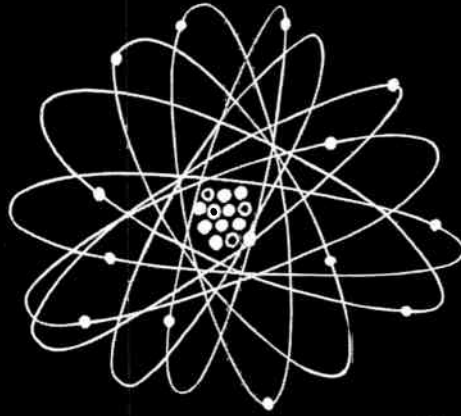
- "An instrument-carrying vehicle will reach Mars and a man-carrying vehicle will reach the moon within our lifetime," predicts Ramo-Wooldridge's Frank W. Lehan.

CONTRACTS awarded

Hallamore Electronics division of Siegler will produce missile test and check-out equipment under a \$9 million plus subcontract. Although prime contractor was not named, it is probably Martin for work on Titan. Hallamore is already producing similar equipment for Atlas.

Elgin National Watch gets a \$1,142,000 contract from Bendix for production of assemblies used in jet air-data computer. Initial installations of computer will be made on Republic's F-105 and McDonnell's F-101B. Bulk of Elgin's production work will be centered in Lincoln, Neb.

Minneapolis-Honeywell will equip USAF's B-47 with more LABS



$$E = mc^2$$

Atomic power in Caesar's day?

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In this sense, then, we have available *today* in existing raw materials the inventions that can make our lives longer, happier, and inconceivably easier. We need only *knowledge* to bring them into reality.

Could there possibly be a better argument for the strengthening of our *sources* of knowledge—our colleges and universities? Can we possibly deny that the welfare, progress—indeed the very *fate*—of our nation depends on the quality of knowledge generated and transmitted by these institutions of higher learning?

It is almost unbelievable that a society such as ours, which has profited so vastly from an accelerated accumulation of knowledge, should allow anything to threaten the wellsprings of our learning.

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The crisis that confronts our colleges today threatens to weaken seriously their ability to produce the kind of graduates who can assimilate and carry forward our rich heritage of learning.

The crisis is composed of several elements: a salary scale that is driving away from teaching the kind of mind *most qualified* to teach; overcrowded classrooms; and a mounting pressure for enrollment that will *double* by 1967.

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toss-bombing system equipment. New contract: \$1 million plus.

Hughes will modify armament control system components under a \$2,865,319 contract with AMC.

Designers for Industry announces completion of four testing devices for Redstone under \$1 million plus subcontract with Chrysler.

Beckman's Helipot division gets a \$400,000 contract with Hughes for five electronic servo computers for radar being developed for Navy.

Westinghouse wins a \$2 million contract with Navy Ordnance to develop high-speed torpedo, its fire-control system and related components.

Berkeley division of Beckman announces completion of high-speed data-handling system for production testing of Bell Aircraft's rocket engines. Employing high-speed printer, Berkeley's system logs 1,800 digits a second, monitors propellant flows, temperature, pressures, voltages, time and frequency.

North American will continue research and development work on Navaho under USAF contract totaling \$21 million.

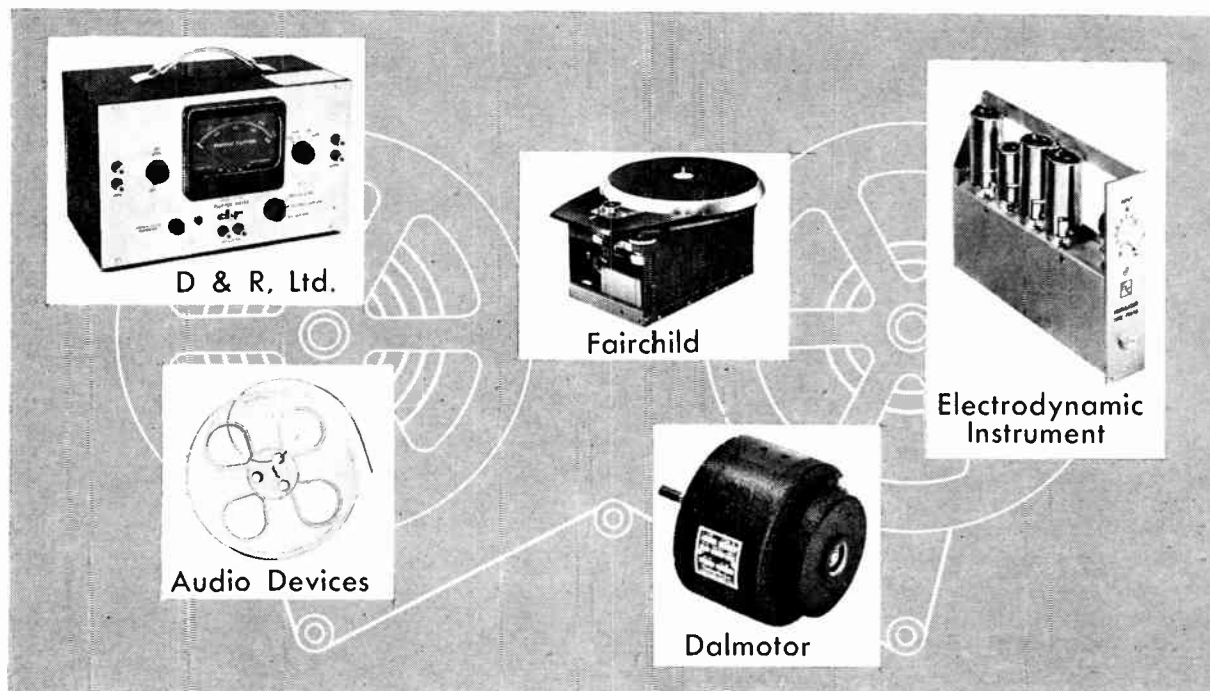
Motorola gets two contracts with Warner Robins Air Materiel Area totaling \$250,597 for modification kits for APS-23 and APS-64 radar sets. Additional contract for repair and modification of components of this equipment amounts to \$819,243.

Philco will repair and modify APS-64 equipment under a \$864,798 contract with Warner Robins. Hughes has a \$2,865,319 service and supply contract with Warner Robins for repair and modification of fire-control system components and assemblies.

Stromberg-Carlson will supply KII type sealed amplifier kits to Warner Robins under \$384,145 contract.

Production Research will sell 4,000 AN/PRC-32 radio sets to Navy Purchasing Office.

New Tape Equipment Arrives



Announce Drives, Reels

Both entertainment and data recording keep interest in magnetic tape and associated electronic and mechanical equipment high. An electronic drive unit furnishes proper frequencies to operate hysteresis synchronous turntable motors by **Fairchild Recording Equipment (P1)** at four speeds. **Dalmotor (P2)** announces torque motors for driving tape recorder take-up reels.

Flutter and wow meters are announced by **D & R, Ltd. (P3)** for use in the design and manufacture of recording and reproducing systems. **Electrodynamic Instrument (P4)** offers f-m modulators and demodulators for use with tape recording systems. Reels with C-slots for magnetic recording tape are said by the maker, **Audio Devices (P5)**, to provide fast easy threading.

Engineered Magnetics (P6) announces magnetic-amplifier power supplies that deliver 5 to 200 volts at 50 ma to 2 amps a-c for airborne instrumentation applications. . . . Two-watt circuit-balancing potentiometers available from **Bourne Labs (P7)** are only $\frac{1}{4}$ by $\frac{1}{8}$ by 1 inch.

