

ELECTRONIC INDUSTRIES

A CHILTON PUBLICATION



In this Issue:

- **ELECTRONICS IN AGRICULTURE!**
- **New Semiconductor — The Binistor**
- **1960 Directory of Western Electronic Mfrs.**

August
1960

Trouble-free Performance

RMC DISCAPS

Temperature Compensating TYPE C



TC	.290	.400	.570	.660	.790	.890
P-100	1- 5 MMF	6- 10 MMF	11- 20 MMF	—	—	—
NPO	1-15	16- 33	34- 69	70- 85 MMF	86-115 MMF	116-175 MMF
N- 33	1-15	16- 33	34- 69	70- 85	86-115	116-175
N- 75	2-15	16- 33	34- 69	70- 95	96-130	131-190
N- 150	2-15	16- 36	37- 67	68- 95	96-130	131-230
N- 220	3-15	16- 36	37- 75	76-100	101-160	161-230
N- 330	3-15	16- 47	48- 75	76-115	116-190	191-270
N- 470	3-20	21- 51	52- 80	81-120	121-208	201-275
N- 750	3-32	33- 75	76-155	156-220	221-300	301-470
N-1500	10-74	75-140	141-220	221-399	400-550	551-800
N-2200	20-75	76-150	151-299	300-450	451-680	681-900

Temperature Coefficients up to N5200 Available on Special Order

SPECIFICATIONS

POWER FACTOR: Over 10 MMF less than .1% at 1 megacycle.

Under 10 MMF less than .2% at 1 megacycle.

WORKING VOLTAGE: 1000 V.D.C.

TEST VOLTAGE (FLASH): 2000 V.D.C.

CODING: Capacity, tolerance and TC stamped on disc

INSULATION: Durez phenolic-vacuum waxed

INITIAL LEAKAGE RESISTANCE: Guaranteed higher than 7500 megohms

AFTER HUMIDITY LEAKAGE RESISTANCE: Guaranteed higher than 1000 megohms

LEADS: No. 22 tinned copper (.026 dia.)

TOLERANCES: $\pm 5\%$ $\pm 10\%$ $\pm 20\%$

These capacitors conform to the E.I.A. specification for Class 1 ceramic capacitors.

The capacity of these capacitors will not change under voltage.

RMC Type C DISCAPS meet or exceed all specifications of the EIA standard RS-198. Rated at 1000 working volts, Type C DISCAPS provide a higher safety factor than other paper or mica capacitors.

Constant production checks assure that all specifications and temperature characteristics are met. Another phase of complete quality control consists of 100% testing of capacities.

Throughout the years leading manufacturers have relied on RMC for quality of product and maintenance of delivery schedules. Write on your company letterhead for additional information on DISCAPS.

DISCAP
CERAMIC
CAPACITORS



RADIO MATERIALS COMPANY
A DIVISION OF P. R. MALLORY & CO., INC.
GENERAL OFFICE: 3325 N. California Ave., Chicago 18, Ill.
Two RMC Plants Devoted Exclusively to Ceramic Capacitors
FACTORIES AT CHICAGO, ILL. AND ATTICA, IND.

Circle 1 on Inquiry Card

ELECTRONIC INDUSTRIES

ROBERT E. McKENNA, Publisher

• BERNARD F. OSBAHR, Editor

1960— WESCON and Western Horizons

IT'S WESCON time again and so again welcome to our *ninth consecutive* annual West Coast issue!

Over the past decade WESCON has grown steadily in stature. Today it is recognized as one of industry's principal annual events. This year, for the first time, the show and convention moves into the new Los Angeles Memorial Sports Arena which only recently housed the 1960 Democratic National Convention. There will be more than 900 exhibits on display and the attendance is expected to exceed 34,000. (Detailed show information begins on page 78.)

During the past ten years we have seen the number of electronic manufacturers in the eleven western states grow from about 400 to well over 1800 today. (Western Electronic Manufacturers Directory starts on page 161.) Originally these companies produced proprietary electronic items primarily. Later their location and engineering talents favored the development and manufacture of military electronic equipment. This in turn spread to equipment for manned aircraft and more recently to guided missile electronic systems. Now, however, with the latter becoming more and more standardized and sophisticated, western producers are eyeing electronic horizons for new achievement goals and for new electronic markets. What will these be?

Because of present space and military requirements there will be a continued effort to miniaturize and microminiaturize components and equipment. With practical molecular electronic circuits still far in the R & D future, we can expect a much greater emphasis to improve the reliability of present day components and equipment. Ways and means will be generated to take advantage of the tre-

mendous know-how that has been developed in the electronic industries over the last ten years so that it can be applied in other industries. To develop these new electronic markets considerable applied research and development will be needed. (See Electronics in Agriculture—2nd in the series of New Electronic Markets—starting on page 91.) Finally, there will have to be new and greater efforts in the areas of basic research in order to develop the new materials, concepts, methods and techniques to assure a virile and lasting industry.

Along these lines, and in keeping with our past practice, we have included two guest editorials from leading western electronic personalities that we believe will have considerable reader interest. The first, by Dr. Harper Q. North, President Pacific Semiconductors Inc., discusses where we are going with semiconductors and molecular electronics (page 76). The second is by Mr. Rollin M. Russell, Executive Vice President of the Electronic Specialty Co., and reviews the search for new electronic markets by the electronic producers (page 77).

In the last year Hawaii became our 50th state. Its location, of course, links it most closely with the eleven western state group. While it does not possess extensive electronic activity at present there is considerable interest for future expansion here. "The 50th State—Its Electronic Future" should be of interest to many (page 232).

Again this year the members of Electronic Industries' editorial, research and sales staff will be on hand to greet you at WESCON-1960. We will all be at booth 2716 and we shall be delighted to render any service we can. Until August 23 then—Aloha.

* * *

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ELECTRONIC INDUSTRIES, August, 1960, Vol. 19, No. 8. A monthly publication of Chilton Company, Executive, Editorial & Advertising offices at Chestnut & 56th Sts., Phila. 39, Pa. Accepted as controlled circulation publication at Phila., Pa. \$1 a copy; Directory issue (June), \$5.00 a copy. Subscription rates U. S. and U. S. Possessions: 1 yr. \$10.00; 2 yrs. \$18.00. Canada 1 year, \$12.00; 2 yrs. \$20.00. All other countries: 1 yr. \$18.00; 2 yrs. \$30.00. Copyright 1960 by Chilton Company. Title Reg. U. S. Pat. Off. Reproduction or reprinting prohibited except by written authorization.

ELECTRONIC INDUSTRIES

Vol. 19, No. 8

August, 1960

MONTHLY NEWS ROUND-UP

Radarscope: What's Ahead for the Electronic Industries...	4
As We Go To Press	7
Electronic Shorts	8
Coming Events	12
International News	14
Electronic Industries News Briefs	16
TOTALS: Late Marketing Statistics	19
Snapshots . . . of the Electronic Industries.....	22
Next Month in Electronic Industries	75
Washington News Letter	124

Editorial: 1960 Wescon—And Western Horizons..... 1

Guest Editorials:

Where are We Going With Semiconductors and Molecular Electronics?..... Dr. H. Q. North 76

The Search For New Electronic Markets..... R. M. Russell 77

WESCON: Showcase of Western Electronic Industry!..... 78

WESCON Technical Papers Program..... 80

The Binistor—A New Semiconductor Device..... N. DeWolf 84

What's New

Electronics and the Future of Agriculture..... R. G. Stranix 91

New Uses for Fluxgate Principle..... G. S. Kan 107

Determining Transistor Power Dissipation..... J. G. Naborowski 110

Recording From DC to 1 MC..... G. N. Johnson & L. Mirchandani 112

Engineer's Notebook #55: Conversion Chart..... J. G. Koch 115

1960 Directory of Western Electronic Manufacturers..... 161

International Electronic Sources..... 199

Electronic Operations..... 211

System Analysis Using Digital Computers..... W. F. Nielsen 212

For Accurate Timing . . . Build a WWV Time Signal Receiver
 S. Saito and F. R. Bretemps 214

Professional Opportunities..... 231

The 50th State—What Is Its Electronic Future?..... C. M. Marcott 232

NEW PRODUCTS & TECH DATA

New Products at WESCON

New Western Tech Data..... 116

New Tech Data for Engineers

DEPARTMENTS

Tele-Tips	44	Systems-Wise	211
Letters	48	Cues for Broadcasters	219
Personals	60	Industry News	239
Books	62	News of Mfrs. Representatives	242



Highlights

of this issue

WESCON—The Show and Convention page 78

The Western Electronic Show and Convention opens in Los Angeles August 23. Headquarters are the Memorial Sports Arena and the Ambassador Hotel. Here is a preview of exhibits, technical papers, and social events at this important conference. The Technical Papers Program (over 200 authorities will participate) begins on page 248. Highlights of product exhibits begin on page 81.

The Binistor—A New Semiconductor Device page 84

This new semiconductor device was developed for switching and storage circuits. It has many of the properties of a flip-flop and depends largely on an external voltage supply for its negative resistance characteristic. It is remarkably stable and uniform.

Electronics and the Future of Agriculture page 91

Electronic techniques offer great savings throughout the production-distribution chain which brings goods to the consumer. How widely these techniques are applied will depend upon the awareness of both the electronic and agricultural industries.

Recording From DC to I-MC page 112

New multi-channel recorders use FM and analog techniques combined in what is called the add mode. Using these techniques permits wide-band multi-channel recording at relatively low tape speeds with high fidelity.

New Uses for Fluxgate Principle page 107

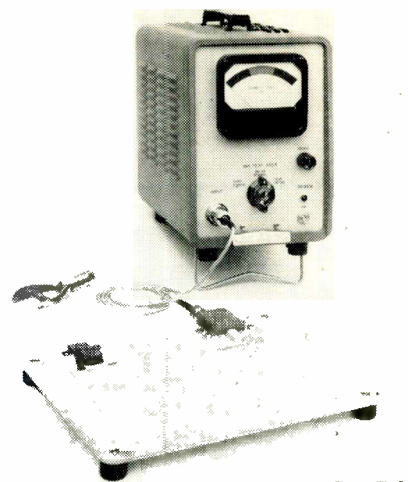
The slow, inconvenient, and often inaccurate methods for measuring dc using voltage-resistance measurements spurred the development of a clip-on type of milliammeter. The instrument used the flux-gate principle. The principle is now being extended to other applications including the measurement of ac fields, varying dc, and in a new device—a Magnetic Ink Tester.

System Analysis Using Digital Computers page 212

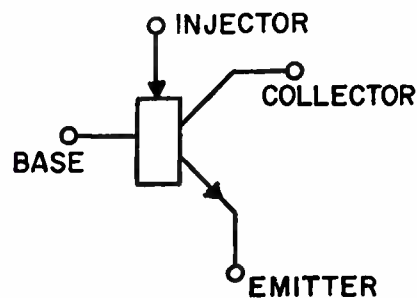
Now we have a technique—useful and economical—for analyzing electronic systems. It is most applicable where non-linear functions make a purely theoretical analysis difficult, but, where these functions can be approximated by empirical equations.

The 50th State—What is Its Electronic Future? page 232

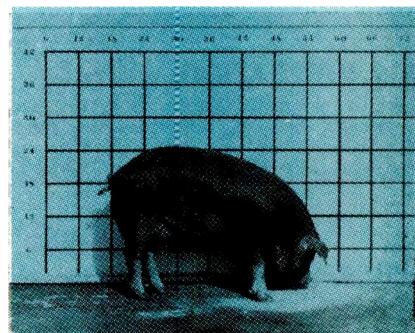
Component manufacturing will be restricted to small, lightweight items in which the "value added by manufacturing" is many times the cost of the raw materials. Research and development activities should be attracted by the same attributes that lure the tourists—climate, recreation, and reasonable real estate values. The future depends on establishing an electronic intellectual atmosphere in the Islands.



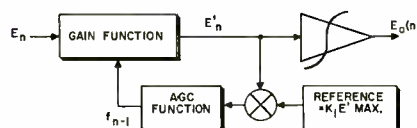
Fluxgate Principle



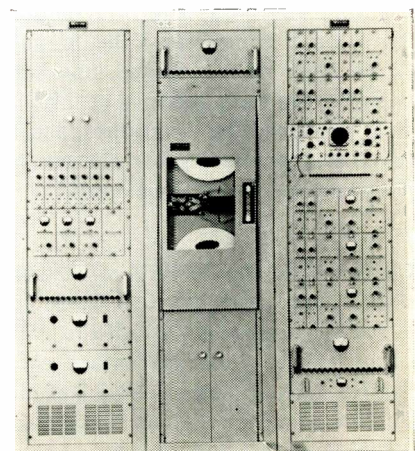
The Binistor



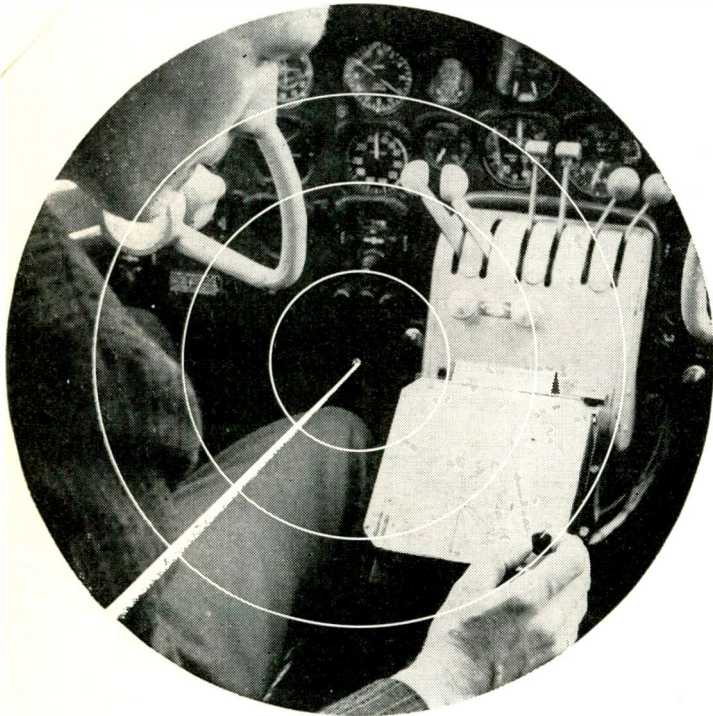
Electronics in Agriculture



System Analysis
Recording to IMC



RADARSCOPE



AIR NAVIGATION

Pictorial navigation display unit for aircraft developed by ACF Electronics Div., ACF Industries uses transparent slide maps and a luminescent "bug" (in upper right quadrant) that tells the pilot of the aircraft where his ship is at all times.

WHERE STEREO has dominated interest at Hi-Fi shows during the past three years "reverberation effect" are being touted to provide the excitement this Fall. Every major audio equipment manufacturer is expected to have reverberation units available by the end of the year, though there is still much discussion as to whether the reverberation effects really enhance the listening on all records.

HEAT-TO-ELECTRICITY CONVERTER which provides practical amounts of power from the heat of ordinary fuels has been developed by RCA Labs. The thermionic converter tube, developed under an Air Force Research contract, operates with 14% of efficiency from heat sources of 1100°C, equivalent to the heat produced by burning gasoline. The device was developed primarily for the conversion of solar heat to energy in space, and contains no moving parts.

JAPANESE EXPORTS of transistor radios (3 or more transistors) to the U. S. in 1960 are expected to be approximately 4 million units—about the same as last year. The figures are estimated by the Electronics Div., Business and Defense Service Administration of the Dept. of Commerce, on the basis of trade reports from Japan.

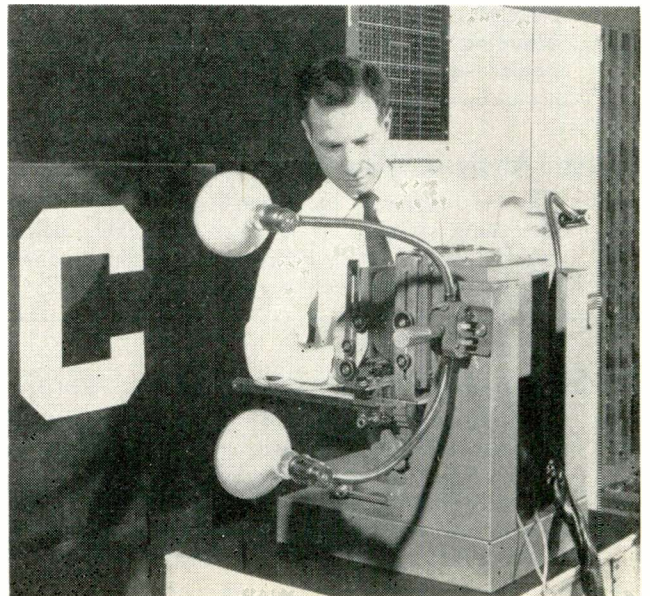
FEDERAL TRADE COMMISSION has a raft of proceedings against cathode-ray tube rebuilders, charging that firms are failing to disclose that the TV tubes they "manufacture" are rebuilt and contain used parts. Many of the firms are going to considerable lengths to identify themselves as manufacturers of "new" tubes.

TO INSURE MORE BIDDERS for its 160 million dollar research and development business, the U. S. Army Signal Supply Agency is installing an electronic Addressograph Bidders Source List at the Ft. Monmouth Procurement Office. The Signal Corps wants to catalog the research and development abilities of all firms, large and small, in the country, for use in future contract bidding.

UHF-TV STUDY will be made by the FCC during fiscal years 1961 and 1962 to determine the feasibility of using these channels for satisfactory TV coverage of the New York City market area. The FCC is looking for interested people from all sections of the industry to serve on an advisory committee. Representatives from the NAB, the EIA, the Assoc. of Maximum Service Telecasters, The IRE, the Joint Technical Advisory Committee, the Joint Council on Educational Television, the Television Allocations Study Organization, the Association of Federal Communications Consulting Engineers, and others have been invited to serve on the committee.

MACHINE THAT "LEARNS"

Cornell Aeronautical Lab's Mark I Perceptron is an experimental machine that can be trained to automatically identify objects such as letters of the alphabet. Here a CAL engineer adjusts the machine's photo "eye" during training sequence.



Analyzing current developments and trends throughout the electronic industries that will shape tomorrow's research, manufacturing and operation

ELECTRONIC MEASUREMENT STANDARDS for the new higher frequencies are so lacking that both industry and the National Defense Program are being hampered. A series of measurement research conferences between the National Bureau of Standards and Industry representatives will look at each field to determine which needs are most urgent and how they can best be met. The Aerospace Industries Association initiated the series.

AIR FORCE RADARS are from time to time being turned to use as weather predicting tools in the hands of specially trained weather bureau meteorologists. The big radars, used by ADC for warning of unidentified aircraft, cover most of the U. S. coast line subject to hurricanes and most of "tornado alley."

RADIATION EFFECTS on components and military equipment will be studied using a new nuclear research reactor designed by General Dynamics Corp. for the Army's Diamond Ordnance Fuse Lab. The reactor will be specifically designed to minimize the possibility of radiological hazard in operation and will be installed next year at Walter Reed Army Medical Center, with the total facility to be known as Diamond Ordnance Radiation Facility.

EUROPEAN INSTRUMENTATION techniques are slowly approaching the U. S., principally in industrial controls, says Herman Schaevitz, president of Schaevitz Engineering, just returned from an extended European tour. Schaevitz estimated the gap could be closed in 5 years. Then, he said, "The European industry will be capable of pulling even with the U. S. only from the standpoint of engineering methods, their principles and applications." European industry in general is hamstrung because their economy is not yet capable of assimilating mass production.

RUSSIA'S ABILITY in certain areas of electronics are fairly well recognized, but there is some question whether they approach the U. S. in the application of automatic control techniques. Engineer Rufus Oldenburger, Purdue University, after a tour of Russian plants voiced his opinion that while some of the theoretical work being done by Russian mathematicians is quite advanced, there is a considerable lag in actually applying the techniques to industry.

FCC is taking an increasingly tough line under the leadership of the new chairman. Last month the commission took Miami's controversial Channel 10 from National Airline's Public Service TV, Inc., and gave it to L. B. Wilson, Inc. The first signs of a "get tough" policy are welcomed by many industry officials who hope for settlement of a number of long standing industry problems.

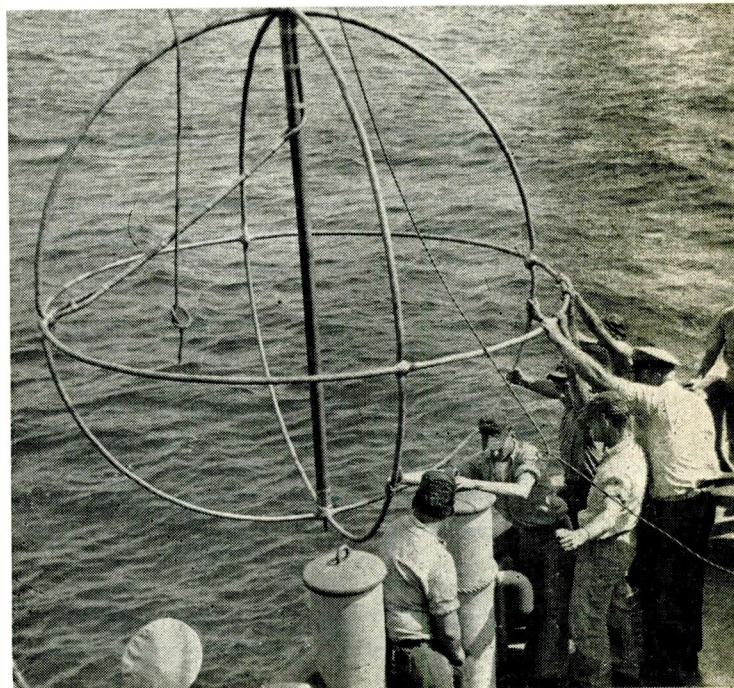
JAPANESE EXPORTS to the U. S. during the first 3 months of 1960 declined seasonally to approximately \$16 million from the volume reached in the last quarter of 1959. This figure, however, is still double the level of the first quarter of last year, according to Electronics Div. of Business & Defense Service Administration, U. S. Dept. of Commerce.

THE NATIONAL ASSOCIATION OF BROADCASTERS is opposing a move to expand the activities of non-commercial, educational FM stations into commercial subsidiary broadcasting areas through the use of multiplexing. NAB's stand, in opposition to a petition filed by the National Association of Educational Broadcasters says, "the establishment of a genuinely educational type of service would not be furthered by permitting educational institutions to operate in substantially the same manner as commercial applicants though they may choose to call it limited commercial non-profit operation."

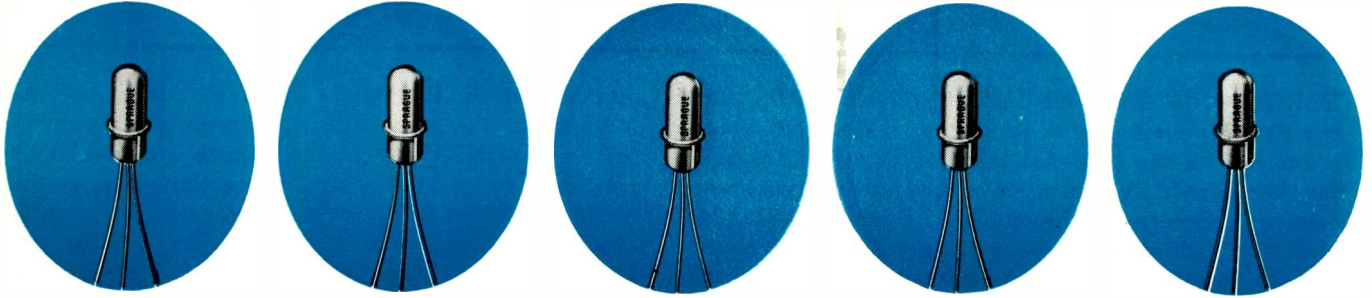
FM RADIO SALES, so long a subject of optimistic sales projections, finally are being realized. Trade newsletter "Television Digest" estimates 1960 sales of FM radios, phonos with FM, FM tuners and imports, somewhere in the neighborhood of 2,000,000 units, up more than 30% over 1959. The number of FM stations is increasing rapidly also. The total now is 741 on the air, 64 of them new stations started during the first half of 1960.

FOR OCEANIC RESEARCH

Large electro-magnetic antenna for Operation Deep Dip is lowered over the side of the U.S.S. Stallion for calibration prior to tests of the complete Deep Dip unit in the Tongue of the Ocean off Nassau. Deep Dip was developed by Naval Ordnance Lab to carry research devices into the deepest ocean voids.



MADT[®] transistors from Sprague*



for the highest r-f operating frequency of all mass-produced transistors



for the fastest switching time of all mass-produced transistors



for storage temperatures up to 100°C

DESIGN AROUND SPRAGUE MICRO-ALLOY DIFFUSED-BASE TRANSISTORS

available now at sensible prices you can afford!

Sprague Germanium Micro-Alloy Diffused-Base Transistors, well-known for their rugged vhf performance, are now priced below other transistors with comparable electrical characteristics. In many areas, this permits designers to improve circuit techniques without necessarily increasing costs. Expanded production facilities enable us to ship quantity orders on short notice. Add to this their ultra-fast switching time, and you have three good reasons why Sprague MADT[®] Transistors have achieved their high level of acceptance.

With Sprague Transistors, circuits in vhf amplifiers and oscillators can now operate with collector currents as high as 50 ma . . . with power dissipation up to 50 mw . . . with collector to base voltages to 15 v. They have been application tested through the entire military electronics vhf spectrum.

The application table may well suggest the use of one or more Micro-Alloy Diffused-Base Transistor types in your latest circuit designs.

* Sprague micro-alloy, micro-alloy diffused-base, and surface barrier transistors are fully licensed under Philco patents. All Sprague and Philco transistors having the same type numbers are manufactured to the same specifications and are fully interchangeable.

MICRO-ALLOY DIFFUSED-BASE TRANSISTOR APPLICATIONS	
Type	Application
2N499	Amplifier, to 100 mcs
2N501	Ultra High Speed Switch (Storage Temperature, 85 C)
2N501A	Ultra High Speed Switch (Storage Temperature, 100 C)
2N504	High Gain IF Amplifier
2N588	Oscillator, Amplifier, to 50 mcs

For complete engineering data on the types in which you are interested, write Technical Literature Section, Sprague Electric Co., 233 Marshall St., North Adams, Massachusetts.

You can get off-the-shelf delivery at factory prices on pilot quantities up to 999 pieces from your local Sprague Industrial Distributor.

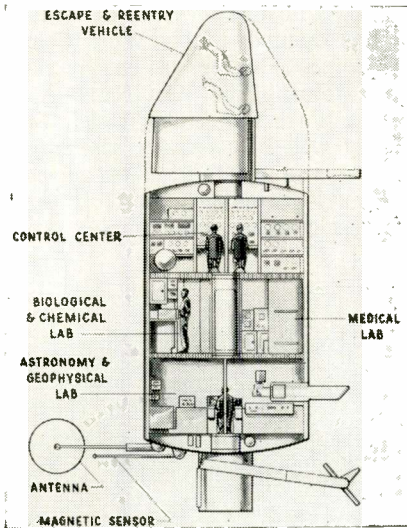
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HIGH TEMPERATURE MAGNET WIRE • CERAMIC-BASE PRINTED NETWORKS • PACKAGED COMPONENT ASSEMBLIES

As We Go To Press...

PROPOSED SPACE LAB



No space suits or provisions for artificial gravity are needed in this 16-ton space lab proposed by engineers at the Martin Co.'s Baltimore Div. Carrying 4 to 6 men, it would stay in a 400 mile orbital altitude a year.

U.S. Top Latin America Electronics Supplier

The U. S. continues to be the principal supplier of electron tubes and semiconductors in nine Latin American countries, namely, Argentina, Brazil, Chile, Colombia, Cuba, Mexico, Peru, Uruguay and Venezuela, according to BDSA's Electronic Div. survey of those countries.

Despite increasing competition from Western Europe and Japan, a strengthening market for U. S. manufactured electron tubes and components exists, pointing to a continuing demand.

ASR Radars Ordered

Texas Instruments Incorporated, Dallas, Tex., is supplying new ASR's (Airport Surveillance Radar) for the Federal Aviation Agency. A total of 34 airports will get the Radars during the next year and a half.

The radars have a range of 60 miles and reach an altitude of 25,000 feet. They will increase FAA capability in handling air traffic—particularly high speed jets. They can be set to present moving objects only and are supplied with an electronic map which shows navigation aids and ground installations.

Subscription TV Application Filed

The Hartford Phonevision Co., a subsidiary of RKO General, Inc., has filed a formal application with the Federal Communications Commission to conduct a three-year test by broadcasting from station WHCT, Channel 18, Hartford, Conn., without use of telephone wires or cable.

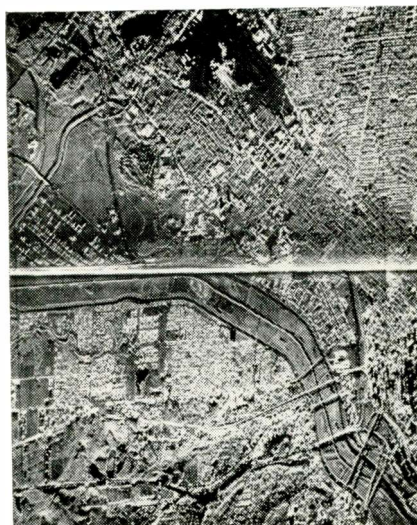
RKO General, TECO, Inc. and Zenith Radio Corp. of Chicago have also joined in filing the application, the former having developed the Phonevision system and the latter to manufacture the equipment and provide technical and other assistance.

It is proposed that WHCT operate as a conventional commercial station through most of its broadcast day, with one or two premium subscription programs aired each day in popular viewing hours without commercials for subscribers use only.

When 2,000 decoders have been installed, Hartford Phonevision proposes to commence operations—possibly within six months after FCC approval.

A preliminary estimate contemplates 10,000 families enjoying subscription within one year. There are 300,000 homes within range of WHCT.

RADAR MAPPING SYSTEMS



Radar map of Dallas, Tex., was made by the AN/APQ-55 surveillance radar developed by Texas Instruments Incorporated, Dallas, Tex., for the U. S. Air Force. Shadows help determine height of objects. Side-looking radar can pin point targets scattered over wide areas.

FOR PROJECT MERCURY



Astronaut M. Scott Carpenter (left) tests communication controls for Project Mercury. Controls, supplied by Collins Radio Co., Dallas, Tex., are in a pressure suit simulator (arm and glove section only).

Largest Radio 'Scope Operational in Fall

A radio telescope, 600 ft. long, 400 ft wide, and 62½ ft deep (its 160,000 ft² of receiving area is more than twice that of the Jodrell Bank Radio Telescope in Manchester, Eng.), will go on the air early this fall near Danville, Ill. Primary mission of the telescope, designed to pick up faint sources outside our own Milky Way galaxy, will be to make detailed maps of the universe. Celestial objects previously undetected and far beyond the range of present optical telescopes, will be charted. The Univ. of Illinois is responsible for construction and will operate it under sponsorship of the ONR.

Since the scope is not steerable, observers will take advantage of the earth's rotation to bring objects over the telescope. The first project will be a detailed map of the sky at 611 MC. The Navy is building a 600-foot steerable dish at Sugar Grove, W. Va.

RCA Price-Cuts Mesa

RCA announced a 36% cut in the price of its 2N1300 Mesa computer transistor last month.

More News on Page 8

Electronic

SHORTS

▶ Numerical control system employing all-static, transistorized circuitry for automatic machine tool control is available from Westinghouse. The PRODAC (programmed digital automatic control) system controls 1 to 5 machine tool motions over a 999.999-in. span. Control is on a point-to-point positioning basis—with an accuracy of ± 0.005 inch.

▶ Self-reproducing machine which can improve succeeding models of itself is theoretically possible, says Prof. John Myhill of Stanford Univ. The self-improving series of machines would each be built of 3 parts—a builder, an instructor and a computer. By telling the original machine, built by man, to reproduce itself and improve its “offspring,” the machine would produce a better version of itself.

▶ Ballistic Missile Radiation Analysis Center at the Univ. of Michigan's Willow Run Labs is collecting data on radiation emitted by ICBM's and IRBM's as they leave and re-enter the atmosphere. Aim is to develop mathematical models of missile behavior which will permit identifying unknown missiles.

▶ Aerojet-General is exploring “hybrid” rocket power plants—combining the best features of liquid and solid-propellant rockets. The hybrid rocket would employ a liquid oxidizer which would be sprayed into a core of solid fuel.

▶ Bell Labs has reduced switching times and collector resistances of diffused base transistors by combining diffused base technology with the epitaxial film technique. Switching time of silicon devices is reduced by a factor of more than 10, and there is a comparable reduction in the collector resistance.

▶ A development of IBM Advanced Systems Development Div. Lab., San Jose, Calif., detects and corrects errors, or bursts of errors, that occur during transmission of computer information over communication links. Transmission errors are caused mainly by static and short interruptions.

▶ “Universal” circuit card which can be prefabricated and adapted to different circuit requirements has been developed by Librascope, Inc., Glendale, Calif. The card contains a universal etched pattern which can be modified by interconnections to form any desired circuit function.

▶ First airborne telemetering gear for the new military band (2150 to 2350 MC), a radio transmitter designated AN/KA-1, will be developed by General Instrument Corp.'s Advanced Development Lab, Westbury, N. Y. The unit will transmit more than 18 channels of information simultaneously.

▶ Supermendur, an alloy discovered 50 years ago, may reduce significantly the weight and size of transformers, magnetic modulators, filter chokes and other inductive components, according to M. Lauriente and R. E. Lee of Westinghouse.

▶ Non-profit organization, Aerospace Corp., formed by the Air Force to manage over-all research and development of missile and space programs will begin operations by assuming some work responsibility of Thompson Ramo Wooldridge.

▶ House Space Committee is urging NASA to adopt a top-priority program to “place a manned expedition on the moon before 1970.” Development of a nuclear rocket and 1,500,000 pound-thrust single-chamber F1 space engine are regarded as vital space research projects, necessary elements to continued U. S. leadership.

▶ Pentagon officials say that Atlas Intercontinental Missile Installation is months behind schedule in key combat sites. However, despite delays, the Air Force's Ballistic Missile Division, which oversees the contractor's work, must achieve the Pentagon's aim of 129 Atlas Missiles deployed and ready for combat by the end of Calendar 1962.

As We Go To Press (cont.)

Build New Electronics Center on West Coast

The Radio Corporation of America has opened a new West Coast Electronics Center on a 50-acre site adjoining the Van Nuys Airport in West Van Nuys, Calif. The facility will be used for the engineering and production of missile checkout, guidance, control, and data processing and display systems.



Over 400 space electronics engineers assemble outside RCA's new West Coast Electronics Center at Van Nuys, Calif. Their combined professional experience exceeds 4,000 man-years.

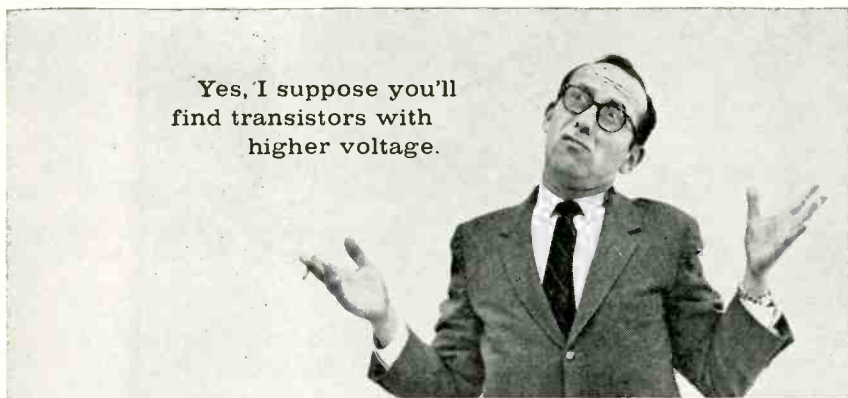
Two of the major systems now being produced at Van Nuys for ground support of missiles are the Atlas ICBM checkout system, and the Thor IRBM autopilot. Other RCA electronic systems produced there are long-range radar navigation instruments, weather radar for the Air Force and Navy; electronic countermeasures equipment, and elements of the Ballistic Missile Early Warning System (BMEWS).

Mobile Long-Range Radar

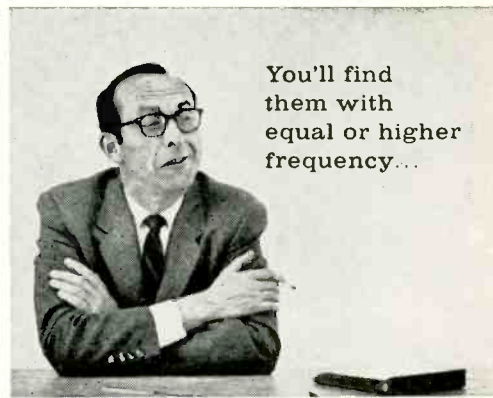
Long-range detection capabilities with full maneuverability and mechanical ease of operation are incorporated in a mobile high-power radar developed by GE's Heavy Military Electronics Dept., Court St., Syracuse, N. Y.

The system, “Project Butterfly,” uses a retractable folding antenna structure. Transmitting and receiving portions of the system are housed in a wheel-mounted antenna assembly.

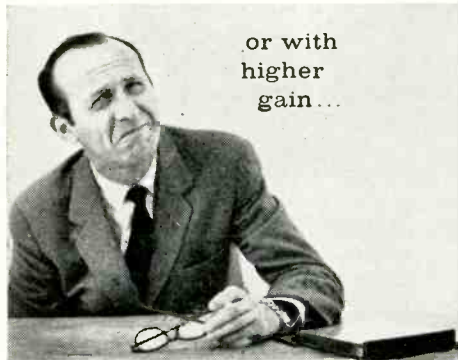
More News on Page 14



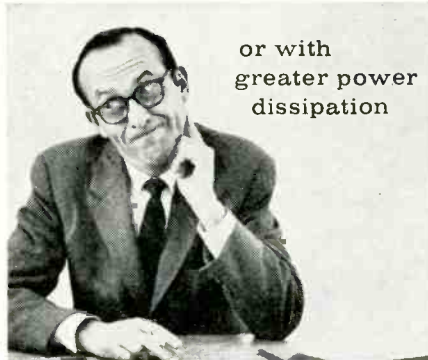
Yes, I suppose you'll find transistors with higher voltage.



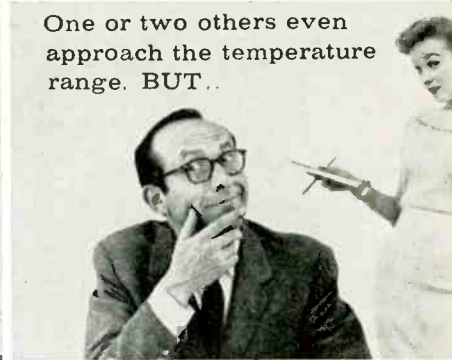
You'll find them with equal or higher frequency...



or with higher gain...



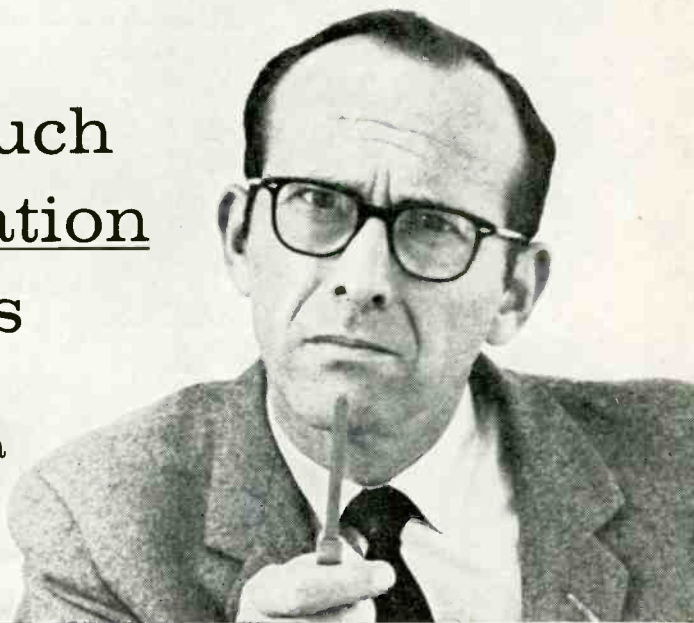
or with greater power dissipation



One or two others even approach the temperature range. BUT..

no other transistor has such an ideal combination of parameters

as the Hughes 2N1196 or 2N1197 double-diffused mesa silicon transistor amplifier.



No other transistor gives you such ideal parameters; no other gives you such reliability. These Hughes high-frequency devices meet or exceed every possible amplifying requirement of a PNP silicon transistor. They have high operating voltage, high temperature rating, high alpha cutoff frequency, high gain at high frequencies, low collector shunt capacitance, good power dissipation, and low signal distortion. In a 5000-hour storage-life test at 200°C, the units re-proved their ruggedness and reliability by showing no significant changes in the beta or leakage current.

The Hughes 2N1196 & 2N1197 transistors were originally developed in conjunction with the U.S. Army Signal Corps on an IPS contract for military devices, and meet the exacting requirements of MIL-T-19500A.

Now they're available for you. If you need high-frequency, double-diffused, mesa transistors for i.f. amplifiers, h.f. amplifiers, oscillators, for communication telemetering, or similar electronic equipment, order from Hughes today. Just call or write your nearest Hughes Semiconductor sales office or authorized distributor—or write Hughes Semiconductor Division, Marketing Department, 500 Superior Avenue, Newport Beach, California.



SPECIFICATIONS @ 25°C			
ABSOLUTE MAXIMUM RATING	2N1196	2N1197	Units
$V_{CE0} @ I_{CE0} = -100 \mu A$	-70	-70	volts max
$V_{CB0} @ I_{CB0} = -100 \mu A$	-70	-70	volts max
$V_{EB0} @ I_{EB0} = -100 \mu A$	-4	-4	volts max
ELECTRICAL CHARACTERISTICS			
P.G. @ $V_{CE} = -10v, I_C = 2mA$	28 @ 4.3MC	22 @ 12.5MC	db typ
$F_{\alpha} @ V_{CE} = -10v, I_C = 2mA$	45	55	MC typ
$C_{cb} @ V_{CE} = -10v, I_C = 0, f = 140KC$	3	3	$\mu\mu$ fd typ
$h_{fe} @ V_{CE} = -10v, I_C = 2mA, f = 1KC$	9	.94	typ

350 mW dissipation in Free Air
Operating temperature range -65°C to +200°C

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TIGHTEN YOUR "SPECS" WITH HUGHES CRYSTAL FILTERS

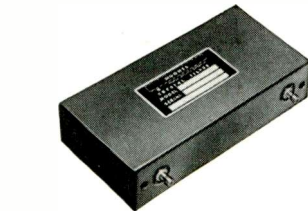
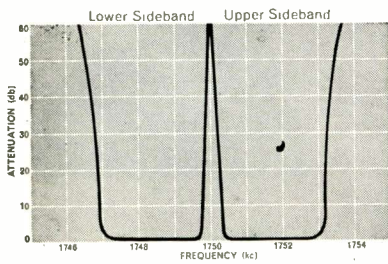
HUGHES has the highly skilled personnel, the "know-how" and the production facilities to fill your every crystal filter need—in any quantity—and with guaranteed on-time delivery.

Experienced Hughes Applications Engineers are available now to work with you on your filtering problems. For additional information,

call your nearest Hughes Semiconductor Sales Office or Representative listed below. Or write:

Hughes Industrial Systems Division, International Airport Station, Los Angeles 45, Calif.

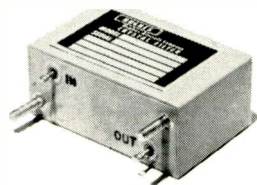
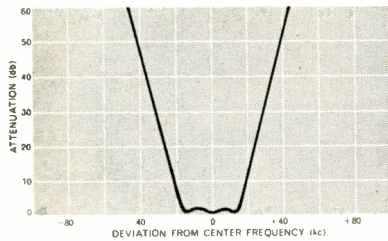
For export information, write Hughes International, Culver City, California.



LOWER SINGLE SIDEBAND 1.75 Mc.

Specifications:

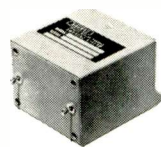
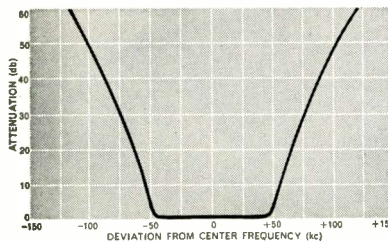
Passband width	2.7 Kc
Carrier rejection	50 db
Maximum ripple	±0.75 db
Impedance (in/out)	50/50 ohms
Maximum insertion loss	3 db
Size	8.5 cu. in.



BANDPASS 10 Mc.

Specifications:

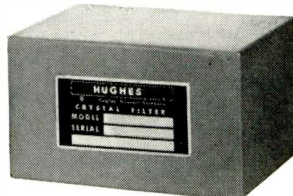
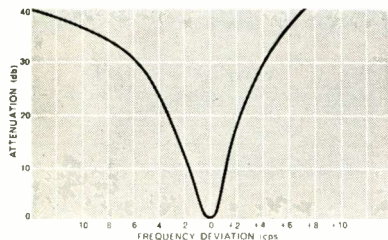
3 db bandwidth	40 Kc
Shape factor (60 db/3 db)	2.2 to 1
Maximum ripple	±0.75 db
Maximum insertion loss	6 db
Impedance (in/out)	1.5K/1.5K
Size	3.6 cu. in.



BANDPASS 30 Mc.

Specifications:

3 db bandwidth	108 Kc
Shape factor (60 db/3 db)	2.1 to 1
Maximum ripple	±1 db
Maximum insertion loss	8 db
Impedance (in/out)	2K/2K
Size	6 cu. in.



BANDPASS 100 Kc.

Specifications:

6 db bandwidth	2 cps max.
Shape factor (30 db/6 db)	5 to 1
Impedance (in/out)	1K/1K
Size	11.75 cu. in.

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Garden City, Pioneer 1-4620, Syracuse, GRanite
1-0163 • Ohio—Cincinnati, ELMhurst 1-5665, 6, 7
Pennsylvania—Philadelphia, MOhawk 4-8365, 6
Texas—Dallas, LAKeside 1-4111

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2-5593

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INDUSTRIAL SYSTEMS DIVISION

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These newest products of HUGHES are especially designed to give you dramatically improved resolution in applications such as: shipborne and ground based radar, sonar, air traffic control, instrumentation, industrial TV, and many others.

HUGHES flat-face storage tubes, now available in quantity, enable you to increase display capability by a factor of 4. Display readouts are easier and more accurate because of the new picture clarity, sharper focus and finer detail provided by the optically-flat face and high light output of these new TONOTRON® Tubes from HUGHES.

Write today for full information and engineering assistance on your applications: HUGHES, Vacuum Tube Products Division, 2020 Short Street, Oceanside, Calif. For export information, please write: Hughes International, Culver City, California.

FEATURES:

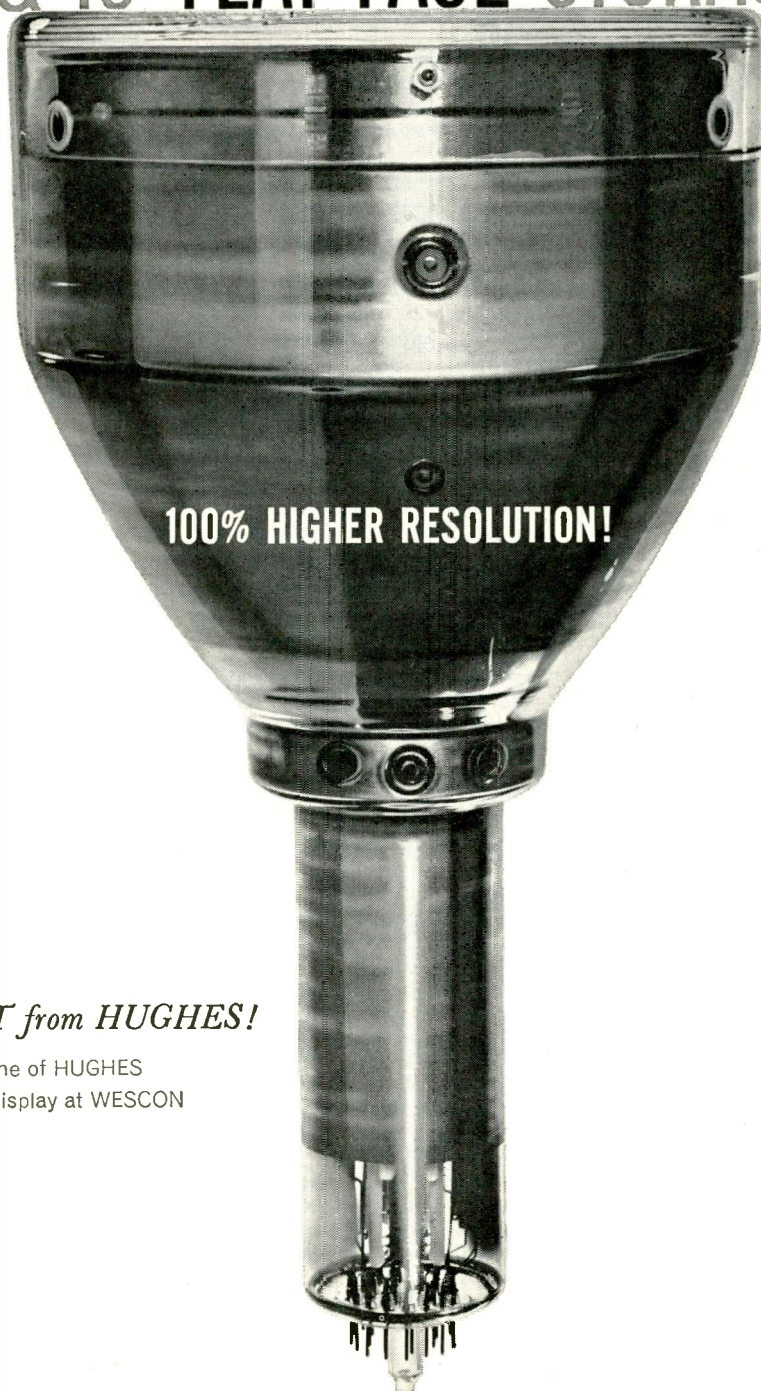
- Axial writing gun
- Electrostatic focusing
- Electromagnetic deflection
- P20 aluminized phosphor

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VACUUM TUBE PRODUCTS DIVISION

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100% HIGHER RESOLUTION!

another FIRST from HUGHES!

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Storage Tubes on display at WESCON
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Coming

Events in the electronic industry

Aug. 1-3: Nat'l Symp. on the Future of Manned Military Aircraft (Class), IAS; San Diego, Calif.

Aug. 1-3: 4th Nat'l Symp. on Global Communications, IRE, U. S. Signal Corps; Statler-Hilton Hotel, Washington, D. C.

Aug. 6-9: 20th Annual Nat'l Conv. & Exhibit, Nat'l Audio-Visual Assoc.; Morrison Hotel, Chicago, Ill.

Aug. 8-10: Annual Meeting, Assoc. of the U. S. Army; Sheraton-Park Hotel, Washington, D. C.

Aug. 8-12: Pacific General Meeting, AIEE; San Diego, Calif.

Aug. 15-17: Heat Transfer Conf. & Exhibit, ASME, AICHE; Statler-Hilton Hotel, Buffalo, N. Y.

Aug. 18-19: Electronic Packaging Symp.; Univ. of Colorado, Boulder, Colo.

Aug. 22-26: Symp. Intro. to Thermonuclear Plasma Physics, Oak Ridge Nat'l Lab., Oak Ridge Institute of Nuclear Studies, U. S. AEC; Gatlinburg, Tenn.

Aug. 23-26: 15th Nat'l Meeting, Assoc. for Computing Machinery; Marquette Univ., Milwaukee, Wis.

Aug. 23-26: WESCON, IRE, WEMA; Ambassador Hotel & Memorial Sports Arena, Los Angeles, Calif.

Aug. 24-Sept. 3: Radio and TV Exhib.; Earl's Court, London, England.

Aug. 25-Sept. 3: Int'l Conf. on High Energy Nuclear Physics, Int'l Union of Pure & Applied Physics, Commission on High Energy Physics; Rochester, N. Y.

Aug. 29-31: Semiconductors Conf. AIME; Statler-Hilton Hotel, Boston, Mass.

Aug. 29-Sept. 2: Int'l Conf. on Semiconductor Physics, Czechoslovak Academy of Sciences, Int'l Union of Pure & Applied Physics; Prague, Czechoslovakia.

Aug. 29-Sept. 3: Int'l Information Theory Meeting, IEE, IRE; London, England.

Aug. 29-Sept. 3: Int'l Conf. on Nuclear Structure, Int'l Union of Pure & Applied Physics, Atomic Energy of Canada Ltd.; Queen's Univ., Kingston, Ont., Canada.

Sept. 5-9: Medium and Small Power Reactors Conf.: Int'l Atomic Energy Agency; Vienna, Austria.

Sept. 5-15: Int'l Scientific Radio Union, 13th General Assembly; Univ. College, London, England.

Sept. 6-16: Production Eng. Show; Navy Pier, Chicago, Ill.; Machine Tool Show; Int'l Amphitheatre, Chicago, Ill.

Sept. 6-17: Use of Radioisotopes in Physical Sciences and Industry Conf.; Int'l Atomic Energy Agency, Copenhagen, Denmark.

Sept. 7-9: 1st Joint Automatic Control Conf., IRE (PGAC), ASME, ISA, AIEE, AICHE; Mass. Inst. of Technology, Cambridge, Mass.

Sept. 9-10: Conf.: Tomorrow's Techniques in Electronics—A Survey, IRE; Roosevelt Hotel, Cedar Rapids, Iowa.

Sept. 11: Fall Meeting, The Material Handling Institute, Inc.; The Cavalier Club, Virginia Beach, Va.

Sept. 11-17: Reliability Training Conf., IRE, ASQC; Dallas-Ft. Worth, Tex.

Sept. 11-20: European Machine Tool Exhib., West German Machine Tool Industry; Hanover, Germany.

Sept. 12-13: Nationwide Conf. on

"CALL FOR PAPERS"

Nat'l Symp. on Engineering Writing and Speech, IRE (PGEWS), Oct. 13-14, Bismarck Hotel, Chicago, Ill. Complete papers deadline is Oct. 1.

1960 Symp. on Adaptive Control Systems, IRE (Long Island Sect.), Oct. 17-19, Garden City Hotel, Garden City, L. I., N. Y. Final manuscripts of accepted papers due Aug. 31. Harold Levenstein, Chairman, Program Committee, in care of W. L. Maxson Corp., 460 W. 34th St., New York 1, N. Y.

Seventh East Coast Conf. on Aeronautical and Navigational Electronics, IRE (Baltimore Section), Oct. 24-26, Lord Baltimore Hotel, Baltimore, Md. Complete papers deadline, Sept. 1, to Sanford Hershfield, Mail No. G-3143, The Martin Co., Baltimore 3, Md.

Sixth Annual Conf. on Magnetism and Magnetic Materials, Nov. 14-17, New Yorker Hotel, New York, N. Y. Deadline for Titles and Abstracts of proposed papers is Aug. 26. Submit to A. M. Colgston or R. C. Fletcher, Program Chairman, Bell Tele. Labs., Murray Hill, N. J.

1960 Eastern Joint Computer Conf. (EJCC), Dec. 13-15, Hotel New Yorker and Manhattan Center, New York, N. Y. Submit Abstracts and Summaries of tech papers by Aug. 13 to Tech. Program Chairman, Elmer C. Kubie, Computer Usage Co., Inc., 18 E. 41st St., New York 17, N. Y.

"The Use of Computers in Undergraduate Engineering Instruction"; Ford Foundation on Computers at Univ. of Michigan, Ann Arbor, Mich.

Sept. 12-15: Int'l Conf. on Atomic Masses, Int'l Union for Pure & Applied Physics, Nat'l Research Council, McMaster Univ., U. S. Nat'l Science Foundation; Hamilton, Ont., Canada.

Sept. 12-16: 2nd Int'l Congress, Int'l Council of the Aeronautical Sciences, IAS; Zurich, Switzerland.

Sept. 13-14: Symp. on Infant Science of Bionics, Air R&D Command's Wright Air Develop. Div.; Dayton Biltmore Hotel, Dayton, Ohio.

Sept. 14-15: 4th Annual Joint Military-Industrial Electronic Test Equipment Symp., Museum of Science and Industry, Chicago, Ill.

Sept. 15-16: 8th Annual Engineering Management Conf., ASME, AIEE, IRE, AICHE; Morrison Hotel, Chicago, Ill.

Sept. 15-17: 2nd Upper Midwest Electronic Conf. & Exhibit, Twin City Electronic Wholesalers Assoc., Electronic Representatives Assoc.; Minneapolis and Minneapolis, Minn.

Sept. 18-22: 65th Annual Conf., Int'l Municipal Signal Assoc.; Astor-Manhattan Hotels, New York, N. Y.

Sept. 18-23: 1st ERA Business Mgt. Institute, Electronic Representatives Assoc.; Univ. of Ill., Monticello, Ill.

Sept. 19-21: Int'l Symp. on Data Transmission, Benelux Section IRE, Het Nederlands Radiogenoots, IRE, Sectie voor Telecommunicatie of the Koninklijk Instituut van Ingenieurs; Technische Hogeschool-Delft, Netherlands.

Sept. 19-21: 1960 Nat'l Symp. on Space Electronics & Telemetry, IRE (PGSET); Shoreham Hotel, Washington, D. C.

Sept. 21-22: 9th Annual Nat'l Industrial Electronics Symp., IRE (PGIE), AIEE; Manger Hotel, Cleveland, Ohio.

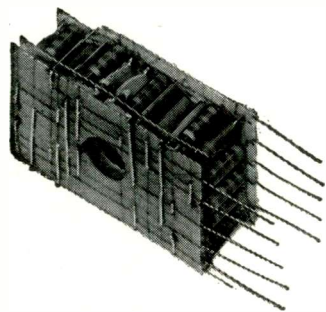
Sept. 21-23: Power Conf. ASME, AIEE; Phila., Pa.

Sept. 21-25: 1960 Aerospace Panorama, Air Force Assoc.; San Francisco Civic Center, San Francisco, Calif.

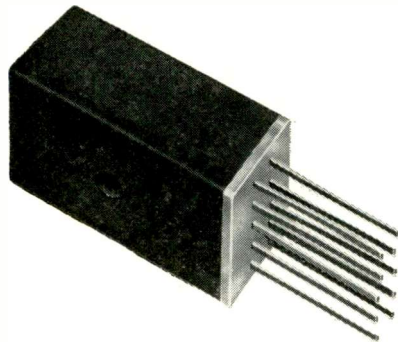
Sept. 22: 1st SPE (Society of Plastic Engineers) Reg. Tech. Conf., "Plastics in Business Machines"; Sheraton Inn, Binghamton, N. Y.

Sept. 23-25: Chicago High Fidelity Show, Int'l Sight and Sound Expos., Inc., Palmer House, Chicago, Ill.

(Continued on page 32)



how do you play the numbers game?

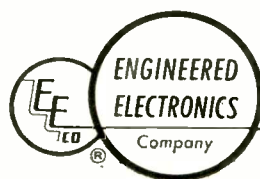


The current numbers game consists of seeing how many components you can wedge into a small space. But there's a catch to it.

Some circuit modules may seem small until you string them together and find that interconnections and supporting structure take more space than the modules themselves. That's why it's important, in evaluating miniaturization, not to consider the module size alone, but to be concerned with the over-all size, including module, interconnections, and supporting structure.

New EECO MINIWELD circuit modules are designed with over-all system size in mind. They offer optimum miniaturization not only of modules, but also of interconnections and supporting structure. Add to this the reliability of proven circuits incorporating readily available standard catalog components rather than hard-to-get specials, the superior strength of welded rather than soldered connections, and you have an unbeatable combination of advantages.

We invite you to see for yourself at WESCON, Booth 1017.



Write, wire, or 'phone today for detailed information on the revolutionary new MINIWELD space-saving package.

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RCA to Open New Research Laboratory in Japan

Tokyo, Japan—RCA will open a new research laboratory in Japan in the near future to conduct fundamental studies in the physics and chemistry of solids, M. E. Karns, Director of License Operations, RCA International Div., announced.

The new organization, Laboratories RCA, Inc., Tokyo, will be located in a building now under construction in the Japanese capital. Dr. Martin C. Steele has been appointed Director of Research.

The laboratory will be staffed initially by several scientists recruited from among Japanese University graduates, with gradual expansion of the staff as required by the growth of the research program.

Laboratory work will include basic studies of the electrical, magnetic, and optical properties of materials. The organization will not be concerned, in any way, with engineering development for the manufacture of electronic equipment.

New Canadian Div. Formed

Toronto, Ontario—Standard Instrument Corp. has formed a new Canadian Division, called Standard Instrument (Canada) Ltd., under the direction of Thomas A. Lisle, formerly of Lisle Instrument Systems.

This new division (767 Warden Ave., Scarborough, Toronto, Ontario) will manufacture and market the same line of instruments as the parent company in New York City.

Production at the Scarborough plant is already underway, and distributors for the line are being established throughout Canada.

U.S. and U.K. Companies Enter 21-Year Exchange Pact

London, England—Robert C. Sprague, Chairman of the Board, Sprague Electric Co., North Adams, Mass., has announced an agreement made with the Telegraph Condenser Co., Ltd., of Great Britain, whereby an exchange of research and technical information plus engineering knowledge shall take place immediately between the two companies.

Additionally, over the next 21 years there will be a further exchange of research, development and manufacturing know-how, extending beyond the field of capacitors (electric condensers) and embracing all of the products of each company.

Sprague has also sold the rights to its U.K. patents and applications to T.C.C., together with the technical and engineering information necessary to exploit them.

Sprague Electric's 1959 sales volume was \$56,352,000. More than 6000 persons are employed in 12 plants in Massachusetts, Vermont, New Hampshire, North Carolina, California and Wisconsin with subsidiaries conducting operations in Italy and Puerto Rico.

Swiss Office For Burroughs

Fribourg, Switzerland—A new company in Switzerland spearheads a major expansion of operations in Western Europe for Burroughs Corp., named Burroughs International, S. A., E. G. Wallace, who has been General Sales Manager for the firm's International Div., has been named President and Managing Director.

On the Continent, Burroughs has manufacturing plants in Pantin and Villers-Ecalles, France. Three other international factories are located in the United Kingdom and Brazil.

New Additions To Telex

New York—RCA Communications, Inc., has added Iran and Panama, including the Canal Zone, to its global Telex system. The new circuits permit subscribers in both countries to engage in two-way teleprinter conversations with over 40,000 subscribers in the U. S. RCA now has 49 overseas points in their worldwide Telex network.

Lightweight Loudspeaker



Dr. R. R. Gamzon (L), Weizmann Institute, Israel, shows new acoustic device to B. Abrams, President, Emerson Radio and Phonograph Corp., Jersey City, N. J. Wafer thin device can be used as a loudspeaker or microphone. Sponsored by Emerson, the device was developed in Israel. Larger model above is 4 x 8 inches.

New Swiss Subsidiaries

Fullerton, California—Beckman Instruments, Inc., has formed two new subsidiaries which will serve as headquarters for the company's foreign sales and manufacturing activities.

The two new subsidiaries are Beckman Instruments International, S. A., and Beckman Instruments Investment, S. A. The first is an operating company which will coordinate Beckman's overseas marketing operations, and the second is a holding company which will own the operating firm and existing Beckman subsidiaries in Munich, Germany, and Glenrothes, Scotland.

The new Swiss operating company will be headed by Edward H. Cherniss, formerly manager of foreign operations for Beckman.

The directors of Beckman Industries Investment, S. A., are Dr. Beckman, Maurice Merkt, Geneva attorney, and Maurice Trottet, a director of the Geneva branch of Credit Suisse, an international commercial banking firm. Directors of Beckman Instruments International, S. A., are Cherniss, Merkt and Trottet.

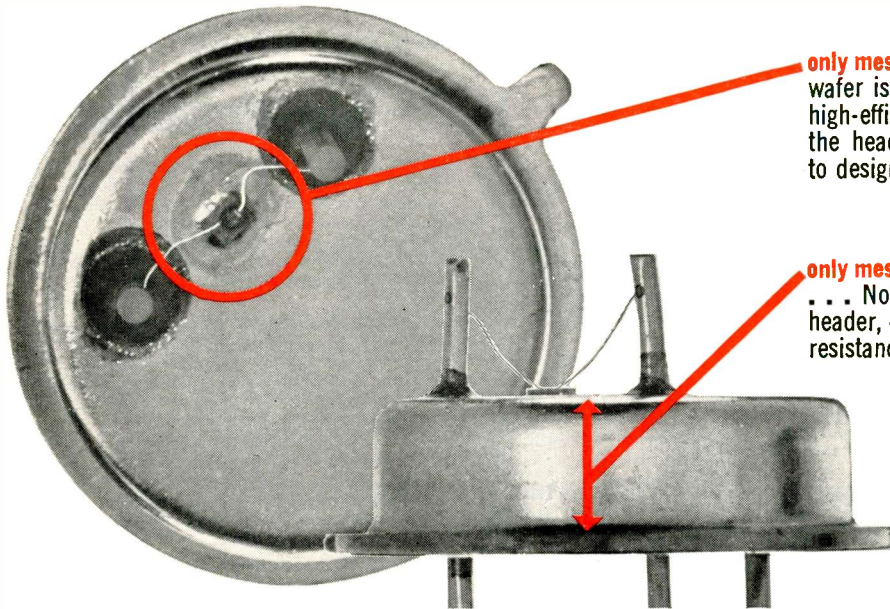
(Continued on page 24)

Japanese Study Group

Dr. K. Morganstern, President, Radiation Dynamics, Inc., Westbury, L. I. explains control panel for a Dynamitron Accelerator, an industrial radiation source, to leaders of a Japanese Radiation Utilization Study Project. (L to r) Junichi Hayakawa; Toshizo Titani, Tetsuro Watanahe; Dr. Morganstern, and Masao Yanagi (interpreter).



NEW TI GENERAL-PURPOSE SILICON MESA TRANSISTORS



only mesas give you maximum dissipation . . . Note how wafer is bonded directly to header, forming a direct, high-efficiency metal-to-metal thermal path through the header. High dissipation capabilities permit you to design conservatively for maximum reliability!

only mesas give you maximum mechanical ruggedness . . . Note how active element is bonded directly to header, close to unit's center of gravity—for maximum resistance to vibration and shock.

TI 2N1564 series **GUARANTEES** -55°C beta, 600-mw dissipation and gain at 30mc



Design now with industry's first small-signal silicon mesa transistors . . . the new TI 2N1564-series! Take advantage of guaranteed -55°C betas of 12, 20 and 40 . . . guaranteed 600-mw free-air dissipation . . . guaranteed current gain at 30 mc. Apply the design flexibility of 1 to 50 ma collector current operating range; 20-50, 40-100 and 80-200 beta spreads at 25°C and 60-v collector-emitter breakdown voltage to your audio, medium-power and higher frequency amplifier and switching designs . . . Specify the new TI 2N1564-series.

absolute maximum ratings at 25°C ambient (unless otherwise noted)	
Collector-Emitter Voltage (see note 1)	60 v
Emitter-Base Voltage	5 v
Total Device Dissipation at 25°C Case Temperature (see note 2)	1.2 w
Total Device Dissipation at 25°C Ambient Temperature (see note 3)	0.6 w
Collector Junction Temperature	175°C
Storage Temperature Range	-65°C to +200°C

Note 1: The voltage at which h_{FB} approaches one when the emitter-base diode is open circuited. This value can be exceeded in applications where the dc circuit resistance (R_{BE}) between base and emitter is a finite value.
 Note 2: Derate linearly to 175°C case temperature at the rate of 8.0 mw/°C.
 Note 3: Derate linearly to 175°C ambient temperature at the rate of 4.0 mw/°C.

Available TODAY in production quantities through all TI Sales Offices and Authorized TI Distributors.

Parameter	Test Conditions	2N1564			2N1565			2N1566			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
I_{CBO} Collector Reverse Current	$V_{CB} = 40 \text{ v}$ $I_E = 0$			1			1			1	μa
BV_{CBO} Collector-Base Breakdown Voltage	$I_C = 10 \mu\text{a}$ $I_E = 0$	80			80			80			volt
BV_{CEO}^* Collector-Emitter Breakdown Voltage	$I_C = 10 \text{ ma}$ $I_E = 0$	60			60			60			volt
h_{FE} A-C Common-Emitter Forward Current Transfer Ratio	$V_{CE} = 5 \text{ v}$ $f = 1 \text{ kc}$ $I_E = -5 \text{ ma}$	20		50	40		100	80		200	
	$V_{CE} = 5 \text{ v}$ $T_A = -55^\circ\text{C}$ $f = 1 \text{ kc}$ $I_E = -5 \text{ ma}$	12			20			40			
	$V_{CE} = 5 \text{ v}$ $f = 30 \text{ mc}$ $I_E = -5 \text{ ma}$	1	4		2	4.5		2	5.0		



the **FIRST** silicon transistor manufacturer

TEXAS



INSTRUMENTS
INCORPORATED

SEMICONDUCTOR-COMPONENTS DIVISION
13500 N. CENTRAL EXPRESSWAY
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News Briefs

Capsule summaries of important happenings in affairs of equipment and component manufacturers

EAST

TEXTRON ELECTRONICS has acquired Allegany Instrument Co. Allegany will operate as a division with no change in management.

LORAL ELECTRONICS CORP. has recently acquired Hillburn Electronic Products Co. of New York. Hillburn will operate as a subsidiary.

BAY STATE ELECTRONICS CORP., Boston, Mass., has taken over the Southbridge manufacturing facilities of Harvey-Wells Electronics, Inc.

THE BENDIX CORP., Radio Div., Towson, Md., has received \$4-million dollar contract authorizing construction of a 5-story demonstration model of the computer-controlled ESAR (electronically steerable array radar) by the Air Force Rome Air Development Center.

BUDD ELECTRONICS, INC., has received a U. S. Signal Corps award of \$1,219,204 for radio equipment.

WALTHAM PRECISION INSTRUMENT CO. has signed an agreement to purchase the Boesch Mfg. Co. of Danbury, Conn. Boesch specializes in design and manufacture of patented toroidal coil winding machines, controls, and accessories.

RAYTHEON COMPANY has just dedicated a new Airborne Equipment Center at Sudbury, Mass. This is the seventh major Raytheon facility to be completed and become operational within the past year.

POLARAD ELECTRONICS CORP. has recently acquired 100,000 sq. ft. of modern manufacturing facilities adjacent to its existing plants and is now in full operation in these facilities.

THE ITEK CORP. and **HERMES ELECTRONICS CO.** have jointly announced that their respective Boards of Directors have agreed upon a merger of the two organizations subject to stockholder approval.

ACF INDUSTRIES INC. has announced the consolidation of its Avion and Nuclear Products-Erco Div. into a new organization known as ACF Electronics Div.

CBS LABORATORIES has received a contract from the U. S. Army Signal Corps to develop new techniques for the formation of micro-junctions in semiconductors.

GENERAL ELECTRIC'S Electronic Specialty Capacitor Product Section, Irmco, S. C., has announced the signing of an R&D contract for high-reliability capacitors for the Minuteman guidance system. The sub-contract with Autonetics, a div. of North American Aviation, is for \$1.8 million.

LOCKHEED ELECTRONICS CO.'s decision to locate its headquarters in the Princeton, N. J., area was cemented with the final closing on the 210 acre property.

BULOVA RESEARCH & DEVELOPMENT LABS, INC., Woodside, N. Y., has received a \$244,000 contract from the Air Force Special Weapons Center to develop a new type of safing-arming device for use in missile warheads.

AEROVOX CORP., New Bedford Div., has announced, after carefully reviewing all aspects of material and labor costs, that an increase in prices must be considered immediately in the oil and electrolytic capacitor areas.

MICROWAVE ASSOCIATES, INC., has entered into an agreement with Antenna Systems, Inc., for a long term loan to Antenna Systems, in return for which Microwave Assoc. receives rights to purchase up to 28% of the outstanding common stock.

ARCO ELECTRONICS, INC., has been awarded two contracts totaling \$122,400 by the Air Force and Naval Ordnance to supply kits containing miniaturized plug-in-type precision capacitor standards.

ELECTRALAB PRINTED ELECTRONIC CORP., Needham Heights, Mass., has acquired the assets and business of Minitron, Inc. of Calif., printed circuits manufacturer, in a cash and stock transaction.

NATIONAL CARBON CO. has been awarded a \$700,000 contract by the Atomic Energy Commission for high-purity nuclear graphite for use in an experimental gas-cooled reactor at Oak Ridge, Tenn.

LORAL ELECTRONICS CORP. has received three new contracts totaling \$5,016,000 and including a \$3,467,500 Navy award for the production of electronic equipment.

TECHNOLOGY INSTRUMENT CORP., Acton, Mass., has reported the acquisition of the product line of electromagnetic clutches and brakes from the Haddam Mfg. Co.

MID-WEST

AVCO CORP., Crosley Div., has received new contracts totaling almost \$8 million for spare parts to be used on bomber fire control systems. Contracts were awarded by the Warner-Robins Air Materiel Area of Robins Air Force Base, Ga.

TELEX, INC., has purchased Aemco, Inc., Mankato, Minn., manufacturer of components for the electrical and electronic industries.

THE JACKSON ELECTRICAL INSTRUMENT CO. has completed a plant expansion program involving the transfer of office and production facilities of its Commercial Div. into 15,000 sq. ft. of space at Dayton, Ohio.

EMERSON ELECTRIC MFG. CO., Electronics and Avionics Div., St. Louis, Mo., has received a contract of about \$10 million from the Boeing Airplane Co. for design and testing of an electronic, active defense system for the B-52H strategic bomber, being produced by Boeing.

DELCO RADIO has started construction of a new engineering building in Kokomo, Ind. The building will contain 132,259 sq. ft. and should be completed by June, 1961.

SOLAR SYSTEMS, INC., 8241 N. Kimball Ave., Skokie, Ill., is a new company just formed to manufacture silicon solar cells, silicon readout assemblies and silicon photocells.

MIDWESTERN INSTRUMENTS, INC., Tulsa, Okla., has just received a \$470,470 contract from the Dept. of the Navy, Bureau of Ships, for magnetic tape recorder/reproducers.

WEST

CHANCE VOUGHT, Electronics Div., has been awarded a \$3,338,258 contract for continued development and manufacture of a highly-advanced actuator system for the Minuteman Intercontinental Ballistic Missile. Award was made by Autonetics, a division of North American Aviation, Inc.

RYAN ELECTRONICS now has a total of \$34 million in contracts for AN/APN-122(V) Doppler navigation systems together with spares, documentation, and other special support equipment. Contracts were issued by the Bureau of Naval Weapons.

AIRBORNE ACCESSORIES CORP., West Coast Div., is now located in a modern office and manufacturing building located at 5456 W. Washington Blvd., Los Angeles, Calif.

HUGHES AIRCRAFT CO. has received a U. S. Navy contract for \$7.5 million to build guidance systems for the Polaris missile. The new contract brings total of Polaris work awarded to Hughes to more than \$15 million.

EITEL-McCULLOUGH, INC., has started construction of two new buildings at a cost of over \$1 million in San Carlos, Calif.

AERONUTRONIC, a Div. of Ford Motor Co., has broken ground for the seventh major building in the multimillion dollar Engineering and Research Center located in Newport Beach, Calif.

VEEDER-ROOT INC., manufacturers of computers and counting instruments, is opening a manufacturing facility, as well as having sales and service facilities already established at a plant located in Glendale, Calif.

INTERNATIONAL RESISTANCE CO. has opened a new West Coast Engineering Laboratory for customer service on precision potentiometers in Hollywood, Calif.

SERVOMECHANISMS/INC., Research Div., Goleta, Calif., has announced receipt of a contract awarded from Picatinny Arsenal for the development and fabrication of a 560 watt thermoelectric generator.

VARIAN ASSOCIATES and SEMICON ASSOCIATES, INC., have completed negotiations for Varian's acquisition of Semicon at a recent meeting.

BECKMAN INSTRUMENTS, INC., has received a \$375,000 contract from Lockheed Missiles and Space Div. for a high-speed EASE analog computer to be used in development and testing of the Polaris missile and its components.

HOUSTON FEARLESS CORP., Los Angeles, Calif., has acquired Marchetti Associates, a Boston electronics research-engineering company formerly affiliated with Avco Corp.'s Crosley Div.

CONTINENTAL ELECTRONICS MFG. CO., a subsidiary of Ling-Altec Electronics, Inc., has received a \$3.5 million contract for additional super power radar transmitters for the U. S. Air Force's Ballistic Missile Early Warning System.

EITEL-McCULLOUGH, INC., has announced receipt of over \$6 million in new orders in the past month. These are firm production orders now entered on the company's books.

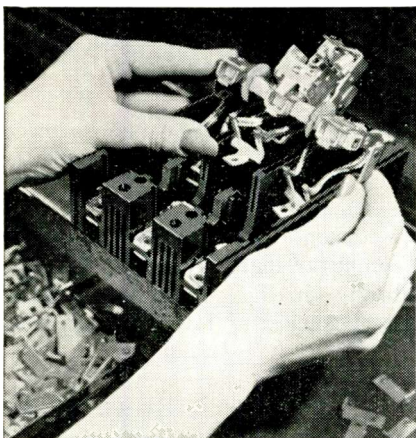
Important facts to know about Laminated Plastics

LAMINATED PLASTICS *What they are, where they can be used*

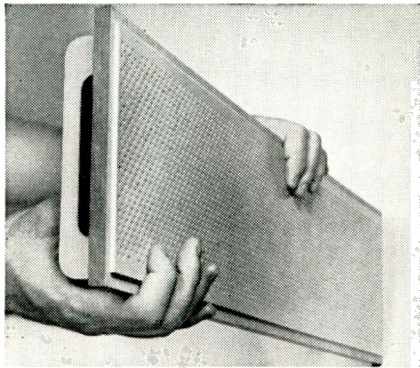
Taylor laminated plastics, also known as reinforced plastics, are thermosetting-type materials formed by impregnating paper, cotton cloth, asbestos, glass cloth, nylon or other base materials with synthetic resins and fusing them into sheets, rods, tubes and special shapes under heat and pressure. These materials exhibit a valuable combination of characteristics, including high electrical insulation resistance, structural strength, strength-to-weight ratio, and resistance to chemical reaction; also adaptability to fabricating operations.

Types of laminated plastics made by Taylor

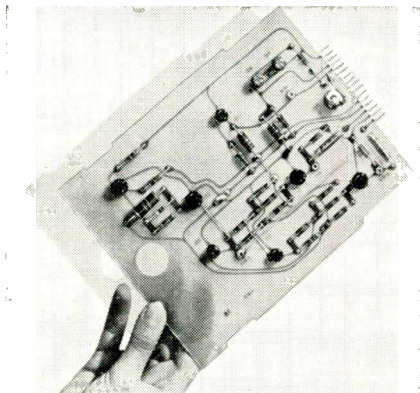
There are four basic types of Taylor laminated plastics commonly specified and used throughout industry today. They are as follows:



Phenolic Laminates. Paper, cotton fabric or mat, asbestos, glass cloth or nylon bases impregnated with phenol formaldehyde resins. These provide strength and rigidity, dimensional stability, resistance to heat, chemical resistance, and good dielectric characteristics. Some Taylor grades are excellent basic materials for gears, cams, pinions, bearings and other mechanical applications. Others are widely used in terminal boards, switchgear, circuit breakers, switches, electrical appliances and motors. Also in radios, television equipment and other electronic devices; and in missiles as nose cones, exhaust nozzles, and combustion chamber liners.

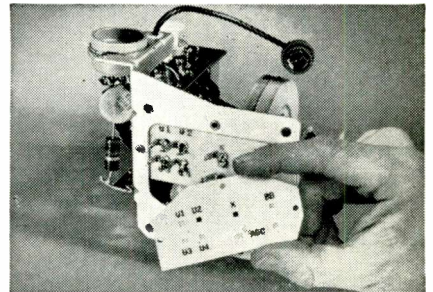


Melamine Laminates. Glass cloth or cotton fabric impregnated with melamine formaldehyde resin. Taylor melamine laminates have superior mechanical strength and are especially desirable for their arc-resistant qualities. Good flame and heat resistance, good resistance to the corrosive effects of alkalis and most other common solvents, besides other favorable characteristics. Typical applications include arc barriers, switchboard panels, and circuit-breaker parts in electrical installations.



Silicone Laminates. Continuous-filament woven glass fabric impregnated with a silicone resin. These laminates combine high heat resistance (up to 500°F. continuous) with excellent electrical and mechanical properties. They are primarily used in high-temperature electrical applications and high-frequency radio equipment.

Epoxy Laminates. Continuous-filament woven glass fabric or paper impregnated with epoxy resin. Glass-fabric grades are designed for use in applications requiring high humidity-resistance, good chemical resistance,



and strength retention at elevated temperatures. Paper grades are used under high-humidity conditions where resistance to acids and alkalis is required. Both grades are characterized by good dielectric strength, low dielectric losses, and high insulation resistance even following severe humidity conditions.

Recent technical advances in the bonding of various metallic and nonmetallic materials to laminated plastics have opened up new design opportunities. It is now possible to bond virtually any compatible material with a laminated plastic to form a composite which combines the advantages of both. One of the first composite materials was a copper-clad laminate used for printed circuits. More recent composite laminates, usually manufactured to customer specification, include the following: Taylorite® vulcanized fibre-clad, rubber-clad, asbestos-clad, aluminum-clad, beryllium-copper-clad, stainless-steel-clad, magnesium-clad, and silver and gold-clad. Any one of these materials can be sandwiched between sheets of laminates, too, and can be molded to fit specific requirements.

Send for complete information about any or all of these Taylor laminates. And remember Taylor's new selection guide will simplify your problems in choosing the right laminate for your specific application. Taylor Fibre Co., Norristown 53, Pa.

Taylor
LAMINATED PLASTICS VULCANIZED FIBRE



Philco
announces
the only

MICRO-ENERGY SWITCH



the industry's first

LOW ENERGY, HIGH SPEED
switching transistor

T-1930...MICRO-ENERGY SWITCH...TO-18 CASE

MAXIMUM RATINGS

Storage Temperature 100° C
Total Device Dissipation at 25° C . . 35 mw

CHARACTERISTICS

	MIN.	TYP.	MAX.
DC Current Amplification Factor, h_{FE} ($V_{CE} = -0.20$ v, $I_C = -2$ ma)	25	40	
Collector Voltage, V_{CE} ($I_C = -2$ ma, $I_B = -0.2$ ma)		.095	.13 V
Gain-bandwidth Product, f_T ($V_{CE} = 1$ v, $I_C = 1$ ma)	125	175	mcs

The Philco T-1930 is a new concept in the design of switching transistors for high speed computer logic circuits! All internal device capacities are exceedingly small . . . and its static characteristics are optimized for operation at low collector voltages and collector currents. *It permits the design of high-speed logic circuits with an overall power consumption only 1/3rd to 1/10th that of circuits with conventional transistors.* It will operate at pulse rates in excess of 10 mc with collector currents as small as 1 ma from collector supply voltages as small as 1 V.

This new micro-energy switch is of great importance in the design of ultra-reliable, high density, high speed equipment. In micro-energy circuits, the total device dissipation is reduced to an absolute minimum . . . 250 microwatts . . . a prime consideration in achieving maximum reliability. The T-1930 is an important step toward microminiaturization . . . permitting high packing densities without excessive internal heat generation. For complete information write Dept. EI-860.

PHILCO[®]



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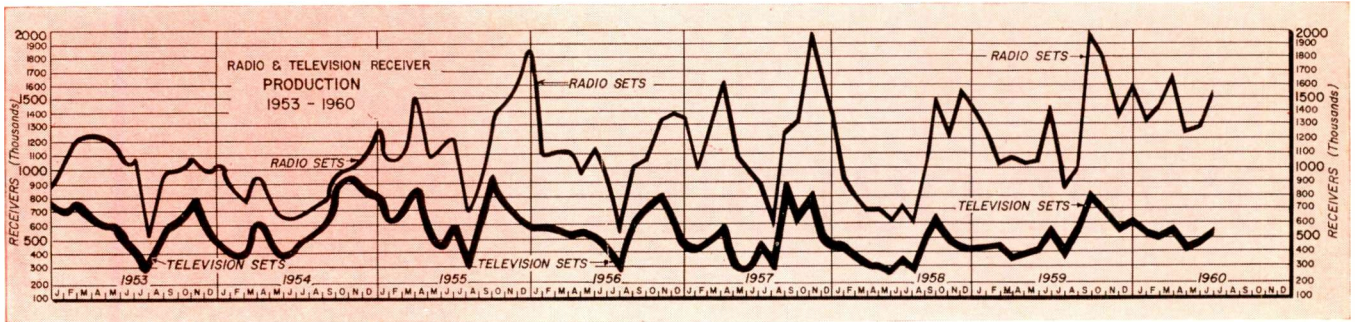
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DEFENSE FUNDS

The Congress has approved new obligational authority for the military services and the Department of Defense totalling \$40,362,108,000 which is \$677,108,000 more than the President's budget request. This sum includes construction money and transfers from revolving funds.

By services, the appropriation breaks down to:

Department of the Air Force	\$17,187,756,000
Department of the Navy	\$12,185,392,000
Department of the Army	\$ 9,797,985,000
Department of Defense	\$ 1,190,975,000

The Navy received an increase over the President's request of \$309,392,000, the Army \$22,985,000 and the Air Force \$160,756,000. Department of Defense was cut \$16,025,000.

—Aerospace Industries Association of America

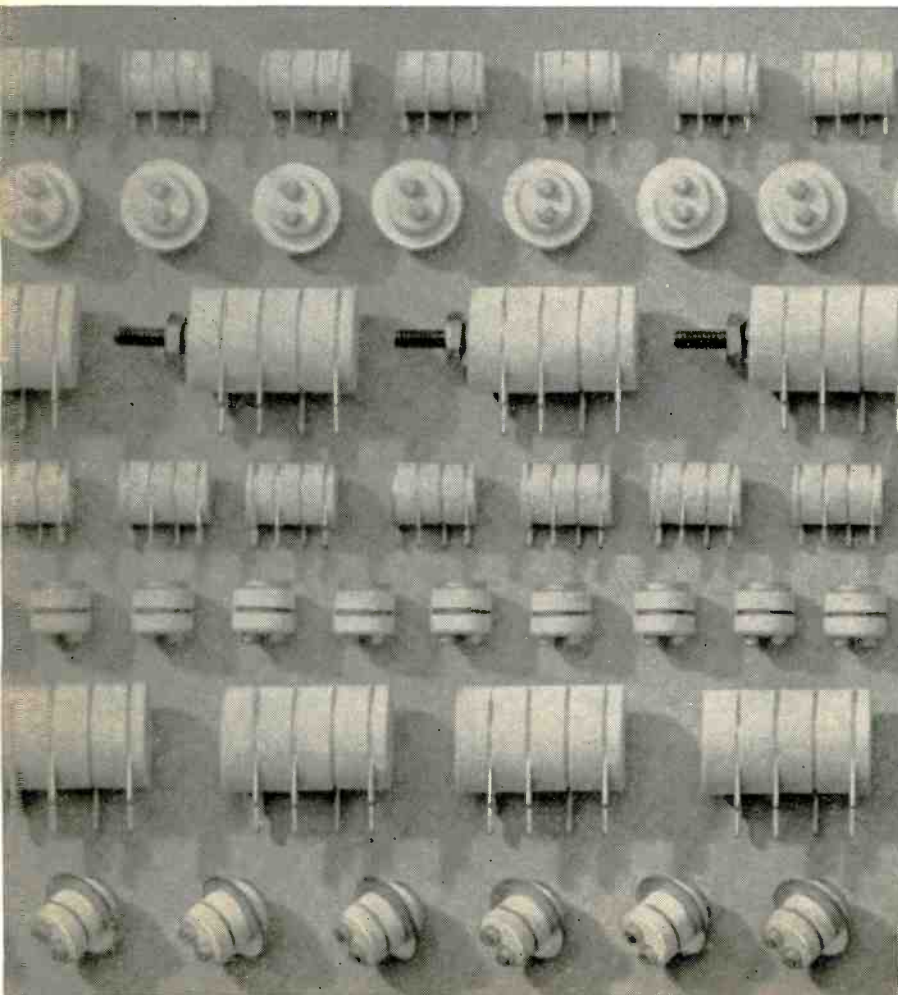
EXPORT OF TUBES AND SEMICONDUCTORS TO LATIN AMERICAN COUNTRIES

Country of destination	Receiving-type tubes		Television picture tubes		Parts & accessories, for electron tubes ¹	Crystal diodes and transistors	
	Units	Dollars	Units	Dollars	Dollars	Units	Dollars
Argentina:							
1956	3,608,629	1,689,042	19,828	385,328	15,694	13,601	7,933
1957	2,128,015	1,306,447	94,637	1,728,037	31,783	27,770	25,427
1958	3,623,506	2,381,469	245,592	4,552,357	110,212	254,280	106,720
1959	3,105,290	1,933,392	89,506	1,603,762	86,615	412,610	321,603
Brazil:							
1956	2,601,783	1,405,091	41,866	782,476	33,327	21,289	7,291
1957	1,844,928	1,096,001	60,828	1,035,527	104,401	104,824	114,557
1958	3,054,712	1,882,675	84,586	1,600,000	184,838	790,052	670,155
1959	1,035,373	667,239	28,245	567,110	204,055	510,525	372,667
Chile:							
1956	139,852	80,567			6,402	286	1,734
1957	179,148	119,565			24,182	1,620	2,126
1958	125,792	93,737			31,883	138	3,587
1959	76,753	77,416			45,384	73,554	61,820
Colombia:							
1956	702,318	443,839	768	15,395		1	800
1957	500,044	316,043	698	14,301		332	2,080
1958	172,530	136,491	1,372	28,184	910	5,250	7,828
1959	212,196	155,075	1,359	27,795		26,664	29,132
Cuba:							
1956	828,962	503,803	8,990	181,733	12,684	5,166	7,756
1957	1,010,502	648,247	12,488	226,283	12,326	11,128	6,836
1958	1,084,775	776,344	12,145	242,868	7,473	23,250	23,707
1959	827,514	554,457	8,145	159,444	18,778	25,222	28,306
Mexico:							
1956	4,094,043	2,271,654	61,355	1,024,488	65,027	13,969	11,689
1957	3,660,502	2,099,903	30,284	505,662	157,237	10,170	16,956
1958	2,830,769	1,789,671	15,236	275,909	153,739	40,597	53,861
1959	2,999,879	1,863,579	2,828	25,898	310,451	109,335	121,633
Peru:							
1956	71,562	52,556					
1957	563,342	389,262					
1958	577,005	389,974	256	5,089	512		
1959	522,243	359,788	2,726	44,338	6,968	120	1,870
Uruguay:							
1956	150,017	85,495	4,850	95,082	33,421		
1957	80,170	72,841	2,690	51,083	35,494	9,400	9,422
1958	9,915	10,009	1,838	38,277	10,729	5,000	1,650
1959	38,758	29,664	4,021	82,804	60,854	20,600	12,930
Venezuela:							
1956	429,078	319,483	4,435	96,519	2,907	330	990
1957	551,667	436,157	6,331	129,719	29,460	10,325	18,515
1958	598,432	535,238	7,159	152,864	5,753	10,677	13,418
1959	675,458	505,760	5,043	99,746	12,526	9,830	14,298

¹ Excludes glass electron tube blanks.
—U. S. Department of Commerce's "Electron Tube and Semiconductors, Selected Latin American Countries"

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power output, bandwidth.
everything else you need:
and radiation tolerance...