Strip chart recorders by **E. H.**

Sargent (P8) for laboratory use feature nine chart speeds and 40 ranges for voltage and current signals. . . . Silicone insulating resins have been developed by **Dow Corning (P9)** for encapsulating electronic assemblies. . . . The type 1236C diode is announced by **Superior Electric (P10)** as a detector for differential voltmeters,

a-c and d-c voltage and current stabilizers.

Reeves Instrument (P11) has size 11 resolvers available in production quantities for airborne systems. . . . An improved X-band stalo cavity by **Varian Associates (P12)** is said to provide a high degree of short-time frequency stability. . . . Swept signal generators announced by **Wave Particle Corp. (P13)** incorporate backward-wave oscillators which can be electronically swept to cover any part or all of the frequency of the BWO.

High-voltage cables designed by **Jetttron Products (P14)** for cathode-ray tubes are said to prevent corona discharge at altitudes up to 60,000 ft. . . . An a-c vtm offered by **Trio Labs (P15)** for panel mounting has twelve scales from 1 millivolt to 300 volts. . . . **Eyelet Tool Co. (P16)** announces an eyeletting machine said to speed the production of printed electronic circuits.

Vibration-isolation mountings

For more information use **READER SERVICE CARD**

available from Lord Mfg. (P17) for heavy electronic equipment feature temperature resistance from -80 to 250 F. . . . Called a time-to-pulse-height converter, an instrument offered by El Dorado Electronics (P18) measures time in the range 0.25 millimicrosecond to 1 microsecond. . . . Phasemeters developed by Statham Development (P19) for measuring phase relationships in electronic gear cover frequencies from 60 cps to 20 kc.

Lear (P20) announces a gyro drift recorder which is said not to respond to Scorsby motion and dither but only to drift and random disturbances. . . . Miniature rate gyros by Minneapolis-Honeywell (P21) are offered for autopilot damping, radar antenna stabilization and fire-control applications.

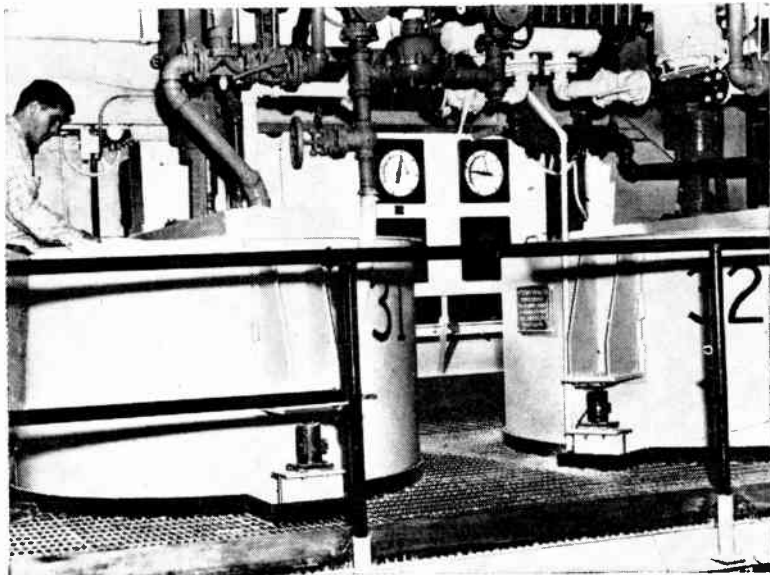
The type 545 external-anode power-diode tube announced by United Electronics (P22) for airborne use weighs 0.7 ounce. . . . Circuit breakers produced by Heilmann Electric (P23) for airborne use can be operated on either

400-cps a-c or on d-c, to facilitate standardization. . . . Altimeters are announced by Hastings-Raydist (P24) for operation in the high-altitude range from 75,000 to 225,000 ft.

Holland Electronics (P25) offers in-line terminations to match impedance of pulse and signal generators to a variety of loads. . . . Frequency power converters developed by James Vibrapower (P26) generate 117 volts at 60 cps from d-c sources. . . . High-speed transistorized counters by Ransom Research (P27) use gated binary reset to zero on the count of 10.

Limited quantities of oriented single-crystal silicon ingots are available from Thermosen, Inc. (P28) for rectifiers, transistors, infrared lenses. . . . Custom-build environmental cabinets are available from Atmosphere Control (P29) for temperature, humidity, altitude testing.

Nylon clips for anchoring tubes and cables have been developed by Weckesser (P30) to eliminate the



Load Cells Mix Wall Paint

Automatic formulation of wall latex coatings at Standard Coated Products, Buchanan, N. Y., is done in two tanks supported on Bakwin-Lima-Hamilton load cells. The cells and the instruments on the panel in the background control the quantities of ingredients and times of the mixing cycles



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TACAN is the most advanced aircraft navigation system yet developed . . . and Hoffman makes the complete airborne portion of the TACAN-VORTAC systems. Hoffman has also developed the highly efficient HLI-103 Beacon Simulator to bench-test airborne equipment for TACAN-VORTAC UNITS. Other navigation equipment under development at Hoffman includes long range airborne radar direction finding and automatic dead reckoning systems.



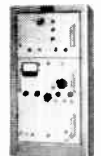
Cockpit control panel



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July 10, 1957 — ELECTRONICS business edition



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352 pages, 412 diagrams, \$8.75

Following each description is a reference to the original source where you can get more details on related mechanical problems or study graphs of performance characteristics. In the index, each circuit is cross-indexed as many as a dozen times, to permit locating specific circuits quickly when they are known by a variety of names.

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need for screws and rivets. . . . Wire-wound axial-lead resistors offered by **Hardwick Hindle** (P31) are said to provide excellent heat dissipation characteristics. . . . Television receivers announced by **Transvision** (P32) for industrial training programs operate from conventional tv signals or as a closed-circuit monitor.

DuMont (P33) will market a complete line of receiving tubes for tv, radio, communications and industrial electronics gear. . . . Metal-cased magnetostrictive delay line by **Deltine** (P34) provides 50-microsecond delay with 10 adjustable outputs. . . . Broadband coaxial attenuators with type C connectors are offered by **Weinschel Engineering** (P35) for the frequency range of 1,000 to 10,000 mc.

Floated rate gyros by **Norden-Ketay** (P36) have been designed for operation in rugged environments. . . . Inductance coils by **Speer Carbon** (P37) housed in hermetically sealed ceramic cases are said to be virtually unaffected by atmospheric conditions. . . . The 6DS5 beam power tube by **RCA** (P38) has been designed for use as a class A audio amplifier for radio and tv receivers.

A contact microradiograph instrument for industrial, agricultural and biochemical research is announced by **Philips** (P39). . . . A tachometer tester by **Servo-Tek Products** (P40) is an electronic decade-type counter that is used with an adjustable speed drive to check tachometer generators.

Mallory (P41) announces a line of subminiature aluminum-cased electrolytic capacitors in values from one to 110 microfarads. . . . Called **Ventureloy II**, a silver alloy by **Venture Corp.** (P42) is said to be particularly suited as a contact material and in wire form for uhf and vhf applications.

Kin Tel's (P43) electronic galvanometer is a combination dc-null detector, linear deflection indicator, microvoltmeter, microammeter. . . . Precision single-turn potentiometers available from **Car-**

rier Corp. (P44) are said to meet military specifications.

Noise tubes by **Ferranti Electric** (P45) provide a stable noise source for checking X-band receiver performance. . . . Four motor gearheads designed for use with size 11 motors are available from **Bowmar Instrument** (P46).

Pulsed power in either L or S band is produced by a **Levinthal Electronics Products'** (P47) system which delivers pulse lengths from 2 to 10 microseconds and repetition rates from 200 to 450 pps. . . . **White Instrument Labs'** (P48) series 520 twin-T filters for hum and harmonic elimination feature hermetic sealing, small size, low cost.

New Product Makers

- P 1: Fairchild Recording Equipment, 10-40 45 Ave., Long Island City 1, N. Y.
- P 2: Dalnator, 1375 Clay St., Santa Clara, Calif.
- P 3: D & R, Ltd., 402 E. Guiterrez St., Santa Barbara, Calif.
- P 4: Electrodynamic Instrument, 2508 Tanglew Rd., Houston 5, Tex.
- P 5: Audio Devices, 414 Madison Ave., New York 22, N. Y.
- P 6: Engineered Magnetics, Hawthorne, Calif.
- P 7: Bouras Labs, 6135 Magnolia Ave., Riverside, Calif.
- P 8: E. H. Sargent & Co., 4647 W. Foster Ave., Chicago 30, Ill.
- P 9: Dow Corning, Midland, Mich.
- P 10: Superior Electric, 83 Laurel St., Bristol, Conn.
- P 11: Reeves Instrument, 215 E. 91 St., New York 28, N. Y.
- P 12: Varian Associates, 611 Hansen Way, Palo Alto, Calif.
- P 13: Wave Particle Corp., P. O. Box 252, Menlo Park, Calif.
- P 14: Jetton Products, Route 10, Hanover, N. J.
- P 15: Trio Labs, 4925 Merrick Rd., Scarsdale, N. Y.
- P 16: Cyclor Tool Co., 236A Bway., Cambridge, Mass.
- P 17: Lord Mfg., 1635 W. 12 St., Erie, Pa.
- P 18: El Dorado Electronics, 1401 Middle Harbor Rd., Oakland 20, Calif.
- P 19: Statham Development, 12411 W. Olympic Blvd., Los Angeles 61, Calif.
- P 20: Lent, 3171 S. Bundy, Santa Monica, Calif.
- P 21: Minneapolis-Honeywell, 1400 Soldiers Field Rd., Boston 35, Mass.
- P 22: United Electronics, 42 Spring St., Newark, N. J.
- P 23: Holhemann Electric, 155 Plum St., Trenton 2, N. J.
- P 24: Hastings-Raylist, Hampton, Va.
- P 25: Holland Electronics, 40 Great Jones St., New York 12, N. Y.
- P 26: James Vibrapower, 4050 N. Rockwell St., Chicago 18, Ill.
- P 27: Hattson Research, P. O. Box 382, San Pedro, Calif.
- P 28: Thermosen, Inc., 361 W. Main St., Stamford, Conn.
- P 29: Atmosphere Control, 5315 Chester Ave., Philadelphia 43, Pa.
- P 30: Wockesser Co., 5701 Northwest Hwy., Chicago 30, Ill.
- P 31: Hardwick Hindle, 40 Hermon St., Newark 5, N. J.
- P 32: Transvision, New Rochelle, N. Y.
- P 33: DuMont Labs, 750 Bloomfield Ave., Clifton, N. J.
- P 34: Deltine, 608 Fayette Ave., Mamaroneck, N. Y.
- P 35: Weinschel Engineering, Kensington, Md.
- P 36: Norden-Ketay, Commerce Rd., Stamford, Conn.
- P 37: Speer Carbon, St. Marys, Pa.
- P 38: RCA, 30 Rockefeller Plaza, New York 20, N. Y.
- P 39: Philips Electronics, 750 S. Fulton Ave., Mt. Vernon, N. Y.
- P 40: Servo-Tek Products, 1086 Goffle Rd., Hawthorne, N. J.
- P 41: P. R. Mallory, 3029 E. Washington St., Indianapolis 6, Ind.
- P 42: Venture Corp., 30 Fulton St., Newark 2, N. J.
- P 43: Kin Tel, 5725 Kearny Villa Rd., San Diego, Calif.
- P 44: Carrier Corp., 1704 S. Del Mar Ave., San Gabriel, Calif.
- P 45: Ferranti Electric, 30 Rockefeller Plaza, New York 20, N. Y.
- P 46: Bowmar Instrument, 2415 Pennsylvania St., Fort Wayne, Ind.
- P 47: Levinthal Electronic Products, 700 Stanford Industrial Park, Palo Alto, Calif.
- P 48: White Instrument Labs., Box 9006, Austin 17, Tex.

FCC to Dump Tv Table

Friend and foe alike say Craven Plan may injure tv's growth. They warn about mileage separation

FINAL FCC acceptance of new tv station allocation plan seems assured. Called the Craven Plan after its originator, Commissioner T. A. Craven, it calls for dropping tv table of assignments.

The plan opens up assignments to any station that can meet mileage separation requirements and conform to safeguards designed to protect uhf stations from further vhf competition. Geographical areas that are within 250 miles of Canadian or Mexican borders remain tied to old table.

Also unaffected are allocations for educational tv stations.

Main opposition to the new plan comes from Association of Maximum Service Telecasters, principally a group of uhf stations. This group believes that plan will not add new facilities except by degradation of existing tv service. It doubts that the plan would give the flexibility intended. It calls

the new plan the first step toward breakdown of mileage separation requirements.

CBS expresses its support for the move. The network says the plan "will promote more efficient use of channels." One objection the network has is that minimum mileage separations might break down.

NBC says: "The protection to be afforded uhf stations should be an actual protection and not predicated upon theoretical computations." This network points out that with the 75-mile separation a vhf station could serve the majority of people served by a uhf station.

The plan provides that a second vhf station can enter an area if its transmitter is farther from the uhf station than an existing vhf station. NBC calls this a "threat to existing uhf service."

Even the Joint Council of Educational Television and the National Association of Educational Broadcasters, though "gratified" that educational channels continue to carry "reserved" signs, have a doubt.

They wonder if the new plan will create a "sound television structure."

FCC actions

- Authorizes first commercial over-the-horizon television transmission. AT&T will use it on scatter system under construction between Florida and Cuba. Hop is 180 miles.
- Exempts passenger vessels from carrying radiotelephone equipment when they are less than 50 gross tons, when they will not be more than 1,000 feet from shore, when passengers can escape any calamity without assistance, when there is no station nearby which could receive distress calls.
- Postpones until June 1, 1958 rule requiring tv stations to employ approved frequency and aural transmitter modulation monitors. It finds that specified equipment is not generally available.
- Rules that all-area inter-ship frequency 2,638 kc is available for public ship-shore telephony on certain interior waters. Exemptions are the Great Lakes and other major inland waterways.
- Appoints Harold G. Cowgill as Chief of Broadcast Bureau and John R. Lambert as Acting Chief of Common Carrier Bureau.
- Makes frequency 123 mc available solely for communications between private aircraft and aeronautical advisory stations.
- Removes restrictions against use of frequency 122 mc by air carrier planes weighing less than 10,000 pounds.
- Proposes to permit operation of ultrasonic measurement equipment over a continuous band of frequencies.
- Extends until June 30, 1958 reduced government rate structure for foreign telegraph messages.

STATION moves and plans

WCIS-TV, Charleston, W. Va., begins transmitting from new 1,000 foot tower. Cost of tower was \$300,000.

KVEC-TV, San Luis Obispo, Calif., becomes satellite station of KSBW-TV, Salinas, Calif.

WIMS, Michigan City, Ind., plans new transmitter upping power five-fold to 5 kw.

WCPO-FM, Cincinnati, Ohio, will establish second subcarrier on a multiplex basis.