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(ACTUAL SIZE)

7462

RF-amplifier triode

7486

RF oscillator-mixer triode

7296

VHF-UHF low-power triode,
shown with mounting bolt

7625

High voltage-gain triode

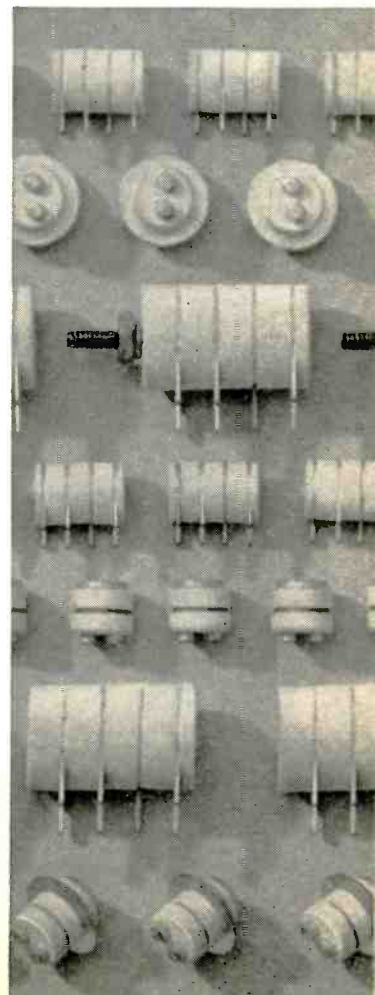
7266

VHF-UHF detector diode

Developmental, broadband,
40,000-G_m triode

7077

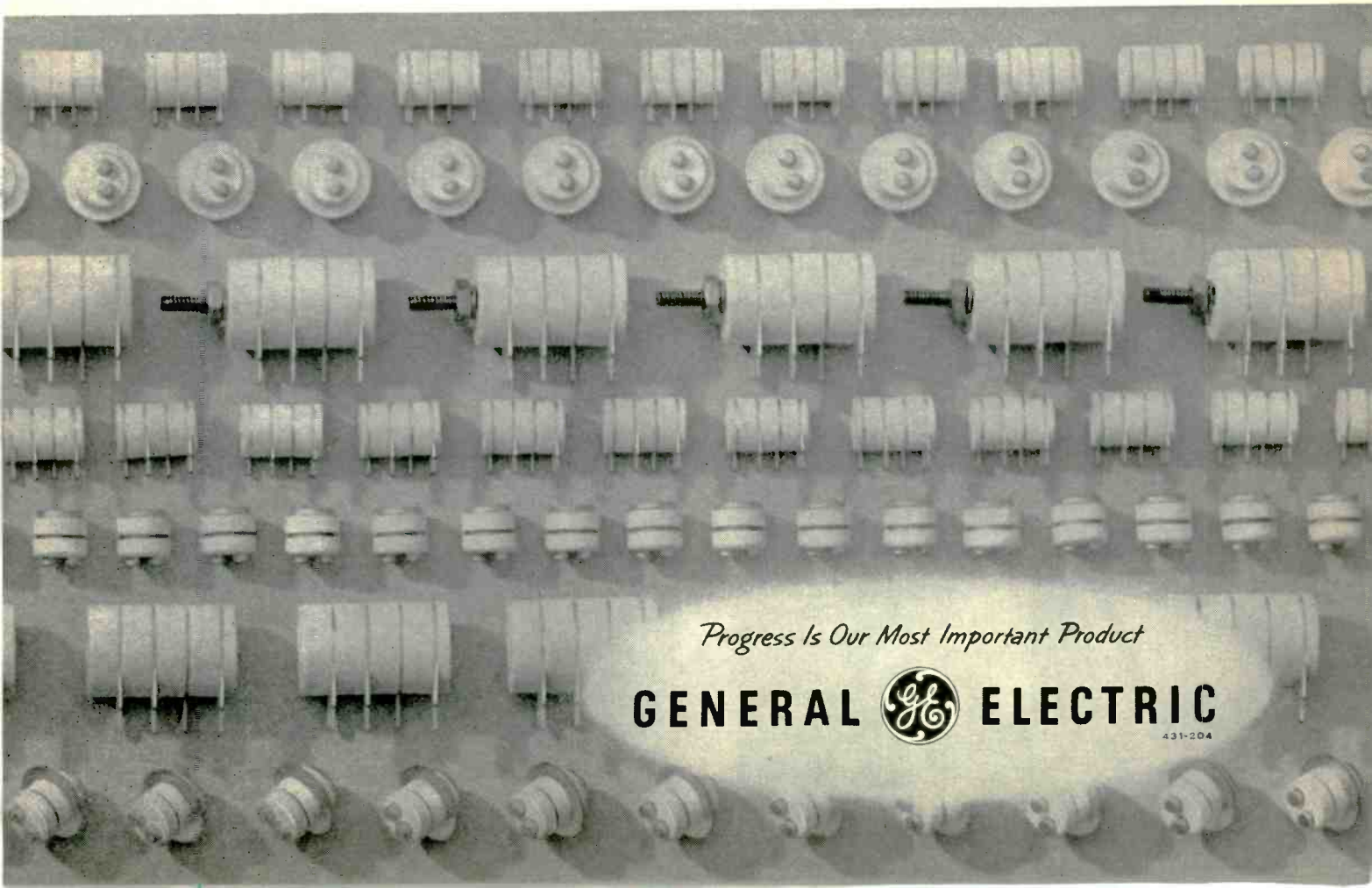
RF-amplifier triode



right frequency, function,
G-E Ceramic Tubes have
ruggedness...temperature
high gain...low noise.

Circle 9 on Inquiry Card

Los Angeles, GR 9-7765, BR 2-8566 . . . San Francisco, DI 2-7201 . . . Or call your General Electric Industrial Tube distributor.

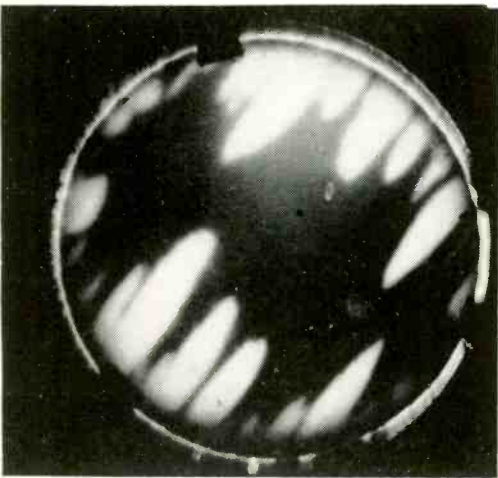


Progress Is Our Most Important Product

GENERAL  ELECTRIC

431-204

Snapshots... of the Electronic



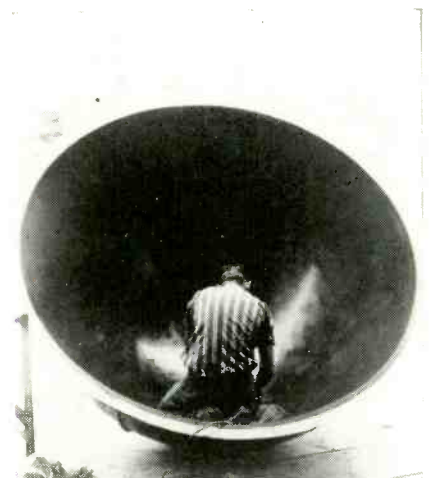
SUPERCONDUCTIVITY

Thin sheet of tantalum shows effect of cold rolling on intermediate state in a superconductor. Normal areas are light—superconducting areas are dark. Dr. Warren DeSorbo of GE developed this technique permitting direct visual observation of the intermediate state.



"OPERATION POP-UP"

Underwater launcher for testing Polaris components during "Operation Pop-Up" maneuvers off the California coast. The "Level-Tel" system used in controlling launcher submergence was designed by Robertshaw-Fulton's Aeronautical and Instrument Div., Anaheim, Calif.



RADOME TOOL

Tools for fabricating this radome were made of high temperature epoxies. Epoxy tools allow continuous operations at temperatures to 300° F. Tools used 10-Q gel coatings and 10-K laminating resins with liquid high temperature hardeners made by Furane Plastics, Inc., Los Angeles.

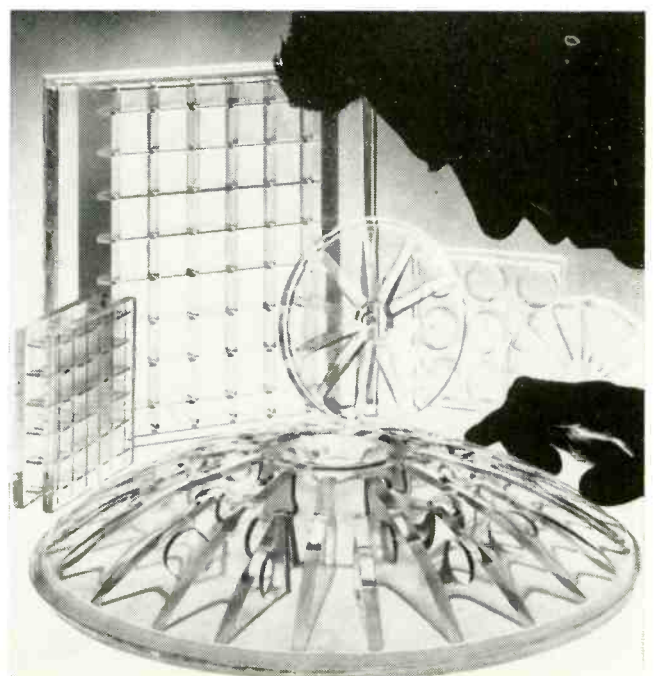
BRIDGE RADAR INSTALLED

Raytheon Engineer, R. D. Spoolman tests new radar installed atop control room of vertical lift bridge on Lake Superior. Radar warns bridge tenders of approaching ships in heavy weather.

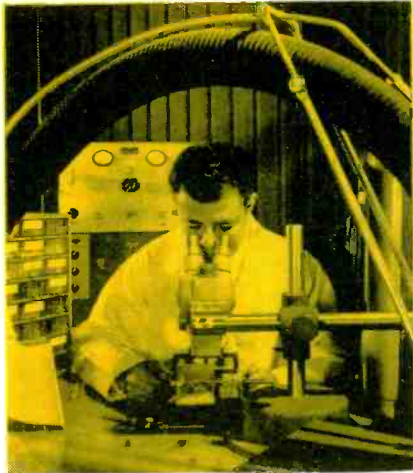


SPACE TELESCOPE MIRRORS

Mirrors for outer space telescopes are made of two plates of fused silica. Lightweight discs were made by Corning Glass Works, Corning, N. Y. for missile, satellite and aircraft use.



Industries

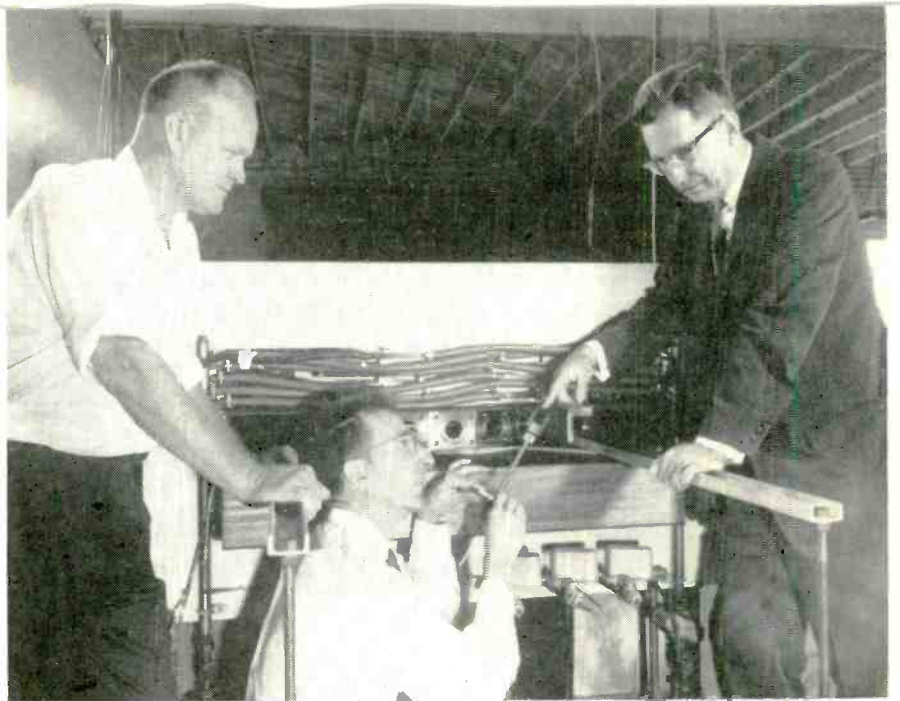
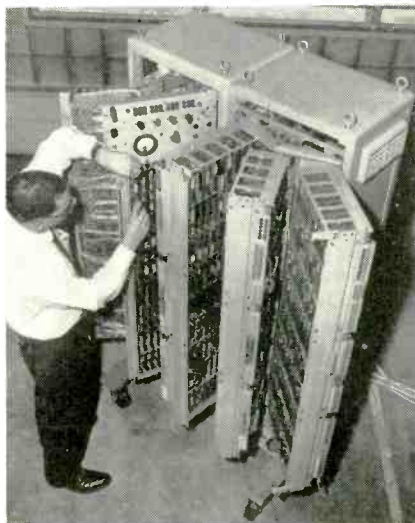


"DO IT YOURSELF"

Engineers can build their own circuit prototypes with this micromodule kit developed by RCA, Somerville, N. J. Kit includes wafers and all equipment for building and testing up to 10 modules. Engineer is using kit to adjust termination patterns on semiconductor diode.

STARDAC COMPUTERS

Epsco, Inc., Cambridge, Mass., has delivered STARDAC control computers to the U. S. Navy for installation on two Polaris missile-firing submarines. STARDAC is comprised of 88,612 electronic components of which 13,226 are transistors and 2,587 are magnetic cores. Packing density is 3,820 components per cu. ft. Operating temperature and shock requirements are 0° to 50° C. and 100 g's respectively.



COMMERCIAL CYCLOTRON

Drs. Kenneth R. MacKenzie (left) and Byron T. Wright (center) display nation's only commercially manufactured cyclotron to Dr. John W. Clark of Hughes Aircraft. Machine is scheduled for September delivery to Pomona (Calif.) College.

ABSTRACT ART?

IBM has been engaged in developing a vapor growth process for "growing" semiconductors. Photo shows a typical epitaxial growth on a (100) silicon substrate magnified 350 times.



ANNOUNCING!



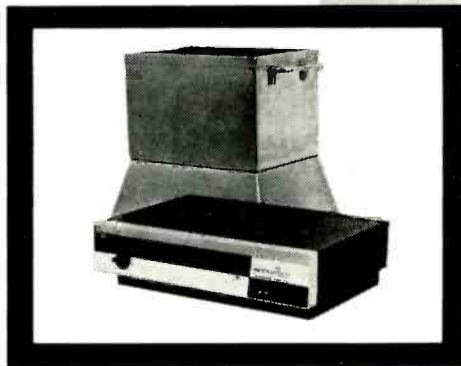
new speed,
new efficiency in ultrasonic cleaning

ACOUSTICA'S NEW TRANSISTORIZED 20-KC LINE

Ultrasonic cleaning takes on a new dimension with Acoustica's fully transistorized electronic generators for use with "Multipower" transducers and tanks. A completely different operating principle eliminates all tuning, adjustments and meter readings and obtains maximum power from all transducers, even when several are used in a single cleaning tank.

Speed and efficiency are greatly increased, for warm up time is completely eliminated... cleaning can start the instant the switch is turned on! In addition, the new transistorized unit automatically compensates for changes in both load and liquid level. Solid-state circuitry, combined with plug-in modular design, assures maximum reliability.

The new fully transistorized generators can be used either in special systems or with Acoustica integral tank-and-transducer combinations. Learn how this new dimension in Ultrasonic Cleaning can cut both production cleaning costs and rejects.



SEE US AT WESCON BOOTHS 2252-2253

WRITE TODAY FOR COMPLETE OPERATING SPECIFICATIONS.

acoustica

ACOUSTICA ASSOCIATES, INC.
10400 Aviation Blvd., Los Angeles 45, Calif.
600 Old Country Road, Garden City, N.Y.

International News

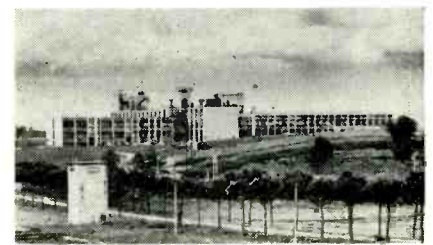
(Continued from page 14)

Canadian Subsidiary Formed

New York—Ultrasonic Industries Inc., Albertson, L. I., N. Y., has formed a Canadian subsidiary, Ultrasonic Industries (Canada) Ltd., 1512 Eglinton Ave. West, Toronto, Ontario, the first of several such companies contemplated by UI in its development of international markets. The Toronto based company will direct the marketing, distribution and service activities for its parent U. S. company in Canada.

Julian Conway has been elected President of the new company. Other officers and directors are Paul M. Platzman, Chairman of the Board; Herbert A. Frankel, Vice President and Director; Barbara A. Jewett, Secretary-Treasurer and Director, and Harold S. Remz, Director.

New Electronics Firm



Headquarters and engineering labs near Rome for Selenia, new electronics company formed by Raytheon Co., Waltham, Mass., and Finmeccanica, an Italian holding company, and the Italian Societa Edison. Company will build radars, industrial controls, microwave equipment, facsimile apparatus, signal equipment, and electronic test equipment. First assignment will be Hawk missile components for NATO.

Marconi Mark IV Cameras For Poland, U.S.A. & Britain

England—An order for three Marconi Mark IV television camera channels and ancillary equipment for the Warsaw studios has been placed by Elektrim, the official Polish import and export organization for electrical products. The cameras will operate to O.I.R. standards (625 lines, 50 fields, 8 Mc/s channel) which are the same as in use in the U.S.S.R. The television station at Katowice, the biggest in Poland, is entirely Marconi-equipped.

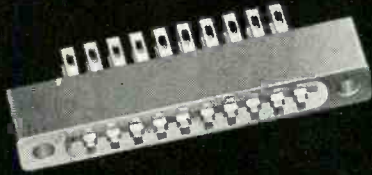
Other recent orders for Mark IV camera channels include 10 more for the Ampex Corp. of America, and 2 for Tyne Tees Television Ltd., the program contractors to the independent Television Authority for the North-East of England.

(Continued on page 26)

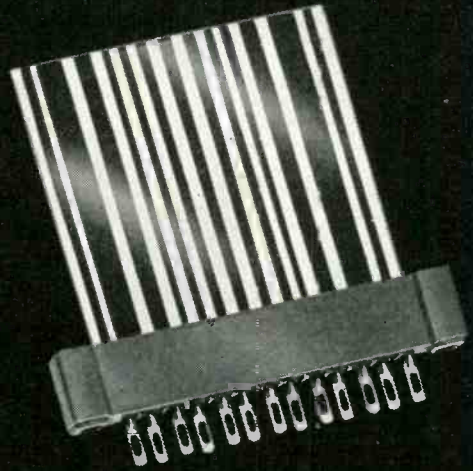
ACTUAL SIZE



Series 600-7-1 18 contacts
for 3/64" PC board or cable



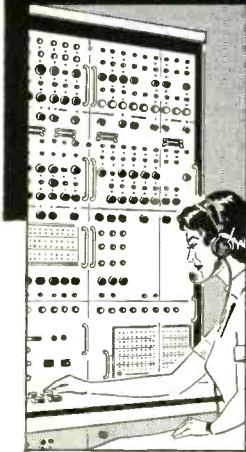
Series 600-4PC10 10 dual contacts
for 1/32" PC board or cable



Series 600-4PCSC13 13 contacts
for 1/32" PC board or cable

Continental Connector MINIATURE PRINTED CIRCUIT CONNECTORS

Continental printed circuit connectors and "Bellowform" contacts are covered by patent number 2,875,425



WHERE RELIABILITY IS A MUST

and space limitations are critical . . .
specify Continental Miniature PC Connectors

Series 600 precision miniature printed circuit connectors provide a positive, space-saving connection between printed circuitry and conventional wiring, through printed circuit boards, tape cables or plug-mounted sub-assemblies.

SERIES 600-7-1. For 3/64" printed circuit board or tape cable. 18 contacts for #24 AWG wire. Solder lug terminations are staggered to simplify soldering operations.

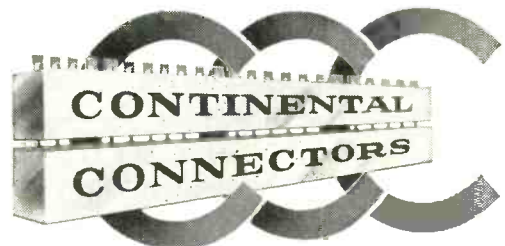
SERIES 600-4PCSC13. For 1/32" printed circuit board or tape cable. 13 staggered contacts accommodate #22 AWG wire. Module design permits stacking of any reasonable number of single units. Contacts have minimum spacing with maximum contact wiping surface.

SERIES 600-4PC10. Accepts 1/32" printed circuit board or tape cable. Double row of 10 contacts with solder lug terminations provides a total of 20 connections. For #22 AWG wire. Overall length only 1 7/8".

Continental Connector's "Bellowform" contacts are used in this series and provide coil spring action grip that clasps the printed circuit board firmly over the entire contact area regardless of board tolerance variations.

Contact material is spring temper phosphor bronze with gold plate over silver plate. Body molding compound is glass reinforced Diallyl Phthalate (MIL-M-19833, Type GDI-30, green color).

Technical literature on Continental Connector Series 600 Miniature PC Connectors is available on request. Write to Electronics Division, DeJUR-AMSCO CORPORATION, 45-01 Northern Boulevard, Long Island City 1, N. Y. (Exclusive Sales Agent)

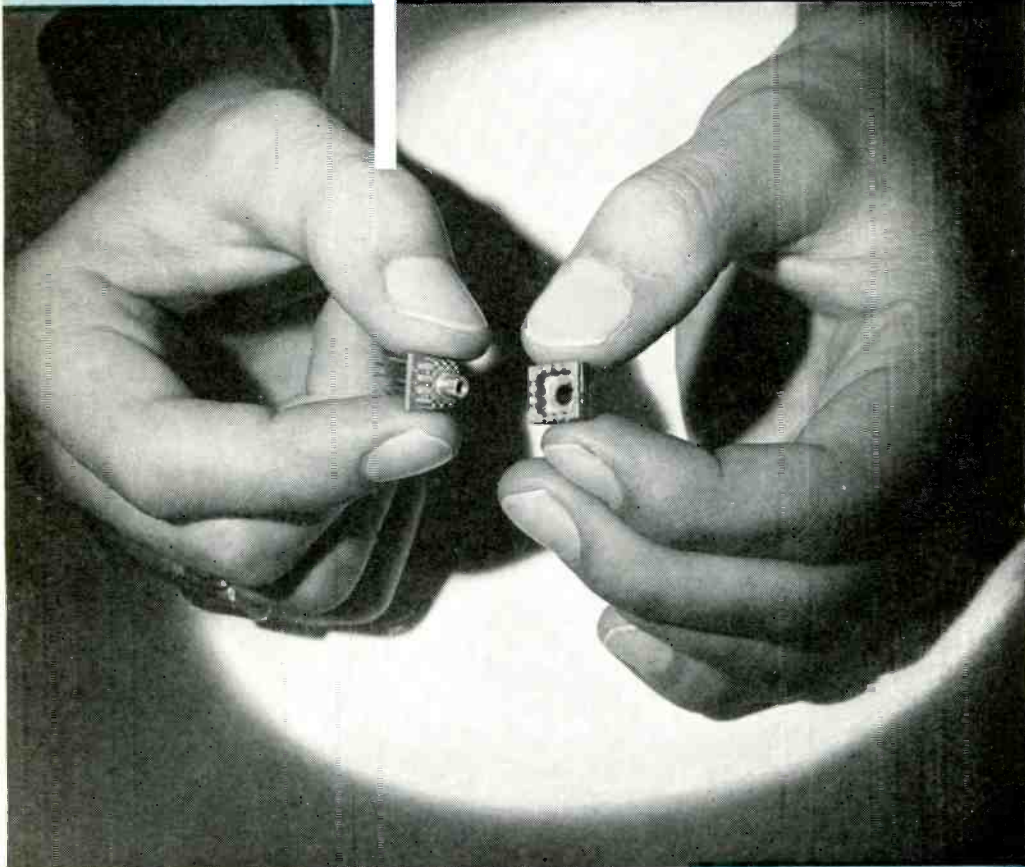


MANUFACTURED BY
CONTINENTAL CONNECTOR CORPORATION,
AMERICA'S FASTEST GROWING LINE OF
PRECISION CONNECTORS

VISIT US AT WESCON SHOW BOOTHS 855-856

this is

Micro Mod



A pair weighs 1.73 grams; they are .380 square; there are 12 gold-plated beryllium copper contacts on .075 centers: this is Micro Mod, AMPHENOL's new connector family for modular circuitries!

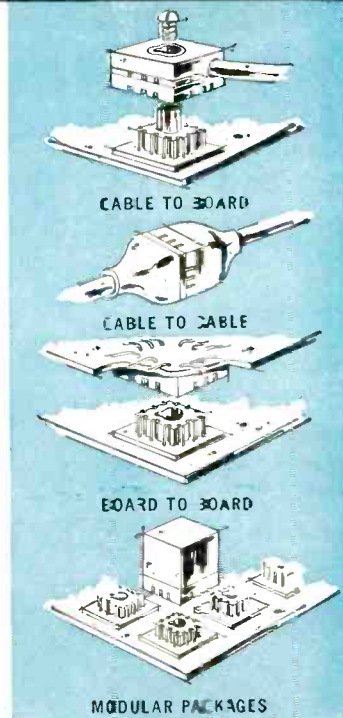
Available in two constructions, Micro Mod can be used with module ("or stick") circuits or in cable plug applications—wherever micro-miniaturization must be combined with outstanding reliability.

96-4 plug is used with 96-3 receptacle; the latter is supplied less contacts—the module leads are used to form the female contacts.

96-2 plug is supplied with a polarizing key assembly, mates with 96-1 receptacle.

Small quantities of Micro Mod connectors can now be ordered for evaluation.

Cataloging is available for your use.



AMPHENOL

CONNECTOR DIVISION

1830 South 54th Avenue, Chicago 50, Illinois
Amphenol-Borg Electronics Corporation
Circle 12 on Inquiry Card

International News

(Continued from page 24)

French Company Formed

Paris, France—A new French subsidiary company has been formed to promote the sales and service of Collins Radio Co., Dallas, Texas.

The new sales subsidiary is Collins Radio Co. (France), S.A.R.L., located at 3 rue Lord Byron, Paris VIII, France. Ross Sampson will serve as General Manager.

Collins recently formed similar subsidiaries in Australia and Germany.

World-Wide Marketing Plan

Culver City, Calif.—Telemeter Magnetics Inc. and the Hughes International Div. of Hughes Aircraft Co. have entered into an agreement for overseas distribution of TMI's core memory products.

Hughes International will represent Telemeter Magnetics throughout the world except for the United States, Japan and Taiwan. The products to be marketed include core buffer memories and large scale memories for computer and data processing systems.

UK Firm Has New Owner

Watford, England—American Bosch Arma Corp. and DeHavilland Holdings, Ltd., have acquired joint ownership of S. G. Brown, Ltd., Watford, England. Operation of the firm would be under DeHavilland Holdings which is a member company of the Hawker Siddeley Group in England. A major producer of precision navigation and gyroscopic equipment, S. G. Brown, Ltd., was formerly owned by the British Admiralty.

Mel Sales—Canadian Rep

Toronto, Canada—Tenney Engineering, Inc., Union N. J., manufacturer of environmental test equipment, has named Mel Sales Ltd. as its sales representative in Canada.

Canadian Distributor Named

Toronto, Ontario—Motorola Semiconductor Products, Inc., Phoenix, Ariz., has named Canadian Motorola Electronics, Ltd., Toronto, Ont., an industrial distributor for Canada.

John E. Raftis, Manager of Microwave and Industrial Products for CME, will direct and administer the marketing program for all Motorola semiconductor products.

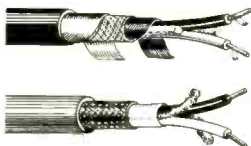


NEW from Belden

for the WESCON SHOW

Come see us at Booth Number 431-432 and get complete information on how these and other Belden wire and cable developments can be applied to your design requirements.

Miniature Microphone Cables— Rubber, Plastic



No. 8413
Rubber

No. 8420
Plastic

Miniature in size with low capacitance, extreme flexibility, and long flex life. Cadmium bronze stranded conductors.

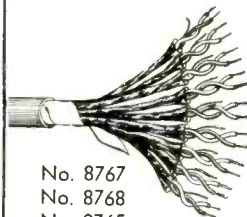
Miniature Broadcast and Audio Cables



No. 8450
No. 8451

Occupy one-third to one-half space of standard cables. BELDFOIL* shielding gives high reliability with easy termination by utilizing the Drain Wire. 100% shielded against electrostatic fields.

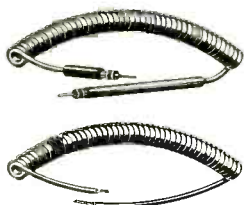
Multiple Pair Individually Shielded Cables



No. 8767
No. 8768
No. 8765

Now available in 3, 6, 9, 11, and 15 pairs. Each BELDFOIL* pair provides 100% shielding and isolation of each pair. Lighter weight—smaller diameter.

Coiled Test Prod Wire



No. 8878

No. 8879

Available with or without prods in standard red and black. Rubber insulated. Retracted length only 8"—stretches to a full 5'.



Coiled 4 Conductor Microphone Cable

No. 8415

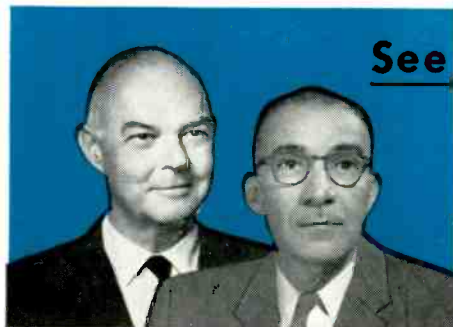
This neoprene four conductor cord is one of an infinite variety of coiled cord possibilities to meet every requirement. Rubber or Plastic.

51 Pair Unshielded Intercom Cable



No. 8751

Another example of Belden's engineering design of a better cable to make intricate circuitry easier to install at lower cost.



Ray Reading

Frank Timmons

See Us in Booth Number 431-432

Ray Reading, Belden Chief Magnet Wire Engineer, and Frank Timmons, Belden Electronic Standards Engineer, will again be available for consultation on all new wire and cable developments and to help you with your specifications.

Ask your Belden jobber

Belden wires, cords, and cables mean the lowest over-all cost from your assembly line to field operation.

One wire source for everything electronic and electrical.

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

magnet wire • lead wire • electronic wire • control cables • power supply cords • welding cable • automotive and aircraft wire & cable

* Belden Trademark
Reg. U. S. Pat. Off.

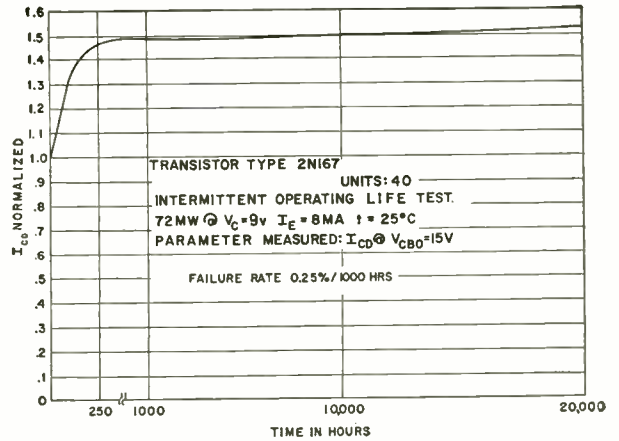
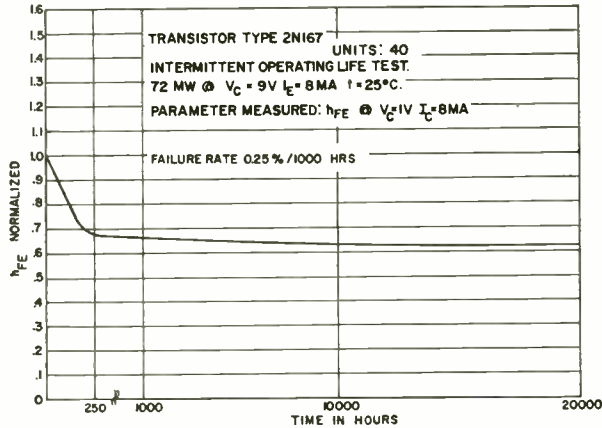
8-6-0



General Electric takes the tubulation

General Electric transistors hold the record in rate-grown reliability

General Electric has manufactured millions of rate-grown transistors in the past seven years. As a result of this experience, G.E.'s parameters are exceptionally stable and a vast amount of reliability data has been accumulated, some of which is shown here. These curves cover 29 lots of General Electric 2N167, tested to MIL-T-19500/11.



The rate-grown process produces a small, clean junction which exhibits almost no drift or deterioration at high voltages and offers the user low I_{CO} and I_{EO} . Two new types, the 2N1510 and 2N1217, will be useful for low-level switch and neon indicator applications. Both the 2N1217 and 2N167 operate at extremely low current and leakage levels, making them ideal for starvation circuits of 2 ma or less.

off rate-grown NPN transistors!

Remove the tubulation (pinch-off) from rate-grown transistors without sacrificing reliability? General Electric has done just that and even improved reliability with stabilized beta and collector cutoff current. Prices have been reduced on some types up to 20%.

Removal of the tubulation was made possible by adding a sieve or getter. Improved beta and collector cutoff current results from a 125-hour 85°C bake, which also improves the paint's resistance to solvents and chipping. Pellet, pellet mount and processing are identical to the previous process before encapsulation. Then a sieve is added rather than evacuation and subsequent pinch-off. The sieve is the same used and proved for years on G.E.'s PNP low-frequency 2N525 and PNP high-frequency 2N396 lines.

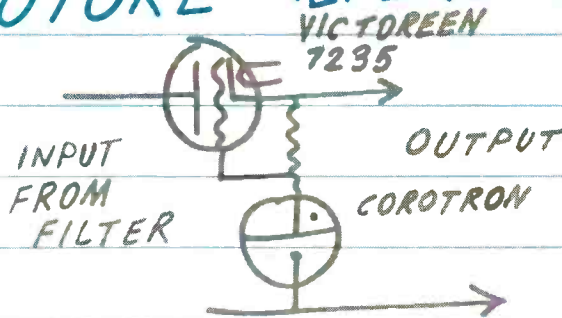
The high-reliability 2N78A and 2N167A have guaranteed 71°C I_{CO} and tight AQL's. The 2N78A also features a 20 volt BV_{CEO} rating compared with the 2N78's 15 volts. The 2N167A, in addition to 71°C I_{CO} , has a lower I_{EO} . For more information, see your G-E Semiconductor Sales Representative or Authorized Distributor. General Electric Company, Semiconductor Products Dept., Electronics Park, Syracuse, N. Y.

ADVANTAGES TO YOU: 40% lower height • Reduced prices • Stabilized I_{CO} and h_{FE} . All units baked 125 hours at 85°C • Greater resistance of paint to solvents, chipping, and salt spray • Improved low-temperature performance and reliability.	Type No.	Maximum Ratings				Electrical Parameters					
		P_{cmw} @ 25°C	BV_{CE} BV_{CB}	I_C ma	T_J °C	h_{FE} MIN @ I_C ma	MIN f_{β} mc	MIN $G_{\alpha db}$	MAX I_{CO} @ V_{CB} (μ a)		
	2N78	65	15	20	85	45	1	5	27	3	15
	2N78A	65	20	20	85	45	1	5	29	3	15
	2N78A (Cert)	65	20	20	85	45	1	5	29	3	15
	2N167	65	30	75	85	17	8	5	—	1.5	15
	2N167A	65	30	75	85	17	8	5	—	1.5	15
	USAF2N167A (per MIL-5-19500/11)	65	30	75	85	17	8	5	—	1.5	15
	2N169A	65	15	20	85	34	1	—	27	5	15
	2N1198	65	25	75	85	17	8	5	—	1.5	15
	2N1217	65	20	20	85	40	2	5	—	1.5	15
	2N1510	75	75	20	85	8	1	—	—	5	75

IN STOCK FOR FAST DELIVERY FROM YOUR AUTHORIZED GENERAL ELECTRIC DISTRIBUTOR



CIRCUIT FOR FUTURE REFERENCE



INPUT V	OUTPUT V	% REG
2000	1500	2½ %
2100	1510	
2200	1520	
2300	1530	
2400	1540	

GIVES SIMPLE, EFFECTIVE VOLTAGE
REGULATION USING VICTOREEN
7235 HV TRIODE . . .

E_p MAX = 10,000v MU = 550
 I_p MAX = 5ma SIZE - T6-½
 P_p MAX = 12w BASE - 9pin MIN

FOR REFERENCE, LOOK INTO VICTOREEN
COROTRONS* AVAILABLE IN VOLTAGES
FROM 900 TO 27 Kv.

NOTE - WRITE FOR DESIGN DATA AND
PERFORMANCE SPECS. TO
APPLICATION ENG. DEPT.

* CORONA TYPE VOLTAGE REGULATORS



Victoreen

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Export Department, 240 West 17th St., New York 17, N.Y.

WESCON Booth 604

A-2470A

Navy To Train Sub Crews With Electronic Battles

The Ordnance Div., Minneapolis-Honeywell Regulator Co., 2600 Ridgway Rd., Minneapolis, Minn., is developing a \$3.6 million nuclear submarine training center for the Navy. Electronically controlled, it will simulate full-scale naval battles with a "startling degree of realism" for crews of Polaris-armed and other nuclear submarines.

The trainer, located at the Navy's Submarine School, New London, Conn., will use a giant computer and advanced electronic techniques. Periscopes for each sub trainer will realistically simulate the view of targets on the surrounding horizon. The targets will appear in color at the correct relative bearing and at a size proportional to the range. The facility will have a Master Instructor's Console for presenting realistic training problems.

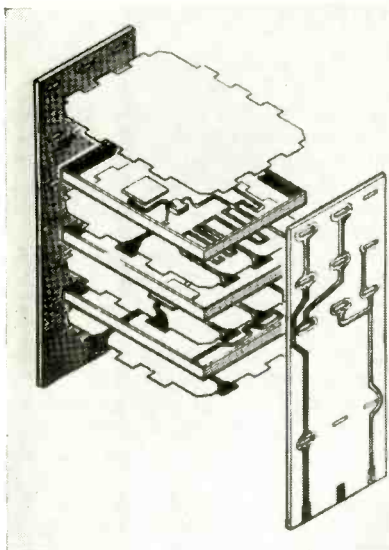
Bidding Team Formed

Seven technical companies in the New York metropolitan area have formed a non-profit technical bidding organization — The New York Research and Development Team. It will specialize in electronic, nuclear, chemical, and mathematic activities. Heart of the "team" is a working force of over 300 employees of which more than 100 are scientists and engineers. The seven companies have a combined sales volume in excess of \$4,000,000 annually.

Members are: Aerolite Corp., Union City, N. J. (electronic components); Computech Corp., N. Y. C. (data processing and computing); Glenn Assoc., N. Y. C. (engineering services); Manhattan Physical Research Group, Inc., N. Y. C. (technical research and consulting); New York Testing Labs, N. Y. C. (general electronics and chemical testing); Stratos Missiles, Inc., N. Y. C. (systems engineering and research); and Radiation Research Corp., N. Y. C. (nuclear engineering and research).

For more information—they are interested in inquiries from other technical firms who may wish to join—write to: Sy Richman, 118 Seventh St., Garden City, N. Y.

MINIATURE CIRCUITS



Microminiature modules, developed by Sylvania Electric Products, Inc., are for packaging electronic circuits on a series of wafers. A complete functioning circuit stage is on a surface less than 1/2 in. sq. and 1/100 in. thick. Entire stage is hermetically sealed as a fused spacer element.

Tiros TV Pictures Oriented by Computer

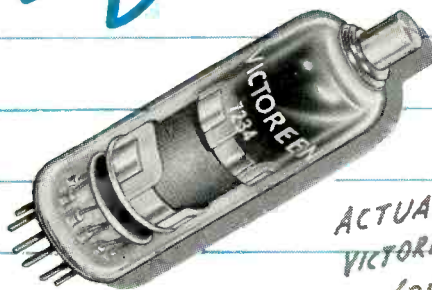
Specially designed computers, designed by RCA's Astro-Electronic Products Div. at Princeton, N. J., calculate the relative position with respect to the sun of the Tiros weather satellite each time it takes a TV Picture.

The computer gets signals from the satellite itself. A "north indicator" system measures the angle of the sun in relation to Tiros' spin axis. Nine special solar sensing cells are arranged at points 40° apart around the perimeter of the satellite. Each cell produces a distinctive pulse signal when it faces the sun directly. The pulses are sent along with the TV picture. By measuring times between pulses and between pulse and picture exposure the exact angle of the sun with respect to the satellite's axis is determined. The figure is displayed with the picture.

New Alloy For High Temperatures

The General Electric Co. Labs at Schenectady, N. Y., have announced a new alloy with heat expansion properties similar to alumina. Fernico-5, an alloy of iron, nickel, and cobalt, will be used in electron tubes, thermionic energy converters and high temperature circuits.

$E_b = 10 K_v$



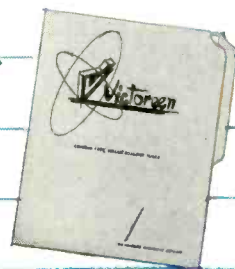
ACTUAL SIZE
VICTOREEN 7234
(PENTODE)

CONSIDER USE IN HIGH VOLTAGE
REGULATOR CIRCUITS OR HIGH
VOLTAGE AMPLIFIERS.

CHARACTERISTICS	7234 PENTODE	6842 PENTODE	7683 PENTODE
E_f	6.3V	6.3V	6.3V
I_f	150ma	150ma	150ma
E_b MAX	10,000V	4,000V	1,000V
I_p MAX	5ma	10ma	20ma
G_m	3800	2500	5000
R_p	1 Megohm	930Kohm	30Kohm
SIZE	T-6 1/2	T-5 1/2	T-6 1/2

A-1483A

WRITE FOR TECHNICAL
INFORMATION
PACKAGE.



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WESCON Booth 604

New!

LENZ

"HYANODE"

HIGH VOLTAGE LEAD WIRE

UL INSPECTED



This new, UL Inspected and Labeled Wire is especially designed for use as Anode Connectors, Fly-Back Transformer Leads and similar applications in TV Receivers, and other electronic circuits carrying high voltages.

Code HYANODE combines high dielectric strength with maximum flexibility and minimum outside diameter. It is available with No. 22 Ga. through No. 18 Ga. Stranded Tinned Copper Conductors. Outer jackets of extruded plastic compounds are rated at 80°C, 90°C or 105°C. Standard Color is Red—other colors available.

OUTSIDE DIAMETERS

Gauge	Max. Fin. O.D.
#22	0.167"
#20	0.174"
#18	0.183"

*Quotations based on your quantity requirements
furnished promptly*



WIRES

and

CABLES

LENZ ELECTRIC MANUFACTURING CO.

1751 No. Western Ave.,

Chicago 47, Ill.

In Business Since 1904

Coming Events

(Continued from page 12)

- Sept. 26-28: 9th Annual Meeting, Standards Engineers Soc.; Pittsburgh-Hilton Hotel, Pittsburgh, Pa.
- Sept. 26-28: Petroleum Mechanical Eng'g Conf., ASME; Jung Hotel, New Orleans, La.
- Sept. 26-30: Fall Instrument-Automation Conf. & Exhibit and 15th Annual Meeting, ISA, Coliseum, N. Y., N. Y.
- Oct. 3-5: Nat'l Midwestern Conf. on Air Logistics, IAS; Tulsa, Okla.
- Oct. 3-5: 6th Nat'l Communications Symp. IRE (PGCS), Rome-Utica Section; Hotel Utica & Utica Memorial Audit., Utica, N. Y.
- Oct. 3-5: 7th Annual Meeting, IRE (PGNS), Oak Ridge Nat'l Lab.; Gatlinburg, Tenn.
- Oct. 4-6: 6th Conf. on Radio Interference Reduction and Electronic Compatibility, All 3 Military Services, Armour Research Foundation, IRE (PGRFI); Museum of Science and Industry, Chicago, Ill.
- Oct. 4-7: 10th Annual Instrument Symp. and Research Equipment Exhibit, American Assoc. of Clinical Chemists, Amer. Chem. Soc., ISA, Soc. of Amer. Bacteriologists, Soc. for Experimental Biology and Medicine; Nat'l Institutes of Health, Bethesda, Md.
- Oct. 5-6: 2nd EIA Value Engineering Conf., Electronic Industries Assoc.; Disneyland Hotel, Anaheim, Calif.
- Oct. 5-7: 2nd Midwest Business Opport. Exhibit, Business Develop. Dept's of: Minnesota, N. & S. Dakota, Nebraska, Iowa, Montana, Wyoming, Wisconsin and Illinois, Dept. of Defense, Fed. Civ. Agencies, Local and State Chamber of Commerce Organizations; St. Paul Municipal Auditorium, St. Paul, Minn.
- Oct. 9-13: Meeting, The Electrochemical Soc., Inc.; Shamrock Hotel, Houston, Tex.
- Oct. 9-14: Fall General Meeting, AIEE, Computing Devices & Systems Committees, New York, N. Y.
- Oct. 10-11: Fuels Conf., ASME, AIEE; Daniel Boone Hotel, Charleston, W. Va.
- Oct. 10-12: Nat'l Electronics Conf., AIEE, IRE, Illinois Institute of Technology, EIA, SMPTE; Northwestern Univ., Univ. of Illinois, Hotel Sheraton, Chicago, Ill.
- Oct. 10-12: 16th Annual Conf., Nat'l Electronics Conf., AIEE, Ill. Inst. of Technology, IRE, Northwestern and Illinois Univ.; Sherman Hotel, Chicago, Ill.

ABBREVIATIONS

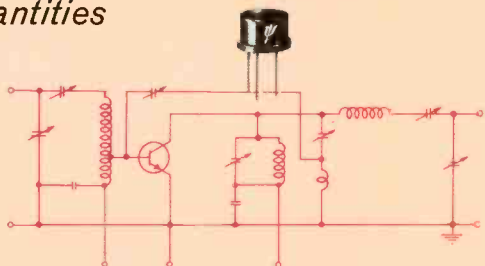
- AEC: Atomic Energy Commission
- AIEE: Amer. Inst. of Chemical Engineers
- AIEE: Amer. Soc. of Electrical Engineers
- AIME: Amer. Inst. of Metallurgical Engineers
- ASME: Amer. Soc. of Mechanical Engineers
- IAS: Institute of Aeronautical Sciences
- IEE: Institute of Electrical Engineers (Brit)
- IRE: Institute of Radio Engineers
- ISA: Instrument Soc. of America
- WEMA: Western Electronic Manufacturers Assoc.

ADVANCED SILICON TRANSISTORS WITH UNIQUE CAPABILITIES...

TYPES 2N1505, 2N1506

Available immediately in production quantities

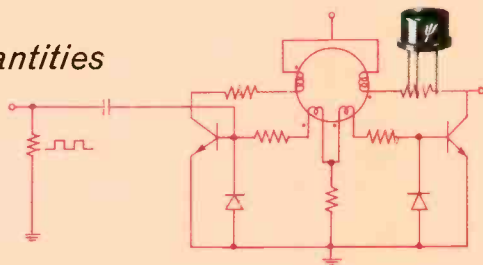
These NPN VHF power amplifiers and oscillators are specially designed for high frequency, high power operation at low supply voltages. They give typical power outputs of 1 w at 70 mc and 500 mw at 200 mc. Highly efficient high frequency operation is assured by combining either with a High-Q Varicap frequency multiplier.



TYPES 2N1409, 2N1410

Available immediately in production quantities

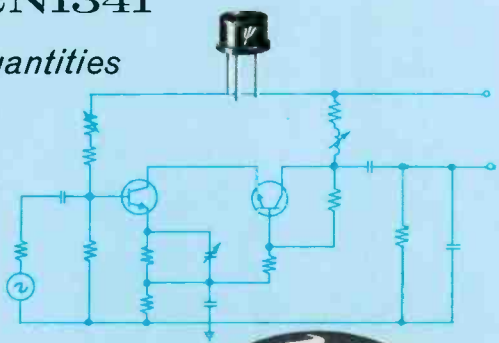
These NPN high speed, high current core drivers and general purpose switches offer fastest switching time at high current ratings with extremely low saturation resistance. This combination makes them ideal for use in transistor-ferrite circuitry and many other computer applications.



TYPES 2N1335 through 2N1341

Available immediately in production quantities

A unique combination of high voltage, VHF and high power is the outstanding feature of these NPN Mesa transistors, which make it possible for the first time to design video amplifiers with output voltages of 140 v and bandwidth of 10 mc. Other applications are power amplifiers, power oscillators and high voltage switches. *At right: Typical high voltage video amplifier circuit.*



TYPES PT 900, PT 901

Available now for evaluation

10 ampere high frequency, high speed, high power oscillators, amplifiers, switches and converters. These are the only power transistors that offer 100 w at 5 mc plus $m\mu s$ high current switching. *At right: Typical 40 w 10 mc amplifier circuit.*



Now Available! TYPES 2N696, 2N697

LOOK INSIDE FOR LATEST INFORMATION AND SPECIFICATIONS ON PSI SILICON DIODES, ZENERS AND RECTIFIERS

Silicon General Purpose Diodes



ACTUAL SIZE



EIA TYPE NUMBER	Minimum Saturation Voltage @ 100 μ A @ 25°C (volts)	Maximum Forward Voltage DC @ 25°C (volts) ¹		Maximum Inverse Current at Maximum DC Operating Voltage (μ A @ volts)		Maximum Average Rectified Current (mA)	
		@ 100 mA	@ 25°C	@ 150°C	@ 25°C	@ 150°C	
1N488A	420	1.0	.100 @ - 380v	25	200	70	
1N488	420	1.1	.250 @ - 380v	50	125	50	
1N487A	330	1.0	.100 @ - 300v	25	200	70	
1N487	330	1.1	.250 @ - 300v	50	125	50	
1N486B	250	1.0	.050 @ - 225v	10	200	70	
1N486A	250	1.0	.050 @ - 225v	25	200	70	
1N486	250	1.1	.250 @ - 225v	50	125	50	
1N485B	200	1.0	.025 @ - 175v	5	200	70	
1N485A	200	1.0	.025 @ - 175v	15	200	70	
1N485	200	1.1	.250 @ - 175v	30	125	50	
1N484B	150	1.0	.025 @ - 125v	5	200	70	
1N484A	150	1.0	.025 @ - 125v	15	200	70	
1N484	150	1.1	.250 @ - 125v	30	125	50	
1N483B	80	1.0	.025 @ - 60v	5	200	70	
1N483A	80	1.0	.025 @ - 60v	15	200	70	
1N483	80	1.1	.250 @ - 60v	30	125	50	
1N482B	40	1.0	.025 @ - 30v	5	200	70	
1N482A	40	1.0	.025 @ - 30v	15	200	70	
1N482	40	1.1	.250 @ - 30v	30	125	50	

EIA TYPE NUMBER	Minimum Saturation Voltage @ 100 μ A @ 25°C (volts)	Minimum Forward Current @ + 1.0 VDC @ 25°C (mA)	Maximum Inverse Current at Maximum DC Operating Voltage (μ A @ volts)		Maximum Average Rectified Current (mA)	
			@ 25°C	@ 150°C	@ 25°C	@ 150°C
1N464A	150	100	.5 @ 125	30 @ 125	200	70
1N464	150	3	.5 @ 125	30 @ 125	40	
1N463A	200	100	.5 @ 175	30 @ 175	200	70
1N463	200	1	.5 @ 175	30 @ 175	30	
1N462A	70	100	.5 @ 60	30 @ 60	200	70
1N462	70	5	.5 @ 60	30 @ 60	50	
1N461A	30	100	.5 @ 25	30 @ 25	200	70
1N461	30	15	.5 @ 25	30 @ 25	60	
1N459A	200	100	.025 @ 175	5 @ 175	200	70
* 1N459	200	3	.025 @ 175	5 @ 175	40	
1N458A	150	100	.025 @ 125	5 @ 125	200	70
* 1N458	150	7	.025 @ 125	5 @ 125	55	
1N457A	70	100	.025 @ 60	5 @ 60	200	70
+ 1N457	70	20	.025 @ 60	5 @ 60	75	
1N456A	30	100	.025 @ 25	5 @ 25	200	70
1N456	30	40	.025 @ 25	5 @ 25	90	

* JAN Types

Zener Diodes 500 mW Power Dissipation

PSI Type Number	Elect. Equiv.	Zener Voltage @ 5 mA @ 25°C		Maximum Dynamic Resistance (ohms) 1	Maximum Inverse Current		At Inverse Voltage (v)
		E _z Min. (v)	E _z Max. (v)		I _z @ 25°C (μ A)	I _z @ 100°C (μ A)	
PS6465	1N465	2.0	3.2	60	75	100	1
PS6466	1N466	3.0	3.9	55	50	100	1
PS6467	1N467	3.7	4.5	45	5	100	1
PS6468	1N468	4.3	5.4	35	5	100	1.5
PS6469	1N469	5.2	6.4	20	5	100	1.5
PS6470	1N470	6.2	8.0	10	5	50	3.5

1. Measured at 10mA DC Zener current with 1mA RMS signal superposed.

Also Available PS6313-6318 covering
7.5v to 27v Zener Voltages.

EIA TYPES	Zener (Breakdown) Voltage @ 5 mA		Maximum Inverse Current		At Inverse Voltage (v)	Maximum Dynamic Resistance (ohms) 1
	E _z Min. (v)	E _z Max. (v)	I _z @ 25°C (μ A)	I _z @ 100°C (μ A)		
1N702	2.0	3.2	75	100	-1	60
1N703	3.0	3.9	50	100	-1	55
1N704	3.7	4.5	5	100	-1	45
1N705	4.3	5.4	5	100	-1.5	35
1N706	5.2	6.4	5	100	-1.5	20
1N707	6.2	8.0	5	50	-3.5	10

1. Measured at 10 mA DC Zener current with 1 mA RMS signal superposed.

Also Available 1N708-1N723 covering
5.6v to 27v Zener Voltages.

EIA Type ¹	Zener Voltage E _z (Volts) ²	Max. Inverse Current E ₀ = -1V μ A		Max. Dynamic Resistance I _z = 20mA I _{ac} = 1 mA (Ohms) (Max.)
		25°C	150°C	
1N746	3.3	10	30	28
1N747	3.6	10	30	24
1N748	3.9	10	30	22
1N749	4.3	2	30	23
1N750	4.7	2	30	19
1N751	5.1	1	20	17
1N752	5.6	1	20	11
1N753	6.2	0.1	20	7
1N754	6.8	0.1	20	5
1N755	7.5	0.1	20	6
1N756	8.2	0.1	20	8
1N757	9.1	0.1	20	10
1N758	10.0	0.1	20	17
1N759	12.0	0.1	20	30

1. $\pm 10\%$ Zener Voltage Tolerance

2. E_z measured at Test Current I_z = 20mA

All of the above types can be supplied in $\pm 5\%$ Tolerance of center Zener Voltage Value. (Add suffix "A" for these units.)

Silicon Diffusion Computer Diodes

*The Broadest Line in
the Industry...*

PSI has developed these fast recovery silicon diodes for every application in advanced computer design. Choose from military approved, low capacitance, high conductance, low leakage, high voltage types—with assurance of unsurpassed reliability!



ACTUAL SIZE



Fast Recovery Types

MILITARY TYPES

Type Number	Minimum Saturation Voltage* @ 100 μ A (volts)	Minimum Forward Current @ + 1.0 volt (mA)	Maximum Reverse Current (μ A)		Reverse Recovery Characteristics	
			25°C	100°C	Reverse Resistance (ohms)	Maximum Recovery Time (μ s)
1N663*	100		5 (75v)	50 (75v)	200K	0.5
1N662†	100		1 (10v) 20 (50v)	20 (10v) 100 (50v)	100K	0.5
1N658*	120		.05 (50v)	**25 (50v)	80K	0.3
1N643†	200		0.25 (10v) 1 (100v)	5 (10v) 15 (100v)	200K	0.3
1N789		10	1 (20v)	30 (20v)	200K	0.5
1N790		10	5 (20v)	30 (20v)	200K	0.25
1N791		50	5 (20v)	30 (20v)	200K	0.5
1N79		100	5 (20v)	0 (20v)	100K	0.5
1N793		10	1 (50v)	30 (50v)	200K	0.5
1N794		0	5 (50v)	30 (50v)	200K	0.25
1N795		50	5 (50v)	30 (50v)	200K	0.5
1N796		100	5 (50v)	30 (50v)	100K	0.5
1N797	120	0	1 (100v)	30 (100v)	200K	0
1N798	120	10	5 (100v)	30 (100v)	200K	0.25
1N799	120	0	5 (100v)	30 (100v)	200K	0.5
1N800	120	100	5 (100v)	30 (100v)	100K	0
1N801	150	10	1 (125v)	30 (125v)	200K	0
1N802	150	50	5 (125v)	50 (125v)	200K	0.5
1N803	200	10	5 (175v)	50 (175v)	200K	0.5
1N804	200	50	10 (175v)	50 (175v)	200K	0
1N659			5 (50v)	25 (50v)	400K	0.3
1N660	120		5 (100v)	50 (100v)	400K	0.3
1N661	240		10 (00v)	100 (200v)	400K	0.3
1N625		4 @ 1.5v	1 (20v)	30 (20v)	400K	1 μ sec
1N626		4 @ 1.5v		30 (3 v)	400K	μ sec
1N627	100	4 @ 1.5v	1 (75v)	30 (75v)	10K	1 μ sec
1N628	150	4 @ 1.5v	1 (125v)	30 (12 v)	400K	1 μ sec
1N629	200	4 @ 1.5v	1 (75v)	30 (125v)	400K	1 μ sec

*Maximum DC working inverse voltage is 85% of minimum saturation voltage.

†Mil-E-1/1171 (SigC) ‡Mil-E-1/1139 (SigC) *Mil-E-1/1140 (SigC) *Mil-E-1/1160 (SigC)

**Max. Reverse Current at 150°C.

OTHER SPECIFICATIONS: Peak Pulse Current, 1 μ sec, 1% duty cycle: 3.0 Amps.

Storage and Operating Temperature Range: -65°C to 200°C.

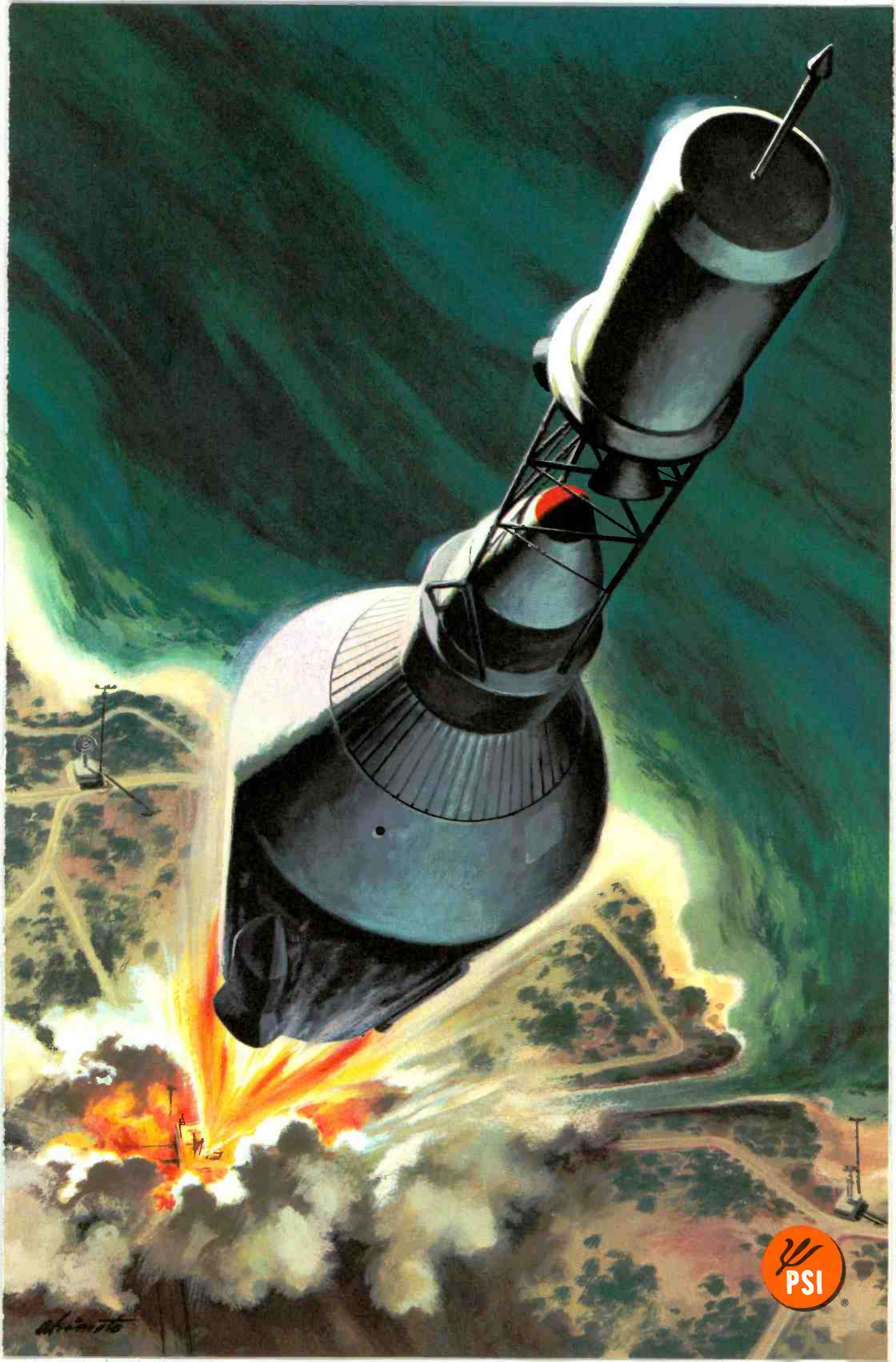
Fast Switching Low Capacitance Types

TYPE NO.	MIN. SAT. VOLTAGE @ 100 μ A (volts)	MIN. FWD. CUR. @ 1.0 volt (mA)	MAXIMUM REVERSE CURRENT (μ A)		REVERSE RECOVERY CHARACTERISTICS			MAX. CAP. @ ZERO VOLTS (μ mf)
			25°C	100°C	REVERSE RESIST. (Ohms)	MAX. RECOV. TIME* (μ s)	TYPICAL RECOV. TIME** (NAs)	
1N925	40	5	1.0 (10v)	20 (10v)	20K	0.15	5.0	4.0
1N926	40	5	0.1 (10v)	10 (10v)	20K	0.15	5.0	4.0
1N927	65	10	0.1 (10v) 5.0 (50v)	10 (10v) 25 (50v)	20K	0.15	5.0	4.0
1N928	120	10	0.1 (10v) 5.0 (50v)	10 (10v) 25 (50v)	20K	0.15	5.0	4.0

*Switching from 5mA to -10 volts ($R_L = 1K$, $C_L = 10\mu$ mf)

**Switching from 5mA to -10 volts ($R_{LOOP} = 100$ ohms, $C_L = 8\mu$ mf including diode capacitance)

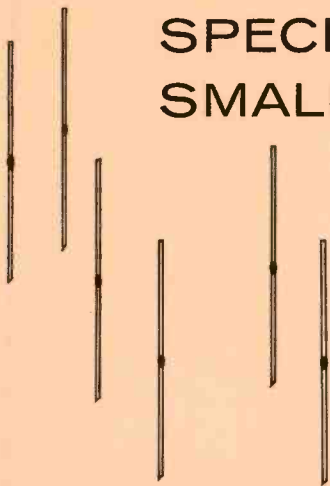
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PSI HIGH-RELIABILITY MINIATURIZATIONS

SPECIFICATIONS ON THE WORLD'S SMALLEST EIA SILICON DIODES



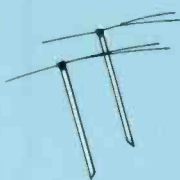
These low leakage EIA types with 250 mW dissipation have been exhaustively tested for reliability and long life. All are available for delivery in production quantities.

Type No.	Min. Sat. Voltage @ 100 μ A (v)	Min. Fwd. Current @ +1.0 V (mA)	Maximum Reverse Current (μ A)		Reverse Recovery Characteristics	
			25°C	100°C	Reverse Res. (Ohms)	Max. Recov. Time (μ S)
1N897	50	5	.025 (10V) .1 (40V)	5 (10V) 20 (40V)	100K	1.0
1N898	50	100	.025 (10V) .5 (40V)	5 (10V) 20 (40V)	100K	0.3
1N899	100	5	.025 (10V) .1 (80V)	5 (10V) 20 (80V)	100K	0.3
1N900	100	50	.025 (10V) .1 (80V)	5 (10V) 20 (80V)	100K	0.3
1N901	100	100	.025 (10V) .5 (80V)	5 (10V) 20 (80V)	100K	0.3
1N902	200	10	.025 (10V) 1.0 (100V)	5 (10V) 15 (100V)	200K	0.3

Phone, wire or write for new low prices and delivery schedules on production quantities.

SPECIFICATIONS NOW AVAILABLE!

*pico*transistor



PSI Type	Equivalent
PMT 011	2N1409
PMT 012	2N1410
PMT 013	2N696
PMT 014	2N697

*micro*transistor



PMT 111	2N1409
PMT 112	2N1410

Write or phone for details on these exciting new Micro components!

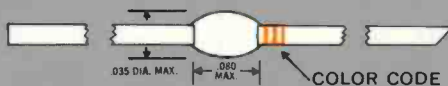
ACTUAL SIZE

NEW LOW PRICES ON PD-100 *micro*diode

PSI's super-miniaturized PD-100 silicon diodes are available now at price reductions of as much as 20%! Look at the performance characteristics of these fast-recovery silicon computer types:

- High power dissipation..... 250 milliwatts
- High conductance..... up to 100 mA @ 1 volt
- High voltage..... 200v operating voltage
- Fast recovery..... 200K @ .3 microseconds
- High temperature..... Operating range -65°C. to 150°C.
- High reliability..... Degradation rates of .01 to .1%/1000 hrs. (or .001%/1000 hrs. with special aging)

Type Number	Min. Sat. Voltage @ 100 μ A (v)	Min. Fwd. Current @ +1.0v (mA)	Maximum Reverse Current (μ A)		Reverse Recovery Characteristics	
			25°C	100°C	Reverse Res. (ohms)	Max. Recov. Time (μ s)
PD-101	50	5	1.0 (10v)	25 (10v)	100K	1.0
PD-102	50	20	.5 (10v)	25 (10v)	100K	0.3
PD-103	50	100	.5 (10v)	25 (10v)	100K	0.3
PD-104	100	5	.5 (10v)	25 (10v)	100K	0.3
PD-105	100	20	.5 (10v)	25 (10v)	100K	0.3
PD-106	100	50	.5 (10v)	25 (10v)	100K	0.3
PD-107	100	100	.5 (10v)	25 (10v)	100K	0.3
PD-108	200	10	.5 (10v) 5.0 (100v)	25 (10v)	200K	0.3
PD-109	200	10	.025 (10v) 1.0 (100v)	5 (10v)	200K	0.3



PHYSICAL CHARACTERISTICS:

- HERMETICALLY SEALED—Bonded Surface films.
- TERMINALS—.004x.019 gold plated leads. Lead length 1/2 inch minimum.
- MARKING—Type number designated by color of body and color of stripes on pointed (cathode) lead.

ALL DIMENSIONS SHOWN IN INCHES.

Please note:

All specifications and information contained herein are current as of

July 15, 1960

Rectifiers

Absolute Max. Rtg. H/W Res. Load at 75°C Ambient		Electrical Characteristics at 25°C Ambient	
Peak Inverse Voltage Volts	Max. Rectified DC Output Current mA	Forward DC Volt Drop at Rated DC Current Volts	Reverse DC Current at Rated PIV mA
3600	65	27.0	.025
3600	65	18.0	.025
4800	60	36.0	.025
4800	50	24.0	.025
6000	50	45.0	.025
6000	65	30.0	.025
7200	50	54.0	.025
7200	60	36.0	.025
8000	45	60.0	.025
12000	45	60.0	.025
14000	50	52.0	.025
16000	45	60.0	.025

Temperature Range -55°C to 150°C



1/2 ACTUAL SIZE

PSI High-Q Varicap

VARICAP TYPE	Capacitance* @ 4VDC 50MC (μf)	Quality Factor Min. (Q) @ 4VDC 50MC	Max. Working Voltage (VDC)	Minimum Saturation Voltage @ 100 μADC (VDC)	Maximum Inverse Current @ 50VDC (μADC)
PC-112-10	10	50		90	0.5
PC-113-22	22	50	80	90	0.5
PC-114-47	47	50		90	0.5

CAPACITANCE CHANGE: From 2VDC to 80VDC, 4.0 to 1 Min.

VARICAP TYPE	Capacitance* @ 4VDC 50MC (μf)	Quality Factor Min. (Q) @ 4VDC 50MC	Max. Working Voltage (VDC)	Minimum Saturation Voltage @ 100 μADC (VDC)	Maximum Inverse Current @ 75VDC (μADC)
PC-115-10	10	100	100	110	0.5
PC-116-22	22	100	100	110	0.5
PC-117-47	47	100	100	110	0.5
PC-122-47	47	75	100	110	0.5

CAPACITANCE CHANGE: From 2VDC to 100VDC, 5.2 to 1 Min.

*All capacitance values are ±20%

All values at 25°C

"VARICAP" is the registered trade-mark of silicon voltage-variable capacitors manufactured by Pacific Semiconductors, Inc.

Rectifiers 61

CHARACTERISTICS	
In (μa) Current v. Voltage at 100°C	Max. Avg. Inverse Current ¹ at 150°C (μa)
50	500
50	500
50	500
50	500
50	500
50	500
75	500
75	500
75	500
75	500

CHARACTERISTICS	
In (μa) Current Peak Voltage @ 100°C	Max. Avg. ² Inverse Current @ 100°C (μa)
75	100
75	100
75	100
75	100
75	100
100	100
100	100
100	100
100	100
100	100

Diode operating at

Voltage Reference Diodes

EIA Type Number	REFERENCE VOLTAGE @ 7.5 mA @ 25°C. (volts)			Max. Voltage change from 25°C Reference Voltage (volts) -55°C to +100°C	Max. Dynamic ¹ Resistance (ohms)
	Min.	Avg.	Max.		
1N2765	6.46	6.80	7.14	±0.050	20
1N2766	12.92	13.60	14.28	±0.100	40
1N2767	19.38	20.40	21.42	±0.150	60
1N2768	25.84	27.20	28.56	±0.200	80
1N2769	32.30	34.00	35.70	±0.250	100
1N2770	38.76	40.80	42.84	±0.300	120

1. Measured with 1 mA AC superposed on 7.5 mA DC
Max. Operating Temp. @ I_Z=7.5 mA: -65°C to +175°C.

NEW! Regulator Diodes 1.5v to 3.0v ±5% and ±2% types—PS1171 thru PS1177

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- Extremely rugged
- Non-metallic "cold" case
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- Use in printed circuit board applications

EIA TYPE NUMBER	Peak Inverse Voltage (volts)	Maximum Average Rectified Current (mA)		MAX RMS Input Voltage* (volts)	MAX DC Fwd Voltage Drop @ 100 mA DC 25°C	Dimensions (Inches)	
		@ 25°C	@ 100°C			L.	Dia.
1N1730	1000	200	100	700	5	.5	.375
1N1731	1500	200	100	1050	5	.5	.375
1N1732	2000	200	100	1400	9	1.0	.375
1N1733	3000	150	75	2100	12	1.0	.375
1N1734	5000	100	50	3500	18	1.0	.5
1N2382	4000	150	75	2800	18	1.0	.5
1N2383	6000	100	50	4200	27	1.5	.5
1N2384	8000	70	35	5600	27	1.5	.5
1N2385	10000	70	35	7000	39	2.0	.5

*Resistive or Inductive Load
 Maximum DC Reverse Current @ Rated PIV 10 μ A @ 25°C, 100 μ A @ 100°C.
 Maximum Surge Current (8msec.): 2.5 Amps.
 Continuous DC Voltage same as PIV.
 Operating Temperature Range -55°C to 150°C.

EIA Type	Length Inches
1N1139	4 $\frac{1}{4}$
1N1140	2 $\frac{1}{2}$
1N1141	4 $\frac{1}{4}$
1N1142	2 $\frac{1}{2}$
1N1143	4 $\frac{1}{4}$
1N1143A	4 $\frac{1}{4}$
1N1144	6 $\frac{1}{4}$
1N1145	4 $\frac{1}{4}$
1N1146	6 $\frac{1}{4}$
1N1147	6 $\frac{1}{4}$
1N1148	6 $\frac{1}{4}$
1N1149	6 $\frac{1}{4}$

Storage and Operating Tem



NEW! Very High Voltage Cartridge 12 to 30 KV 1N3052 thru 1N30

Silicon Subminiature Rectifiers

MEDIUM POWER - Military Types*

EIA TYPE NUMBER	MAXIMUM RATINGS			ELECTRICAL CHARACTERISTICS			
	Peak Inv. Voltage (v)	Maximum Avg. Rectified Current (mA) ¹		Minimum Saturation Voltage @ 100°C	Maximum Reverse Current @ PIV (μ A)		Max. Avg. Voltage Drop @ I _o = 400 mA @ 25°C (v)
		@ 25°C	@ 150°C		@ 25°C	@ 100°C	
AF1N645	225	400	150	275	0.2	15	1.0
AF1N646	300	400	150	360	0.2	15	1.0
AF1N647	400	400	150	480	0.2	20	1.0
AF1N648	500	400	150	600	0.2	20	1.0
AF1N649	600	400	150	720	0.2	25	1.0

* MIL-E-1/1143 (USAF)
 1. Resistive or Inductive Load
 Maximum Storage and Operating Temperature Range -65°C to 150°C

TYPE NO.	MAXIMUM RATINGS				ELECTRICAL CHARACTERISTICS		
	Recurrent Peak Inv. Voltage at 150°C (Volts)	RMS Voltage at 150°C (Volts)	Avg. Forward Current I _o (mA)		Min. E _s at 100 μ A @ 25°C (Volts)	Max. E _f at 500 mA @ 25°C (Volts)	Max Rec Peak I _r at 25°C
			@ 25°C	@ 150°C			
PS405	50	35	400	150	75	1.5	5
PS410	100	70	400	150	130	1.5	5
PS415	150	105	400	150	180	1.5	5
PS420	200	140	400	150	240	1.5	5
PS425	250	175	400	150	285	1.5	5
PS430	300	210	400	150	340	1.5	5
PS435	350	245	400	150	400	1.5	15
PS440	400	280	400	150	450	1.5	15
PS450	500	350	400	150	560	1.5	15
PS460	600	420	400	150	675	1.5	15

TYPE NO.	MAXIMUM RATINGS				ELECTRICAL CHARACTERISTICS		
	Recurrent Peak Inverse Voltage (Volts) @ 100°C	RMS Voltage @ 100°C (Volts)	Avg. Forward Current I _o (mA) ¹		Min. E _s @ 25°C (Volts)	Min. I _f @ 25°C (mA)	Max. Recur. Inv. @ 25°C
			@ 25°C	@ 100°C			
PS005	50	35	250	140	75	100	10
PS010	100	70	250	140	130	100	10
PS015	150	105	250	140	180	100	10
PS020	200	140	250	140	240	100	10
PS025	250	175	250	140	285	100	10
PS030	300	210	250	140	340	100	30
PS035	350	245	250	140	400	100	30
PS040	400	280	250	140	450	100	30
PS050	500	350	250	140	560	100	30
PS060	600	420	250	140	675	100	30

1. Resistive or Inductive Load.
 2. Average over one cycle for half wave resistive or choke input circuit with full rated current and maximum RMS input.

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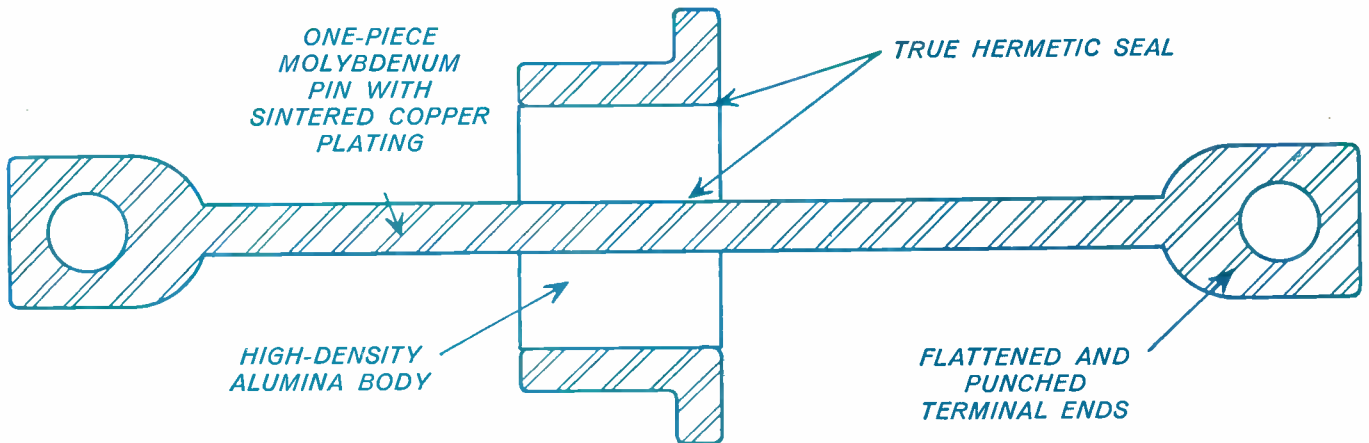
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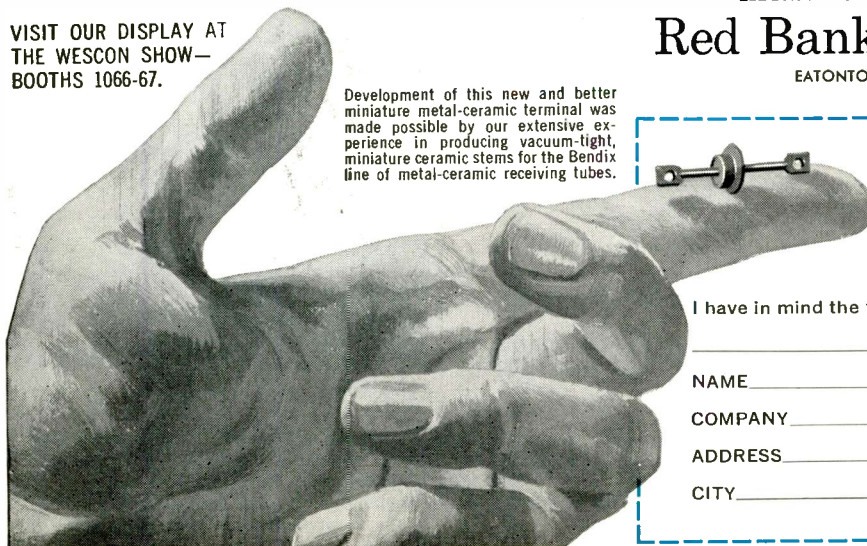
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Machine to "Identify" Objects Developed

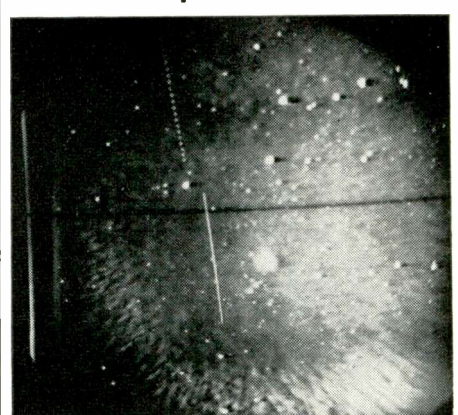
The Mark I Perceptron, an electromechanical machine, which can be trained to automatically identify objects or patterns, such as the alphabet, has been developed at the Cornell Aeronautical Laboratory, Buffalo, N. Y., to demonstrate the feasibility of the basic perception concept.

The Perceptron Research Program is sponsored by the Office of Naval Research with assistance from the Rome Air Development Center, Rome, N. Y., of the Air Research and Development Command.

Though not designed for practical applications, the Mark I Perceptron is rather a limited capacity version of what may become a family of efficient pattern-recognizing machines. However, the Perceptron, unlike some pattern-recognition machines, does not recognize forms by matching them against an inventory of stored images or by performing a mathematical analysis of characteristics. Instead, its recognition is direct and almost instantaneous since its memory is in the form of altered "pathways" through the system rather than a coded representation of the unique stimuli.

The Mark I consists basically of a "sensory unit" of photo cells which views the pattern shown to the machine, "association units" which contain the machine's memory, and response units which visually display the machine's pattern-recognition response.

THERE IT GOES! (Sputnik IV)



Russian satellite is photographed passing over Detroit. Photo was successful test of Bendix Corp's TV Satellite Tracker developed at their Research Labs at Southfield, Mich. Tracker was developed for National Space Surveillance Control Center (Bedford, Mass.) under a program sponsored by Advanced Research Projects Agency, DOD.

AGE IT!



Ancient Egyptian artifacts from University of Nebraska State Museum

INHERENT STABILITY Assured in a DALOHM RS Resistor

IN-HER-ENT, *adj.* Firmly infixed; esp., involved in the essential character of anything.

Stored on the shelf for months... or placed under continuous load... operating in severe environmental, shock, vibration and humidity conditions... Dalohm precision resistors retain

their stability because it has been "firmly infixed" by Dalohm design and methods of manufacture.

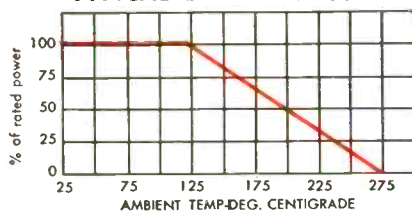
For all applications demanding resistors that meet or surpass MIL specifications, you can depend on Dalohm.

WIRE WOUND • PRECISION • POWER DALOHM TYPE RS RESISTORS

When space is at a premium, and precision and power are needed, specify DALOHM RS Type resistors.

Configurations: Type RS with radial leads and in most ratings and resistances shown; Type RLS with axial leads for printed circuits, and Type RSE for clip mounting.

TYPICAL DERATING CURVE



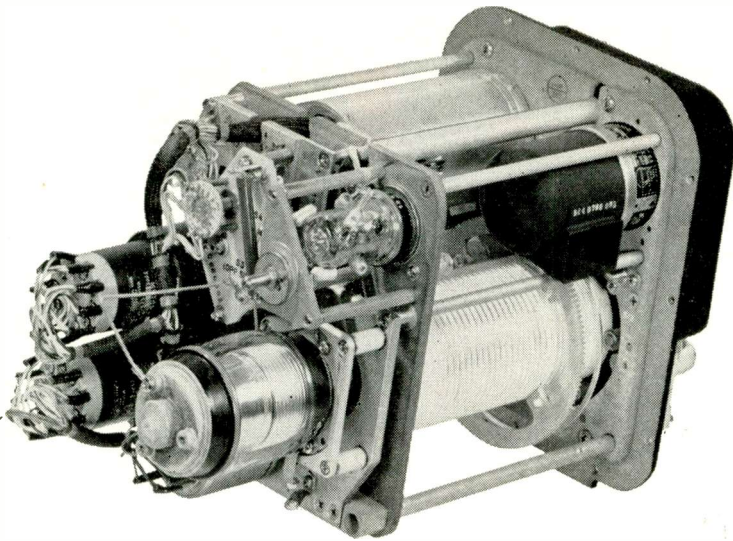
Write for Bulletins R-23, R-25 and R-30, with handy cross-reference file cards.

SPECIAL PROBLEMS?

You can depend on Dalohm, too, for help in solving any special problem in the realm of development, engineering, design and production. Chances are you can find the answer in our standard line of precision resistors (wire wound, metal film and deposited carbon); trimmer potentiometers; resistor networks; collet-fitting knobs; and hysteresis motors. If not, just outline your specific situation.

from **DALOHM**
Better things in
smaller packages
DALE PRODUCTS, INC.
1304 28th Ave., Columbus, Mebr.

Tele-Tips



JENNINGS VACUUM RELAYS AND CAPACITORS

... when reliability counts



Jennings Vacuum Relays and Variable Capacitors play an important role in the Air Force's "Project Sideband," aimed at constant radio contact on intercontinental missions.

The high standards of reliability and performance required by the Air Force were more than met by Collins Radio Company's new 1 KW SSB system for "Project Sideband." The airborne end of the system, designated ARC-58, includes an automatically tuned antenna coupler. Jennings vacuum relay, RB3, and vacuum variable capacitor, USLS 465, are used in the coupler to match the 52 ohm impedance of the equipment with the antenna.

Jennings vacuum components were chosen for their recognized ability to withstand high voltage in limited space applications. The Type RB3 vacuum

transfer relay is designed to meet peak voltages of 15 kv and rf currents to 15 amps yet it is only 3¼ inches long. The relay also has an auxiliary set of low voltage contacts for control purposes designed to operate after and release before the high voltage set. The Type USLS 465 is only 5 inches long and will withstand 10 kv at its minimum capacity of 5 mmfd and 5 kv at its maximum capacity of 465 mmfd. Both units will withstand 10G vibration to 500 cycles, 30G shock, and 50 hours salt spray.

Send for catalog literature on Jennings complete line of vacuum capacitors and relays.



USL-5-465
VACUUM
VARIABLE
CAPACITOR



TYPE RB3
VACUUM
TRANSFER
RELAY

A LITTLE KNOWLEDGE . . . The technique of building "mathematical models" of businesses has intrigued mathematicians for some time, though selling the idea to business men has not been easy. The non-mathematical mind finds it difficult to comprehend that mathematical analogs of businesses can be manipulated to predict actual profit returns. It was made a little easier by the cooperative spirit of the businessmen. They were, as a matter of fact, awed.

But lately the mathematicians have begun to suspect that they have explained too much. Inquiries now sound like this, "What can Boolean algebra do for my business?"

RADIOACTIVE materials being transported across state lines are a concern and a problem of local state governments. An experiment is being conducted in New York City to determine whether it is feasible to monitor highways for the illegal transport of radioisotopes. Tracerlab Inc. designed a continuous radiation monitor which is checking all cars and trucks crossing New York's George Washington Bridge.

TV RECEIVERS have been installed on each tier of Cook County Jail, providing recreation for the 2,000 inmates in the maximum security institution. The jail is the only institution in the country permitting TV viewing by inmates under maximum security. The 37 Admiral receivers operate on their own built-in antennas.

ENGINEER EMPLOYMENT ads are one of the most reliable barometers of industry trends, and often tell interesting little stories of their own. Our eye was caught by this line, "CANADIANS COME HOME." "Salaries are not always equal to the highest. The weather can be miserably uncomfortable. But there are interesting and challenging jobs in companies whose future is geared to the country."

JENNINGS RADIO MANUFACTURING CORPORATION
970 McLAUGHLIN AVE., P. O. BOX 1278 SAN JOSE 8, CALIF

Jennings

Tung-Sol/Chatham CROWBAR Thyratrons

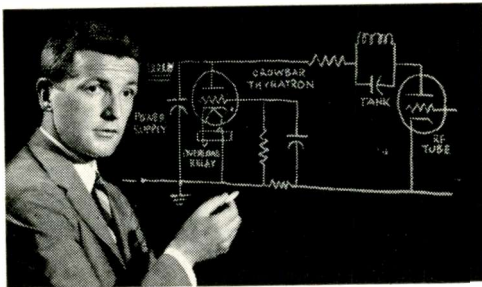
PROTECT HIGH-POWER CIRCUITS AGAINST DESTRUCTIVE ARCS

Any one of a host of causes can trigger internal arcs in high-power tubes with little or no warning . . . even if the tubes are well designed, operate in well-engineered circuits, and have conservative demands placed upon them. Cosmic rays, line-voltage transients, parasitic oscillations, spurious primary and secondary electrons and material whiskers are just a few of the potential sources of these highly destructive arcs.

But by engineering Tung-Sol/Chatham high reliability crowbar hydrogen thyratrons into your design, you can safeguard against costly arc-generated breakdowns. By short-circuiting destructive currents, these zero bias "arc-busters" extinguish the arcs before circuit elements can be damaged.