WMIX, Mt. Vernon, Ill., installs new transmitter.

WETU, Wetumpka, Ala., plans raising power from 1 to 5 kw, installing new transmitter.

WSNT, Sandersville, Ga., changes hands. Herschel L. Webster and

Circuit Breaker has Trip Level Independent of Temperature

Magnetic time delay mechanism provides trip level that is unaffected by ambient or operating temperature. Breaker protects your equipment equally well under all conditions. It withstands severe shock and vibration. Toggle is trip free.

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Inertial Guidance for ICBM and IRBM

R-W's broad systems responsibility for ICBM and IRBM has created unusual technical and project opportunities in the field of inertial guidance. Positions are open in Los Angeles, the Midwest, in the New York area, and at Patrick Air Force Base, Florida.

The field of Inertial Guidance is an important one in guided missile research at Ramo-Wooldridge, where engineers and scientists are providing systems engineering and technical direction for the Air Force Ballistic Missile Programs.

The systems team concerned with inertial guidance represents many technical specialties. Among them are: controls . . . inertial components . . . airborne computers . . . data processing . . . ground support equipment . . . test planning and analysis . . . packaging . . . and mechanical design.

The essential function of Project Engineering supplements these technical specialties. Project Engineers are responsible for technical management liaison with other organizations participating in these missile programs.

Please address inquiries to: Mr. W. J. Coster

The Ramo-Wooldridge Corporation

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John C. Foster pay \$27,600 to Jack Bradley and Claude Williams for the station.

WKDL, Clarksdale, Miss., becomes property of Coahoma Broadcasting for \$40,000 paid to Anne P. McLendon and W. L. Kent.

KICA-TV and KICA, Clovis, N.M., share (one-third interest) is sold by Garfield C. Packard to Mac Strauss and Frank Lesley for \$36,666.

WLOS-TV, Asheville, N. C., installs auxiliary antenna at main transmitter location.

KWIL, Albany, Ore., control passes from Ralph R. Cronise, Glenn L. Jackson and Olga Jackson Burns to Albany Radio for \$80,000.

WDOV, Dover, Dcla., plans new transmitter.

WNAC, Boston-Lawrence, Mass., plans shifting station location from Boston-Lawrence, to Boston, giving up studios in Lawrence.

WAMM, Flint Mich., plans to increase power from 500 watts to 1 kw.

WEAT-TV and WEAT, West Palm Beach, Fla., is sold by RKO Teleradio Pictures to Palm Beach Television for \$600,000.

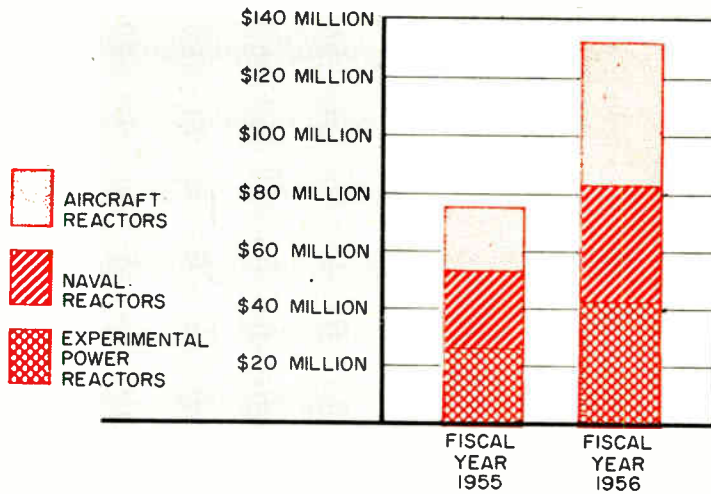
KOWH, Omaha, Neb., is bought by National Weckly from Mid-Continent Broadcasting for \$822,500.

KCLN, Clinton, Iowa, is bought by Valley TV and Radio from Kenneth W. Evans, H. Richard Petterson and Wharton L. Murray for \$35,000.

WDBF, Delray Beach, Fla., is sold by Delray Broadcasting for \$56,000. Buyer is Boca Raton Bible Conference Grounds.

KSUB, Cedar City, Utah, is sold by Radio Service Corp. of Utah to W. Arthur Jones, Lanell N. Lunt, Durham Morris and Lorin C. Miles. Price is \$33,778.

AEC EXPENDITURES IN REACTOR RESEARCH AND DEVELOPMENT



AEC Boosts Research

Shifts emphasis from heavy plant building to smaller projects which hold the promise of a mass electronics market in nuclear field

Atomic Energy Commission report for 1956 shows sharp dip in heavy plant construction. But more money was spent on research projects, which promise to create mass markets for electronics.

Research and development of aircraft reactors rose from \$22.6 million in fiscal 1955 to \$49.6 million in fiscal 1956. Naval propulsion reactors rose from \$26.8 to \$40.9 million and experimental power reactors from \$26.3 to \$42.2 million.

No figures were given on instrumentation costs in these fields. However, the commission estimates it is spending \$9 to \$10 million on radiation instruments in connection with major activities. Half is for development, half for purchase and maintenance. Another \$8.6 million was spent in 1956 for accelerators.

An additional \$1.3 million is budgeted for research in radiation detection and monitoring instruments. Half is contracted, including \$280,000 for development of multiplier phototubes and scintillators.

Moves in civilian applications:

- Nearly all industrial atomic information was declassified. Royalty-free patents increased to 1,100. Electronic tubes and light meters containing radioactive materials were placed under general licensing.
- Six regional libraries of classified materials were ordered established. Access permits increased 40 a month, to 1,145.
- Almost 60 firms, persons and institutions were licensed monthly to use radioactive isotopes. Year-end total of 3,600 includes 1,509 medical users and 1,486 industrial users.
- Irradiation experiments showed metal yield strengths can be increased 63 to 453 percent.
- Seventy-three reactors were reported in operation, 118 on tap.
- Atomic demonstration shows were booked before 300,000 high school pupils as part of \$1.7-million education program.

ELECTRONICS business edition — July 10, 1957

ACCEPTED SYMBOLS

14 28-06

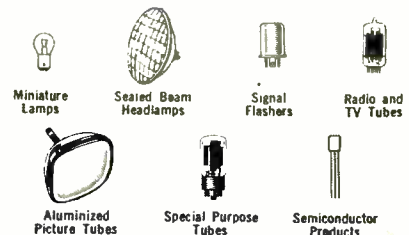


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Packers Sort By Color

Electronic color-sensing device spots shade differences. Built-in memory governs operation, eliminates error

ELECTRONIC color-sensing devices are adding bright hues to California's food-processing picture.

Hiring crews of hand sorters has been a major headache for food processors and packers. Payrolls have eaten away at profits too. During the past year, electronics setups have started color-grading lemons, oranges, tomatoes, peanuts and beans.

Market for Librascope's color discriminator in food processing looks good. One of the Bay Area's cling-peach canners recently adapted a color sorter to reject machine-pitted fruit that still had some of the pit. Upstate, color-discriminating devices watch maraschino cherries.

One recent installation is at Diamond Walnut Growers cooperative in Stockton. Fifty units made by Electric Sorting Machine sort walnut kernels into diamond, emerald and suntan color categories. Each machine does work of 5 to 8 manual sorters, depending upon size of kernels being run.

Two photoelectric cells equipped with infrared filters scan opposite sides of kernels passed through viewing chamber. Machine makes 150 decisions a minute. Decision is delayed by magnetic memory drum until vacuum-held kernel reaches proper spot on delivery wheel. Thyatron then ejects kernel into bin according to color.

Third photocell governs height to which kernels are loaded in hopper bowl. Three other sorting machines are used for determining the price of various grades.

Soviets Push Microwave

RAPID buildup of telecommunications is now underway in the Soviet Union. Part of this will be a 6,210-mi microwave radio-relay system using traveling-wave amplifiers.

The 4,000-me system, apparently Russia's biggest civilian electronics effort, will be completed in 1960 and handle 2,400 voice channels, or 5 television channels.

This was the report of five Russian electronics engineers last month in an exclusive interview with ELECTRONICS. Under U.S. States Department auspices the Russians returned the visit paid to the Soviet Union by a group of American electronics engineers. The Russians' visit included the Johns Hopkins University, Bell Telephone Laboratories, Sylvania, RCA, Westinghouse, Bendix and ELECTRONICS editorial offices.

The group included G. P. Kas-

anski, division chief in the Soviet Ministry of Radio-Technical Industry; E. M. Kondratiev, engineer in the scientific research institute of the Ministry; Prof. A. G. Aleksandrov, of a vacuum-tube-plant research laboratory; K. J. Petrov, chief engineer of a radio factory; and V. V. Petrov of the Ministry of Communication's research institute.

Delay in their airplane's arrival prevented a scheduled attendance in Washington at an Institute of Radio Engineers meeting on automation. L. M. Allison, an electronics scientist of the National Bureau of Standards, acted as host during the tour.

According to the Russians, they are also building up their television broadcasting network and now have 22 stations. Largest station, they said, uses 30-kw video transmitter

and a 15-kw audio transmitter. A 50-kw unit is slated to start operation in 1959. In addition, there are 100 two-kilowatt translators used to bring tv to outlying areas near major cities. Plan is reportedly to have 75 major stations and 200 translators by 1960. All Russian tv is vhf; there are 5 channels.

Television service shops run by the Ministry of Communications are being set up. Underwater tv has recently been introduced in the fishing industry. Electronics controls are becoming important in metallurgy and railroading. Under development is a video magnetic tape recorder requiring a bandwidth of four or five megacycles, due to the wider bandwidth of Russian tv.

For the first time, the Russians said, the Soviet Union this year is turning out electronics engineers trained in all aspects of the art. Until now, each graduate was a specialist such as a television engineer or radio-receiver engineer. Now the young Russian engineer will get specialized training in industry like his U. S. counterpart.

Asked about education of engineers, the Russians said their engineering education is largely practical in nature at a 6-year technical institute. For advanced training, such as use of Laplace transforms in circuit analysis, the holder of an engineering diploma goes to a 3-year graduate school where he must write and defend a thesis. About 35 percent of Russia's engineers are women, they said.



Interviewing Russian electronics engineers. From left to right: Managing Editor Carroll, E. M. Kondratiev, K. J. Petrov, Prof. A. G. Alexandrov, Associate Editor Findlay, G. P. Kasanski, V. V. Petrov, Associate Editor Manoogian (scatced) and Associate Editor Janis

GYROS

for every application

The Kearfott miniature 4 Gimbal 3 Gyro, stable platform, provides precise azimuth, pitch and roll information—irrespective of the airframe attitude. It is hermetically sealed for environmental protection. Because of its rapid warmup characteristic, this unit is fully operational in less than five minutes. This platform provides the features of a magnetic slaved or a latitude corrected directional gyro for heading reference. Dependable, accurate single purpose Kearfott Gyros also available.



ALL ATTITUDE 3 GYRO STABLE PLATFORM

Suitable for use in both missile and aircraft, random drift rate 1° per hour in azimuth and 3° per hour in vertical. Measures only 8" Diam. x 8 3/4" High, weighs but 23 lbs.



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Japan: A New Concept

Japanese manufacturer parlays
\$150 initial investment into million-
dollar sales

A \$150 ELECTRONICS venture that snowballed in a decade into a concern capitalized at more than a half-million dollars practices a business concept new to Japan.

The firm, Tokyo Tsushin Kogyo, says it's out to beat its competitors by offering new products rather than undercutting price on older ones.

Totsuko, as the company is known, pioneered manufacture of magnetic tape and tape recorders in Japan. Today, it's concentrating on making transistors, transistorized radios and a transistorized tape recorder.

Coming soon are a miniature transistorized dictating machine, phonograph, and a tape recorder for use with a new computer. Totsuko has also set its sights on an all-transistorized television set.

Sales of \$4.7 million last year were double 1955 sales. This year they're expected to jump to \$6.9 million. Firm expects its exports to 40 countries to expand tenfold in 1957, to \$4.2 million. Of this, Totsuko hopes to sell \$2.8-million worth to the U. S.

a jump from 17 to 66 percent of the firm's exports. "We can sell our products anywhere," says one company official, "because we're turning out things that are better or different from anyone else's."

Chief export goal is to boost Asian shipments from \$186,000 in 1956. The firm hopes to hit the \$1.1 million mark this year, \$1.6 million in 1958.

But Japanese domestic competition is becoming stiffer. Totsuko, the only maker of transistorized radios in Japan a year ago, now has four competitors and four prospective ones.

Totsuko fortunes were boosted in 1952 when the company signed a 15-year contract with Western Electric providing for payment of royalties for transistor rights. Today the firm says it's negotiating with Hoffman Electronics for a technical information exchange.

Biggest shareholder in Totsuko is a brewery which puts an electronic head on its profits by holding 12 percent of the company's 2 million shares. Five percent of the shares are held by the Mitsui Bank, which also supplied \$560,000 of the \$830,000 borrowed by Totsuko.

About 1,000 employees, including 250 college graduates and 750 factory workers, turn out the firm's products. Most workers are girls of 16 and 17, selected for their manual dexterity.

Developments ABROAD

- London will soon begin trial operation of a photoelectric scanning device that monitors bus traffic. Aim: avoid bus bunching and allow routing around heavily congested areas. Ray from bus is picked up by lamp-post-mounted scanner; signal is amplified and relayed to control panel. Then extra buses may be sent or routing instructions telephoned to dispatchers along regular route.

- British firm Airsonic Ltd. offers a new electronic stethoscope which shuts out sounds a doctor doesn't want to hear by selecting the frequency of a particular sound. Equipment weighs 18 oz., is suspended from the neck and can be connected to a tape recorder. It's said to permit a doctor to hear the heartbeats of a polio patient in an operating iron lung.

- In West Germany a 35 million-volt betatron for cancer treatment has been delivered by Siemens-Reiniger to Max Planck Institute for Biophysics in Frankfurt. New apparatus is reported to penetrate 4.5 in. into human body. During 10-minute treatment doctor leaves room, watches patient through 28 in. thick lead glass pane.

- England's Metropolitan-Vickers Electrical Co. introduces Magistor phototransistor relay which substitutes for a mechanical switch and dispenses with electron tubes and large photocells. Lamp box and receiver with power consumption of 16 w have simple printed-wiring circuit, only two wire interconnections. Firm says applications include counting, level control, warning devices, inspection, materials handling and sorting.

EXPORTS and IMPORTS

In Venezuela a six-channel, 25-mi radiotelephone link will be installed by Pvc Telecommunications for Socony Mobil Oil Company de Venezuela. Equipment will provide trunk connection between administrative offices and oil field; vhf multiplex link uses 50-w f-m transmitters.

Guatemala wants nationwide radiotelephone network and may request bids soon on microwave system. A technical council was recently appointed to advise government on the purchase of communications equipment. Meanwhile, Guatemala City gets a 4,000-6,000 kc radiotelephone system.