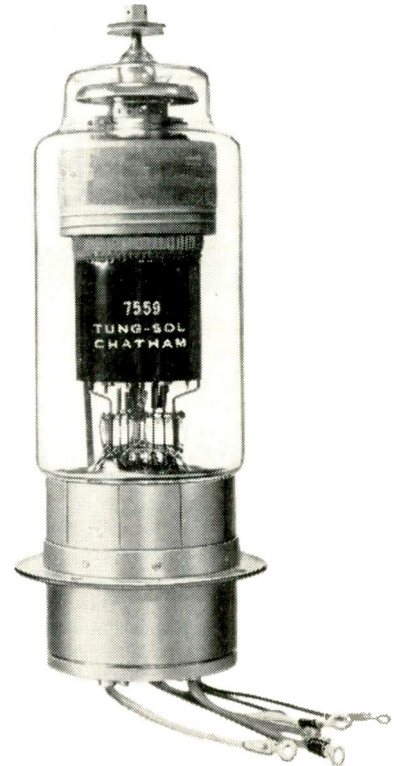
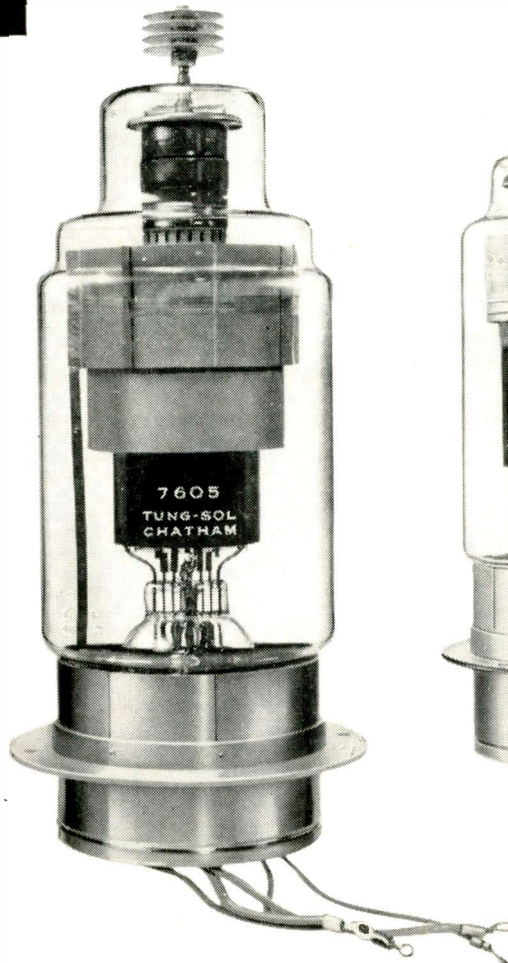
Instantaneous response and the ability to carry extremely large currents make these rugged thyratrons ideally suited for this purpose. Moreover, they are able to conduct these heavy surge currents even after having been idle for long periods. Each tube contains a hydrogen reservoir which promotes long life and permits optimum gas pressure adjustment for various operating conditions. Write for full technical details. Tung-Sol Electric Inc., Newark 4, N. J. TWX: NK193

Technical assistance is available through the following sales offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Philadelphia, Pa.; Seattle, Wash. Canada: Toronto, Ont.



Typical application: A crowbar thyatron is connected in series with a suitable impedance across the filter of the high voltage power supply for a high frequency amplifier tube. Whenever an arc occurs in the power

tube, the rising current is used to deliver a suitable signal to the grid of the thyatron. The thyatron immediately conducts to short circuit the power supply, until the protective circuit breaker opens 0.1 second later.



Type	DC. Anode Forward Voltage	Peak Cathode Current
7559	18KV	1500A
7568	25KV	800A
7605	25KV	2500A

 **TUNG-SOL**[®]

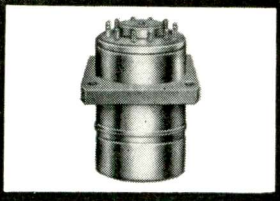
FAIRCHILD
SENSING
DEVICES
PROVEN
IN FLIGHT



SATURN

WILL BE ON COURSE!

...AIDED BY 3 FAIRCHILD GYROS



This is the huge Saturn Super-Booster under development for the National Aeronautics and Space Administration at Redstone Arsenal, Alabama. Consisting of eight H-1 liquid propellant engines with a combined thrust rating of 1.5 million pounds, it will be four times as powerful as the largest group of engines available to the free world today. When assembled with second, third, fourth and possible fifth stages, Saturn Super-Booster will be able to put several tons of instruments on the moon.

Each mammoth Saturn vehicle may have three sub-miniature FAIRCHILD RG-101 RATE GYROS at the heart of the main control system. Now under evaluation by NASA at Huntsville, each of these thimble-sized gyros (weighs only two ounces) measures rates about one of three mutually perpendicular axes—generates anticipatory corrective signals to keep Saturn on course.

Built to the most demanding specifications, these RG-101 floated gyros represent the most advanced state of the art—another reason why Fairchild is the foremost manufacturer of high-performance precision sensing devices.

See you at the WESCON Show, Booth No. 2603

Fairchild components . . . built and tested beyond the specs for Reliability in Performance.

Fairchild RG-101 floated rate gyros are the smallest made by anyone! And the most rugged!—Only $\frac{1}{8}$ " diam. x $1\frac{1}{2}$ " long. Withstand 150 g's of shock and 30 g's vibration to 2000 cycles without damage, over the entire design range 5 degs./sec. to 1000 degs./sec. max. rate. Threshold rate is less than .025 degs./sec. Self-test capabilities for easy remote checkout. Gimbal system's freedom of movement can be checked over entire range of travel, from limit stop to limit stop in most designs. Friction or threshold level, sensitivity, and even damping ratio can be checked from the blockhouse. Run-up time is less than five seconds, using over-voltage techniques.

FAIRCHILD CONTROLS CORPORATION
COMPONENTS DIVISION
225 Park Avenue, Hicksville, L. I., N. Y. • 6111 E. Washington Blvd., Los Angeles, Calif.
A Subsidiary of Fairchild Camera and Instrument Corporation

GYROS
PRESSURE
TRANSDUCERS
POTENTIOMETERS
ACCELEROMETERS

Tele-Tips

(Continued from page 44)

RED CHINA has started production of an 18-tube TV receiver. The 5-channel set uses tubes manufactured in China, except for the picture tubes, which are imported.

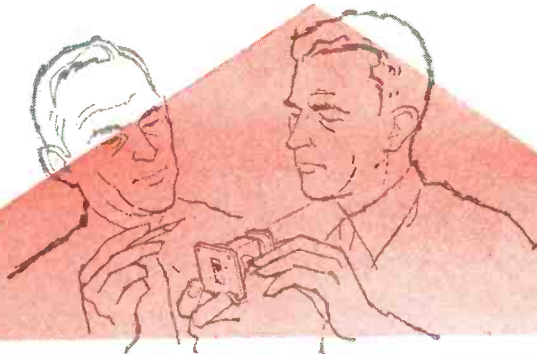
RADIO SETS in the world, outside the U. S. and Canada, totalled 165,667,000, at the end of 1959. This was an increase of 12,000,000 sets during the previous 12-month period. The biggest rise, 3,300,000 sets, to a total of 26,520,000, occurred in Communist Eastern Europe, half of it in the Soviet Union.

REPLACEMENT TV market may be larger than expected. A survey by Storer Broadcasting Co. found that 50% of all sets are at least five years old. A surprising 15% are ten years old or older.

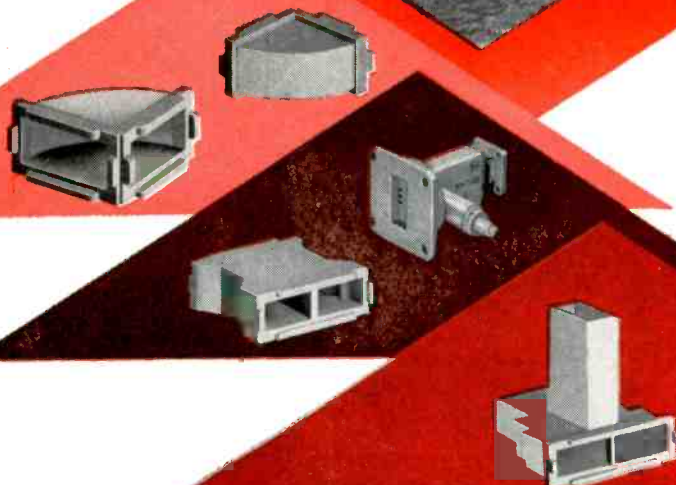
DREAM ANALYZER. An Illinois Bell Telephone staff engineer reports progress on a subvocal interpreter, a dream analyzer that can codify speech that can not be heard from a sleeping person. The instrument measures lip movements and vocal cord vibrations and translates them into symbols for interpretation.

CLOSED-CIRCUIT TV is being installed in one New York City apartment house to keep an eye on the self-service elevator, to protect passengers against muggers. A Dage TV camera in the elevator car is connected to a screen in the lobby so that the lobby attendant can take immediate action in case of trouble. A 2-way sound system is included in the installation.

FCC ENGINEERS are playing a hand in the Cuban troubles, diligently monitoring illegal transmitters in the Florida area beamed at the Cuban mainland. One illegal transmitter has already been seized at Tavernier in the Florida Keys. The two operators, a man and a woman, were arraigned in Miami for violating the sections of the Communications Act dealing with illegal operations of transmitters.



COMPREHENSIVE MICROWAVE COMPONENT CAPABILITIES



This modern three-quarter-acre plant has significantly expanded the services and production capabilities of Microwave Associates' experienced Waveguide Components Division. This new research and production facility is one of the most completely equipped on the east coast. A large 3' x 2' capacity dip-brazing unit as well as complete plating and other shop facilities are now handling both large volume and custom-engineered orders. Components are precision-machined and produced in beryllium-copper, cast and fabricated aluminum, and cast magnesium.

Over 500 microwave components for applications from 1.12 to 90.0 kMc/s are standard items. Our Sales Engineers will gladly discuss current work in sophisticated components and RF packaging with you.

A FEW OF THE MANY COMPONENTS MANUFACTURED HERE

New High-Power Varactor Harmonic Generators — excellent suppression of unwanted harmonics and record power levels are available from these solid-state harmonic generators.

New Cast Bends — Zero bend radius — 90° E and H plane bends in S through Ka bands... Each bend is compensated to a VSWR of 1.05 over its entire waveguide band.

Sidewall Hybrid Couplers (3db) and H-Plane Folded Hybrid Tees — Cast in aluminum and beryllium-copper are available in S through Ka-band models.

Two New Catalogs — Waveguide Components Short-form Catalog (CSF-60) gives data on over 500 items of waveguide components and test equipment.

Pressure Window Catalog (12 pages) contains electrical and mechanical data on a complete line of glass-kovar, mica, and special pressure windows plus valuable installation and testing tips.

MICROWAVE ASSOCIATES, INC. Burlington, Mass. • Western Union FAX • TWX: Burlington, Mass. 942 • BRowing 2-3000
Export Sales: Microwave International Corporation, 36 West 44th St., New York, New York.

Letters

to the
Editor

"New Product Program"

Editor, ELECTRONIC INDUSTRIES:

In accordance with our planned expansion, we have set up a New Product Program for the purpose of seeking additional new products to manufacture, or new product ideas to develop, or existing companies for acquisition or merger.

As you well know, B&K in just a few years has become one of the largest test equipment manufacturers in the country. This has been due to a fresh and practical approach in the electronics servicing field.

The New Product Program is aside from our own regular product research and development engineering. It opens up an unusual opportunity to individuals or companies with products or ideas.

However, we are not limiting our scope to the test equipment field. We will consider consumer products as well as other service and industrial items. Naturally, in any submission of products or ideas, there is no obligation either way.

Carl Korn
President

B & K Manufacturing Company
1801 W. Belle Plaine Ave.
Chicago 13, Ill.

"Designing Microwave Printed Circuits"

Editor, ELECTRONIC INDUSTRIES:

I am attaching to this letter a request from the Navy Department for a reprint from my recent article as indicated. Please send them a copy if one is still available.

For your information, I have been writing magazine articles for about fifteen years and I have never seen a response from readers as great as the one I received from this article. I have long since exhausted my supply of reprints and I have received correspondence and telephone calls from many people expressing interest in the article. This is an excellent measure of the coverage and value of your fine magazine.

Allan Lytel, Manager
Defense Marketing Publications
Avco Corporation
Crosley Division
Cincinnati 25, Ohio

"EI at ARDC"

Editor, ELECTRONIC INDUSTRIES:

It was a pleasure to hear from you again after a lapse of so many years since you published my last article—I believe on Equipment Reliability. I must agree that the fault
(Continued on page 50)

IS STATIC POWER YOUR PROBLEM?

For Airborne Power Packages...

whether it's an extensive R&D project or a simple component, ITT takes over your power problem at the design inception... carefully analyzes the load... and engineers the package to assure system performance. Add to this ITT's vast inventory of proven power designs and application data, and the results are reliable power solutions... faster... more economically.

ITT power specialists build systems to work from battery, industrial or airborne sources... are particularly experienced with transformer-rectifiers, high-voltage and multi-output regulated power supplies.

Put your next power problem in the hands of ITT's power specialists. Contact your local ITT power representative, or write us for Data File EI-1047-2.

Airborne Power: Missile Launchers, Integrated Multi-Output Power, High Voltage Display Tube Power, Constant Current Klystron Coil Power, Emergency Aircraft Power, T/R Units (AC to DC), Transistorized Supplies, Converters (DC to DC), Inverters (DC to AC), DC and AC Controls.

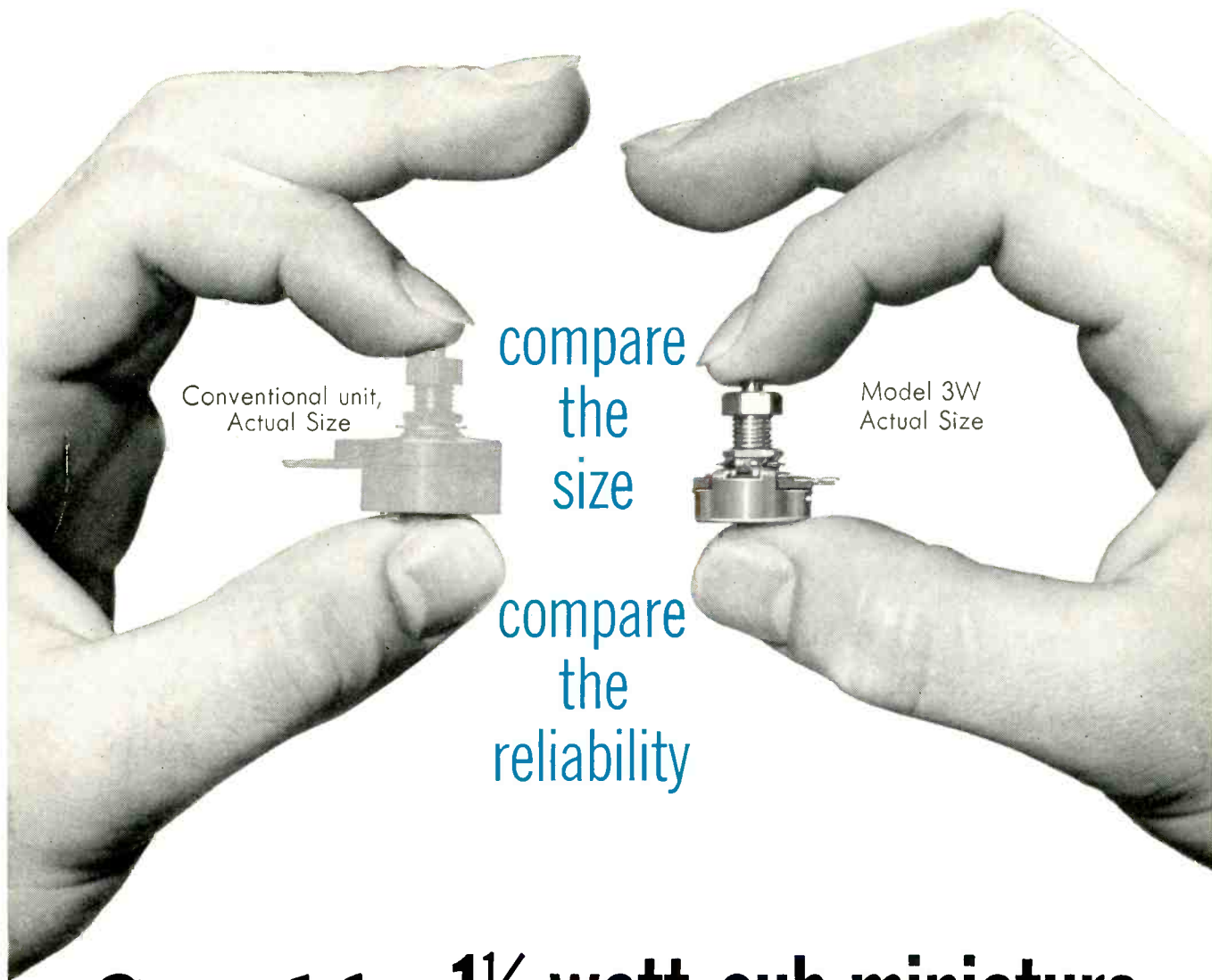
Openings exist for qualified Engineers.

PUT
YOUR
STATIC
POWER
CONVERSION
REQUIREMENTS
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HANDS
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Industrial Products Division
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static power conversion • instruments • closed circuit television



Centralab's $1\frac{1}{2}$ watt sub-miniature Wirewound Variable Resistor

CENTRALAB'S Model 3W is the smallest $1\frac{1}{2}$ watt variable resistor on the market— $\frac{1}{3}$ smaller than otherwise similar units! Designed especially for high reliability applications, it meets the environmental and electrical specifications of MIL-R-19. The Model 3W is recommended for high temperature operation up to 125°C . Its completely closed construction is designed for sealing or potting.

SPECIFICATIONS:

Dimensions: $\frac{11}{16}$ " maximum diameter over encapsulation. $\frac{5}{16}$ " depth.

Shaft: 0.125" diameter stainless steel.

Terminals: Gold-plated nickel silver.

Resistance range: 4 ohms to 30K ohms $\pm 10\%$, linear taper.

Rating: $1\frac{1}{2}$ watts at 40°C .

Complete specifications on the Model 3W variable resistor are given in CENTRALAB Technical Bulletin EP-891. Write for your free copy.

Centralab  

B-6016

SEE US AT WESCON, Booth 664
The Electronics Division of Globe-Union Inc.
938H E. Keefe Ave. • Milwaukee 1, Wisconsin
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ELECTRONIC SEAM WELDING

fastens with parent-metal strength.

Here's the newest technique in electronic welding—automatic spot or seam welding from the same power supply! Weldmatic's new Model SA-3010 Varimatic Seam Weld Control connects to 115 volts a.c. and any Weldmatic power supply to give you these six advantages:

Structural seam welds with original parent-metal strength

30 to 180 welds per minute at a continuous adjustable rate

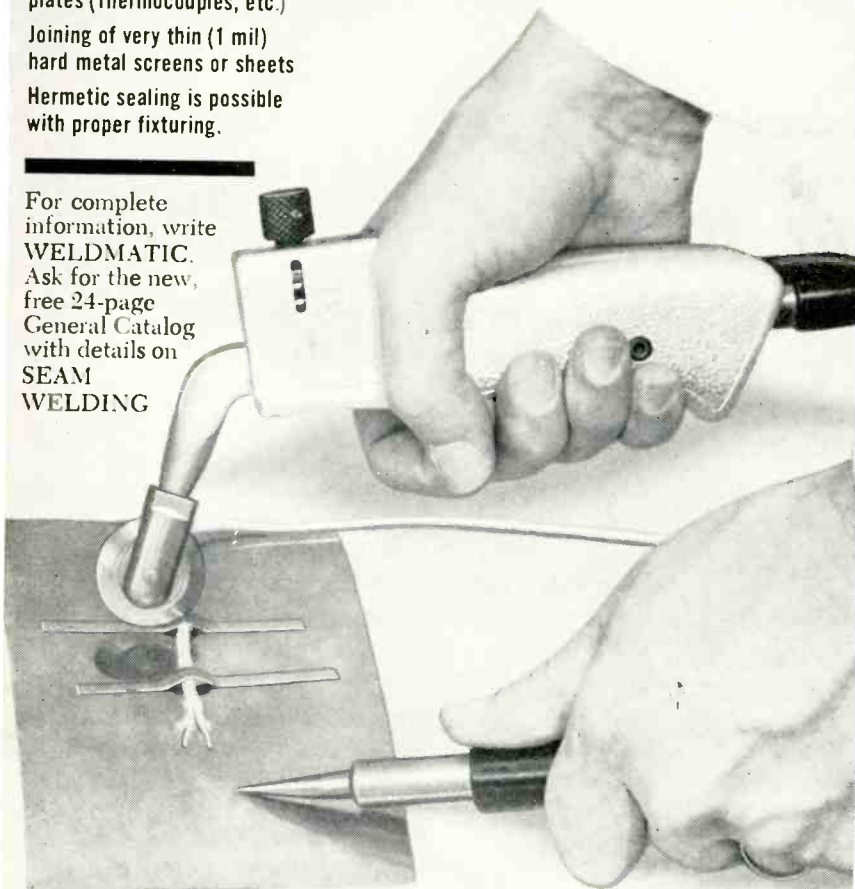
Ideal preliminary fastening of metals prior to final assembly

Quick fastening of strips and protective plates (Thermocouples, etc.)

Joining of very thin (1 mil) hard metal screens or sheets

Hermetic sealing is possible with proper fixturing.

For complete information, write WELDMATIC. Ask for the new, free 24-page General Catalog with details on SEAM WELDING



UNITEK Corp.

WELDMATIC DIVISION • 950 Royal Oaks Drive, Monrovia, California

Letters

to the Editor

(Continued from page 48)

has been all mine.

Electronic Industries has a good circulation in the newly-formed, autonomous Communications Laboratory under the reorganization of Wright Air Development Division. I find it most valuable for keeping current with advances in the state of the electronic art and often refer articles to subordinate engineers for further investigation. All of us appreciate the job your periodical is doing and hope for an even brighter future along with the snowballing advances in technology today.

George H. Scheer
Chief, Basic Techniques Branch
Communications Laboratory
Wright Air Development Division
Air Research and Development
Command
United States Air Force
Wright-Patterson Air Force Base,
Ohio

"Human Factors—"

Editor, ELECTRONIC INDUSTRIES:

It would be appreciated if you forwarded to me a reprint of the article, "Celent, C. Human Factors—Newest Engineering Discipline, Electronic Industries, 19, 2, 86-100."

I would like to draw your attention to the following errors in the article:

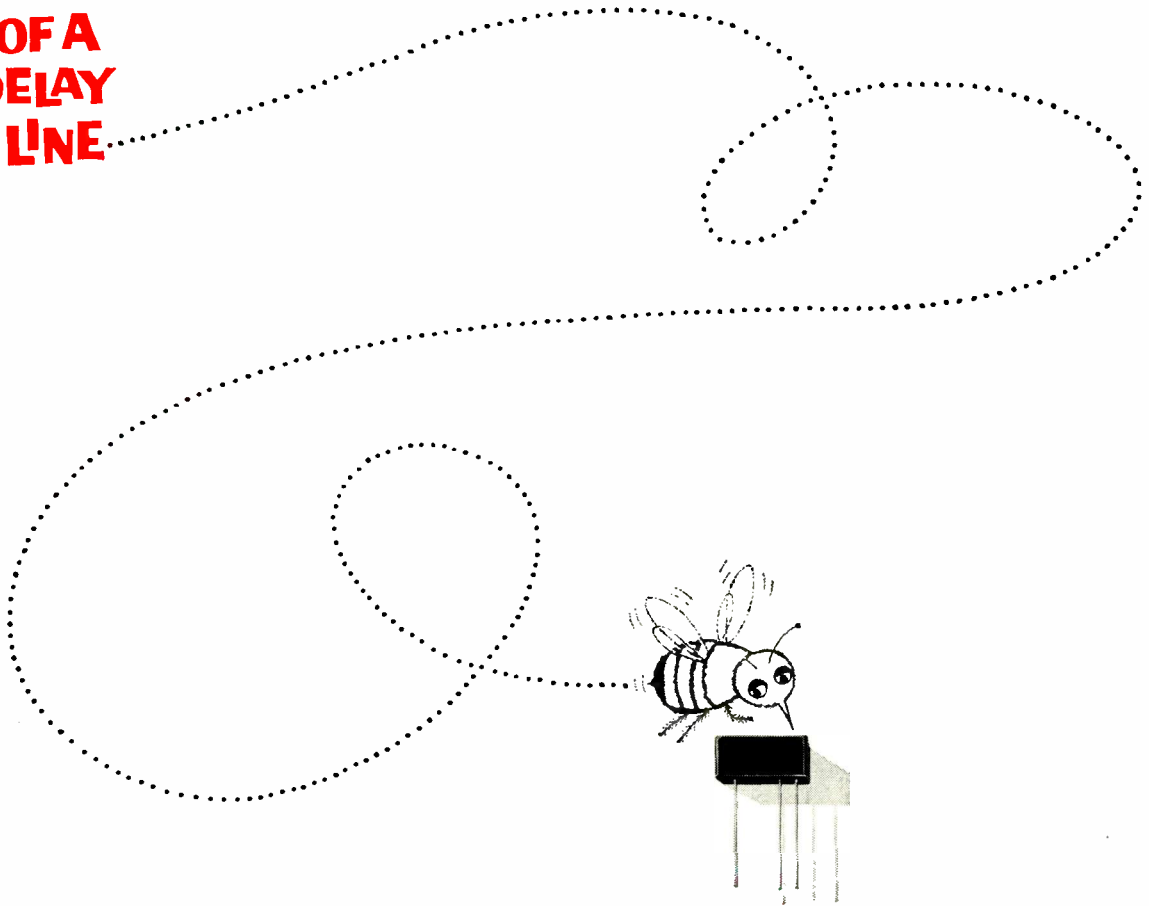
- (1) p. 95 *Randolf A. F. Base for Randolph A. F. Base.*
- (2) p. 99 *Electrol Minescesne, for Electro-luminescence.*
- (3) p. 99 *The simulation room provides sound attenuation of at least 30 db at 125 cycles, instead of the simulation room provides sound attenuation down to 30 db SPL at 125 cycles.*
- (4) p. 100 *Under reference #9. Allowed auditory signal for, a loud auditory signal.*

As implied in the article, the total human factors work for the new SAC control system (p. 95) is not being done by the System Development Corporation. International Electric Corporation, the System Manager for Contract 465L, has its own human factors staff and counts SDC (for system training) as only one of many sub-contractors in this effort.

Dr. John J. O'Hare
Systems Engineering Group
International Electric Corporation
Paramus, N. J.

Ed: Dr. O'Hare is quite right on items (1) and (2). But item (3) is correct as printed in the article. As for item (4), what can we say . . .

**A
HONEY
OF A
DELAY
LINE**



**ESC'S NEW
SUBMINIATURE
LUMPED CONSTANT
DELAY LINE***

Model 16-92 is the latest example of creative versatility from ESC, America's largest producer of custom-built and stock delay lines. The specifications: 1/10 usec. delay, 1,600 ohm impedance, 1/4" x 1/4" x 1/2" dimensions. Only ESC produces so many different delay lines, for so many varied applications. From the largest to the smallest, ESC has the best, most economical answer to your particular delay line problem. Write today for complete technical data.

**shown actual size*



ESC

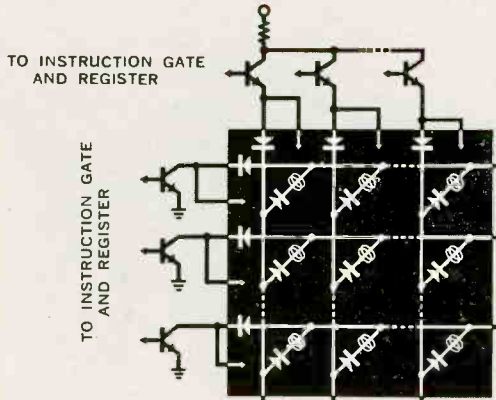
See You at the Wescon Show — Booth # 906

*exceptional employment opportunities for engineers experienced
in computer components... excellent profit-sharing plan.*

ELECTRONICS CORP. 534 Bergen Boulevard, Palisades Park, New Jersey

Distributed constant delay lines • Lumped constant delay lines • Variable delay networks • Continuously variable delay lines • Step variable delay lines • Shift registers • Video transformers • Filters of all types • Pulse-forming networks • Miniature plug-in encapsulated circuit assemblies

NEW



Typical n-junction matrix for n-stage matrix configuration. Fairchild 2N1613 transistors and FD200 diodes, used throughout, guarantee acceptable leakage, switching speed and conductance values up to 125°C.

ANSWER

TO COMPUTER MATRIX PROBLEMS

LOW LEAKAGE TRANSISTORS AND FAST RECOVERY, LOW CAPACITANCE DIODES FROM FAIRCHILD

Approach to the ideal matrix. 2N1613 silicon transistors and FD200 silicon diodes from Fairchild are unique in making feasible the ideal matrix. They give you low leakage and low capacitance with high conductance and high speed, even at high ambient temperatures. These characteristics are combined only in Fairchild Planar devices. With them you can now largely ignore stray leakage or capacitance build-up across the matrix. Temperature effects and long-term performance decay are no longer critical. You can eliminate complex circuitry previously necessary in designing around these losses.

Fairchild's Planar structure for transistors and diodes features the industry's most advanced diffusion and surface passivation techniques. Current leakage is reduced to 10 m μ A maximum (2N1613) and 0.1 μ A maximum (FD200) at 25°C. Maximum values at 150°C are 10 μ A and 100 μ A.

Surface passivation also prevents significant degeneration of parameters during circuit life which could introduce error or failure in the matrix. This technique also lends itself to precisely controlled manufacture, assuring excellent product uniformity.

2N1613 ELECTRICAL CHARACTERISTICS (25°C except as noted)

Symbol	Characteristic	Min.	Typical	Max.	Test Conditions
h_{FE}	D.C. Current Gain	40		120	$I_C = 150 \text{ mA}$ $V_{CE} = 10 \text{ V}$
$V_{BE(sat)}$	Base Saturation Voltage			1.3V	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$
$V_{CE(sat)}$	Collector Saturation Voltage			1.5V	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$
C_{ob}	Collector Capacitance	18		25 μf	$I_E = 0$ $V_{CB} = 10 \text{ V}$
I_{CBO}	Collector Cutoff Current	0.8 m μ A	1.0 μ A	10 m μ A	$V_{CB} = 60$ $T = 25^\circ\text{C}$ $V_{CB} = 60$ $T = 150^\circ\text{C}$

FD200 ELECTRICAL SPECIFICATIONS (25°C except as noted)

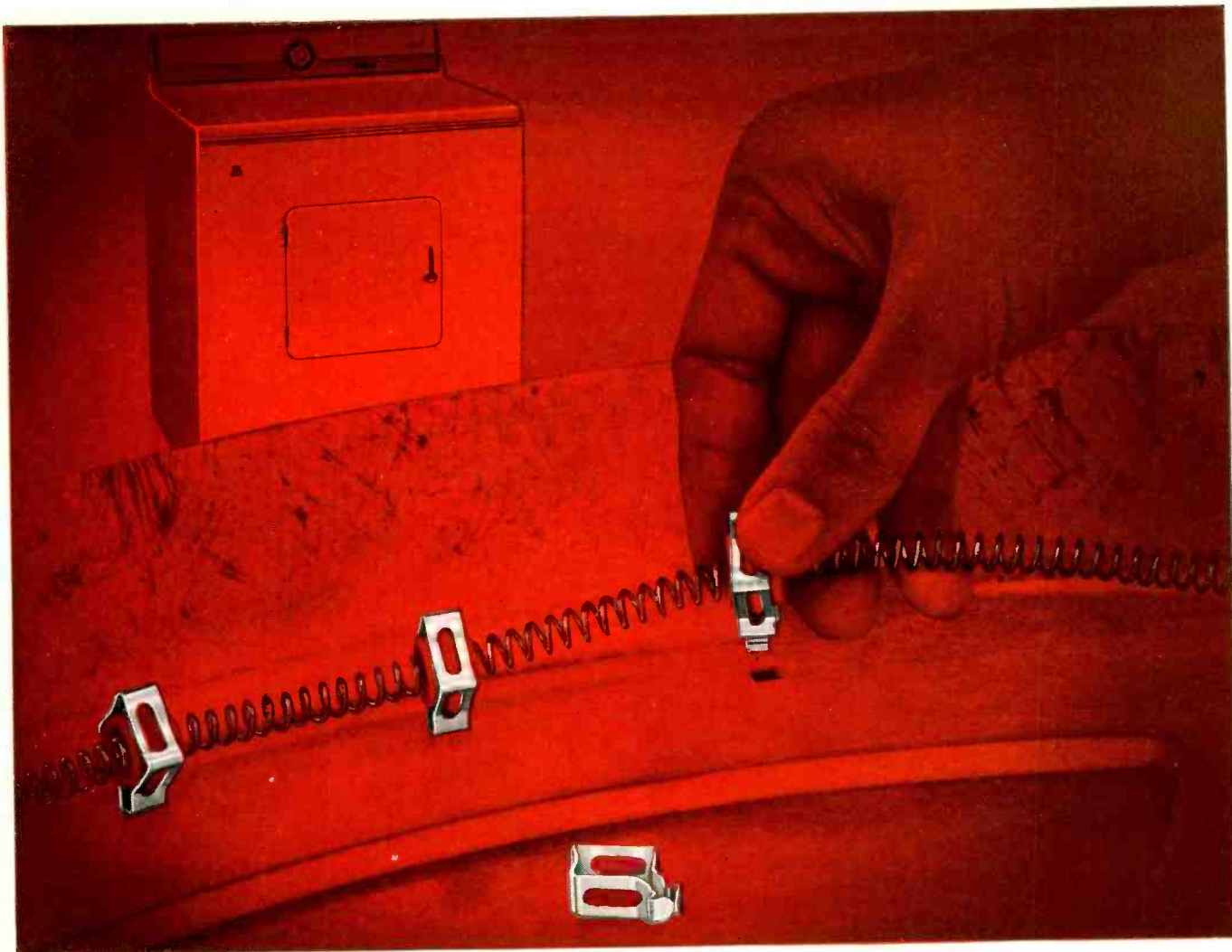
Symbol	Characteristic	Min.	Typical	Max.	Test Conditions
V_F	Forward Voltage			1.0V	$I_F = 100 \text{ mA}$
I_R	Reverse Current			0.1 μ A	$V_R = -150 \text{ V}$
I_R	Reverse Current (150°C)			100 μ A	$V_R = -150 \text{ V}$
B_V	Breakdown Voltage	200 V			$I_R = 100 \mu\text{A}$
t_{rr}	Reverse Recovery Time			50.0 m μ sec	$I_f = 30 \text{ mA}$ $R_L = 150\Omega$ $I_r = 30 \text{ mA}$
C_0	Capacitance			5.0 μf	$V_R = 0 \text{ V}$ $f = 1 \text{ mc}$
RE	Rectification Efficiency	35%			100 mc
	Forward Voltage Temperature Coefficient		-1.8 mV/oC		



A Wholly Owned Subsidiary of
Fairchild Camera and Instrument Corporation

For specification sheets, write Dept. J

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SPEED CLIPS® reduce costs, simplify assembly and servicing on Maytag "Halo of Heat" Dryer

Clothes are dried efficiently in the famous Maytag "Halo of Heat" automatic dryer. And now the quality of the "Halo of Heat" dryer is even better than ever because its unique circular heating element is fastened quickly, securely by 22 special Tinnerman SPEED CLIPS developed by joint efforts of Tinnerman and Maytag designers.

Each one-piece SPEED CLIP eliminates a separate welding operation on the "Halo of Heat" assembly. Various screw-driving operations formerly required on Maytag's assembly line to capture the ceramic insulator and secure the mounting clamp were also eliminated, with equally interesting reductions in cost. Now, the stainless steel, vibration-proof fastener is snapped in place with simple "button-hook" action. No special skills or equipment are required. Assembly and parts costs have been reduced... *substantially!* Serviceability in the field has been improved.

A free Tinnerman Fastening Analysis of your own product can show you where similar assembly and cost-saving advantages are possible. Call your Tinnerman representative—he's listed in the Yellow Pages under "Fasteners". Or write to:

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Dept. 12 • P. O. Box 6688 • Cleveland 1, Ohio

TINNERMAN

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*Sylvania introduces
a new concept in*

MICROMINIATURIZATION

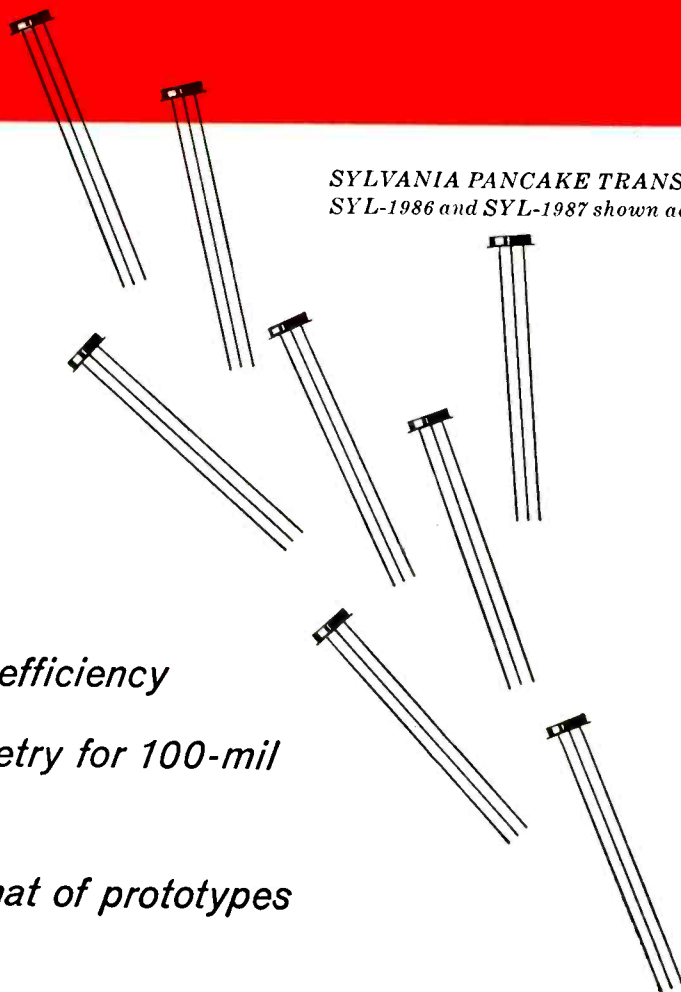
• wafer thin! • feather light!

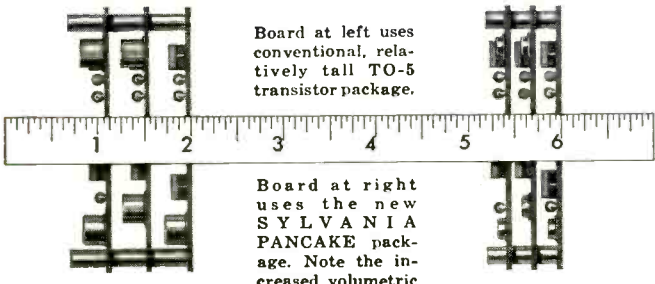
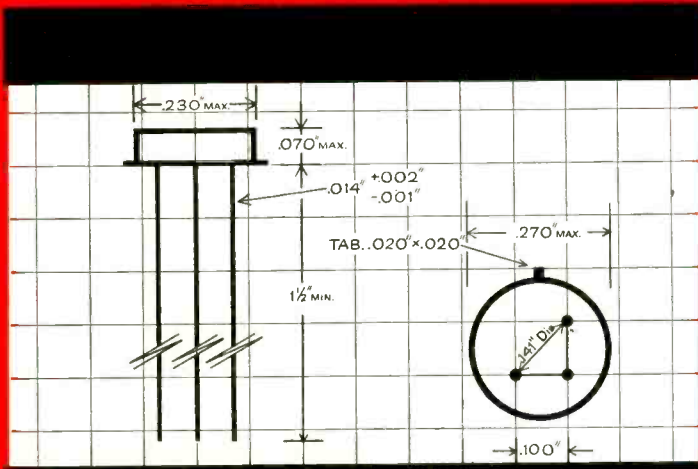
"PANCAKE" TRANSISTORS

*Now...
a new
dimension
in packaging
that offers...*

- * exceptional volumetric efficiency*
- * correct pin-circle geometry for 100-mil automation grid-system*
- * performance equal to that of prototypes*
- * increased ruggedness*

*SYLVANIA PANCAKE TRANSISTORS
SYL-1986 and SYL-1987 shown actual size*





Board at left uses conventional, relatively tall TO-5 transistor package.

Board at right uses the new SYLVANIA PANCAKE package. Note the increased volumetric efficiency.

PANCAKE TRANSISTORS — a SYLVANIA development — herald a new era in the art of designing subminiaturized electronic equipment. PANCAKE TRANSISTORS are 85% smaller, 85% lighter in weight than their larger electrical counterparts. PANCAKE TRANSISTORS are shorter in height than the diameter of conventional 1/2-watt resistors, flatter than conventional silvered-mica capacitors.

PANCAKE TRANSISTORS are equipped with leads spaced to fit the 100-mil grid-system for automated installation. PANCAKE TRANSISTORS feature clear-glass stress-free matched seals, true chemical bonds that offer exceptional hermetic reliability and strength, excellent resistance to thermal shock. PANCAKE TRANSISTORS withstand atmospheric pressure as high as 200 p.s.i., enabling high-pressure leakage tests for military and industrial quality-assurance.

SYLVANIA launches its PANCAKE program with two germanium alloy switching types: PNP type SYL-1986 (electrically similar to 2N404) and NPN type SYL-1987 (electrically similar to 2N388). Many other types utilizing drift, mesa, and alloy-junction techniques are under development at Sylvania.

FOR CONSULTATION on PANCAKE transistor value to your circuit developments, contact your Sylvania Representative. For technical data, write Semiconductor Division, Sylvania Electric Products Inc., Dept. 198, Woburn, Mass. Sylvania PANCAKE TRANSISTORS also available through Sylvania franchised Semiconductor Distributors.

Tentative data

MAXIMUM RATINGS AT 25°C	SYL-1986	SYL-1987
Collector to Base Voltage	-25V	25V
Collector Current	100mA	200mA
Power Dissipation	100mW	100mW
Temperature Range	-55°C to +100°C	-55°C to +100°C
Alpha Cutoff Frequency (min.)*	4Mc	5Mc

* $(V_{cb} = 6V, I_e = 1.0mA)$ $(V_{cc} = 6V, I_c = 1.0mA)$

SYLVANIA

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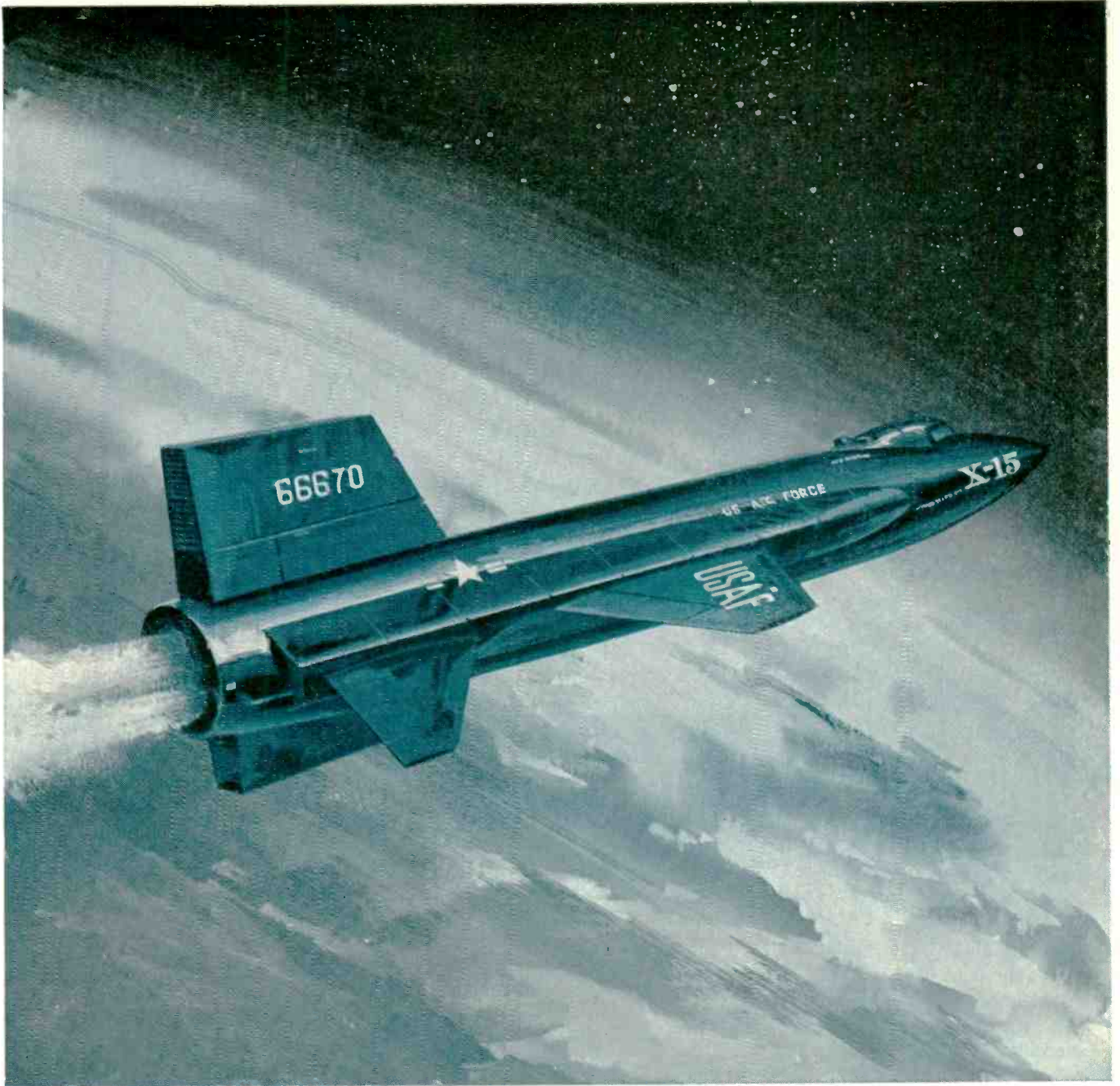


Whatever the beat you wish to "equal" or check out, you'll find the Bulova portable lab and field standard assures an uncompromised balance between stability and reliability.

For instance, the FS-100 will hold to $\pm 1\text{pp}10^7$ in the 10kc thru 20 mc range... or to $\pm 1\text{pp}10^9$ in the 50kc thru 10 mc group—for a full twenty-four hours. Its output is 1v P to P into 1K, sine or square wave, in either rating, with a 115v ac input

or with its own self-contained, rechargeable power pack. Though it measures only a scant 6 x 8 x 8 inches—power supply and all—the advanced design and transistor construction of the FS-100 underwrites a life expectancy of over 25,000 hours.

For more information on how the Bulova FS-100's portability, reliability and stability can assist you in pulling more accurate on-the-spot checks, write Department 1672, Bulova Electronics, Woodside 77, New York.



Spark for the edge of outer space:

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The X-15 project is a truly national research effort by the Air Force, Navy, and National Aeronautics and Space Agency. In manned flight, the X-15 will scorch through uncharted skies at speeds of more than 4,000 miles an hour.

This edge-of-space craft will take its pilot closer to

the stars than any human has ever dared to venture. 50,000 pounds of thrust will be provided by the most powerful single-chamber rocket engine ever built for manned flight. The ignition system was specially designed and produced for this installation by Bendix® . . . foremost name in ignition.

Scintilla Division
SIDNEY, NEW YORK



Canadian Affiliate: Aviation Electric Ltd., 200 Laurentien Blvd., Montreal 9, Quebec. Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

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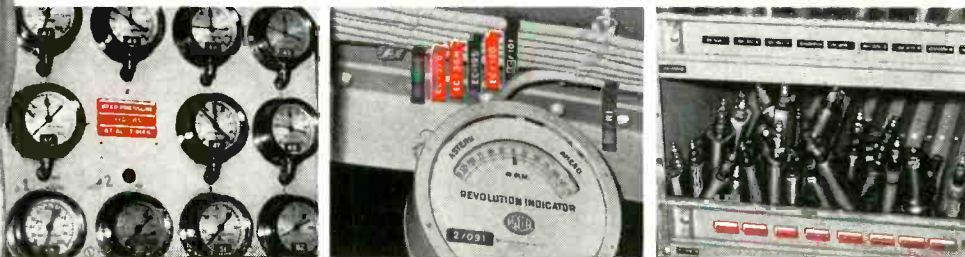
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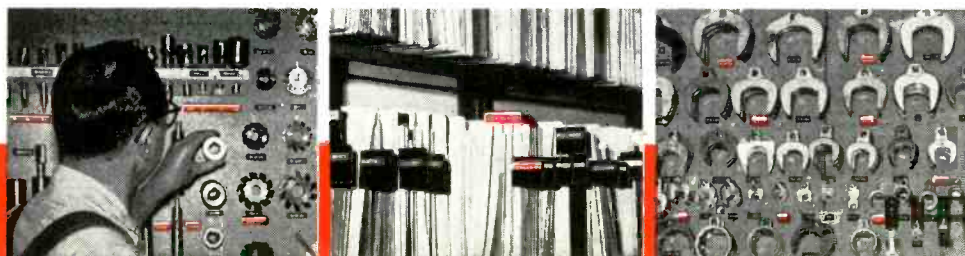


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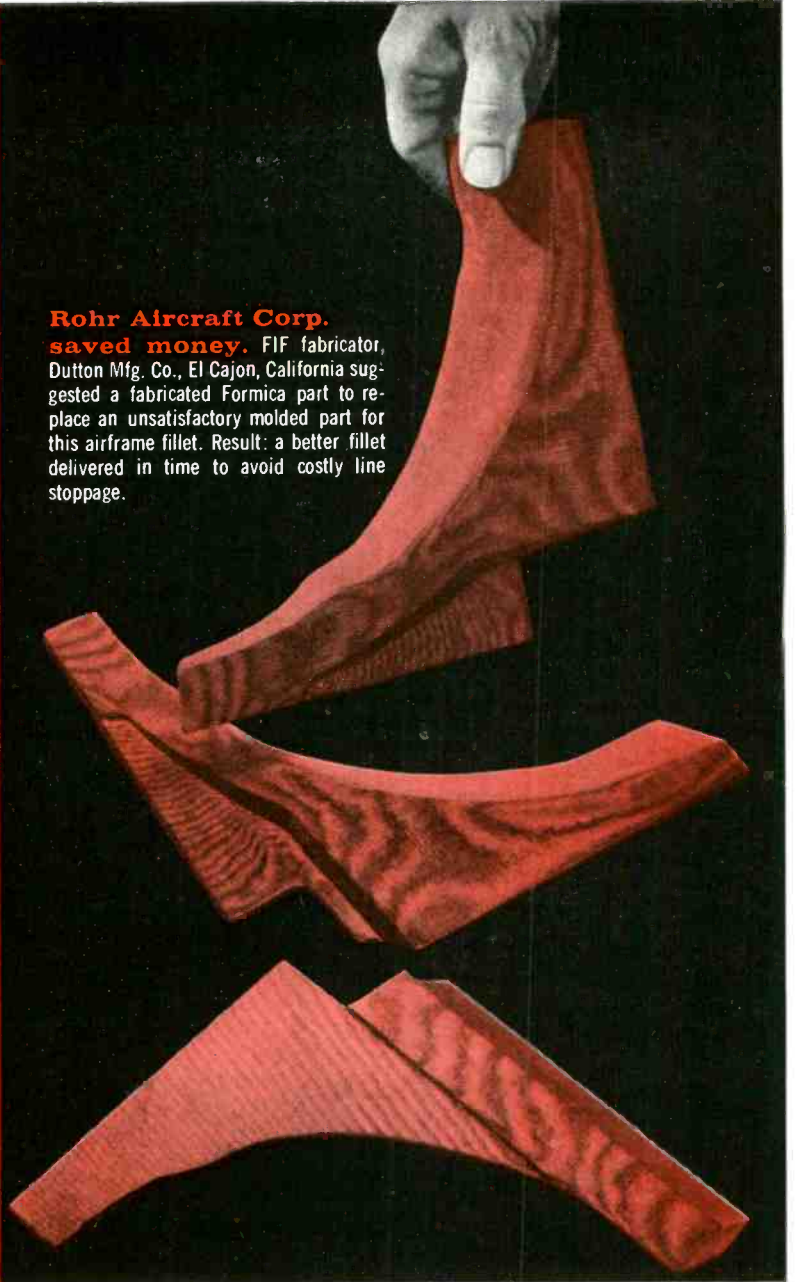
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Marlin-Rockwell Corp. saved time with the fast service received from Curbell, Inc. Buffalo FIF fabricator. M-R-C needed 1500 Formica grade LN-42 ball bearing retainer ring blanks machined to precise length, ID and OD within 24 hours. Actually delivered in 14 hours!



Rohr Aircraft Corp. saved money. FIF fabricator, Dutton Mfg. Co., El Cajon, California suggested a fabricated Formica part to replace an unsatisfactory molded part for this airframe fillet. Result: a better fillet delivered in time to avoid costly line stoppage.



Here's proof new **FORMICA**® fabricated parts service can save you time and money

Rohr Aircraft, Marlin-Rockwell and many other leading manufacturers now save time and money on the new and dependable parts service offered by their local Fabricators of Industrial Formica laminated plastics. So can you. Regardless of your location, there's an *FIF fabricator nearby. He's equipped to deliver *all* your fabricated parts faster, simple or complex, in prototype or production quantities. He'll adhere strictly to your

blueprint specs, and will give you cost-cutting parts design and materials selection suggestions, too.

So, for *better parts faster*, be sure to contact your local FIF fabricator. Phone your Formica district office for his name and address, or write Formica Corporation, a subsidiary of American Cyanamid, 4536 Spring Grove Ave., Cincinnati 32, Ohio.



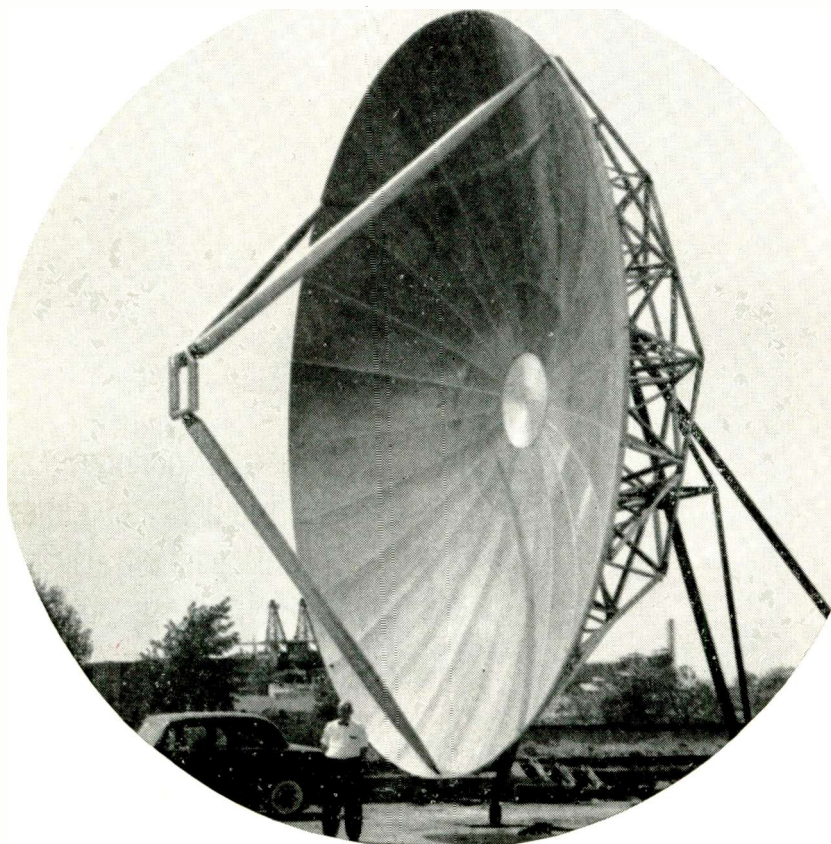
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* **FIF** This seal identifies your local Fabricator of Industrial Formica. Remember: FIF for the fastest parts service, Formica for the finest laminated plastics.

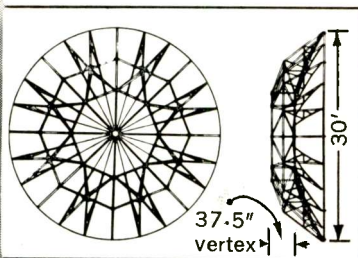
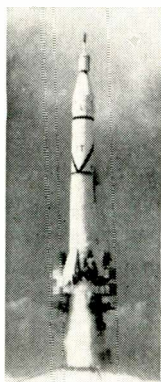
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Personals



This precision 30-foot antenna has a more accurate surface than any other production parabolic reflector of comparable size.



Antenna System's new solid surface, high precision 30-foot antenna (model 103) is designed to set a new standard for accuracy in the fields of radio astronomy, tropospheric scatter propagation, tracking radar, and experimental test installations. It features:

- High precision — The static surface tolerance of the first unit has been measured. The deviation from the ideal curve measured 0.033 inches RMS.
- Has an f/d ratio of 0.417 which readily adapts to a wide variety of feed systems.
- Fully machined sections are interchangeable and easy to assemble.
- Solid surface panels permit use at any frequency.
- Useable with a wide variety of feed support systems.
- Built to withstand 150 MPH wind with 4" ice.
- Can be mounted on either the top or side of a tower with azimuth and elevation adjustments, on el-az or equatorial pedestals, self-contained trailer tower mounts, or other types of mounts.

Write for specification sheet.

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Foto-Video Electronics, Inc., has appointed Robert D. Hamilton as Head of the Systems Engineering Dept. at the Cedar Grove, N. J., operations. He was formerly Consulting Engineer with IBM Corp.

William Goldman was appointed Research Supervisor of Engineering Equipment for Keuffel & Esser Co. He was formerly a Research Chemist for K&E.

Beryl L. McArdle has been appointed Scientific Advisor on the staff of Dr. Royal Weller, Vice President for Engineering of the Stromberg-Carlson Div., General Dynamics Corp., Rochester, N. Y.

A. B. Buchanan has established an independent engineering consultant business. The address is 2000 Second Ave., Detroit 26, Mich.

Dr. William L. Firestone has been appointed Director of Engineering for Motorola's Communications Div., Chicago, Ill. He was Chief Engineer of the Applied Research Dept. for Motorola in 1956.



Dr. W. L. Firestone



Dr. Henry T. Minden

Dr. Henry T. Minden has been appointed a Physicist at the General Electric Advanced Semiconductor Laboratory at Electronics Park, Syracuse, N. Y.

Donald S. Elkort has joined Narda Microwave Corp., Mineola, L. I., as Microwave Engineer. He was formerly Associate Project Engineer with the Microwave Electronics Div. of Sperry Gyroscope Co.

Richard C. Landis has been promoted to Chief Engineer and Quality Control Manager at Printronics Corp., Palo Alto, Calif.

Gustave A. Bleyle has been appointed Vice President in Charge of Engineering Activities at Arthur D. Little, Inc., Cambridge, Mass.

Lawrence T. Garnett has joined Robertshaw-Fulton's Aeronautical and Instrument Div., as Sr. Development Engineer. He was formerly Assistant Chief Engineer of the Electronic Control Div. of Manning, Maxwell & Moore, Inc.

TAPCO ELECTRICAL POWER COMPONENTS

TAPCO Group primary and auxiliary electrical power systems for space, missile, aircraft and ground power applications are tried and proven. Systems performed under environmental conditions including nuclear radiation, high-temperature, liquid metal vapor, zero-G and vacuum.

Below are typical TAPCO components now

available for integration into systems for such applications. Other available TAPCO electrical power components include tachometer generators, speed sensors, high temperature electromagnets and solenoids, nuclear reactor rod drive controls, static inverters, voltage regulators and electronic power conversion devices.

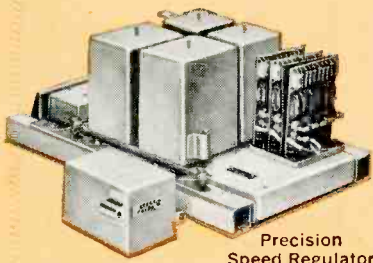
ALTERNATORS

Among the special purpose rotating machines designed by TAPCO is a series of high temperature alternators. These range in capacity from a few watts to 15 kw at temperatures up to 1000°F.

PERFORMANCE DATA: TYPICAL ALTERNATOR—Power Rating: 3 kw, 0.8 pf lagging. Ambient Temp.: 700°F. max. Operating Speed: 40,000 rpm. Output: 115v, 2000 cps. Inherent Voltage Regulation: $\pm 5\%$. Harmonic Content: 5% total. Efficiency: 85%. Weight: 9 lbs w/o shaft and bearings. Size: 3 $\frac{3}{8}$ " OD, 5 $\frac{1}{8}$ " long. Special Conditions: Operates in mercury vapor.



High Temperature Permanent Magnet Alternator



Precision Speed Regulator

VOLTAGE REGULATION AND SPEED CONTROLS

Associated with the TAPCO alternator and drive systems are system speed and voltage controls for extremely accurate frequency and voltage regulation. The unit shown is adaptable to many drive systems.

PERFORMANCE DATA: TYPICAL SPEED REGULATOR—Frequency Stability: 1 part in 100,000 integrated over minimum 1 hour period. Input: 115v, 400 cps. Output: 0-10v, 400 cps (phase reversing). Feedback: Valve position 0-57.5v, 400 cps. Environmental Conditions: -65 to +200°F, 50g shock for 11 millisecond., vibration 0.1" double amplitude from 3 to 23 cps, 10g from 23 cps to 10 kc. Weight: 10 lbs. Size: 12" x 6" x 5".

LIQUID METAL PUMPS

A rotating permanent magnet driven by an external source induces pumping force in the liquid metal within a hermetically sealed system. This concept provides operation without friction-producing rotating seals and provides exceptional reliability and life.

PERFORMANCE DATA: TYPICAL ELECTROMAGNETIC PUMP—Fluid: Sodium. Fluid Temperature: 1000°F. Capacity: 20 lbs/min. Driving Speed: 40,000 rpm. Pressure Rise: 3 psi. Weight: 3 lbs. Size: 2 $\frac{3}{4}$ " diam. flange bolt circle, 1/2" nominal pipe size.



Electromagnetic Sodium Pump

Tapco Group Export Representative:
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Books

Mathematical Methods for Digital Computers

Edited by Anthony Ralston and Herbert S. Wilf.
Published 1960 by John Wiley & Sons, Inc., 440
Park Ave., South, New York 16. 293 pages.

This book is of value to anyone who is interested in or has contact with digital computers. For such a reader the book offers mathematical analysis and derivations of commonly used techniques of digital computation; and detailed, step-by-step discussion of the actual processing of complex mathematical and physical problems.

Each chapter of the book has been contributed by a man in close contact with the latest developments in his field, and each deals with an important and representative mathematical problem. In each case the chapters follow a standard format—giving in order the purpose of the program, a mathematical analysis of the problem under consideration, the calculation procedures to be used, a detailed flow chart, a description of the flow chart, the memory requirements, an estimate of running time, and a list of references.

Photo Chemistry in the Liquid and Solid States

Edited by L. J. Heidt, et al. Published 1960 by
John Wiley & Sons, Inc., 440 Park Ave., South,
New York 16. 174 pages. Price \$6.00.

This book is based on a symposium sponsored by the National Academy of Sciences and the National Research Council. It contains the contributions of outstanding authorities in the field of photo chemistry.

The authors present the basic principles of photo chemistry storage, survey the field of photochemical reactions, and state the requirements for reaction types which might prove useful for storing solar energy. The book also presents basic research findings, and suggests those areas for further research which can and will lead to the use of the sun as an important and inexpensive source of energy.

The Relay Guide

By Raymond N. Auger. Published 1960 by Reinhold
Publishing Corp., 430 Park Ave., New York 22.

Now it is possible to find the ideal relay for any particular requirement in one convenient source.

Where one relay has many variations, the book provides tables or listings of them next to the basic model. A relay which belongs to more than one type is classified into the most specialized chapter in which it fits.

The guide presents application data, relay circuits, arc suppression information, relay definitions and terms in addition to relay descriptions. Custom made relays for which no specific de-

(Continued on page 68)

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Weatherford Co., 6921 San Fernando Rd., Glendale 1;
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COLORADO: Denver Electronics Supply Co., 1254
Arapahoe St., Denver 4.

DISTRICT OF COLUMBIA: Capitol Radio Wholesale
Inc., 2120 14 St., N.W., Wash., D. C.

FLORIDA: Elect. Supply, 909 Morningside Dr., Melbourne;
Elect. Supply, 61 N. E. 9th St., Miami.

ILLINOIS: Newark Electronics Corp., 223 W.
Madison St., Chicago 6.

MARYLAND: Kann-Ellert Electronics Inc., Howard
& Redwood Sts., Balt. 1; Wholesale Radio Parts
Co. Inc., 308 W. Redwood St., Baltimore 1.

MASSACHUSETTS: Cramer Electronics Inc., 811
Boylston St., Boston 16; Radio Shack Corp.,
730 Commonwealth Ave., Boston 17.

NEW JERSEY: Federated Purchaser Inc., 1021
U.S. Rte. 22, Mountainside; General Radio Supply
Co., 600 Penn St., Camden 2; Radio Elec.
Service Co., Inc., 513 Cooper St., Camden 2.

NEW MEXICO: Midland Specialty Co., 1712 Lomas
Bl. N.E., Albuquerque; Radio Specialties
Co., Inc., 209 Penn Ave., Alamogordo.

NEW YORK: Arrow Elect. Inc., 525 Jericho Turnpike,
Mineola, L. I.; Elect. Center Inc., 211 W. 19th
St., N. Y. 11; Harvey Radio Co., Inc., 103 W. 43rd
St., N. Y. 36; Lafayette Radio, 100 Sixth Ave., N. Y.
13; Terminal Elect. Inc., 236 W. 17 St., N. Y. 17.

NORTH CAROLINA: Dalton-Hege Radio Supply
Co., Inc., 938 Burke St., Winston-Salem.

PENNSYLVANIA: Almo Radio Co., 412 N. 6th St.,
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& Co., 2520 N. Broad St., Phila.; Wholesale
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Paisano Dr., El Paso; The Perry Shankle Co., 1801
S. Flores St., San Antonio.

UTAH: Carter Supply Co., 3214 Washington
Blvd., Ogden.

WASHINGTON: C & G Radio Supply Co., 2221
Third Ave., Seattle.

CANADA: Electro Sonic Supply Co., Ltd., 543
Yonge Street, Toronto 5, Ont.

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DM-10



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$\frac{1}{4}$ " wide ...

$\frac{1}{8}$ " thick!

Smaller than a
1-carat diamond!

Mica Capacitor...

Sets New Standard in Miniature Reliability!

■ This sub-miniature DM-10 Mica Capacitor retains the same superior electrical characteristics of silvered mica capacitors as found in much larger sizes. It assures a high order of performance in extreme miniaturization applications — missiles, printed circuits and all compact electronic equipment. Parallel leads provide greater versatility. Tough phenolic casings protect against physical damage and penetration of moisture.

Capacity and Voltage Ranges

Working Voltage	Capacity Range
100 WVDC	1 MMF thru 360 MMF
300 WVDC	1 MMF thru 300 MMF
500 WVDC	1 MMF thru 250 MMF

Operating Temperature: up to 150° C.

Characteristics: C, D, E and F, depending on capacitance value

Leads: #26 AWG (.0159") Copperweld wire

EL-MENCO'S DM-10 MEETS ALL THE ELECTRICAL REQUIREMENTS OF MILITARY SPEC. #MIL-C-5B AND EIA SPECIFICATION RS-153

Other sizes also ideal for miniaturization applications —

DM-15 ... up to 820 mmf at 300 VDCW, up to 400 mmf at 500 VDCW.

DM-19 ... up to 5400 mmf at 300 VDCW, up to 4000 mmf at 500 VDCW.

WRITE FOR SAMPLES OF EL-MENCO DM-10 CAPACITORS and brochures describing El-Menco's complete line of capacitors.

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Powertron's unique feedback transducer senses the energy level in the cleaning tank and automatically tunes itself for maximum cleaning efficiency. Every change in operating conditions is sensed by the Autosonic transducer and is immediately compensated for to keep cleaning performance at its peak continuously without operator attention.

Powertron Autosonic cleaning systems are high power, heavy duty units, ruggedly constructed for continuous operation on any cleaning job—even those that other ultrasonic systems can't handle.

A single switch is the Autosonic's only control, so careless operation can't affect the rate or degree of cleaning. Because Powertron's advanced design has eliminated knobs, meters and moving parts, even mishandling, such as no-load operation, won't damage the Autosonic. Every Autosonic cleaner is unconditionally guaranteed.

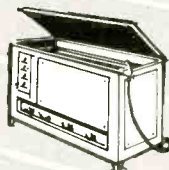
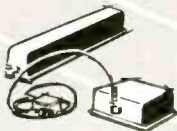
Powertron's complete line of Autosonic cleaners includes tank models from 2 gals. to 100 gals., cabinet models, immersible transducers, degreasers and accessories, competitively priced and available from stock. Whatever you want to clean can be cleaned better in an Autosonic.

Powertron will be glad to show you how your cleaning problem can be solved Autosonically. Simply describe your application, or send a sample of the item you want to clean, and Powertron will send you proof that the Autosonic can increase your output, cut production time, and increase your profits. If you prefer, send for details on Powertron's free trial offer.

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WITH SELF TUNING"



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POWERTRON'S COMPLETE LINE OF AUTOSONIC CLEANERS INCLUDES TANK MODELS, CABINET MODELS, IMMERSIBLE TRANSDUCERS, DEGREASERS AND COMPLETE PROCESS SYSTEMS.

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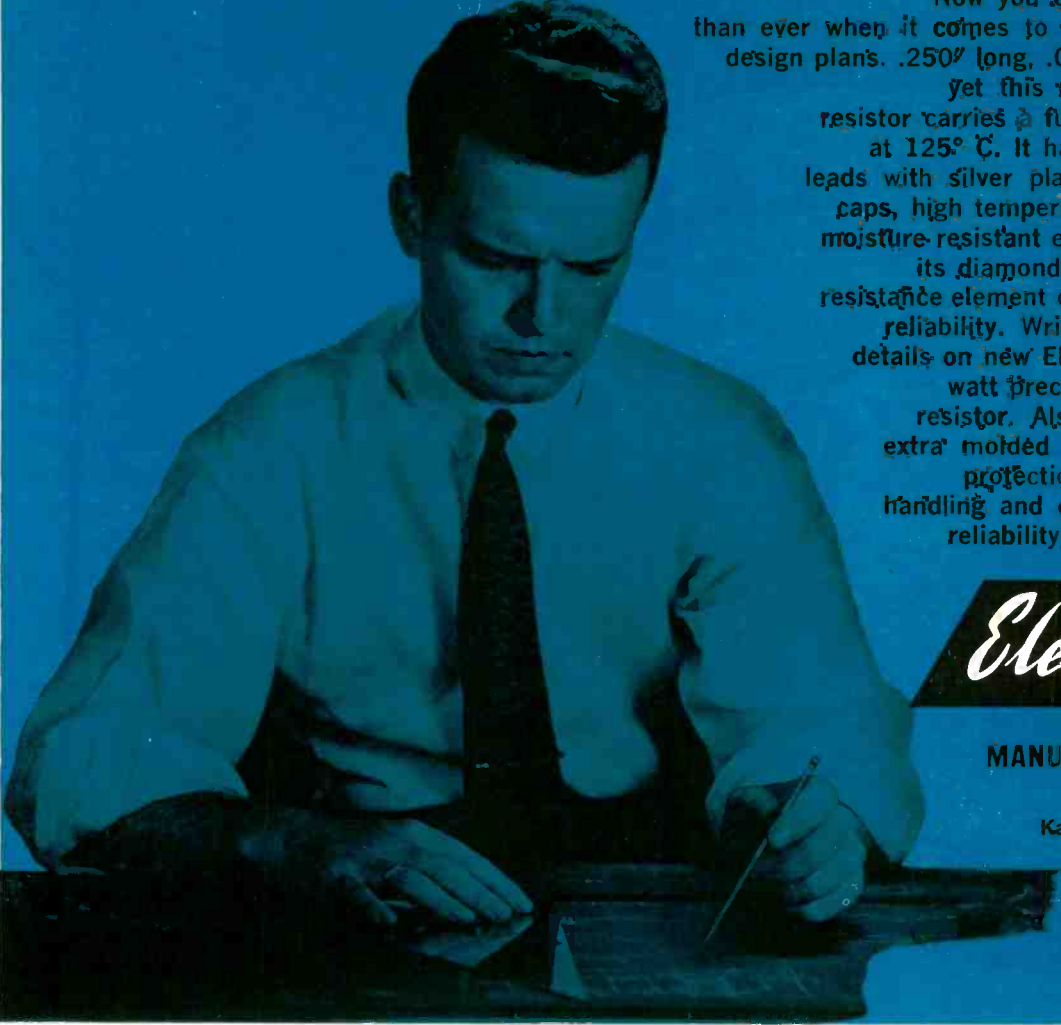
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Now you can think smaller than ever when it comes to resistors in your design plans. .250" long, .093" in diameter, yet this new 1/10th watt resistor carries a full wattage rating at 125° C. It has sturdy No. 22 leads with silver plated compression caps, high temperature impact and moisture-resistant epoxy coating and its diamond spiralled carbon resistance element offers exceptional reliability. Write today for full details on new Electra DC 1/10th watt precision carbon film resistor. Also available with extra molded jacket for extra protection against rough handling and other enemies of reliability. Just write . . .

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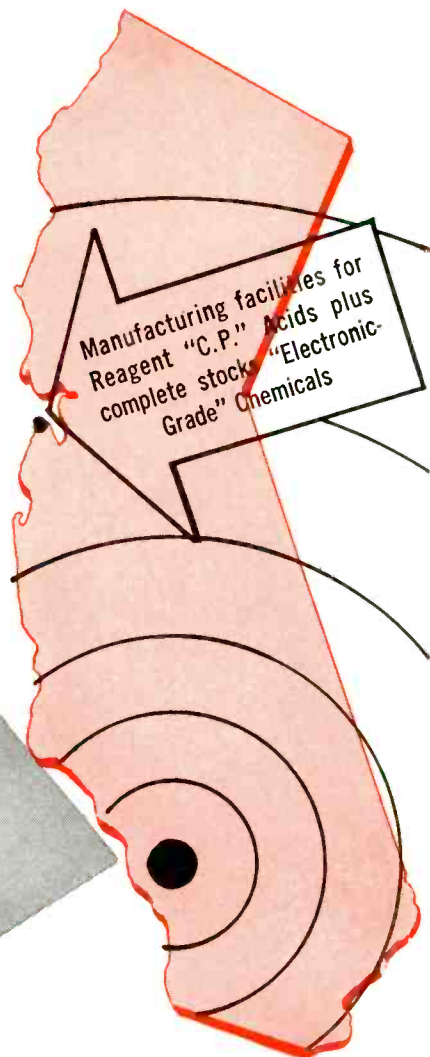
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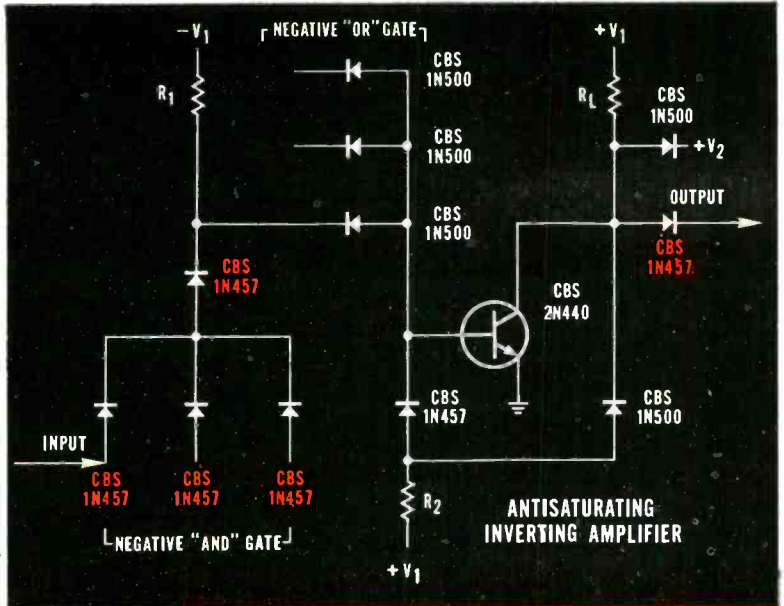
New CBS high back-resistance diffused silicon diodes for positive switching now join CBS high-conductance and fast-recovery types. Efficient and flexible switching is made possible (see circuit). CBS diffusion techniques offer three major advantages over the alloying method: Close process control of all parameters, great uniformity, and high reverse voltage through the graded junction.

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Check These Characteristics

Type	Min. Rev. Voltage @ 100 μ A (volts)	Min. Forward Current		Maximum Reverse Current				Avg. Rect. Fwd. Current (mA)
		I_F (mA)	E_F (volts)	@ 25°C		@ 150°C		
				I_R (μ A)	E_R (volts)	I_R (μ A)	E_R (volts)	
1N456	-30	40	1.0	0.025	-25	5	-25	90
1N457	-70	20	1.0	0.025	-60	5	-60	75
1N458	-150	7	1.0	0.025	-125	5	-125	55
1N459	-200	3	1.0	0.025	-175	5	-175	40

Other CBS Diffused Silicon Types

Type	Min. Reverse V @ 100 μ A	Min. Avg. Forward @ 1V mA @ 25°C	Bulletin
High Conductance Types			
1N482	-40	100	E-373
1N483	-80	100	E-373
1N484	-150	100	E-373
1N485	-200	100	E-373
Fast Recovery Types			
1N625	-35	20	E-374
1N626	-50	20	E-374
1N627	-100	20	E-374
1N628	-150	20	E-374
1N629	-200	20	E-374

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semiconductors

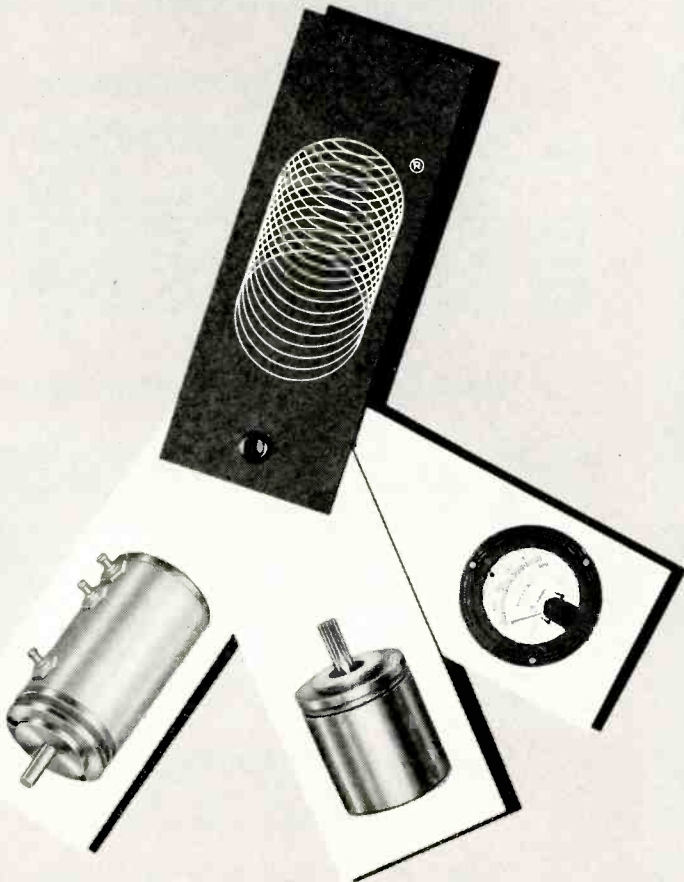
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Books

(Continued from page 62)

scriptions are available are covered in a separate section. An appendix presents complete information on relay testing techniques.

Books Received

Silicon Controlled Rectifier Manual

Published 1960 by General Electric Semiconductor Products Dept., Charles Bldg., Liverpool, N. Y. 225 pages, spiral bound. Price \$1.00.

Fundamentals of Semiconductors

By M. G. Scroggie. Published 1960 by Gernsback Library, Inc., 154 W. 14th St., New York 11. 160 pages, paper bound. Price \$2.95.

Transistor Projects

Published 1960 by Gernsback Library, Inc., 154 W. 14th St., New York 11. 160 pages, paper bound. Price \$2.90.

Basic Ultrasonics

By Cyrus Glickstein. Published 1960 by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11. 144 pages, paper bound. Price \$3.50.

Marine Radio for Pleasure Craft

By Harold McKay. Published 1960 by Gernsback Library, Inc., 154 W. 14th St., New York 11. 160 pages, paper bound. Price \$2.95.

Understanding Microwaves, Abridged Reprint

By Victor J. Young. Published 1960 by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11. 403 pages, paper bound. Price \$3.50.

The Theory of Heat Radiation

By Max Planck. Published 1960 by Dover Publications, Inc., 180 Varick St., New York 14. 224 pages, paper bound. Price \$1.50.

Principles of Quantum Mechanics

By William V. Houston. Published 1960 by Dover Publications, Inc., 180 Varick St., New York 14. 288 pages, paper bound. Price \$1.85.

Microwave Transmissions

By J. C. Slater. Published 1960 by Dover Publications, Inc., 180 Varick St., New York 14. 309 pages, paper bound. Price \$1.50.

Tensors for Circuits

By Gabriel Kron. Published 1960 by Dover Publications, Inc., 180 Varick St., New York 14. 250 pages, paper bound. Price \$1.85.

Hydromagnetic Channel Flows

By Lawson T. Harris. Published 1960 by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, and the Technology Press, Massachusetts Institute of Technology. 90 pages. Price \$2.95.

Physics for Students of Science and Engineering, Part II

By David Halliday and Robert Resnick. Published 1960 by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 510 pages. Price \$6.00.

1960 United States Aircraft, Missiles, and Spacecraft

Published 1960 by Aerospace Industries Association, 610 Shoreham Bldg., Washington 5, D. C. 153 pages, paper bound. Price \$1.00.

The Other Side of the Moon

Translated from the Russian by J. E. Sykes. Published 1960 by Pergamon Press, Inc., 122 E. 55th St., New York 22. 36 pages. Price \$2.50.

(Continued on page 72)

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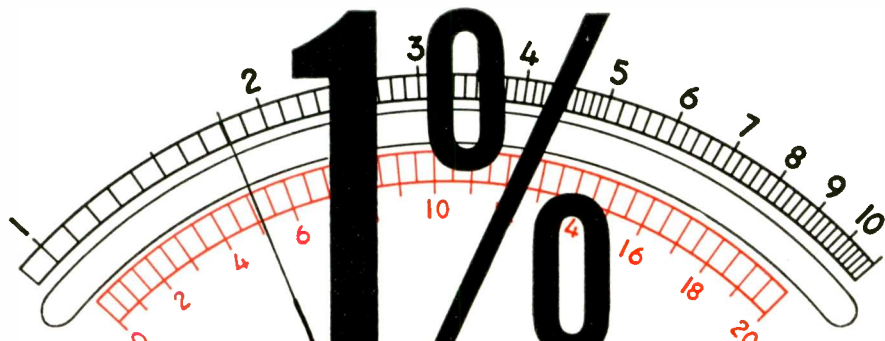
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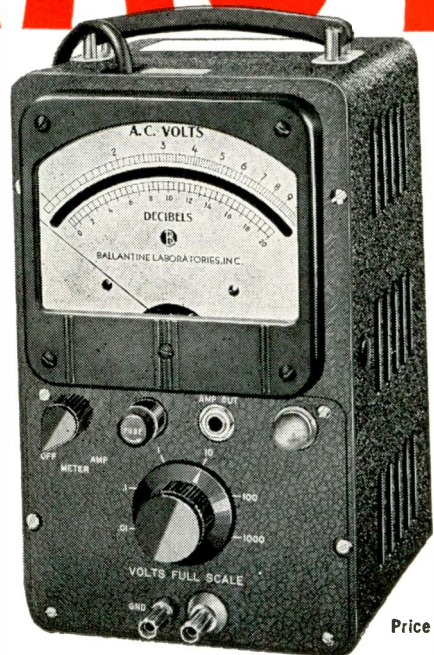
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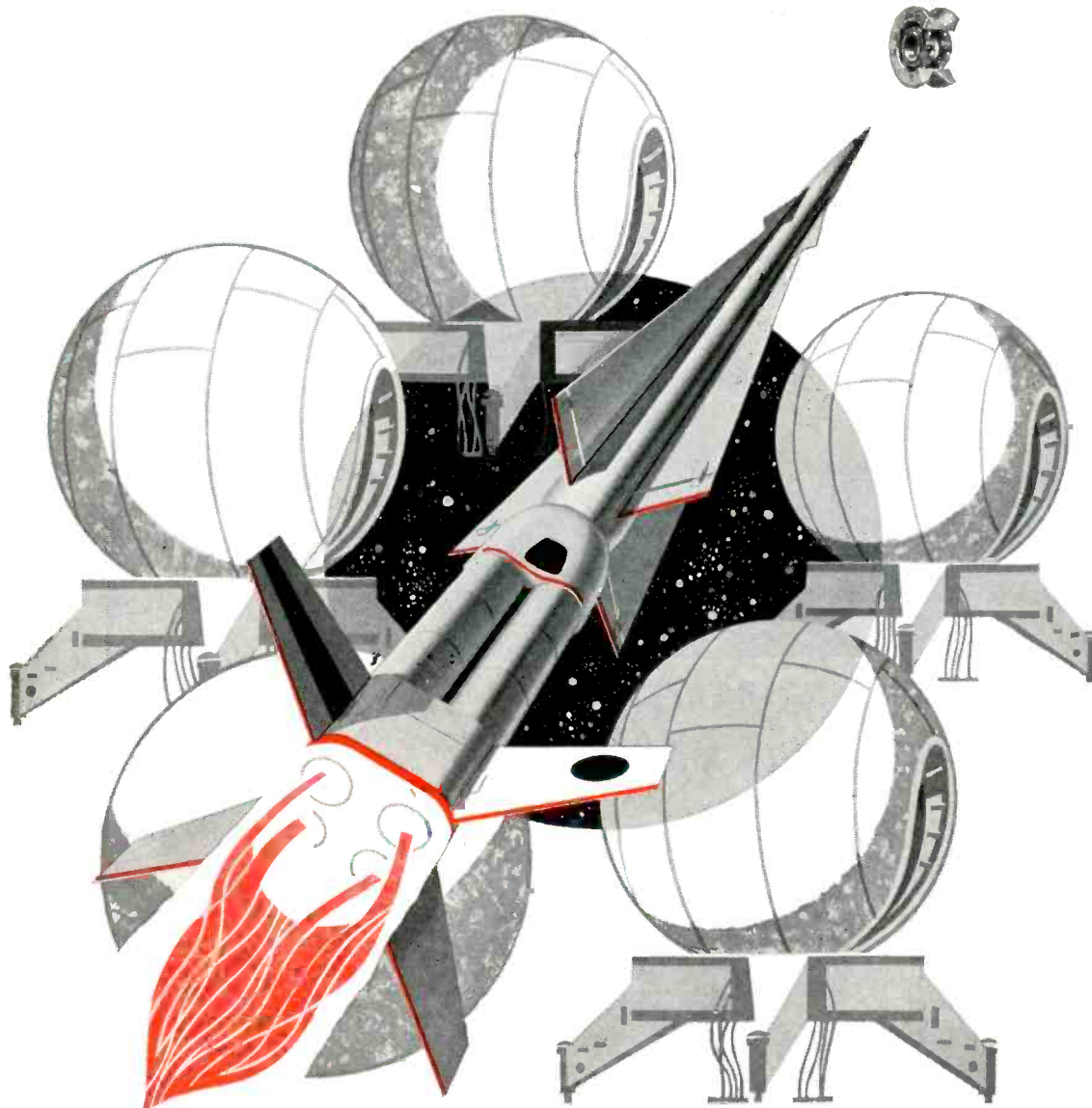
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N/D Designs Assembly Savings Into Critical Miniature/Instrument Ball Bearings!

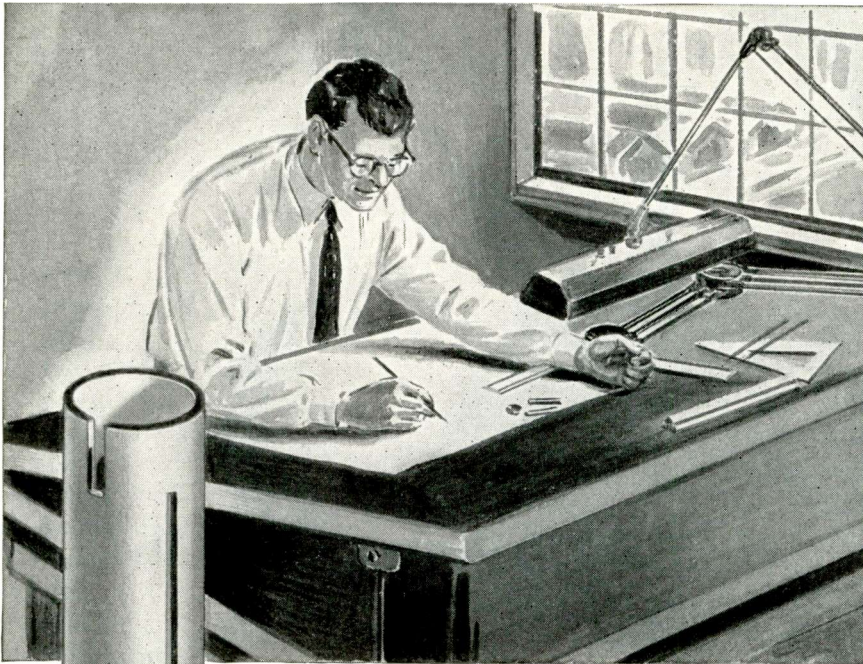
Helping customers *simplify* instrument assembly is a specialty of the N/D engineering group. How? Through *creative* Miniature/Instrument ball bearing application and design. Often, a new ball bearing design will produce assembly savings in excess of its additional costs. Integral ball bearings, too, very often cut down difficult and costly hand assembly of shaft and parts.

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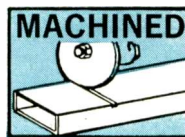
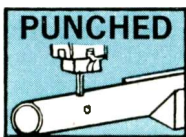
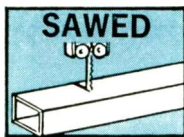
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Books

(Continued from page 68)

Proceedings of the 1960 Electronic Components Conference

Published 1960 by AIEE, EIA, IRE, and WEMA. 162 pages, paper bound. \$6.00.

Proceedings of the 1959 Institute in Technical and Industrial Communications

Published 1960 by the Institute in Technical and Industrial Communications, Colorado State University, Ft. Collins, Colo. 130 pages, spiral bound. Price \$5.00.

Unclassified Proceedings of the 5th Conference on Radio Interference Reduction and Electronic Compatibility

Published 1960 by Armour Research Foundation, Illinois Institute of Technology, Chicago 16, Ill. 691 pages, paper bound.

Proceedings of the 1959 Symposium on Low Temperature Nuclear Process Heat (TID-7580)

Available from the Office of Technical Services, Dept. of Commerce, Washington 25, D. C. 73 pages, paper bound. Price \$75.

15th Annual Technical and Management Conference, Reinforced Plastics Div.

Published 1960 by the Society of the Plastics Industry, Inc., 250 Park Ave., New York 17. Price \$7.00.

Digest of Technical Papers of the 1960 Solid State Circuits Conference

Published 1960 by the IRE, 1 E. 79th St., New York 21. 100 pages. Copies available from H. G. Sparks, Moore School of Electrical Engineering, University of Pennsylvania, Phila. 4, Pa. Price \$5.00.

Practical Statistics in Experimental Design

By Dr. A. W. Wortham and T. E. Smith. Published 1960 by Dallas Publishing House, P. O. 30143, Dallas 30, Tex. 128 pages. Price \$3.50.