Canada is installing Bendix-Decca Navigator system to give position fixing for ships, planes and land vehicles in a 1-million sq mi area

of eastern Canada and adjacent waters. Seamen and airmen with suitable receivers can interpret low-frequency radio position lines into accurate fixes by reading a dial. So says Computing Devices of Canada which holds Canadian rights from Bendix Aviation. System will have four chains, each with one master and three slave stations.

Japan receives electronic instruments that complete her first atomic energy reactor, built by Atomics International division, North American Aviation. Japan Atomic Energy Research Institute will use 50-kw solution-type reactor for studies in biology, agriculture, materials and radioisotope production.

West Germany's Dutch Philips subsidiary, Allgemeine Deutsche Philips Industrie GmbH, in Hamburg, reports 1956 sales index of 336 against 262 for 1955, based on 100 for 1950. Production index was 348 against 248 for same years. Export index reached 387 based on 100 for 1951.

Portugal and the U.S. are linked by new RCA direct radioteletype-writer service (TELEX). Previously, circuits to Holland and France were used for Portuguese traffic.

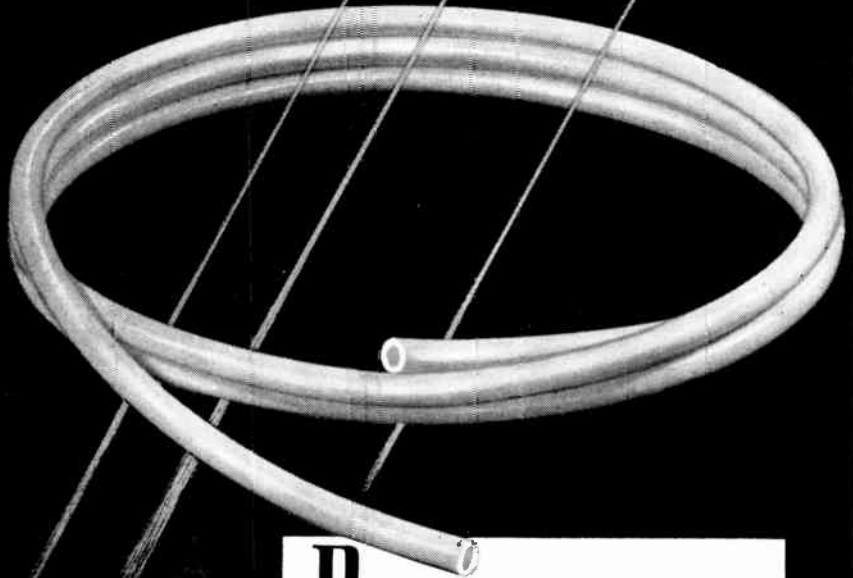
In Denmark three tv stations will be equipped with \$270,000 worth of Marconi transmitting gear, including aerial systems, monitoring equipment and flying spot scanning units.

England's F.M.I. Electronics will manufacture and sell electronic-photographic equipment of Log-Electronics Inc., Alexandria, Va.

South Africa has ordered two solar energy converters from Hoffman Electronics for evaluation as power source on remote telephone lines.

Indonesia is equipping four Italian-built destroyers and escort vessels with British Redifon transmitters, receivers, combined loudspeaker, watch and emergency receivers; and both vhf and uhf radiotelephone for ship-to-ship and ship-to-air communications.

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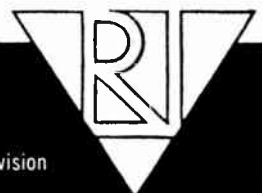
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GD's Atom Program

THE \$10-million John Jay Hopkins Laboratory for Pure and Applied Science gets its first big job from parent General Dynamics. Lab will work out the contract between GD and Texas Atomic Energy Research Foundation for research in the field of controlled thermonuclear reactions.

Results of the work in deriving energy from fusion process may have far-reaching effect on electronics:

- Magnetic devices will most probably be used to confine and control fusion process. Scientists in AEC's Sherwood Program push the "magnetic bottle" principle, using powerful magnetic fields to deflect ionized particles, keeping them from melting down container walls with the 100-million-degree temperatures fusion may entail.

- Heavy electrical discharges may be used as additional controls to pinch plasma streams together, suspend them in thin lines away from container.

- Direct conversion to electrical

energy of charged particles released by fusion is considered feasible. Two-thirds of the energy in deuterium reaction is in charged particles. Electronics may show the way to convert these directly into power.

- Ever-present control problem will be serious in fusion reactors, though less so than in fission. No radioactive by-products are produced in fusion, although reactors eventually become radioactive. Controls and instruments business will benefit from program.

The \$10-million contract employs public-utility money: the Texas foundation is supported by the state's electric utilities. The program is first of its kind to be supported by industry, will extend over the next four years.

The San Diego laboratory, named for the late founder of General Dynamics, is headquarters for the firm's General Atomics division. Division executives shown in the picture are, from left, H. B. Frye, director of administration;

Edward Creutz, director of research, and GD v-p Frederic de Hoffman, division general manager.

De Hoffman is pointing to the 44,000-sq ft experimental building, now being finished. Whole building complex will total 185,000-sq ft of lab and office space.

Sprague Buys Old Mill

WITH the Commonwealth of Massachusetts running an East-West arterial highway right through Sprague Electric's main warehouse in North Adams, the company goes crosstown, buys an old mill.

Sprague will use the 4-story, 100,000-sq ft structure mainly as a warehouse, may do some manufacturing there. The building was once the north mill of Hoosac Mills Corp., was bought from Gevaert Corp. of America.

Airpax Packs Up, Heads South

WHILE a lot of companies make plans for expansion into green pastures of Florida, Airpax Products is quietly moving its central engineering division down to the Sunshine State from former Baltimore headquarters. Engineering and production people will have finished shift to new 14,000-sq ft building by July 15.

Airpax had trouble finding engineers in Baltimore, scouted Fort Lauderdale area for space. Company found a 10-acre site, started building, then advertised for people. They got so many applicants that the move went ahead of schedule, into leased quarters.

Elgin Firms Up Electronics

LIKE other watchmakers who've stuck an oar into the electronics business, Elgin National Watch Co. of Chicago is finding it necessary to pry men loose from other parts of our industry.

Elgin recently hired Albert Binash away from Motorola Inc., made him sales supervisor for

American Microphone products.

Joining the firm this month is Dale V. Cropsey, formerly v-p and sales director for Potter & Brumfield. Cropsey becomes assistant to the president, will be responsible for both electronic and abrasives divisions of the firm.

Electronics division general manager A. P. Barton moves up to become assistant to watch manufacturing vice president. Taking over his job is George Ensign, Elgin's R&D director, who headed the staff that developed the company's electronic watch.

Bosch Runs USAF Plant

AMERICAN Bosch Arma Corp. gets a USAF facilities contract to operate a sprawling government-owned plant near Chicago's Midway Airport.

Plant covers more than 750,000 sq ft of floor space. Bosch's Chicago division will run it for the Air Force. Facilities include a personnel building, power house, production and office buildings. Main factory floor is a 670,140-sq ft production area.

Plant sits on a 50-acre tract, almost 15 acres of which is parking lot. Specialized labs include atmospheric and stratospheric test chambers.

Missile Firms Push R&D

KEEPING its operations centered in Seattle, Boeing is building a \$21-million development center near its main plant to house facilities for Bomarc. Boeing had initially planned to build Bomarc outside of Seattle, finally decided—with USAF approval—to stay home, keep 5,000 Bomarc-workers happy.

Lockheed meanwhile is integrating engineering and research branches of its missile systems division under research director Louis N. Ridenour. Assistant general manager is Willis M. Hawkins, former director of engineering. One of the division's programs is Navy's Polaris IRBM.

Lockheed's management plan-

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The systems team concerned with digital computers represents many technical specialties. Among them are logical design... circuit design... programming... data conversion and handling... component and system reliability... input-output design... and environmental and mechanical design.

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ning head Wilbur D. Snow moves over to missile division as head of product planning branch.

Top Shifts at IT&T

In top-level shifts at International Telephone & Telegraph Corp., C. Douglas Webb moves into the Secretary's office, and former Underwood president Fred M. Farwell becomes executive vice president in charge of research and manufacturing activities in the U. S.

Webb succeeds retiring secretary Geoffrey A. Ogilvie. A member of IT&T's legal department since 1943, Webb was assistant general attorney prior to his present appointment. He remains v-p and secretary of IT&T subsidiary International Standard Electric.



Farwell of IT&T

Farwell was with IBM from 1928 through 1950, and an officer of wax-maker S. C. Johnson & Sons from 1951 to 1955. In August, 1955, he became president of Underwood Corp.

At IT&T, Farwell will be in charge of 14 subsidiaries and divisions in the U. S., with some 3 million sq ft of floor space and 12,000 employees.

FTR Accents Transistors

SHORING up its semiconductor division, IT&T subsidiary Federal Telephone & Radio appoints Frank M. Viles Jr. to job of v-p for manufacture. Viles was director of FTR's

components division, guided firm's work on the electronics for Convair's Hustler supersonic bomber.

James Conto follows Viles from components division to take over as sales manager for semiconductors.

IT&T service subsidiary Federal Electric gets new v-p for customer relations as sales manager Warren F. Morgan moves up to company officer ranks.

Driver-Harris Promotes Three

KEY men at Driver-Harris, Harrison, N. J., manufacturer of special alloys, move up following retirement of Joseph B. Shelby from job of assistant v-p in charge of sales.

Kenneth H. Hobbie, former assistant sales manager, assumes Shelby's old job of sales manager and assistant v-p. W. Paul Smith slips into Hobbie's lobby.

Frank L. Driver III moves up from post of assistant v-p to become administrative vice president.

Raytheon Splits Money Job

DOUBLE job of controller and treasurer for Raytheon has been split in two. Incumbent A. E. Reed retains the treasurer's job. New controller is George Ingram Jr., who left Riegel Paper Co. to go with the Waltham, Mass., manufacturer.

Ingram has the job of strengthening Raytheon's financial position by tighter control over expenditures, accounting procedures, money handling. A whole new lineup backstops him.

New manager of special tube sales for firm's receiving and cathode-ray tube operations is Julius Dorfman, moving in from a regional managership.

Datamatic Expands

BOSTON'S Datamatic Corp. buys additional plant space to permit increased production of its large-scale data-processing systems. Firm

Want more information? Use post card on last page.

will soon expand into 75,000 sq ft of production space, bringing total plant area to 130,000 sq ft.

First of the \$2-million-plus Data-matic computers is scheduled for installation this fall at Michigan Hospital Service, Detroit.

PLANT Briefs

FORD Motor's Aeronutronic Systems Inc. spreads out into 10,000 sq ft additional plant space in Glendale, Cal. The \$200,000 lease-hold expansion brings total operating space to 65,000 sq ft.

Universal Transistor Products—name changed from Universal Atomics—is completing move to a new 12,500-sq ft plant in Westbury, L. I.

EXECUTIVE Moves

LITTON Industries v-p Myles L. Mace becomes chairman of firm's management committee. George Friedl Jr., also a v-p, slips into Mace's old job as general manager of electronic equipments.

New v-p of Bell & Howell's electronic products and instruments divisions is James D. Kingery, former assistant to B&H's executive vice president.

J. Vance Holdam Jr., who helped found Boston's Laboratory for Electronics, moves out of vice-presidency of Tracerlab to go home, become assistant to LFE's president.

Francis P. Halas vacates sales managership of Infra Electronics, takes over as midwestern sales manager for Norden-Ketay.

Sigurd F. Varian moves up to vice chairman of Varian Associates, with Myrl Stearns moving up behind him to be president and chief executive.

General Motors' AC Spark Plug division moves Joseph Holland up from sales manager to director of field service. Salesman Moreton Price moves up to job of military sales manager.



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THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers — and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.



McGRAW-HILL PUBLICATIONS

Reps Profit from Parts

COMPONENTS are a big item in the income to both manufacturers' reps and distributors. Profit margins are relatively lush, and the products are basic to the industry—with resultant steady sales.

Eaton Electronics, Moodus, Conn., maker of printed circuits and assemblies, is just now blanket-ing eastern and midwestern territories with a network of reps. In the East, Paul R. Sturgeon, Boston, Mass., handles New England; R. H. Whitehead, Guilford, Conn., serves Connecticut; Par Distributors, Syosset, N. Y., is rep for the metropolitan New York area; Samuel Jeffries, Narbertin, Pa., sells Eaton's line in the mid-Atlantic region.

In the Midwest, the line is served in Michigan and Indiana by Detroit's A. S. Walters; in the Chicago area by Felleisen Associates, and in the plains states by Inland Associates, Mission, Kans.

Goory Sales, Cleveland, handles the specialty wire products of Chicago's Hudson Wire Co.

In Los Angeles, Yarbrough Sales moves into new quarters, takes on Bow Solder Products' line.

Wire-wound resistors of Chicago's Tru-Ohm Products are represented in metropolitan New York by O. F. Masin, Pelham, N. Y.

Cincinnati jobber Modern Distributing Co. now wholesales Sylvania's consumer products. New wholesale jobber for the firm's electron tubes is Radio-Tv Products, Redding, Calif.

New rep in the West: Hugh Gray Co., San Francisco, serving northern California and Nevada. Gray, a former branch manager for Kittelson Co., handles instruments and allied gear.

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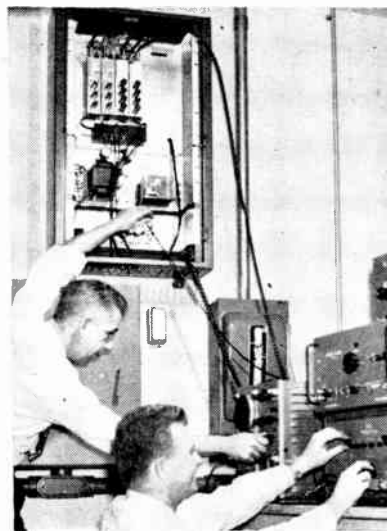
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F. J. Eberle, Business Mgr.

PROFESSIONAL SERVICES..... 46

In Our July 1 TECHNICAL Edition, Don't Miss . . .

- **Tv signal distributor.** An average of 25 db isolation among up to 256 television receivers connected to single antenna can be obtained according to Schlegel-milch, Nilssen and Pan of RCA. Signal strength is down only 12 db at each outlet, providing a 10-millivolt receiver input signal level for most apartment locations. Basic distribution network uses nine 68-ohm resistors and six balun coils to give four outputs from one input. System also includes provisions for inserting locally generated television signal.

- **On the beam.** J. T. Wallmark of RCA tells how output from a semiconductor photocell varies in relation to angle of light source from photocell axis. Varying bias on base contracts gives scanning action similar to mechanically turning photocell. Applications include gun-fire locator, computer function generator and vibration detector.



Engineers adjust distribution amplifiers in typical tv antenna-multiplex system

- **Broadcast time-setter.** Any electric clock, connected to a radio receiver, can be triggered by time-signal tone broadcast by station WWV. According to Ronald L.