Proceedings of the 1959 Eastern Joint Computer Conference

Published 1960 by IRE, AIEE, ACM. 260 pages. Price \$3.00.

Information Processing

Published 1960 by International Publications Service, 507 Fifth Ave., New York 17. 600 pages. Price \$25.00.

Proceedings of 1959 National Electronics Conference

Published 1960 by National Electronics Conference, 228 N. LaSalle St., Chicago 1, Ill. 1089 pages. Price \$10.00.

Advanced Magnetism and Electromagnetism

Edited by Alexander Schure, PhD. Published 1959 by John F. Rider, Publisher, Inc., 116 W. 14th St., New York 11. 104 pages, paper back. Price \$2.25.

Magnetism and Electromagnetism

Edited by Alexander Schure, PhD. Published 1959 by John F. Rider, Publisher, Inc., 116 W. 14th St., New York 11. 80 pages, paper bound. Price \$1.80.

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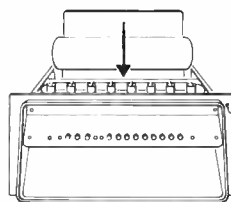
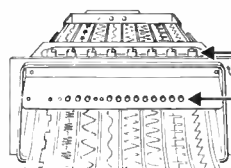
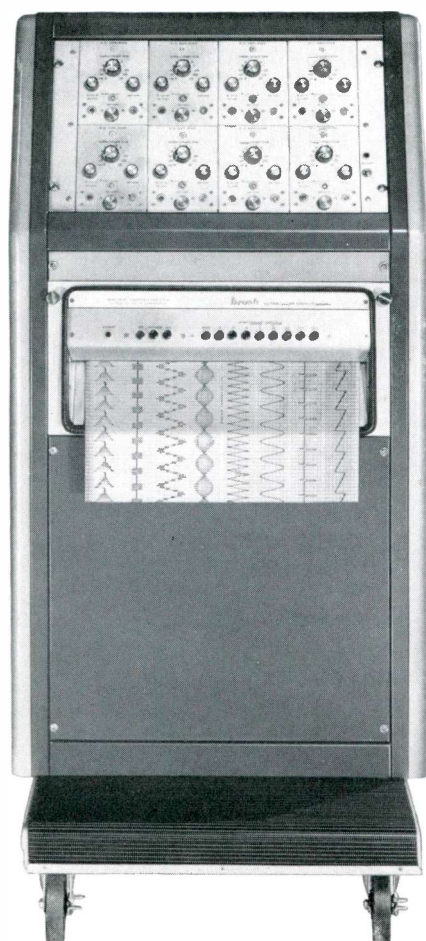


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Next month

● UNCONVENTIONAL POWER CONVERTERS

Another in the series of EI's editorial staff studies. This feature reviews state-of-the-art advances in several electronic and allied disciplines—solid-state, high temperature plasma etc.—and new power requirements of the Military and Space Agencies. New methods include fuel cells, magnetohydrodynamic generators, thermoelectric and thermionic generators and solar cells.

● ELECTRONIC COUNTERMEASURES REQUIRE BINARY TO ANALOG CODE CONVERSION

Binary stored information, used in ECM receivers, is often needed in analog form for processes requiring a dc control voltage. The advantages of circuitry and packaging of such a device are presented here.

● MAPPING SMALL MAGNETIC FIELDS

As magnetic tape is used more and more in computers and other business machines, the quality of recording is required to go higher and higher. What actually occurs at the recording head? Here is a new technique for proper investigation.

● STORING WITH THIN FILMS

The so-called fast ferrite core storage unit has actually been the limiting factor in computer speed. All other central computer circuits are capable of operating at least ten times as fast. A memory using thin film techniques is presented which offers high potential.

● CONTROLLING RFI SUSCEPTIBILITY IN RECEIVERS

With good design it is usually possible to produce receivers that have low susceptibility to undesired signals. Some of the factors to consider in the receiver's design are sensitivity, selectivity, spurious responses, intermodulation, and cross-modulation as well as standard shielding considerations. Part VI in the continuing RFI series in Electronic Industries.

Plus all our other regular departments

Our regular editorial departments are designed to provide readers with an up-to-the-minute summary of world wide important electronic events. Don't miss Radarscope, As We Go To Press, Elec-

tronic Shorts, Coming Events, EI Totals, Snapshots of the Electronic Industries, EI International, News, Briefs, Tele-Tips, Books, Representatives News, International Electronic Sources, Personals, etc.

Watch for these coming issues:

* **NOVEMBER**
Microwave Issue

* **JANUARY**
Industry Review

* **MARCH**
Annual IRE Issue

Things to Come . . .

Two Guest Editorials That Scan
Some New Western Electronic Horizons

Where Are We Going With Semiconductors



BY HARPER Q. NORTH

President, Pacific Semiconductors, Inc.

EVERY semiconductor device which employs principles not developed to full advantage until the time of its emergence arouses considerable controversy. The varactor diode fell into that category because of the required pump power and initial narrow band characteristics. By now all will agree that it will probably be with us from now on in mixing frequency multiplication, and perhaps duplexing applications.

The Esaki, or tunnel, diode is still a controversial device because of the low voltage at which the negative resistance appears and because of the high capacitance of the unit. This remarkable component seems to have found its way, however, into use in microwave oscillators of modest amplitude. It should become increasingly important in computer circuits, particularly if a third electrode can be added.

The solid-state circuit, on the other hand, is in a somewhat different class. It is a composite circuit element consisting of an assembly of devices—diodes, transistors, resistors, and voltage variable capacitors all formed within a single block of semiconductor material, preferably silicon (for the present, at least).

The solid-state circuit is a wonderful concept but it has been badly degraded by over-publicity and is about to experience retardation, I think, as a result of over-optimism. It is certainly true that computer circuitry is becoming exceedingly complex and space technology is crying for an absolute minimum in the weight and space requirements of such circuitry. Ultimate reliability calls for redundancy of compon-

And Molecular Electronics?

ents which cannot be achieved until such components have been reduced to elemental form. The real stumbling blocks in the way of solid-state circuitry lie in the technology of semiconductors themselves, both with respect to yield of devices with closely defined characteristics, and with respect to the reliability limitations imposed by surface phenomena.

It is not quite true, but almost, that the yield of good semiconductor circuits is a product of the yields of the individual components comprising those circuits. If the yield of a sophisticated individual component is, say, 50%, that of circuits with four such components is $(.5)^4$, or about 6%. I worry about the economics of producing circuits to this kind of yield except where size is of ultimate importance, as perhaps in satellites where the market, to say the least, is rather small.

Isn't it better at this stage of limited technology to weld together micro-components, each of which has been proved through prolonged life tests before being introduced into the required micro-circuit?

Reliability has been touted as a compelling reason for solid-state circuits. Perhaps if we know how to protect such circuits well, this is an achievable virtue. We are getting there and can do it, but the yield is modest even on individual components.

For what it is worth, my opinion is that desire is ahead of technology in solid-state circuits. We had better set about improving technology before talking about the wild blue yonder of "molecular circuits," even though solid-state circuits may be produced at low yields in modest quantities. In the recently publicized "molecular circuit," molecules of semiconductors are supposed to be laid down in such a manner as to tailor circuit paths at will and to produce distributed components rather than lumped components familiar to most circuit designers. For such fancy tailor work each molecule of semiconductor or impurity must be dropped into place within tolerances far beyond those achievable by any known technique. I am sure that publicity is well ahead of technology; it's a somewhat easier field, and much less expensive to pursue.

In my opinion, a manufacturer of micro-components has several years to enjoy a market for his products before he is superseded by solid-state circuits, to say nothing of molecular circuits. Solid-state circuits are on their way and work on them is well advised. Five

to ten years from now I would guess they will be in mass production. In this period they will begin to take over and when they do, we'll see a brand new type of computer with redundant components and of incredibly small size. Meanwhile, it seems to me that much miniaturization is to be done successfully with Micro-Diodes and Micro-Transistors as these components become more readily available. There are several reasons for this guess:

1. Cost—known production techniques make a high yield of Micro-Diodes and Micro-Transistors possible. Only thoroughly tested devices need be assembled into final micro-circuits.

2. Design flexibility—solid-state circuits, when available, will require major changes in processing techniques to accommodate minor changes in circuit connections or component characteristics. Micro-components can accommodate design changes immediately. Moreover, replacement of elements in the testing phase of micro-circuitry permits salvage of remaining components which must be scrapped in solid-state circuits if one element fails.

3. Micro-components offer the circuit designer an

opportunity to become acquainted with the eccentricities of micro-circuits. Cross-talk and heat dissipation, for instance, become major problems in micro-circuit design.

4. Reliability is an important consideration which should ultimately be decided in favor of the solid-state circuit. Today, however, the micro-circuit seems more reliable. Active components in micro form have attained reliability seldom reached by other semiconductor components of standard size. It will be some time before the same degree of reliability can be demonstrated in solid-state circuits.

5. Microminiature components are available in quantity today and at a cost equal to or approaching that of standard components.

Work being done on solid-state circuits today is certainly well advised. The enormity of their potential is attested by the large number of companies engaged in such work. I would argue only with the irresponsible type of publicity which forewarns of an early demise for the misguided component manufacturer and an immediate success for solid-state and "molecular" circuits.

The Search For New Electronic Markets

BY ROLLIN M. RUSSELL

*Executive Vice-President
Electronic Specialty Co.*



THE search for new markets for the burgeoning array of products and services of the maturing Electronic Industry challenges the ingenuity of every member of the team of this dynamic business. Marketing, Research, Engineering, Manufacturing and Service, working together, can bring about the gains expected in the industrial, commercial and military markets. Few industries have been faced with as rapid growth and as explosive an opportunity. The industry must look to truly serving the markets' needs while improving performance in development, engineering, reliability, cost and productivity.

New industrial markets do not materialize quickly. These markets develop gradually as designs are shaken down and performance is proved. When reliability is assured, lower costs and increased productivity over previous methods become apparent. The Electronic Industry that has itself had to learn the bitter lesson of careful cost control can hardly expect the industries it serves to be unmindful of the costs involved in commercial and industrial use

of the new electronic tools. Computers must pay their way in engineering and finance or suffer the same scrutiny and ultimate "reduction in force" as any other unwarranted element of cost. The glamour of tape controlled machine tools quickly tarnishes if costs soar and planned production gains are not realized.

Markets for new ideas must be planned, tested and developed. Development of devices from the laboratory model into saleable products must be carefully and wisely scheduled. Such areas as molecular electronics, electro-luminescence, deposited circuitry, light amplifiers and the like offer just such possibilities but profitable markets are probably somewhere down the road and should be planned for accordingly.

In the search for new electronic markets some organizations have followed the merger path. This may result merely in summing the markets of the merged organizations. The wiser combination produces a multiplication of markets brought about by the catalyst of aggressive engineering, sales, production and management thinking.

The need to protect existing markets for present products is fundamental. It becomes the sales goal

(Continued on page 228)

Mr. Russell is commenting on a subject which has long been of continuing interest to ELECTRONIC INDUSTRIES. In EI's October 1959 issue the lead editorial, "Ideas—Insure the Future" described just this problem. Last month, Assoc. Editor Jack Hickey, in his article, "New Electronic Markets," reviewed the requirements of a wide variety of industries which might be solved by electronics. And in this issue, Assoc. Editor Dick Stranix describes the many applications of electronics to agriculture in "Electronics and the Future of Agriculture." (page 91)



Walter E. Feterson
Chairman of the Board, WESCON



Hugh P. Moore
Chairman, WESCON Executive Committee



Donald C. Duncan
WESCON Show Director



Bruce S. Angwin
Convention Director—WESCON

Kenneth J. Slee
Chairman, WESCON Industrial Design Comm.



WESCON—Showcase

ALL the conveniences of the nation's newest and most luxurious amphitheater, plus major additions made specifically for WESCON, will provide a unique setting for the big show and convention August 23-26.

The Memorial Sports Arena, just past its first birthday, has already achieved national attention for its air-conditioned comfort and flexibility. The Arena has already been the site of circuses, professional basketball, tennis, and ice hockey, home shows and track meets—and, only a month ahead of WESCON, the scene of the Democratic convention.

For WESCON, the Arena will gain six new "rooms" for technical sessions, an open-air restaurant, and 56,000 square feet of new, air-conditioned exhibit space.

The technical session rooms are being constructed in the seating area of the sweeping audience concourse of the Arena. Designed to provide optimum acoustical and visual conditions, they consist of double draped walls surrounding 600-seat sections of upholstered theater type seats, with a stage

and podium at the front. Screens for projection of slides will be 15x20 ft. hung above the heads of speakers, at eye-level to viewers.

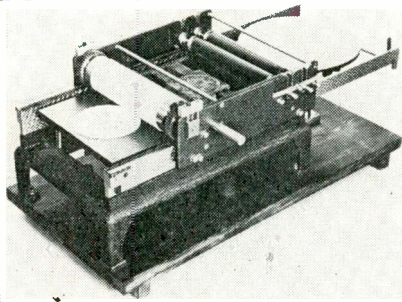
The restaurant, shaded by the Arena's central pedestrian "bridge," will be established in a beautifully landscaped area, and will include colorful umbrella-tables and deck furniture for relaxing during the show.

WESCON's 56,000-square-foot annex may be the most unusual structure ever built for such a short "life." Measuring 140 by 400 ft., it will be fully air-conditioned.

A Los Angeles-based firm with a national reputation in the field of specially designed air-conditioning equipment, has designed and manufactured a 150-ton, twin compressor unit that will serve the annex.

More than 200 nationally recognized authorities in the field of electronics and related technical areas will participate in the 40 convention sessions of WESCON.

Presentation of new developments in technical fields will take a range of forms, including contributed papers, tutorial papers,



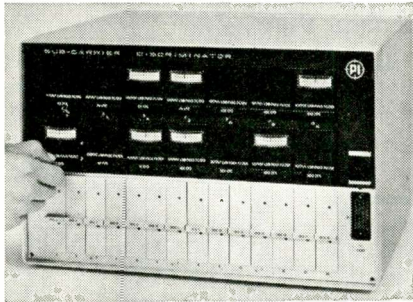
Scale Printer

Model R1 for printing meter scales, circuit boards, etc., employs the dry offset method and has high accuracy. It is a hand operated machine but is available in motor driven and 3-color presses. The 3-color models apply the 3 colors in one pass of the machine. International Eastern Co. Booth 204.

Circle 250 on Inquiry Card

Telemetry Discriminator

All-solid-state portable telemetry sub-carrier discriminator, the MINI TEL a pulse-averaging discriminator,



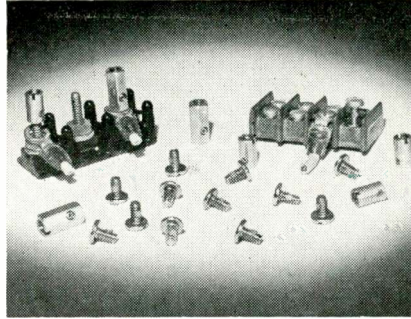
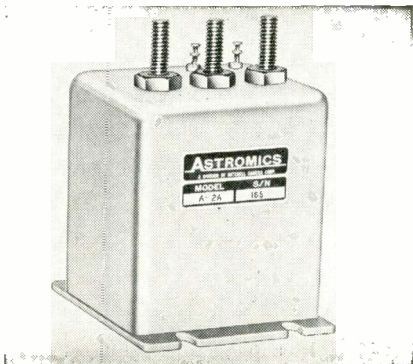
accommodates 14 standard IRIG channels. Power requirements are under 3 w per channel. DC linearity is better than 0.05% of best straight line. Precision Instrument Co. Booth 440.

Circle 251 on Inquiry Card

Latching Relay

Non-magnetic latching relay, A-2A, mechanically locks in either open or closed position, and requires a new command pulse each time before it can be re-activated or moved in any way. It permits a load up to 20 a at 26.5 vdc (resistive). Astromics Div., Mitchell Camera Corp. Booth 838A.

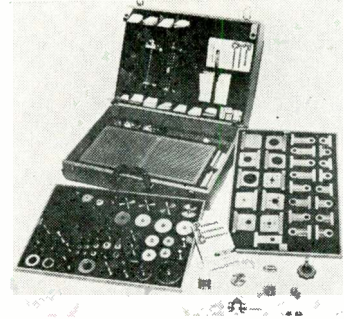
Circle 252 on Inquiry Card



Fasteners

Self-locking fasteners provide a positive method of retaining wire leads to terminal blocks where shock and vibration conditions exist. The fasteners meet all applicable military specifications. The NYLOK Corporation. Booth 218A.

Circle 253 on Inquiry Card



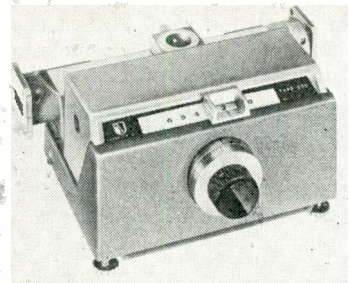
Breadboard Kits

Series of Master Breadboard Kits, in Precision 1, 2 and 3 tolerances in 1/8, 3/16, and 1/4 in. shaft dia. Kits contain over 2,000 different precision items, such as precision gears, speed reducers, differentials, limit stop assemblies, and other precision components. PIC Design Corp. Booth 311.

Circle 255 on Inquiry Card

Probe Carriage

The PRD 230 Universal Probe Carriage is built to operate with the PRD 231 Waveguide Slotted Lines. They



are used for making accurate standing wave and impedance measurements on all types of waveguide components in the frequency region from 8.2 to 40 KMC. Polytechnic Research & Development Co., Inc. Booth 2633.

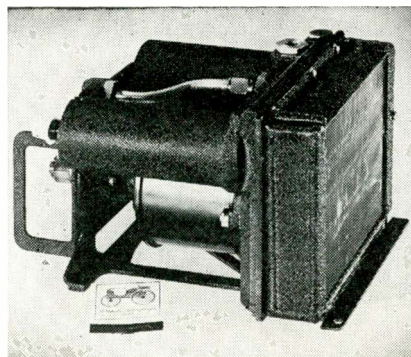
Circle 256 on Inquiry Card

See
These
Products
At
WESCON

Cooling System

Cooling system, Model E/HT-100, Type 100, provides OS-45 coolant heat sink for an Airborne Electron Tube of 250 w dissipation. It meets MIL-E-5400 for Class II equipment. It weighs 3.9 lbs. and requires only 95 va under continuous operation. Eastern Industries, Inc. Booth 2054.

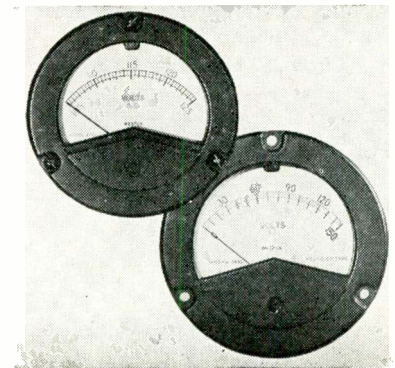
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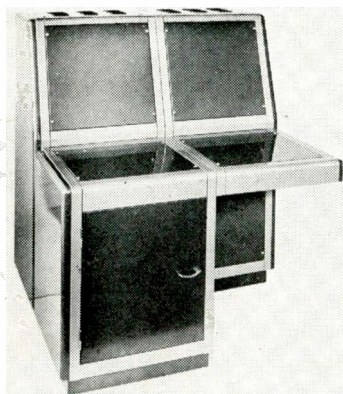


Voltmeters

Voltmeters offer increased readability and precise indication of true RMS values. The new expanded scale instruments are Model 1761 ac commercial and Model 2531 ac ruggedized voltmeters. Weston Instruments Div., Daystrom, Inc. Booths 1042-1044.

Circle 257 on Inquiry Card





Electronic Housings

Line of electronic housings combines all of the functional characteristics required, such as ease of wiring, installation of equipment, mobility and loading capacity, with beauty in design. Uses two-tone light and darker grey metallic paint. Stantron, Div. Wyco Metal Products. Booths 523-524.

Circle 258 on Inquiry Card

Pulse Generator

High repetition rate, Pulse Generator, Model B-7B, is rack mountable and compact. Amplitude is 50 v. de-



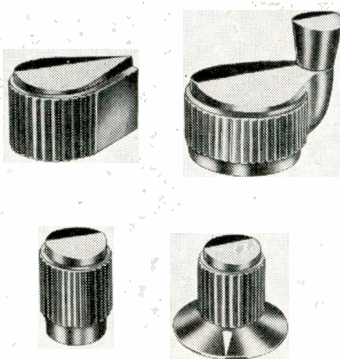
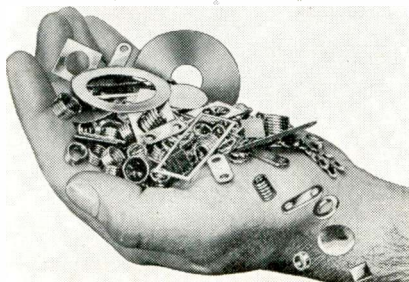
livered into a 50 ohm load; delay with respect to Sync. Out: 0-10,000 μ s; width: 0.05 μ s-10,000 μ s; repetition rate: 20 c to 2 mc. Rutherford Electronic Company. Booth 635-636.

Circle 259 on Inquiry Card

Solder-Flux Preforms

Preformed solder and flux combined in washers, discs, and also in any other unusual shapes, and in all sizes or dimensions are for use in automated assembly of electronic products such as transistors, germanium diodes and other applications. Kester Solder Co. Booth 320.

Circle 260 on Inquiry Card



Control Knobs

Line of instrument control knobs, designed to MS-91528 specs, Series 500, knobs are in 6 types, including rounds, skirted rounds, dial-skirted rounds, plain and skirted pointers, and crank-types. Six different sizes are provided in mil-spec matte black finish, and also in mirror finish. Lercro Electronics, Inc. Booth 2504.

Circle 261 on Inquiry Card



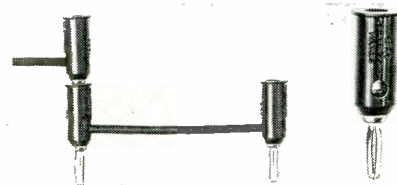
Power Modules

Regulated Power Modules (RPM's) in a new militarized series, designed to meet MIL-E-1640B and developed to operate under more stringent environmental conditions. Featured is a life expectancy of 5 years, the unit will operate up to 65°C in continuous use. ACDC Electronics, Inc. Booth 2230.

Circle 263 on Inquiry Card

Banana Plug

Model 1325, Solderless Molded Single Banana Plug features unbreakable molded plastic insulation,



125°C. Ten colors available: red, black, green, yellow, orange, blue, brown, gray, white and violet. Beryllium copper one-piece heat treated spring and top stacking. Pomona Electronics Co., Inc. Booth 2303.

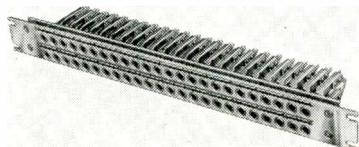
Circle 264 on Inquiry Card

See
These
Products
At
WESCON

Jack Panels

Aluminum Jack Panels, Model 2800, meet requirements for strength and lightness. Weight is approx. 25% less than Phenolic Panels. Double row jack panels mount 24 jacks per row -48 per strip. Offset ground terminal for easy connection to common terminals. Switchcraft, Inc. Booth 2843.

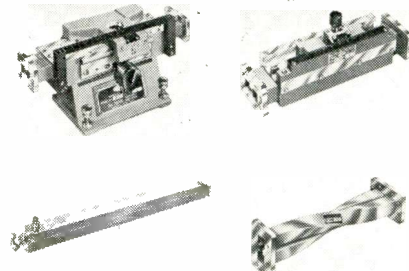
Circle 262 on Inquiry Card



Waveguide Components

New line of measurement equipment and components for D9 double ridged waveguide systems in the 4.75 KMC to 11.0 KMC band includes an impedance meter, a slide screw tuner, a directional coupler, and a 90° axial twist. The Narda Microwave Corp. Booth 822.

Circle 265 on Inquiry Card





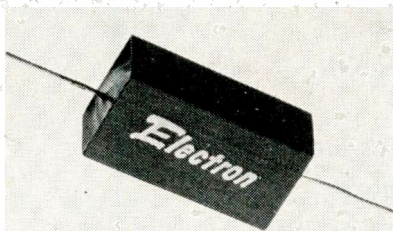
Filter

A 4-channel filter of the type used in the Polaris Missile Guidance System. It withstands shock of 50 g's. Temp. range is -65° to $+160^{\circ}$ F. Also delay lines and a 3,000 v. power supply for photomultiplier tubes. Regulation for the supply is 0.1% for a 5% voltage and a 1% frequency variation at 115 v. 2,000 CPS input. Palo Alto Engineering Co. Booth 544.

Circle 266 on Inquiry Card

Capacitors

New ME, WE, and DE series of epoxy cases, metallized paper and metallized Mylar capacitors, in a



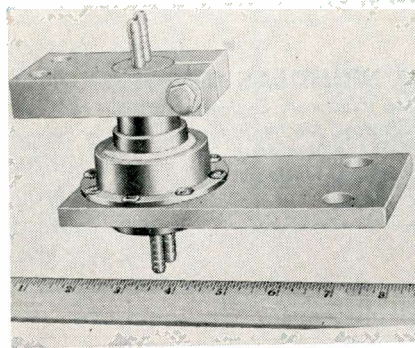
complete range of capacity and voltage to meet MIL-C-25 temp. cycling and immersion testing and MIL-STD-202, Method 106. Also: a 0.5 mfd., 10,000 v., wrap and fill capacitor. Electronic Products Div., Marshall Industries. Booth 621.

Circle 267 on Inquiry Card

Size 8 Geared Servo Motor

Size 8 servo motors are characterized by high torque and low inertia. Centered-shaft gearheads available in 28 ratios from 7.62:1 to 1254:1, and eccentric-shaft gearheads can be provided in ratios from 7.62:1 and 903:1. Geared servo motor operates in amb. temp. of -54° to $+105^{\circ}$ C. Kearfott Div., General Precision Inc. Booth 626.

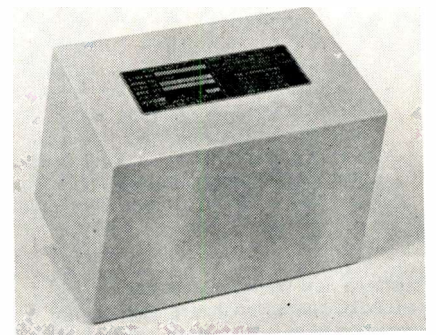
Circle 268 on Inquiry Card



Water Cooled Rectifier

A 1000 amp water cooled rectifier. Voltage range from 50 to 200 piv. Also: a line of 1 w and 10 w zener diodes. Voltage range from 2 to 200 v., and a line of subminiature silicon rectifiers. Hermetically sealed. Rating 200 to 600 v. peak inverse. Sarkes Tarzian Inc., Semiconductor Div. Booth 811.

Circle 269 on Inquiry Card



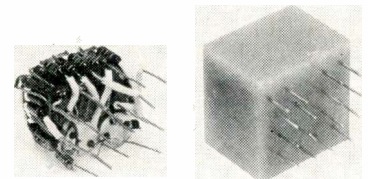
Static Converter

Model 3078, 60 CPS to 28 VDC for missile checkout systems, fire control systems, computer power and general instrumentation. Also: Demodulator & Phase Detector, Model 1806, for data transmission, error sensing, and servomechanisms. An Operating microcircuitry transmitter will also be exhibited. Varo Mfg. Co., Inc. Booth 2332.

Circle 271 on Inquiry Card

Computer Modules

Digital "building block" modules for use in computers, digital data systems, digital frequency dividers and



frequency standards, telemeter data handling, digital test equipment, logic decision networks, and other applications. Ten basic types and 15 variations of modules are offered. Delco Radio Div., General Motors Corp. Booth 2345.

Circle 272 on Inquiry Card

Transistor Chopper

Type 6025 transistor chopper with self-contained drive transformer, has SPDT switching action for operation over a chopping range from 50 to 5000 CPS. It may be used as a replacement for some electro-mechanical choppers in operational amplifiers, dc measuring instruments and servo systems. Airpax Electronics, Cambridge Div. Booth 711.

Circle 273 on Inquiry Card

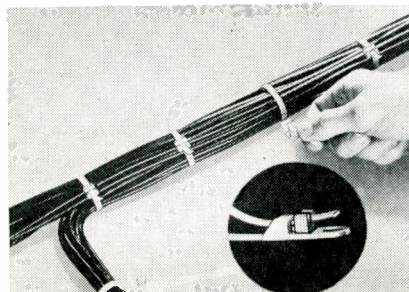


See These Products At WESCON

Cable Clamps

"Lok-Strap" Nylon Cable Clamps and Cable Ties incorporate a miniature quick-release tab which holds the band of the clamp or tie securely and tightly around wires—but which opens instantly with a few ounces of fingertip pressure. This tab also allows almost infinite adjustment to accommodate wire harnesses from $\frac{1}{8}$ to 2 in. dia. Panduit Corp. Booth 346.

Circle 270 on Inquiry Card



What's New . . .

LASER— Coherent Light Source

LASER is an acronym derived from the first letters of the principal words of the phrase, "Light Amplification by Stimulated Emission of Radiation." The laser amplifies and generates coherent energy in the optical, or light, region of the spectrum; for this reason the laser is sometimes called an "optical maser,"

The laser, developed at the Hughes Aircraft Company's research laboratories in Southern California, is similar in size to a glass tumbler.

A solid state device, it is being used to generate coherent light in those laboratories.

Achievement of the laser marks the culmination by American industrial research of efforts by teams of scientists in many of the world's leading laboratories. Some of these are privately and some publicly supported, some are working under defense contracts, some

not. At Hughes the work was with the company's own funds.

Laser projects the radio spectrum into a range some ten thousand times higher than that which was previously attainable. The laser jumps the gap from 50 KMC to 500 TC (500 teracycles = 500×10^{12} CPS); as such, it opens the way for a great many important applications.

For the first time in scientific history, true amplification of light waves has been achieved. Light may even be projected into very high-intensity beams for space communications. Available communications channels may also be increased enormously. High light concentration offers possibilities for industrial, chemical and medical purposes.

Light is electrical in nature—it is a form of electromagnetic energy.

The properties of electromagnet-

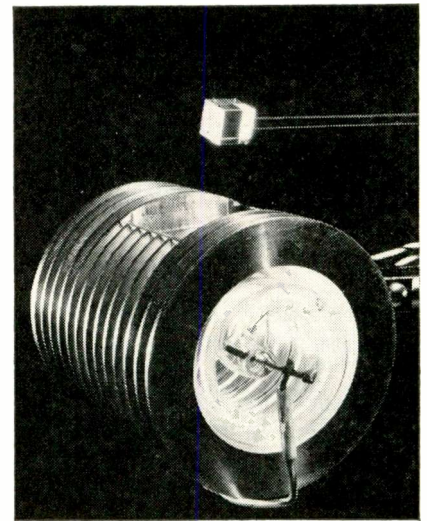


Fig. 2: Synthetic ruby crystal glows with absorbed light. Light source in the glass tumbler size cylinder pours "random" waves of light into the ruby, exciting the gem's tightly-packed atoms. Stored energy then reradiates light in a sharp beam.

ic energy at higher and higher frequencies changes in the sense that the techniques of generating, amplifying, and detecting it depend essentially on this frequency.

Throughout the entire radio spectrum it has been possible to generate energy which can be characterized or specified to be of almost one definite, or single, frequency. The band of frequencies, or indefiniteness of specification, can be quite small, sometimes a fraction of one cycle per second. This band of frequencies, or portion of the electromagnetic spectrum over which any particular source generates energy, is often referred to in terms of its "coherence"; the smaller the band in which energy is radiated, the more "coherent" the source.

Previous sources of light energy such as incandescent lamps, are "incoherent" sources since they simultaneously generate energy over a relatively large part of the electromagnetic spectrum. Radio frequency sources, on the other hand, are very coherent.

The advantages of a coherent source are many. It can be used, for example, for communications purposes because each one occupies only a small part of the spectrum.

Scientists have recognized for years that if coherence at much higher frequencies could be achieved, i.e., in the infrared and optical spectral regions, many worthwhile things could be accomplished.

Progress in extending the avail-

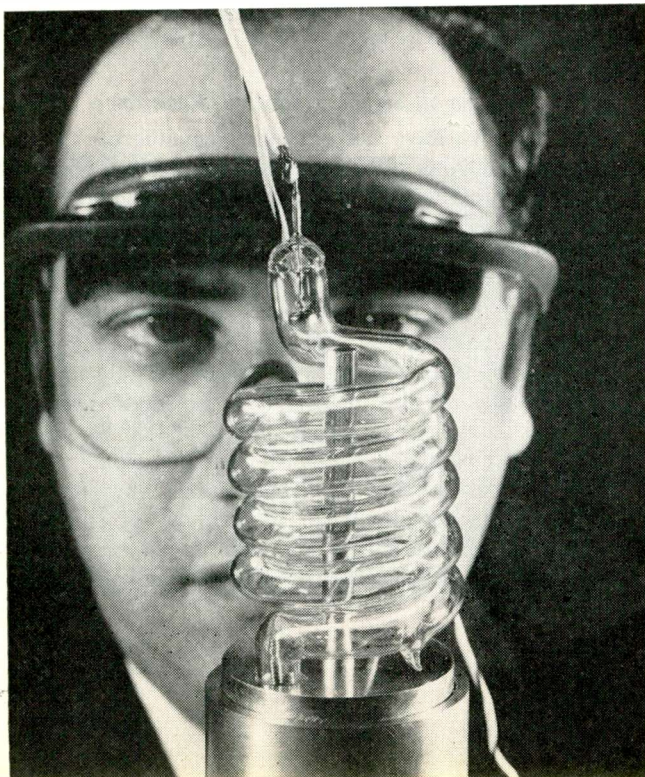


Fig. 1: The laser's main parts are a light source surrounding a rod of synthetic ruby crystal through which excited atoms generate the intense beam.

Semiconductors by Vapor Growth

SCIENTISTS of the International Business Machines Corporation can "grow" electronic components with a new technique of arranging atoms of one material on another—a kind of "atomic bricklaying."

The fabrication process, which the scientists call vapor growth, is a new advance in solid-state technology.* It has been used already by IBM to produce a variety of experimental semiconductor devices, including Esaki tunnel diodes and transistors. It does this in one continuous operation. In conventional semiconductor device fabrication,

* IBM Journal of Research and Development, Vol. 4, No. 3, July 1960.

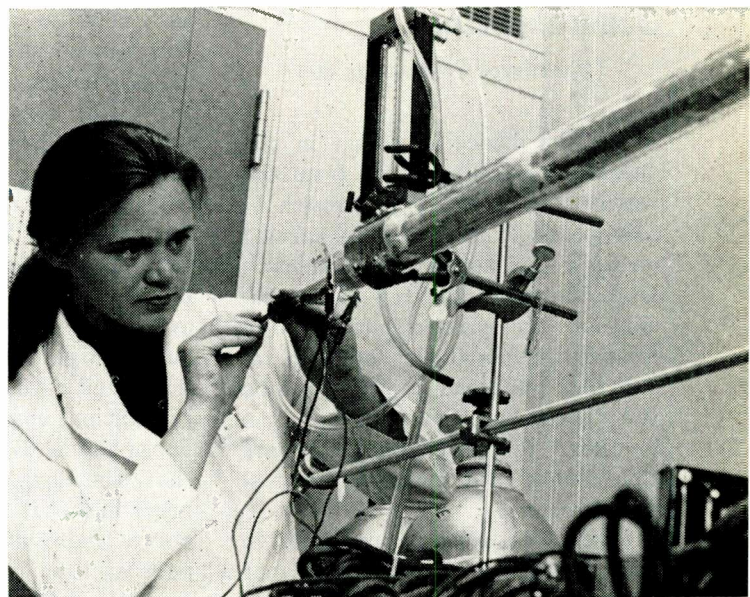
able coherent spectrum has been slow. At World War II's end the highest frequency that we could easily generate was in the microwave area at about 10 KMC. In the intervening 15 years we have been able to go up only by a factor of 5 to about 50 KMC.

Properly designed masers, taking advantage of the natural properties of atoms or molecules in interacting with electromagnetic radiation, amplify or generate electromagnetic energy. Although masers operate in the microwave region, it was clear from the start that the basic principle could be used to generate and amplify energy at much higher frequencies, perhaps up into the optical region.

The laser represents the result of a research program in the optical spectral region at the Hughes Research Laboratories. Instead of jumping a gap in the spectrum by 5 as has been done in the last 15 years, the laser represents a jump by a factor of 10^4 .

The essential steps in the op-
(Continued on page 222)

IBM research staff member Patricia McDade is unloading an open tube furnace after a vapor growth run. With this new method of "growing" semiconductors, iodide vapors are used to transport the semiconductor material.



many separate operations are required to form the active parts of the device. The vapor growth process makes practical for the first time a special type of growth—epitaxial—of a layer of one semiconductor on another, such as germanium on gallium arsenide. This means the top layer automatically duplicates the same crystal structure as the one beneath it.

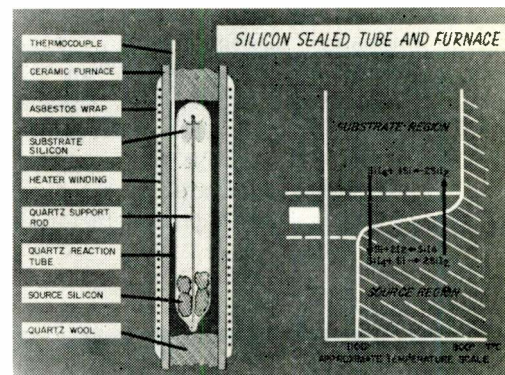
The vapor growth process used takes place through the intermediary of semiconductor iodide vapors. These pick up the semiconductor (e.g. germanium or silicon) from a piece of this material at a high temperature. The vapors then move into a cooler zone where the semiconductor "grows" from the vapor onto a suitable single crystal seed. The process can be carried out in two types of apparatus. In one, a continuous flow of gas carries the vapors in one end of a furnace and out the other. Alternatively, a closed tube is used and the vapors recirculate, carrying the semiconductor from the hot end to the cooler end. It is possible to incorporate selected impurities in the growing semiconductor at the cooler end during the growth process.

The vapor growth method of growing semiconductor materials is in marked contrast to the usual process involving growth by appropriately freezing the molten semiconductor. This is carried out in complex apparatus at a white heat, by processes known as zone

levelling, crystal pulling or dendritic growth and offers only a limited opportunity for controlling impurity content and distribution in the growing crystal.

Semiconducting devices such as transistors or Esaki tunnel diodes consist of layers of semiconductor of positive or negative conductivity

Method for "growing" epitaxial multilayers of silicon is illustrated. Experimentally, the reaction is carried out in a sealed, evacuated tube placed in a two-zone furnace. The disproportionation of SiI_2 is used to transport silicon from high-temperature source zone to lower temperature substrate zone.



type determined by suitable "doping" impurities with "junctions" between them. Such devices are presently made from melt grown material by cutting it up into minute pieces and introducing the desired series of impurities by separate operations of alloying or diffusion, followed by careful hand assembly under the microscope.

Vapor growth introduces a new system of device fabrication in
(Continued on page 90)

Semiconductors

(Continued from page 89)

which the device is grown in one operation layer by layer from the vapor. Layer by layer growth is only possible because it is carried on at a low temperature. Growth from the melt, alloying and diffusion all are carried out at high temperatures and this has the result that one layer is disturbed by the treatment necessary to form another. Complex structures are thus difficult to make by conventional means.

Quality is a prime requisite in semiconducting materials. Vapor grown material compares very well with semiconductors grown from the melt. The purity is very good and, although it might be expected that a large amount of iodine might be incorporated, radioisotope measurements have shown that the crystals contain as little

as 1 part in 1×10^8 of iodine and this has no effect on their electrical properties. The crystalline perfection is excellent. It has been possible to grow germanium free of dislocations. This high quality is in marked contrast to semiconductors grown by vacuum evaporation of the material itself, where the purity and perfection are poor even when the process is carried out at high temperature.

Impurities have been introduced in sufficient concentrations to make Esaki tunnel diodes. It seems likely that the low temperatures used may make it possible to incorporate more of some desired impurities than is possible in growth from the melt. Devices which have been fabricated by this method include simple diodes, variable capacity diodes and Esaki tunnel diodes, both singly and in arrays and transistors. This is the first time that such Esaki tunnel diodes have been made by a method other than alloy-



Typical epitaxial growths, ranging in thickness from 25 to 800 microns, deposited on the (111) surfaces of silicon substrates are shown at a magnification of 400.

ing. The interface between layers of different semiconductors (heterojunctions) can form wide gap emitters which are important for improved transistor performance at high current levels.

Quicker Than You Can Wink an Eye . . .

HIGH-SPEED electromechanical glasses, developed and constructed to protect the eyes of the wearer from burns or flashblindness caused by exposure to high-intensity flashes (nuclear explosions), are evaluated in an Air Force report, PB 151924, recently released by the Office of Technical Services, U. S. Dept. of Commerce.

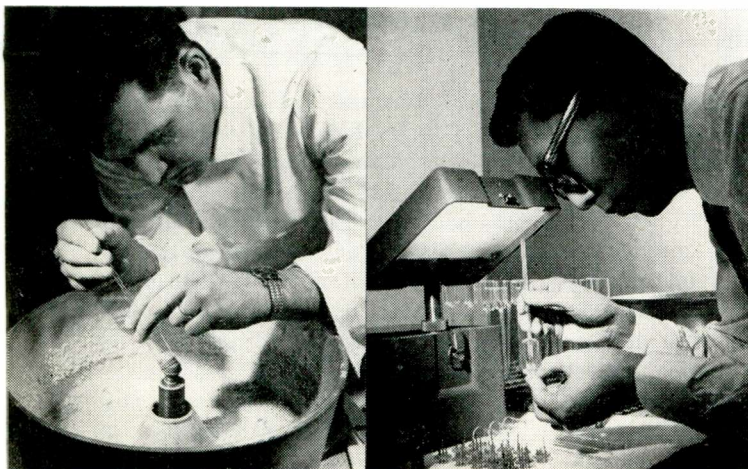
A signal, generated at the onset of the flash by a photodetector, is

amplified and actuates the shutters on the goggles, shutting out the light. The shutters are actually alternate opaque vertical bars and transparent strips. When open, the light transmission is 30%; closed, less than 0.01%. Closing time is less than 500 microseconds—20 times faster than the eye can blink.

The development was performed by the Wayne-George Corp., Boston, Mass.

Copies of the report may be obtained from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The price is 75¢ and the report contains 29 pages.

The Boston firm performed the work under a contract awarded by the Aero Medical Laboratory, Wright Air Development Center, USAF, Wright-Patterson Air Force Base, Ohio.



Polyoptic Sealing

A SEALING technique adapted from optical manufacturing processes will substantially increase tube reliability and life according to Chatham Electronics, Livingston, N. J. Bulb polishing (left) gives the bulb the precise contour to mate exactly with the critically fashioned button stem. Monochromatic helium light (right) is used to determine exactness of bulb and stem fit. With this light, fringe patterns appear as pink "stripes" separated by black bands, where the light waves interfere due to the presence of foreign particles between mating surfaces or surface irregularities.

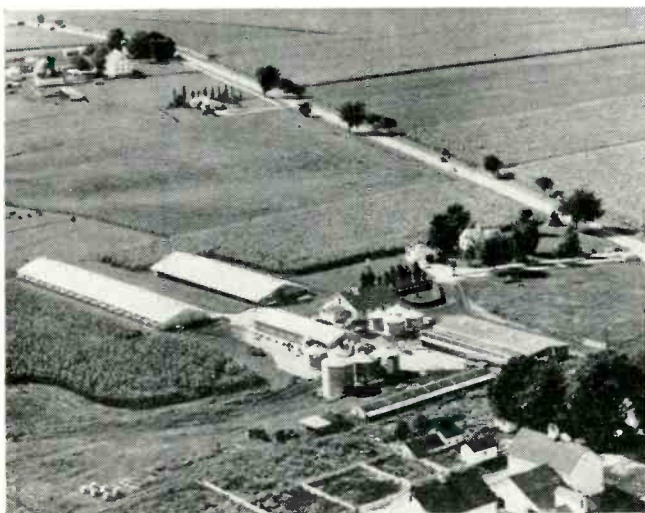
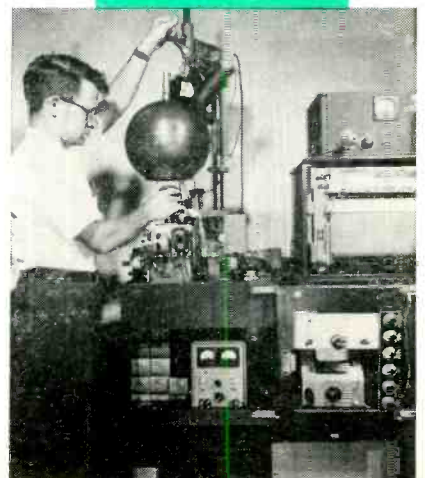
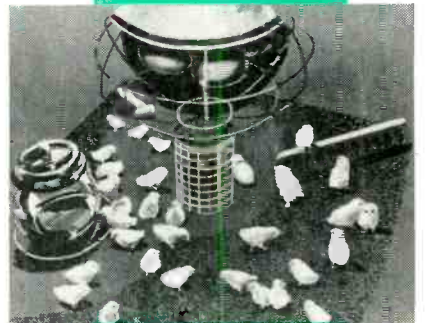
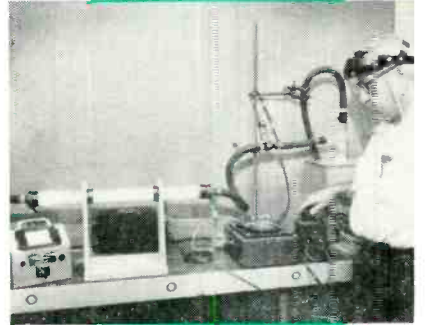
ELECTRONIC INDUSTRIES

A CHILTON PUBLICATION

Electronics and the Future of Agriculture

An Editorial
Staff Report

Second in a Series
on New and Expanding
Electronic Markets



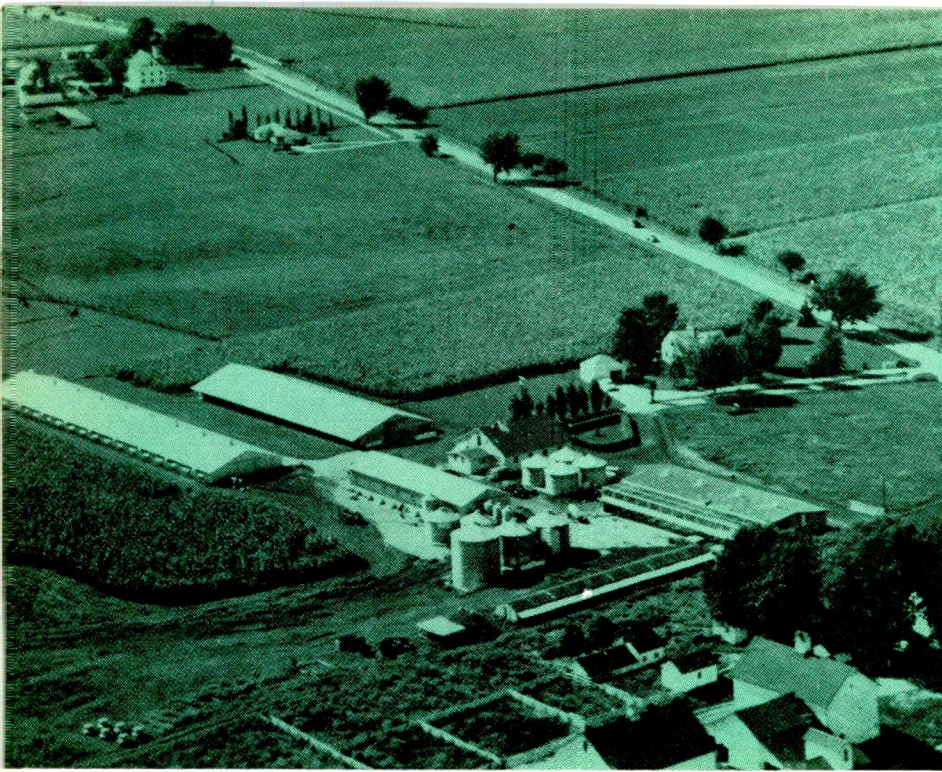


Fig. 1: On this farm, owned by W. T. Frye, Peoria County, Ill., the complete handling of poultry feed is automatically controlled. Feed is stored in bulk bins (cylindrical structures in center). Unloading, storage, and processing is performed in the central building. The feed then moves through pipes to the turkey and poultry houses at left.

By **RICHARD G. STRANIX**

Associate Editor
ELECTRONIC INDUSTRIES

Second of a Series

Electronics

HOW did your tomato juice look this morning? Off color? Or the bacon? Too fatty? Egg albumen blood-specked? Chances are none of these annoyances occurred.

But why did they not occur? Mainly because continuous, expensive human decisions were made during the processing. Sure, some of the work has been automated, but not the decision-making part—except for physical size.

As another expanding market for electronic manufacturers, we investigated the possibilities of agriculture. This industry grossed over \$85-billion* in 1959.

For quite a while, a few private research labs, several agricultural colleges, and numerous State Experiment Stations have been doing work on the adaptation of electronics to agriculture. Most of the work has been done in cooperation with the U. S. Dept. of Agriculture (USDA) which has also been doing its own experimentation.

At its Beltsville (Maryland) Experimental Station, USDA is acting both as a clearing house for this type of information as well as a research and development center.

Various branches of two of USDA's services—Agricultural Research Service (ARS) and Agricultural Marketing Service (AMS)—are doing extensive work in their respective fields.

A rather simplified breakdown of

activities would give the actual application of electronics to the farm itself to ARS; in particular, to the Farm Electrification Research Branch of the Engineering Research Division, ARS. The use of electronics after the product leaves the farm is a function of the Instrumentation Research Laboratory of the Market Quality Research Division, AMS.

Eggs and Bacon

Let's get back to the bacon and eggs.

Sure, we know about egg candling! And bacon's bacon! But, do they have to be so expensive? They do, as long as human decision-making on each unit has to be performed. Why can't electronic equipment be substituted? The truth is, in many cases, it can, and has been; but, not extensively. One reason for the slow acceptance has been the high initial cost of equipment. Obviously, mass production techniques could considerably lower these costs.

Here are examples of what's been done with egg candling and hog fat measurements.

A spectrophotometric method of detecting blood in white eggs,² developed by USDA engineers, decreased the error in detection about 90% when tested on a commercial grading line. The detector, Fig. 3, which can scan 7,200 eggs per hour, is sensitive to the color of blood and automatically diverts eggs in which it is present, Fig. 4. Till recently, brown eggs could not be tested with this device because that pigment

R. G. Stranix



* This figure represents the retail value for food, tobacco, liquor, and clothing.

Editor: This is the second in our continuing series on new and expanding markets for electronic manufacturers.

Agriculture embraces much more than food and the farm. Tobacco, liquor, clothing, textiles, and shoes—all are included. Processing and production of these items make it truly one of America's greatest industries.

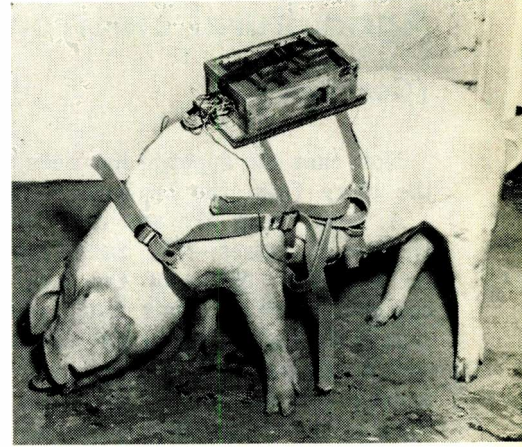


Fig. 2: Radio - electrocardiograph equipment as used in the study of jet aircraft noise, 135 db max., effects on farm animals.

and the Future of Agriculture

Electronic techniques offer great savings throughout the production-distribution chain, which brings goods to the consumer. How widely these techniques are applied will depend upon the awareness of both the electronic and agricultural industries.

represents nearly the same color as blood. However, this difficulty has been overcome.

Using the same eggs, licensed graders missed 3.9 blood spot eggs per thousand; the detector missed only 0.38.

Radiation measurements, Fig. 5, are now being used to get an objective measurement of the proportion of lean to fat tissue in livestock and poultry.³ Counting the minute natural gamma ray emission always

given off by animal muscle tissue, biologists can translate the impulses into an estimate of the proportion of fat to lean meat. The present device can handle 70 pounds of meat and works so quickly that a frozen cut can be measured for composition and returned to the freezer without danger of thawing. With modifications, the machine could estimate fat in live animals to help breeders select the most desirable animals.

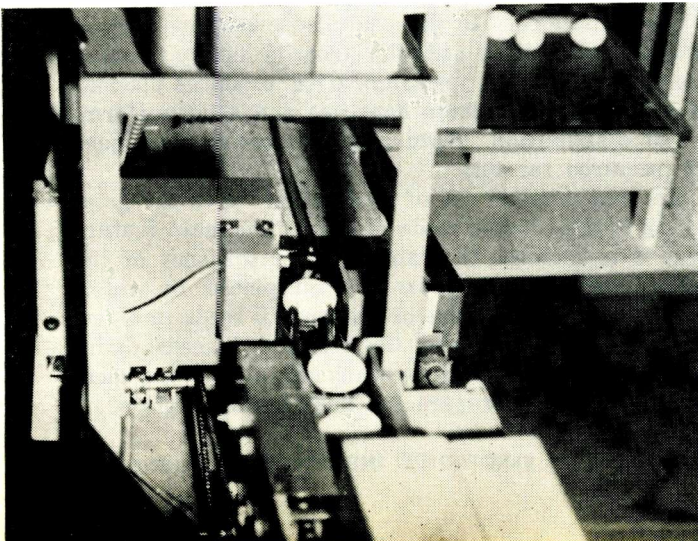
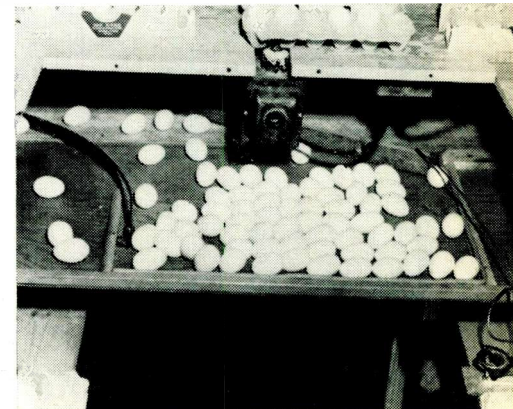


Fig. 3 (left): Blood spots in eggs can be detected by this device which scans 120 eggs per minute.

Fig. 4 (right): When a blood spot is detected, a tripping device diverts the egg from the pack. The three eggs on the left have been rejected; the others are ready for packing.



Agricultural Electronics

(Continued)

Down on the Farm

Now that our appetite has been whetted, let's start the story from the beginning—the farm!

A farm house like any other home has the usual electronic devices—TV, radio, phono, and possibly an intercom. Many of the larger farms are now equipped with citizen's band radio communication type equipment, enabling the occupant to keep in touch with truck and tractor operators in distant fields. The home might also be the electronic control center for some of the electro-mechanical devices.

Though it is not electronic as such, it is probably worth mentioning the electric fence to control the grazing of livestock. Of more practical value is the portable electric fence which permits maximum use of existing herbage.⁴

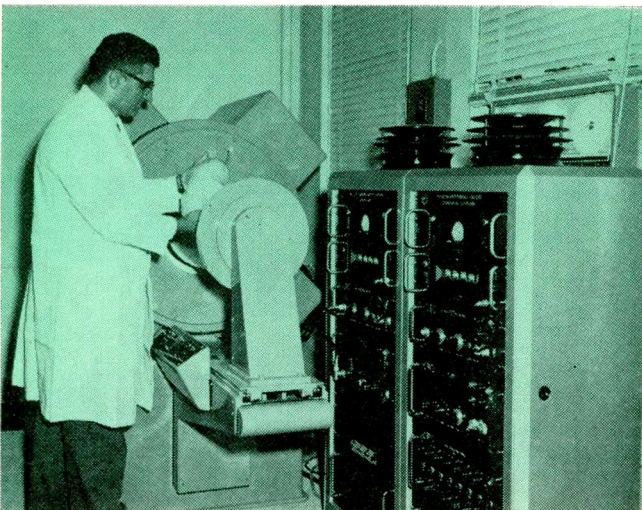
Almost since the time Franklin discovered that lightning was electricity man has been trying to determine the effect of this phenomenon on living organisms. As early as 1747, Nollet, according to Riccioni,⁵ experimented with the idea of irradiating seeds with electric energy for the purpose of inducing changes. He used a friction machine as the source of electric energy.

Since that time, many different methods have been tried.⁶ The simplest: make the organism part of a series circuit and use either ac or dc. Though measurements are simple, results can not be predicted due to the variable parameters of the materials. Also, electric arc burns at the surface are caused by the point concentration of current at the electrodes.

Another method of irradiation has been the use of r-f energy.⁷ This treatment subjects the seeds to strong electric but weak magnetic fields.

Riccioni⁵ used a somewhat different method. He placed the seeds in an electric field and increased the potential until an arc formed, thus subjecting the seeds to both a high electric and a high magnetic field—but at different times. This is probably similar to the radiation the seeds are subjected to when there

Fig. 5: This equipment is used to detect the gamma rays emitted by potassium-40, always present in animal tissues. The measurements are then used to estimate the amount of fat present. Besides its present use, detector can measure fallout contamination in food.



is a lightning discharge between a cloud and earth striking in a field.

Probably the newest method is the most practical. It may be used for low as well as high frequency work. Its major contribution is the introduction of a controlled vacuum, Fig. 6. This technique, invented by O. A. Brown,⁸ subjects the specimens to a glow discharge. The method also has the advantage of placing the electric and magnetic fields under the control of the operator. Experiments can be readily repeated and the results compared.

Before describing the procedure and equipment used in this system, it might be well to tell why we are interested in irradiating seeds.

Experiments have shown that germination may be speeded or inhibited, at will, and the rate of water sorption increased.⁸ Corn seeds exposed to radiation for a short time also germinate more uniformly, Fig. 9. But field trials have not shown any significantly higher yield than the control seed. Cottonseed and fiber experiments at the Tennessee Agricultural Experiment Station have revealed that radiation makes the seeds and fiber more water absorbent and the yarn stronger,⁹ Fig. 8.

After irradiation, the fiber samples are no longer soft and pliable—but rather rough and stiff. Inspection shows that the normal wax coating has been pierced in many places and the fiber surface roughened. Analysis shows that the percentage of wax and its melting point are lowered. The yarn strength increased about 20%.

Another effect of irradiation due to the individual tolerances of seeds is the killing of certain unwanted types, e.g., wild garlic can be killed when in mixture with barley, with only 20% injury to the barley.

Brown's glow discharge equipment consists of a tube fitted with electrodes at each end, a vacuum pump equipped with a pressure regulator, and a variable high voltage source.

The seeds are placed in the tube, Fig. 7, usually made of glass, synthane, fused quartz, polystyrene, and the tube is evacuated to some predetermined pressure, e.g., 1.0 mm of Hg. The tube has 2 ports: one to insert the seeds (this is corked during ionization); the other has a hose attached to the vacuum pump. When the applied potential is increased sufficiently, the gas molecules are ionized. When ionization occurs, the inner volume of the partially evacuated tube is almost entirely filled with a luminous region—plasma. Striations indicate the variation in potential gradient in the tube.

Glow discharges in gases at low pressures may be produced with little difficulty from dc on up through the radio frequency spectrum. UHF produces plasmas of high ion and electron densities and good uniformity of distribution. Naturally, microwave techniques are required for UHF.

Another possible use of irradiation is in the processing of dehydrated seeds for food. The main feature here is to increase the rate of water sorbency of the seeds. Irradiated soybeans, when placed in water, swelled to twice the size of the control seeds in a few minutes; in 30 minutes the irradiated seeds disintegrated. Incidentally, soybeans are among the most difficult seeds to prepare for human consumption.

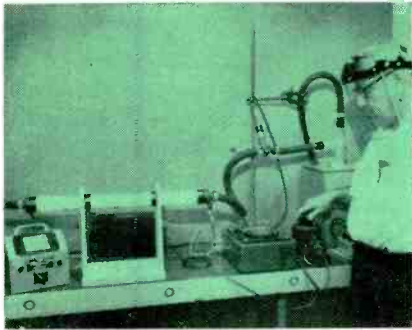
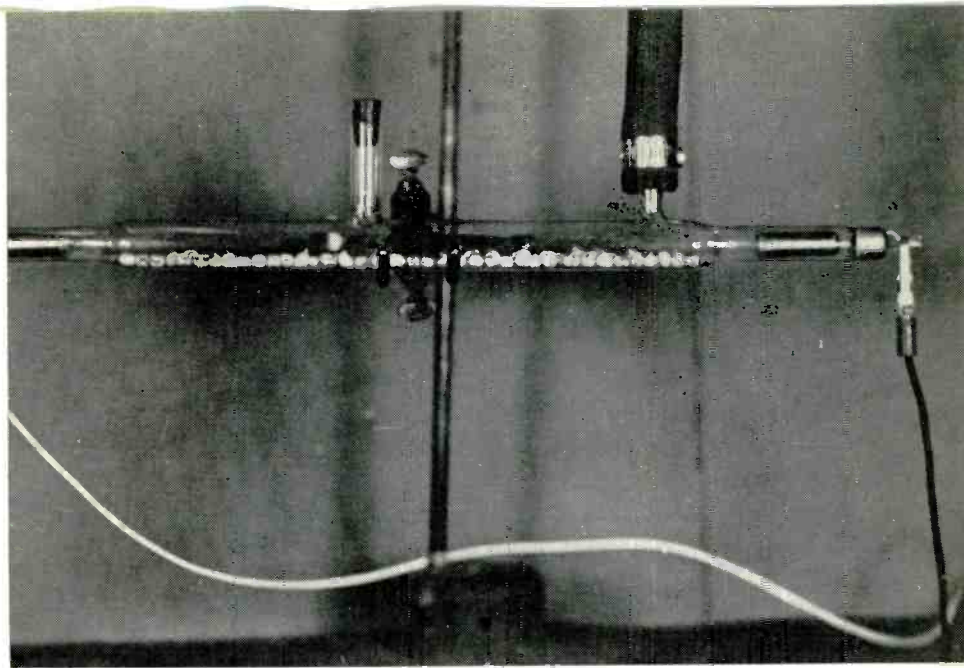


Fig. 6 (above): Weak current applied to ends of tube causes rarefied air in the tube to glow. Irradiation alters some properties of plant materials exposed in the tube.

Fig. 7 (right): Treating tube has terminals at each end so that the current passes along the length of tube. Corked mouth admits seeds. The hose is connected to a vacuum pump for the removal of air.



Back-Fat Measurements

Earlier we mentioned that radiation measurements were being used to obtain information on the proportion of lean to fat, and that with modifications it might be used on live animals. Another method, using ultrasonics, has already been used.¹¹ The results indicate that with additional circuitry to simplify the visual display, the equipment can be used by untrained operators. The system has a correlation of 0.79 between the ultrasonic measurement and the ruler measurement.

For this type of measurement, the transducer was placed at three different positions directly on the pig's back—over the shoulder, over the last rib (loin area), and directly above the stifle joint, Fig. 10.

Measurements were made on both live hogs and carcasses after slaughter. A small amount of transformer oil was placed on the point of measurement to provide acoustical coupling between the probe and the hide of the animal. The actual point of measurement lay on the mid-line of the back. Some additional measurements were located 2½ in. to the right and left of the mid-line. Check measurements by the ruler method were made at the same points on the hanging, split carcasses.

Ruler measurements are made by inserting a narrow steel ruler in a slit made by a scalpel.

An electrical pulse of about 1600 volts is applied to the transducer crystal and is converted to an ultrasonic pulse. The duration of the pulse may be varied from ½ to 2 microseconds. When ultrasonic pulses reach a boundary between two media of different densities, e.g., fat and lean, a portion of the sound wave is reflected back along the transmission path and when this reflected signal reaches the crystal, a small pulse is produced.

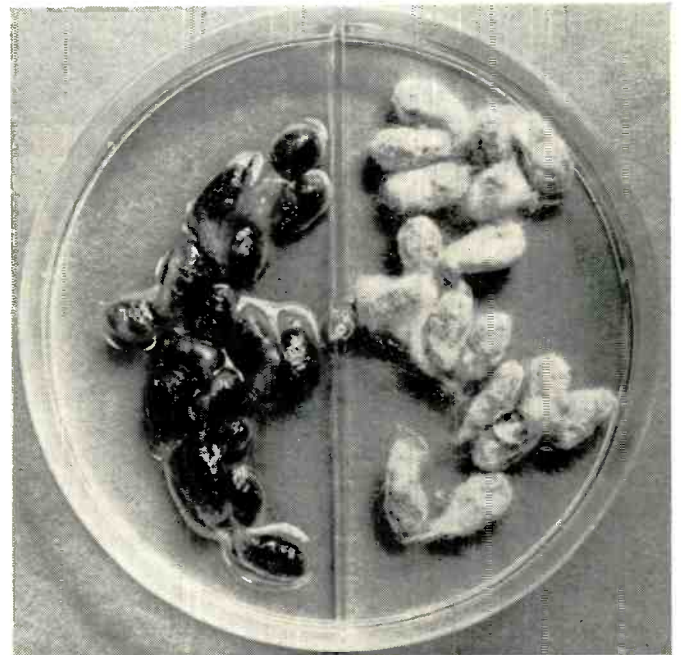


Fig. 8: All of these cotton seeds have been in water for the same period. Untreated ones at right absorbed little water, but treated ones at left became saturated. Irradiation speeds germination.

Since distance is directly proportional to the time between the generation of the original pulse and production of the reflected signal at the crystal, measurement of this time interval provides a depth dimension. A cathode-ray tube with suitable time base is used for a display of the original pulse and its reflected signal. A repetition rate of 300/sec. is used.

Calibration in terms of depth of hog fat is based upon a sound velocity in animal fat of 1.44×10^5 cm/sec. An aluminum bar 4.44 in. in length, equivalent to 1 in. of hog fat, is used as a standard to



Fig. 9: Corn germinated faster after exposure at less than atmospheric pressure to low frequency radiation. Seeds at left were not treated; the others were treated at 4, 8, and 16 ma, respectively.

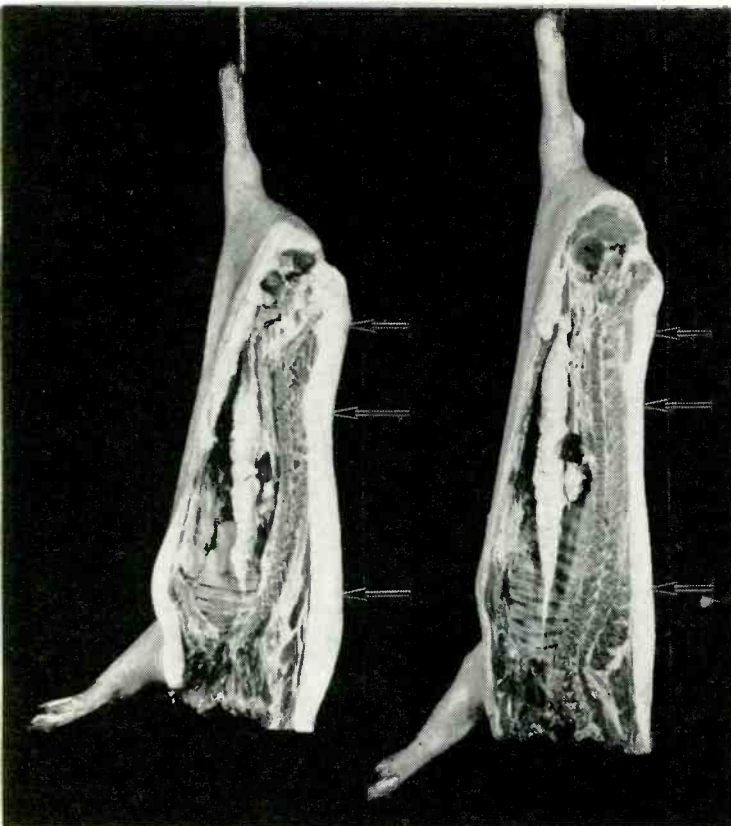


Fig. 10: Arrows indicate points of measurement with an ultrasonic transducer. Carcass at left is from high-line hog; that at right from a fifth-generation low-line, developed to improve lean-to-fat ratio.

Agricultural Electronics

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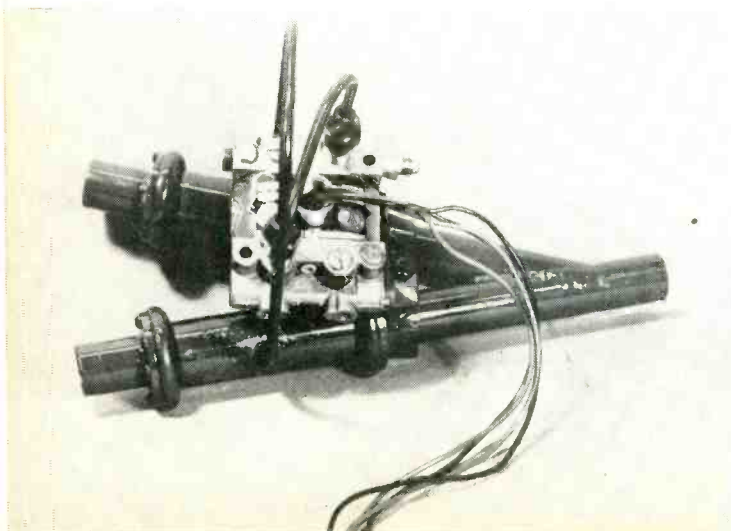
calibrate and check the display sweep of the apparatus.

The average difference between the live ultrasonic and carcass ruler measurements was 0.20 in. with a standard deviation of 0.26 in. (± 0.26).

One difficulty of establishing absolute accuracy is the variation which may occur in ruler measurements. Aside from the human element, soft flesh is somewhat difficult to measure more closely than to the nearest 1/16 in. Measurements in hanging position are believed to deviate from the standing position, Fig. 14.

The total fat pip on the visual display is usually easily distinguished on the loin and ham measuring points, while the shoulder measurements usually yield a more complicated pattern. However, the reliability of the shoulder measurements compared closely with

Fig. 11: Three-way pinch valve is suitable for direction controls of feed. It is operated by compressed air and electronically controlled.



the reliabilities of the ham and loin measurements, in spite of these complications.

Although we quoted a figure of sound velocity in animal fat of 1.44×10^5 cm/sec., there is disagreement among authorities on the precise velocity of sound in tissue. This fact along with animal movement and fluctuations in hand pressure on the transducer are the major sources of error.

Chickenfeed

No threat of labor trouble on the farm due to automation. Distribution of feed can be a laborious and time consuming task—not to mention costly. A completely automatic feed handler is now in operation on a Peoria County, Ill., farm, Fig. 1. It was developed by H. B. Puckett, a USDA agricultural engineer, in cooperation with the Illinois Agricultural Experiment Station scientists and an Illinois farmer.¹⁰

The electro-mechanical system, which also involves pneumatics, maintains a constant supply of feed in the poultry houses. This is how it works.

Bulk feed, blended and ground, is moved to the poultry houses by a pneumatic conveyor as easily as water is piped—up, down, and around corners, Fig. 12.

The conveyor, actually a one inch pipe, carries the feed to small storage bins at discharge stations in the houses. At set time intervals, the feed is then distributed by automatic feeders.

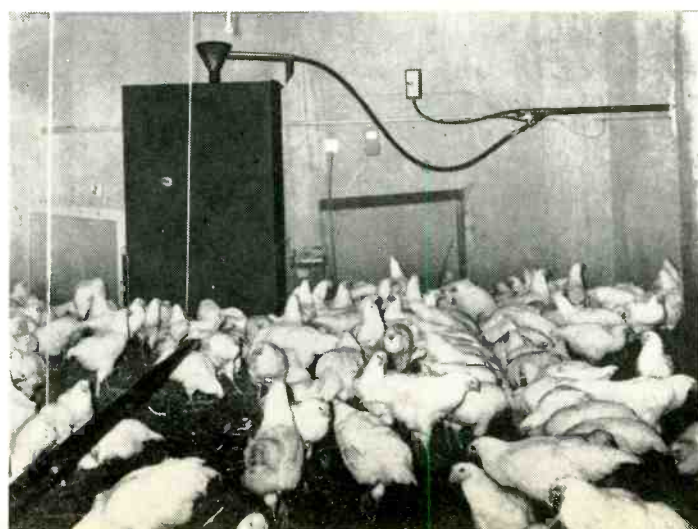
The entire system can be controlled by a bin switch at each feeding location. The type of mix to be delivered to each location can be controlled from the master control panel at the hammermill, Fig. 13. Three-way pinch valves, located at several places throughout the system, route the feed to the proper location. The valve, Fig. 11, was specially designed by Mr. Puckett. It consists of a metal tube with a collapsible rubber liner. The tube and liner work like a milking-machine teat cup and liner. Compressed air is injected between the tube and the liner, forcing the liner to collapse and divert the feed to the other outlet.

This low-volume, medium-pressure, pneumatic conveying system is growing in popularity because of the small size of the pipe required, the ease of installation, the automatic controls, and the small amount of dust generated at discharge stations.

Artificial Chick

A new control, responsive to radiant heat, auto-

Fig. 12: Pipe at right carries feed to 3-way pinch valve which may direct it to the storage bin at left or route it to another point.



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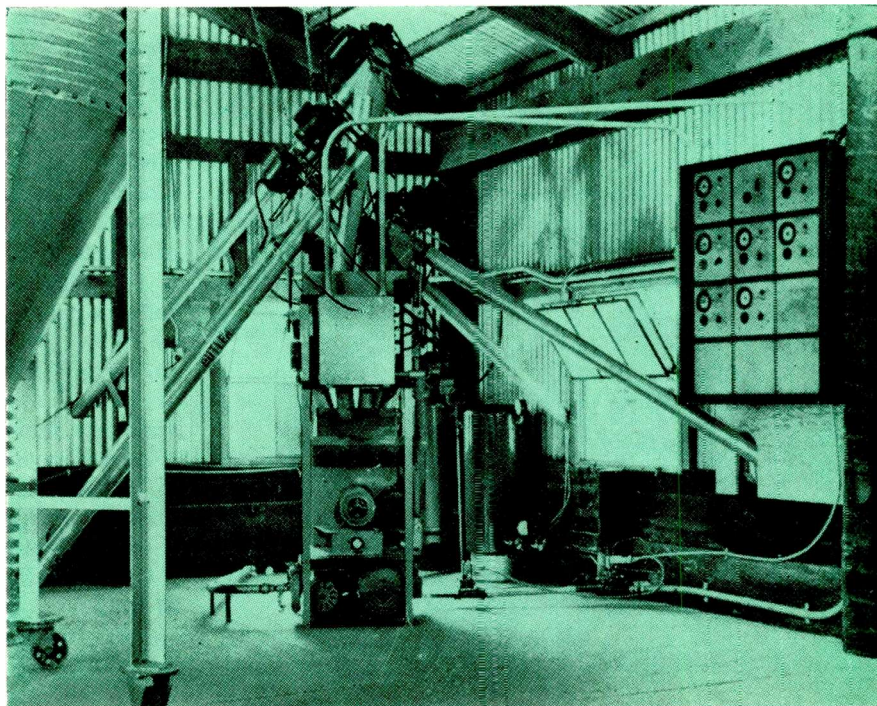


Fig. 13: Distribution control panel at right contains a subassembly for each feeding location. After grinding and blending, feed can be automatically moved by compressed air to the selected discharge point.

matically controls infrared brooder lamps according to chick needs.

The heat sensing element of this control is a sort of imitation chick. It operates under a brooder near chick's body temperature and reacts as they do.

The device¹² is a 4 in. black globe that loses heat by radiation and convection in much the same way that the chicks lose heat to their surroundings. Thus, a temperature change affecting the chicks also affects the control. Basically the globe contains a thermistor for sensing temperature and a resistance heating element to supply internal heat. It also contains a transistor amplifier, Fig. 15.

A brooder regulates the rate of a chick's heat loss by controlling environmental temperature, or by supplying radiant energy to the chicks from sources such as infrared lamps. The device operates without greatly raising the temperature of the surrounding air.

The black globe is located just above the litter under the brooder lamp. Fig. 14. The globe's 105°F temperature is maintained with heat from two sources — some continuously through the electrical resistance heating element inside the globe; the rest, intermittently, by the infrared brooding lamps.

As they grow older, chicks produce more heat by eating more feed and they become better insulated with feathers. Consequently, they require less external heat from the lamps.

Naturally, the globe cannot grow feathers. Yet to perform its job efficiently it must obtain this warmth, or heat, from some other source. This is accomplished through the internal heating element. A simple adjustment of a rheostat is all that is required. Increasing the globe's internal heat in proportion to chick age allows this device to maintain its internal temperature in progressively cooler surroundings without any additional heat from the infrared brooder lamps.

In controlling infrared lamps, it is best to keep the "off" periods as short as possible, to keep chicks from

getting chilled. This is done through a proportional-time-cycle principle.

The thermostat setting continually sweeps back and forth across a band of about 3°F every 15 sec. Thus, when the sensing sphere's temperature is within this 3° range, the lamps are turned on for a portion of the 15-sec. cycle. The length of the "on" period decreases as the sphere's temperature approaches the upper limit of the 3° range. Quite naturally above this range, lamps are off continuously; below, they are on continuously.

There are a few disadvantages to this new control. The fairly large sensing element occupies space under the brooder and must be protected from the birds. Moreover, present cost of the device is high, limiting it to large installations where one unit could control several brooders. It is possible that mass production of this device could bring the cost of it within the reach of all poultry farmers.

Farm Research

Considerable research has been done with electronics for improving operating conditions on the farm and also for testing the effects of environment upon animals. Most of these equipments will never

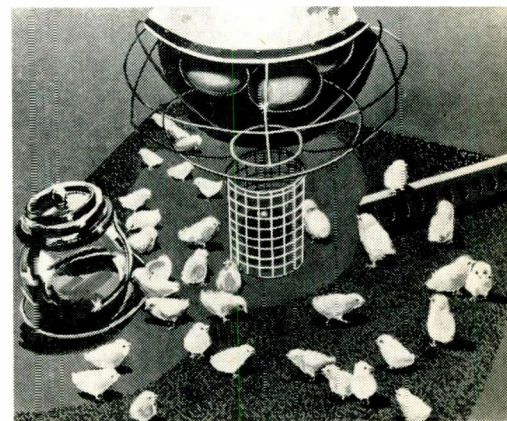


Fig. 14: Radiant heat from infra-red lamps keeps chicks warm. Artificial chick — small enclosed black globe — automatically turns on lamps when the chicks need more heat.

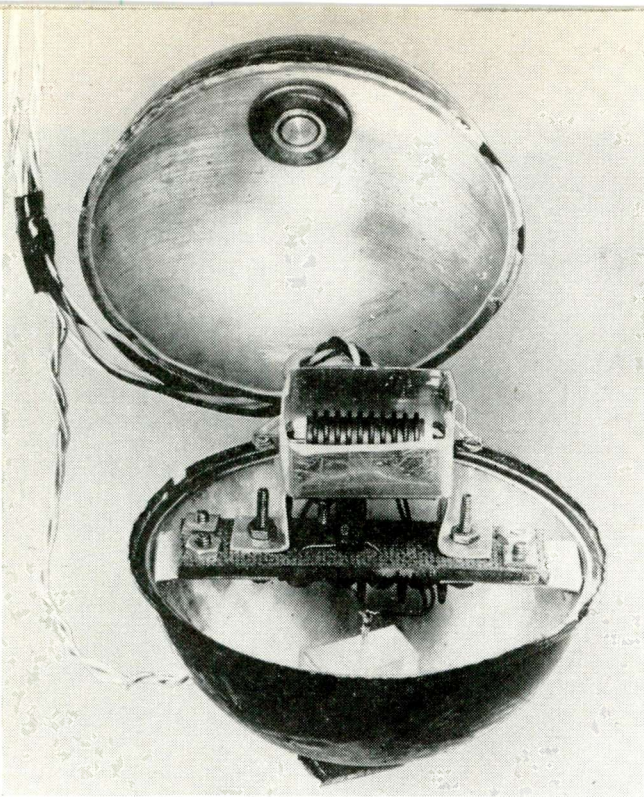


Fig. 15: Mounted in the black globe are a thermistor (center), resistance heating element, and a transistor amplifier.

Agricultural Electronics

(Continued)

be used in actual practice on the farm, but it might prove interesting to see just what has been done.

There has been considerable discussion about jet aircraft noise and its effects on humans, but what has been done to study its effect on livestock?

Farmers and livestock men would like to know specifically:

Does prolonged jet aircraft noise cause a drop in egg or milk production? Does meat production from meat-type animals go down? Does feed efficiency decrease? Do any actual physiological changes occur?

The USAF contracted with the ARS to begin a series of jet-noise experiments on pigs. Pigs are selected because they grow rapidly and have shorter life-cycles than larger animals. Results of this long-range research are expected to provide noise tolerance levels for stock.

Work so far shows that exposed animals display no outward symptoms and undergo no anatomical changes.

During the tests, a radio-electrocardiograph, Fig. 2, powered by hearing aid-type batteries, checked the test animals' heart action before and during sound exposure.¹³ Cardiographic signals were picked up by a radio receiver and displayed on an oscilloscope. They were also recorded as electrocardiograms, Fig. 16.

The animals' ears, thyroids, and adrenal glands were also carefully studied for possible changes due to jet noise.

Under the testing procedure, six pigs in each of three pens were exposed at intervals during the day—6 A.M. to 6 P.M.—to the recorded sound of both jet and conventional piston-type aircraft "flyovers." One

pen with six control animals was located outside the range of noise.

Sound was piped into the test pen during the 12 hr. period at predetermined irregular intervals ranging from only a few seconds to 10 or 12 min. Sound intensity varied from 110 to 135 db. Maximum intensity of sound one mile from a jet airfield is about 120 db. Sound intensity beside a large tractor normally ranges from 95 to 100 db.

Animals were exposed to constant jet sounds for definite periods of time and to pure tones, produced by tuning forks, of different levels. Some pigs were born right into the jet noise environment. Researchers hope to discover if life-long exposure to this sound may be a factor in determining tolerance.

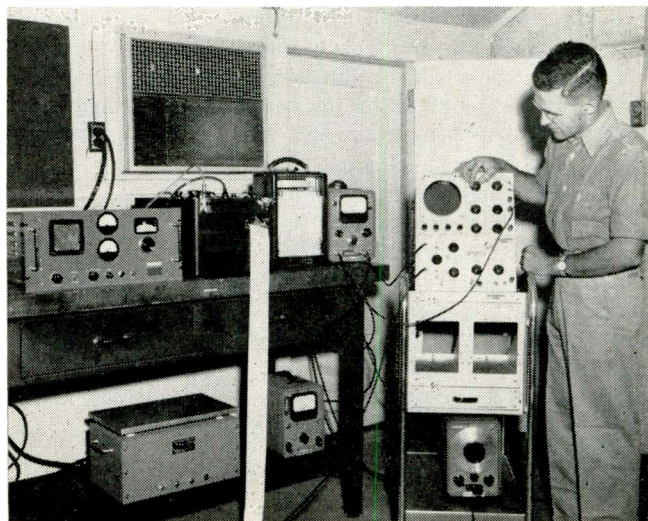
As we have said, outwardly, the pigs do not appear to be affected by the noise. The only visible reactions are a momentary pause in eating, and an occasional start or gentle waggle of the ears.

Congress has recently appropriated approximately \$1-million for the study in the State of Georgia specifically, for the effects of temperature and humidity control on chickens.¹⁴ Last year's rejection of a large portion of that state's poultry by USDA inspectors prompted the action. It has been believed that chickens can live comfortably in environments with a temperature range of 45° to 75°F. If the investigation reveals that the hen house temperature and humidity must be controlled in states where severe environmental conditions are encountered, electronics will undoubtedly be used for the control.

Insect Traps

Electrically operated survey-type insect traps, Fig. 17, are being used rather extensively for determining the presence, abundance, and type of occurrence of many species of economic insects.¹⁵ Such traps are used primarily by research and regulatory entomologists of State and Federal Agencies and by commercially employed entomologists. The need often arises for operation of traps at locations remote from central-station electric service; this requires a dependable, portable source of 115 v., 60 cycle current to

Fig. 16: Cardiographic signals are picked up by a radio receiver, displayed on an oscilloscope, and recorded as an electrocardiogram. The radio-electrocardiograph and transmitter are shown in Fig. 2.



operate the attracting black light. Even in areas where central-station electric service is available, need has been demonstrated for such a power source to reach certain suspect fields. In addition, it may be impractical to obtain conventional electric service in turning on research, because of the expense of line extensions.

A transistorized power supply and automatic control unit for battery operation of these traps has been designed, constructed and is operating efficiently and dependably.¹⁶ Using an automobile-type battery, the inverter has the highest possible efficiency to extend the useful life of the battery. The inverter provides a 115 v., 60 cycles because the commonly used survey



Fig. 17: Insect traps such as this can be powered by a transistorized power supply, thus extending their use to areas where line extension cost might be prohibitive.

traps are designed for operation at this voltage and frequency.

ARS scientists are working to develop better survey-trap devices, too.¹⁷ They are trying to find bands of ultraviolet light that will attract a wide range of insects, and to develop "fine-tuning" techniques for attracting only single species. Thus far, however, they have found no wavelength that attracts the boll weevil although the adult pink bollworm and cotton bollworm moths are attracted by the near-ultraviolet range.

Incidentally, there are two types of survey traps: One uses an electrified grid to kill them; the other a suction fan that collects the insects in a mesh bag.

Storage

Insects in stored grain may some day be killed by the use of electronics. Research work at the Nebraska Experiment Station using high frequency electric fields to kill weevils and flour beetles in small batches shows that the insects die within a few seconds when they are exposed to the radiation.¹⁸ Treatment seems to increase the germination and early plant growth is speeded.

Electrical heat treatments prior to milling also may improve the baking qualities of flour made from the wheat. Moisture removal and prevention of mold in storage are often benefits that come from electrical treatment of grain. Finally, this method leaves no residues like those left by chemical fumigants.

Experimentally, insects are killed by placing infested grain between two parallel metal plates, part of a power oscillator, which sets up a field of several thousand volts. Temperature of the wheat placed be-

tween the plates is raised as much as 50° or 60°F in three or four seconds.

You will recall that in dielectric heating the heat is generated within the wheat and insects themselves as they absorb energy from the field.

Naturally, the rate of heating depends on the electrical characteristics of the material being treated. If the insects have the right electrical characteristics, their body temperatures can be raised to a killing point without heating the grain to damaging temperatures.

One of the problems encountered in this method is that different temperatures are required to kill insects in different stages of maturity. While adult rice weevils may be killed by bringing the wheat to about 100°F, immature rice weevils require that the temperature of the wheat be brought to about 140°F. This latter temperature does not damage wheat with a moisture content of less than 13.5%. Moisture content of seeds is very important in determining the maximum temperatures they can tolerate.

Problems involved in the transition to field application of this equipment are not expected to be very serious. Some large-scale experimental work has already verified the laboratory findings. To handle large quantities, the grain will probably be treated as it moves between metal plates either in a chute or on a conveyor belt. Suitable synthetic materials are now available to make chutes and belts which are not heated by the high frequency field.

In addition to dielectric heating, there are some other new possibilities for insect control. Scientists believe that the ionizing beta and gamma rays, emitted from radio active material, may some day be applied to stored-grain insects.

Beta rays, with their limited penetration capabilities, will probably limit the thickness of the material being treated to one inch. Thus, infested grain would have to be treated in thin layers.

In contrast, gamma rays are very penetrating. Probably the best sources for gamma radiation would be in spent fuel elements from nuclear reactors. Shielding, of course, will be necessary with either beta or gamma rays.

Radiation doses large enough to kill insects also damages grain for seed purposes. But, they do not seem to affect milling and baking qualities.

Beta and gamma rays kill immature insects more readily than adults—the opposite of high frequency treatments.

Marketing

Included among the primary functions of AMS are marketing research and development programs relating to the assembly, transportation, storage, handling, packaging, distribution, and pricing farm products.¹⁹ Included in the distribution and pricing function, is the field of inspection. To date, it is in this field, where electronics has made its greatest contributions—electronic equipment is in greatest use.

Objective measurement of the quality in foods by physical methods has always been difficult. However, such measurements are being made possible on an exact, scientific basis that will mean better products for the consumer.

The physical characteristics of dielectric constant,

Agricultural Electronics

(Continued)

dielectric loss factor, electrical conductivity, sonic energy absorption, and spectral reflectance, transmittance and fluorescence are the quantities of greatest value in indicating the quality of agricultural products.²⁰

Appearance

The appearance of a good product, as viewed by the human eye, is one of the most important quality factors to be measured. Also it is the quality factor most often measured by physical methods. In addition to size and shape, the appearance of the product is determined by its color and gloss.

In most cases it is not necessary to specify completely the color of a product because the variation of one sample to another is only in the lightness to darkness or in the intensity of a given color. In such cases, one- or two-filter reflectance photometers can adequately measure the color variation. Such instruments have been successfully applied to tomatoes, corn, tomato products, lemons, eggs, beans, peas, cotton, peanuts, and other materials.²¹⁻²⁶ For many of these products, automatic color-sorting equipment is available.

Rheological Properties

Rheological properties are those which determine the consistency, toughness, hardness, and other characteristics generally evaluated by the consumer with his sense of feel. These properties lend themselves to objective measurement by mechanical devices. In general, the measurements are destructive to the prod-

uct, and it is often highly desirable to have a non-destructive test. Such non-destructive tests are possible using sonic energy or electro-magnetic energy measuring techniques.

Consistency can be indicated by the absorption of ultrasonic energy; meat texture can be related to the absorption of radio frequency energy; and, rheological properties related to the absorption of light or of ionizing radiations. In these measurements, the rheological property is not measured directly; but rather the density, fiber content, or other compositional factor which determines the properties of the material is measured.

Moisture Content

The moisture content is definitely an important quality characteristic of practically every agricultural product. Much work has been done on the development of physical methods for measuring moisture content, and many successful methods are in use.

Electrical conductivity is used to measure the moisture content of wood, grain, hay, cotton, and many products where the moisture content of importance is within the range of 6 to 40%.²⁷⁻³³ Radio frequency measurement of dielectric constant is also used for this same class of material.³⁴⁻³⁷

Recently, nuclear magnetic resonance has been applied to the measurement of moisture content of materials ranging in moisture content from 5 to 100%.^{38, 39} This method shows promise of offering an absolute method of measurement.

By suitable control of thickness of sample, density can be measured to give a measure of moisture content.

Maturity and Ripeness

A direct method is not available for measuring maturity and ripeness; but it can be indicated by a variety of indirect methods. For some products, such as tomatoes, the external color is a good index of maturity. For other products, e.g., peas and beans, tenderness measurements give the best indication of maturity.