Ives, operator sets clock to verbal announcement of time and a relay connected to a diode-triode circuit starts clock the instant tone is broadcast. Setting error, owing to electromechanical lag, is within 0.06 second.

- **Sorting capacitors.** Breskend, Cooperman & Franklin of Diamond Ordnance Fuze Labs describe automatic two-channel capacitor sorting system that uses a Schering bridge to measure dissipation factor and capacitance variation from standard values. Thyatron controlled relays route tested capacitors to over, under and acceptable bins. System accuracy is better than 1 percent in sorting 1,000- μmf capacitors.

- **Muscle for lung.** Potentials picked up from respiratory muscles as paralyzed patient attempts to breath can be used to trigger a control circuit for artificial respirator.

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

are numbered using last numbered page plus A, B, etc. If you are not sure of a page number, consult the advertisers index.

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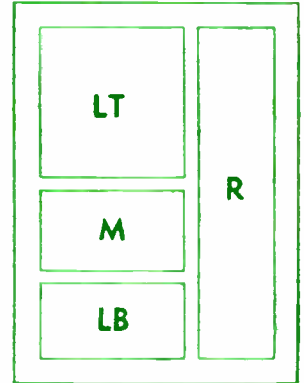
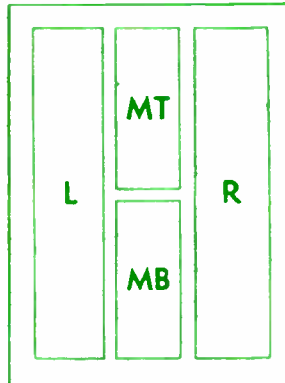
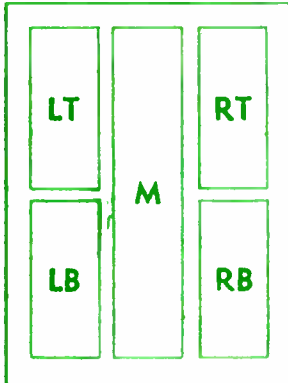
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P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

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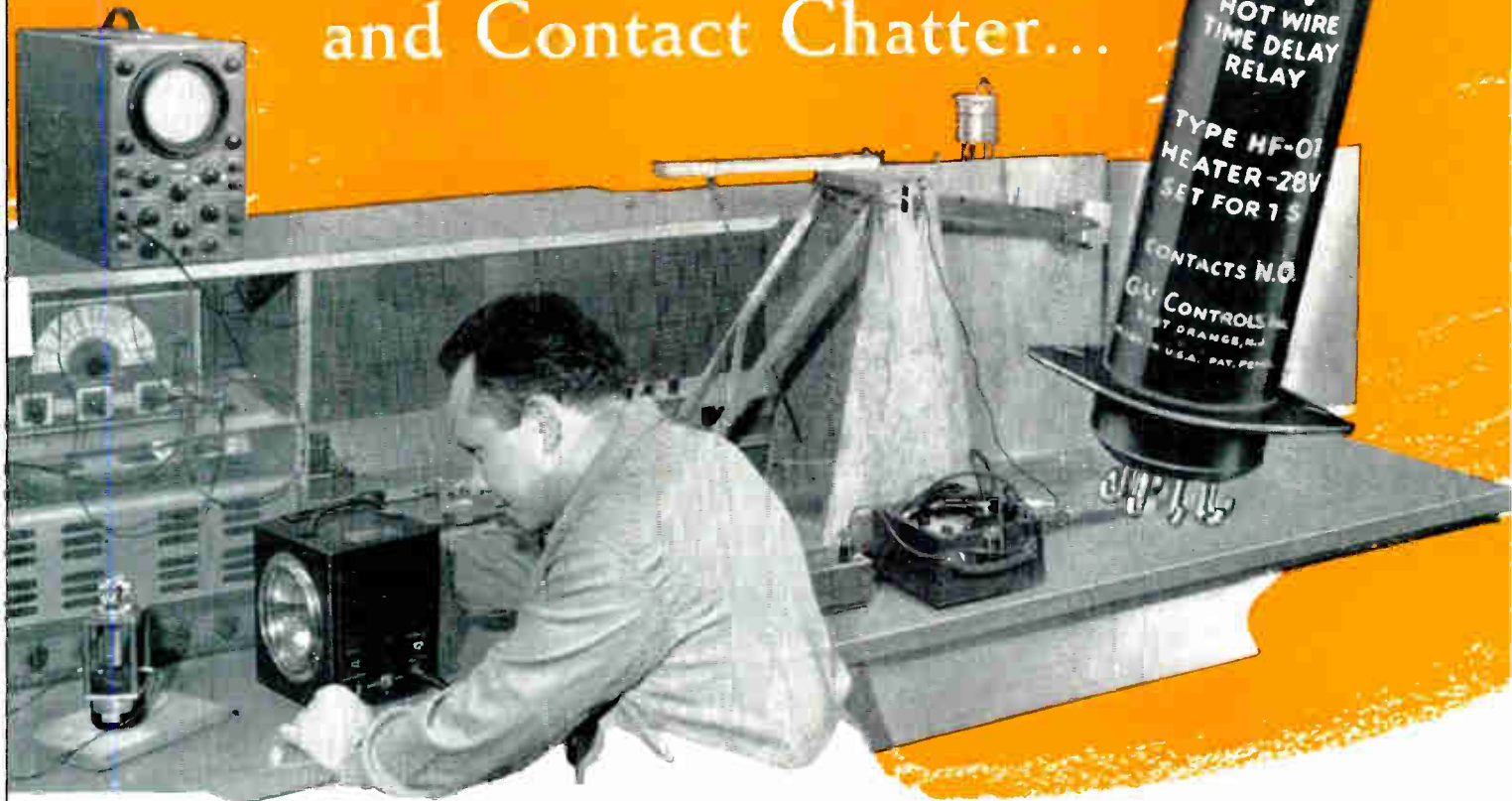
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USE THIS KEY

- R—Right
- RT—Right Top
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- L—Left
- LT—Left Top
- LB—Left Bottom
- M—Middle
- MT—Middle Top

Ruling-out Resonance and Contact Chatter...



Strobotac studies Behavior of Thermal Relays under Vibration

Strobotac makes it possible to see rapidly moving parts and mechanisms as though they were operating in s-l-o-w motion or actually standing still. The instrument operates from usual 105 to 125v, 60c lines . . . is 7 $\frac{1}{2}$ x 9 x 10 inches . . . weighs less than 10 pounds.

Type 631-BL Strobotac, \$160.

Range: Direct reading 600 to 14,400 rpm;
useful 60 to 100,000 rpm

Flash Duration: 10 to 40 microseconds
for sharp images

Accuracy: 1% of scale over most of range.
Built-in calibration system



at **G-V CONTROLS Inc.**, East Orange, N. J. design engineers found that though they were able to detect mechanical resonant points in their thermal relays by observing contact chatter on an oscilloscope, they were learning little of the nature or origin of the resonance.

With the Strobotac, they could *SEE* the sources of vibration and the reactions of the entire structure. From there it was easy to make design changes which would eliminate resonance or boost the resonant point to a value above the resonance-free range required.

All over the world, Strobotac helps solve research and design problems. This "laboratory" instrument is also a prime industrial tool for maintaining production, quality control, and diagnosing all kinds of mechanical troubles. Strobotac measures the speed of rotating, reciprocating, or other cyclic motions with accuracy. The operator can "stop" the moving part completely — study it in slow motion — or measure its rpm while it is running at full speed. There is no mechanical connection to induce even a slight "drag" in low-powered mechanisms.

Write for the **STROBOSCOPE BULLETIN** and complete information

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