For those products where color gives a good index of maturity, instruments are available to measure maturity by making a reflectance or transmittance measurement. For many other products, moisture content gives a good index of maturity and this can be measured as indicated above. On other products rheological properties are measured to indicate the maturity.

Defects

In food products, defects most often consist of dark spots, decayed areas, or other discoloration. The presence of some material foreign to the product may also be classed as a defect. The complexity of the types of defect that occur in agricultural products makes the problem of indicating these defects very difficult.

External discoloration can be detected by reflectance photometry if the discoloration is large enough. The chief difficulty in detecting these defects is that of scanning the entire sample for a sample that may vary greatly in size and shape. Various techniques have been used to solve this problem: lemons have been dropped through a ring of filtered phototubes to give a view of as large a surface as possible; speci-

Fig. 18: Experimental apparatus used in Nebraska tests for dielectric-heat treatment of infested wheat consists of (1) radio-frequency oscillators, (2) heating electrodes, (3) belt conveyor, loaded from left, to move wheat through electrical field, (4) r-f voltmeter to measure field strength, and (5) infrared units that speed up process by preheating grain.

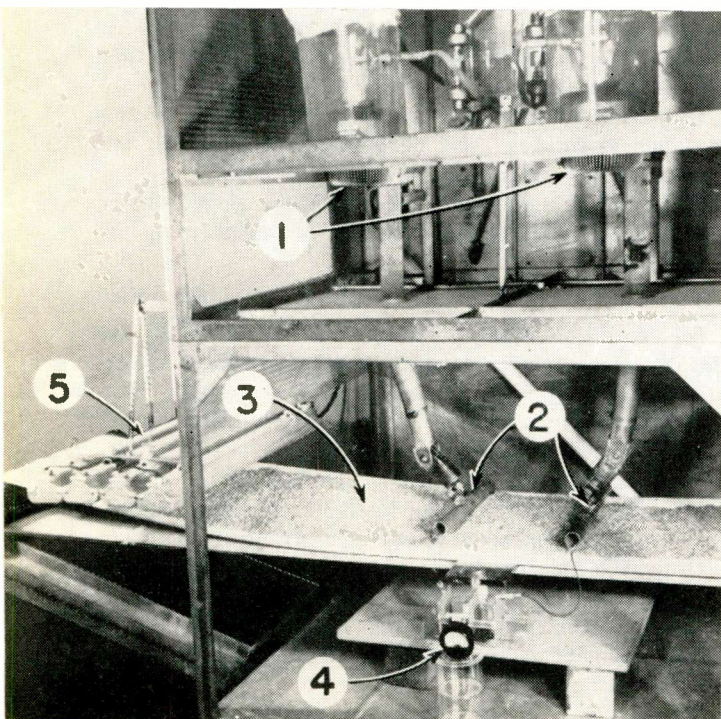




Fig. 19: Spout-type automatic sampler draws samples of peanuts as they flow by gravity through the discharge spout of a belt and bucket elevator.

mens have been placed in the center of a ring of filtered phototubes; and, beans have been placed inside an integrating sphere.

Since external defects are readily detected by subjective evaluation, the problem of replacing this method by physical techniques is even more difficult.

Internal defects are also difficult to detect; but here, physical methods can be most readily applied, and other techniques cannot compete. X-ray units are now being used to inspect grain for the detection of insects within the kernel. Similar techniques can also be used to detect internal defects in fruits and vegetables. The possibilities for much wider application of X-ray inspection are very good. The transmission of visible light through agricultural products can also be used to indicate defects.⁴⁰

Fluorescence measurement can be used to indicate the internal as well as surface defects. Many of the common decay-producing organisms produce chemicals which fluoresce when exposed to ultraviolet light. Unfortunately, many chemicals common in agricultural products also fluoresce; but it is possible in many cases by proper choice of excitation wavelength and by spectral analysis of the fluorescence, to distinguish the decay from the natural material.

Other physical methods such as measurement of dielectric constant, electrical conductivity, heat conductivity, and ultrasonic energy absorption can also be used for detecting specific defects in materials.

As we increase the number of automatic operations in our food processing and handling, it becomes more important to reduce the amount of subjective evaluation involved. Therefore, it is expected that the future development in this field will be very extensive.

Peanut Sampling

Dependent upon the rating given to a farmer's peanut crop, so goes the price that is affixed for his product. Most of the grading equipment has been automated starting with an electrically operated sampler placed near the head of a belt and bucket elevator, Fig. 19, where samples are drawn at specified time intervals as the peanuts pour into the storage bins.⁴¹ Where belt and bucket elevators are not used, but rather where samples are drawn from the farmer's truck, a suction-type sampler has replaced the old sampling probe. Even the pre-sizing, shelling, and

splitting has been mechanized. Naturally, the sample drawn now is more representative of the lot than those obtained by human means.⁴²

The part of the sample that has not been split is then counted and weighed. Coming off a vibrating spiral the shells interrupt a light beam as they pass down a shoot, Fig. 20. The known sample quantity is then weighed and an average figure of number of nuts per pounds is obtained. From this figure, the rate to be paid the farmer for his crop is determined. High moisture content of nuts would account for weight and consequently there would be less nuts per pound.

The Rephobiospect

Regardless of the amount of picking, squeezing, thumping and color examination of tomatoes, cantaloupes, watermelons, etc., the consumer can never really be sure what the fruit is like inside until they cut it open. Neither are the wholesalers, processors, and handlers.

Light absorption techniques offer a possible solution to this unhappy situation. The light transmittance characteristics of a sample can be related to the maturity and ripeness. Commercial instruments of suitable design were not available when the initial work was done. Consequently, USDA developed its own instrumentation.

The main problem in attempting to measure the spectral transmittance properties of an object such as an apple or a tomato, is the problem of collecting sufficient energy from the transmitted signal. Such samples contain a large quantity of scattering material. The light is not transmitted in a straight line through the object, but rather is reflected and scattered many times. As a result the light emerges from all parts of the sample.

If we had phototubes in the shape of a sphere which would completely surround the sample, the problem would be simple. The nearest thing that approaches this condition can be obtained by enclosing the sample in a light-integrating sphere with a phototube viewing a small port in the sphere to measure the brightness of the sphere's surface. Nearly all the transmitted light can be collected by this arrangement regardless of where it emerges from the sample.

A few details of the Rephobiospect^{43, 44}—Recording Photometer for Biological Spectral Transmission—shown in Fig. 21, are in order.

The integrating sphere must be coated internally with a material having a high diffuse reflectance over the spectral region to be covered. High-quality flat white paints are suitable for wavelengths from 500 to

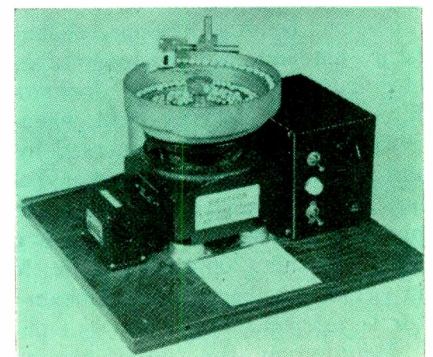


Fig. 20: Seeds are counted as they drop off the top of spiral and break the light beam to a photocell.

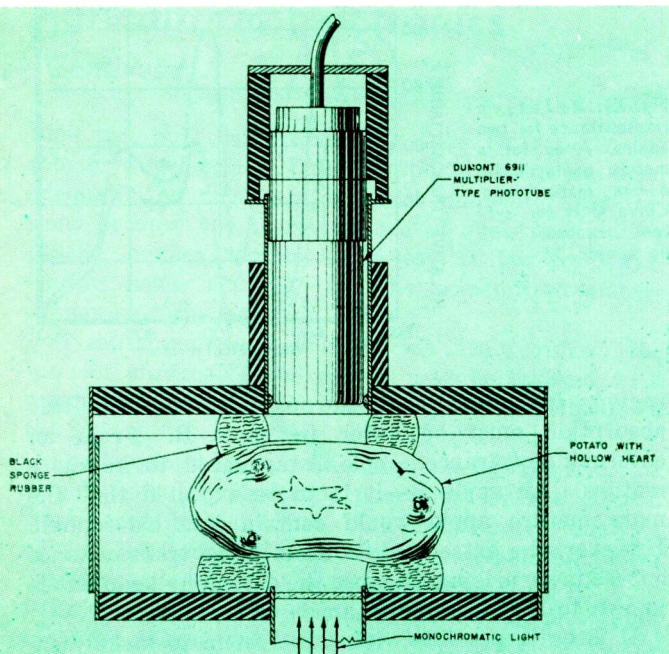


Fig. 24: Direct mount designed for detecting hollow heart. Note that defect appears directly between light source and the phototube.

Agricultural Electronics

(Continued)

with a reference to the inspection by the USDA, many of the equipments will be placed, or have been placed at the processor's plant, because this is where inspection usually takes place. Consequently there should be a fairly large market for some of the systems described in this section.

There are several other applications of electronics in the marketing or processing side of the story. Most of these are concerned merely with the control of a process, but we shall review some of them at this point.

Hog Slaughtering

Humane slaughtering of hogs is becoming a practice of the meat packing industry. This is due to a law recently passed by Congress. The law requires humane slaughtering of animals for meat sold under government contract.

The most successful and approved procedure for slaughtering hogs renders them unconscious with CO_2 before they are bled.⁴⁶ This system uses a conveyor belt which carries the hogs through a steel tunnel. The tunnel has a dip, filled with CO_2 in its center. As the hogs pass through the CO_2 , they are made unconscious by the shortage of oxygen.

An analyzer-controller measures and controls the gas content in the tunnel. The amount of CO_2 is critical. Hogs will remain conscious if there is not enough; an excess will kill them and cause improper bleeding. In a typical installation, a 72% CO_2 concentration is desirable. When the concentration drops to 70%, the hogs are conscious when they leave the tunnel.

The system consists of a sensing head, a calibration and power supply box, and a recorder-controller. The sensing head is mounted on the tunnel wall while the

recorder-controller and power supply are contained in a remotely mounted panel.

The sensing head converts the detected amount of CO_2 to an electrical signal. This signal is then sent to the recorder-controller. With this method of analysis, the system has little dead time and gives a smooth control.

The system is simple to use. A few minutes before the slaughtering begins, a switch is closed to place the analyzer-controller system into operation. The tunnel is automatically filled to the preset concentration of CO_2 . There is very little overshoot at the set point.

If the operator finds that the hogs have not been subjected to the correct amount of CO_2 , he may quickly change the concentration by turning a knob in the recorder. This assures proper slaughtering with a minimum amount of CO_2 .

Electronic recorder controllers are also used extensively throughout the processing industry for temperature and humidity control of the environment along with temperature control of cooking batches, conductivity, and viscosity of liquids, and in many other areas.

Computers

Up to this point we have not mentioned that area which means electronics to many people outside of the industry. That is the computer. Most of us in the electronic industry could readily see how computers would be a valuable asset in the field of wholesale inventory, distribution to local retailers, shelf stocking in the supermarket, and cost tabulation of items selected by a consumer. This last item requires only a suitable indicator on the item and detector at the checkout station, e.g., magnetics or optics.

Given sufficient raw data, computers in a centralized location could also be used to determine proper planting time, quantities, harvesting time, fertilization requirements, water supply and transportation costs.

Pesticides

As already mentioned, detection of pesticide residues offers some difficult problems. Farm products in a particular area are grown by scores of farmers—each using different types and amounts of bug killers. Heretofore, no rapid, quantitative method was available for identifying various pesticides in the presence of one another. The tester had to have a prior idea of what compounds are present before he could detect and measure the residue. A different identification procedure was necessary for every compound and each procedure was lengthy and complicated, involving elaborate equipment and highly trained technicians.

A new test device is now on the market that can be used to determine the nature and amount of pesticides on a sample in a very short period of time.⁴⁷ A concentrated sample is injected into the device, and within minutes the pesticide content can be read on a chart.

The first step in the new procedure is to run a small sample of the vegetable through a food chopper. Then it is extracted with suitable organic solvents and concentrated by evaporation. At this point, it is ready for injection into the analyzer.

The sample passes first into a gas chromatographic

column where a helium carrier gas pushes the individual components along at different rates according to their volatility—thus separating them. From the column, the compounds enter a combustion furnace one after another, and the combustion products move on into a detection cell.

In the cell, silver ions are generated electrolytically and titrate with chloride from the sample. The amount of silver ion generated is measured electrically and recorded on a strip chart. The more organic chloride that is present in the sample, the more silver ion generated, so that the measurement for silver ion is also a measure of the chloride.

Thus, when a decomposed chloride-containing component enters the detection cell, a peak appears on the strip chart. The time, in minutes, after injection that the peak occurs is determined by the rate at which the particular compound went through the chromatographic column—in other words, by its volatility. Hence, time of appearance on the chart is characteristic and will identify the compound. The area under the peak on the chart is measured, and this indicates the amount of the component in the sample. Then, the peak for the next compound, if present, appears and is measured and so on.

Less than an hour is required to chop, extract, and

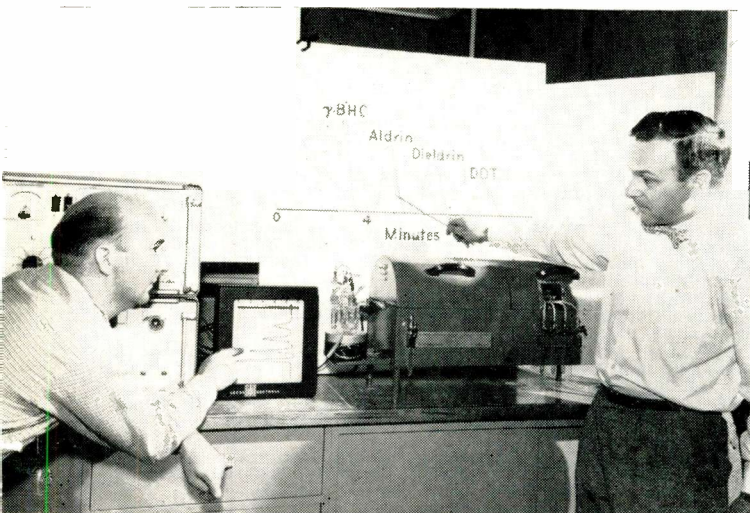


Fig. 25: Dr. Dale Coulson (right) indicates pesticide concentration detected by the Stanford Research Institute analyzer. Leonard Cavanaugh points to the corresponding peaks recorded by the analyzer.

concentrate the sample, and only a few minutes pass between injection in the test device and recording the test results. Consequently, the new method should prove useful in testing laboratories concerned with food purity.

Chlorine or Sulfur

The analyzer is designed primarily to detect pesticides containing chlorinated hydrocarbons because these compounds are those that are retained the longest in the vegetable or in animal tissue.

Many pesticides, however, are sulfur-containing thiophosphates. The analyzer can be arranged to detect them also.

In this case, a stream of hydrogen is added in the combustion furnace. Hydrogen sulfide is formed if sulfur is present, and this compound can be titrated with silver ion, producing peaks on the chart in the

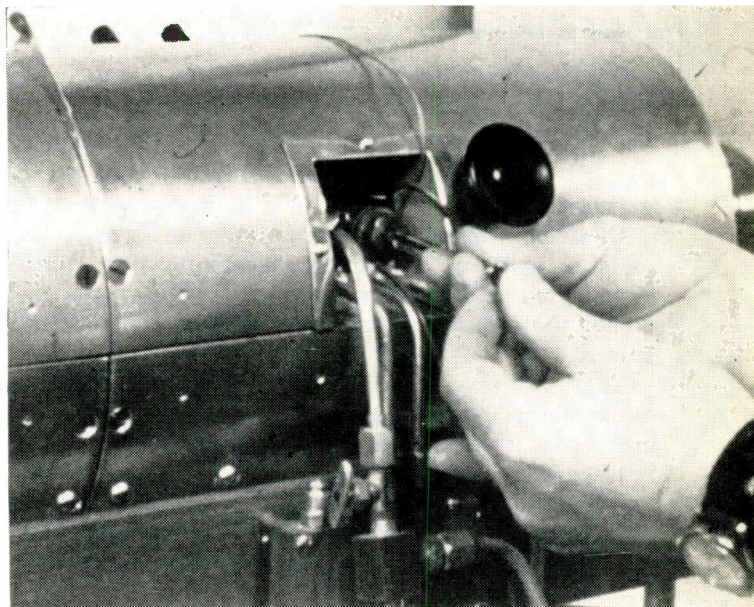


Fig. 26: Technician injects a sample of vegetable concentrate into the SRI pesticide analyzer. Within minutes contents will be known.

same manner as chloride-containing pesticides.

The analyzer, which is far more rapid than any previous method, has an added advantage. A single procedure may be used for a variety of pesticides. This eliminates the need for chemists trained in the use of all of the individual procedures customarily used.

Still another advantage is that the analyzing equipment, though not designed for field use, is small and contained, and large laboratory facilities are not necessary.

As for sensitivity, the procedure can detect chlorine or sulfur in as small amount as 1/10 part per million. This equals the highest allowable level for some of the more toxic pesticides. Therefore, the analyzer represents an important step in protection for the public.

Tractors

Electronic systems and controls which will make the operator of farm equipment a button pusher are rapidly becoming economic necessities for this type of equipment.⁴⁸

These controls can automatically guard against abuse or overloading of expensive equipment, speed up operation of the equipment, and cut down on the operator training needed.

Some electrical control systems that 10 years ago would have been considered radical or ridiculous were offered as optional equipment on 1959 models. More systems will be offered and will become standard in the future as the designers "zero in" on the specific environmental demands of this type of equipment.

A number of components are now available which make feasible remote control of transmissions, engines, and emergency automatic systems; electrical actuation of brakes, throttle control, and other protective functions; central control of multiple engine installations; and, eventually, fully automatic and remote control vehicles.

Practical application of fuel cells as a power source for electrical powered vehicles is indicative of a trend

Agricultural Electronics

(Concluded)

toward such energy sources. Efficiency levels are now so high as to command attention from all builders of prime movers.

Electrical controls and actuators can give a big assist to hydraulic systems by shortening line length, simplifying and making more versatile for the designer the location and arrangement of controls and valves.

There are several reasons electrical, not to mention electronic, controls and actuators have been slow in acceptance by farm equipment manufacturers:

1. Lack of reliability and operational features providing emergency mechanical override provisions.
2. High incidence of trouble with mandatory electrical equipment such as regulators, generators, and cranking motors.

REFERENCE PAGES
The pages in this section are perforated for easy removal and retention as valuable reference material.

SOMETHING NEW HAS BEEN ADDED
An extra-wide margin is now provided to permit them to be punched with a standard three-hole-punch without obliterating any of the text. They can be filed in standard three-hole notebooks or folders.

3. Cost for environmental design requirements.
4. Service—lack of technical knowledge in the field on theory and function.

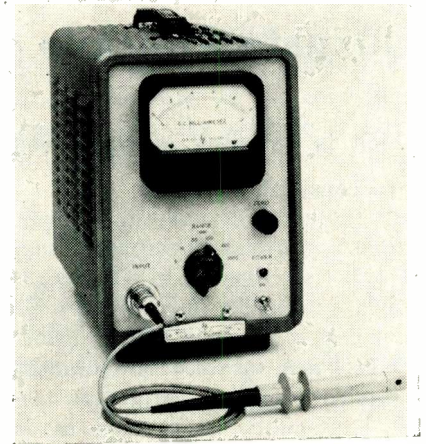
Acknowledgments

The author wishes to express his appreciation to the following for their valuable advice and assistance in the preparation of this article: Dr. T. E. Heinton, L. E. Campbell, and J. F. Silbaugh, of ARS, USDA; and, K. Norris, R. Decker, and M. Hoffman of AMS, USDA.

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Fig. 1: Clip-on DC Milliammeter has two main parts. The probe is a second harmonic fluxgate type of magnetometer for sensing dc flux. Electronic section amplifies and rectifies signal.



The slow, inconvenient, and often inaccurate methods of measuring dc using voltage-resistance measurements spurred the development of a clip-on type of milliammeter. The instrument used the fluxgate principle. The principle is now being extended to other applications including the measurement of ac fields, varying dc, and in a Magnetic Ink Tester.

New Uses for Fluxgate Principle

By **GEORGE S. KAN**

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CLIP-ON type probes have long been used for ac measurements in the power field. These generally depend on transformer action and are not applicable to dc type measurements. However, now clip-on type devices can be made which are sensitive to the magnetic field surrounding a wire carrying dc current. They convert the magnetic field information to a suitable dc current which can be read on a common dc front panel meter.

The development of this technique has spurred the development of other devices using the principle. Many devices have been proposed and several have been developed. Before discussing these new devices, let us examine the basic operating principle as illustrated in a Clip-on DC Milliammeter.*

General Description

The instrument has two main parts: the probe and the electronic section. See Fig. 1. The probe clamps around the wire carrying dc and produces an ac signal

*The instrument described here is the Model 428A, Clip-on Milliammeter made by Hewlett-Packard Co., Inc., 1501 Page Mill Rd., Palo Alto, Calif.

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proportional to the current. The electronic section amplifies and rectifies the ac signal and presents its amplitude on an indicating meter. This section also serves auxiliary functions such as excitation of the probe, and range switching, and negative feedback to provide high accuracy.

The probe head is a second harmonic fluxgate type of magnetometer used for sensing the dc flux around the wire. Its principle of operation may be simulated by the mechanical model shown in Fig. 2. The main parts are the magnetic yoke, rotating armature, sensing coil N_2 and the one turn N_1 of the wire being measured.

The flux in the magnetic circuit may be described by:

$$\phi = \frac{M}{R}$$

where ϕ = the total flux around the magnetic circuit, M = the magneto motive force and R = the path reluctance.

Since:

$$\begin{aligned} M &= 0.4\pi N_1 I_{dc} \\ &= 0.4\pi I_{dc} \end{aligned}$$

for $N_1 = 1$, with:

$$R = \frac{l}{\mu A}$$

where l = the path length, A = the cross sectional area and μ , the permeability is a function of 2ω since the gate closes twice for every rotation of armature

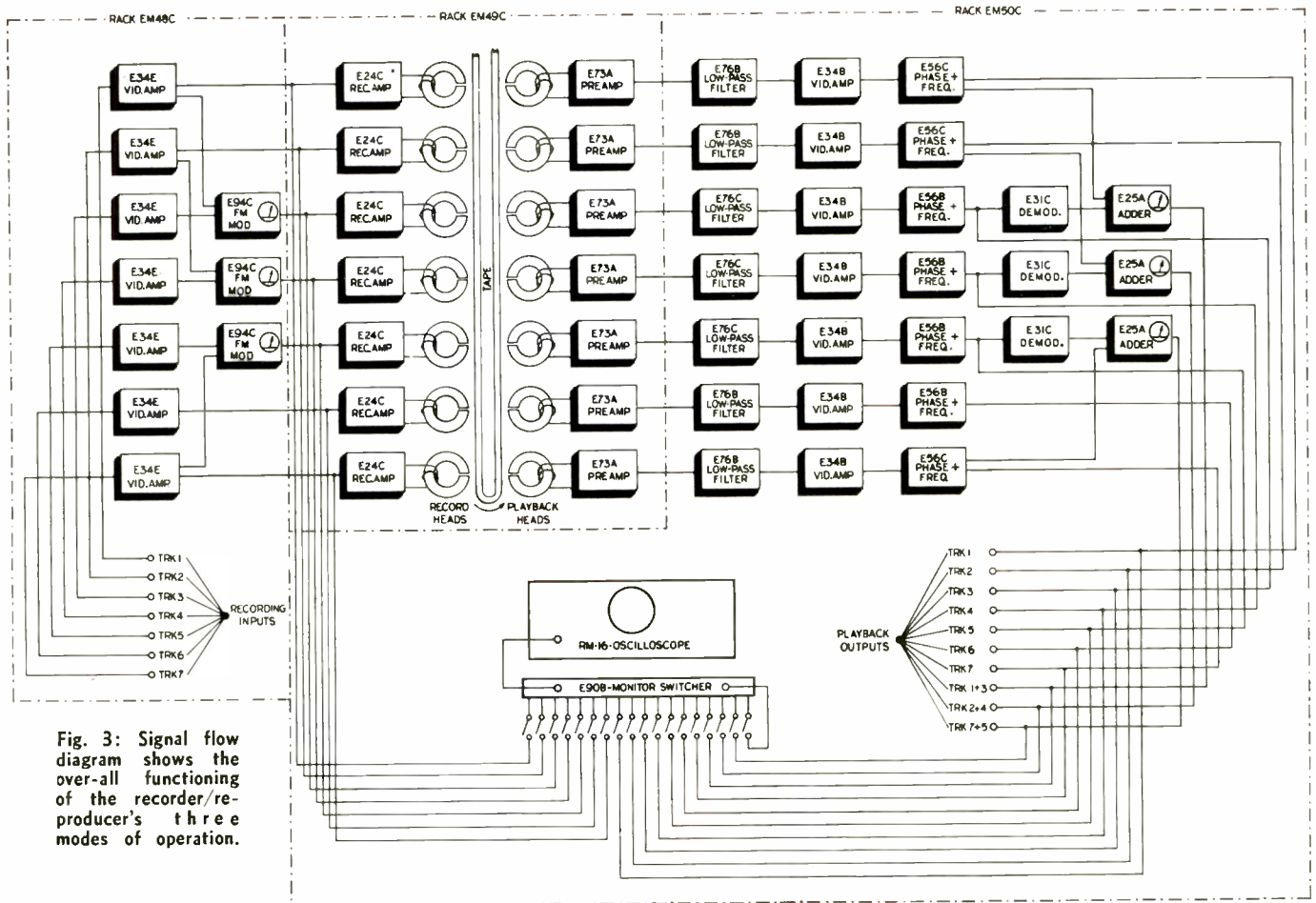


Fig. 3: Signal flow diagram shows the over-all functioning of the recorder/reproducer's three modes of operation.

Multi-Channel Recording (Continued)

and the low frequency capabilities of the FM channels.

For illustration, let us assume that a square wave is applied at the input of track 1 and the front panel controls are set for the Add mode of operation. (See Fig. 4A.) The square wave goes directly on track 1 and is recorded, reproduced, and amplified by the analog circuits described above, before it is phase and frequency equalized in the appropriate equalizer. It must be remembered, however, that a filter is provided in the phase and frequency equalizer which allows only the high frequencies to be applied to the adder. Hence the waveform appearing at the input of the adder is not a square wave but of the form shown in Fig. 4B. This signal is fed into the "highs" section of the adder.

The original signal at the output of the recording video amplifier of track 1 also is applied to the FM modulator of track 3 which contains a low-pass filter. This permits only the low frequencies to modulate the FM modulator. The filtered low frequency information appears as shown in Fig. 4C. The modulated carrier is recorded on the tape and in reproduction it is made to pass through the circuits described under FM operation. The demodulated signal then appears as shown in Fig. 4D. This signal is fed into the "lows" section of the adder where the high and low frequency signals are combined. Due to the different time delays encountered in the high and low frequency circuits, the adder is provided with delay

(Continued on page 250)

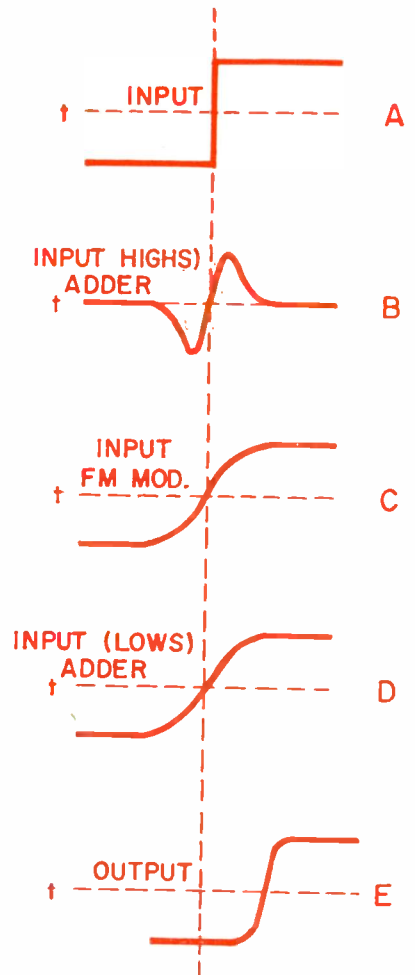


Fig. 4: The important waveforms of the recording system are illustrated

Decimal to Binary to Gray Code

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THERE is frequently a need to convert decimals to binary and/or gray-code in a simple direct manner without the effort involved in repetitively solving standard equations. This is particularly true when decimal fractions must be converted since there is rarely an exact binary solution for a decimal fraction.

This conversion chart simplifies the translation from one system to another. A linear presentation of the familiar code disk is used in a manner analogous to an analog-digital converter.¹ The dimensions of the chart have been selected so that the sheet may be cut into two long strips which may be glued one to each side of an inexpensive slide-rule, the hair-line serving as the index. This will increase its utility to the serious student or practicing engineer. Both positive whole numbers and decimal fractions can be converted; limited by space to seven bits each side of the decimal point.

The conversion process is carried out in two steps:

- The whole number to the left of the demical point is located on the scale. A horizontal line (or the slide rule hair-line) is drawn across the chart intersecting various heavy vertical lines each representing the presence of a bit in the binary or gray code. Read from left to right the presence or absence of a bit in the code and record the result. If the horizontal line intercepts a vertical bit bar at its bottom, i.e., the entire bit lies above the line, include this bit in the code.
- The decimal number to the right of the decimal point is located as accurately as possible, interpolating if necessary, on the decimal scale. A horizontal line (or the slide-rule hair-line) is again drawn intersecting the code bits present in the binary or gray code equivalent for this decimal fraction. Once again record the bits from left to right with the most significant bit first.

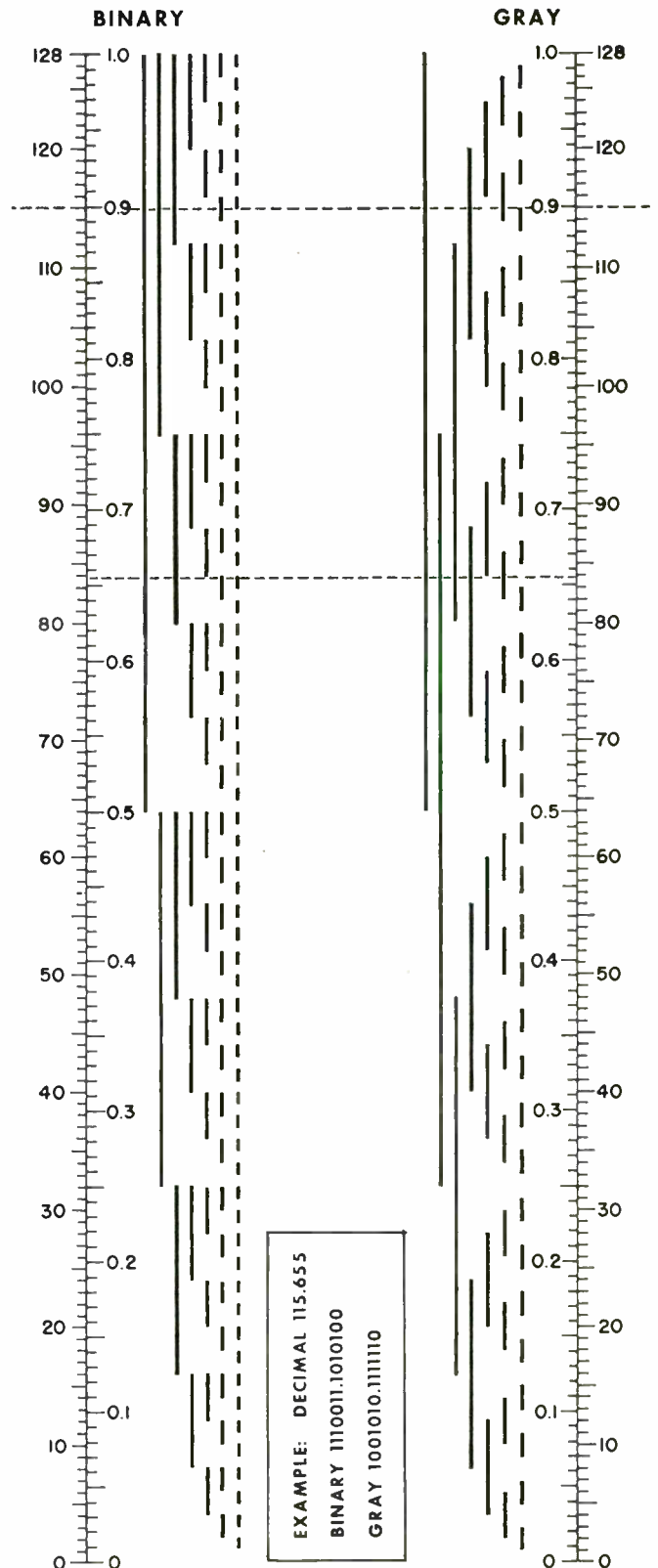
In summary, if the horizontal hair line intercepts a given vertical code bit line, record as a 1. If the line does not intercept a given vertical code bit, record as a 0.

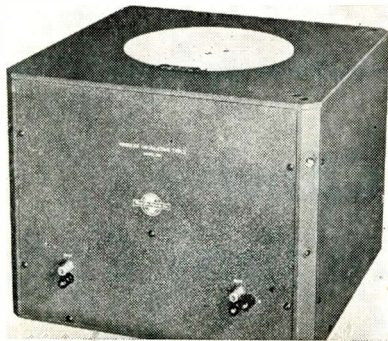
The cyclic gray code used here is derived as follows from the binary code

Write the binary code	1011011
Shift each bit one place to right	0101101(1)

Add, ignoring all carries	1110110
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¹ H. J. Gray, P. V. Levanian, M. Rubinoff, "An Analog to Digital Converter for Serial Computing Machines," Proc. IRE, Page 1462, October, 1953.





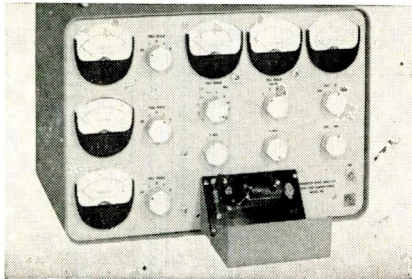
Angular Oscillating Table

Model 61A for subjecting gyros, accelerometers and guidance systems to smooth sinusoidal motion for precise frequency response tests. A rate pickoff provides instantaneous rate information for presentation on an oscilloscope or recorder. Input may be from any good audio, dc power, or shaker amplifier over the range of 0 to 100 CPS. Micro Gee Products, Inc. Booth 2624.

Circle 274 on Inquiry Card

Transistor Noise Analyzer

Model 310 Transistor Noise Analyzer measures noise simultaneously at separate frequencies of 100 CPS, 1000 CPS and 10 KC. Low frequency bandpasses are necessary for the



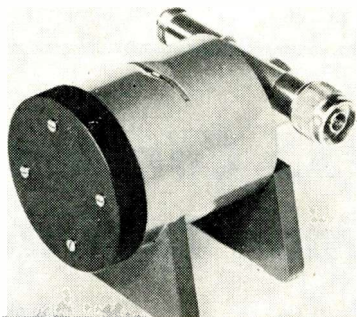
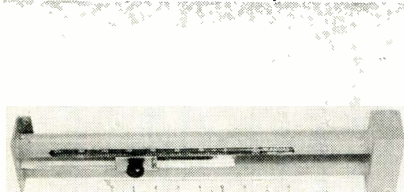
measurement of $1/f$, or fluctuation noise, whereas the higher frequency bandpass is a measure of "shot" noise, thus providing a 3-point spectrum analysis of the transistor noise characteristic. Quan-Tech Laboratories. Booth 1029.

Circle 275 on Inquiry Card

VHF Phaser

The 2260 VHF Phaser provides relative phase adjustment of 65° at 100 MC to 270° at 400 MC with no change in the physical length of the phaser. Input and output terminals are type "N" 50 ohm coaxial. Impedance match maintains over the entire range of adjustment and frequency. Unit shown is calibrated for 332 MC and rated at 200 w CW. Meridian Metalcraft, Inc. Booth 2519.

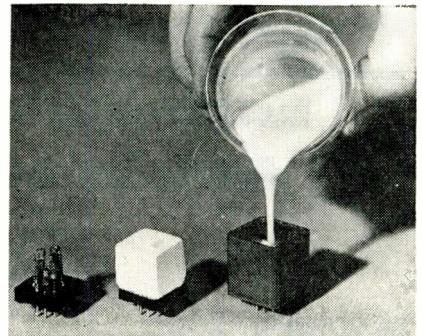
Circle 276 on Inquiry Card



Microwave Line

Coaxial Frequency Meter, Model N414A, with a range from 3.95 to 11 KMC. It absorbs power only at the resonant frequency of a half wavelength resonant cavity. Also: a line of broadband waveguide and coaxial ferrite isolators, Series 157 and two coaxial broadband bidirectional couplers for measuring VSWR by the incident and reflected power technique. FXR Inc. Booth 2325.

Circle 277 on Inquiry Card



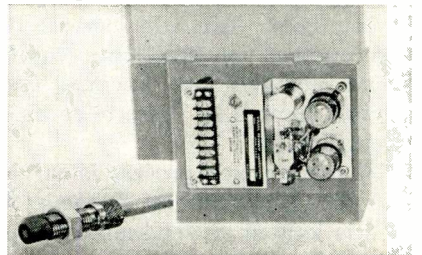
Casting Resin

Stycast TPM-4C is a 1-part casting resin which features extremely low dissipation factor and excellent high temp. properties. Dissipation factor is below 0.0003 over the frequency range 10^2 to 10^{10} CPS. It has excellent thermal stability up to 400°F . At this temperature, it remains completely rigid. Thermal shock characteristics are outstanding. Emerson & Cuming, Inc. Booth 120.

Circle 279 on Inquiry Card

Proximity Transducers

Proximity transducer systems provide a means of sensing moving or stationary ferrous and nonferrous metal work pieces without contact. They provide an economical means



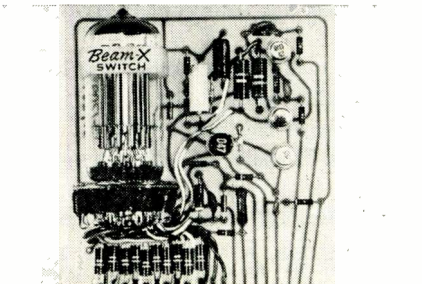
of automating a wide variety of industrial processes from the control of vibratory bowl parts feeders to sorting work pieces of varying sizes. Electro Products Laboratories, Inc. Booth 2117.

Circle 280 on Inquiry Card

Electronic Counter

Miniature Decade Counter Module, the DC-111, combines the BEAM-X switch, Type BX-1000, with transistors. Circuit can resolve pulses at 110 KC. Also: Model D-9000 Distributor Module for sequencing, sampling, multiplexing, etc., and BEAM-X Switch Type BX-1000, a multiposition switching device with a 24-electrode structure per position. Burroughs Corp. Booth 2132.

Circle 281 on Inquiry Card

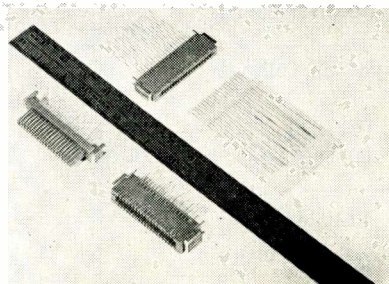


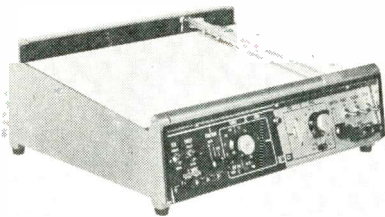
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Products
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Connectors

"Micro Min," and "Micro Mod," series of micro-miniature connectors. "Micro Min," available in 19 contacts, single side and 38 contacts, double side, is for flat form packaging. "Micro Mod" provides interconnection and quick removeability for "stick" or module packaged circuits. Two versions available. Amphenol Connector Div., Amphenol-Borg Electronics Corp. Booth 848.

Circle 278 on Inquiry Card





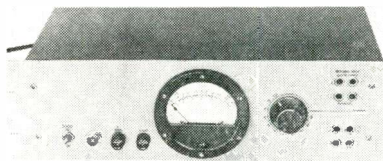
X-Y Recorder

The Model 2D Autograf X-Y Recorder is designed to plot cartesian coordinate graphs from dc electrical information. It will also plot functions of time, accept ac input data, and operate with a variety of accessories, including punched tape and card converters, keyboards, logarithmic converters, and curve followers. F. L. Moseley Co. Booth 660.

Circle 282 on Inquiry Card

Volume Level Indicator

Transistorized version of 924 series Volume Level Indicator Panels, TR-924-C, measures the power level on



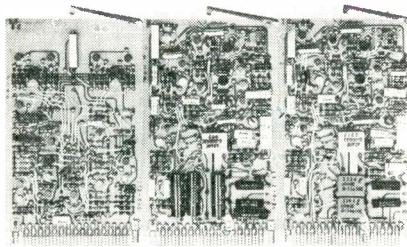
600 ohm audio transmission circuits within the range of -40 to $+20$ dbm. Frequency response is ± 0.1 db from 50 to 10,000 CPS and ± 0.25 db from 20 to 20,000 CPS. Temperature range is -25° to $+65^\circ\text{C}$. Not affected by $\pm 10\%$ line changes. The Daven Co. Booth 444.

Circle 283 on Inquiry Card

Digital Voltmeter

All-electronic digital voltmeter, the V44 makes 200 readings/sec. in ranges of $\pm 9.999/99.99/999.9$ vdc. Accuracy is ± 1 digit and input impedance is 10 megohms. The instrument eliminates the need for periodic adjustment of trim pots in decade circuits. Balancing time of 5 msec permits high-speed measurement of transient data. Non-Linear Systems, Inc. Booth 2815.

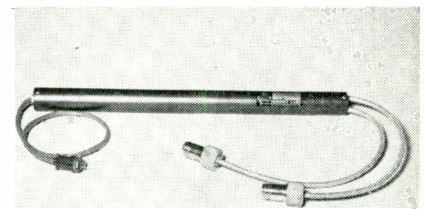
Circle 284 on Inquiry Card



AC to DC Conversion

For automatic instrumentation, method combines high accuracy, reliability, and speed with long-term stability. It is implemented with all solid-state precision amplifiers and semiconductor switches. The circuitry used is essentially an "averaging" technique (normally calibrated to read rms) for flexible choice of self-synchronous or phase sensitive measurement of ac signal. Adage Inc. Booth 537.

Circle 285 on Inquiry Card



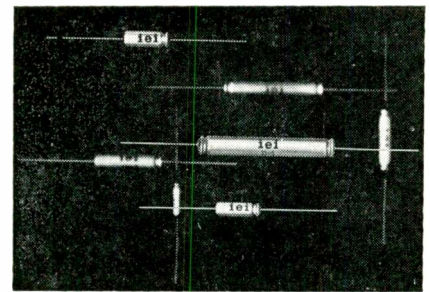
Traveling Wave Tubes

Addition to line of traveling wave tubes, the HA-70, operates with a noise factor in the 1 to 5 mw power range. It is focused in a 750 Gauss Solenoid: it has a noise figure of 7 DB max., 25 DB gain min., 1 mw saturation power output min. frequency range of 2300 to 3400 MC. Min. of 70 DB back attenuation. Tube is 22.4 in. long and 1 in. dia. Huggins Laboratories. Booth 820.

Circle 287 on Inquiry Card

Tantalum Capacitors

Manufactured to MIL-C-3965, tantalum capacitors are available in either polar or non-polar type plain



or etched foil. They operate over a temp. range from -44° to $+85^\circ\text{C}$ without voltage derating, in a voltage range from 3 to 150 wvdc and carry a dc surge rating of 116% of rated working voltage. International Electronic Industries, Inc. Booth 107.

Circle 288 on Inquiry Card

DC Multimeter

Transistorized Dc Multimeter is a battery-operated portable instrument which can be used in both conventional tube and transistor applications. It has 9 voltage, 12 current measurement and 5 resistance measurement ranges. Full scale readings are from 100 mv to 1,000 v., from 1 μa to 300 ma and from 10 to 100,000 ohms. Motorola Inc. Booth 605.

Circle 289 on Inquiry Card

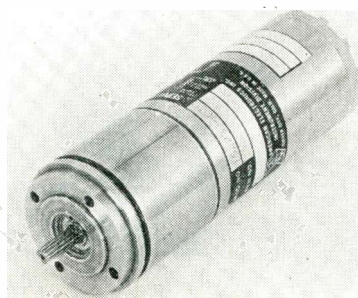


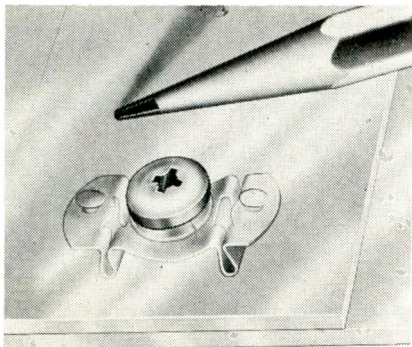
See These Products At WESCON

Motor Tachometers

Temperature compensated motor tachometers, Model 15A23D-01C. Output voltage is 2.75 v./1000 RPM held to $\pm 0.25\%$ from 0° to 70°C . Guaranteed adjustability is $\pm 0.01\%$ from 60° to 80°C . Maximum sensitivity change between 60° to 80°C . from the value at 70°C . is $\pm 0.05\%$. Linearity ranges as low as $\pm 0.01\%$. Guaranteed linearity 3600 RPM is $\pm 0.07\%$. American Electronics, Inc. Booth 2349.

Circle 286 on Inquiry Card





Fasteners

Miniature 1/4-Turn Fasteners measure 0.812 x 0.375 in. overall and have a thickness of 0.012 in. Six different stud lengths accommodate total material thickness (both sheets) of 0.040 in. min. to 0.159 in. max. The three parts are made of cadmium-plated steel. Southco Div., South Chester Corp. Booth 326.

Circle 290 on Inquiry Card

DC Power Supply

Transistorized, convection cooled, dc power supply line, ranging from 1.5 v to 100 v. output. Units meet



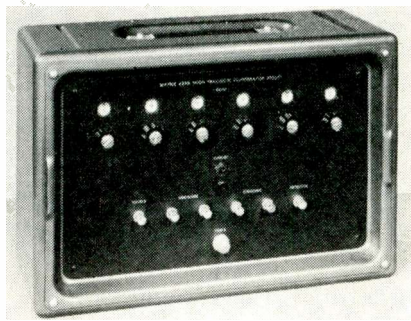
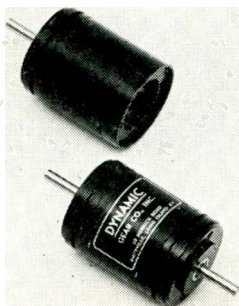
NEMA MR-2-1958 Standards, have defined voltage regulation requirements, and have optional features available for inclusion in the standard line shown above. General Electric Co. Booth 2145.

Circle 291 on Inquiry Card

Reducers—Gearheads

Line of Buord Size 11 Frame speed reducers and gearheads feature whole-number ratios and postless type construction. Ratios (from 7:1 to 5950:1) are accurate to within 0.5%. The units are for mounting on standard Buord MK 14 servomotors. They are lubricated for life. Dynamic Gear Co., Inc. Booth 438.

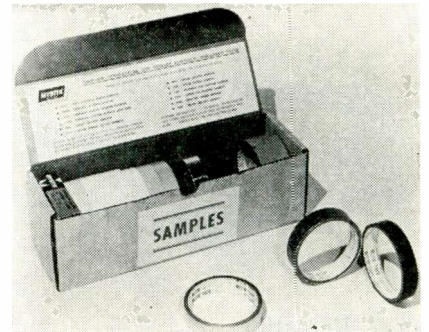
Circle 292 on Inquiry Card



Comparator

Type B-921, is a 3-terminal bridge to compare impedances of the order of megohms against a known standard. Accurate to 0.001%, voltage ratio is adjustable between 0.33:1 and 3:1. Frequency range is 400 CPS to 10KC; range of comparison is 0—3; discrimination, 1 in 10⁶ (at ratios 1 to 3). Wayne Kerr Corp. Booth 553.

Circle 293 on Inquiry Card



Silicone Tapes

Line of hi-low temp. pressure-sensitive tapes have silicone adhesives to permit use between -110°F and +550°F to 1000°F. Tapes offer excellent performance in aircraft, missile, electronics, and electrical applications where temp. extremes are encountered. Mystik Adhesive Products, Inc. Booth 203.

Circle 295 on Inquiry Card

Elapsed Time Indicator

Miniature elapsed time indicator has high readability and accuracy. A decimal type counter, the Model



1440 indicator presents 4 white 0.109 in. numerals on a dull black counter drum. The counter provides readings from 0000 to 9999 hrs. with return to 0000. Bowmar Instrument Corp. Booth 765.

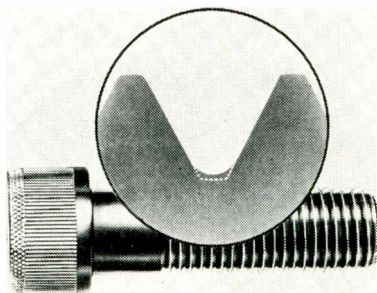
Circle 296 on Inquiry Card

See These Products At WESCON

Socket Screws

The Unbrako "pHd" features increased bearing area under the head, bigger wrenching socket, which provide up to 2 1/2 times as much holding power without indenting bolted material. The Hi Life thread permits up to 100% greater fatigue life. Sizes 1/4 through 1 inch. Standard Pressed Steel Co. Booth 107.

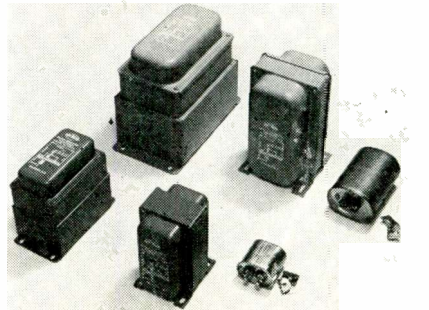
Circle 294 on Inquiry Card



Voltage Regulators

Expanded line of 2,020 standard models of voltage regulators range from 10 va to 10,000 va. Units are available in 4 case styles, have isolated secondary windings and provide virtually constant output voltage with input variations up to ±15%. External magnetic field is negligible. Raytheon Co. Booth 2019.

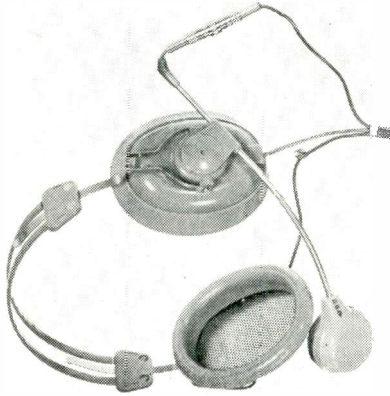
Circle 297 on Inquiry Card



High Fidelity Headset

The Dyna-Twins, for language learning, stereo listening, etc., where fidelity is important. It weighs 9 oz. (not including cord) and provides 50-15,000 CPS response. Standard impedance is 12 ohms for binaural and 6 ohms for monophonic applications. Sensitivity is 80 db above 0.000204 dynes/sq cm per mw input. Communications Accessories Div., Telex, Inc. Booth 721.

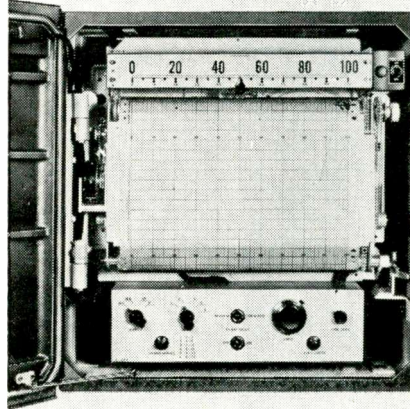
Circle 298 on Inquiry Card



Potentiometer Recorder

Dynamaster Potentiometer Recorder input signal selection switches and span adjustments provide flexibility. A 4-position input selector provides for mv., v., μ a., or ma. input. A 5-position span selector offers ranges 0-2, 0-5, 0-10, 0-25, and 0-50. A continuously adjustable span from 0-2 and 0-50 also available. The Bristol Co. Booth 701.

Circle 300 on Inquiry Card



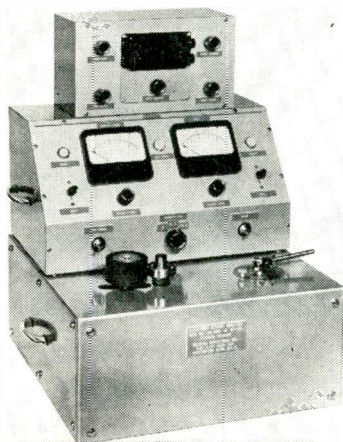
Millivolt Voltmeter

A 1,000 mc, 1 mv voltmeter and a newly-designed 10 to 1,000 mc oscilloscope, Model 185A, which has full 10 cm vertical deflection and dual channel input for waveform and time comparisons. Model 411A voltmeter has a voltage range of 1 mv to 10 v. It measures small voltages to 1,000 mc, and includes a linear scale for maximum resolution and high accuracy Hewlett Packard Co. Booth 651.

Circle 302 on Inquiry Card



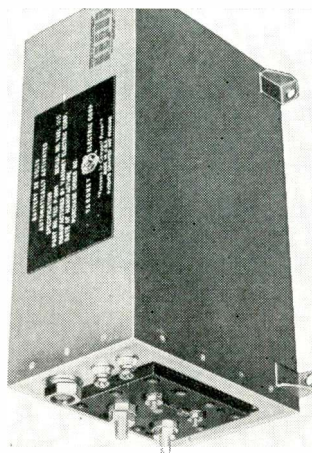
See These Products At WESCON



Circle 299 on Inquiry Card

Bearing Analyzer

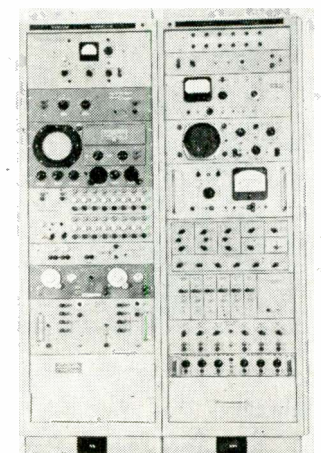
Model BA-20 Electronic Bearing Analyzer checks bearing serviceability. It is especially for analyzing the quality of anti-friction bearings and identifies unserviceable bearings both visually and audibly. Unit will analyze bearings from the smallest instrument sizes up to 10 in. O.D. Bearing Inspection, Inc. Booth 105.



Circle 301 on Inquiry Card

Missile Battery

Model P-3001, Silvercel Silver-Zinc Battery offers continuous discharges of more than 60 times nominal. Nominal capacity is 4 amp-hrs. It can be discharged at 250 a, at 25 v., for 1 min., or pulsed at currents up to 1500 a. Typical discharge ranges from 66 a to 178 a, at 30 to 24 v., for 2 min. Yardney Electric Corp. Booth 551.



Circle 303 on Inquiry Card

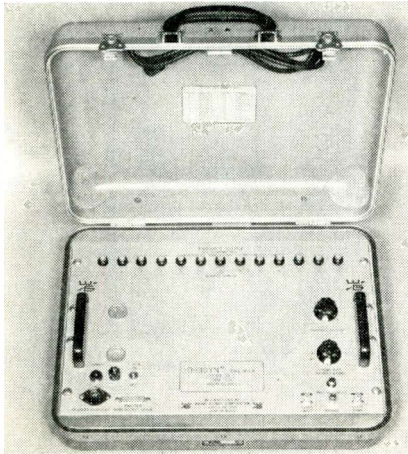
Vibration Control System

Model A1011, random Vibration Control System is compatible with any power amplifier and electro-dynamic shaker combination. System may be switched from one mode of operation to another without adjustment. "Mix" of two signals may be varied while test is in progress. Genisco, Inc. Booth 842.

Encoder Display Test Set

Encoder Display Test Set, TS-13. Also the RD-17 and the RD-13G shaft position encoder. The shaft position encoders are of the optical (non-contacting) types. They are used to convert an analog shaft position to a cyclic binary code number in the form of electrical pulses usable by a computer. Wayne-George Corp. Booth 2032.

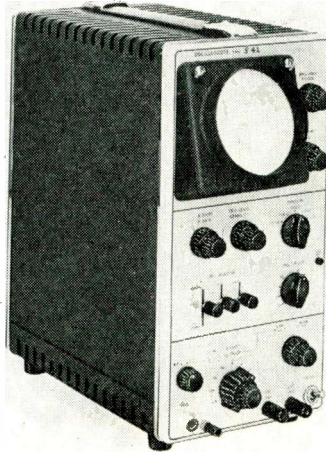
Circle 304 on Inquiry Card



Portable Scope

Model S42 uses a 4 in. CR tube with extremely fine focus. Operating at 3.7 KV, brightness is such that a 1 μ sec "single, shot" pulse can be seen and photographed. Balanced low-drift amplifiers have bandwidth of dc to 6 mc up to 100mV/cm and a high gain facility gives 10mV/cm sensitivity with bandwidth limited to 500 kc. The Scopes Co., Inc. Booth 2210.

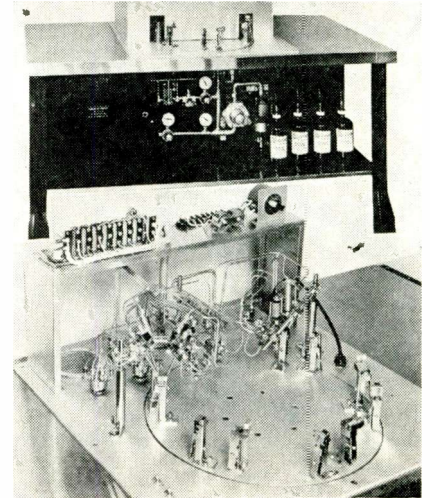
Circle 306 on Inquiry Card



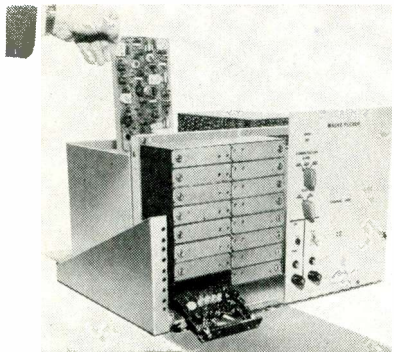
Spray Cleaner

High-velocity spray-cleaning equipment, Model RT-R-13-5, will critically clean crystal case relays and other precision components at the high production rate of 900 parts/hr. Removes oil, grease, silicone lubricants, rosin flux, finger-prints, lapping compounds and other soluble and insoluble contaminants. Cobehn, Inc. Booth 104.

Circle 308 on Inquiry Card



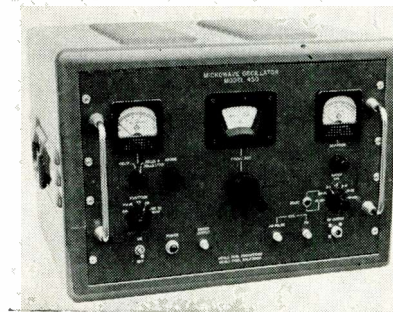
See These Products At WESCON



Circle 305 on Inquiry Card

Multiplexer

Using miniature high frequency (500 KC) Magnetic amplifiers for input sensor on each channel, solid state device, the Magne-Plexer, can handle thousands of channels of strain gage and thermocouple inputs at rates up to 20,000 samples/sec. without preamplifiers. It is for millivolt level commutating applications needing reliability, stability, continuous operation, and high performance. San Diego Scientific Corp. Booth 2157.



Circle 307 on Inquiry Card

Microwave Signal Source

Model 944 Constant Power Microwave Signal Source for analysis of active and passive microwave networks and devices. Features include: swept frequency operation to 100 CPS over the 8.2 to 11.0 KMC range. Output power is 10 dbm min. Also: a permanent magnet focused TW tube amplifier, Model TA-36, operating in the UHF band with 30 db gain and 10 dbm output power, and a low noise microwave amplifier, Model TA-23. Menlo Park Engineering. Booth 835.



Circle 309 on Inquiry Card

Stroboscopic Tachometer

A new version of the stroboscopic tachometer, Type 1531-A, is for the measurement and study of machine speeds of up to 250,000 RPM. Also an impedance comparator (Type 1605-A) for the measurement of small semiconductor capacitances of the order of 1 or 2 pf and a transfer-function and immittance bridge (Type 1607-A) measuring the R, L and C parameters of tunnel diodes at ultra-high frequencies. General Radio Co. Booth 957.

Diode Chart

Germanium Diode Chart, a study of specific applications of selected sub-miniature diodes to reduce selection time of germanium diodes for specific applications or general purpose use; high reverse voltage; high voltage detection; high reserve resistance; high conductance; and for computer use. Nucleonic Products Co., Inc., 1601 Grande Viste Ave., Los Angeles 23, Calif.

Circle 162 on Inquiry Card

Analog Computer

Details on the CM-3 Analog Computer, which provides continuous "real time" solutions for mathematical computations and "real time" control of variables, available from Southwestern Industrial Electronics Co., a division of Dresser Industries, Inc., 10201 Westheimer, P.O. Box 22187, Houston 27, Texas. Featuring all solid state electronics, it contains a single CM-3 cabinet, contains a max. of 12 amplifiers, however there is no electronic limit to the number that can be used. Any number of amplifiers, square root and logarithmic networks may be specified according to functional requirements. Two or more units can be used with their programming boards interconnected.

Circle 163 on Inquiry Card

Coil Data

A new 8-page publication, "The Coil Forum" issued by the J. W. Miller Co., 5917 S. Main St., Los Angeles 3, Calif., is edited for the electronic equipment experimenter. It deals with information on circuits and theory and supplies data for selecting coils. The first issue deals with how to build a transistorized FM receiver. Complete data is given on circuits, construction, testing, and alignment. Sketches show locations of components, AFC layout, and ratio detector layout.

Circle 164 on Inquiry Card

Limit Sensor

Single-page bulletin from General Automatics, Inc., 2443 Ash St., Palo Alto, Calif., describes the Company's Limit Sensor. Applications include diode sorting, thickness gauging, weighing, or any application where the measurement is converted to a voltage. Some specs: Operation, actuation with signals from 0 to -250 v, unresponsive to signals from 0 to +250 v; Hysteresis, less than 250 mv at 25°C; Input impedance, 100K ohms; Reaction time, less than 50 msec.; Output, two sets of SPDT contacts, rated at 5 a, 28 vdc or 115 vac for 100,000 cycles. Circuit diagrams and outline drawings are included.

Circle 165 on Inquiry Card

Solving Quadratics

Illustrated brochure outlines step-by-step programming and solution of quadratic equations (such as: $ax^2+bx+c=0$) on the DE-60 computer. Programming of repetitive problems on the computer as shown on the coding sheet and wiring on a plugboard are described in detail. Instructions to the computer can be written and executed by non-technical personnel. The DE-60 is a low-cost, compact general-purpose all-transistor digital computer. Clary Corp., San Gabriel, Calif.

Circle 166 on Inquiry Card

Transistor Tester

Bulletin No. 124C, from Sierra Electronic Corp., 3885 Bohannon Dr., Menlo Park, Calif., describes their Model 219A Transistor Tester. The tester can measure the Beta parameter without unsoldering the transistor from its surrounding circuit. It does this by electronically isolating the transistor under test. It can measure transistor leakage current (I_{C0}) and Beta out of the circuit. The single-page bulletin gives principle of operation (with block diagram) and physical and electrical specs. Also available is Bulletin No. 127A describing Model 201B, UHF FM Signal Generator. An external signal of 0.4 v peak-to-peak amplitude with a bandwidth of 500 KC can produce deviations of 2MC peak-to-peak with better than 1% linearity.

Circle 167 on Inquiry Card

Instrument Cases

Twelve-page booklet, No. 403-C, gives details on TA Standard Instrument Cases. It covers features, sizes, colors, and standard hardware. TA Mfg. Corp., 4607 Alger St., Los Angeles 39, Calif.

Circle 168 on Inquiry Card

Recorders/Reproducers

The RA 1500 series of magnetic film recorders and reproducers is described in a 4-page illustrated brochure from Wextrex Recording Equipment Dept., 6601 Romaine St., Hollywood 38, Calif. The series consists of precision recorders, reproducers and recorder/reproducers for film used in the motion picture and broadcast industries. Specs included.

Circle 169 on Inquiry Card

AC Motors

Alternating current motors meeting government specs for aircraft and missiles are described in a catalog from Electro-Mechanical Div., Lear, Inc., P. O. Box 688, Grand Rapids 2, Mich. Information includes horsepower, torque, speed, duty cycle, weight and size.

Circle 170 on Inquiry Card

Resin Selector Chart

Bulletin 121 from Plastic Associates, 185 Mountain Rd., Laguna Beach, Calif., contains selector charts for potting compounds, coatings, foams, and bonding agents. Definitions are provided for such terms as casting, encapsulation, impregnation, and coating. Metals, glass, ceramics, plastics and other materials are arranged along both vertical and horizontal borders. Intersections show the bonding agent that can be used to join the materials indicated.

Circle 171 on Inquiry Card

Waveform Synthesizer

Four-page brochure from Exact Electronics, Inc., P.O. Box 552, Portland 7, Oregon, describes the Type 200 Waveform Synthesizer and Plug-In Generators. General Specs. include: No. of increments, 10, 20, 30, 40, or 50; Increment position, indicated by neon bulbs; Power required, 105-125 v, 50 — 60 CPS, 425 w.; Weight, 58 lbs. Brochure gives full details on the instrument which is used for computer programming, basic research, servo design and test, PCM—PTM systems, spectrum simulation, radar pulse coding, speech and sound synthesis, telemetering channel synthesis, etc.

Circle 172 on Inquiry Card

Laminate

A new epoxy laminate, Grade EG-761-T, developed primarily for the "plated-through" process is described in Tech Data from The Mica Corp., 4031 Elenda St., Culver City, Calif. "Micaply" is a non-adhesive, all purpose laminate exhibiting no significant "weave telegraph" and retaining the best electrical, mechanical and machining properties. The important feature of this material is the elimination of any transfer of fabric weave pattern through the copper surface, providing a glass-smooth finish for satisfactory and durable electroplating.

Circle 173 on Inquiry Card

Storage Tubes

Literature on 2 direct viewing storage tubes developed by the Vacuum Tube Products Div., Hughes Aircraft Co., 2020 Short St., Oceanside, Calif. Spec brochure describes the 5-in. H-1027 tube which features potting of high voltage leads to prevent corona at extremely high altitudes. Another brochure gives details of the 21-in. H-1019 Typotron tube which writes 25,000 letters, numbers or symbols/sec. Images may be retained at high brightness levels for 2 min. The large view screen stores up to 17,000 characters.

Circle 174 on Inquiry Card

Tracking Cameras

Synchronization of satellite tracking cameras spaced 200 mi. apart to within 0.1 msec is described in a technical paper on "Ballistic Camera Synchronization System" available from the Electronic Engineering Co. of Calif., 1601 E. Chestnut Ave., Santa Ana, Calif. The Ballistic Camera Synchronization System was designed for the Army Ordnance Corps and developed and built by EECo. The system consists of a central camera control station and 2 remote control stations. Also available: A description of a system for the digitizing of radar position information in a technical paper on "Precision Data Recording System for Instrumentation Radars." The paper details the design and development of systems now in operation at the Air Force Flight Test Center, Edwards, Calif., in conjunction with X-15 rocket research airplane tests and other high-speed flight tests.

Circle 175 on Inquiry Card

Electronic Ceramics

An 8-page brochure describes the activities of the Lockheed Electronics Co. in the field of electronic ceramics. It discusses ferrite cylinders and ultra thin-walled toroids; toroidal tape recorder heads; and rectangular hysteresis loop memory cores. Applications include description of multi-aperture devices; read selector module assemblies; shift registers; logic module assemblies; memory cores and planes; and recording heads. Lockheed Electronics Co., Avionics & Industrial Products Div., 6201 E. Randolph St., Los Angeles 22, Calif.

Circle 176 on Inquiry Card

Capacitors

Engineering data sheet, DE, covers metallized Mylar capacitors. Complete specs of the new epoxy-cased capacitors are presented, including temp. characteristics, curves (insulation resistance, dissipation factor, derating); capacitance, physical dimensions, and part numbers for 200, 400 and 600 vdc models. Electron Products Div., Marshall Industries, 430 N. Halstead St., Pasadena, Calif.

Circle 177 on Inquiry Card

Oscilloscope

A 4-page pamphlet gives a detailed presentation of the new transistorized, battery-operated, portable, Type 321 oscilloscope. It includes specs, block diagram, and performance details. Some features are: A high-performance, light-weight instrument in the dc-to-5 MC range. It operates on batteries on dc power systems or on any standard ac system. Operating temp. range from 30° to 120°F and at altitudes to 20,000 ft. Tektronix, Inc., P. O. Box 500, Beaverton, Ore.

Circle 178 on Inquiry Card

Servomotor

A 4-page folder shows performance data for Model 8 SM 461, Size 8 Servomotor. Servomotor is 0.840 in. in length, and wound for 115 v. operation. It shows dimensional outline drawings and torque-speed curves for the unit. Also, construction features and electrical and mechanical characteristics. Helipot Div. Beckman Instruments, Inc., 2500 Fullerton Rd., Fullerton, Calif.

Circle 179 on Inquiry Card

Controlled Atmospheres

Brochure describes a line of "Controlled Atmosphere Systems for the Manufacture of Semiconductors." The Heliarc welded enclosures can be constructed of stainless or carbon steel and can be used for dry gas, dry air, and dust and oil free atmospheres. Kewaunee Scientific Equipment, 4012 Logan St., Adrian, Mich.

Circle 180 on Inquiry Card

Transistor Modules

Loading Manual contains loading rules and a load chart for T-Series germanium transistor circuit modules. The load chart can be used to determine the max. load, each T-Series unit can drive and the loading rules present additional information concerning loading requirements and capabilities of the units. Manual is a supplement to EECO Catalog 859—Also available. Engineered Electronics Co., Dept. C, 1441 E. Chestnut Ave., Santa Ana, Calif.

Circle 181 on Inquiry Card

Index—Application Notes

A complete index of some 40 available "Application Notes" issued by the company over the past several months. It presents an abstract of each of the articles which cover electronic measuring instruments. They describe electronic theory, measurements, and applications of Hewlett-Packard instruments. Typical topics covered are traveling wave amplifiers, solid state devices, masers, various frequency, microwave and current measurements; and applications for oscilloscopes and oscillators. Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

Circle 182 on Inquiry Card

Boxes and Covers

A new 24-page catalog "B60" from Zero Mfg. Co., 1121 Chestnut St., Burbank, Calif., lists over 12,000 standard deep drawn aluminum boxes and covers. Standard sizes range from $\frac{7}{8}$ x 1 $\frac{1}{2}$ in. to 20 $\frac{1}{2}$ x 32 $\frac{1}{2}$ in. Wide range of heights available in each box size.

Circle 183 on Inquiry Card

Resistance Measurements

Issue No. 2 of Design Ideas, ESI quarterly technical bulletin, presents Part I of a detailed discussion of ways to make high accuracy resistance measurements with minimum effort and calculations. Described are resistance measuring systems incorporating 3 and 4-terminal measurement methods and their applications. Issue No. 3 will further develop and complete the discussion. Electro Scientific Industries, Inc., 7524 S. W. Macadam Ave., Portland 19, Ore.

Circle 184 on Inquiry Card

Planar Diodes

An 8-page, 2-color brochure/catalog No. SL-201/1 introduces more than 200 Planar Diodes. Listings include 115 standard 1N series and 103 FD series diodes with essential data. Featured diodes are FD-100 (ultra fast switching computer diode) and FD-200 (high conductance, ultra fast "universal" type) with complete specs and performance graphs. Fairchild Semiconductor Corp., 4300 Redwood Hwy., San Rafael, Calif.

Circle 185 on Inquiry Card

X-Band Switch

Data sheet describes X-Band Switch by Waveguide, Inc., Costa Mesa, Calif. The switch is a precision built single pole, double throw, manually operated device for laboratory use. It permits convenient switching from a slotted line to a reflectometer; or for switching from one signal source to an alternate source for gain measurements. Specs included.

Circle 186 on Inquiry Card

Power Supplies

Bulletin SE-102, 2-pages, describes line of silicone dc power supplies, magnetic amplifier controlled. Units are rated from 100-1500 a, 14-36 v. Transients are 1% max. on ratings to 500 a and 2% for 500-1500 a. Max. drift is 0.05% after 15 min. warmup. Ripple is 0.1% on ratings to 500 a and 0.5% for the 500 to 1500 a range. Sprague Engineering Corp., 19300 So. Vermont Ave., Gardena, Calif.

Circle 187 on Inquiry Card

Electronic Hardware

A 32-page catalog of electronic terminals and hardware. Included are more than 380 standard part numbers. Complete specs and ordering information are contained for standard and molded insulated terminals; terminal boards; eyelets, stand-offs, shaft locks and miscellaneous hardware; handles and control knobs; and custom engineering facilities. Also a new line of instrument control knobs, designed to MS-91528 specs. Catalog 32, Lerco Electronics, Inc., 501 S. Varney St., Burbank, Calif.

Circle 188 on Inquiry Card

Latest Western Literature

for Engineers

Measurement Device

The Model 302 Inside Diameter Measurement device, which measures inductor internal diameters within a variation of ± 0.035 in. under water and at high temperatures, is described in a 3-page technical manual. The unit operates at the end of a 14 ft. rod (or longer) and is electrically connected to a digital readout unit. Included is a drawing of the measurement device showing the sensor, measuring jaws, and electrical connection. Physical Sciences Corp., 389 N. Fair Oaks Ave., Pasadena, Calif.

Circle 189 on Inquiry Card

Instruments

Three data sheets from Vidar Corp., 2107 El Camino Real, Palo Alto, Calif., describes a voltage-to-frequency converter (Vidar 240A); a frequency meter (Model 311A); and frequency-to-dc converter (Model 320A). Each data sheet includes principles of operation, descriptive data and tech specs.

Circle 190 on Inquiry Card

Crystal Can Relays

Three-page bulletin describes the MV series crystal can relays including those meeting USAF specs. Details of the specs involved are included as well as comparative characteristics. The MV series described includes coil resistance from 30 up to 15,000 ohms. Elgin National Watch Co., Electronics Div., 2435 N. Naomi St., Burbank, Calif.

Circle 191 on Inquiry Card

Silicon Rectifiers

Data sheets on 10 new very high voltage silicon rectifiers available from Pacific Semiconductors, Inc., 10451 W. Jefferson Blvd., Culver City, Calif. Types 1N3052 through 1N3061 are rated at 12,000 to 30,000 v. respectively and are of the "wire-in" coaxial lead configuration. All types are $\frac{1}{2}$ in. dia. and range from 4 to 8 in. in length according to voltage. No voltage derating is required up to 175°C. They are suited to radar modulator and power supply applications where light weight and high reliability is important.

Circle 192 on Inquiry Card

Coaxial Latching Switch

Solenoid actuated Coaxial Latching Switch requires no holding power. It operates from 28 vdc and draws 3.2 μ a/hr. Switching time is 10 msec. The 50 ohm switch is make-before-break. Weight is 8.7 oz. Freq. range extends to 11 KMC with typical specs at 7 KMC of: VSWR, 1.4; insertion loss, 0.4 db.; crosstalk, 30 db. Full information from Transco Products, Inc., 12210 Nebraska Ave., Los Angeles 25, Calif.

Circle 193 on Inquiry Card

Ratio Transformers

A 4-page, 2-color brochure gives tech. data on line of sub-miniature, coaxial ratio transformers. Units are for use where min. panel space and light weight are required. The text describes two types: a $2\frac{1}{2}$ in. dia. unit qualified to Mil Specs, and a $3\frac{1}{2}$ in. dia. unit for commercial applications. Included are specs., complete dimensions on 6 models, and photographs. RatioTrans feature 0.011% accuracy and linearity, and up to 6-place resolution. Gertsch Products, Inc., 3211 S. La Cienega Blvd., Los Angeles 16, Calif.

Circle 194 on Inquiry Card

Delay Lines

An 18-page booklet describes the advantages, disadvantages and limitations of different types of delay lines including High density, Lumped constant, Distributed constant, Magnetostrictive, and Ultrasonic delay lines. Factors to consider when establishing specs for a special delay line and their effect on the cost of the line is explained. The influence of the delay-to-rise-time-ratio on the cost and size of a delay line is emphasized. Valor Instruments, Inc., 13214 Crenshaw, Gardena, Calif.

Circle 195 on Inquiry Card

Reinforced Plastics

Reinforced plastic parts for aircraft, missiles, and space vehicles are described in a catalog sheet from Horkey-Moore Associates Plastics Div., 24660 Crenshaw Blvd., Torrance, Calif. Parts include: rocket nozzles, radomes, rocket motor cases, pressure vessels, and launching tubes.

Circle 196 on Inquiry Card

Connectors

A 30-page catalog describes a new line of electrical fittings and accessories to be known as "Bronco-Grip Connectors." The line includes connectors for both copper and aluminum wires. The types initially offered are split bolt, vise grip, service entrance, various clamps, parallel connectors, aluminum compression sleeves, solderless terminal lugs, ground clamps and straps. Bronco-Grip Connectors, Western Insulated Wire Co., Los Angeles 58, Calif.

Circle 197 on Inquiry Card

Gas and Liquid Control

Over 2,500 components for control of gas or liquid over a temp. range of -320° to 1500° F and pressures to over 3500 psig are covered in a catalog from AiResearch Mfg. Co., 402 S. 36th St., Phoenix, Ariz. Major items available for aircraft, missile or process industry applications include: Fuel control systems, Pneumatic and electrical valves, Actuators, Air motors, and Thermostats.

Circle 198 on Inquiry Card

Recording Oscillograph

Type 5-123 Recording Oscillograph is illustrated in an 8-page bulletin 1623 from Electro Mechanical Instrument Div., Consolidated Electro-dynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif. The rack-mounting oscillograph is designed for reliability, flexibility, ease of installation, operation, and maintenance.

Circle 199 on Inquiry Card

Pulse Generator

A two-page data sheet, describing a high voltage pulse synchronizing generator (10 kv peak) with a pulse of 100 nanosec., is available from Electro - Optical Instruments, Inc., 2612 East Foothill Blvd., Pasadena, Calif. System description, Applications, Specs., and Typical pulse and wave form illustrations are included.

Circle 200 on Inquiry Card

AC Motor

Catalogs on AC Multi-Shielded Motors includes pricing and dimensional data on motors ranging from $\frac{1}{4}$ to 200 hp. A special section deals with motor selection and application. Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif.

Circle 201 on Inquiry Card

Electronic Cables

Brochure, DM - S - 6015, highlights specialized electronic wire and cable line. It details a variety of basic materials available for conductors, insulations, shields, jackets, and armors. Sequoia Wire & Cable Co., 2201 Bay Rd., Redwood City, Calif.

Circle 202 on Inquiry Card

Profile Monitor

Model 201, Profile Monitor, is described in tech data sheet PM2-917 from Advanced Technology Laboratories, 369 Whisman Rd., Mountain View, Calif. The instrument provides an accurate, easily interpreted, visual display of any phenomena measurable by an electrical output (temperature, pressure, strain, velocity, etc.). Tech specs are included.

Circle 203 on Inquiry Card

Resistor Elements

Wafer-like, metal-film resistor elements used in micro-module circuit assemblies are described in Engineering Bulletin 1007. These tiny elements, each of which can carry 4 precision resistors, offer a packaging density of as high as 600,000 parts/cu. ft. Ohmite Mfg. Co., 3678 Howard St., Skokie, Ill.

Circle 204 on Inquiry Card

WASHINGTON

News Letter

ACTION DELAYED—The FCC proposals contemplating a 30-channel or a 50-channel VHF television system are to be delayed for a final answer from the executive branch of the government until the early part of August. The proposed system would be accomplished through an exchange of UHF spectrum space for the VHF portions which are occupied by the military services.

REPLY NOT YET PREPARED—Commission Chairman Ford notified the Senate committee that the FCC now has been informed "that it has not as yet been possible for the executive branch (working through the Office of Civil & Defense Mobilization) to prepare a properly staffed and coordinated reply to the commission's proposals" on the VHF television system.

DIM OUTLOOK—Government officials expressed the view privately to Electronic Industries' Washington bureau that there was virtually no chance to secure the additional VHF space for commercial television from the military services. The complexities, particularly equipment costs, involved in shifting military and non-broadcast users of this VHF portion of the spectrum have been stressed. The armed services also feel the move would be harmful to the national defense.

FULL COMPLEMENT—The FCC now is to have a full complement of seven Commissioners. Commissioner Robert E. Lee, who began serving on the FCC Oct. 6, 1953, after a broad background with the FBI and as an expert with Congressional committees, was confirmed by the Senate for a new seven-year term. Vote was 64 to 19 after a 20-minute debate. To complete the unexpired term of resigned Chairman John C. Doerfer which expires July, 1961, President Eisenhower has nominated Charles H. King, Dean of the Detroit College of Law. The latter's nomination is expected to be resubmitted by the President as a recess appointment after the adjournment of Congress.

AIRLINE'S REQUIREMENTS—A program of basic requirements for air-ground-air radio automatic communications has been issued by the Air Transport Association for the nation's scheduled airlines. The ATA statement stressed that the automatic communications system is "a matter of considerable operational urgency," particularly in air traffic control. The ATA stated that the AGACS combining the best

features of the Radio Corporation of America and Stromberg-Carlson systems "is most likely to be correct." The airlines participating in the meeting declared that planning for this system and all other data link services "suffers seriously from the lack of established operational requirements."

ROBOT MICROWAVE—The Hughes Aircraft Company has asked the FCC for a frequency allocation of 100 MC in the high microwave regions of the spectrum, approximately within the 13,000-35,000 MC range, to give added mobility for its "Mobot," its mobile robot equipment for remote control operation. The Hughes "Mobot" equipment can handle dangerous materials, fight forest and petroleum fires, harvest crops, aid in the design of nuclear "hot cells" and test reactors and a myriad of other functions. The "Mobot" equipment is now actually in use on a cable-controlled basis, but this method seriously limits the effectiveness of the equipment.

National Press Building ROLAND C. DAVIES
Washington 4

NASA FUNDS—The National Aeronautics and Space Administration has been voted approximately \$621.5 million for research for the fiscal year that just begun.

The Federal Aviation Agency will receive \$163 million for air navigation facilities; National Science Foundation is getting \$175 million; and the Federal Communications Commission will receive \$13 million, including \$2 million to evaluate UHF television facilities.

SURPLUS PROPERTY—The U. S. House of Representatives, by a vote of 124 to 61, defeated H. R. 9996. H. R. 9996 was a bill to permit wide-open importation of U. S. surplus property from overseas. A large portion of this property was said to be electronics.

DOD BUYING MANUAL—The 1960 edition of the Department of Defense's Armed Services Procurement Regulations (ASPR) is now available. It is the guide for military procurement and is available from the Superintendent of Documents, Washington 25, D. C., for \$18.00.

The 1960 edition contains all of the material in the 1954 issue plus the revisions issued since 1954. It is being sold as a subscription service consisting of the basic manual and about two years of supplementary service for future revisions.

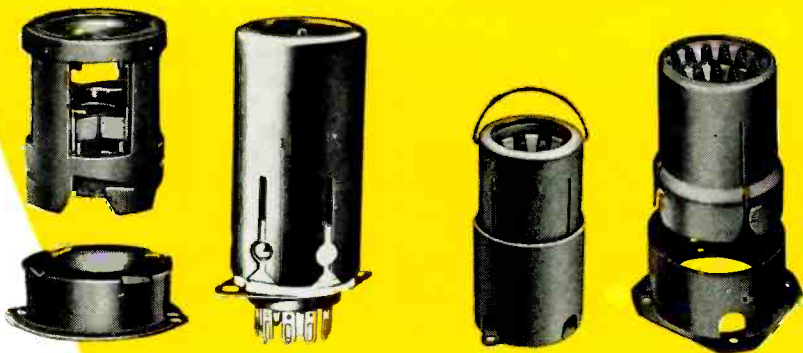
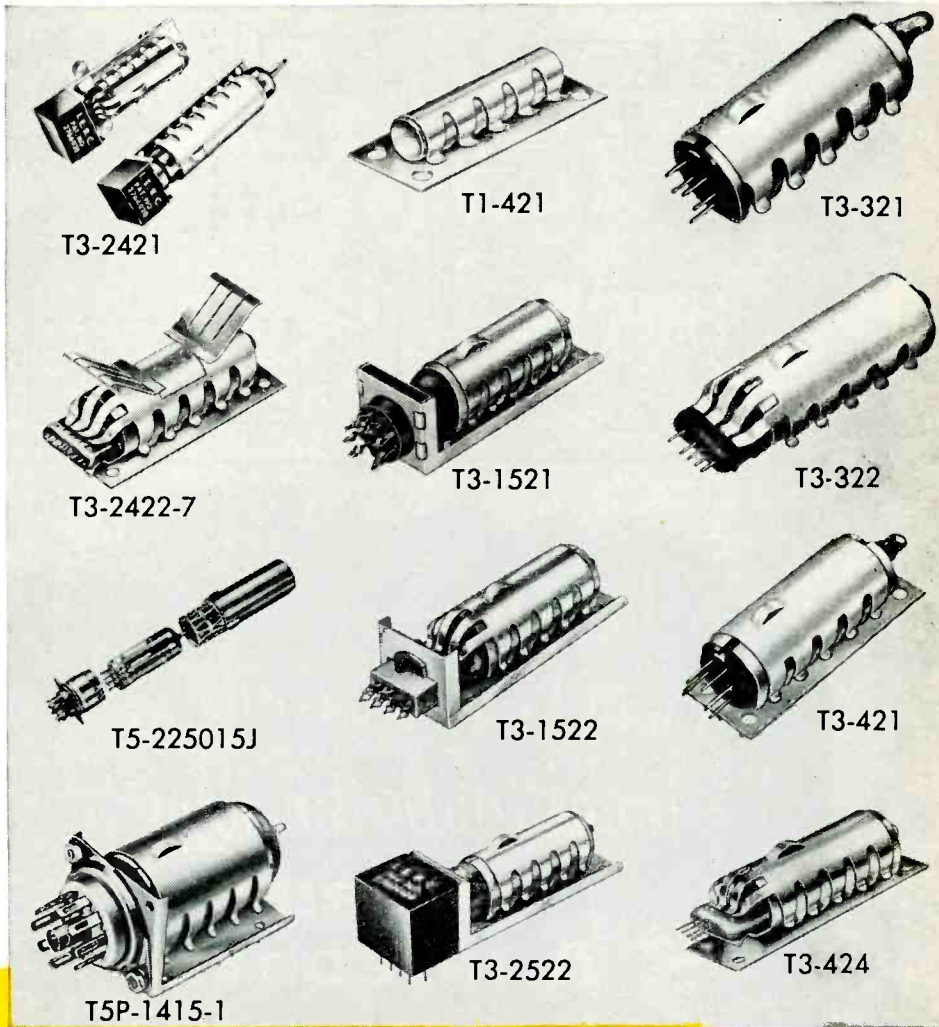
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T5 and T6

TR5 and TR6

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Manufactured under license agreement with International Electronic Research Corporation

The 7 and 9 pin Miniature Series, T, TR and NW Series are covered by Military Specifications:

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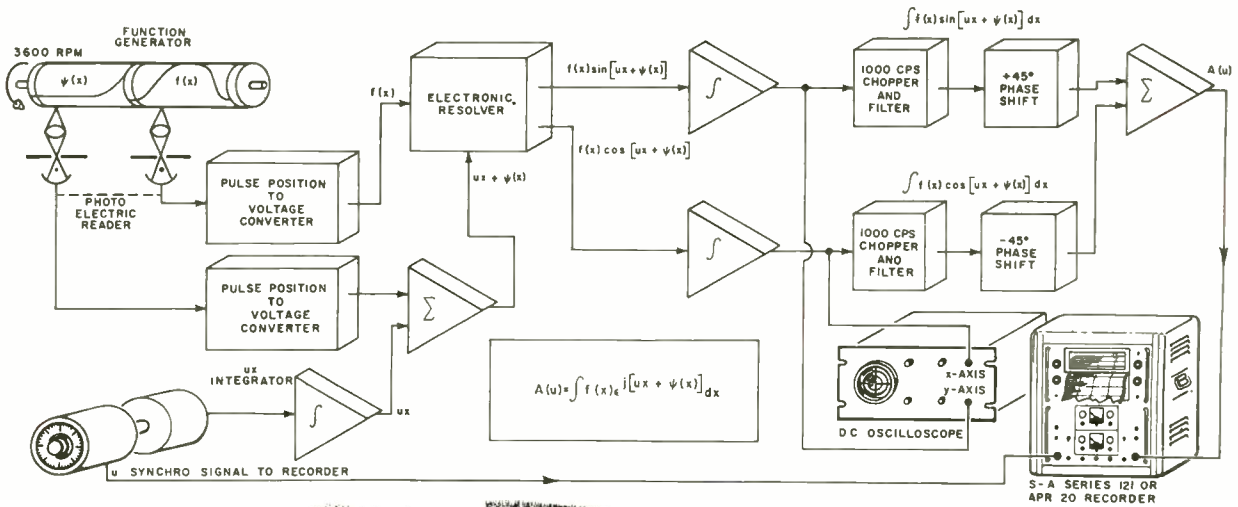


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Circle 53 on Inquiry Card

Centrally located plants at
Chicago, Illinois; Shelbyville,
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Simplified block diagram of Model CF-1. Amplitude and phase input functions are plotted on graph paper for presentation. Integration is observed on a dc oscilloscope. Absolute magnitude is recorded on any S-A Series 121 or APR 20 Antenna Pattern Recorder with a logarithmic response. Time of solution is 15 to 25 minutes.

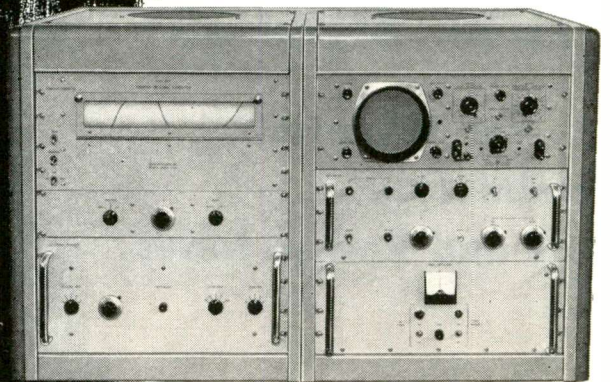


To solve

$$A(u) = \int_{-1}^1 f(x) e^{j[ux + \psi(x)]} dx$$

investigate the new

S A **FOURIER INTEGRAL COMPUTER**



Model CF-1

A sophisticated solution to the vexing problem of solving bounded Fourier integrals quickly and accurately, Scientific-Atlanta designed the Model CF-1 especially for the antenna design engineer.

The computer has broad general application including determination of the far fields of aperture antennas from the distribution of the field in the aperture, the far fields of arrays from the magnitude and phase of the currents in the elements, the frequency spectra of voltage pulses, and other physical problems involving Fourier transforms and their inverse transforms over finite limits.

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Model CF-1
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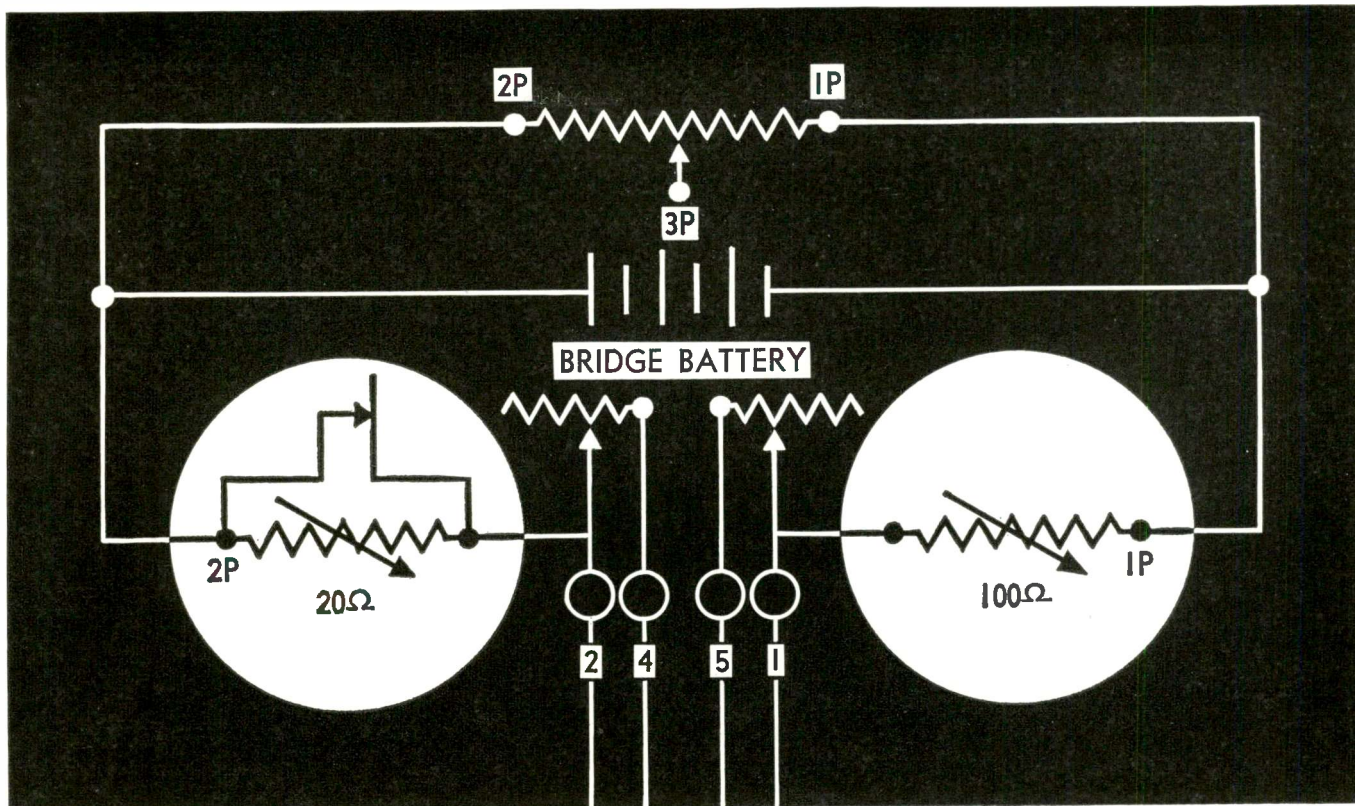


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Eliminate Trimming Resistor Problems with Borg Absolute-Linearity Micropots



The above schematic illustrates how many original equipment manufacturers are eliminating trimming networks from circuits by replacing conventional potentiometers with Borg 900 Series Absolute-Linearity Micropots. The Borg 900 Series eliminates electrical overhang . . . trimming becomes unnecessary. A further advantage is accomplished by setting the 900 Series mechanical stop to a phasing point. Field replacement of the primary potentiometer now becomes a simple mechanical process of attaching leads and phasing from the preset stop. This means you do not have to replace trimmers or resistors each time you replace the primary potentiometer. The design

advantages and cost savings brought about by the absolute linearity of the Borg 900 Series can now be fully appreciated. With 900 Micropots, your equipment will afford greater accuracy, reliability and practicality because trimming and adjustments with auxiliary resistors are no longer required. Trained assembly personnel can now be concentrated on more profitable areas of production. Many other 900 Series advantages can help solve your potentiometer problems as they are now doing in all types of industry. The 900 Series is available in ten and three turn models with several optional features. Contact your Borg technical representative or let us put him in touch with you. Ask for data sheets BED-A128 and BED-A129.



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Tech Data

for Engineers

Distance Meter

Catalog sheet, Bulletin WM-DM-100, gives a general description of Distance Meter, Type DM-100, applications, the operating principle, and discusses the instrument's probes and output connections. In addition, specifications and a probe dimensions diagram are included. Wayne Kerr Corp., 1633 Race St., Phila. 3, Pa.

Circle 205 on Inquiry Card

Surge Test Adapter

Data sheet 107 describes the self-contained Wallson 75 amp. Surge Test Adapter, Model 142A. The unit supplies single $\frac{1}{2}$ wave sinusoidal surge currents, adjustable between 5 and 75 a at a max. repetition rate of 4/min. Wallson Associates, 912-914 Westfield Ave., Elizabeth, N. J.

Circle 206 on Inquiry Card

Low Voltage Power Supply

Data sheet from Power Sources, Inc., Burlington, Mass., describes their low voltage transistor regulated power supplies. Included are variable voltage models and fixed voltage models.

Circle 207 on Inquiry Card

Step Down Transformer

Practical data for proper size selection of Step Down Transformers is included in Bulletin, 16-B01, from Acme Electric Corp., Cuba, N. Y. Four examples of common step down transformer applications are listed. Included are illustrations, specs and dimensions on the company's line of step down and step-up transformers.

Circle 208 on Inquiry Card

Airborne Power Supplies

Bulletin GEC-1540, 2 pages, gives specs of GE's unregulated airborne transformer-rectifier, Model 6RW162-YF1, 28 v, 200 a. It included a photograph, electrical and mechanical characteristics, electrical circuit, graph, outline and schematic drawings. General Electric Co., Schenectady 5, N. Y.

Circle 209 on Inquiry Card

Infrared Components

Infrared Sections Catalog 103, 2-pages, gives information on low-cost infrared do-it-yourself oven components incorporating G-30 type infrared lamps. Fostoria Corp., Infrared Div., Dept. 45, Fostoria, Ohio.

Circle 210 on Inquiry Card

Relay Catalog

Catalog of relays includes products of over 20 leading relay manufacturers. Lines are listed with complete description and prices. A thumb-indexed table of contents speeds finding relays. Relay Sales, Inc., Box 186, West Chicago, Ill.

Circle 211 on Inquiry Card

Model
791D

\$920

DEVIATION MEASURED

10 cps to 125kc

New FM Deviation Meter has carrier frequency range 4—1024Mc; crystal controlled LO enables measurement down to 10cps deviation. Used with a 'scope, it measures peak deviation of complex wave-forms. Very easy to operate, Model 791D *s p e e d s* deviation measurements.

Carrier Freq. Range: 4—1024Mc, xtal locked
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Accuracy: 3%. Xtal standardized
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21 tubes: 6AK5, 6C4, 0B2, 5651, 6CD6G, 5Z4G, 5647, 6AS6

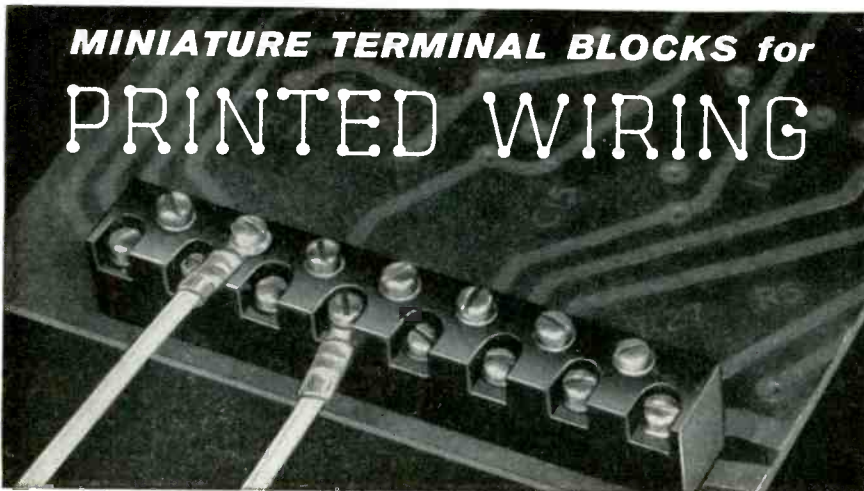


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Circle 56 on Inquiry Card

MINIATURE TERMINAL BLOCKS for PRINTED WIRING



You can simplify those external connections to printed-wiring boards, no matter how jammed up. Kulka Type 520 miniature terminal blocks mount on board, with terminal pins slipping into standard connector mounting holes for dip soldering. Screw connections for external leads. Readily connected or disconnected. Available in 2 to 24 terminals. Entire printed-circuit board with terminal blocks and lead wires, can be encapsulated if desired.

WRITE FOR LITERATURE . . .

Descriptive bulletin on request. If you do not already have the big Kulka Terminal Block Catalog in your reference file, ask for it.

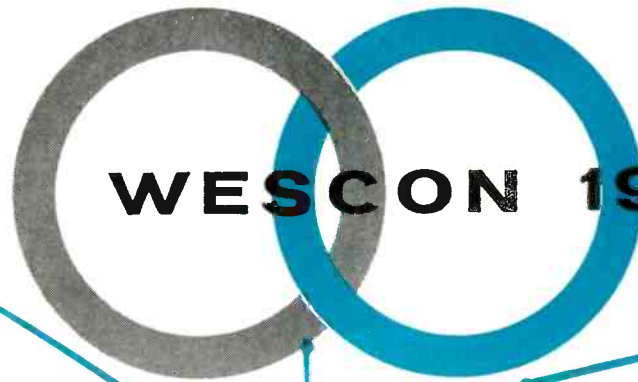
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633-643 So. Fulton Avenue
Mount Vernon, N. Y.

KULKA

Circle 57 on Inquiry Card

ELECTRONIC INDUSTRIES



WESCON 1960



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New Tech Data

for Engineers

IR Cooling Systems

Four new liquid nitrogen cooling systems for infrared detector devices are described in a 6-page folder F-1265, from Linde Co., Div. of Union Carbide Corp., 30 East 42nd St., New York 17, N. Y. The four types are: integrally-mounted cell; liquid feed-vacuum insulated line; liquid generator to cryostat; and liquid feed-uninsulated lines. Also: information on design features, performance data, and specs.

Circle 212 on Inquiry Card

Silicon Rectifiers

Four separate data sheets for any engineer or designer who specifies, uses or is concerned with silicon rectifiers. The sheets cover many of the technical aspects of application, heat sink requirements, surge voltage protection, parallel operation and series operation of silicon power rectifiers. Additional information is included in curves, diagrams, formulas and charts helpful in the selection and use of silicon rectifiers and rectifier circuits and in attaining optimum efficiency from them in all applications. Data sheets are numbered 6SI-101 through 104. Fansteel Metallurgical Co., Publications Dept., N. Chicago, Ill.

Circle 213 on Inquiry Card

High Alumina Ceramics

Six-page brochure from Diamonite Products Mfg. Co., Shreve, Ohio, covers data and application of high alumina technical ceramics to the electronics industry. It contains a chart of comparative properties of Diamonite materials for electronic applications. It covers all factors—physical, electrical and environmental—of the material so that potential applications can be evaluated. A graph of dielectric loss factors on a comparative scale is also shown.

Circle 214 on Inquiry Card

Vaneaxial Airmover

Engineering information on a newly developed compact vaneaxial with a "non-stall" characteristic, designed to deliver air at high pressure for cooling tightly packed electronic components and other related applications. Model BC 1607V-1, measures 3 in overall dia. and 2 5/16 in. length. Design features are: 115 v., 400 CPS, single phase, weight 15 oz. Design options include: 115/200 vac 3 phase, 310-1100 CPS, single phase—sine wave or square wave, "hi-slip" altitude varying speed motors. It meets MIL specs for environment and performance. IMC Magnetics Corp., 570 Main St., Westbury, N. Y.

Circle 215 on Inquiry Card

Resins Chart

Standard Resins chart has been completely revised and brought up to date. It is a reference for data and end-use information about epoxy and ceramic type casting and impregnating resins and adhesives. Some of the newest products from Emerson & Cuming research are presented here for the first time. Chart is in color. Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.

Circle 216 on Inquiry Card

Pre-Amplifier

Model A-10 transistorized ac pre-amplifier is described in data sheet from Medistor Instrument Co., 1443 Northlake Way, Seattle 3, Wash. The unit can be used to convert dc oscilloscopes or pen recorders into high fidelity instruments for the recording of electrocardiograms, electroencephalograms, and electromyograms. Some specs: Gain, 200 to 2000 in 4 steps; In phase rejection ratio, adjustable to better than 10,000:1; Input impedance, approx. 1 megohm; calibration, 50 uv and 1 mv ($\pm 1\%$); Noise level, approx. 1.5 uv at 100 CPS; band pass; Low freq. response, adjustable to 0.1, 1.0, and 10 CPS—a 2 sec step function will decay approx. 5%. High freq. response, adjustable to 100 CPS, 1 KC, 40 KC.

Circle 217 on Inquiry Card

Static Control

A new control, called Static Slip-syn® starter, for low and high voltage synchronous motor starting equipment employs all static components and performs complex logic operations, including: application of motor-field excitation at both the proper speed and the most favorable rotor and stator relationship; detection and removal of excitation if the motor pulls out of synchronism; and protection of the starter or damper winding from overheating when operating at subsynchronous speed. For more information: Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Penna.

Circle 218 on Inquiry Card

Servomechanism Components

Introduction to the line of precision components for servomechanism and computing equipment from Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, New Jersey. Four-page, two-color brochure, Publication No. 603-17, describes component packaging, precision gyros, radar antenna devices, servo motors, stepper motors, tachometer generators — damping — temperature compensated and integrating—and Motor damping tachometers.

Circle 219 on Inquiry Card

Polyvariables

Polyvariable Experimentation (newly developed methods for experimentation in 10, 20, or more variables) is described along with available training programs and literature in a 4-page brochure from the Statistical Engineering Institute, 8 Fuller Road, Wellesley, Mass.

Circle 220 on Inquiry Card

Electrical Insulation

Catalog No. 36 lists "Standard Packaged" electrical insulation offered by Insulation Manufacturers Corp. 565 West Washington Blvd., Chicago 6, Illinois. Shown are prices and dimensions of stock paper and paper-combination cupped coils for motor slot insulation; crimped paper transformer insulation; fibre washer assortments; as well as motor wedges formed of Mylar® film; asbestos and glass mat laminates; hard maple wood; and formed fibre. Also included is a resume of made-to-order insulation products.

Circle 221 on Inquiry Card

Filters-toroids

Four-page catalog on toroids and filters lists various toroid types and shows typical performance curves. A new standard line of encapsulated toroids is described and illustrated. The catalog has a section on the ordering of filters, with a listing of requirements under eight general groups which cover the information necessary to develop suitable characteristics. Barker & Williamson, Inc., Canal St. & Beaver Dam Road, Bristol, Penna.

Circle 222 on Inquiry Card

Phenolic molding

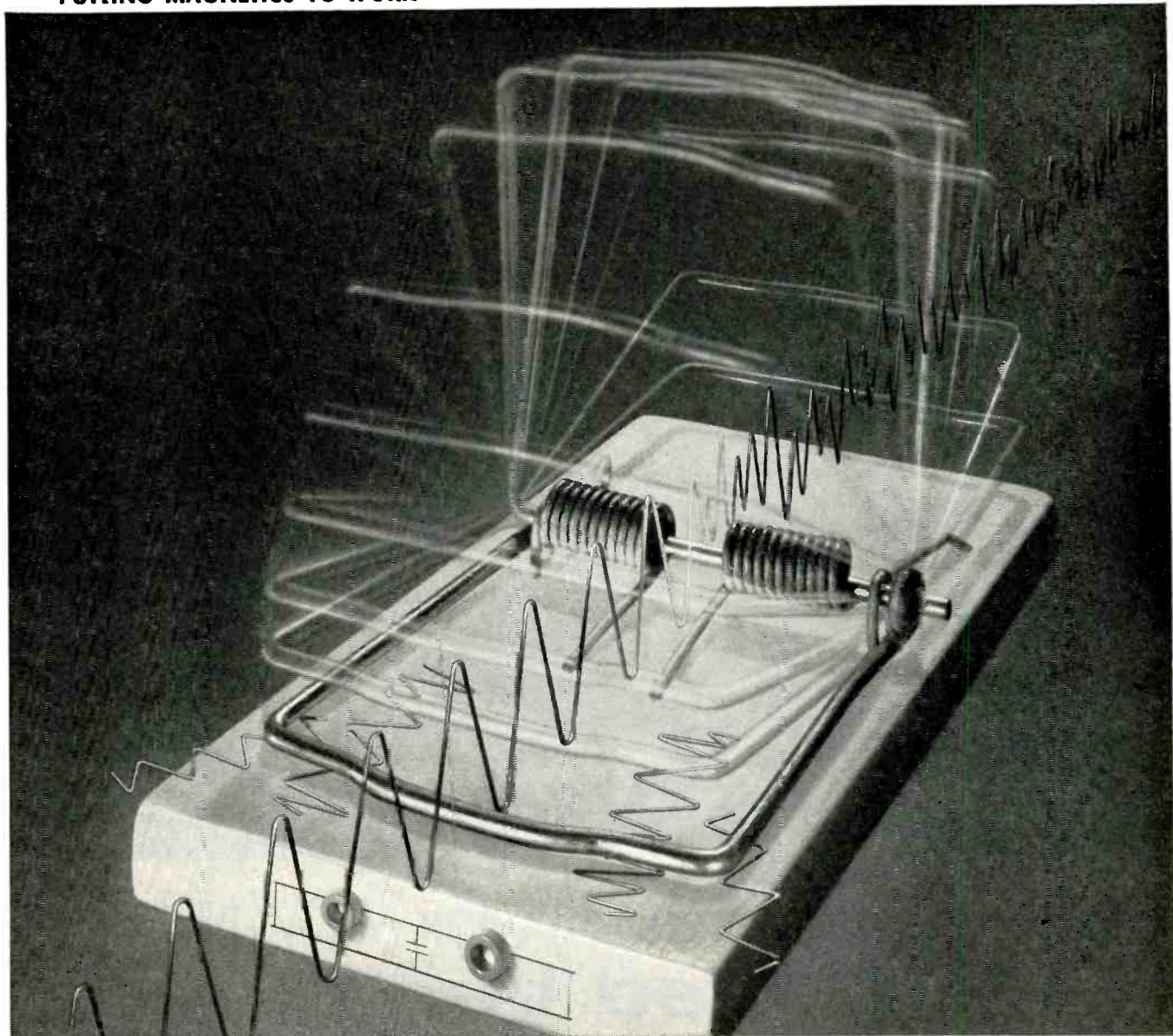
Two new Bakelite brand phenolic molding materials with fast cure times and wide molding latitudes are described in a brochure from Union Carbide Plastics Co., 30 East 42nd St., New York 17, N. Y. BMM-7001 is a dust and fines free material for fast powder automatic molding, either cold or r-f pre-heated. BMM-7002 is supplied in Stokes granulation for plunger molding with high frequency preheat.

Circle 223 on Inquiry Card

Solder Performs

Tech Data, Bulletin Z-103, a 2-page report, describes ultra-pure precision solder preforms. It lists compositions and melting points of 33 typical alloys available as preforms from the Company. Melting range is from 360° to 700° F. Accurate Specialties Co., Inc., 37-11 57th St., Woodside 77, N. Y.

Circle 224 on Inquiry Card



How to build a better (audio signal) trap!

Magnetics Inc. permalloy powder cores give filter designers new attenuation and stability standards—and miniaturization to boot!

The art of trapping unwanted frequencies has been advanced during the past year with a succession of improvements in molybdenum permalloy powder cores by Magnetics Inc. Most audio filter designers now work with smaller cores, more stable cores and cores whose attenuation characteristics are ultra-sharp. Do you?

Do you, for example, specify our 160- μ cores when space is a problem? With this higher inductance, you need at least 10 percent fewer turns for a given inductance than with the 125- μ core. What's more, you can use heavier wire, and thus cut down d-c resistance.

What about temperature stability? Our linear cores are used with polystyrene capacitors, cutting costs in half compared to temperature stabilized moly-permalloy cores with silvered mica capacitors. Yet frequency stability over a wide swing in ambient temperatures is increased!

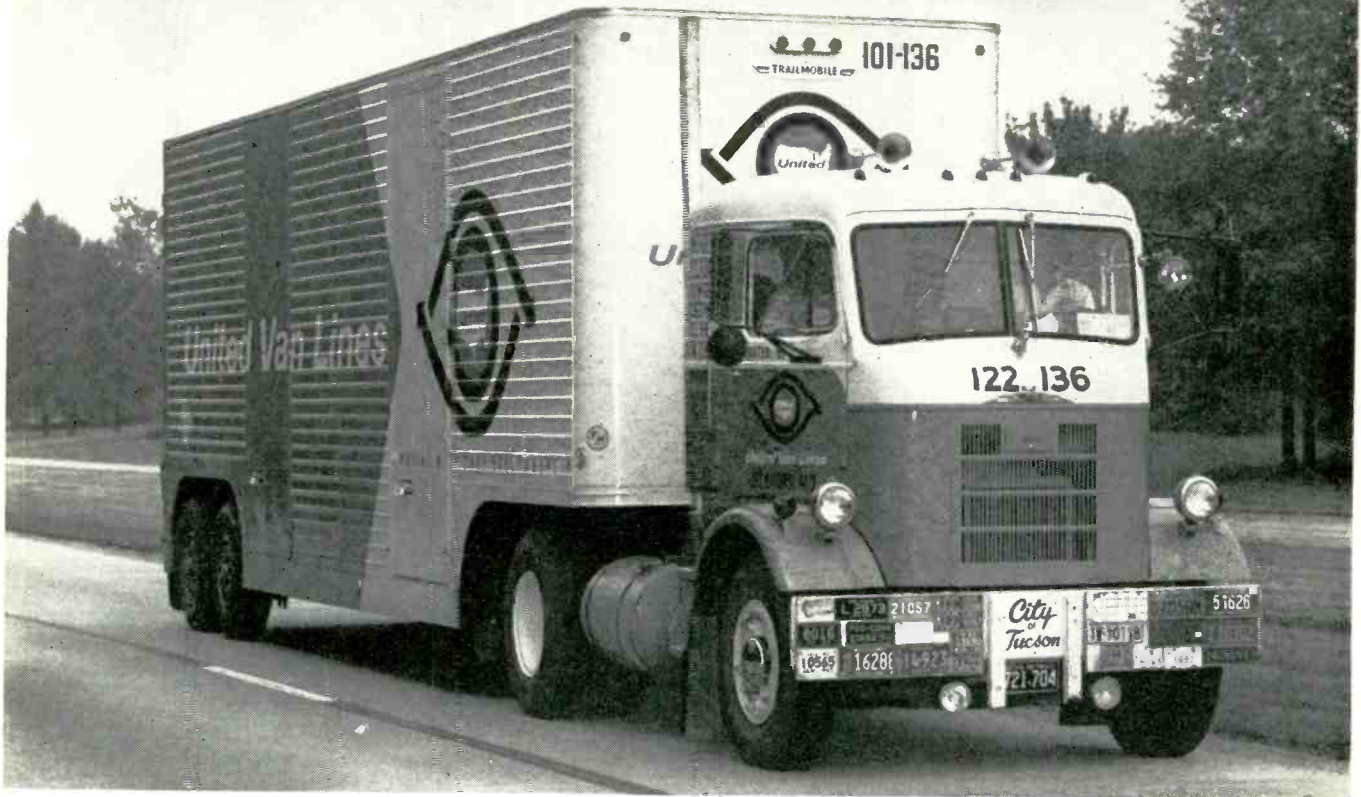
And what do you specify when you must rigidly define channel cut-offs, with sharp, permanent attenuation at channel crossovers? Our moly-permalloy cores have virtually no resistive component, so there is almost no core loss. The resultant high Q means sharp attenuation of blocked frequencies in high and low band pass ranges.

Why not write for complete information? Like all of our components, molybdenum permalloy powder cores are *performance-guaranteed* to standards unsurpassed in the industry. *Magnetics Inc., Dept. EL-82, Butler, Pa.*

MAGNETICS inc.
®

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loading of large units—in one piece—without costly dismantling. And because crating is not needed on most "Safe-Guard" shipments, there's an extra saving in time and expense.

For "Pre-Planned", straight-through service in exclusive Sanitized* vans, call your United Agent today. He's listed under "MOVERS" in the Yellow Pages.

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Provides valuable inches between wheel boxes... more usable loading area than standard vans.



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A full 72 inches, permit easy, one-piece loading of large items.



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AS MISSILES GO EVER HIGHER
temperatures go down
and down

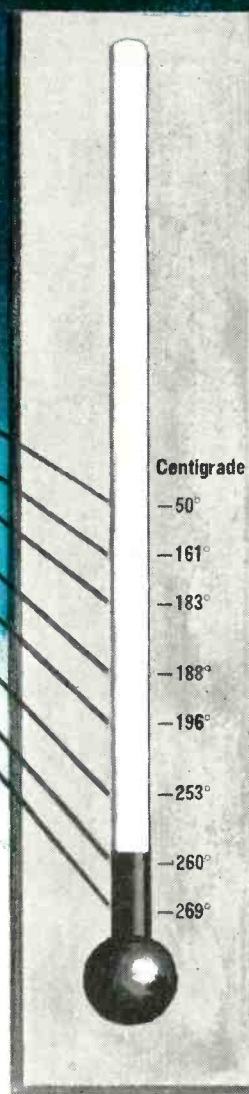


Here's how the problem is met by
KEYSTONE THERMISTORS

Just as surely as missiles are going higher and higher, the demand is for Thermistors to operate at lower and lower temperatures. Sooner or later, such demands are being met by the research people at Keystone.

Ten years ago the low temperature range for Thermistors was approximately -50°C . Then a new area of interest was born—still lower temperature operation. By 1955 we had developed units that were useful down to -183°C . Today we are delivering units for applications operating at -260°C (below liquid hydrogen) for use in space as liquid level indicators or as flow control mechanisms. Our Thermistors are also working in gas liquefaction apparatus with fluorine, argon, oxygen, etc. and in the petrochemical industry with methane. New missiles, new products, and the whole new field of Cryotronics challenge us to even lower temperature response. Degree by degree we make progress toward lower temperatures and maximum reliability within the precision tolerances and wide selection of temperature coefficients in which we work.

There may be a low temperature indication or control problem in your present product, or, more likely, in a product you're thinking about for the future. Here at Keystone we're working on both today's and tomorrow's problems and we would like to hear about yours. *Glad to have you call us, anytime.*



Centigrade

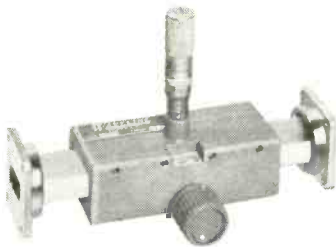
- -50° Keystone Thermistors, 1948
- -161° Liquid Methane
- -183° Liquid Oxygen
Keystone Thermistors, 1955
- -188° Liquid Fluorine
- -196° Liquid Nitrogen
Keystone Thermistors, 1956
- -253° Liquid Hydrogen
Keystone Thermistors, 1958
- -260° Keystone Thermistors, 1959
- -269° Liquid Helium



CARBON COMPANY
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PRECISION WR-51 TEST EQUIPMENT



- PRECISION COUPLERS
- TERMINATIONS
 - High Power
 - Low Power
 - Sliding
- ADJUSTABLE SHORTS
- TRANSITIONS
- SHORTING SWITCHES
- CRYSTAL MOUNTS
- SLOTTED LINES

- ATTENUATORS
 - Flap
 - Variable
 - Precision
 - Direct Reading
 - Fixed Pad
- ELBOWS and TWISTS
- PRESSURE UNITS
- BULKHEAD FLANGES



- VARIABLE SCREW TUNERS
- FREQUENCY METERS
- TEES
 - Shunt
 - Series
 - Magic



Our WR-51 Test Equipment brochure is available on request.

WAVELINE INC.

CALDWELL NEW JERSEY

CApitol 6-9100

TWX Caldwell, N. J. 703

Tech Data

for Engineers

Bobbin Winders

A 2-color catalog page illustrates and describes Model 39-AM Miniature Bobbin Winder and Model 315-AM 5000 RPM 3 in. stroke 5 in. OD Bobbin-Solenoid-Repeater-Resistor Coil Winder. Geo. Stevens Mfg. Co., Inc., Pulaski Rd., Peterson, Chicago 46, Ill.

Circle 225 on Inquiry Card

Sensing Elements

Line of sensing-element modules for closed-loop control, regulating, alarm systems is described in Bulletin SXD-5916 from Regulators, Inc., P.O. Box 266, 455 West Main St., Wyckoff, N. J.

Circle 226 on Inquiry Card

Quick-Connect Terminals

Bulletin 20 describes the different types of quick-connect terminals used on ESCO Type P, 10 amp. rotary switch. It includes photographs, dimension drawings, electrical ratings, mounting styles, as well as contact diagrams. Electro Switch Corp., King Ave., Weymouth (Boston 88), Mass.

Circle 227 on Inquiry Card

Klystrons—Planar Triodes

The characteristics and applications of a wide range of klystron oscillators and "rocket" planar triodes are described in a brochure from Sylvania Electric Products, Inc., 1100 Main St., Buffalo 9, N. Y. The booklet contains operational data on the company's complete line of disc seal and metal klystrons and Sylvania "rocket" tubes for pulse oscillator, CW oscillator and other applications up to 3,300 MC. Listed is info. on the SK-220 and SK 222 series which operate with 1 w output in the 6,125 to 8,100 MC range.

Circle 228 on Inquiry Card

Tape Perforator

New 24-page booklet describes Model GP-2 Super-Speed Tape Perforator. It can record digital data in standard perforated tape at the rate of 300 codes/sec. Booklet describes mechanical components, circuit design considerations, mechanical and electrical characteristics of the unit, as well as theory of operation. Soroban Engineering, Inc., Box 1717, Melbourne, Fla.

Circle 229 on Inquiry Card

Coaxial Cable

Catalog W3, 40 pages, provides information on Amphenol coaxial cable as well as an up-to-date RG-/U nomenclature listing and electrical and mechanical information on cable materials and performance. Amphenol Cable & Wire Div., Amphenol-Borg Electronics Corp., Chicago, Ill.

Circle 230 on Inquiry Card

**"FREON"-TF
SOLVENT**



This magnet wire was exposed to "Freon" solvent liquid. The "Glyptal" coating on this wire is completely unaffected by "Freon"-TF.

**ORDINARY
CHLORINATED SOLVENT**



This "Glyptal"-insulated wire was exposed to ordinary chlorinated solvent for the same length of time as the one on the left. The solvent dissolved the resin binder and softened the alkyd finish.

Comparison with ordinary chlorinated solvent proves:

FREON[®] solvents won't damage metal, elastomers or plastics . . . are safer for degreasing precision equipment

"Freon" solvents give you an effective and remarkably safe means of cleaning electric motors, ultra-precision mechanical and electronic equipment, and component parts. They minimize swelling of elastomers and plastics . . . will not soften paint, wire coatings or insulators. "Freon" solvents are also non-corrosive to metals without inhibitors. In addition, "Freon" solvents leave no residue when they

dry and can be recovered and reused readily.

"Freon" solvents are safe for personnel, too. They are non-explosive and non-flammable. "Freon" is virtually non-toxic. Vapors are odorless and will not cause nausea or headaches.

FREE 12-PAGE BOOKLET explains the unique properties of "Freon" solvents and how they minimize cleaning hazards.

FREON[®]
solvents



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

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"Freon" Products Division 558
Wilmington 98, Delaware

Send me your free, 12-page booklet on "Freon" solvents.

Name _____

Company _____

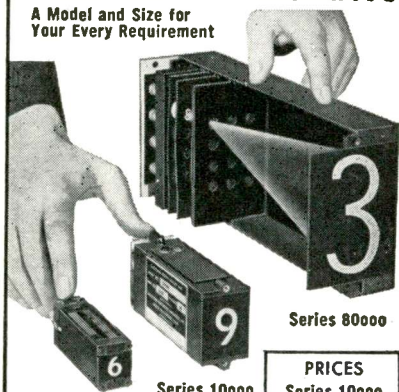
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Proven, Dependable, Rear-Projection Type

IN-LINE DIGITAL DISPLAYS

A Model and Size for Your Every Requirement



Series 80000

Series 10000

Series 120000

OUTSTANDING FEATURES

- All digits displayed on front viewing screen
- All digits uniform in size and intensity
- High-contrast viewing screen
- Digit style of your choice
- Colored digits of your choice
- Individual units may be group assembled for panel mounting

WRITE TODAY FOR COMPLETE SPECIFICATIONS
Representatives in principal cities

INDUSTRIAL ELECTRONIC ENGINEERS, Inc.



5528 Vineland Avenue,
North Hollywood, Calif.

Circle 66 on Inquiry Card

PRICES	
Series 10000	1 1/16" wide 2 5/8" high 5 5/8" long \$18.00 each
Series 80000	3 1/4" wide 5 1/4" high 11 1/16" long \$33.00 each
Series 120000	1" wide 1 1/16" high 3 7/8" long \$35.00 each
Quantity Prices On Request	

New Tech Data

for Engineers

Bridge Rectifier

A miniature open bridge assembly, the selenium rectifier Flat 155V90 is described in Bulletin F-313. The unit is rated at 90 ma dc at 155 v rms. Tech. data, circuit and dimensional diagrams, and mounting instructions are given. Dept. F, Radio Receptor Co., Inc., subsidiary of General Instrument Corp., 240 Wythe Ave., Brooklyn 11, N. Y.

Circle 231 on Inquiry Card

Power Supplies

Catalog, Form 3114-9, describes line of high voltage power supplies. The 8-page, 2-color bulletin pictures main components in single and dual units for operation up to 5000 v. The Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, Ohio.

Circle 233 on Inquiry Card

Handling Equipment

Condensed catalog, No. 605, of vibratory materials handling equipment, vibrating parts handling equipment, power rectification equipment, mechanical shaft seals, paper jogggers and portable power tools. Lines listed include vibrators, car shakers, car rappers, packers and jolters, hopper level switches, flow control valves, feeders, conveyors, spiral elevators, dry feeders and weigh-feeding equipment, a complete line of vibrating screens, test sieve shakers, parts feeders, lapping machines, rectifiers and rectifier power units, battery chargers, shaft seals, paper jogggers, paving breakers and rock drills, electric hammers and hammer drills, and concrete vibrators and floats. Syntron Co., 263 Lexington Ave., Homer City, Pa.

Circle 234 on Inquiry Card

Inductor Wall Chart

Ready-reference wall chart on toroidal and variable inductors. The 3-color chart measures 24 x 36 in. and has metal edging. Twenty graphs provide Q versus frequency curves for several ranges of voltage or inductance. Also a table of the electrical characteristics and physical dimensions of 25 typical toroidal inductors with diagrams and sizes of a number of commonly-used hermetic and epoxy-potted metal cases. Similar information is supplied for a range of variable inductors. Burnell & Co., Inc., 10 Pelham Pkwy. Pelham Manor, N. Y.

Circle 232 on Inquiry Card

CINCINNATI SUB-ZERO CHAMBERS are TRIPLE-SEALED

Ruggedly constructed, accurate, compact . . . the complete line for testing under conditions of hi-lo temperatures, humidity, radiation, and altitude . . . with

Custom Engineered Design

Double-duty fin-coil blower assembly minimizes temperature stratification . . . serves as primary evaporator. Electric heaters furnished for hi-temp operation.

- Gaskets around doors and lids triple seal
- No seams, rounded corners, electric welded
- Stable non-settling, low conductivity insulation
- Interior galvanized or stainless steel; or with lead liners if specified
- Multipane frostproof windows for hi-lo temp, altitude and humidity testing



For literature and estimates write



CINCINNATI SUB-ZERO PRODUCTS

General Offices & Plant
3930-EF Reading Rd. • Cincinnati 29, Ohio

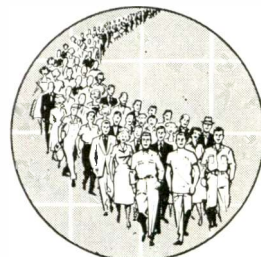
Representatives in major industrial areas
Member: Environmental Equipment Institute

Circle 67 on Inquiry Card

METROPOLITAN MIAMI MARKETS

THE LABOR MARKET

The Last Unlimited Source of Skilled and Professional Labor. A great percentage of Americans want to live in South Florida . . . this area, therefore, has an immediate pool of skilled labor in every category.



THE SALES MARKET

Metropolitan Miami is the Focal Point of Four Great Markets: Dade County, the Gold Coast, the Southern U.S. Market and the Caribbean—Latin America.



Send for 30-SECTION ECONOMIC SURVEY OF METROPOLITAN MIAMI



This important survey will be mailed to you free of charge—in strictest confidence—if you write, on your letterhead, to the address listed below.

Write: T. Richard Welsh, Director

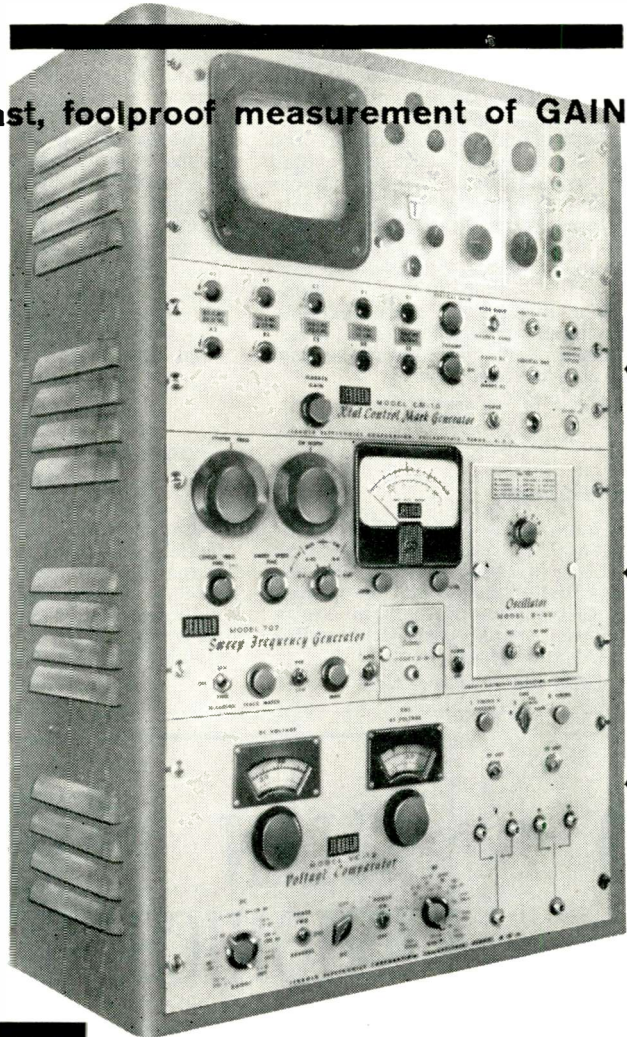
DADE COUNTY DEVELOPMENT DEPARTMENT
345 NORTHEAST SECOND AVENUE • MIAMI, FLORIDA

An agency of the Metropolitan Miami Government

Circle 68 on Inquiry Card

BEST TEST SET YET!

For fast, foolproof measurement of GAIN, LOSS, VSWR, Q, X_L , X_C , Z



Crystal Controlled Marker Generator

Model CM-10—A 10-crystal unit producing any selected fundamental and/or harmonic frequencies. Each oscillator has its own independent amplitude control. Features built-in scope pre-amplifier and VSWR filter.

Precision Sweep Generator

Model 707—The heart of the test set. Features an extremely flat RF output ($\pm 5/100$ db) and variable rate, all electronic sweep with plug-in oscillators available covering 2 to 265 mcs. Provisioned for use with an X-Y plotter.

Accurate Voltage Comparator

Model VC-12 — The unit that makes Measurement By Comparison possible. A 3-section instrument that contains regulated DC and RF voltage supplies and a wide band coaxial comparator for the simultaneous visual presentation of reference standards against which the test information is compared.

JERROLD MODEL 1707

Complete RF TEST SET employs the **Measurement By Comparison** technique

Model 1707 Price **\$1,570.00**
(Oscilloscope, rack, or recorder not included)

Interested in more than one frequency . . . an entire band, octave, or spectrum? Now it's no longer necessary to employ the slow, tedious, point-by-point method of measurement when working with a spectrum of frequencies. Jerrold's new 1707* test set will do the same measurement job *Faster*, more accurately, and with fool-proof results. Featuring the **Measurement By Comparison** technique, the model 1707 provides a continuous visual presentation and self calibration against precision standard attenuators (and/or accurate DC and RF voltage sources referenced against a standard cell). So, whatever your laboratory, production, or field needs—Jerrold's sweep frequency **MBC** method will serve them better.

Write today for complete catalog and technical newsletter series on MBC procedures.

JERROLD

ELECTRONICS CORPORATION

Industrial Products Division, Dept. ITE-63, Philadelphia 32, Pa.

Jerrold Electronics (Canada) Ltd., Toronto • Export Representative: Rocke International, N.Y. 16, N. Y.

*Similar test sets available for other ranges

WESCON BOOTHS 426-427

New Tech Data

for Engineers

High Temp Motor

An HM-420 type high temp. motor with a working amb. temp. range from -65°F to $+600^{\circ}\text{F}$ is described in PS-8A Product Bulletin from Airborne Accessories Corp., 1414 Chestnut Ave., Hillside 5, N. J. Two-color, 4-page Bulletin includes performance curves, outline drawing, general engineering data and a section on special design features.

Circle 235 on Inquiry Card

Life Support Systems

Life Support system R&D for space flight plus related programs are summarized in a new booklet, PIB-D-8, distributed by General Electric's Missile & Space Vehicle Dept., 3198 Chestnut St., Phila. 4, Pa. Projects outlined include the satellite aeromedical recovery vehicle, life support systems for manned re-entry vehicles, food preservation systems for space flight, closed environmental systems for small primates, and ecological systems. Related programs on nuclear emulsion recovery vehicles, electrical power systems for space and the G. E.-MSVD Biosciences Development and Human Factors Labs. are summarized.

Circle 236 on Inquiry Card

Timers

Condensed Catalog D-31 from Automatic Timing & Controls, Inc., King of Prussia, Pa., is a reference for automation components and control systems. 30-page, 2-color publication covers timing components and linear measuring systems for industrial and military users. Also: sections devoted to electronic timers, special timers and their applications, package control systems, military components and systems and in one grouping, test equipment, switches, controllers, contactors and valves. Treated separately are differential transformers, motion transmitters, edge guide, pressure transmitters, demodulators and indicators and recorders.

Circle 237 on Inquiry Card

Test Equipment

A 28-page catalog from Electronic Instrument Co., Inc., 33-00 Northern Blvd., Long Island City 1, N. Y., covers its line of stereo and mono high fidelity, test instruments, ham equipment, citizen transceivers and radios in both kit and wired form.

Circle 238 on Inquiry Card

Random-Noise Generator

Illustrated 4-page brochure describes the Type 1390-B Random-Noise Generator. Highlights are a basic schematic of the instrument, curves comparing the amplitude distribution of random noise with that encountered in active communication systems, and the amplitude-frequency characteristic of the noise generator. Typical measurement setups are shown, with a list of typical applications in electrical and acoustical measurements, environmental testing and statistical investigations. Includes electrical, electronic, and mechanical specs. General Radio Co., West Concord, Mass.

Circle 239 on Inquiry Card

Transistor Choppers

"A Review of the Transistor Chopper" titles Vol. 1, No. 2 of the Airpax Technical Journal. Issue discusses basic, bilateral and series-shunt transistor choppers. Multiple oscilloscope photographs compare noise voltages using typical circuit configurations. Airpax Electronics Inc., Cambridge Div., Cambridge, Md.

Circle 240 on Inquiry Card



**START WITH A
PERFECT FINISH...**

Specify CAMBION[®] panel handles



You can be certain of flawless finishes on CAMBION Panel Handles when you install them. They're buffed before plating to remove every surface imperfection . . . color buffed after plating for lasting luster. Then they're packaged in individual envelopes . . . positive protection against damage no matter how often they're handled, or how long they're stored before use. Available in 36 different *standard* combinations: rigid, adjustable, and folding types. Finishes of polished nickel, black oxide, semi-frost and black alumilite. Base metal: aluminum or brass. Write Cambridge Thermionic Corporation, 458 Concord Avenue, Cambridge 38, Mass., for full details on these and other products in the wide line of

CAMBION[®]

The guaranteed electronic components

Circle 70 on Inquiry Card

ALLEN AVIONICS

new!



DELAY LINES



**new
bulletin**

New Allen Avionics Bulletin "DL" describes lumped constant, phase and frequency compensated Delay Lines, utilizing sub-miniature inductors and temperature compensating capacitors.

Write for your copy today!

ALLEN AVIONICS, INC.
PRECISION COILS, CAPACITORS, DELAY LINES, FILTERS, TRANSFORMERS

255 EAST SECOND STREET • MINEOLA, NEW YORK
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Circle 71 on Inquiry Card

Circle 72 on Inquiry Card

ELECTRON TUBE NEWS

...from SYLVANIA

SYLVANIA

GOLD BRAND SUBMINIATURE TUBES

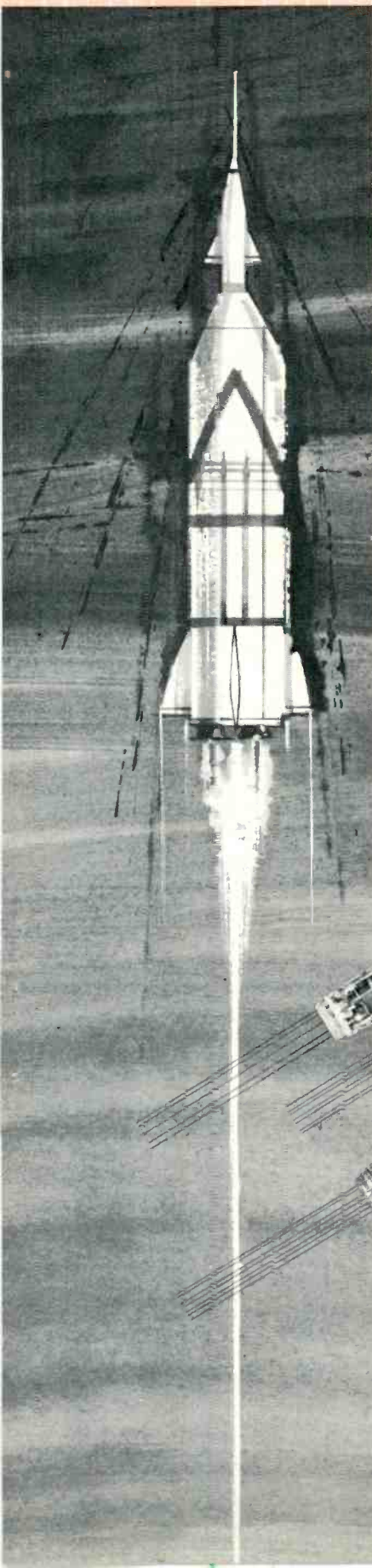
add a high degree of reliability to your critical designs

... **new tests prove it!**

New manufacturing techniques *build* reliability *into* Sylvania Gold Brand Subminiature Tubes.

New survival rate criteria provide *quantitative definition of Subminiature Tube reliability*, aid designer compute reliability of end-equipment.

New—four Gold Brand Subminiature types—featuring *rugged-design heater for 26.5V applications*—increase versatility of line, widen designer's choice.



SYLVANIA INCREASES SHOCK TEST LEVELS!

- 750g for Gold Brand Premium Subminiature Types
- 1000g for Gold Brand Guided Missile Subminiature Types

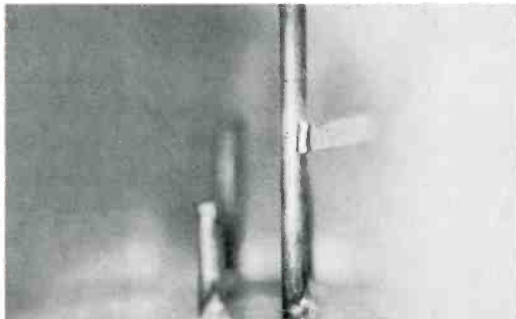
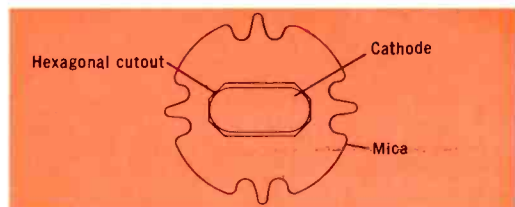


Photo shows the result of Sylvania advanced welding methods. Weld area is extremely rugged and free of weld splatter and oxidation. As a result, catastrophic failures under severe environmental conditions are minimized.

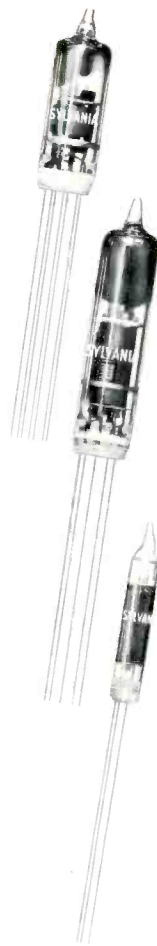


Hexagonal cutout in mica provides firm 6-point contact with cathode, offers increased resistance to shock.

Sylvania has significantly improved the design and manufacture of subminiature type tubes. Now, Gold Brand Subminiature Tubes are capable of withstanding greatly increased impact acceleration tests. For example, newly designed micas provide tight 6-point contact with the cathode. A reducing welding method produces an exceptionally sturdy, clean weld area. Special flared-lip envelopes assure that mica points are not damaged in insertion, maintain the tube structure rigidly within the bulb.

In addition to the increased shock of 1000g applied to Guided Missile Subminiature Tubes, the shock intensity pattern has been changed by eliminating the usual $\frac{1}{2}$ " synthetic rubber pad between the hammer and striking plate of the high impact machine. *Although shock tests are increased, rigid control of end points has not been relaxed.*

Too, low-frequency vibration tests assure low signal to noise ratio. Vibration tests for "random" or "white" noise are made over a frequency range of 100 to 5000 cps and read up to 10,000 cps to control harmonics. Additional checks include tests for low voltage stability and fatigue.

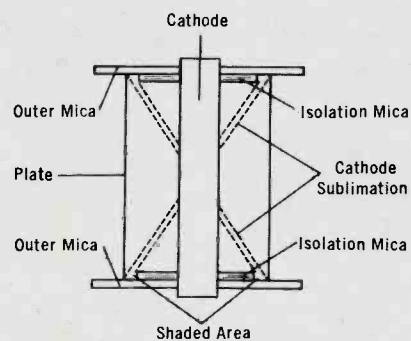


SYLVANIA INCREASES LIFE TESTS TO 1000 HOURS! NEW CONTROLS ADDED TO 100-HOUR TEST!

Now, Sylvania Gold Brand Subminiature Tubes are tested for 1000 as well as 500 hours. They must meet the same tight limits at 500 and 1000 hours for such end points as: inoperatives, grid current, filament current, Gm, heater-to-cathode leakage, electrical insulation, and cathode interface impedance.

These end points are controlled during manufacture by such operations as: chemically etching the cathode sleeve to provide a good bonding surface for the cathode coating which helps reduce interface impedance, provides improved electrical levels, especially at reduced voltage conditions; use of isolation micas to increase insulation resistance; coating the inside of the cathode sleeve with a nonconductive material to minimize heater-to-cathode leakage.

Further controls are included in the 100-hour life test to assure early-hour stability. For example, new specifications are added for grid current, heater-to-cathode leakage and insulation resistance. The 100-hour life test is performed at room temperature—a critical level for cathode sublimation and resultant leakage paths—and on concurrent samples at various operating temperatures.



Isolation mica "shades" outer mica from sublimation, forms laminated path and greatly increases dc resistance of leakage paths.

SYLVANIA TIGHTENS GLASS AQL LIMITS!

Sylvania has lowered the Acceptance Quality Level from 6.5% to 4% for combined glass defects. Individual glass defects must now meet a 1.5% AQL. This is made possible by increased manufacturing controls to maintain strain-free glass envelopes. Strains that may occur in manufacture are eliminated by annealing glass of Gold Brand Subminiature Tubes after envelopes are sealed. "After-manufacture" annealing is made possible by a special process that keeps the tube structure relatively cool during the annealing. Gold Brand Guided Missile Subminiature types utilize high-resistivity glass. Tubes are capable of withstanding operating temperatures of 250°C, electrolysis caused by heat is virtually eliminated.



HEATER TEST AT ELEVATED VOLTAGE ASSURES FAST WARM-UP TIME!

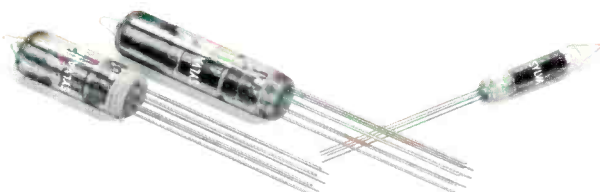
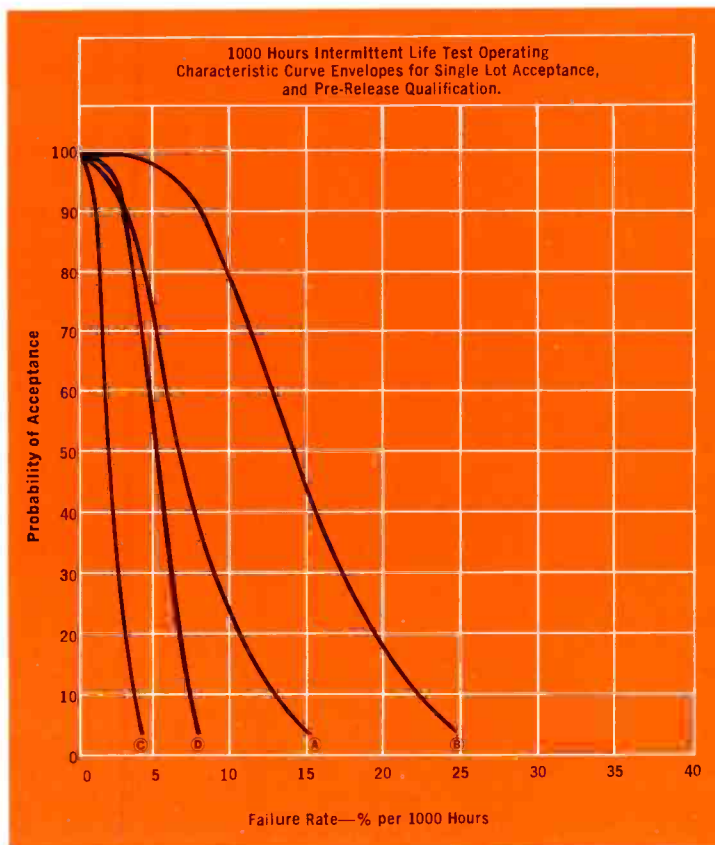
SYLVANIA ADDS INTENSE RADIATION TESTS

SYLVANIA "GLEAM PROJECT" INCREASES TUBE RELIABILITY

Sylvania Gold Brand Subminiature Tubes with 6-volt heaters are sample-tested at a heater voltage of 10 volts and a peak heater-to-cathode voltage of 150 volts—cycled 10 seconds "on" and 4 minutes "off" for a total of 300 cycles. In addition, all Gold Brand Subminiature types are tested at normal heater voltages cycled 1 minute "on," 4 minutes "off" for 2000 cycles. To more closely correspond to equipment variations, heaters are designed to operate in a wider voltage range. Ratings for heater voltage variations have been increased from $\pm 5\%$ to $\pm 10\%$.

Gold Brand Subminiature Tubes are capable of withstanding radiation dose rates (fast neutrons) of 10^{12} NV and accumulated radiation of 10^{16} NVT—further proof of Gold Brand reliability under the most severe environmental conditions.

Initiated 15 years ago, "Gleam" is contributing to Gold Brand Subminiature Tube reliability by—welding in a reducing atmosphere to eliminate weld splatter and oxidation • use of special flared-lip bulbs to allow easy insertion of tube structure into bulb without damaging and flaking mica points • ultrasonic cleaning of critical parts • specially processed getter material which resists flaking • air-conditioning in factories • lint-free clothing, enclosed cloakrooms • individual hooded worktables • lint-free parts containers • microscopic examination of completed tubes for loose particles



SYLVANIA INITIATES NEW SURVIVAL RATE CRITERIA ON GOLD BRAND SUBMINIATURE TUBES!

Sylvania rigorous acceptance criteria is based on the average number of *cumulative* failures for a *five-lot* moving average—instead of one—tested for 1000 hours. The first five lots are tested and the cumulative number of inoperatives and combined failures are plotted with their respective bogey rates. Inoperatives and failures for the sixth lot are added to the cumulative figure and the first lot figures deleted. Sampling consists of 40 tubes per lot. The result is a more stringent control over a wide range of production as well as giving the customary lot by lot results. Too, percent failure rate in 1000 tube hours can be statistically predicted with a high degree of accuracy and provide a quantitative measure of reliability.

Acceptance Numbers for all Sample Sizes
Inoperatives Total incl. Inops.

Single Lot	2	5
Five-Lot Moving Sum	5	14
Pre-Release at 500 Hours:		
Five-Lot Moving Sum at 1000 Hours	4	12
Current Lot at 500 Hours	1	2

Base Scale for Exemplary Curves Shown Relates to

Single Lot Acceptance	AFR	IFR	RFR
Ⓐ Single Lot for Inops.: $n=40, c=2$	2.0	6.5	13
Ⓑ Single Lot for Total: $n=40, c=5$	6.6	14.0	22
Pre-Release Qualification			
Ⓒ Five-Lot Moving Sum for Inops. at 1000 hours and current lot at 500 hours: $n=200, c=4$ and $n=40, c=1$	.80	2.0	3.3
Ⓓ Five-Lot Moving Sum for Total at 1000 hours and current lot at 500 hours: $n=200, c=12$ and $n=40, c=2$	2.4	5.0	7.2

SYLVANIA ANNOUNCES 4 NEW GOLD BRAND SUBMINIATURE TYPES FOR 26.5 VOLT APPLICATIONS

These remarkable new Gold Brand Subminiature Tubes utilize a rugged-design heater that combines very low heater power with excellent mechanical strength. A heavy mandrel coated with a high-temperature insulator forms the base of the heater. A fine heater wire is wound over the coating and the entire assembly recoated to form a sturdy, efficient, folded coil heater. Your Sylvania Sales Engineer has complete technical data on all four types.

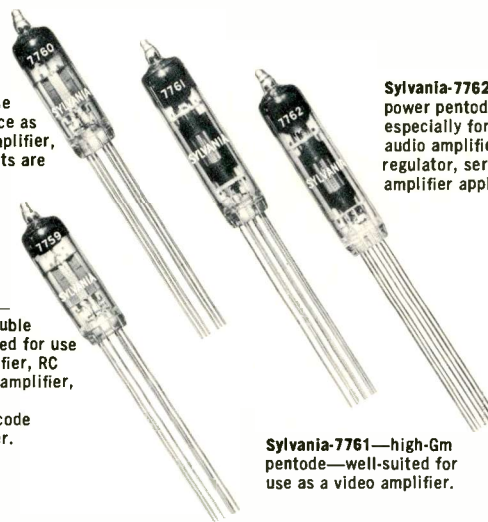
Average Characteristics and Typical Operation	7759 (Each Section)	7760 (Each Section)	7761 Class A Video Amplifier	7762 Class A1 (Single Tube)	Unit
Plate Voltage	100	26.5	—	110	Vdc
Plate Supply Voltage	—	—	200	—	Volts
Cathode Resistor	0.15	—	0.1	0.27	Megohms
Grid Resistor	—	2.2	0.47	—	Megohms
Plate Current	6.5	3.0	—	—	mAdc
Transconductance	5400	5000	—	—	μ mhos
Amplification Factor	35	20	—	—	—
Grid Voltage for Ib=100 μ Adc Max.	-6.5	—	—	—	Vdc
Grid Voltage for Ib=50 μ Adc	—	-3.5	—	—	Vdc
Grid #2 Voltage	—	—	100	110	Volts
Signal Voltage (rms)	—	—	1.6	6.4	Volts
Zero Signal Plate Current	—	—	19	30	mAdc
Max. Signal Plate Current	—	—	18.5	29	mAdc
Zero Signal Grid #2 Current	—	—	4.0	2.2	mAdc
Max. Signal Grid #2 Current	—	—	4.5	5.5	mAdc
Voltage Output (Peak to Peak)	—	—	135	—	Volts
Load Resistance	—	—	4.7	3.0	Megohms
Power Output	—	—	—	1	Watts
Total Harmonic Distortion	—	—	—	10	%

Sylvania-7760—medium- μ double triode—for service as an RC coupled amplifier, mixer. All elements are 26.5 volts.

Sylvania-7759—medium- μ double triode—designed for use as a UHF amplifier, RC coupled audio amplifier, low frequency oscillator, cascade amplifier, mixer.

Sylvania-7762—beam power pentode—especially for Class A audio amplifier, series regulator, servo-amplifier applications.

Sylvania-7761—high-Gm pentode—well-suited for use as a video amplifier.



GOLD BRAND PREMIUM SUBMINIATURE TYPES for 26.5-Volt Applications

Type	Description
5903	UHF Double Diode
5904*	UHF Medium-Mu Triode
5905*	UHF Sharp Cutoff Pentode
5906	UHF Sharp Cutoff Pentode
5907*	UHF Remote Cutoff Pentode
5908*	UHF Pentode
5916	Dual-Control
7759	Medium-Mu Double Triode
7760*	Medium-Mu Double Triode
7761	High Gm Video Pentode
7762	Beam Power Pentode

*All elements 26.5 volts

GOLD BRAND PREMIUM SUBMINIATURE GUIDED MISSILE TYPES

Type	Description
6943	Sharp Cutoff RF Pentode
6944	Semi-Remote Cutoff RF Pentode
6945	AF Beam Power Pentode
6946	Medium-Mu Triode
6947	Medium-Mu Double Triode
6948	High-Mu Double Triode
6788	Sharp-Cutoff AF Pentode

GOLD BRAND PREMIUM SUBMINIATURE TYPES

Type	Description
5636	Dual Control Pentode
5639	Video Pentode
5641	Diode
5643	Tetrode Thyatron
5644	Cold Cathode Diode
5647	UHF Diode
5718	UHF Medium-Mu Triode
5719	High-Mu Triode
5840	UHF Sharp Cutoff Pentode
5896	UHF Double Diode
5899	UHF Semi-Remote Cutoff Pentode
5902	Beam Power Pentode
5977	Medium-Mu Triode
5987	Low-Mu Power Triode
6021	Medium-Mu Double Triode
6110	UHF Double Diode
6111	Medium-Mu Double Triode
6112	High-Mu Double Triode
6205	UHF Sharp Cutoff Pentode
6206	UHF Semi-Remote Cutoff Pentode
6308	Cold Cathode Diode
6352	Double Diode
6814	Medium-Mu Triode
7327	Medium-Mu Double Triode (Pulse Tube)
7550	Medium-Mu Double Triode (Pulse Tube)

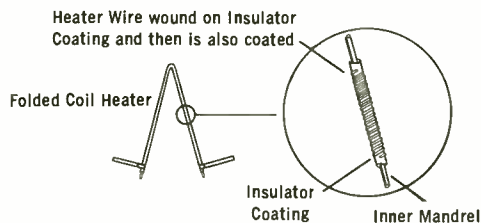


Diagram shows enlarged view of rugged new 26.5-Volt heater for Gold Brand Subminiature Tubes.

Gain the benefits of Gold Brand Subminiature Tubes in your military and industrial designs. Call your nearest Sylvania Field Office for the new specifications and delivery information. For data on individual types, write Electronic Tubes Division, Sylvania Electric Products Inc., Dept. H, 1100 Main St., Buffalo, N. Y.

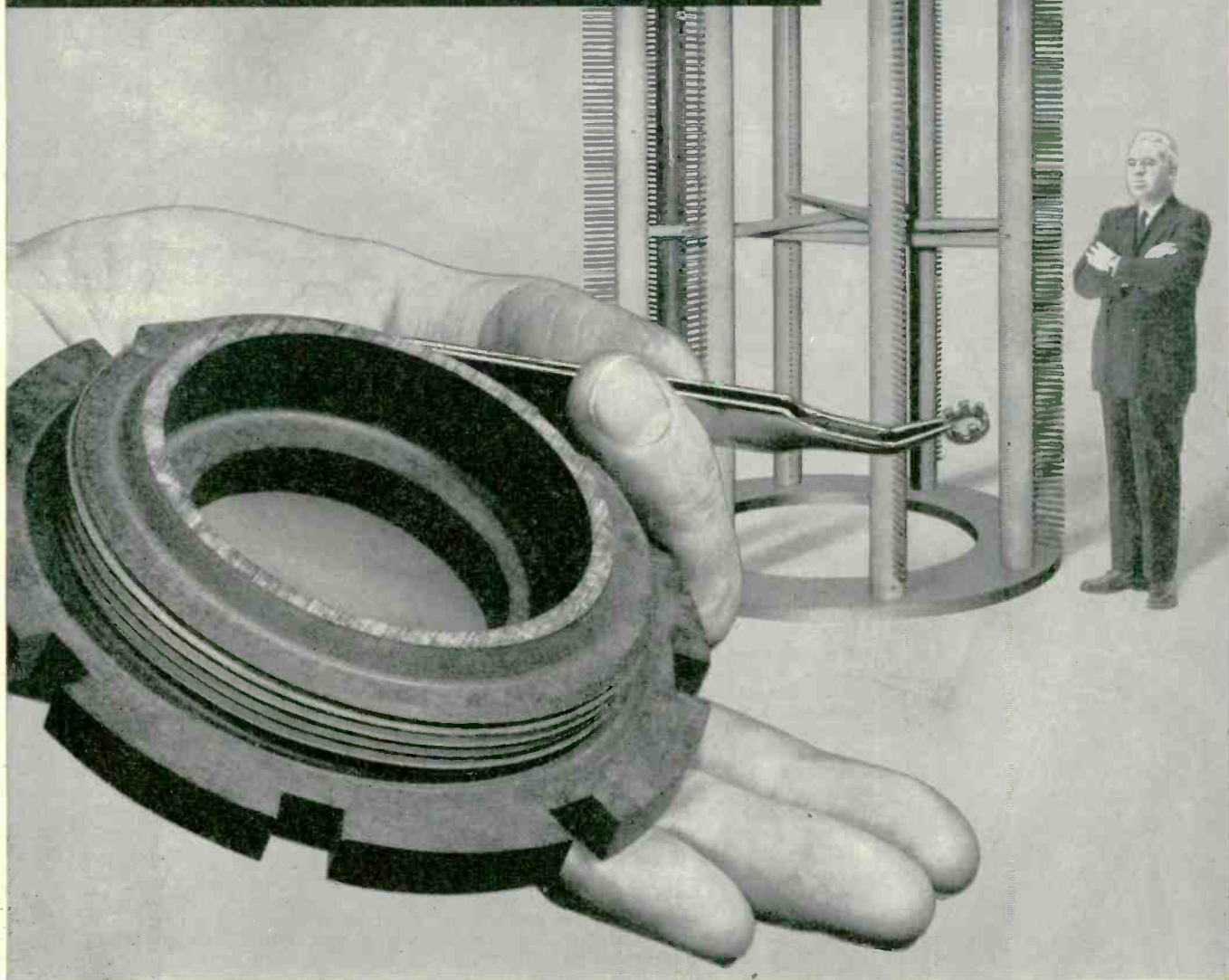
See the Sylvania Exhibit at Wescon—Booth #2009-2011, 2058-2061, 2108-2111.

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**



Synthane makes and fabricates
laminated plastics



Large, small or in between...we make it

Size is no problem in our fabrication of Synthane laminated plastics. Whether the part fits into your palm or onto the head of a pin, or towers over you, we believe we can handle it.

Why? Because we make the material and can control it to suit the job. Our variety of machines and

tools, many of them special, permit the widest freedom in the choice of a machining approach. Our skilled people have rolled up over 30 years of experience in doing the difficult and impossible. So, large, small or medium in size, let us take the production worries of your part off your mind.

Call your Synthane representative for a quotation or write Synthane Corp., 11 River Road, Oaks, Pa.

SYNTHANE
CORPORATION **S** OAKS, PENNA.

Sheets • Rods • Tubes • Fabricated Parts
Molded-laminated • Molded-macerated

You furnish the print—we'll furnish the part

WILMAD...

Glass Craftsmen To The Electronics Industry

Specify Wilmad

**For Precision Bore Tubing That Is Uniform
In Quality And Consistently Accurate**

Top quality in every component is the key to long service life and dependable operation in electronic tubes. Whether the glassware becomes a component part of vidicons, orthicons, semicons, diodes, triodes, capacitors, traveling wave tubes, planar storage tubes . . . no matter what the tube function . . . if glassware is a component part, it must be consistently accurate and uniform in quality.

Wilmad precision bore tubing is guaranteed to meet the exacting requirements of electronic use. In fact in millions of electronic tubes now in use, Wilmad tubing has been service-proved to perform satisfactorily as an important electronic tube component.

The inside diameter of our precision bore tubing is plus or minus .0002" and the outside diameter can be ground or polished to your specifications within a tolerance limit of plus or minus .0002". Special sizes and shapes can be supplied to meet your particular specifications. Tubing can be ground and polished with a concentricity of .002 T.I.R. Available in Pyrex Brand Glass and the following special glasses: 0120, 1720, 1723, 7052, 7056, 7070, 7520, 7800, Vycor and Quartz.

*Send for our Bulletin 102 which
gives complete details on
Wilmad precision bore tubing.*

WILMAD GLASS CO., INC.
BUENA, NEW JERSEY



Transitron

introduces

an exciting new device for simpler, more reliable, more economical switching circuitry

BINISTOR

(BY-NIS-TOR)

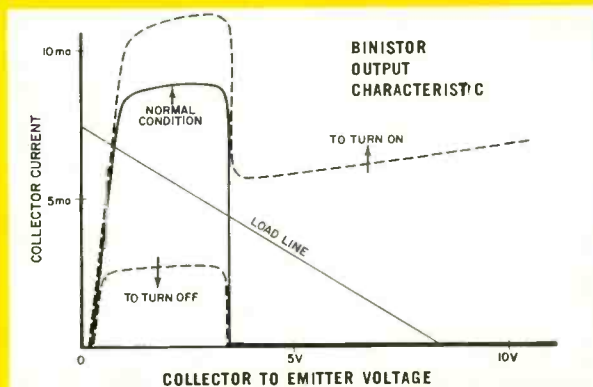
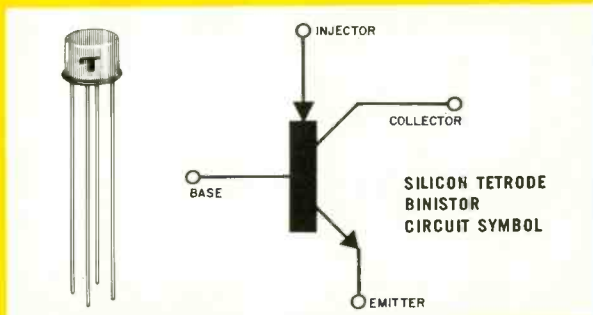
The Silicon NPN Tetrode binistor is a new component and a new concept for the circuit designer!

The key parameters of this bi-stable, negative resistance device are determined by external circuitry in contrast to existing devices. The significant reduction of peripheral circuitry results in outstanding savings in cost, space, weight and solder connections. For example, a typical flip-flop requires at least 13 components versus only 4 in an equivalent binistor stage. Very large current and voltage gains are realized in both on and off directions. Inputs and output are compatible in level with typical transistor and diode circuits. The tetrode binistor can operate from -80°C to $+200^{\circ}\text{C}$.

To learn more of this important new development — THE BINISTOR — and how it works — write for Bulletin No. TE-1360.

CONDENSED SPECIFICATIONS TRANSITRON BINISTOR

Typical Turn-off Current Gain	50 @ 15ma Collector Current
Operating Collector Current Range	$50\mu\text{a}$ to 15ma
I_j critical	0.5ma @ 5ma Collector Current
Operating Temperature Range without Temperature Compensation	-65°C to 150°C



MEET US AT WESCON — BOOTH 2638-39

Circle 75 on Inquiry Card

Transitron



electronic corporation
wakefield, melrose, boston, mass.

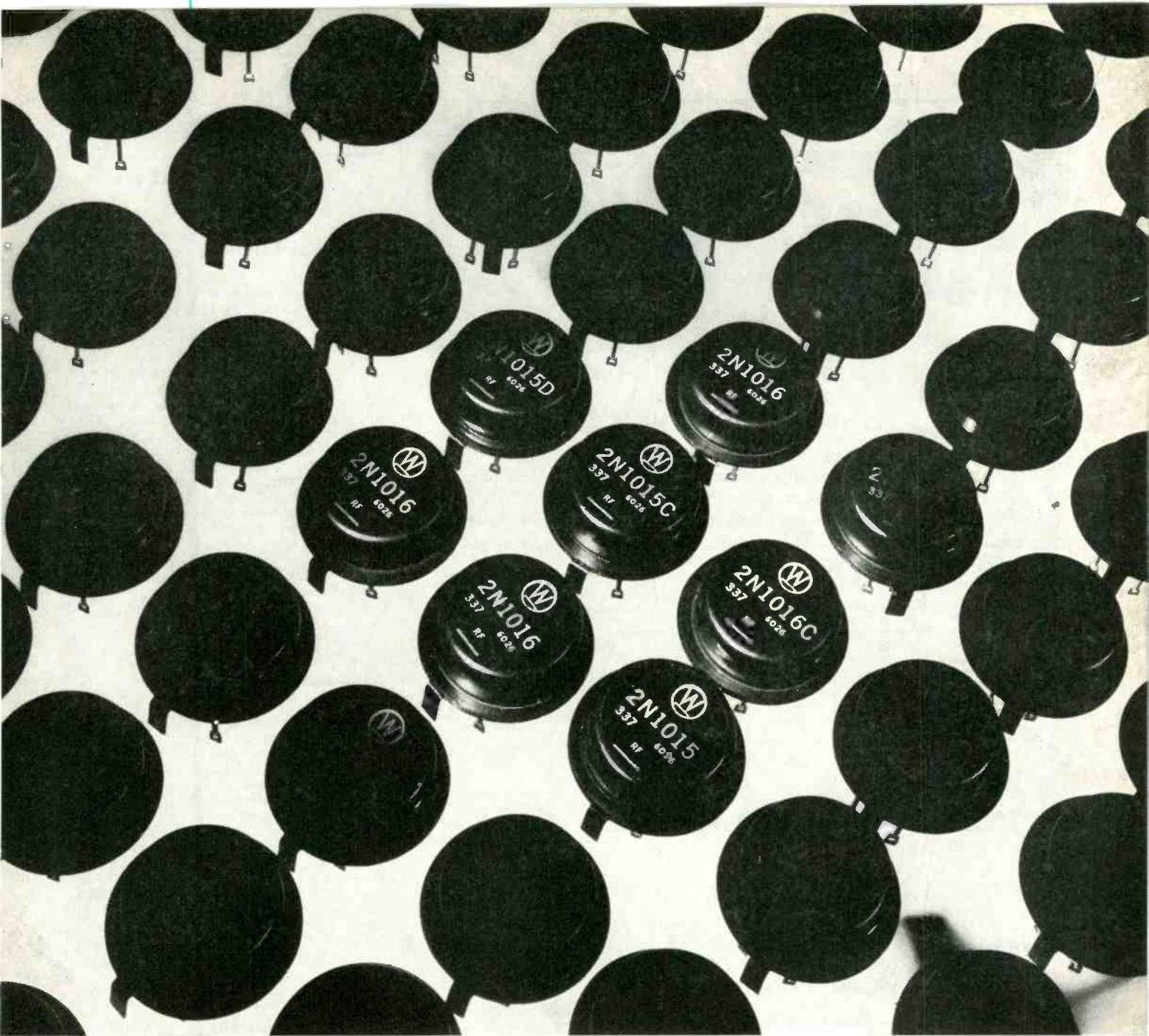
SALES OFFICES IN PRINCIPAL CITIES THROUGHOUT THE U.S.A. AND EUROPE • CABLE ADDRESS: TRELCO

new low prices

ON WESTINGHOUSE SILICON POWER TRANSISTORS

PRICES
REDUCED
UP TO 40%!

AVAILABLE NOW IN ANY QUANTITY! Now you can have the proven quality and reliability of Westinghouse Silicon Power Transistors at the lowest cost yet. Types 2N1015 and 2N1016 are available in 30, 60, 100, 150 and 200 volt ratings in production quantities to meet your requirements at all times. Because these transistors have **True Voltage Ratings**, they can be operated continuously at full published voltage ratings without risk of failure.



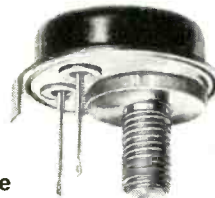
Other Westinghouse Transistor advantages include:

- High Power . . . up to 150 watts
- Collector current to 7.5 amperes
- Junction temperature to 150° C
- Designed to meet or exceed MIL specifications
- Extremely low saturation resistance

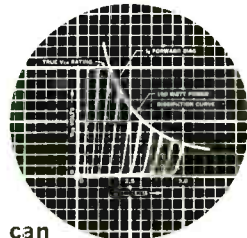
Present industrial and military applications include: Inverters • Regulators • Amplifiers • High Power Switching • Telemetry • Guidance • Power supplies.

For additional information, and quotation of new low prices, call your nearest Westinghouse representative or semiconductor distributor. Or write: Westinghouse Electric Corporation, Semiconductor Department, Youngwood, Penna. SC-1001

YOU CAN BE SURE...IF IT'S **Westinghouse**



Each Westinghouse Silicon Power Transistor is guaranteed by 100% power testing before shipment.



True Voltage Ratings—you can operate Westinghouse Silicon Power Transistors at full rating without risking transistor failure.

For immediate "off-the-shelf" delivery, order from these Westinghouse distributors:

EASTERN

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|--------------------------------|------------------------------|
| CAMERADIO | Pittsburgh, Pa./EX 1-4000 |
| CRAMER ELECTRONICS, INC. | Boston, Mass./CO 7-4700 |
| ELECTRONIC SUPPLY | Melbourne, Florida/PA 3-1441 |
| GENERAL RADIO SUPPLY CO., INC. | Camden, N.J./WD 4-8560 |
| KANN-ELLERT ELECTRONICS, INC. | Baltimore, Md./TU 9-4242 |
| MILGRAY ELECTRONICS | New York, N.Y./RE 2-4400 |
| RADIO & ELECTRONIC PARTS CORP. | Cleveland, Ohio/UT 1-6060 |
| SCHWEBER ELECTRONICS | Long Island, N.Y./PI 6-6520 |

MIDWESTERN

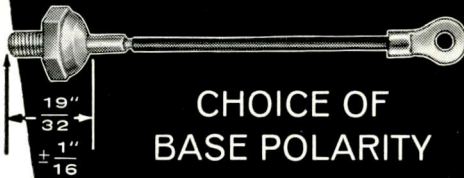
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| ELECTRONIC COMPONENTS FOR INDUSTRY CO. | St. Louis, Mo./WO 2-9917 |
| INTER-STATE RADIO & SUPPLY CO. | Denver 4, Colo./TA 5-8257 |
| LENERT CO. | Houston, Texas/CA 4-2653 |
| RADIO DISTRIBUTING CO. | Indianapolis, Ind./ME 5-8311 |
| SEMICONDUCTOR SPECIALISTS, INC. | Chicago, Ill./WA 2-8860 |
| UNITED RADIO, INC. | Cincinnati, Ohio/MA 1-6530 |

WESTERN

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|------------------------|-------------------------------|
| ELMAR ELECTRONICS | Oakland, Calif./TE 4-3311 |
| HAMILTON ELECTRO SALES | Los Angeles, Calif./BR 2-8453 |
| NEWARK ELECTRONICS CO. | Inglewood, Calif./OR 4-8440 |

SARKES TARZIAN SILICON RECTIFIERS

NEW J



CHOICE OF
BASE POLARITY

...new 12-amp J3 Series

We've added a new group of four rectifiers with option of positive or negative base polarity. The new J3's offer exceptionally large capacity for their compact design, with the reliability and long operating life that is characteristic of all Sarkes Tarzian silicon rectifiers. They are stud mounted, with an insulated flexible lead for ease of connection.

Tarzian Type	Amps DC (100°C)	PIV	Max. RMS Volts	Max. Amps	
				Recurrent Peak	Surge (4MS)
10J3N	12	100	70	60	150
10J3P					
20J3N	12	200	140	60	150
20J3P					
30J3N	12	300	210	60	150
30J3P					
40J3N	12	400	280	60	150
40J3P					

The 1.5-amp J1 SERIES

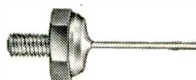
has axial leads



Tarzian Type	Amps DC (100°C)	PIV	Max. RMS Volts	Max. Amps	
				Recurrent Peak	Surge (4MS)
10J1	1.5	100	70	10	100
20J1	1.5	200	140	10	100
30J1	1.5	300	210	10	100
40J1	1.5	400	280	10	100

The 10-amp J2 SERIES

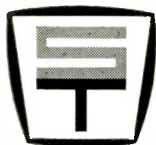
is stud mounted (Stud is negative) with wire lead (cathode) Negative Base Only



Tarzian Type	Amps DC (100°C)	PIV	Max. RMS Volts	Max. Amps	
				Recurrent Peak	Surge (4MS)
10J2	10.0	100	70	50	150
20J2	10.0	200	140	50	150
30J2	10.0	300	210	50	150
40J2	10.0	400	280	50	150

The three J Series rectifiers described above are part of the Sarkes Tarzian line of more than 200 distinct types, all available from stock in production quantities. Application assistance is always available.

For more information about J Series rectifiers, call the Sarkes Tarzian sales representative or write Section 5176C.



SARKES TARZIAN, INC.

World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices

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In Canada: 700 Weston Rd., Toronto 9 • Export: Ad Auriema, Inc., New York

Tech Data

for Engineers

Real Root Solutions

A method of real root evaluation for the approximate solution of algebraic equation is the subject of a new booklet, U1888, published by Remington Rand Div., Sperry Rand Corp., 315 Park Ave. So., New York 10, N. Y. It gives a complete program for the Univac 120 Punched-Card Electronic Computer to be used in finding Real Root evaluations. The program itself is based upon the Newton-Raphson Method and incorporates floating decimal subroutines. The program rapidly approximates, to 9 significant digits, the real roots of algebraic equations of any degree and achieves, thereby, a high level of accuracy. The booklet explains the method, algebraic equations and synthetic division and floating-decimal operations.

Circle 241 on Inquiry Card

Atmosphere Table

A 6-in. plastic ruler shows the new 1959 ARDC model atmosphere table with pressures and temperatures at altitudes up to 2 million ft. It shows temperatures in Fahrenheit, and air pressure in mms and inches of Hg and also psia for altitudes from sea level to the 2 million mark. Three temp. inversions, at 90,000, 180,000 and 325,000 ft. can be clearly followed in hundredths of degrees, along with the interesting plateaus between 37,500 and 80,000 ft. and between 250,000 and 300,000 ft. Tenney Engineering, Inc., 1090 Springfield Rd., Union, N. J.

Circle 242 on Inquiry Card

Cooling Equipment

A 16-page, short-form catalog on electronic cooling equipment from McLean Engineering Laboratories, Box 228, Princeton, N. J., highlights the features and applications of a line of 19 in. rack-mounted, packaged fans and blowers. Over 80 models are included in the line with CFM's ranging from 150 to 1000.

Circle 243 on Inquiry Card

Precision Gears

Master Catalog #F-128 lists over 50,000 components. Catalog lists the entire line of miniature precision gears, including anti-backlash gears (spring loaded solid & split hub), spur gears (hub, hubless, clamp type), bevel gears (mitre & ratio), worms and mating helical gears. Also differentials, speed reducers and gearheads, and transmission with up to 15 available range of speeds from 3.3 RPM to 7812 RPM. Dynamic Gear Co., Inc., Dixon Ave., Amityville, N. Y.

Circle 244 on Inquiry Card

Let's Talk Dollars and Sense About Hermetic Terminals



A manufacturer of electrical or electronic components becomes a customer for Fusite Glass-to-Metal Hermetic Terminals when the very guts of his fabricated product depend on the ability of the terminal to remain hermetic when roughly handled or when subjected to extreme thermal shock.

Only Fusite Terminals with their exclusive V-24M glass can assure an inter-fusion between the glass and metal parts that is the basis for their great ruggedness.

While Fusite Terminals are usually competitive in price, the important cost cutting opportunities they offer are in the extremely low rate of production rejections and field failures. When installed in your product, Fusite Terminals promote a high yield at the end of your production line where profits are made or lost.

The way to find out if Fusite Terminals can do your job better is to test them yourself.

Samples are yours for the asking. Write Fusite G-4.



THE **FUSITE** CORPORATION

6000 FERNVIEW AVE., CINCINNATI 13, OHIO

Woodford Mfg. Co., Versailles, Kentucky.

In Europe: FUSITE N. V. Konigsveg 16, Almelo, Holland

Max Schweizer is a Specialist



...at "RACKING UP" RELIABILITY

That incredibly short (3½") rack-mounting counter-timer tucked under Max Schweizer's forearm is a tribute to the many years of specialized experience he brings to the position of Chief Mechanical Engineer at TSI. Every one of the 2162 components in the Model 361-R APTI®-METER* is logically located, thermally protected and instantly accessible. No "sardine packing" here!

Incidentally, Max found his job about 800 components easier, because our circuits group has achieved what we call "reliability through sophisticated simplicity" in the 360 Series. His superb packaging job further enhanced that reliability — and the Model 361-R bears a 5-year guarantee.

If you like sharp contrasts, compare this cool, compact, all-solid-state beauty with the hot-as-a-pistol vacuum-tube monsters five times its height and weight, not nearly as versatile or convenient.

Why plod along with old-fashioned counters? Let us send you literature on the newest — Model 361-R APTI®-METER, the only 1 MC solid-state counter!

**APTI®-METER is our registered trade-mark for an ACTIONS-PER-TIME-INTERVAL meter. Model 361-R counts from 0-1MC, has crystal-plus-oven stability of 0.3 ppm/week, IN-LINE NIXIE READ-OUT, and identical-twin, high-impedance, high-sensitivity amplifiers. Features galore, unlimited flexibility, yet the sensible-compromise price is only \$1680.*



TRANSISTOR SPECIALTIES

INCORPORATED

Sophisticated Digital Instrumentation

TERMINAL DRIVE, PLAINVIEW, NEW YORK • WELLS 5-8700

Tech Data for Engineers

Thermistor Manual

Fenwal Electronics, Inc., 51 Mellen St., Framingham, Mass., has released thermistor manual—EMC-3. The 24-page book describes what thermistors are and what they do, gives several examples of how they are used, tells how to solve thermistor problems, and contains a listing and ratings of Fenwal Electronics' line of thermistors. It also includes resistance-temperature tables, and a list of aids to help solve thermistor problems.

Circle 245 on Inquiry Card

Cryogenic Gas Data

Data on the physical properties of cryogenic gases in both wallet size and full-sheet size cards from Air Products, Inc., Allentown, Pa. Information includes boiling points, critical points, triple points, specific heats and densities of most gases ranging from acetylene to xenon. Also: data on nitrogen trifluoride.

Circle 246 on Inquiry Card

Resistors—Controls

A general line catalog, 48-pages, features a complete listing of available replacement parts for the radio, TV and electronic industries. Included are detailed specs and other data on resistors, diodes, fuse resistors and controls. Distributor Div., International Resistance Co., 401 N. Broad St., Phila. 8, Pa.

Circle 247 on Inquiry Card

AC, AC/DC Testers

Data sheet describes high-voltage ac and ac/dc testers The 4-page data sheet covers Sorenson 800 Series portable ac testers, 7000 Series stationary ac testers and 8000 Series stationary ac/dc testers. Twenty-eight models are covered in all with electrical and mechanical specs. Ac output voltage of portable models ranges from 0-2000 to 2-20,000 v. Ac output of stationary testers (7000 and 8000 Series) ranges up to 0-150,000 v. and the dc output of Series 8000 to 0-300,000 v. Sorenson & Co., Richards Ave.,

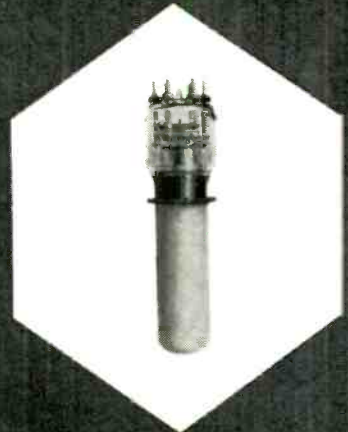
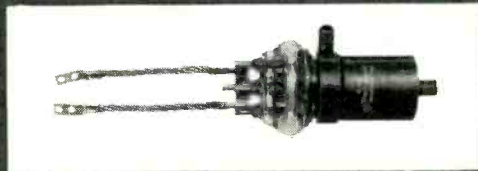
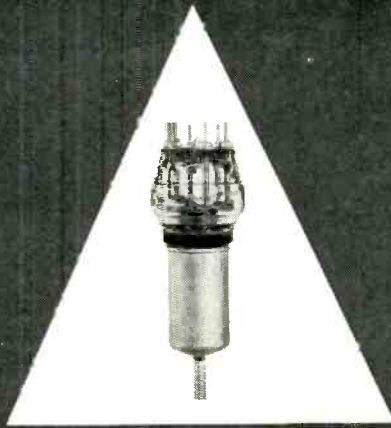
Circle 248 on Inquiry Card

Impulse Counters

A 6-page bulletin, describes the TCe Series of small electric impulse counters. Tech. data on these 3, 4, 5, and 6 digit manual or remote electrical reset types is furnished including operating information, electrical data, available types and weights, dimensional drawings. A special section is provided giving details for operation on ac. Landis & Gyr, Inc., 45 W. 45th St., New York 36, N. Y.

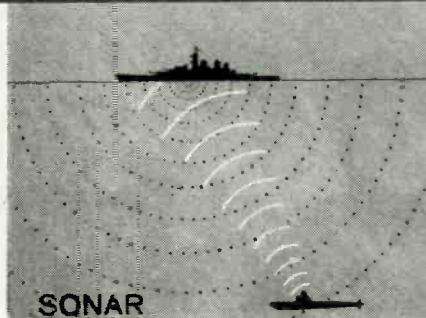
Circle 249 on Inquiry Card

AB₁



NEED 500 WATTS...OR 75,000 FOR CLASS AB₁ SERVICE?

LOOK WHERE
YOU CAN USE
WESTINGHOUSE
HIGH POWER AB₁
AMPLIFIER
TUBES:

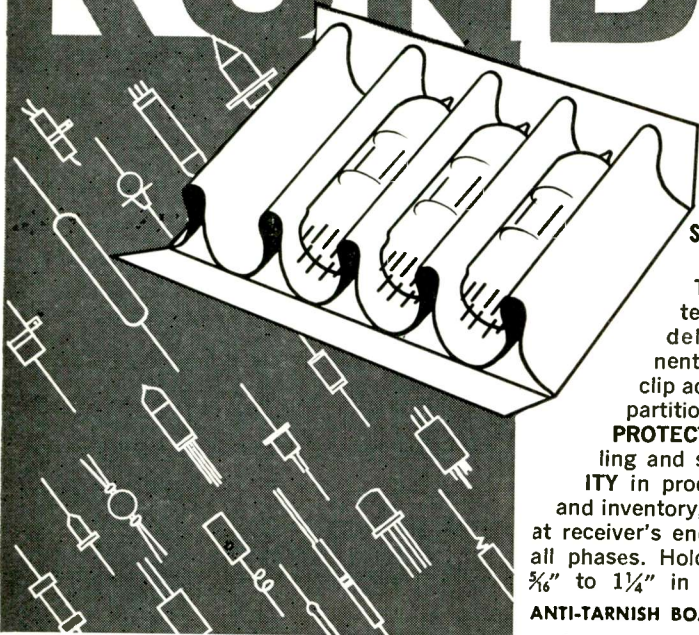


Westinghouse high power amplifier tubes in class AB₁ service provide low distortion, high dissipation, high power gain and zero watts drive! For specifications, or information about new applications including **Sonar** and **missile shaker tables**, call or write: Electronic Tube Division, Westinghouse Electric Corporation, Elmira, N. Y.

TYPE	Po WATTS
WL 7371	100
WL 7685	500
WL 7464	5000
WL 7540	35,000
WL 6379	75,000

YOU CAN BE SURE...IF IT'S **Westinghouse**
Westinghouse Electronic Tube Division, Elmira, N. Y.

RONDO®



"the pack
with the
built-in
shock absorber"

This Unique System holds small delicate components by the spring-clip action of its fluted partitions and offers: **PROTECTION** in handling and shipping, **FACILITY** in production, storage and inventory, **CONVENIENCE** at receiver's end, **ECONOMY** in all phases. Holds objects from $\frac{3}{16}$ " to $\frac{1}{4}$ " in diameter.

ANTI-TARNISH BOARD SUPPLIED

Further information on request.

RONDO process and designs patented in all major countries.

RONDO IS A PAPER PRODUCT SOLD AT PAPER PRICES.

RONDO of AMERICA INC.

100 E SANFORD STREET, HAMDEN 14, CONN.



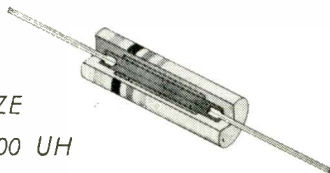
Representatives: C. S. Shotwell, 527 S. Alexandria Ave., Los Angeles 5, Cal., Phone: DUnkirk 8-8879
Package Development Corp., 100 S. Water St., Milwaukee 4, Wisc., Phone: ORchard 2-5004

Circle 59 on Inquiry Card

MOLDED CHOKE COILS



ACTUAL SIZE
10,000 UH



Nicknamed the "Micro Mite", these reliable, rugged coils exhibit high Q, very low distributed capacity, all concentrated into an amazingly small package.

Miller's new "Micro Mite" coils are perfect for use where weight, space and high Q considerations are involved. Their volumetric reduction ranges up to 80%, with current ratings approximately 75-300 millamps and standard series values up to 10,000 uH.

The "Micro Mite" coil construction permits miniaturization without the use of ferrite materials, thus maintaining temperature stability to 125° C. These hermetically sealed molded coils conform to MIL-C-15305A.

See us at the WESCON SHOW Booth #1001
ASK FOR OUR MICRO-MITE BULLETIN

J. W. MILLER COMPANY • 5917 So. Main St., Los Angeles 3, Calif.

Circle 60 on Inquiry Card

Tech Data for Engineers

Instruments

Type 519, dc to 1 KMC Distributed Deflection CRT; 24 kv accelerating potential; sensitivity, 10 v/cm; rise time, less than 0.35 nsec; also Type 585, dc to 100 MC, Sweep Delay; triggered or conventional; ranging from 1 μ sec to 10 sec/cm. risetime, 3.5 nsec; sensitivity, 0.1 v/cm., and Type 175 Transistor Curve Tracer High-Current Adapter; Type P6016 Current Probe, and Type C12 Tekamera for oscilloscope photography. Tektronix, Inc. Booth 817.

Circle 312 on Inquiry Card

Noise Spectrum Analyzer

The model 303 Wave and Noise Spectrum Analyzer is described in a 4-page brochure from Quan-Teck Laboratories, Boonton, N. J. Frequency range is 30 CPS to 100 KC. It has high sensitivity, wide frequency range, and variable selectivity. Full specs including curves and block diagrams are included.

Circle 313 on Inquiry Card

Particle Counter

Four-page bulletin from Royco Instruments, Inc., 365 San Antonio Road, Mountain View, Calif., describes the Particle Counter, Model PC-200A. The instrument originally designed for smog control, etc., is expected to have clean room applications in missile and electronic plants. It provides rapid and convenient analysis of complex size and frequency distribution of sub-micron and micron-sized particles (aerosols). Any of the 15 channels may be examined for 0.3 min., 1 min., 3 min., or 10 min. intervals with automatic scan cycle in all channels. Includes specs and a block diagram.

Circle 314 on Inquiry Card

Solar Measurements

The May-June issue of SPAN, from Hoffman Electronics Corp., Semiconductor Div., 1001 Arden Drive, E. Monte, Calif., has part 2 of "Understanding Solar Measurements." The concluding part of an article discussing solar cell measurements, it discusses power applications. Part 1 dealt with signal applications and appeared in the March-April issue of SPAN.

Circle 315 on Inquiry Card

Electronic Voltmeters

Eight-page bulletin from Ballantine Laboratories, Boonton, N. J., describes their line of electronic voltmeters, decade amplifiers, calibrators, capacitance meters, ac/dc converters, and dc/ac inverters. Full tech specs are included.

Circle 316 on Inquiry Card

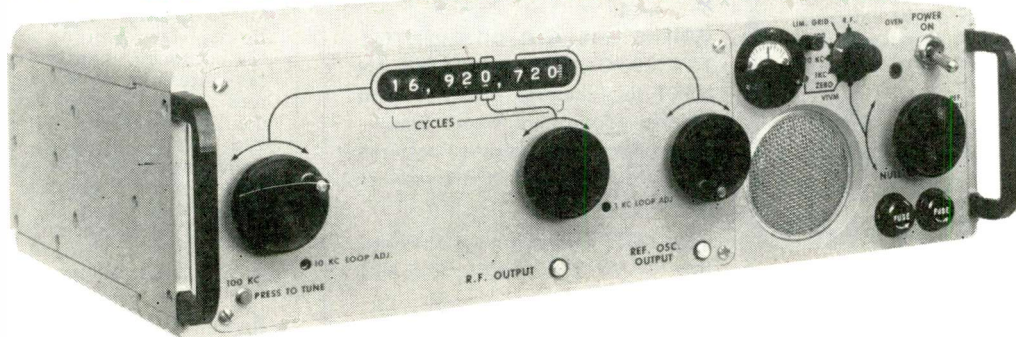
The new model RD-190 16-32 Mc Continuous Coverage Synthesizer incorporates 8 million discrete crystal frequencies to choose from.

Highly stable, continuous coverage of the 16-32 Mc spectrum is accomplished by the Manson RD-190 Crystal Synthesizer, with a single one-megacycle crystal as the internal reference. Double superheterodyne circuitry is employed in the indirect method of synthesis to discipline freerunning oscillators, the RD-190 is of unique character in that the fundamental crystal frequency is linearly tuned over a range of 62.5 parts per million — without degradation of stability — in order to offset the internal harmonic reference spectrum precisely as needed for "Cycles" accuracy.

Three variable frequency oscillators, providing tuning increments of 100 kc, 10 kc, and 1 kc, are phase-locked to the reference in an all-electronic system in which no mechanical servos are used. Pull-in and hold-in characteristics are equal and instantaneous over the entire band. The setting of frequency to cycles is accomplished by direct control of the crystal, which is capacitively trimmed to an accuracy of better than 1 part in 10^7 .

Frequency readout is displayed by means of counter-type dials across the front panel, assuring zero error readability and resettability. Fast drive lever knobs permit the setting of any frequency in a matter of seconds, and since tuning condensers are linear, the unit is adaptable to remote operation.

MANSON PROVIDES EIGHT MILLION DISCRETE CRYSTAL FREQUENCIES IN ONE SPACE-SAVING UNIT!

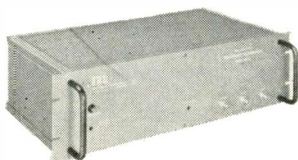


FREQUENCY STABILITY: Better than 1 part in 10^8 per day
OUTPUT FREQUENCY RANGE: 16 to 32 Mc, continuously tunable (non-incremental).
TUNABILITY ACCURACY: Better than 1 part in 10^7 .
RESETTABILITY ACCURACY: Zero error
READABILITY ACCURACY: Zero error
SPURIOUS SIGNALS: Down a minimum of 80 db, except for harmonics of the output
OPERATING AMBIENT TEMPERATURE RANGE: 0 to +50°C
OUTPUT POWER: 100 milliwatts minimum
OUTPUT IMPEDANCE: 50 ohms nominal
NUMBER OF QUARTZ CRYSTALS: One
INPUT POWER REQUIRED: 105/125 volts, 60 or 400 cps, 1 phase
DIMENSIONS: 14" W x 4 1/4" H; Depth 11"
MOUNTING: For rack or bench use



MANSON LABORATORIES, INC.

375 FAIRFIELD AVENUE / STAMFORD, CONNECTICUT / DAVIS 5-1391



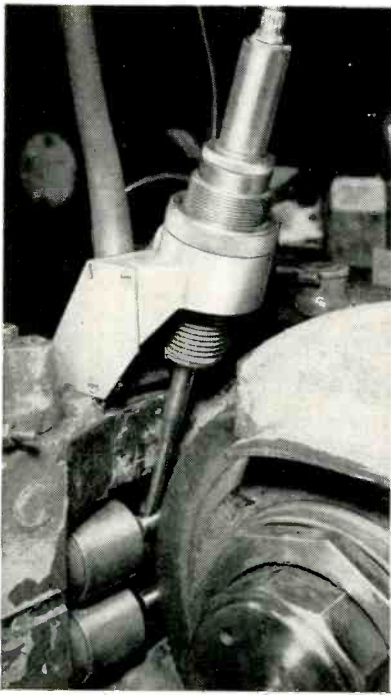
Model RD-170
1000 Mc reference generator



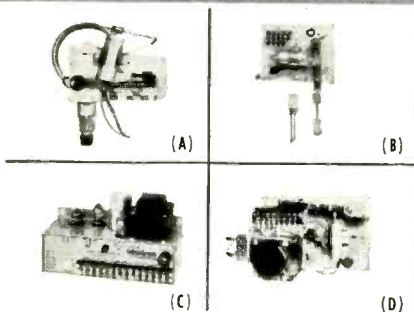
Model RD-144
1 Mc transistorized oscillator in mercury switch oven



Model N-317
2 Mc to 34 Mc crystal frequency synthesizer

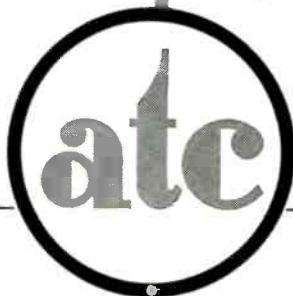


± 3 micron sensitivity in this typical differential transformer application. The ATCOTRAN[®] differential transformer measuring probe continuously senses amount of stock removed from work piece during this grinding operation, stops feed above established grinding dimensions, and simultaneously starts timed dress-up. Automatic cut-off at end of dress-up actuates withdrawal and stops spindle motor. Probe tip may be equipped with diamond point, roller, shoe or other work contact element suitable for position, thickness or tolerance measurement. Displacement measuring range is from 0 to 0.025 inches.



ATCOTRAN COMPONENTS

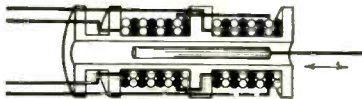
- (A) Pressure Pick-up measures and controls flow of gas or liquid.
- (B) Edge Guide senses edge position of continuous strips.
- (C) Amplifier operates from input of any Atcotran sensing device.
- (D) Servo Mechanism to position remote indicators with precise accuracy.



AUTOMATIC TIMING & CONTROLS, INC.
 KING OF PRUSSIA, PENNSYLVANIA
 A SUBSIDIARY OF AMERICAN MANUFACTURING COMPANY, INC.

SYSTEM-PROVED STANDARD ATC DIFFERENTIAL TRANSFORMERS

INCREASE SENSITIVITY, SIMPLIFY CIRCUIT DESIGN



WHAT IS A DIFFERENTIAL TRANSFORMER? An electromechanical device which continuously translates displacement or position change into linear AC voltage.

WHAT ARE ITS ADVANTAGES? It is frictionless, has infinite resolution, high signal to noise ratio, low null voltage, unaffected by wide temperature ranges or radiation exposure, linear to 1/10th of 1%, small in size and weight.

WHERE ARE ATC DIFFERENTIAL TRANSFORMER SYSTEMS IN USE? In numerous industrial and military applications where sensitivity, economy, and consistent performance are demanded in a control or indicating system.

HOW CAN I FIND OUT HOW DIFFERENTIAL TRANSFORMERS WILL HELP ME?

Write now for new illustrated condensed catalog; contains complete specifications and performance data.



HOW CAN I EXPERIMENT WITH DIFFERENTIAL TRANSFORMERS?

ATC's Experimental Kit offers all essentials for experimentation and development: technical data, seven transformers (linear range ± 0.01 to ± 2.5 inches), flexure plate and mounting clamp, and demodulator.



Tech Data

for Engineers

Antennas

Spec sheet from Scala Radio Co., 2814 19th St., San Francisco, Calif., describes the Paraflector[®] Model PR 450. Over the 350-1,000 MC range it equals performance of a parabolic dish of the same aperture but weighs only 25 lb. Basically a parabolic section in one plane, it withstands 100-mile winds with a $\frac{1}{4}$ in. radial ice load.

Circle 317 on Inquiry Card

Mobile Tracking Antenna

Specs and detailed information, including antenna pattern data are reported in a 2-page bulletin describing a mobile tracking antenna system. The antenna features a folding 28-ft. reflector, tilting mast, which lowers into the self-contained trailer, and hand-operated azimuth and elevation drive. D. S. Kennedy & Co., Cohasset, Mass.

Circle 318 on Inquiry Card

Telemetry Discriminator

Details and specifications of a new all solid state, portable, telemetry sub-carrier discriminator, the Mini-Tel, available from Precision Instrument Co., 101 Commercial St., San Carlos, Calif. Unit is a pulse-averaging discriminator for reliable "quick-look" monitoring functions at test sites, in instrumentation trailers, and under many varieties of field conditions. It accommodates 14 standard IRIG channels. Power requirements are under 3w per channel from batteries or from 115 vdc. Dc drift is under 1% in 8 hr. over temp. span of 80°F. Dc linearity is better than 0.5% of best straight line.

Circle 319 on Inquiry Card

Reflectivity Measurements

Reflectivity studies and measurement facilities are discussed in "Radar Reflectivity," a 6-page brochure from Radiation Inc., Melbourne, Fla. It discusses the basic practical uses of measurement results in design of airframes and radars.

Circle 320 on Inquiry Card

Shock Mounts

Bulletin 59-04, 1 page, from Barry Controls Inc., 700 Pleasant St., Wattertown 72, Mass., describes their cupmounts, series 2000, for shock and vibration isolation of loads up to 250 lb per isolator. Drawings, curves, and tech data included.

Circle 341 on Inquiry Card

Time Delays

Technical Publication No. 80 describes transistorized time delays. It contains dimensional drawings, typical curves and complete specs for Types 401 and 404 General Purpose Units covering time delays from 0.1 to 300 sec. G-V Controls Inc., 101 Okner Pkwy., Livingston, N. J.

Circle 342 on Inquiry Card



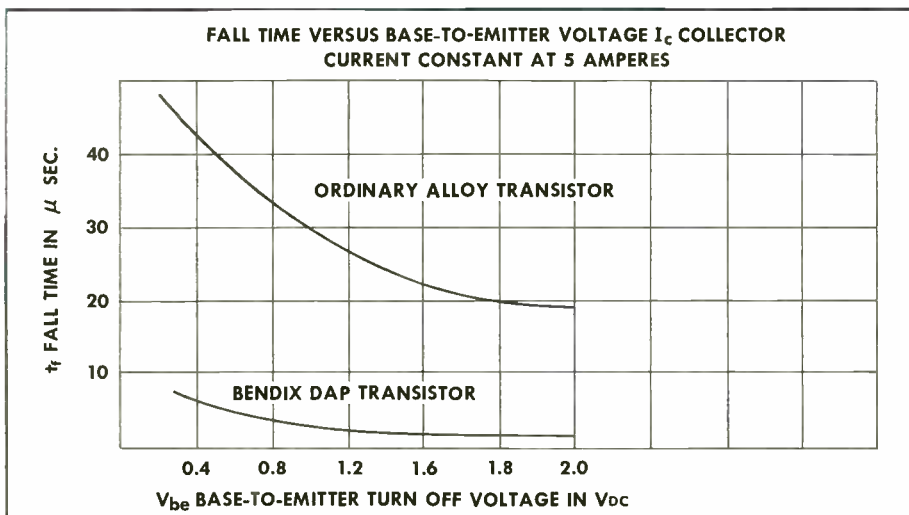
EXTRA QUALITY AT NO EXTRA COST WITH BENDIX TRANSISTORS

Bendix Bulletin



Up-to-the-minute news about transistors

NEW DAP TRANSISTORS SWITCH 5 TIMES FASTER



Higher breakdown than ordinary transistors also a DAP feature.

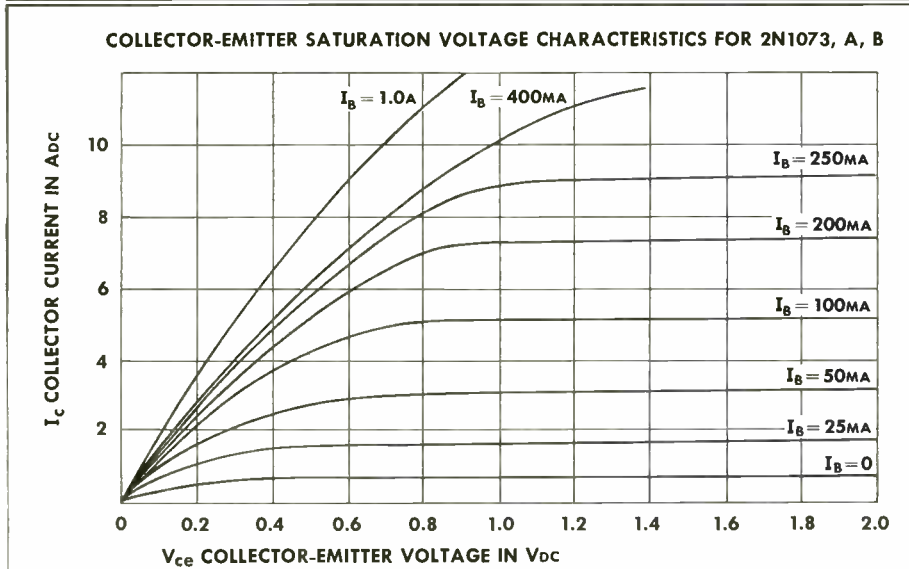
Now design engineers are freed from many of the limitations imposed by ordinary germanium alloy transistors. Bendix* germanium PNP Diffused-Alloy-Power DAP* transistors can switch up to 10 amperes with typical speeds of a microsecond.

While maintaining high collector-to-emitter breakdown voltage—up to 120 volts—the new transistors provide lower input resistance, controlled current gain, and higher cut-off frequency. Particularly suited to high current, high frequency switching, the DAP transistor's exclusive features will suggest to the design engineer many new applications which, until now, have not been feasible.

NEW BENDIX SEMICONDUCTOR CATALOG on our complete line of power transistors, power rectifiers and driver transistors available on request.

Bendix offers many challenging opportunities in semiconductor engineering and sales. Write Personnel Manager for full details.

*TRADEMARK



ABSOLUTE MAXIMUM RATINGS

TYPE NUMBERS	V_{ce} Vdc	V_{cb} Vdc	V_{eb} Vdc	I_c Adc	P_c W	T Storage $^{\circ}C$	T_j $^{\circ}C$
2N1073	- 40	- 40	10	10	35	-60 to +100	100
2N1073A	- 80	- 80					
2N1073B	-120	-120					

Ideal for such applications as: **ULTRASONICS** • **HORIZONTAL OUTPUT AMPLIFIERS FOR TV OR CATHODE RAY TUBES** • **POWER CONVERTERS** • **HIGH CURRENT AC SWITCHING** • **CORE DRIVERS** • **HI-FI**

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Red Bank Division
LONG BRANCH, N. J.



West Coast Sales Office:
117 E. Providencia Avenue, Burbank, California

Midwest Sales Office:
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New England Sales Office:
4 Lloyd Road, Tewksbury, Massachusetts

Export Sales Office: Bendix International Division,
205 E. 42nd Street, New York 17, New York

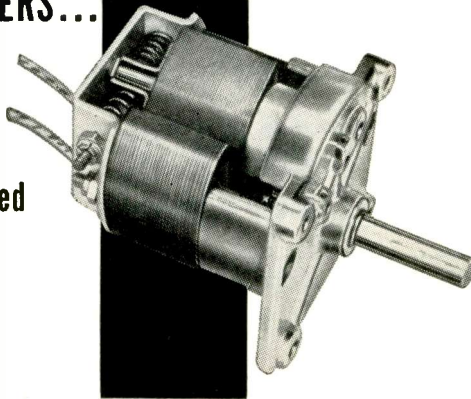
Canadian Affiliate: Computing Devices of Canada, Ltd.,
P. O. Box 508, Ottawa 4, Ontario, Canada

NEW AIRBORNE

ROTORAC®

STEPPING MOTOR OFFERS...

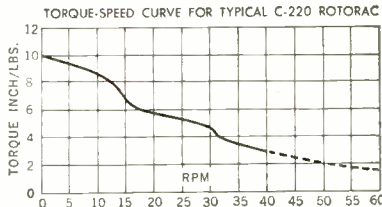
- High torque, low speed
- Instant starting-stopping
- Low cost



For remote switching, valve operation, indexing devices — wherever high torque - low speed combined with split-second starting and stopping is required — Airborne's new ROTORAC motor offers excellent performance at minimum cost.

A typical C-220 ROTORAC weighs only 10 oz., yet delivers 6 in.-lb. torque at 20 rpm with current draw less than .75 amp at 115 v input. ROTORAC thus provides a lightweight motor capable of handling many electrical and hydraulic switching functions now performed by more expensive gear-head, brake-equipped motors. The ROTORAC motor is a true rotary solenoid with a dynamically stable armature vibrating at a rate of 120 cps when operated from a 60 cycle power source. The vibratory motion consists of a power stroke and a return stroke. Energy from the power stroke is utilized primarily for output torque, although a small portion is stored in a pair of balanced springs and utilized for the return stroke of the armature. This full cycle takes place within each half of an a-c cycle.

Output torque is transmitted from the armature through a unique



Standard C-220 adjusted for 20 rpm $\pm 20\%$ at 6 in.-lb. Speed may be adjusted for other load points. Curve is based on 115 v a-c and 400 ma.

rapid-action, one-way clutch to the output shaft, resulting theoretically in a very rapid start-stop rotation. Under very light loads, however, the inertia of clutch and output shaft is sufficient to cause practically uniform rotary motion. Under heavy loads, or with the addition of detenting action, the motion is of a stepping type where full torque is delivered and complete stopping obtained within each half of an a-c cycle. Because of this start-stop motion, the starting torque and the running torque of the motor are approximately equal.

Available for either 60 or 400 cycle 115 v a-c, the ROTORAC can be supplied with variations of performance, mounting provisions and output shaft configurations. For further information, contact any of our offices. Write for new Product Bulletin PS-7A.



Engineered Equipment for Aircraft and Industry

AIRBORNE ACCESSORIES CORPORATION

HILLSIDE 5, NEW JERSEY • Offices in Los Angeles and Dallas

Circle 85 on Inquiry Card

Tech Data

for Engineers

Silicon Resistors

Application Note (12 pages) from Texas Instruments Incorporated, Semiconductor Components Div., P. O. Box 312, 13500 N. Central Expressway, Dallas, Tex., discusses the use of Sensitor® silicon resistors as temperature-compensating elements for bias stabilization in silicon transistor circuits. Included are sections on: "Causes and Effects of DC Operating Point Instability," Operating Point Stabilization, Compensating and Shaping Networks, Compensation for Base-Emitter Voltage Changes, etc. All math, curves, schematics, etc., included. Also spec sheets on Types 1N650, 651, 652, and 653 Gallium Arsenide Tunnel Diodes; Types TI 010, 025, and 050 Diffused Silicon PNP switches; Types 1N2878 through 1N2925 High Voltage Diode Stacks; and Types G129 and G130 Silicon Forward Conductance Diodes.

Circle 343 on Inquiry Card

Time Code Generator

Brochures from Epsco-West Div., Epsco Inc., 240 East Palais Rd., Anaheim, Calif., describe the Models 6190 and 6160 Time Code Generators. The first generates 36-bit, 100-pps code; 28-bit, 2-pps code, and 20-bit, 1-pp code. The second supplies a continuous 1KC sine wave carrier modulated by a marker at one sec. intervals. This is followed by a 10-bit binary elapsed time identification word. Brochures include circuit description, block diagram, and complete specs. These and Model 6162 Time Code Translator can be seen at Booth 2716, WESCON.

Circle 344 on Inquiry Card

Ultrasonic "Joining"

Details on Ultrasonic Joining Unit for soldering materials such as aluminum, silicon, germanium, and ferrites, etc., from Commercial Apparatus and Systems Div., Raytheon Co., 1415 Providence Turnpike, Norwood, Mass. The unit uses sound waves at 25,000 CPS to join materials previously considered difficult or impossible to "wet" with fluxless solder or weld. Unit will be shown at WESCON Booth 2019.

Circle 345 on Inquiry Card

R-F Spectroscopy

Radio Frequency Spectroscopy Bulletin (Vol. 2 #1) from Varian Associates, Instrument Div., 611 Hansen Way, Palo Alto 4, Calif., contains full information on both N-M-R (Nuclear Magnetic Resonance) and E-P-R Spectroscopy and the complete "N-M-R at Work" series. Also information on the Varian M-49, Magnetometer including principles, applications, and equipment details.

Circle 346 on Inquiry Card

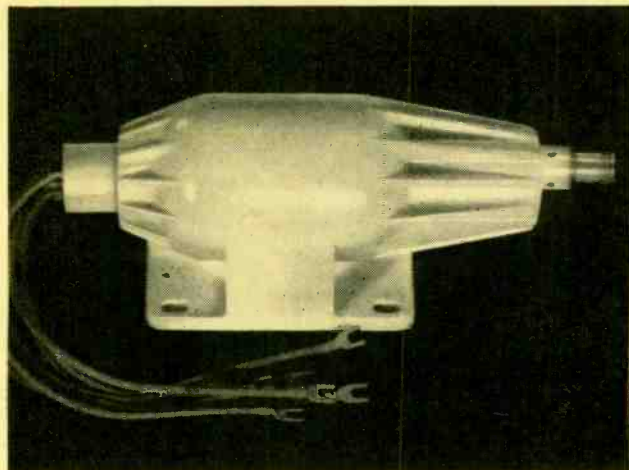
Creative Microwave Technology

Published by MICROWAVE AND POWER TUBE DIVISION, RAYTHEON COMPANY, WALTHAM 54, MASS., Vol. 2, No. 2

A TOTALLY NEW CONCEPT IN "O"-TYPE BWO CONSTRUCTION

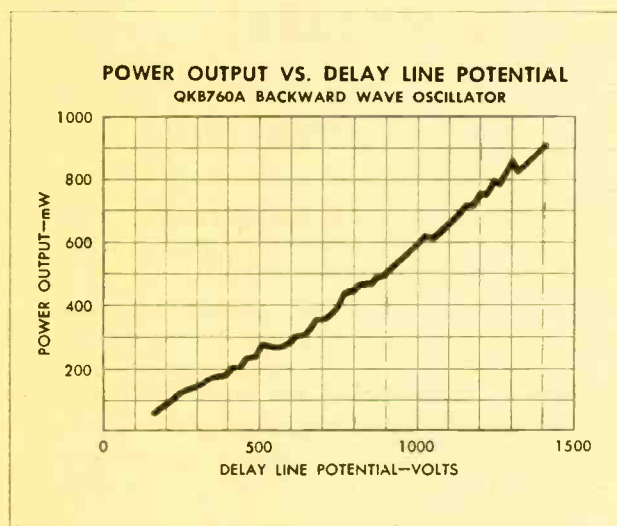
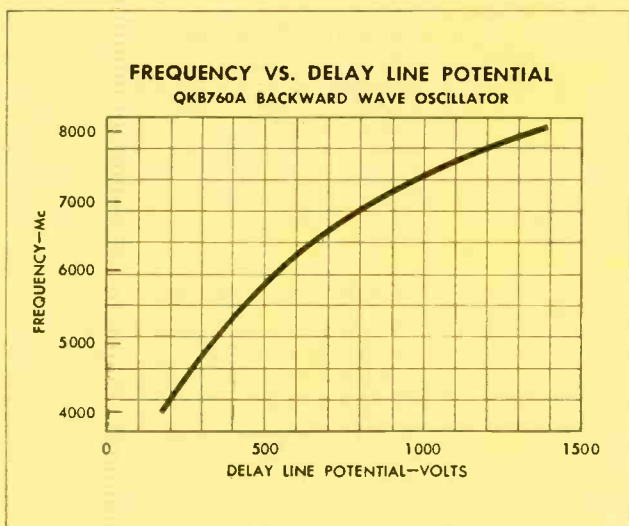
--Interdigital-type delay line affords maximum heat dissipation at high power outputs

These broadband voltage tunable backward wave oscillators are the smallest, lightest and most reliable of their kind. They were developed especially for modern airborne and ground-based applications utilizing swept oscillator and frequency diversity techniques. Four compatible types are available. They cover a continuous frequency range of 1 to 12.4 KMC. They are magnetically shielded and are insensitive to the effects of external fields. They exhibit a minimum of fine-grain power output variations. Potted leads permit operation at high altitudes over a wide temperature range. Raytheon-perfected laminating techniques make possible interdigital construction which results in maximum heat dissipation. Under normal operating conditions, no forced-air cooling or protective circuitry is required. Laminate-thickness held to extremely close tolerances assures improved fine-grain frequency characteristics with optimum line matching and consistently reproducible characteristics from tube to tube.



Typical Operating Characteristics

	QKB786	QKB816A	QKB760A	QKB776
Frequency Range	1.0-2.0KMC	2.0-4.0KMC	4.0-8.0KMC	8.0-12.4KMC
Power Output	100 mW Min.	70 mW Min.	30 mW Min.	50 mW Min.
Delay Line (Tuning) Voltage	100-1500 Vdc			
Filament Voltage	6.3 v.			
Cathode Current	45 mA Max.			
Anode Voltage	60-150Vdc	100-200 Vdc	60-130 Vdc	60-130 Vdc
Control Grid Cut-off	-150 Vdc	-100 Vdc	-100 Vdc	-100 Vdc



Excellence in Electronics

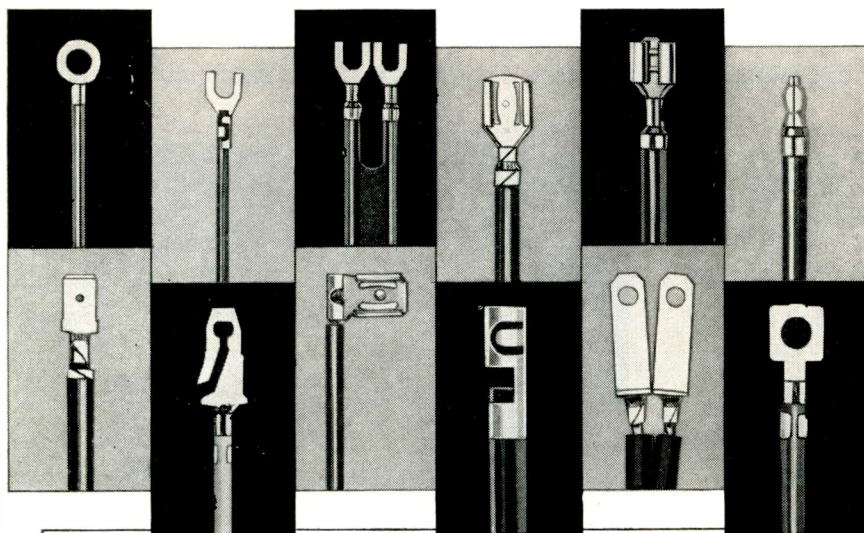


You can obtain detailed application information and special development services by contacting: Microwave and Power Tube Division, Raytheon Co., Waltham 54, Mass. In Canada: E. Waterloo, Ontario. In Europe: Zurich, Switzerland.

A LEADER IN CREATIVE MICROWAVE TECHNOLOGY
SEE THESE TUBES AT RAYTHEON'S WESCON BOOTH

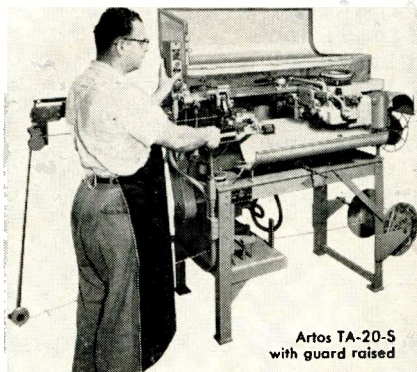
Circle 86 on Inquiry Card

DO YOU NEED *Automation* FOR FINISHING WIRE LEADS WITH TERMINALS ATTACHED?



SOME EXAMPLES OF TERMINALS ATTACHED BY ARTOS MACHINE

NEW ARTOS TA-20-S Performs 4 Operations Automatically!



Artos TA-20-S
with guard raised

1. Measures and cuts solid or stranded wire 2" to 250" in length.
2. Strips one or both ends of wire from 1/8" to 1".
3. Attaches any prefabricated terminal in strip form to one end of wire. (Artos Model CS-AT attaches terminals to BOTH ENDS OF WIRE simultaneously.)
4. Marks finished wire leads with code numbers and letters. (Available as optional attachment.)

PRODUCTION SPEEDS up to 3,000 finished pieces per hour. Can be operated by unskilled labor. Easily set up and adjusted to different lengths of wire and stripping—die units for different types of terminals simply and quickly changed.

ENGINEERING CONSULTATION . . . recommendations without obligation. Special adaptations made to fit requirements of your product. Machines for all types of wire lead finishing.

VISIT US AT
BOOTH 119
WESCON SHOW

WRITE for FREE Bulletin No. 655 on Artos TA-20-S

World Leaders in
Automatic Machines for Finishing Wire Leads

ARTOS ENGINEERING CO.

2753 South 28th Street • Milwaukee 46, Wisconsin

Tech Data

for Engineers

Binary Encoder

Single page data sheet, Bulletin No. 124, describes the E-101 Mini-module Encoder, a compact 10-bit binary encoder with built-in logic. Unit will encode and store shaft position data "on the fly" at angular velocities up to 2 RPS and provide a digital output in binary code and its complement. Specs and outline drawing included. Datex Corp., 1307 S. Myrtle Ave., Monrovia, Calif.

Circle 347 on Inquiry Card

Moisture Measurement

Four-page pamphlet, "Moisture and Its Measurement" is available from the Henry Francis Parks Laboratory, 7544 23rd Ave., N. E., Seattle 15, Washington. After a definition of moisture, it discusses moisture vs humidity, and methods of determination.

Circle 348 on Inquiry Card

Component Dispenser

Data sheet from Schmit Engineering Co., 4062 Fabian Way, Palo Alto, Calif., describes the Bend-Amatic component dispenser which automatically or semi-automatically cuts and bends axial leads of electronic components. It has 48 in. of storage capacity in six hopper chutes.

Circle 349 on Inquiry Card

Language Translators

A 4-page leaflet, 3C Pulse No. 8, describes a large magnetic tape to magnetic tape language translator. The machine's output may be fed directly into a printer, paper tape, punch, plotter, or other devices. Computer Control Co., Inc., 983 Concord

Circle 350 on Inquiry Card

High Vacuum Pumps

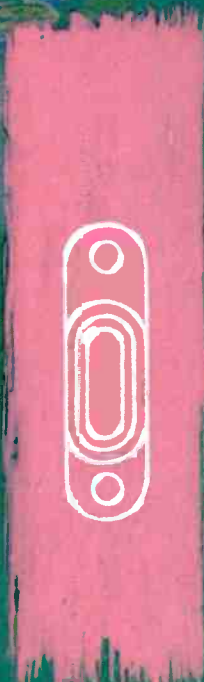
Four data sheets from Ultek Corp., 920 Commercial St., Palo Alto, Calif., describe their line of electronic high-vacuum pumps: the Ulte Vac series 240, series 150, and series 318. Included are outline drawings, curves (pump current vs pressure in mmHg) and specs.

Circle 351 on Inquiry Card

Strip Terminal Machine

Bulletin from The Kent Manufacturing Corp., 188 Needham St., Newton 64, Mass., describes the wire-dial Machine. Machine is designed for high speed production and the elimination of set-ups. Machine changes terminals from ring to spade, grip to no-grip etc. with a combination dial.

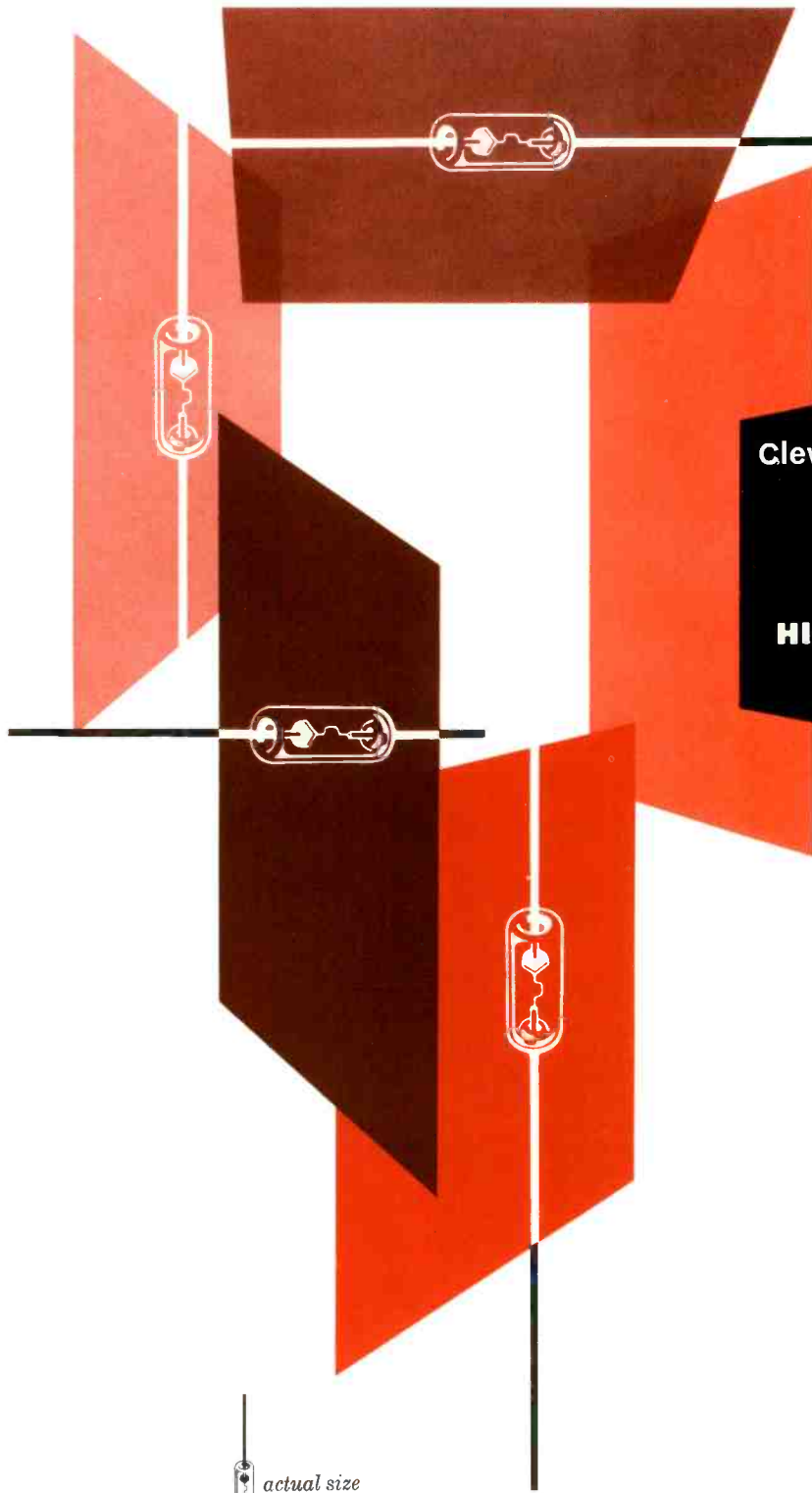
Circle 352 on Inquiry Card



Reliability in volume...

CLEVITE
TRANSISTOR
WALTHAM, MASSACHUSETTS





Clevite Germanium Diodes . . .

**YOUR BEST BUY
FOR TODAY'S
HIGH SPEED SWITCHING
CIRCUITS**

At voltages typical of solid state switching circuitry . . . and recovery times in the millimicrosecond range Clevite *germanium* diodes offer several outstanding advantages over costly silicon types:

Lower forward voltage drop. An especially valuable characteristic for saturated circuitry applications.

Superior forward transient response.

Reliability, availability, uniformity. Years of experience in the production and application of hundreds of millions of germanium diodes have brought these types to a high state of perfection and predictability. They take the gamble factor out of your design and production problems.

Low cost. Thoroughly developed manufacturing techniques utilizing automated processes and close controls result in high yields and high production efficiencies. This means top quality product at prices well under the present cost of comparable silicon types.

Take a close look at germanium . . . for fast switching at low voltages, it may well be your best buy!

Send for bulletin B-213-2

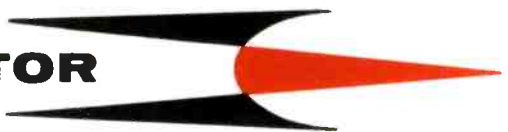
A DIVISION OF

CLEVITE
CORPORATION

Reliability In Volume . . .

CLEVITE TRANSISTOR

254 Crescent Street Waltham 54, Mass. Tel: TWinbrook 4-9330



ELECTRONIC INDUSTRIES

1960

DIRECTORY

of

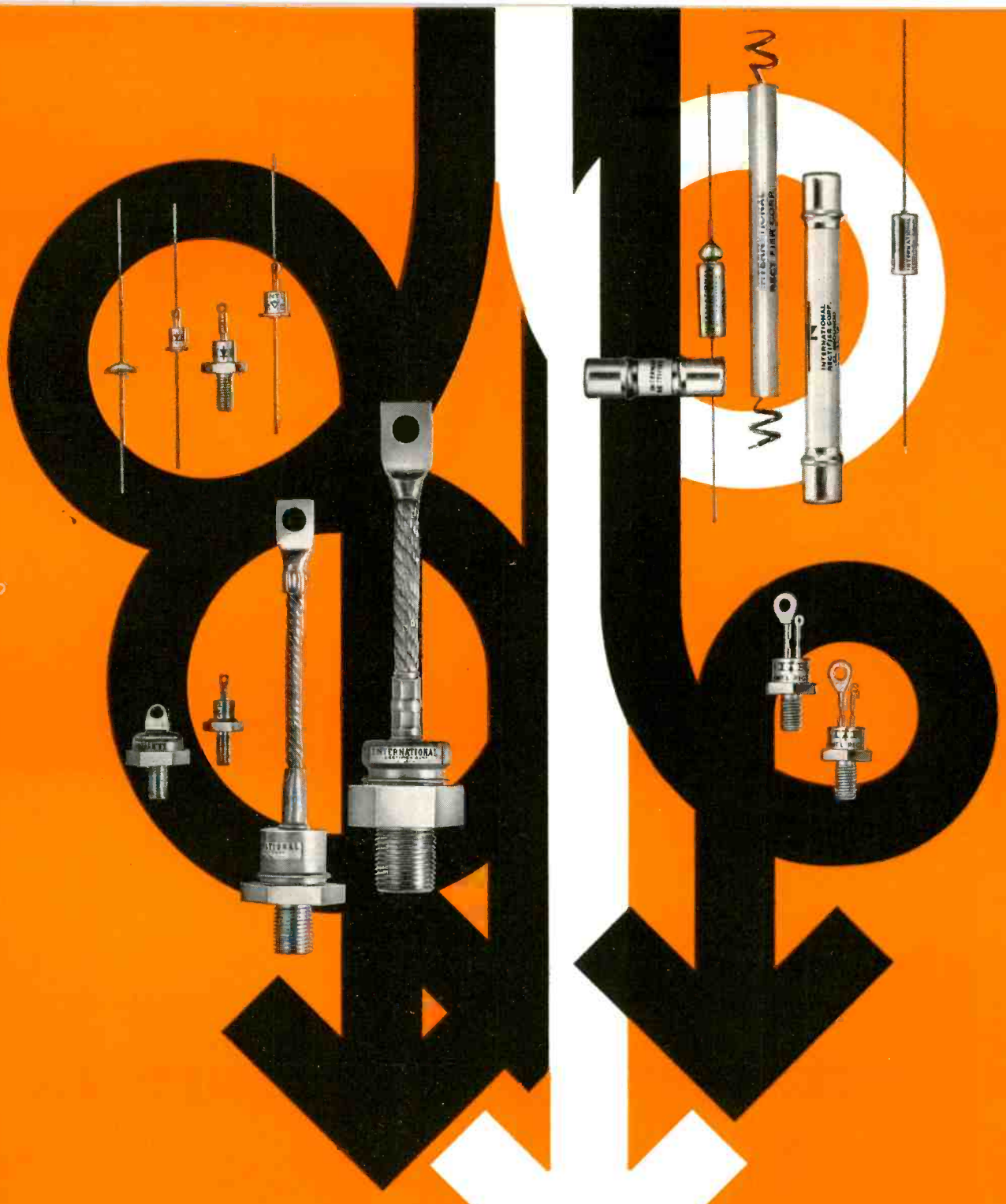
WESTERN

Electronic Manufacturers

*This directory is an alphabetical listing
of Western electronic manufacturers.*

*Address, person to contact and telephone number
are included to speed contacts.*

*Triangle signifies WESCON exhibitors;
an asterisk signifies Eastern and Midwestern firms
with Western manufacturing facilities.*



FOR PRECISELY WHAT
YOUR CIRCUIT NEEDS
CHOOSE FROM THE WORLD'S WIDEST LINE OF RECTIFIERS

INTERNATIONAL RECTIFIER

Whatever you want a rectifier to do, there's an International Rectifier to do it. As *the specialists* in the field, we have developed more different types of rectifier configurations than anyone else in the world. Which means that International Rectifier not only offers you the quality line of rectifiers with the reliability that comes with vast production experience. It also means we can supply you with the widest selection of rectifiers to most closely meet the precise needs of your application. **INTERNATIONAL RECTIFIER CORPORATION**



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Circle 89 on Inquiry Card

1960 Directory of Western Electronic Manufacturers

A

- Abbott Instrument & Engineering Co** 10513 Santa Monica Blvd Los Angeles 24 Calif—J F Dauber
Accurate Electronics Corp 13215 Leadwell St N Hollywood Calif—TR 7-7455—Precision Wirewound Resistors, Power Supplies, Printed Circuit Boards
ACDC Electronics Inc 2979 N Ontario St Burbank Calif—R Hyder—App 125 Employees—VI 9-2414—Transformers, Power Supplies, Delay Lines
ACE Industries Inc Avion Div 5333 Sepulveda Blvd Culver City Calif—EX 7-4747
AC Electronics Inc 11725 Mississippi Ave Los Angeles 25 Calif—Edwin L Almo—GR 8-4288
Ackerman Gould Co Box 188 Oceanside Calif
***Acoustica Assoc Inc** 10400 Aviation Blvd Los Angeles 45 Calif—D S MacGregor—180 Employees—Ultrasonic Cleaning & Degreasing Systems, Liquid Level Gauging Switches, Continuous Liquid Level Sensing Gauges
Acousticraft Inc 14122 Aetna St Van Nuys Calif—TR 3-2520
Acroscope Engineering Co 1001 E Manchester Los Angeles Calif—LU 3-2243
Action Machine & Mfg Co 1028 W Evelyn St Sunnyvale Calif—RE 6-9656
Actuation Research Corp 416 N Glendale Glendale Calif—CH 5-6866
Adams Rite Mfg Co 540 W Chevy Chase Dr Glendale 4 Calif—C Schlewis—175 Employees—CH 5-1095—Hardware
Admiral Coated Products Inc 2151 San Pasqual St Pasadena Calif—MU 1-3093—Roll Leaf for Wire Marking on Plastic Coated Wire, Tubing, etc
Advance Carton & Electric Mfg Co 2505 Mariposa St San Francisco 10 Calif—Leo M Alchimi—9 Employees—Motors, Generators & Blowers, Seals, Ray Materials
Advanced Electronics Mfg Corp 11121 Hindry Ave Los Angeles Calif—OR 4-8022—Modular Oscilloscopes, Data-Display Devices, Digital Computers
Advanced Instrument Corp 700 S 4th St Richmond Calif—Robert E Krueger 5 Employees—BE 5-5433—Computers, Military Systems (Engg), Recorders (Special Purpose)
△Advance Relays-Electronics Div Elgin Nat'l Watch Co 2435 N Naomi Burbank Calif—VI 9-1446—Electrical Relays Open & Sealed
Advance Technology Lab 369 Whisman Rd Mountain View Calif
Advance Tooling & Mfg Co 2622 S Alveron Wy Tucson Ariz
Aero Electronics Corp 1745 W 134th St Gardena Calif—Steve Taylor—25 Employees—FA 1-2196—Trimming Potentiometers (High Reliability)
Aero Inc 1194 S 2nd San Jose Calif—CY 4-2345
Aero Guidance Corp 873 Linden Ave Carpentaria Calif—CA 9-1721
Aero Instrument Co 11423 Van Owen St N Hollywood Calif—T O Cox—ST 7-5433—Indicators, Meters (Special Purpose), Switches
Aerojet-General Corp Avionics Div 6352 N Irwindale Azusa Calif—ED 4-6211
Aerojet-General Corp Aetron Div 410 N Citrus Covina Calif
Aerojet-General Corp Neulronics Div P O Box 77 San Ramon Calif—VE 7-5311
Aerojet-General Corp Liquid Rocket Plant P O Box 1947 Sacramento Calif—YU 5-5111
Aerojet-General Corp Liquid & Solid Plant Box 1947 Sacramento Calif—YU 5-5111
Aerojet-General Corp Ordnance Facility 11711 S Woodruff Downey Calif—SP 3-0130
Aerolab Development Co 330 W Holly St Pasadena Calif—SY 3-1184—Semiconductor Systems, Power Supplies, Sounding Rocket Systems
Aero Mechanism Inc 13918 Saticoy Van Nuys Calif—ST 2-1952
***Aeronautical & Instrument Div** Robertshaw Fulton Controls Co Santa Ana Freeway at Euclid Ave Anaheim Calif—Fred H Weisel—488 Employees—KE 5-8151—Crystal Ovens, Computers, Data Transmission Systems
Aeromtronic Systems Inc Ford Rd Newport Beach Calif—Richard P Lytle—OR 5-1234—Computers, Military Systems (Eng'g), Aviation Auxiliary Electronics Equipment
Aerophysics Development Corp Sub Curtis-Wright Corp 6767 Hollister Ave Goleta Calif—WO 7-3411—Missile-Prime Contractor
Aerospine Inc 3155 N Rosemead Blvd Rosemead Calif—AT 0-2112
Aertron Supply Co 3906 W 139th St Hawthorne Calif—OR 8-5423
Aero-Tronix 2049 Main St San Diego Calif—BE 9-1564
***Aerovox Corp** Cinema Div 1100 Chestnut St Burbank Calif—James Fouch—Amplifiers, Capacitors, Filters
Airterra 620 Paula Ave Glendale 1 Calif Donald A Benbow—150 Employees—Connectors & Terminal
Airborne Navigation Co 2818 N Stone Ave Tucson Ariz
Air Electronics Co 7250 Hinds Ave N Hollywood Calif—TR 7-4476—Transtistorized Power Supplies, Amplifiers, Aircraft Control Panels & Cable Assemblies
Aircraft Bolt Corp 701 W Garvey Blvd El Monte Calif—GI 8-7753
Aircraft Electronics 6219 S Sears Blvd Tucson Ariz—MA 4-6348
Airesearch Mfg Co Arizona Div Garrett Corp 402 S 36th St Phoenix Ariz—S D Whitaker—BR 5-6311—Motors, Generators & Blowers, Control Equipment (Industrial), Power Supplies & Converters
Airframe Mfg & Supply Co 6887 Farmdale N Hollywood Calif—TR 7-2681—Missile Ground Support Equipment, Control Cabinets
△Air-Marine Motors Inc 2221 Barry Ave Los Angeles Calif—BR 2-6489—Electric Motors, Blowers, & Fans
Air-O-Tronics Eng'g Co P O Box 31 Lancaster Calif—S F Trush—10 Employees—WH 3-4654—Chassis, Accessories, Fuses & Shielding, Hardware, Tools (Hand)
Airtite Products Inc 3516 E Olympic Blvd Los Angeles Calif AN 8-4137
△Airtron Inc Div Litton Industries 336 N Foothill Rd Beverly Hills Calif—Philip J Quinn
Airtronics 2834 East Rickey Vista Tucson Ariz
Ajax Condenser Co 10950 Chandler Blvd N Hollywood Calif—TR 7-1345
A & J Mfg Co 1013 N Hillcrest Inglewood Calif—OR 8-3504
A & J Mfg Co 4212 Artesia Fullerton Calif—LA 2-6423
Akrofab 5310 Blakeslee Ave N Hollywood Calif—TR 7-5345
Alac Inc 365 W Arden St Glendale Calif—Milton Terkla—85 Employees—CI 4-7261—Electronic Hardware (Standard & Custom)
△Aladdin Electronics Div Aladdin Ind Inc 380 Green St Pasadena 1 Calif—Chas L Freel
Aladdin Metal Craft & Plating Works Inc 2126 E Washington Phoenix Ariz
Alco Coil & Electronics Co 425 Mess Burbank Calif—VI 9-4511
Alda Plastics & Mfg Co 2601 Norton Ave Lynwood Calif—NE 6-8574
△Alfred Electronics 897 Commercial Palo Alto Calif—Paul N Fulton—47 Employees—DA 6-6496—Traveling Wave Tube Amplifiers, Electronically Swept Microwave Oscillators, Microwave Power Supplies
All Chrome Mfg Co 2610 Willo Lane Costa Mesa Calif
Allen Engineering Co 108 Graham Place Burbank Calif—Solenoids
Allen Mfg Co 927 Industrial Ave Palo Alto Calif—Steve Allen—5 Employees—DA 1-4050—Amplifiers, Chokes, Delay Lines
Allied Chemical Corp General Chemical Div Bay Point Calif—Chemicals
Allied Control Co Inc 1326 Flower St Glendale 1 Calif—46 Employees—CI 2-5125—Relays, Coils, Switches
Allied Engg & Production Corp 2421 Blanding Ave Alameda Calif—H E Miller Jr—78 Employees—Services (Industrial), Nuclear Products, Production Machinery & Equipment
Allied Neulronics 2421 Blanding Ave Alameda Calif—LA 3-6556
Allied Research & Engineering Div Allied Record Mfg Co 6916 Santa Monica Blvd Hollywood Calif—HO 2-1251—Radar Waveguides & Precision Thin-Walled Tubing, Custom Electroforming Prototype & Production, Guidance Components
Allison Labs Inc 11301 E Ocean Ave La Habra Calif—R E Allison—OW 1-0115—Filters, Meters (Audio)
Allmetal Screw Products Co Inc/West Coast Div 5822 W Washington Blvd Culver City Calif—Julian Leventhal—We 3-9595—Hardware
Alpar Mfg Co 220 Demeter St Palo Alto Calif—R V Laustrop—9 Employees—DA 6-8105—Towers, Parabolic Reflectors, Passive Reflectors
Almor Development Co Inc 2021 W 17th St Long Beach Calif—Mr Forman—HE 7-2781
Alpar Mfg Corp 220 Demeter St E Palo Alto Calif—DA 6-8105—Custom Mfg of Aluminum Telescoping Guide Towers, Antennas, Passive Reflectors
Alpine-Atomic Labs Ltd 1610 S Nevada Colorado Springs Colo
Altec Lansing Corp 1515 S Manchester Ave Anaheim Calif—E F Grigsby—187 Employees—PR 4-2900—High Fidelity & Stereophonic Home Sound Systems, Public Address Systems, Microphone & Telephone Products
Altec Lansing Corp Peerless Elec Prod Div 6829 McKinley Ave Los Angeles Calif PL 8-4175
Alto Fonic Corp 981 Commercial St Palo Alto Calif—DA 6-5280—Sound Systems, Recorders (Audio)
Alto Instrument Corp 1357 E 14th St Oakland 6 Calif—Remy L Hudson—10 Employees—KE 4-4297—Amplifiers, Assemblies, Power Supplies
Alto Scientific Co Inc 855 Commercial St Palo Alto Calif—David D Cherry—45 Employees—DA 1-3434—Switches, Power Supplies & Switches, Time Delay Relays
Alwac Computer Div El-Tronics Inc 13040 S Corise Hawthorne Calif—C A Penta—OR 8-5774—Computers
AMECO-Div Antennavision 2949 W Osborn Rd Phoenix Ariz—Malcolm Edwards—40 Employees—AL 4-5511—Distribution System Equipment, Community & Closed Circuit Television
△Amelco Inc 2040 Colorado Ave Santa Monica Calif—UP 0-5475—Amplifiers, Transistors, Potentiometers
Amerace Corp 455 N Quince St Escondido Calif—SH 5-3181
Amercoat Corp 4809 Firestone Blvd South Gate Calif—D O Lachmund—LO 4-2581—Chemicals, Coatings & Related Products, Materials
American Avionics Inc 11513 W Washington Blvd Los Angeles Calif—EX 1-5749—Cables, Harnesses, Power Supplies
American Concertone Div American Electronics Inc 9449 W Jefferson Blvd Culver City Calif—UP 0-7245—Communications & Magnetic Tape Recorders
△American Electronics Inc 1725 W 6th St Los Angeles Calif—Jack McNutt—DU 5-7401—Motors, Generators & Blowers, Computers, Measurement & Test Equipment (Special Purpose)
American Electronics Inc Nuclear Div 9456 W Jefferson Blvd Culver City Calif—UP 0-7245—Leak Detectors, Rate Meters & Spectrometers
American Electronics Inc Ground Support Div 2112 N Chico Ave El Monte Calif—CU 3-7151—Ground Support Equip
△American Electronics Inc Electro-Mechanical Div 4811 E Telegraph Rd Los Angeles Calif—AN 9-7551—Electro-Mechanical Assemblies, Blowers & Clutches
△American Electronics Inc Instrument Div 9503 West Jefferson Blvd Culver City Calif—UP 0-5581—Miniature Motors & Servomechanisms
△American Electronics Inc Precision Power Div 2112 N Chico Ave El Monte Calif—CU 3-7151—Rotary Power Equipment, AMSTAT Solid State Devices
American Etched Circuits Co 1213 N 16th St Phoenix Ariz—BR 5-7023
American Industrial & Scientific Co 11836 Pico W Los Angeles Calif—GR 8-1134
American Machine & Metals Inc U S Gauge Div 11973 San Vicente Los Angeles Calif—GR 2-9584
American Marc Inc 1601 W Florence Ave Inglewood Calif—Frank S Hill—258 Employees—OR 7-7149—Diesel Engines, Generators, Generator Sets
American Marietta Co 3400 13th St N W Seattle Wash
American Metal Co Ltd of Calif 609 S Grand Ave Los Angeles Calif—MA 4-3421
American Microphone Co Div G C-Textron Inc 3225 Exposition Pl Los Angeles Calif—AX 3-7201
American Missile Products Co Inc Sub of the Maytag Co 15233 Grevillen Ave Lawndale Calif—Ruben H. Hundley—Services (Industrial), Missiles Amplifiers (Special Purpose)
American Semiconductor Corp 13942 Saticoy Van Nuys Calif—TR 3-4732—Silicon & Germanium Choppers, Diode Modulators, Amplifiers & Pre-Amplifiers
***American Super Temperature Wires Inc** 3440 Overland Ave Los Angeles 34 Calif—John M Cooper
American Thermo-Electric Co 1023 N Fuller Ave Los Angeles Calif—A Levy—12 Employees—HO 4-1632—Vacuum Thermocouples
American Transistor Products 1540 Cassil PI Hollywood Calif—HO 7-2131
Ampex Audio Inc 1020 Kifer Rd Sunnyvale Calif—C A Foy—325 Employees RE 6-2110—Tape Recorders, Home Music Consoles
Ampex Corp/Instrumentation Div 934 Charter St Redwood City Calif—Robinette E McCabe—3250 Employees—EM 9-1481—Mobile & Laboratory Magnetic Tape Recorders for Instrumentation Applications
△Ampex Data Products Co Dept 511 934 Charter St Redwood City Calif—Richard M Garvin
△Ampex Magnetic Tape-Orp Industries Broadway & Charter Sts Redwood City Calif—Richard M Garvin
Amphenol Western Div Amphenol-Berg Electronics 9201 Independence Ave Chatsworth Calif—James Schaefer—90 Employees—DI 1-0710—Connectors & Terminals
AMP Inc Captron Div 3138 W El Segundo Blvd Hawthorne Calif—OS 5-1186—Connectors, Capacitors, Transformers
Anadex Instruments Inc 14734 Arminta St (PO Box 4720) Van Nuys Calif—R M Flygare—ST 0-7911—Automatic Data Handling Equipment, Strain Gage Bridge Balance Units & Power Supplies, Transistorized Power Toggles & Static Relays
Anaheim Electronics Co Inc 1016 Raymond Way Anaheim Calif—TR 1-1918—Punched Tape Readers, Relay Testers, Relays
Analytic Systems Co Div/Research Instrument Corp 980 N Fair Oaks Ave Pasadena Calif—James F McNamara RY 1-6634—Industrial Electronic Equipment, Meters (Special Purpose), Analyzers
△Anchor Plating & Tinning Co Inc 9536 Rush St El Monte—CU 3-8281—Specialists Plating of Aluminum, Magnesium, Stainless Steel & All Other Metals
△Andrew Calif Corp 931 Marylind Claremont Calif—Jeff D Montgomery Jr—Antenna (Commercial), Antenna Accessories, Microwave Components
Angelus Industries Inc Phonolarm Div 10856 Burbank Blvd N Hollywood Calif—TR 7-9775
Angle Computer Co Inc 1709 Standard Ave Glendale Calif—CH 5-2983
Applegate C J 1840 24th St. Boulder Colo—M E Applegate
Appleton Co Inc Harry 136 San Fernando Rd Los Angeles 31 Calif—John B Miller—40 Employees—CA 5-5513—Antennas, Materials (Metal), Wire & Cable
Applied Electronics Co Inc 213 E Grand Ave San Francisco Calif—B H Ballard Jr—150 Employees—PL 6-4100 Marine Electronic Equipment, Radio Telephones, Depth Sounders & Direction Finders
Applied Electronics Labs 340 S Sepulveda Manhattan Beach Calif
Applied Magnetics Corp Santa Barbara A/P Bldg 304 Santa Barbara Calif H R Frank—11 Employees—WO 7-2016—Magnetic Recording Heads for Instrumentation Use, Special Magnetic Recording Devices
Applied Physics Corp 2724 S Peck Rd Monrovia Calif—HI 6-7181—Radioactivity Instruments
Applied Precision Products 1431 S LaBrea Los Angeles Calif—WE 6-0444
Applied Radiation Corp 2404 N Main St Walnut Creek Calif—A S Klein—93 Employees—YE 5-2250—Electron Linear & Positive Ion Accelerators, High Voltage DC Power Supplies, Custom Precision Electromagnet Systems
Applied Research Labs Inc P O Box 1710 Glendale Calif—Wm E Davis—150 Employees—CH 5-5524—Spectrochemical Analyzers, Denistometers, Power Source Units
Applied Technology Inc 930 Industrial Ave Palo Alto Calif—V Barker—6 Employees—DA 1-5135—Research, Development & Custom Fabrication
Araphow Chemicals Inc 2800 Pearl St Boulder Colo
Arco Electronics Co 111 S Vermont Los Angeles Calif—DU 8-0634
ARD Corp 2465 Lincoln Blvd Venice Calif—EX 8-8745
Aremac Associates 50 S San Gabriel Blvd Pasadena Calif—SY 5-5938

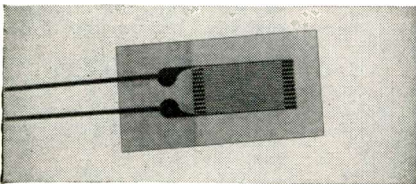
FIRST in strain measurement



HOW TO MATCH THE STRAIN GAGE TO THE JOB

If your business is mechanical design, development or testing, chances are good that you have used, or will some day use, SR-4® Bonded-Filament Strain Gages. Unique in their simplicity, versatility and accuracy, they are the natural answer to a great many problems involving the behavior of materials, components and structures under load.

When the need arises, however, many engineers without specific background in strain-gage techniques find themselves on unfamiliar ground in attempting to select the best gage for the job from over 250 available types. Although it is important to the validity of the results that the gage used be properly suited to the application, selection is normally not a difficult matter and depends principally on known test conditions and on the nature of the data required. When the following criteria have been established, a suitable gage type for a specific application may be readily selected from the SR-4® Catalog.



Bonded foil gage

1. Temperature—The temperature at which the test is to be conducted is an important (frequently limiting) factor in determining suitable grid and base materials. At room and moderately high temperatures, both wire and foil gages are used. At temperatures above 350°F (and at very low temperatures), foil gages must be used. Some types are available with a backing material which may be stripped off during application, the grid alone being bonded to the test area. Such gages may be used up to 1400°F (for dynamic-type tests).

SELECTION OF GAGE MATERIALS BASED ON TEMPERATURE

Maximum Temperature (°F)	Base Material	Filament Material
180	Paper, Bakelite, Epoxy	Any
250	Bakelite, Epoxy	Any
350	Bakelite	Any
600	None	Constantan or Nichrome foil
1000*	None	Nichrome foil
1400* (dynamic only)	None	Nichrome foil

*Limit imposed by available bonding adhesives

STRAIN MEASUREMENT

DATA SHEET No. 2

2. Test duration—For short-term tests (a few days) at temperatures below 150°F, paper-base gages are satisfactory and are usually more economical than other types. Extra-thin paper gages speed the curing of the bonding cement for fast application. For longer test periods (months or years), phenolic (Bakelite) or epoxy-base gages are usually used.

Dual-lead-type gages, with intermediate lead joints, provide good fatigue life. For better fatigue resistance and minimum hysteresis foil gages are advisable. They exhibit combined hysteresis and zero shift of less than 0.10% in strain reversals of up to ±1.5%, have generally higher fatigue resistance than equivalent wire gages.

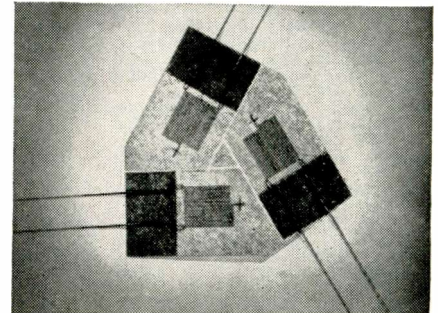
3. Strain type and magnitude

—For static strains, gages having grids of Constantan are usually used up to 600°F. For dynamic strains—particularly those of small magnitude—isoelastic gages are often recommended because of their relatively high strain sensitivity and improved fatigue resistance. Their high sensitivity to temperature change, however, limits usage to the measurement of vibratory strains unless appropriate precautions can be taken to cancel out or allow for this effect. When static strains of high magnitude (±2% to ±10%) are involved, a "post yield" gage is used.

4. Test-area geometry—Gage size depends primarily on the test space available. In general, the largest gage possible should be used. The probable strain gradient of the test area should also be considered, since the strain gage essentially averages the surface strain beneath its grid. When the test space is curved, foil gages are recommended, since they are flexible and will readily assume almost any continuous contour. When small wire gages are used, the new fine-pitch, flat-grid types are generally superior to "wrap-arounds".

5. Strain direction—Single-grid gages are used when the direction of the principal strain to be measured is known. If the strain field is biaxial and the directions are known, a 90°, 2-element rosette gage may be employed. When the strain field is unknown, a 3- or 4-element rosette may be used to determine the direction and magnitude of principal strains.

6. Output requirements—The required gage resistance and sensitivity are frequently dictated to some extent



Rosette-type gage

by the sensitivity of the measuring system to be used. Maximum gage output can be achieved by using a high-resistance gage with maximum bridge voltage.

7. Temperature compensation requirements

—Strain gages are sensitive to changes in temperature as well as strain. This temperature effect on the measuring gage can often be canceled out by use of an unstressed "dummy" gage sensing identical temperatures and connected in the strain-gage circuit. In cases where a dummy gage cannot be used, some form of self-temperature-compensation is required. There are three general types of temperature-compensating strain gages available.

a. Self-temperature-compensating wire gages—individually compensated for specific materials and specific temperature ranges.

b. "Selected-melt" foil gages—with grids produced from a "melt" of strain-sensing material specifically selected for minimum temperature response over a specific temperature range.

c. Self-temperature-compensating foil gage—a recently developed grid design with an appropriate external circuit, which may be adjusted to provide minimum temperature response on any desired material over any temperature range.

For Engineering Assistance

When tests involve unusual conditions (e.g., high frequencies, strong magnetic or radiation fields, etc.) or necessitate special gage configurations, unusually accurate data, etc., it is advisable to consult your local SR-4® Strain Gage Sales Engineering Representative. He can also supply you with information and specific recommendations on strain-gage instrumentation (static and dynamic), cements, waterproofing compounds, and other accessories.

To obtain a free copy of the latest B-L-H Strain Gage Catalog, write Dept. 24-H

See us at the Wescon Show, Booth 659

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SR-4® Strain Gages • Transducers • Force Measurement Systems

1960 Directory of Western Electronic Manufacturers

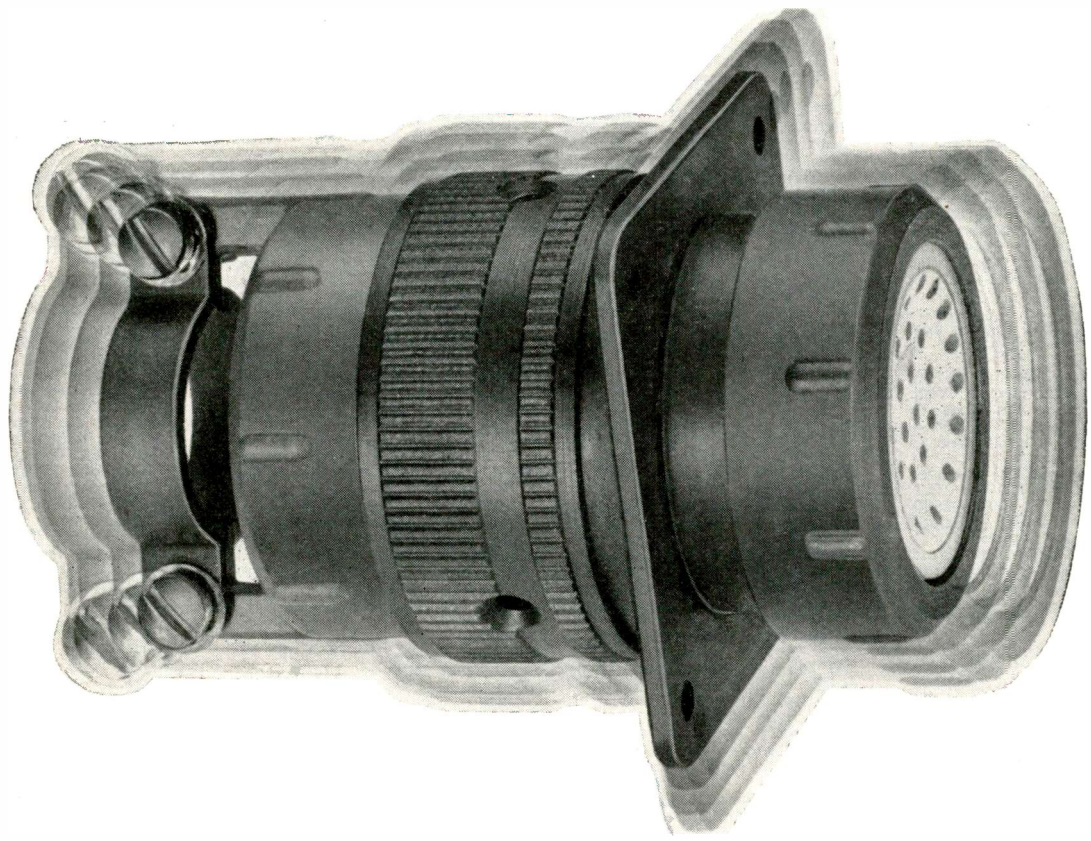
- ARF Products Inc Gardener Rd Raton N M—Dave Joseph—100 Employees 995—Electronic Test Equipment, Remote Controls, Printed Circuits
- Arizona Air Assoc Inc P O Box 2041 Tucson Ariz
- Arizona Gear & Mfg Co 3544 E Ft Lowell Rd Tucson Ariz
- Arizona Telemetering Corp 2923 E McDowell Rd Phoenix Ariz—Floyd F Lewis Jr—8 Employees—BR 5-3822—Voltage Controlled Oscillators, Sub-Contract Assembly
- Arizona Tube Mfg Co 1914 E Henshaw Rd Phoenix Ariz—BR 5-3822
- Arkay Eng'g Inc 255 Santa Monica Blvd Santa Monica Calif—EX 3-6959
- Arkay Products Mfg Co 4111 W Jefferson Blvd Los Angeles Calif—RE 1-2501
- Armour Electronics Div Cardinal Instrumentation Corp 4201 Redwood Ave Los Angeles 66 Calif—Jerry S Frank Arnold Eng'g Co/Repach Pacific Div 641 E 63rd St Los Angeles 1 Calif—R C Tehterow—Hardware, Transformers
- Arnold Magnetics Corp 6050 W Jefferson Blvd Los Angeles 16 Calif—Jack Batta—UP 0-6284—Power Supplies & Converters, Transformers, Production Machinery & Equipment
- Arnoux Corp 11924 W Washington Blvd Los Angeles 56 Calif—Lester Cole—75 Employees—TE 0-5371—Telemetering Decommunication Systems, Power Supplies, Temperature-Measurement Equipment
- Asquith Co S A 427 West Chevy Chase Dr Glendale 4 Calif—James V Keith—25 Employees—CI 3-2878—Accelerometers, Metal Bonding, Multiturn Counting Dials
- Asquith Co S A Braunsen Electronics Div 427 W Chevy Chase Dr Glendale Calif—CH 5-1747—Solenoids
- A-S-R Products Corp Com-Air Products Div 1201 Rio Vista Ave Los Angeles Calif—AN 3-2171—Missile Propulsion Systems & Checkout Equipment
- Astra Technical Instrument Corp 1132 Mission St Pasadena Calif—MU 2-2114—Temperature Probes, Thermocouples, DC Amplifiers
- Astral Electronics Inc 14620 Armita St Van Nuys Calif—ST 0-3270
- Astravac Corp 1011-D Industrial Way Burlingame Calif—DI 2-6048—Missile Ground Support & Handling Equipment
- Astro-Gear Inc 67 Yesler Way Seattle 4 Wash—Jack Cratty
- △Astromics Div Mitchell Camera 611 W Harvard St Glendale 4 Calif—Victor T Carbone
- Atcheley Inc Raymond 2339 Cotner Ave Los Angeles 64 Calif—John Pegram—GR 9-8626—Power Supplies & Converters, Amplifiers (Special Purpose), Control Equipment (Industrial)
- Atkinson Lab Inc 7070 Santa Monica Blvd Hollywood 38 Calif—R W Reed—10 Employees—HO 9-8347—Photographic Chemicals
- Atlas Electric & Engineering Co 617 7th St San Francisco Calif—KL 2-3676
- △Atlas Components Inc 8220 Lankershim Blvd N Hollywood Calif—Frank McAvoy—7 Employees—TR 7-0755—Hardware, Chassis, Accessories, Fuses & Shielding
- △Atomh Electronics 7648 San Fernando Rd Sun Valley Calif—G. H. Elliott—Miniature Potentiometers & Test Equipment
- Atomic Engineering Corp 424 S 7th Grand Junction Colo
- Atomic Research Lab 10717 Bernice Bldg Los Angeles 34 Calif—R D Finkle—TE 0-1161—Radioactive Isotopes
- Atomic Laboratory 3086 Claremont Berkeley Calif—OL 5001
- Atomic Research Corp P O Box 205 Colorado Springs Colo
- Audio Co of America 401 W Jackson St Phoenix Ariz—AL 4-5888
- Audio Electronics 15858 35th N E Seattle 55 Wash—A Wallace Johnson—4 Employees—EM 3-1613—Sound Systems, Intercommunicators & Hearing Aids, Testers
- Audiospeakers Labs 2209 E Alaska St W Covina Calif
- Audiotronics Corp 11057 Weddington N Hollywood Calif—TR 7-0567
- Austin Craft P O Box 389 Burbank Calif—VI 9-1777
- Automation Industries Inc 3613 Aviation Blvd Manhattan Beach Calif—A J Edwards—150 Employees—OR 8-0808—Measurement & Test Equipment (Special Purpose), Analyzers, Industrial Electronic Equipment
- Auto-Control Labs Inc 333 S Hindry Ave Inglewood Calif—OR 8-4924
- Automatic Corp of America 5546 Satsuma North Hollywood Calif—TR 7-5493
- Automatic Switch Co 1233 Goodrich Blvd Los Angeles Calif—RA 3-3669
- Automation Controls Corp 5737 W 98th St Los Angeles Calif—SP 6-0420
- Automation Electronics Inc 1500 W Verdugo Burbank Calif—VI 9-2341
- Automation Inc 5959 S Hoover Los Angeles Calif—PL 3-2221
- Automation Industries Inc Magnetics Div 771 Hamilton Ave Menlo Park Calif H E Wilcoxon—DA 6-7110—Amplifiers (Audio), Transformers, Power Supplies & Converters
- Automation Industries Inc Industrial Park Boulder Calif—Gerald J Posakony—40 Employees—HI 2-1124—Transformers, Industrial Electronic Equipment, Medical Electronic Equipment
- Automation Insts Inc 401 E Green St Pasadena Calif—Rod Klient—6 Employees—SY 3-8169—Industrial Electronic Equipment, Control Equipment (Industrial), Services (Industrial)
- Automation Service Co 2123 Outpost Dr Hollywood 28 Calif—A E Klipp—HO 7-3844—Electronic Analog Computers, Function Generators, Oscilloscopes
- △Autonetics Div North American Aviation Inc 920 N Nash St El Segundo Calif—J R Doudna
- Autonetics/Div North American Aviation Inc 9150 E Imperial Hwy Downey Calif—C B Raferty—7000 Employees—SP 3-2233—Inertial Navigation Systems, Flight & Armament Control Systems
- Autotron Inc 2413 Main St Santa Monica Calif—EX 9-8256
- Autron Eng Inc 1301 Wilshire Blvd Los Angeles 17 Calif—L P Appelmann—HU 3-7030—Communications Systems
- Aurtonics Corp 5440 Alhambra Ave Los Angeles Calif—CA 5-4134—Aircraft Frequency & Voltage Sensors, Electronic Sequence & Time Delay
- Avalon Machine Products Inc 2535 E Imperial Hwy Los Angeles Calif—LO 9-7156
- Avery Adhesive Label Corp 1616 S California Monrovia Calif—EL 8-2524
- Avia Products Co 7270 Beverly Blvd Los Angeles Calif—WE 6-7295
- Aviation Developments Inc 210 S Victory Blvd Burbank Calif—Missile Frames & Test Equipment—VI 9-4631
- △Aviel Electronics Inc 1755 Berkeley St Santa Monica Calif
- Avionics Inc 2013 S Alvernon Tucson Ariz
- Avionics Research Products Corp 1215 El Segundo Blvd El Segundo Calif—EA 2-5440
- Avo Engg Co 5021 E 5th St Tucson Ariz

B

- Babcock Engineering 618 S Glenwood Pl Burbank Calif—VI 9-2941
- Babcock Radio Engg Inc 1640 Monrovia Ave Costa Mesa Calif—Norman E Cime—400 Employees—LI 8-7705—Remote Control Transmitters, Remote Control Receivers, Test Equipment
- Babcock Relays Inc 1640 Monrovia Ave Costa Mesa Calif—Carl L Martin—LI 8-7705—Relays
- Bach Auricon Inc 6900 Romaine Ave Hollywood 38 Calif—A N Brown—HO 2-0931—Amplifiers (Audio), Recorders (Audio), Recorders (Special Purpose)
- Baldwin & Baldwin 2929 N Main Walnut Creek Calif—YE 5-0300
- Baldwin Products Corp 432 E Valley Blvd San Gabriel Calif—CU 3-5634—Electronic Hardware
- Ball Brothers Research Corp Industrial Park Boulder Colo—HI 2-2966
- Band-It Co 48th & Dahlia Denver Colo—DU 8-4116
- Barksdale Valves 5125 Alcoa Ave Los Angeles Calif—LU 7-6181—Missile Ground Support
- Barrett Electronics Corp Western Div 1436 El Camino Real Menlo Park Calif—DA 6-7095
- Barstow Co A G 8420 Otis Sough Gate Calif—LO 9-8125
- Barton Instrument Corp 580 Monterey Pass Rd Monterey Park Calif—CU 3-6501
- Barwood Electronics Inc 120 S Maryland Glendale Calif—C H 5-4063—Missile Ground Support
- Basco Metal Products Inc P O Box 268 Burbank Calif
- Basic Tool Industries Inc 14439 S Avalon Blvd Gardena Calif—FA 1-2665
- Baskon Corp 1547 10th St Santa Monica Calif—L V Robinson—EX 3-8218—Relays, Measurement & Test Equipment (Bridges), Motion Picture Equipment
- Bauer Electronic Mfg Co 3728 Southwood Ave San Mateo—Fritz Bauer—4 Employees—FI 5-0897—Transmitters
- Bay Electronics P O Box 93 Cedar Ridge Calif
- B & B Electronics Corp 17360 Gramercy Pl Gardena Calif—FA 1-1956—Multiconductor Control Cable & Harness Assemblies, Molded Breakouts
- B & B Magnetics Co 331 E 4th Ave La Habra Calif—OW 7-8712
- Beach Electronics Labs 3111 Halladay St Santa Ana Calif—KI 5-0451—Custom Test Equipment, Engineering Design & Fabrication
- Bear State Transformer Co 2105 W Cowles Long Beach Calif
- △Bearing Inspection Inc 3311 E Gage Ave Huntington Park Calif—LU 2-6431—Electronic Bearing Analyzers
- △Beattie-Colman Inc 1000 N Olive St Anaheim Calif—T B Olsson—90 Employees—PR 4-4503—Oscilloscope Recording Cameras, "Oscilatron" Type Programmers, Electrically Operated Pulse Cameras
- Beauzart Electronics Co 7459 Deering Canoga Park Calif—DI 0-8792
- △Beckman/Berkeley Div 2200 Wright Ave Richmond Calif—John Scheck—App 425 Employees—LA 6-7730—Digital Frequency Meters, Preset Counter-controllers
- △Beckman Inst Inc Scientific & Proc Inst Div 2500 Fullerton Rd Fullerton 6 Calif—Joseph W Lewis—OW 7-1771—Control Equipment (Industrial), Analyzers, Amplifiers (Special Purpose)
- Beckman Instruments Inc Systems Div 325 N Muller Ave Anaheim Calif—F J Scheufele—PR 4-5430—Amplifiers (Special Purpose), Computers, Control Equipment (Industrial)
- Beckman & Whitley Inc 993 E San Carlos Calif—Myron B Baldwin—108 Employees—LY 3-7824—High Speed Cameras, Meteorological Instruments, Missile Products
- Begen Co M 1683 Jerrold St San Francisco 24 Calif—Sam Blake Jr—Lighting Equipment & Accessories, Industrial Electronic Equipment
- △Behlman Engg Co 2911 Winona Ave Burbank Calif—J M Schroeder—100 Employees—VI 9-5733—Electronic AC Power Supply
- Bell Air Electronic Corp 6919 San Fernando Rd Glendale Calif—VI 9-1142
- Bell Alarm Systems Inc Box 786 San Leandro
- Belleville-Hexem Corp 638 University Ave Los Gatos Calif—Logan M Belleville—6 Employees—EL 4-1379—D-C Amplifiers, Electric Measuring Instruments, Kilovoltmeters
- Bemco Inc 11631 Vanowen St N Hollywood Calif—TR 7-5339
- Benbow Mfg Corp 11920 W Jefferson Blvd Culver City Calif—EX 8-5766—Missile Ground Support & Test Equipment
- Benchmark Mfg Co 1835 W Rosecrans Ave Gardena Calif—Arch C Shafer—65 Employees—FA 1-0411—Milling Machines, Punch Press, Various types of Feeding Machines
- *Bendix Computer Div Bendix Aviation Corp 5630 Arbor Vitae St Los Angeles 45 Calif—450 Employees—SP 6-2220—General Purpose Digital Computers, Data Processing Systems, Flight Control Systems Simulators
- △*Bendix-Pacific Div Bendix Aviation Corp 11600 Sherman Way N Hollywood Calif—Herbert Wilkinson—3500 Employees—ST 7-2881—Telemetering, Radar, Missile Guidance, Sonar & Underwater Ordnance
- Bennett Labs Inc 4224 Holden St Emeryville Calif—R S Fisher—OL 5-9446—Communications, Systems, Inter-Communicators & Hearing Aids
- Bennett Products Mfg Co 815 S San Antonio Palo Alto Calif—YO 7-7249
- Beison-Lehner Corp 11930 W Olympic Blvd Los Angeles 64 Calif—Don Press—13 Employees—GR 9-3723—Film & Oscillogram Record Readers, Automatic Plotting Machines, Photo Instrument
- Bentley Scientific Co 2811 7th St Berkeley 10 Calif—D E Bentley—5 Employees—TH 3-6303—Distance Detector, Energizer, Angular Accelerometer
- Berkeley Custom Electronics 2302 Roosevelt Ave Berkeley Calif—TH 3-4180
- Berkeley-Dynamics 2831 7th Berkeley Calif—TH 3-2788—Industrial Electronic Controls
- Berndt-Bach Inc 6900 Roamine St Hollywood Calif—HO 2-0931
- Bertelen Products Mfg Co 114 Lomita St El Segundo Calif—OR 8-7969—Metal Cabinets, Chassis Panels, Cases (Custom or Production)
- Best Speaker Mfg Co P O Box 635 Minter Village Bakersfield Calif
- B-H Electronics 2022 S Sepulveda Los Angeles Calif—Dudley Cassard—2 Employees—BR 2-3757—Trimmer Potentiometers
- Biederman Inc 1101 Airway Glendale Calif—CH 5-8621—Missile Checkout & Test Equipment
- Biggs Co Inc Carl H 1547 14th St Santa Monica Calif—D B Lott—11 Employees—TE 0-4910—Bonding Agents, Potting Compounds, Circuit Board Coatings
- Bill Jack Scientific Instrument Co 143 S Cedros St Solano Beach Calif—SK 5-1551—Counters & Mechanical Test Equipment
- Birdsell Mfg Co Inc 750 San Antonio Palo Alto Calif—DA 1-0491
- Bio-Rad Labs 32nd & Griffin Ave Richmond Calif—David Schwartz—TH 3-0923—Chemicals (Coatings & Related Products), Production Machinery & Equipment, Insulation Materials & Compounds
- △Birchler Corp 4371 Valley Blvd Los Angeles 32 Calif—Charles F Booher—75 Employees—CA 2-9101—Tube Devices, Transistor Retaining & Cooling Devices, Diode Closures
- Bone Engrg 701 W Broadway Glendale Calif—CH 5-2638—Missile Ground Equip & Power Supplies
- B J Electronics Borg-Warner Corp 3300 Newport Blvd Santa Ana Calif—Herbert G Ayers—363 Employees—KI 5-5581—Vibrotrom Transducer, Miniature Tape Recorders, Nuclear Instrumentation
- Blaine Electronics Inc 14757 Keswick St Van Nuys Calif—Robert F Blaine—20 Employees—ST 2-6303—Antenna Pattern Lab Equipment, Scale Models For Antenna Study, Scale Models For Technical Sales Purposes
- Bodde Screen & Projector Co 11541 Bradley Ave San Fernando Calif—B M Bodde Jr—EM 5-2551—Studio Equipment, Motion Picture Equipment
- Boeing Airplane Co 7755 Marginal Way Seattle 4 Wash—Wm W Coldren
- Booth Co Arthur E 265 S Alexandria Ave Los Angeles 4 Calif—Arthur F Booth—7 Employees—DU 1-2163—Power Supplies for Calibrating Electrical Instruments, Relay Test Sets for Testing, Calibrating Power Systems network Protective Relays
- Borg-Warner Controls 3300 Newport Ave Santa Ana Calif—H G Ayers—KI 5-5581—Nuclear Products, Measurement & Test Equipment (Special Purpose), Measurement & Test Equipment (Generators)
- Borg-Warner Corp 7500 Tyrone Van Nuys Calif—TR 3-4340—Missile Propulsion System & Guidance Equipment
- △Bourns Inc P O Box 2112 Riverside Calif—D P Vaughan—530 Employees—OV 4-1700—Leadcrew Actuated Potentiometers, Transducers-Pressure, Position, Accelerometers
- Boymar Electrical Service Co 1271 Mission San Francisco Calif—UN 1-2245
- △*Branson Ultrasonic Corp 12438 Ventura Blvd Studio City Calif—Kenneth P Haves
- Braun-Knecht-Heimann Co Glass Engg Dept 601 O'Neil Ave Belmont Calif—Hugh Hutchings—20 Employees—LY 3-8276—Special Glass Apparatus, Flat Glass Fabrication
- Braunson Electronics Inc 12008 Venice Blvd Los Angeles Calif—UP 0-1825
- Brea Instruments 13035 Catcot N Hollywood Calif
- Broadview Labs 1811 Trousdale Dr Burlingame Calif
- B & R Tool & Die Co 947 Industrial Ave Palo Alto Calif—YO 8-6141
- Brubaker Electronics Inc 3642 Eastham Dr Culver City Calif—E Fredericks—220 Employees—TE 0-6441—Radar Test Equipment, IFF Equipment, Air Traffic Control Equipment
- Bruce Engg Co 1633 W 134th St Gardena Calif—FA 1-2220
- Bryon Jackson Pumps Inc 2301 E Vernon Ave Los Angeles Calif—LU 7-6171—Missile Ground Support & Test Equipment

1960 Directory of Western Electronic Manufacturers

- Bucholz Mfg Co 909 Camelia Berkeley Calif
- Bundy Mfg Co 2160 Cilorado Santa Monica Calif—EX 3-0558
- Burgmaster Corp Box 311 Gardena Calif—FA 1-3510
- Burklyn Co 3429 Glendale Blvd Los Angeles 39 Calif—Roland Stevens—NO 2-3111—Hardware, Production Machinery & Equipment
- Burnett Radio Lab William W L 4814 Idaho St San Diego 16 Calif—Wm W L Burnett—AT 2-2740—Piezo-electric Products, Temperature Controlled Ovens Crystal Holders, Calibration & Consulting Service
- △Burr-Brown Research Corp P O Box 6444 Tucson Ariz—Thomas R Brown Jr—7 Employees—AX 8-0772—Operational Amplifiers, AC Decade Amplifier, Millivoltmeters
- △*Burroughs Corp/Electro Data Div 460 Sierra Madre Villa Pasadena Calif—1200 Employees—RY 1-0471—Electronic Data Processing System, High Speed Printer System
- Burton Electrical Engineering Co 111 Maryland St El Segundo Calif—OR 8-6101
- Burton Mfg Co 2520 Colorado Ave Santa Monica Calif—100 Employees—EX 3-0255—Aircraft Instrument, Non Support Test Equipment, Medical Dental Lamps
- △Burton Silverplating Co 8640 Alden Dr Los Angeles 48 Calif—Jerry Burton Butcher Co L H 2050 McKinley Ave Fresno 3 Calif—J A Raskin—Chemicals (Coatings & Related Products), Production Machinery & Equipment, Industrial Electronic Equipment
- By-Buk Co 4314 W Pico Blvd Los Angeles 19 Calif—Don L Lenzi—App 25 Employees—WE 6-6151—Printed Circuit Drafting Aids (Pressure Sensitive), Components Leads Bending Tool (Hand Operated), Product Finishing Masking Aids
- C**
- Cadillac Gage Co 644 Terminal Way Costa Mesa Calif—LI 8-7761
- Cadre Industries Corp 565 University Ave Los Gatos Calif—Fred J DuBois—82 Employees—EL 4-8600—Cables, Panels
- Calbest Electronics Co 4801 Exposition Blvd Los Angeles Calif—Charles B Epstein—95 Employees—RE 1-7291—Amplifiers, Audio Equipment, Baffles
- Cal-Connector Co 7360 Varna Ave N Hollywood Calif—Scott L Glenn—TR 7-2623—Connectors & Terminals, Wire & Cable
- Calife Co Inc P O Box 832 Redlands Calif—PY 4-1166—Missile Materials & Metals
- Calibration Standards Co 1079 Coronet St Pasadena Calif—EL 5-2982
- Califone Corp 1041 N Sycamore Ave Los Angeles Calif—Robt J Margolis—65 Employees—HO 2-2353—Phonographs, Audio Recorders, Sound Systems Training Equipment
- California Aircraft Products 790 Greenfield Dr El Cajon Calif
- California Chassis Co 5445 E Century Blvd Lynwood Calif—H P Balderson 50 Employees—NE 6-7777—Boxes, Cabinets, Chassis
- California Computer Products Inc 8714 Cieta St Downey Calif—L Kilpatrick—10 Employees—WA 3-1913—Incremental X-Y Plotters, Digital Systems, Multiplexers & Converting Equipment
- △California Magnetic Control Corp 11922 Valerio St N Hollywood Calif—M B Leskin—100 Employees—ST 7-1104—Amplifiers, Telemetering Systems, Transformers
- California Plastic Inc 221 E 4th St Los Angeles 13 Calif—Harry Simmons—MA 4-4311—Dials & Front Panel Accessories
- California Scientific Glass 35 E Raymond Pasadena Calif—MU 1-6794
- California Stamping & Mfg 909 E 59th St Los Angeles Calif—AD 1-5143
- △*California Technical Industries Div Textron Inc 1421 Old Country Rd Belmont Calif—Carl Trost—160 Employees—LY 3-8466—Automatic Test Equipment, Microwave Instruments, Flight Simulation Equipment
- Cal-Lee Mfg Co 6759 West Blvd Inglewood Calif—OR 8-9456
- Caltresin Corp 4543 Brazil Los Angeles Calif—CH 5-1079
- Calmag Div Calif Magnetic Cont Corp 11922 Valerio St N Hollywood Calif—W R McPeak—TR 7-1104—Transformers, Power Supplies & Converters, Coils
- Cal Tech Industries Div Textron Belmont Calif
- Cal-Tronics Corp 11307 Hindry Ave Los Angeles Calif—OR 8-7141—Test Equipment, Cable & Harnesses
- Caltron Products Co 3518 W Pico Blvd Los Angeles 19 Calif—C P Swanson—RE 4-2420—Production Machinery & Equipment, Control Equipment (Industrial), Industrial Electronic Equipment
- Calvideo Tube Corp 18601 S Santa Fe Ave Compton Calif—NE 9-4435
- Calvideo Electronics/Sub Calvideo Tube Corp 11712 Englewood Ave Hawthorne Calif
- Campbell Carol Enterprises Inc 7333 Coldwater Canyon N Hollywood Calif
- *Canoga Div Underwood Corp 14330 Oxnard St Van Nuys Calif—R A Potter—200 Employees—ST 6-9010—Radar Systems, Microwave Telemetry Systems, Antennas
- △*Cannon Electric Co 3208 Humboldt St Los Angeles 31 Calif—Don A Drake—2900 Employees—CA 5-1251—Multi-contact Electrical Connectors, Guided Missile Plug/Harness Systems, Subminiature Teflon Terminals
- Cantania Sound 1541 4th St San Rafael Calif—GL 4-0802
- Capital Engineering Corp 8609 W 3rd St Los Angeles Calif—CR 6-3028
- Carad Corp 2850 Bay Rd Redwood City Calif—George E Glatthar—35 Employees—EM 8-2969—High Voltage Pulse & Miniature Pulse Transformers, Modulators, Band Pass & Low Pass Filters
- Carder Co John 1624 1st St N W Box 808 Albuquerque N M
- Cardinal Instrumentation Corp 4201 Redwood Ave Los Angeles 66 Calif—Jerry S Frank—52 Employees—TE 0-6731—Transducers, Power Supplies, Voltage Regulators
- Carlson Co 1201 Dexter Ave Seattle Wash
- Carma Mfg Co 1879 Mullin Ave Torrance Calif—SP 5-2221
- Carmac Aviation 8414 San Fernando Rd Sun Valley Calif—Missile Frames & Propulsion Systems
- Carruthers & Fernandez Inc 1501 Colorado Ave Santa Monica Calif—Missile Ground Support & Guidance
- Carstedt Research 2501 E 68th St Long Beach 5 Calif—B K Smith—65 Employees—NE 6-9364—Magnetics
- Cascade Research 5245 San Fernando Rd Los Angeles 39 Calif—Harry O'Donoghue—90 Employees—CH 5-8625—Antennas, Microwave Equipment, Test Equipment
- Carter Engineering Co 5117 W Jefferson Blvd Los Angeles—WE 3-7326—Headsets & Microphones, Intercom Systems, Mobile & Light Units
- Cavitron Electron Oscillator 355 N Newport Blvd Newport Beach Calif—LI 8-6123
- Caswell Electronics Corp 414 Queens Lane San Jose 12 Calif—Dwight A Caswell—11 Employees—CY 7-9333—Microwave Transmission Line Components, Ferrite Microwave Components, Microwave Subassemblies
- C E S Electronic Products Inc 5026 Newport Ave San Diego Calif—AC 2-3505—Logarithmic Attenuators, Twin-T Filter, Plug-In Preamplifiers
- *C G Electronics Corp 15000 E Central Albuquerque N M—H Poulsen—93 Employees—AL 6-9858—Antennas, Converters, Resonant Reed Relays
- Celco-Constantine Engg Labs Co 9593 9th St Cucamonga Calif—YU 2-2688—Amplifiers, Chokes, Transformers
- Centimeg Electronics Inc 312 E Imperial Hwy El Segundo Calif—OR 8-4842
- Central Telemetering & Control 504 E Valley Blvd San Gabriel Calif
- *Century Lighting Inc 1840 Berkeley St Santa Monica Calif—Louis Erhardt—35 Employees—TE 0-6961—Electronic Dimming Control Systems, Theatrical Lighting Equipment, Architectural Lighting Fixtures
- Century Machined Products Box 1073 Scottsdale Ariz
- *Central Scientific Co of Calif 1040 Martin Ave Santa Clara Calif—V F Duensing—App 25 Employees—CH 8-1600—Scientific Instruments & Apparatus for Labs of Industry, Education & Research
- *Central Scientific Co of Calif 6446 Telegraph Rd Los Angeles Calif—Gordon Baker—App 25 Employees—RA 3-6141—Scientific Instruments & Apparatus for Labs of Industry Education & Research
- Chadwick-Helmuth Co 42 E Duarte Rd Monrovia Calif—Wm F Cox—6 Em-ployees—EL 8-4567—Stroboscope Synchronizer, Stroboscopic Light, Electronic Multiplier
- Champion Electronics 15100 S Broadway Gardena Calif—FA 1-4744
- Chase Mfg Co 329 W Washington Pasadena Calif—W L Chase—RY 1-9800—Tools (Hand)
- Chemalloy Electronics Corp Gillespie Airport Santee Calif—Samuel Freedman—9 Employees—HI 4-7661—Calorimeters (RF Microwave), Loads (RF Water), Solder (Fluxless Aluminum)
- Chem-Ionics Inc 7834 Bothell Way Seattle Wash
- Chem-Tronics Inc Bldg 9 Gillispie Field Santee Calif
- Chemical Process Co Redwood City Calif
- Chet Engineering Co 8140 Orion Ave Van Nuys Calif—ST 6-7226—Solenoids
- *Chicago Telephone of Calif Inc 105 Pasadena Calif—R A Stackhouse—120 Employees—CI 5-7186—Variable Resistors, Coils & Transformers, Custom Compression Molded Products
- △Christie Electric Corp 3410 W 67th St Los Angeles 43 Calif—E E Hughes—125 Employees—PL 3-2607—Automatically Regulated D-C Power Supplies, Manually Controlled D-C Power Supplies, Automatic Battery Chargers
- Christie Machine Works 201 Harrison St San Francisco Calif—EX 2-2187
- C H Supply 415 E Beach Inglewood Calif—James C Colfer—OR 8-4181—Dials & Front Panel Accessories
- Cico Corp 9615 Glenoaks Blvd Sun Valley—TR 7-0575
- CIcoil Corp 13833 Saticoy St Van Nuys Calif
- *Cinch Mfg Co Graphik-Circuits Div 200 S Turnbull Canyon Rd City of Industry Calif—CU 3-8354
- △Cinema Eng'g Div Aerovox Corp 1100 Chestnut St Burbank Calif—G M Smith—180 Employees—VI 9-5511—Precision Wire-Wound Resistors, Instrument Switches, Audio Attenuators
- Cinematic Developments 2125 32 Ave San Francisco 16 Calif—Thomas Rhenhart—MR 4-2435—Motion Picture Equipment, Motion Picture Equipment (Accessories), Studio Equipment
- Circon Components Corp Santa Barbara Municipal Airport Goleta Calif—M J Ainsworth—WO 7-1113—Hardware, Connectors & Terminals, Dial & Front Panel Accessories
- Circuit Platers 13736 Saticoy Van Nuys Calif
- Clark Controller Co 4755 E 49th St Los Angeles Calif—K D Christopher—9 Employees—LU 3-6366—Control Equipment (Industrial), Switches, Relays
- Clark Electronic Labs Box 165 Palm Springs Calif—D B Clark—FA 8-2210—Control Equipment (Industrial) Rectifiers, Measurement & Test Equipment (Special Purpose)
- Clary Corp 408 Junipero St San Gabriel Calif—Wm R Beall—CU 3-2724—Computers, Recorders (Special Purpose)
- Clear Bears Antenna Corp 21341 Roscoe Blvd Canoga Park Calif—Bob Raynor—75 Employees—DI 7-2255—Antennas (Home), Antenna Accessories, Insulators
- Clearpoint Paper Co 1482 67th St Emeryville Calif
- Clear Print Paper Co 1482 67th St Emeryville 8 Calif
- Clemco Aero Products Inc 210 E Manville St Compton Calif—NE 6-8162—Missile Guidance Equip
- *Clevite Corp Western Engg Div 3336 E Foothill Blvd Pasadena Calif—MU 1-3021
- Coast Coil Co 5333 W Washington Blvd Los Angeles 16 Calif—C Harris Adams—240 Employees—WE 6-6188—Toroidal Windings
- △Coast Pro-Seal & Mfg Co 2235 Beverly Blvd Los Angeles 57 Calif—J W Winkler—DU 7-5141—Insulation Materials & Compounds
- Coastal Mfg Corp 217 Rose Ave Venice Calif
- Coen Controls Co 40 Boardman Pl San Francisco 3 Calif—D H Hudson—5 Employees—Combustion Controls, Components & Systems
- Cole Electric Co 8439 Stellar Dr Culver City—UP 0-4701—Electrical Connectors
- Cole Instrument Co 144 Via Trieste Newport Beach Calif
- △Coleman Electronics Inc 133 E 162nd St Gardena Calif—FA 1-4775—Analog to Digital Encoders, Data Recording Systems & Components, Machine Tool Control Systems
- Coleman Engg Co Inc 3500 Terrance Blvd Torrance Calif—T N Tracy—FA 1-3900
- △*Collins Radio Co/Western Div 2700 W Olive Ave Burbank Calif—A A Collins—700 Employees—TH 5-1751—Servo Amplifiers, Radar Antennas, Special Antennas
- Colorado Research Corp Broomfield Colo—David R Miller—56 Employees—HA 9-3501—Analog Computers, Digital T V Systems, High Precision Shaft Angle Encoding Systems
- Color Corp of America 11801 W Olympic Blvd Los Angeles Calif—BR 2-4331
- Columbia Radio Co 17536 Ventura Blvd Encino Calif—ST 9-0781—Voltage Dropping Resistors
- Com-Lab Inc 2049 Main St San Diego Calif
- Comerford Mfg Co 880 S Rose Place Anaheim Calif—MA 6-3762
- Communication Lab 2049 Main St San Diego Calif
- Communications Measurement Lab Inc 2803 Los Flores Blvd Lynwood Calif
- Communications Research Inc 9416 Ruffner Sepulveda Calif
- Component Evaluation Lab 1432 Potrero El Monte Calif
- Component Research Co Inc 3019 S Orange Dr Los Angeles 16 Calif—D Kellerman—Capacitors (Variable), Capacitors (Fixed), Coils
- Components For Research Inc 979 Commercial St Palo Alto Calif—Ernest W Bianco—3 Employees—DA 1-5252—Insulators, Services (Industrial), Transformers
- △Computer Control Co Inc 2251 Barry Ave Los Angeles 64 Calif—R D Chamorro—GR 8-0481—Computers, Amplifiers (Special Purpose), Military Systems (Eng'g)
- Computer Eng'g Assoc Inc 350 N Halstead St Pasadena Calif—Marilyn B Holstrom—38 Employees—EL 5-7121—Direct Analog Computers, Amplifiers, Power Supplies
- Computer Equipment Corp 1931 Pontius Ave Los Angeles Calif—GR 8-0856
- △Computer Measurements Co 12970 Bradley Ave Sylmar Calif—J K Ronden—100 Employees—EM 7-2161—Electronic Counters & Timers, Digital Printers & Readout Equipment
- Computer Measurements Corp 5528 Vineland Ave N Hollywood Calif—Roger K Stewart—ST 7-0401—Computers, Controls, Control Equipment
- Computer Operations Aeronutronics Ford Rd Newport Beach Calif
- Com-Tronics Inc 3409 Venice Blvd Los Angeles 19 Calif—J B McKinley—App 25 Employees—RE 4-6338—Delay Lines (Variable, Spira-Cord & Constant)
- Condon Co Earl S 3450 Wilshire Blvd Los Angeles 5 Calif—Roger K Stewart
- Con-Elco 1711 S Mountain Ave Monrovia Calif—E A Moore—82 Employees—EL 8-4571—Resistors, Volume Controls
- Connector Corp of America 12959 Sherman Way N Hollywood Calif—Ralph R Thomas—10 Employees—ST 7-9653—Waveguide Flanges, R F Coaxial Cable Connector
- △Connector Seals Corp 4224 Temple City Blvd Rosemead Calif—Don D Allen—25 Employees—CU 3-8307—Connectors
- Condor Radio Mfg Co 4068 Paseo Grande Tucson Ariz
- Connolly & Co Wallace E P O Box 295 Menlo Park Calif—G Connolly—DA 3-1930—Crystals (Crystal Products & Accessories), Magnetics, Coils
- Conrac Inc 19217 E Foothill Blvd Glendora Calif—W J Moreland—90 Employees—ED 5-0541—TV Receivers & other Receivers, Video Monitors
- *Conrad Inc 3848 E Colorado St Pasadena Calif—MU 1-0181—Test Chambers & Equipment
- Consolidated American Services Inc 9999 W Jefferson Blvd Culver City Calif—UP 0-4725
- Consolidated Controls Corp 750 S Isis Inglewood Calif—J A Fontana—30 Employees—OR 1-7589—Industrial Electronic Equipment, Aviation Auxiliary Electronic Equipment, Switches
- Consolidated Diesel Electric Corp 15519



VIBRATION PROOF CANNON PLUGS

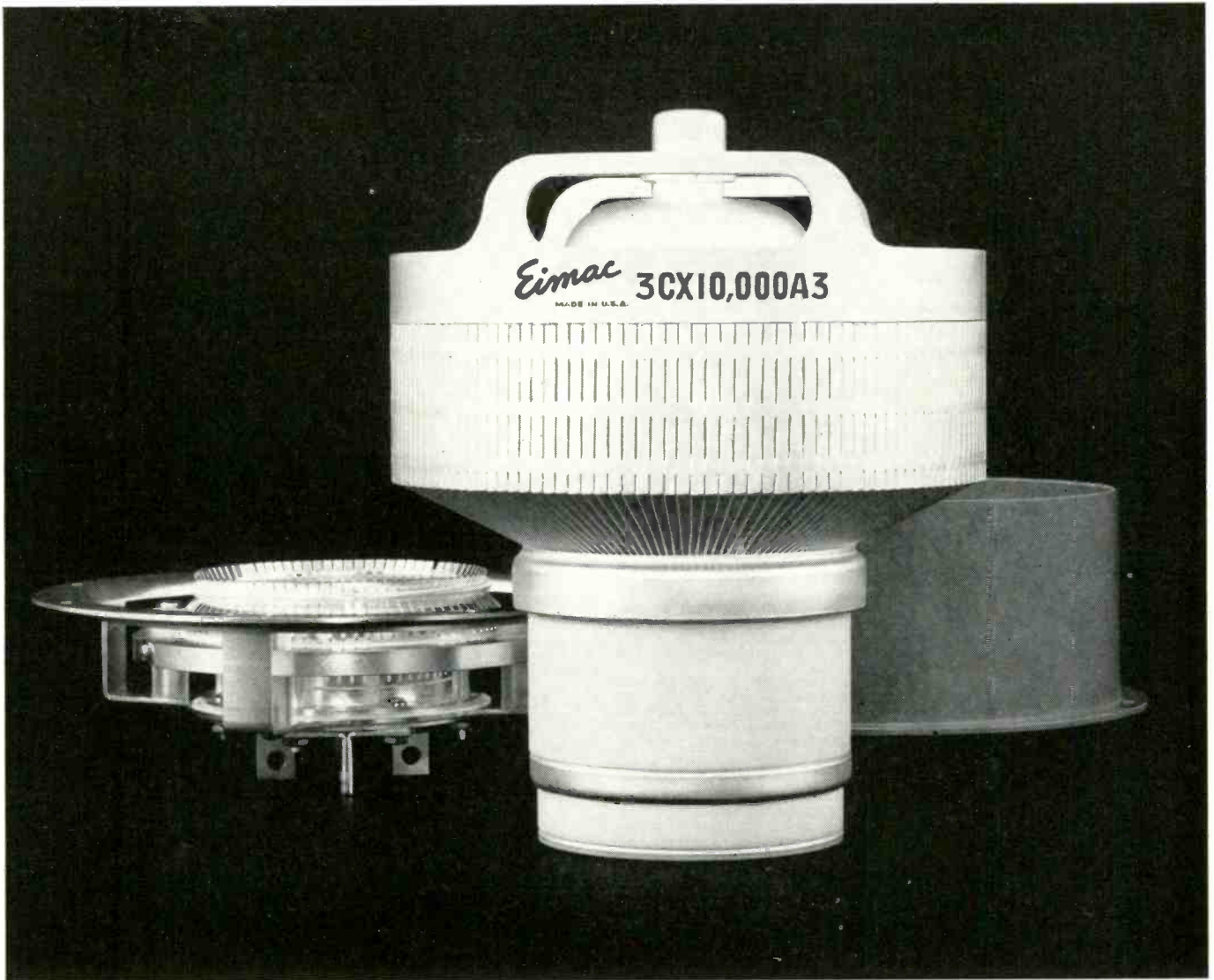
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1960 Directory of Western Electronic Manufacturers

- Sanark St Van Nuys Calif—ST 2-4060—Support Handling Equipment, Propulsion Systems
- △*Consolidated Electrodynamics Corp 360 Sierra Madre Villa Pasadena Calif—C C Snider—2200 Employees—MU 1-8421—Data Recording & Processing Instruments, Analytical & Control Instruments, High Vacuum Equipment
- Consolidated Systems Corp 1500 S Sharnock Ave Monrovia Calif—Frank Chase—420 Employees—EL 9-8211—Data Processing Equipment—Systems Eng'g, Process Control Equipment
- Constantine Engr Lab Co 9593 9th St Cucamonga Calif—YU 2-2688
- Continental Device Corp 12911 Cerise Ave Hawthorne Calif—Duncan Loop—150 Employees—OR 8-4894—High Voltage Diodes, Voltage Regulators
- Continental Electronics Corp 2724 Leonis Blvd Los Angeles 58 Calif—Milton Schindler—55 Employees—LU 2-8101—Tubes
- Control Switch Div Control Co of America 1379 Illinois St El Segundo Calif—Switches, Lighting Equipment & Accessories, Coils
- Convair (Astronautics) Div General Dynamics Corp 5001 Kearny Villa Rd P O Box 1128 San Diego 12 Calif—J R Dempsey—BR 7-8900—Missiles, Missile Guidance Systems & Controls
- Convair (Pomona) Div General Dynamics Corp 1675 W 5th St P O Box 1011 Pomona Calif—C F Horne—5500 Employees—NA 9-5111—Guided Missiles, Electronic Components
- △Convair/San Diego Electronics Div of General Dynamics Corp 3165 Pacific Hwy San Diego Calif—Wm R Rauth—CY 6-6611—Computers, Microwave Components, Amplifiers (Special Purpose)
- Cook Batteries 3850 Olive St Denver 7 Colo—M B Winder—83 Employees—FL 5-3531—Primary & Secondary Silver Zinc Batteries (Automatically & Manually Activated)
- Cook Research Labs P O Box 696 Menlo Park Calif—L H Cook—25 Employees—Em 8-3329—Tools & Metal Components for Aircraft, Missile & Electronic Industry
- △Coors Porcelain Co 600 9th St Golden Colo—L Coulson Hageman—CR 9-2536—Connectors & Terminals, Insulation Materials & Compounds, Insulators
- Corbett Scientific Labs F W 3117 Venice Los Angeles—RE 3-5251
- Corder Co John 1624 1st St N W Albuquerque N M
- Cornell Deep Drawing Co Div Lanes Industries Corp 612-620 Colorado Ave Santa Monica Calif—Perry Smith
- Costello & Co 2740 La Cienga Blvd Los Angeles 34 Calif—Joseph D Costello
- △Craig Corp 3410 S LaCienega Blvd Los Angeles 16 Calif—Howard Luray
- Craig Electronics 3455 Meler St Los Angeles Calif—EX 7-8245
- Crane Electronics Co 4345 Hollister Ave Santa Barbara Calif—WO 7-1193—Pulse Generators, Testers
- Cratex Mfg Co Inc 1600 Rollins Rd Burlingame Calif—J C Craven Jr—Chemicals, Coatings & Related Products
- Crescent Eng'g & Research Co 5440 N Peck Rd El Monte Calif—L L Noble 54 Employees—GI 4-0528—Indicators, Measurement & Test Equipment (Special Purpose), Control Equipment (Industrial)
- Crescent Eng'g Co Western Astronautics Corp Div 4626 Santa Fe San Diego Calif—BR 3-7110—Electronic Components
- Crittenden Transformer Works 13011 S Spring St Los Angeles 61 Calif—E C Kinzy—FA 1-4355—Transformers, Chokes
- Croan Eng'g Co 2019 N Lincoln Ave Pasadena Calif—SY 8-6011
- Cromer Mfg & Eng'g Inc 2138 E 88th St Los Angeles Calif—LU 2-5383
- Crown Eng'g—Electronics 3821 Commercial N E Albuquerque N M
- Crown Rubber Co 333 W Washington Pasadena Calif—MU 1-6465
- Crown Eng'g 3821 Commercial N E Albuquerque N M—J W Hurlbut—50 Employees—DI 4-1423—Circuit Analyzer (Cable Checker), Frequency Selective Voltmeter, Contract Mfg & Eng'g Development
- C T C Mfg Co 11936 Valerio St N Hollywood Calif—TR 7-0955
- Cubex Co 3322 Tonia Ave Altadena Calif—Radio Antennas
- △Cubic Corp 5575 Kearny Villa Rd San Diego 11 Calif—W J Thompson—300 Employees—BR 7-6780—Missile Tracking Systems, Data Translating Equipment, Digital Voltmeter & Automatic Test System
- △*Curtiss-Wright Corp Municipal Airport Sta Santa Barbara Calif—WO 7-3411—Missile Frame & Ground Support Equipment
- *Curtiss-Wright Corp Electronics Div IMI Branch 4401 Lunada Ave S E P O Box 8324 Albuquerque N M—Victor V Myers—24 Employees—AM 8-8791—Solid State Relays & Switching Circuitry, Transistor Test Instruments & Systems, Instrumentation Systems & End Instruments
- Custom Component Switches Inc 3137 Kenwood St Burbank Calif
- Custom Magnetics Inc 2901 Winona Ave Burbank Calif
- C-W Mfg Co Box 2065 El Monte Calif—Quartz Crystals for Frequency Control of Communications Equipment
- Cycle Equipment Co 17510 Farley Rd Los Gatos Calif—EL 4-9959
- Cyclotron Specialties Co P O Box 1000 Moraga—DR 6-4712
- D**
- Dakota Eng'g Inc 4315-17 Sepulveda Blvd Culver City Calif—PL 8-6090
- Daley Electric Co 1825 E Jefferson Phoenix Ariz
- Dallons Labs Inc 5066 Santa Monica Blvd Los Angeles 29 Calif—Oscar Dallons—70 Employees—NO 4-1951—Crystals, Delay Lines, Medical Equipment
- Dalmotor Div Yuba Consolidated Inc 1375 Clay St Santa Clara Calif—C B O'Neal—125 Employees—CH 3-9414—Motors & Generators, Converters, Airborne Instrumentation
- Dalmotron Co 534 Laurel St P O Box 741 San Carlos Calif—Paul L Beale Dalmotron & Talkmaster Intercommunication Equipment
- △*Dalmo Victor Co 1515 Industrial Way Belmont Calif—Geo C Stewart—875 Employees—LY 1-1414—Airborne Radar Antenna, MAD Equipment, Sonar
- Darco Industries Inc 2151 E Rosecrans Ave El Segundo Calif—J C Chapin—156 Employees—OR 8-2251—Gyroscopes, Aircraft Values & Actuators, Electronic Assemblies
- Darling Technical Labs 1015 W Victoria St Costa Mesa Calif—LI 8-5451
- Data Instruments 12838 Saticoy St N Hollywood Calif—R E Poole—250 Employees—ST 7-8181—Film & Oscilloscope Reading Systems, Electro-Mech Counters, Tape Performers & Control Devices
- *Data Systems Dept Norden Div/United Aircraft Corp 13210 Crenshaw Blvd Gardena Calif—W H Saylor—120 Employees—FA 1-1775—Automatic Data Handling Systems, Machine Tool Control Systems
- Data Technology Inc 1122 E San Mateo SE Albuquerque N M—Edward P Brooks—2 Employees—Control Equipment (Industrial), Power Supplies & Converters, Amplifiers (Special Purpose)
- Datex Corp 1307 S Myrtle Ave Monrovia Calif—Michael J Joncich—80 Employees—Computers, Military Systems (Eng'g)
- Datran Div Automation Industries Inc 1836 Rosecrans Ave Manhattan Beach Calif—Corwin Denney—OS 5-7131—Indicators, Aviation Auxiliary Electronic Equipment, Measurements & Test Equipment (Special Purpose)
- Davidson Optronics 2223 Romana Blvd W Covina Calif
- Davies Moulding Co Harry 3121 E 12th St Los Angeles Calif—AN 1-0165—Mfg of Knobs
- Davis Electronics 630 S Flower St Burbank Calif—VI 9-1815
- Davis Wire & Cable 2226 Santa Fe Ave Los Angeles Calif
- Day-Ray Products Inc 1133 Mission St S Pasadena Calif—Willie D Adams—20 Employees—Lighting Equipment & Accessories
- △*Daystrom Pacific/Div Daystrom Inc 9320 Lincoln Blvd Los Angeles 45 Calif—Alan G Richards—App 500 Employees—OR 4-7100—Potentialmeters, Gyroscopes, Airborne Instruments
- *Daystrom Systems Div Davstrom Inc Miramar Rd La Jolla Calif—John A Palmer—88 Employees—GL 4-0421—Digital Computers for Control & Data Reduction, Systems Engineered Digital & Magnetic Equipment
- Decimeter Products Co Star Route Box 67 Littleton Colo—Harvey L Waters—NA 9-4703—Chemicals (Coatings & Related Products), Dials & Front Panel Accessories
- Decker Corp 3522 Geary Blvd San Francisco Calif—SK 2-0846—Instruments & Systems for Static & Dynamic Measurement & Control of Capacitance, Pressure, Displacement, etc
- Decoursey Eng'g Lab 11828 W Jefferson Blvd Culver City Calif—W E Decoursey—EX 7-9668—Filters, Coils, Chokes
- Deeco Instruments 14737 Arminta St Van Nuys Calif—TR 3-2932
- De Cuir Sample Case Co 4012 Broadway PI Los Angeles Calif—AD 3-4185
- Del Mar Eng'g Labs 6901 Imperial Hwy Los Angeles Calif—GR 8-8251
- Deltron Co Inc 5224 Southern Ave South Gate Calif—LO 7-2477
- Delsen Corp 719 W Broadway Glendale 4 Calif—Leland E McCrory—CH 5-8517—Services (Industrial), Indicators, Measurement & Test Equipment (Special Purpose)
- △Delta Design Engineers Inc 3163 Adams Ave San Diego Calif—GL 4-1185
- Delta Mfg Co 1137 W Hilton Phoenix Ariz
- Deltron Co 14736 Arminta St Van Nuys Calif—ST 6-3613
- Dement Labs 5918 S E 72nd Ave Portland Ore—Dr Jack DeMent—PR 5-2373—Amplifiers (Special Purpose), Control Equipment (Industrial)
- Demolab Corp 1550 N Highland Hollywood Calif
- △DeMornay-Bonardi 780 S Arroyo Pkwy Pasadena Calif—L Della Penna—App 100 Employees—SY 2-4142—Microwave Lab Test Equipment Components
- Desco Mfg Co 551 W Glenoaks Blvd Glendale Calif—CI 1-9560
- Dessert Lab 3309 Clay St Newport Beach Calif
- Destron Co 25914 Chalmette Rolling Hills Est Calif—Dr E St John—1 Employee—FR 8-3450—Control Equipment (Industrial), Communication Systems, Relays
- Detroit Controls Research Dept 1650 Broadway Redwood City Calif—Les Elmore
- Detronic Corp 929 Baker St Costa Mesa Calif
- △Deutsch Co Electronic Components Div Municipal Airport Banning Calif—Donald R Lea—PL 1-4131—Connectors & Terminals, Hardware
- Deutsch Fastener Corp 14504 S Figueria St Box 61072 Los Angeles Calif—DA 3-6640—Missile Frame & Ground Support Equipment
- Developmental Electronics Corp 4213 S Broadway Los Angeles 38 Calif—A S Jimenez—25 Employees—AD 4-7751—Delay Lines, Pulse Transformers, Chokes
- Development Instrumentation Calibration Automation Inc 11645 McBean Dr El Monte Calif—CU 3-1087—Precision Electronic Assemblies, Prototypes, Pilot Orders
- Devices Unlimited 1209 E El Segundo Calif—OR 8-9709
- Digital Instrument Labs 152 S Atlantic Blvd Los Angeles Calif—RA 3-4214
- Digitran Co/Div Endevo Corp 45 W Union Pasadena Calif—J M Reitzell—120 Employees—RY 1-5231—Digital Actuators, Switches, Counters
- Dikewood Corp 4805 Manual Blvd N E Albuquerque N M—AM 8-2487—Operations Research, Systems Analysis
- Dirigo Compass & Instrument Co Boeing Field Box 37 Seattle 8 Wash—H V Wenger Jr—PA 3-5940—Aviation Auxiliary Electronic Equipment, Services (Industrial)
- Disclosures Inc 11695 Bonita Dr Arlington Calif
- Dollar Co Robert 50 Drum St San Francisco 11 Calif—R W Bunce—EX 2-8454—Radio Paging Transmitter & Pocket Receivers, Base Station Equipment for Civil Defense Purposes
- Dondar Devices 2748 Jackson Hwy Medford Ore
- Donel Co P O Box 7013 Portland Ore
- Don-Lan Electronics Co 1101 Olympic Blvd Santa Monica Calif—Harold W Arlidge—EX 3-0758—Antennas (Commercial), Microwave Components, Switches
- △Donner Scientific Co 888 Galindo St Concord Calif—MU 2-6161—Accelerometers, Analog Computers, Electronic Test Equipment
- Doozey Co J K 3215 Western Ave Seattle Wash
- Dorco Electronics 108 N Central Compton Calif—NE 6-5522
- Double "E" Product Co 208 Standard St El Segundo Calif—J S Trier—30 Employees—Filters, Capacitors (Fixed), Coils
- Double T Products Co 310 Arcacia Ave Hawthorne Calif—OR 8-1557
- Douglas Aircraft Co Inc 3000 Ocean Park Blvd Santa Monica Calif—EX 9-9311
- Dow Elco Inc 1313 W Olympic Blvd Montebello Calif—RA 3-1288—Missile Ground Support & Handling
- △Dressen-Barnes Corp 250 N Vinedo Ave Pasadena Calif—P K Bennett—97 Employees—SY 5-7731—Regulated & Unregulated D C Power Supplies
- Dresser-Ideco Co 8909 S Vermont Ave Los Angeles Calif—PL 8-4194—Microwave Towers
- D R Ltd 402 E Gutierrez St Santa Barbara Calif—B C Rogers—WO 3116—Filters, Motors, Generators & Blowers, Power Supplies & Converters
- Dumont Aviation Associates 1401 Freeman Ave Long Beach Calif—Warhead & Nose Cone Equipment
- *DuMont Labs Inc Allen B 11800 Olympic Blvd Los Angeles Calif—R F Feland—90 Employees—GR 7-4271—Amplifiers, Analyzers, Calibrators
- Duval Electronics Inc 1222 W Washington Blvd Los Angeles 7 Calif—C Merle Brooks
- △Dymec Inc 395 Page Mill Rd Palo Alto Calif—Thomas J Smith—205 Employees—AD 6-1755—Counters, Measurement Equip, Microwave Equip
- Dymo Corp 2546 Tenth St Berkeley 10 Calif—Dials & Front Panel Accessories, Tools (Hand)
- Dynachrome Labs 2939 Carlsbad Blvd Carlsbad Calif—PA 9-2215—Printed Circuit Boards, (Design & Production)
- Dynair Electronics Inc P O Box 1103 El Cajon Calif—HI 4-7737—Electronic Products & Research, Television Products
- Dynalysis Dev Labs Inc 1375 Clay Santa Clara Calif
- Dynamatic Inc 2955 E Colorado Blvd Pasadena Calif
- Dynamic Air Eng'g Inc 7412 Maie Ave Los Angeles 1 Calif—H E Lever—LU 8-3292—Motors, Generators & Blowers
- Dynamics Instrumentation Co/Div Alberhill Corp 1118 Mission St S Pasadena Calif—Nathan Brownstone—20 Employees—RY 1-3318—Instrumentation Amplifiers, D C Microvoltmeters, Electronic Filters
- Dynamic Air Eng'g Inc 7412 Maie Ave Los Angeles Calif—LU 8-3292
- Dynatron Cable Eng'g Corp 128 San Fernando Rd Los Angeles Calif—CA 5-5513
- Dyna-Therm Chemical Corp 3813 Hoke Ave Culver City Calif—UD 0-4751—Missile Materials & Metals
- E**
- Eberline Instrument Corp 805 Early St Santa Fe N M—Francis S Smith Jr—135 Employees—YU 2-1881—Portable Survey Monitoring Instruments—Fixed Area Monitoring Instruments, Radiation Detection—Measuring Devices
- Eckel Valve Co 1425 1st St San Fernando Calif—EM 1-6251
- ECM Corp 8160 Orion Ave Van Nuys Calif—Richard G Andrew—6 Employees—ST 2-9901—Etched Circuits, Terminal Boards
- Eclipse Eng'g Co 3046 Fletcher Dr Los Angeles Calif—CL 7-3478
- Edcliff Instruments 1771 S Mountain Ave Monrovia Calif—J R Thompson 125 Employees—EL 8-4571—Accelerometers (A C & D C), Pressure Transducers (A C & D C), Linear Potentiometers
- *Edgerton Gernsmausen & Grier Inc 1622 S "A" St P O Box 1912 Las Vegas Nev—Robt A Lusk—80 Employees—Nuclear Products, Measurement & Test Equipment (Special Purpose), Military Systems Engg
- Ederer Eng'g Co 2943 1st Ave S Seattle Wash
- △E-H Research Labs 1922 Park Blvd Oakland Calif—John C Hubbs
- Eir Corp 5177 Overland Ave Culver City Calif—UP 0-7601—Voca Differen-



UNIQUE NEW EIMAC 3CX10,000A3 CERAMIC TRIODE OFFERS VHF POWER—UP TO 20 KW

Eimac expands its ceramic tube line with the introduction of the 3CX10,000A3—the only 10 kilowatt air-cooled ceramic triode in the field. This advanced power tube is intended for use at maximum ratings through 110 megacycles.

An outstanding feature of this clean, efficient ceramic triode is the large reserve of grid dissipation assured by platinum-clad tungsten grid wires. Overload protection has also been built into the 3CX10,000A3 to make it ideal for use in industrial heating—dielectric and induction.

This newly developed triode is also well suited for such applications as broadcast, FM and single-sideband transmitters, ultrasonic generators and sonar pulse amplifiers. It can also be used as a class-AB₂ or class-B linear amplifier in audio or r-f service.

A companion air-system socket and chimney, as shown above, is available with the 3CX10,000A3 to meet your specific requirements. Watch for a low mu version of this high-power triode in the near future.

GENERAL CHARACTERISTICS

EIMAC 3CX10,000A3 CERAMIC TRIODE	Height	Diameter	Max. Operating Temp.	Filament Voltage	Filament Current	Frequency for Max. Ratings	Max. Plate-Diss. Rating
	8.25"	7.0"	250°C.	7.5	102 amp.	110 Mc.	10,000 watts

EITEL-McCULLOUGH, INC.
San Carlos, California

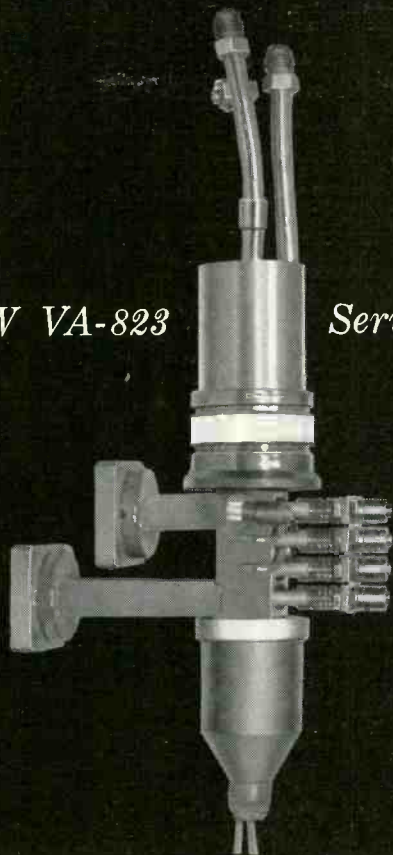


1960 Directory of Western Electronic Manufacturers

- tial Voltmeter, AC & DC Constant Impedance Decade, Regulated Power Supplies
- △Eitel-McCullough Inc 301 Industrial Way San Carlos Calif—Berkley J Baker—2000 Employees—LY 1-1451—Tubes, Rectifiers, Electron Tube Accessories
- Eitel-McCullough Inc 798 San Mateo Ave San Bruno Calif—JU 8-1212
- △Eitel-McCullough Inc 1678 Pioneer Rd Salt Lake City Utah
- Ekeradio Electronic Div 650 N Fair Oaks Pasadena Calif—SY 2-5378
- Elco Pacific 2200 Centinela Ave W Los Angeles 64 Calif—Lea Kagan—GR 8-0671—Connectors & Terminals
- Eldema Corp 1805 Belcroft Ave El Monte Calif—J A Moore—26 Employees—GI 4-7077—Dials & Front Panel Accessories
- Eldorado Electronics Co 2821 10 St Berkeley 10 Calif—H J Lewenstein—TH 1-4613—Amplifiers (Special Purpose), Analyzers, Nuclear Products
- Elco-Elec Communications Co 202 Fillmore Phoenix Ariz
- Elcor Products Inc 690 S Arroyo Pkwy Pasadena Calif—MU 1-9020
- Eldema Corp 1805 Belcroft Ave El Monte Calif—CU 3-3498
- Electrical Service Co 1271 Mission St San Francisco Calif—F M Boyce—UN 1-2245—Control Equipment (Industrial), Photoelectric Equipment, Control Equipment (Industrial)
- △Electrical Specialty Co 2820 E 12th St Los Angeles 23 Calif—David E Brown
- Electrical Specialty Co 158 11th St San Francisco 3 Calif—Wm T Martin
- *Electric Autolite Co 505 E Rosecrans Ave Gardena Calif—FA 1-2184—Wire & Cable, Electronic Magnet, Anodized Aluminum Products
- Electric Cords & Supply Corp 413 E 3rd St Los Angeles Calif—MA 8-2278—Missile Ground Handling & Checkout Equipment
- Electric Eye Equipment Co 1518 Belleville Way Sunnyvale Calif
- Electric Mfg Co Inc 1345 Howard St San Francisco Calif
- Electrical Eng'g & Mfg Corp 4612 W Jefferson Blvd Los Angeles Calif—RE 3-0151
- Electrical Products Corp 950 30th St Emeryville Calif—OL 5-9300
- Electro-Alarm Safety Devices 745 Pleasant Fresno Calif—AM 4-6894
- Electro-Board Inc 620 Terminal Way Costa Mesa Calif—LI 9-3632
- Electro-Capacitors Co Inc 10132 Edes Ave Oakland Calif—LO 8-7910—Missile Guidance Equipment, Tracking & Telemetering
- *Electro-Ceramics Inc 2645 S 2nd W Salt Lake City Utah—R D Hess—60 Employees—HU 5-8081—Piezoelectric Ceramics & Crystals, Transducer Assemblies
- Electro Circuits Inc 401 E Green St Pasadena Calif—SY 3-8169
- △Electro Cords Co 4020 Avalon Blvd Los Angeles Calif—Robt A Clifford
- *Electrodota Div Burroughs Corp 460 Sierra Madre Villa Pasadena Calif—R G Dee—SY 3-6121—Computers, Control Equipment (Industrial)
- Electro Development Co 14701 Keswick St Van Nuys Calif—Ray Vaccarello—55 Employees—ST 6-3660—Slipping & Brushholder Assemblies, Commutators, High Speed & Manual Operated Miniature Rotary Switches
- Electro Development Corp 3939 University Ave Seattle Wash—ME 3-3094
- Electrodyne Corp 503-a S McClay Santa Ana Calif—KI 7-6204
- △Electro Engg Works 401 Preda St San Lenardo Calif—Rex E Brooks—148 Employees—LO 9-3326—Transformers, Reactors, High Voltage Power Supplies
- Electro-Etch Circuits Inc 7112 S Victoria Ave Los Angeles 43 Calif—Robt Taylor—PL 2-6111—Printed Circuits, Services (Industrial)
- Electro-Fabricators 11672 McBean Dr El Monte Calif—GI 3-1242
- Electrofilm Inc 7116 Laurel Canyon Blvd N Hollywood Calif—Ralph E Crump—PO 5-4420—Chemicals (Coatings & Related Products) Industrial Electronic Equipment, Antenna Accessories
- Electroform Inc 7356 Santa Monica Blvd Los Angeles Calif—HO 7-5509
- Electrographic Labs Box 2433 S Annex Van Nuys Calif—TR 3-4961
- △Electro Instruments Inc 3540 Aero Court San Diego 11 Calif—R T Applin—250 Employees—BR 7-6590—Amplifiers, Calibrators, Circuits
- Electro-Logic Corp 515 Bocaccio Ave Venice Calif—David Van Minden—5 Employees—Computers, Control Equipment (Industrial), Meters (Electrical Measurement)
- Electrol Inc 9000 W Pico Blvd Los Angeles Calif—BR 2-6010—Missile Ground Support & Ground Handling
- Electromation Co 1646 18th St Santa Monica Calif—EX 5-9975—Miniaturized Recording Equipment, Data Handling Equipment, Navigational Computers
- Electro-Measurements Inc 7524 S W Macadam Portland 19 Ore—Douglas C Strain—80 Employees—CH 6-3331—Bridges & Accessories, Decade Voltage Dividers, Decade Resistors and Capacitors
- Electro-Mechanical Specialties Co 407 N Maple Dr Beverly Hills Calif—James Goodman—BR 2-9459—Relays
- △Electro-Mechanical Specialties Co Inc 528 W Lambert Rd Whittier Calif—James Goodman
- Electrome Co 5121 San Fernando Los Angeles Calif
- Electrone Corp 915 River Lane Santa Ana Calif—KI 2-0832
- Electronic Assemblies Corp 421 S Pasadena Calif—SY 2-2748
- Electronic Coil Co 2506 Ontario Burbank Calif—VI 9-3895
- Electronic Coil Engineers 5830 Main Hollydale Calif—NE 6-4333—Precision Coil Winding
- Electronic Communications Inc 4475 Vineland N Hollywood Calif—TR 7-0738
- Electronic Components Div Telecomputing Corp 14706 Armita St Van Nuys Calif—H E Wardein—60 Employees—ST 5-1581—Transformers, Power Supplies & Converters, Capacitors (Fixed)
- Electronic Contractors Inc 2101 SE 6th Ave Portland 14 Ore—Dr Dolph Craig—BE 4-3515—Computers
- *Electronic Control Systems 2231 S Barrington Ave Los Angeles 64 Calif—James Vrungos—50 Employees—BR 2-7711—Numerical Controls for Machine Tools, Automatic Gauging & Inspection Machines
- △Electronic Enclosures Inc 3629 Holddrege Los Angeles 16 Calif—Michael M Jacobs
- △Electronic Eng'g Co of Calif 1601 E Chestnut St Santa Ana Calif—R F Lander—225 Employees—KI 7-5501—Amplifiers, Power Supplies, Telemetering Systems
- Electronic Engineering Co Instrumentation Systems & Test Equipment 614 G St San Diego Calif—BE 4-5978
- Electronic Instruments Service 8907 S Vermont Ave Los Angeles Calif—PL 8-1098
- Electronic Lab 1968 1/2 Laurel Canyon Blvd Los Angeles Calif—OL 4-2921
- Electronic Machine Products Inc 134 Industrial Way Costa Mesa Calif—LI 8-6701
- Electronic Mfg Corp 227 W Chestnut Ave Monrovia Calif—EL 8-6149
- Electronic Micromolding Co 2219 Main St Santa Monica Calif—EX 9-7890
- Electronic Plastics Co Box 434 Northridge Calif
- △Electronic Plating Service Inc 8723 Melrose Ave West Hollywood 46 Calif—Lee Davis
- Electronic Processes Corp of Calif 436 Bryant St San Francisco 7 Calif—A F Hogland—40 Employees—EX 7-3881—Temperature Controls (Electronic On-Off & Electronic Proportional), Resistance Bulb Sensing Elements
- △Electronic Production & Development 501 N Prairie Ave Hawthorne Calif—Leonard A Dodge—OR 8-7642—Chemicals (Coatings & Related Products) Industrial Electronic Equipment, Wire & Cable
- *Electronic Research Assoc Inc 1760 Stanford St Santa Monica Calif—Bob Bowditch
- Electronics Components Inc 12838 Saticoy St N Hollywood Calif—Roland King—52 Employees—ST 7-8181—Relays, Capacitors, Magnetic Amplifiers
- Electronics Development Co Inc 3743 Cahuena Blvd N Hollywood Calif—Joseph H Leaming—20 Employees—ST 7-3223—Microwave Sound Subcarrier Systems, Wideband Data Transmission Systems, Low Power Broadcast Television Transmitters
- Electronics Int'l Co 145 W Magnolia Blvd Burbank Calif—J E Markley Jr—15 Employees—VI 9-2481—Precision Power Oscillators, AC Power Generators
- Electronic Seals Co Inc 7327 Varna Ave N Hollywood Calif—Wendell L Mattsen—8 Employees—ST 7-7415—Glass-to-Metal Hermetically Sealed Connectors, Headers & Feed-thru Terminals
- Electronics of Northern California P O Box 665 San Bruno Calif—JU 9-0181
- △Electronic Seals Inc 13766 Saticoy St Van Nuys Calif—C J Lombard
- Electronics Sealing Inc 5090 Alhambra Ave Los Angeles Calif—CA 5-2324
- Electronic Specialty Co 5121 San Fernando Los Angeles Calif—CH 5-3771
- Electronic Systems 7309 Varna Ave N Hollywood Calif—PO 5-4185
- Electronic Systems Div Telecomputing Corp 12838 Saticoy St N Hollywood Calif—TR 7-8181—Pulse Coding & Decoding, I F F Radar, Reader Beacons
- Electronic Systems Development Corp 1484 E Main St Ventura Calif—Charles Antoniak—50 Employees—MI 8-1827—Analogue & Digital Systems, Instrumentation & Ground Checkout, Solid State Devices
- Electronic Systems 7412 Varna Ave N Hollywood Calif—Ralph B Carter—10 Employees—PO 5-4185—Sound Systems, Inter-Communications & Hearing Aids
- △Electron Products Co/Div Marshall Ind 430 N Halstead Ave Pasadena Calif—Richard F Hastings—90 Employees—RY 1-0666—Connectors, Radio Interference & Noise Filters
- Electro-Optical Instruments 2612 E Foothill Pasadena Calif—SY 6-3405
- Electro-Physics Labs 2065 Huntington Dr San Marino Calif—Walter Gauik—5 Employees—RY 1-6781—Connectors & Terminals, Microwave Components, Wire & Cable
- Electro Products Div Western Gear Corp 132 W Colorado St Pasadena Calif—T W Yeakle—110 Employees—MU 1-6604—Motors & Generators & Blowers, Hardware, Military Equipment
- △Electro-Pulse Inc 11861 Teale St Culver City Calif—J E Niebuhr
- △Electro Scientific Ind Inc—7524 S W Macadam Ave Portland 19 Ore—James Kirwan—CH 6-3331—Measurements & Test Equipment (Bridges), Resistors & Volume Controls, Capacitors (Fixed)
- Electrosolids Corp 13745 Saticoy St Panorama City Calif—Gerald J Widawsky—135 Employees—ST 2-1410—Power Supplies for Missiles & Aircraft, Interphone Amplifiers, Headset Adapters
- Electro-Sonic Inc 4553 Seville Ave Los Angeles Calif
- Electrosonic Mfg Co 1719 Harmil Way San Jose 25 Calif—F A Butterworth—3 Employees—AN 6-6716—Special Record Players, Twin Jacks, Speaker Extension Cords
- Electrosystems Inc P O Box 551 Alhambra Calif
- Electro-Switch & Controls Inc 5755 Camille Ave Culver City Calif—J K Brose—40 Employees—TE 0-4643—Relays
- Electro Tech Enn'n Co 308 S Hindry Ave Inglewood Calif—OR 4-4260
- Electro-Winders Co Inc 854 W Front St Covina Calif—ED 2-6207—Coils, Toroids, Chokes
- Elgenco 1555 14th St Santa Monica Calif—Duane E Beecher—2 Employees—EX 3-3023—Computers, Measurement & Test Equipment (Generators)
- △Elin Div Int'l Electronic Research Corp 145 W Magnolia Blvd Burbank Calif—John R Foster—15 Employees—VI 9-2481—Power Supplies & Converters, Amplifiers (Audio), Measurement & Test Equipment (Oscillators)
- Eliff Eng'g & Mfg Co 15342 Pimenta Ave Paramount Calif—ME 0-3000
- Elliott Electronics Inc 418 N 4th Tucson Ariz
- Elison Eng'g Co 4530 San Fernando Rd Glendale Calif—CI 1-8501
- Eltronics Inc ALWAC Computer Div 13040 South Cerise Ave Hawthorne Calif—OR 8-5774
- El Ray Motor Co 11747 Vose St N Hollywood Calif—TR 7-3351
- E M J Mfg Co 760 Reed Santa Clara Calif—CH 8-0700
- Empcor 101 W Verdugo Ave Burbank Calif—VI 9-3147
- Empire Tool & Eng'g Co 3125 N Castro Tucson Ariz
- Empire Vacuum Products 12211 Brantford Sun Valley Calif
- Emsco Mfg Box 2098 Terminal Annex Los Angeles Calif
- Endeco Eng'g Development Co of Los Angeles 11148-50 Wilmington Blvd Wilmington Calif—Carl W Witt—9 Employees—TE 5-7271—Marine Radiotelephones, Antennas & Receivers
- △Endevco Corp 161 E California Blvd Pasadena Calif—Warren D Hancock—100 Employees—RY 1-5231—Piezoelectric Accelerometers (Subminiature), Pressure & Force Pick-ups, Subminiature Amplifiers—Airborne
- Enfab Inc 312 E Bokaw Rd San Jose Calif—H Paul Sherlock—50 Employees—CV 5-1801—Hardware, Chassis (Accessories, Fuses, Shielding), Insulation Materials & Components
- △Engineered Electronics Co 1441 E Chestnut Ave Santa Ana Calif—Thomas W Gaul—50 Employees—KI 7-5651—Computers, Amplifiers (Special Purpose), Services (Industrial), Printed Circuits
- Engineered Instruments Inc 22815 Suro St Hayward Calif—George C Lydiken—55 Employees—JE 7-1545—Amplifiers, Boxes, Cabinets
- Engineering Inc 4315-17 Sepulveda Blvd Culver City Calif—PL 8-6090
- *Eng'g Magnetics Div Gulton Industries Inc 13041 Cerise Ave Hawthorne Calif—James Alexakis—125 Employees—OR 8-7608—Static Inverters for Missile Applications, DC to DC Converters, AC to DC Power Supplies
- Environmental & Development Labs Inc 1368 W 11th St Long Beach Calif
- Eoff Electric Co 556 Charnelton St Eugene Ore
- Eoff Electric Co 509 N W 10th St Portland Ore
- △Epsco-West 240 E Palais Rd Anaheim Calif—Thomas Gaul
- Era Engg Inc 1009 Montana Ave Santa Monica Calif—Harold D Hutchinson—5 Employees—EX 5-9995—Acceleration Switch, Material Erosion, Rate Instrument, Transport Shock Recorder
- *Era Pacific Inc 1760 Stanford St Santa Monica Calif—R S Bowditch—22 Employees—EX 3-0511—Transistorized Power Conversion Devices, High & Low Voltage Supplies, High Current Supplies
- Eric Engg Co 1823 Colorado Ave Santa Monica Calif—Bob Mueller—25 Employees—EX 3-9610—Amplifiers P A Systems, Tuners
- △Erie Pacific Div Erie Resistor Corp 12932 S Weber Way Hawthorne Calif—G R Fryling—18 Employees—Measurement & Test Equipment (Counters), Computers, Control Equipment (Industrial)
- Erickson Products Co 1906 Carroll Ave San Francisco Calif—DE 3-3447
- Erikson Specialized Tool Co P O Box 424 Pico Calif—Jerry R Erikson—10 Employees—OX 9-3719—Electronic Hand Tools, Soldering Tools for Wiring, Printed Circuits
- Ernitron Corp 1742 S Crenshaw Blvd Torrance Calif—Precision Synchros, Resolvers, Tachometers
- ESCO Group Div Electronic Specialty Co 5121 San Fernando Rd Los Angeles 39 Calif—T R Cataldo—CH 5-3771—Power Supplies & Converters, Aviation Auxiliary Electronic Equipment, Antenna Accessories
- Escollite Corp 4217 W Jefferson Los Angeles Calif—RE 1-2230
- ESI Inc 7524 S W Macadam Ave Portland 1 Ore—Laurence A Morin—80 Employees—CH 6-3331—Null Amplifiers, Attenuators, Bridges
- Essex Electronics 2979 N Ontario Burbank Calif—VI 9-2414
- Essex Wire Corp 1075 N Patt St Anaheim Calif
- Etching Co of Calif 1208 Howard St San Francisco 3 Calif—Harry Scott—26 Employees—Dials & Front Panel Accessories, Printed Circuits, Hardware
- Ets-Hokin & Galvan 218 N Avalon Blvd Wilmington Calif—E D Smith—TE 5-5601—Cabinets, Racks, Panels & Accessories, Services (Industrial), Motors, Generators & Blowers
- △Eubanks Eng'g Co 260 N Allen Ave Pasadena Calif—Edward F Eubanks
- Everetts Electronics 1122 Shasta St El Monte Calif—GI 3-2554
- Everlube Corp 6940 Farmdale Ave N Hollywood Calif—TR 7-7101—Missile Ground Support & Handling Equipment

NEW VA-823

Series Klystrons



VARIAN IS DELIVERING THE HIGHEST CW POWER AT X-BAND

5 kilowatts CW • 7.5 to 10.0 kMc • Noise 100 db below carrier*
50 db gain • 20 Mc bandwidth • Tunable 100 Mc**

Conservatively rated at 5 kilowatts CW in operational environments, the VA-823 has produced over 20 kilowatts CW under test conditions. In system use these tubes are providing extremely low noise performance for refined CW radar and communications. They open a new area of design possibilities in microwave radar, communications, and radio astronomy. To assist you in your particular system design problems, Varian makes available its broad experience in super-power tubes at UHF and microwave frequencies. May we work with you or furnish further data?

*AM and FM noise is more than 100 db below the carrier in any 1 kc channel more than 1 kc removed from the carrier.
**Tubes in the range from 9.0 to 10.0 kMc tune 200 Mc.

Representatives thruout the world



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KLYSTRONS, WAVE TUBES, GAS SWITCHING TUBES, MAGNETRONS, HIGH VACUUM EQUIPMENT, LINEAR ACCELERATORS, MICROWAVE SYSTEM COMPONENTS, NMR & EPR SPECTROMETERS, MAGNETS, MAGNETOMETERS, STALOS, POWER AMPLIFIERS, GRAPHIC RECORDERS, RESEARCH AND DEVELOPMENT SERVICES

1960 Directory of Western Electronic Manufacturers

Exactel Instrument Co 185 Evelyn Ave Mountain View Calif—YO 8-6558—Instruments, Servo-Instruments
 Exactel Instrument Co 5545 Eva Ave Los Altos Calif—YO 8-5404
 Exact Eng'g & Mfg Inc 2375 Canyon Dr Oceanside Calif—George A Brush—38 Employees—SA 2-2144—Computers, Control Equipment, Controls
 Excel Transformer Co 2567 38th Ave Oakland Calif
 E-Z Way Templates P O Box 535 Reseda Calif—Warren Juran—Drafting Aids for the Electronic Industry

F

Faber Mfg Co 35 Stillman St San Francisco Calif—EX 2-7302
 Fabrication Labs Inc 1209 E El Segundo El Segundo Calif
 Fabrodynamics Inc 15524 S. Broadway Gardena Calif—FA 1-2454
 *Fairchild Controls Corp 6111 E Washington Blvd Los Angeles 22 Calif—D C Manning—170 Employees—RA 3-5191—Precision Potentiometers, Accelerometers, Pressure Transducers
 Fairchild Engine & Airplane Corp Stratons Div Manhattan Beach Calif
 ΔFairchild Semiconductor Corp 545 Whisman Rd Mountain View Calif—T H Bay—YO 8-8161—Semiconductors
 Falcon Tech Products Corp 6610 Santa Monica Blvd Hollywood Calif—HO 7-8682
 Farinon Electric Co 416 D St Redwood City Calif—H B Sutton—Transmitters, Receivers (Communication), Communication Systems
 Farnsworth Electronics 815 San Antonio Palo Alto Calif—YO 7-7249
 Fast Pak Co 1559 105 Ave Oakland Calif—NE 8-9295
 Fearonics 1083 American St San Carlos Calif

Federal Equipment Co 38 Brady St San Francisco 3 Calif—R W Randolph—Approx 25 Employees—UN 3-3607—Photoelectric Traffic Counting Equipment, Printing Counter Recorder Units
 Federal Mogul Bearings Inc Arrowhead Products Div 2300 Curry St Long Beach Calif—NE 6-0571
 Federal Pacific Electric Co 333 Brookway Santa Clara Calif—AX 6-8366
 *Federal Telecommunication Labs Div III 937 Commercial St Palo Alto Calif—W S Chaskin—YO 8-1616—Filters, Transformers, Communication Systems
 Felker Mfg Co Torrance Calif—Larry Michaux—100 Employees—FA 8-4704—Production Machinery & Equipment, Chemicals (Coatings & Related Products), Materials (Raw)

Felthousen Audio Service 17609 Chatsworth St Granada Hills Calif—Robt A Felthousen—EM 3-1451—Services (Broadcast)
 Ferro-Magnetics Co 989 Commercial St Palo Alto Calif—S J Henke—11 Employees—DA 1-5141—Chokes, Delay Lines, Filters
 Field Emission Corp 210 North Ford McMinnville Ore—Stanton Bennett
 Filter-King 3310 Balboa San Francisco Calif
 Filters Inc 13273 Ventura Blvd Studio City Calif—TR 3-2770—Miniature & Sub-Miniature Relays
 ΔFiltron Co Inc 10023 W Jefferson Blvd Culver City Calif—Wm M Lana—75 Employees—VE 9-2206—Capacitors, Chokes, Filters

*Firestone Tire & Rubber Co Guided Missile Div 2525 Firestone Blvd Los Angeles Calif—LU 3-4411
 Fischer & Co R A 517 Commercial St Glendale 3 Calif—Medical Electronic Equipment
 Fisher Berkeley Corp 4224 Holden St Emeryville 8 Calif—R S Fisher—OL 5-9696—Sound Systems, Intercommunicators & Hearing Aids, Amplifiers (Audio), Communication Systems

Fisher Research Lab Inc 1975 University Ave Palo Alto Calif—E A Feichtmeir—48 Employees—DA 2-4646—AC & DC Millivoltmeters, Pipe & Cable Finders, Leak Detectors
 Fiske Mfg Co 1619 Pine St San Francisco Calif
 Flexo Inc 7856 Salt Lake Huntington Park Calif
 Flite-Tronics Inc 3312 Burton Ave Burbank Calif—TH 2-2887
 Flotron Industries Inc 301 E Regent St Inglewood Calif—OR 8-0777—Chassis Holders, Card Holders, Vises
 ΔFluke Mfg Co Inc John 1111 W Nickerson St Seattle 99 Wash—92 Em-

ployees—AT 2-5700—Voltmeters, Power Supplies, Electronic Wattmeters

Fluor Corp P O Box 7030 E Los Angeles Sta Los Angeles Calif
 Food Machinery & Chemical Corp 1105 Coleman San Jose Calif
 Ford Eng'g Co Inc 129 "A" St Upland Calif—YU 2-4859

Ford Motor Co Computer Div 2701 Hal-lady Santa Ana Calif
 Ford Motor Co Tactical Weapons Systems Div 5656 E Slauson Maywood Calif—RA 3-9681

Forehan Electronics Box 823 Solano Beach Calif
 Foster-Barker Co 408 W 4th St Santa Ana Calif

*Franklin Electronics Inc/Communications & Control Div Van Nuys Calif—Dr Martin L Klein—Precision Data Systems, Language Translators, Data Logging Systems
 Frederick Research Corp 2713 W Valley Alhambra Calif

F & R Enterprises 910 Valencia San Francisco Calif—MI 8-1248—Transformers
 Friden Inc 2350 Washington Ave San Leandro Calif—NE 8-0700—Data Processing Equipment & Counters

ΔFurane Plastics Inc 4516 Brazil St Los Angeles Calif—CH 5-1151

G

Gabriel Co Talco Eng'g Co Div Falcon Field Mesa Ariz—WO 4-1711
 Gane Bros & Lane Inc 715 Bryant San Francisco Calif

Gardiner Electronic Co 2545 E Indian School Rd Phoenix Ariz—R F Gardiner—Detectors, Nuclear Products, Medical Electronic Equipment
 Gardner Neon & Ignition Transformer Inc 1010 38th Ave Oakland Calif

Garner Co T H 177 S Alexander Ave Claremont Calif—NA 6-3526—Precision Drawn Glass
 Garnett Young & Co 390 4th St San Francisco Calif

ΔGarrett Corp/Airesearch Mfg Div 9851 Sepulveda Blvd Los Angeles 45 Calif—Charles Hansen—8700 Employees—SP 6-1010—Central Air Data Systems Electronic Cooling Equipment, Aircraft Temperature Controls
 *Gavitt Wire & Cable Co 455 N Quince St P O Box 336 Escondido Calif—John T Hall—40 Employees—SH 5-3181—Insulated Electronic Hook-Up Wire, Cables & Cable Accessories

Gaylor Plastics Inc 1643 19th St Santa Monica Calif—EX 4-5585
 Gaylor Products Co 11100 Cumpston St N Hollywood Calif—Russell I Hare—1 Employee—Filters
 Gaylor-Rives Co 181 N Hill St Pasadena Calif—SY 6-5944

ΔG B Components Inc 14621 Arminta St Van Nuys Calif—TR 3-1328—Encapsulated Wire Wound Resistors, Precision Null References, Precision Voltage References

ΔG C Electronics Co Div Textron Inc 3225 Exposition Pl Los Angeles Calif—AX 3-7201—Hardware, Tools, Electronic Chemicals

Gearhart Electronics C B Portola Ave Point Reyes Calif—MO 3-0142
 Gebhardt Ware 11840 W Olympic Los Angeles Calif

Geisler Labs Box 252 Menlo Park Calif—DA 5-2684
 General-American Valve Co P O Box 444 Corona Del Mar Calif—Eugene C Greenwood—7 Employees—OR 3-2326—Control Equipment (Industrial)

General Antronics Corp 9036 Culver City Blvd Culver City Calif—UP 0-6489
 General Automatics Inc 2443 Ash St Palo Alto Calif

General Controls Co 801 Allen Ave Glendale 1 Calif—John E Flickinger—1800 Employees—VI 9-2181—Potentiometers, Electronic Systems, Hi-g Valves for Missile, Aircraft & Radar Application

General Design Inc 11910 Valerie Ave N Hollywood Calif—TR 7-5067
 General Dynamics Corp Atomic Power Equip Div 2155 South 1st St San Jose Calif

General Dynamics Corp Computer Lab Div 951 Commercial Palo Alto Calif
 General Dynamics Corp General Atomic Div 10955 John Hopkins Dr San Diego Calif—GI 9-2310

*General Electric Co Computer Dept 13430 N Black Canyon Hwy P O Drawer 270 Phoenix Ariz—G A Hagerty—1000 Employees—WI 3-2351—Electronic Computers

*General Electric Co 1034 66th Ave Oakland 21 Calif—C R Benson—60 Employees—Wire & Cable

*General Electric Co Power Tube Dept Palo Alto Calif—A H Ryan—DA 4-1661—Filters, Tubes

*General Electric Co Magnetic Materials Sec 2106 W Washington Blvd Los Angeles Calif—RE 108286
 General Electric Atom Power Equip Dept San Jose Calif

General Mfg Co 724 Ruberta Ave Glendale Calif CI 3-2069
 General Meters Inc 424 S 7th St Grand Junction Colo

General Microwave Lab 601 California Ave Palo Alto Calif—Alden H. Ryan—425 Employees—DA 4-1661—Amplifiers, Microwave Equipment, Tubes

General Plastics Corp 2260 Centinela Ave Los Angeles Calif—BR 2-6737—Housings, Protective Packaging, Parts Handling Boxes

*General Precision Lab Inc 180 N Vinado Ave Pasadena Calif—T C LeVay—20 Employees—MU 1-5669—Military & Commercial Aircraft Navigation Equipment, Closed Circuit T V Equipment, Special Test Equipment

General Scientific Corp 1535 1st St San Fernando Calif—EM 1-8681
 General Sound Control Inc 11810 Center Hollywood Calif—NE 6-0133

*General Testing Labs Inc 227 W Chestnut St Monrovia Calif—Test Equipment
 *General Transistor Western Corp Magnet Head Div 6110 W Venice Blvd Los Angeles 34 Calif—Martin Braude—50 Employees—WE 3-5867—Tape Head, Magnetic Computer & Audio Drum Heads

ΔGenesys Corp 10131 National Blvd Los Angeles Calif—UP 0-4671
 ΔGenisco Inc 2233 Federal Ave Los Angeles 64 Calif—W R Esser—197 Employees—GR 9-4331—Test Equipment, Instruments, Electric Motors & D C Motors

Genistron Inc 6320 W Arizona Circle Los Angeles 45 Calif—John F. Harrison—38 Employees—Filters, Coils, Chokes

ΔGertsch Products Inc 3211 La Cienega Blvd Los Angeles 16 Calif—E W Watts—TE 0-2761—Measurement & Test Equipment (Special Purpose), Transformers, Measurement & Test Equipment (Bridges)

ΔGiannini Controls Corp 918 E Green St Pasadena 1 Calif—R L Lawrence—40 Employees—RY 1-7152—Air Data Instruments, Inertial Instruments, Avionic Subsystems

Giannini Controls Corp Systems Div 1902 W Chestnut St Santa Ana Calif—C R Hodges—65 Employees—KI 7-5485—Avionic Subsystems, Ground Support Test Equipment, Instrumentation

Giannini Controls Corp Transducer Div 55 N Vernon Ave Pasadena Calif—MU 1-9311
 Giannini Controls Corp Gyroscope Div 2275 E Foothill Blvd Pasadena Calif MU 1-9489

Giannini Controls Corp Western Potentiometer Div 422 S Pasadena Calif MU 1-0136
 Giannini Plasmadyne Corp 3839 S Main St Santa Ana Calif—KI 5-7171

ΔGiffilan Bros Inc 1815 Venice Blvd Los Angeles Calif—DU 1-3441—Missile Contractors

Gilliland Instrument Co Inc 1448 29 Ave Oakland Calif—KE 6-1118—Custom Made Instruments, Design & Development

ΔGirard-Hopkins 1000 40th Ave Oakland 1 Calif—A R Stack—25 Employees—KE 2-8477—Fixed Capacitors, Resistors

Gladden Products Corp Electronics Div 635 W Colorado Glendale Calif
 Gladding McBean & Co Technical Ceramics Div 2901 Los Feliz Blvd Los Angeles Calif—NO 3-3361

Glasscraft Co 1628 E 7th Los Angeles Calif
 Glass—Solder Eng'g 4232 Temple City Blvd Rosemead Calif—Donald R Heins—CU 3-7224—Connectors & Terminals, Insulators, Switches

Glennair Inc 1211 Air Way Glendale Calif—CH 5-4078—Connector Accessories, Backshells, Extension & Adapter Steeves

Glenn Pacific Power Supply Corp 703 37th Ave Oakland Calif—KE 2-2704
 Glenronics Inc 859 E Alosta Ave Glendora Calif

ΔGlobe Electrical Mfg Co 1729-45 134th St Gardena Calif—Joe A Gamache—

140 Employees—FA 1-3311—Relays, Potentiometers, Printed Circuits
 ΔGoe Eng'g Co 219 S Mednik Los Angeles 22 Calif—Jack Goerg—8 Employees—AN 1-2183—Terminals, Standoffs, Handles, Ferrules

*Gonsel Div/Young Spring & Wire Corp 801 Main St Burbank Calif—W E Hunter—255 Employees—VI 9-2222—Radio Communications Equipment

Goodhart Co R E P O Box 1220-E Beverly Hills Calif—Oscillographs
 *Goodyear Tire & Rubber Co Ariz Div Litchfield Park Ariz

Gordon Enterprises 5362 N Cahuenga Blvd N Hollywood Calif—Kenneth Knipe—7 Employees—PO 6-3725—Motion Picture Equipment (Accessories), Studio Equipment, Lighting Equipment & Accessories

Goslin Electric & Mfg Co 2921 W Olive Ave Burbank Calif—William S Williams—VI 9-3025—Transformers, Coils, Chokes

Grand Central Rocket Co 1946 Mentone Bldg Mentone Calif—Missile Contractor
 ΔGranger Assoc 966 Commercial St Palo Alto Calif—C A Walter—46 Employees—DA 1-4175—Amplifiers, Antennas, Power Supplies

Graphik-Circuits/Div of Cinch Mfg Co 200 S Turnbull Canyon Rd—City of Industry Calif—S L Glaspell—123 Employees—ED 3-1201—Printed Circuits & Terminal Boards, Flexible Printed Cables

Greco Co 3107 La Cienega Blvd Los Angeles Calif
 Greer Hydraulics Inc 4474 East Olympic Blvd Los Angeles 23 Calif—Leonard H Seeman—OL 9-9700—Missiles, Analyzers

Grinnell-Harris Electronics Inc 4130 Temple City Rosemead Calif—GI 3-1759
 Gudeman Co 2669 S Myrtle Ave Monrovia Calif—K R Clark—60 Employees—HI 6-3101—Delay Lines, Transformers

Gudeman Co of Calif 190 Commercial St Sunnyvale Calif—Mary Gudeman—200 Employees—RE 6-5471—Capacitors, Condensers

Gudeman Co of Calif 7473 Ave 304 Visalia Calif—K R Clark—RE 2-4811—Capacitor (Fixed)

Guild Radio & TV Co 460 N Eucalyptus Ave Inglewood Calif—Lou Dolgin—OR 8-7771—Receivers (Home)

*Gulton Industries Inc Engineered Magnetics Div 13030 Cerise Ave Hawthorne Calif—OR 8-7608
 *Gulton Industries Inc Nuclear Instrumentation Div 15000 Central Ave Albuquerque N M

G W Assoc P O Box 363 El Segundo Calif—10 Employees—Calorimetric, Wattmeter, Power Supplies
 ΔGyrex Corp 3003 Pennsylvania Ave Santa Monica Calif—W A Barton—7 Employees—EX 3-0462—Production Machinery & Equipment, Missiles, Aviation Auxiliary Electronic Equipment

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Hadley Co Inc Robert M 750 W 51st St Los Angeles 37 Calif—Arthur H Hadley—90 Employees—AD 4-9091—Transformers

Halex Corp P O Box 425 Shelbourne Way Los Gatos Calif—Arthur Oltz
 Halex Inc 310 E Imperial Hwy El Segundo Calif EA 2-2000—Voltmeters, Micro-Circuitry & Thin Film Products

Hallamore Electronics Co 714 N Brookhurst St Anaheim Calif—John R Frost—700 Employees—PR 4-1010—Ground Support Systems & Equipment, Space Communication Systems & Equipment, Instrumentation Systems

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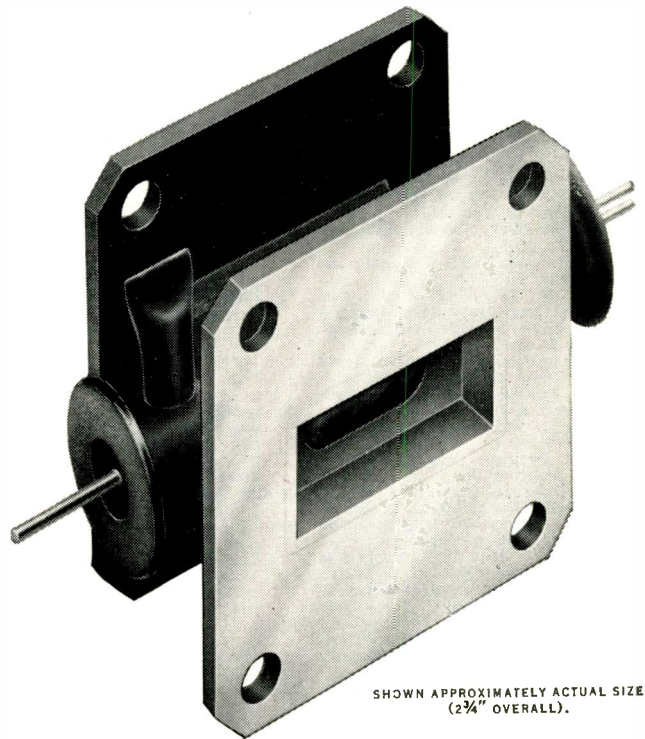
ΔHalliburton Inc Mfg Div 4724 S Boyle Ave Los Angeles 58 Calif—J W Murphy

Hallikainen Instruments 1341 7 St Berkeley 10 Calif—E F Schimbor—LA 4-1757—Control Equipment (Industrial), Amplifiers (Special Purpose), Analyzers

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 Handley Inc 12960 Panama St Los Angeles 66 Calif—Ralph Seiler—25 Employees—UP 0-7950—Resistors & Volume Controls
 Hannon Engineering Inc 5290 W Washington Blvd Los Angeles Calif—WE 6-5176
 Harder Co Donald C 2850 K St San Diego Calif—BE 9-8021—Toroidal Coil Winding Machines, Magnetic Amplifiers, Saturable Reactors
 Hartman Electric Mfg Co 9815 Wilshire Blvd Beverly Hills Calif
 Hartwell Co 9035 Venice Blvd Los Angeles Calif
 Harvey Aluminum 19200 S Western Ave Torrance Calif—SP 5-2181
 Harworth Mfg Co 409 El Camino Real Menlo Park Calif—Keith Harworth—2 Employees—DA 3-9965—Detectors, Counters
 Hathaway Instruments Inc 5800 E Jewell Ave Denver 22 Colo—Jim Carson—125 Employees—SK 6-8301—Measurement & Test Equipment (Oscilloscopes), Recorders (Special Purpose), Gages
 Hawthorne Electronics 700 S Hawthorne Blvd Portland Ore
 Hayward Scientific Glass Corp 217 N Magnolia Ave Whittier 1 Calif—John E Young—OX 5-8213—Insulation Materials & Compounds
 Hearever Co Inc 2644 Castro Valley Blvd Castro Valley Calif—JE 7-0950
 *Heiland Div/Minneapolis-Honeywell 5200 E Evans Ave Denver 22 Colo—Lloyd J Moyer—App 400 employees—SK 6-3681—Direct-Recording Oscillographs, Carrier & Linear/Integrate Amplifiers, Bridge Balance Units
 Helco Products Corp 7832 Balboa Blvd Van Nuys Calif—ST 0-6091—Precision Wire-Wound Potentiometers to Specification Only
 ΔHelipog Div Beckman Instruments Inc 2500 Fullerton Rd Fullerton Calif—Karl E Heller—TR 1-4848—Resistors & Volume Controls, Meters (Electrical Measurements), Motors, Generators, Blowers
 Heller Co Gerald K 1819 Industrial Rd Las Vegas Nev
 Henley Eng'g & Dev Co 11814 W Jefferson Blvd Culver City Calif
 Hernfeldt Eng'g Corp 5716 Camille Ave Culver City Calif—EX 8-4780
 Hesco Eng'g 322 E Beach Ave Inglewood Calif
 Hetherington Inc 139 Illinois St El Segundo Calif
 ΔHewlett-Packard Co 275 Page Mill Rd Palo Alto Calif—Peter N Sherrill—1800 Employees—DA 5-4451—Oscilloscopes, Digital Voltmeters, Frequency Counters & Recorders
 Hewlett-Packard Co Dymec Div 395 Page Mill Rd Palo Alto Calif—DA 6-1755
 Hickok Electrical Instrument Co of Calif 2585 Shattuck Ave Berkeley Calif TH 5-1771—Chargicator, Dynamic Mutual Conductance Tube Tester, Taut-Bank Suspension Meter
 Hieatt Eng'g Co P O Box 349 Burbank Calif—VI 9-2327
 Hi Fidelity Unlimited Audiocrafters Div 1601 Bluff Rd Montebello Calif—RA 3-9869
 Hiram-Jones Electronics Co 2313 W Olive St Burbank Calif
 Hi-Shear Rivet Tool Co 2600 W 247th St Torrance Calif—Guy Nach—DA 6-8110—Hi-Shear Rivets & Tools, Hi-Torque Bolts & Tools, Hi-Lok Fasteners & Tools
 Hi-Spec Electronics Corp 7328 Ethel Ave N Hollywood Calif—J H Mattson—12 Employees—PO 5-5075—Relays
 ΔHitemp Inc 1532 S California Ave Monrovia Calif—Robert J Martin
 HMM Industries 2528 W 9th St Los Angeles Calif
 Hocks Labs 935 N E Couch St Portland Ore
 ΔHoffman Electronics Corp Semiconductor Div 1001 N Arden Dr El Monte Calif—G W DeSousa—100 Employees—CU 3-7191—Semiconductors, Rectifiers, Missiles
 Hoffman Electronics Corp Consumer Products Div 2761 S Hill Los Angeles Calif—RI 7-4488
 ΔHoffman Electronics Corp Military Products Div 3761 S Hill St Los Angeles 7 Calif—Z W Pique—RI 7-4488—Aviation Auxiliary Electronic Equipment, Transmitters, Receivers (Communication)
 *Hoffman Labs Div/Hoffman Electronics Corp 3740 S Grand Ave Los Angeles 7 Calif—R A Maher—2000 Employees—RI 7-4488—Navigation Equipment & Communications Equipment, Countermeasures Systems
 Holan Corp J H P O Box 11384 Phoenix Ariz
 Holec Inc 2751 San Juan Rd Hollister Calif—J W Jones—18 Employees—ME 7-5306—Explosive Cartridge, Electric Initiated Explosive Valves, Switches, Thrusters & Ignition Primers
 Holmes & Navar Inc 828 S Figueroa St Los Angeles Calif
 Home Electronics Mfg Co 14629 Armita St Van Nuys Calif
 *Hoover Electric Co 2100 S Stoner Ave Los Angeles 25 Calif—H W Shaffer—300 Employees—BR 2-3125—Linear & Rotary Actuators, AC & DC Motors, Mechanical Drive & Control Components
 ΔHopkins Eng'g Co 12900 Foothill Blvd San Fernando Calif—John Schlenker—125 Employees—EM 1-8691—Fixed Capacitors, Condensers, Filters
 Horkey-Moore Assoc 24660 S Crenshaw Blvd Torrance Calif—E J Horkey—DA 6-0733—Force Ejection Devices, Ground Support Equipment, Heat Exchangers
 Houston Fearless Corp 11801 W Olympic Los Angeles Calif
 Houston Fearless Corp. 11801 W Olympic Blvd Los Angeles 64 Calif—A J Kjonvtedt—315 Employees—BR 2-4331—Motion Picture Film Processing Equipment, TV & Motion Picture Studio Equipment, Astrodomos
 Howard Industries Inc 942 S La Brea Los Angeles Calif—WE 8-2444—Sub Fractional H P Electric Motors AC & DC, Gear, Fan & Blower
 Hudson Assocs 50 Drumm St San Francisco Calif—YU 2-4470
 Hudson Plating Works 14516 Armita St Van Nuys Calif
 Hufco Industries 2815 W Olive Ave Burbank Calif—O F Huffman—26 Employees—VI 9-2118—Relays
 ΔHuggins Labs Inc 999 E Arques Ave Sunnyvale Calif—V D Varenhorst—175 Employees—RE 6-9330—Tubes
 Hughes Aircraft P O Box 11337 Tucson Ariz—L H Hyland
 ΔHughes Aircraft Co/Airborne Systems Div Florence & Teale Sts Culver City Calif—32,168 Employees—RE 6-9330—Diodes, Radar Systems, Semiconductors
 Hughes Aircraft Co Communication Div Box 9-0902 Airport Sta Los Angeles Calif—SP 6-1515
 Hughes Aircraft Co Electronic Mfg Div Box 90426 Los Angeles 45 Calif—Robt J Harris—OR 8-0361—Aviation Auxiliary Electronic Equipment, Computers, Military Systems (Eng'g)
 Hughes Aircraft Co Ground Systems Group 1901 Malvern P O Box 2097 Fullerton Calif—R M Sweeney—TR 1-3232—Radar Systems, Data Processing, Display & Computer Systems
 Hughes Aircraft Co/Hughes Products Div International Airport Sta P O Box 90427 Los Angeles Calif—OR 8-0361—Airborne Flight, Control Systems & Digital Computers
 Hughes Products/Industrial Systems Div Imperial Hwy Los Angeles 45 Calif—C C Roberts—165 Employees—OR 0-1515—Crystal Filters, Memoscope (Storage Oscilloscopes)
 Hughes Aircraft Co Missile Div Box 11337 Emery Park Station Calif—MA 4-2711
 Hughes Semiconductor Div 500 Superior Ave Newport Beach Calif—Robt J Harris—1200 Employees—MA 9-3271—Semiconductors, Rectifiers, Microwave Components
 Hughey & Phillips 3200 N San Fernando Blvd Burbank Calif—J H Ganzhuber—16 Employees—VI 9-1104—Obstruction Lighting Equipment, Obstruction Lighting Control & Lamp Failure Alarm Units, Tower Lighting Isolation Transformers
 Humidial Co 465 Vernon Ave Colton Calif
 Humphrey Castings Inc 3944 Riley St San Diego 10 Calif—George P Wilson—35 Employees—CY 6-6173—Investment Castings (Ferrous & Nonferrous)
 Humphrey Inc 2805 Canon St San Diego Calif—J H Bender—AC 3-1654—Accelerometers, Gyroscopes, Missile Guidance Systems & Controls
 Hundley Co 3520 Fletcher Dr Los Angeles Calif—CL 5-9708
 Hunt Co Philip A 420 Market San Francisco Calif—YU 6-4761
 Hunter-Douglas Aluminum Corp 3017 Kansas Ave Riverside Calif—Missile Contractor
 Hunter Tools 9851 Alburdis Ave Sante Fe Springs Calif—R N Hunter Jr—50 Employees—OX 2-7231—Folding Hex Wrench Sets, Screwholding Screwdrivers, Color Coded Nut Drivers
 Hy-Catron Inc 1431 Washington Blvd Venice Calif
 Hycor Mfg Co 1030 S Arroyo Pkwy Pasadena Calif—R A Ballweg Jr—125 Employees—Aviation Auxiliary Electronic Equipment, Industrial Electronic Equipment, Antennas (Commercial)
 Hycor Div 1136 N La Brea Hollywood Calif
 Hydra-Aire Co Div Crane Co 3000 Winona Ave Burbank Calif—Clarence Lenox—400 Employees—Power Supplies & Converters, Aviation Auxiliary Electronic Equipment, Missiles
 Hydra-Electric 3151 Kenwood St Burbank Calif
 Hydro Aire 3000 Winona Ave Burbank Calif
 Hydro Deep Draw 115 Penna St El Segundo Calif—EA 2-0940
 Hymac Corp 4625 Leahy St Culver City Calif—UP 0-4991
 ΔHysol of Calif Div Houghton Labs Inc 1706 Potrero South El Monte Calif—Lloyd A Dixon
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 I
 Iconix Inc 945 Industrial Palo Alto Calif—Peter R Carlson—6 Employees—DA 3-1411—Measurement & Test Equipment (Counters), Control Equipment (Industrial), Nuclear Products
 Ideal-Aerosmith Inc 3913 Evans Ave Cheyenne Wyo—Ronald G Popelka—59 Employees—7-7715—Manometers, Test Tables & Pressure Chambers, Needle Valves (Sensitive)
 Ideas Inc 214 Ivison Ave Laramie Wyo—FR 5-2597
 Illuminor Inc Eng'g Co 680 E Taylor Ave Sunnyvale Calif—Joe D Givlie—20 Employees—RE 9-2395—Airdux Air Wound Inductors, Automatic Weigher, Spiral Wrap
 *Induction Motors of Calif/Div of IMC Magnetics Corp N Y 6058 Walker Ave Maywood Calif—C B Pearson—149 Employees—LU 3-4785—Solenoids, Synchro Components, Step-Servo Motors
 Industrial Electronic Engineers Inc 3973 Lankershim Blvd N Hollywood Calif—John J Byle—20 Employees—ST 7-0328—Control Equipment, Indicators
 Inflico Inc P D Box 5033 Tucson Ariz
 ΔInfrared Standards Lab Div Infrared Industries Inc 10555 Magnolia Ave Riverside Calif—A J Cussen—6 Employees—OV 8-1805—Amplifiers (Special Purpose), Measurement & Test Equipment (Special Purpose), Control Equipment (Industrial)
 Instrol Inc 135 E Del la Guerra St Santa Barbara Calif
 *Instron Eng'g Corp 1271 S Boyle Ave Los Angeles 23 Calif—A E Cozens
 Instrument Case Div TA Mfg Corp 4607 Aluer St Los Angeles 39 Calif—F Betancourt—CH 5-5767—Cabinets, Racks, Panels & Accessories
 Instrument Service Co Rt 2 Box 789 Tucson Ariz
 Insul-8-Vicon Corp 1369 Industrial Rd San Carlos Calif—Winston Boone—LY 3-8003—Studio Equipment, Amplifiers (TV), Control Equipment (Industrial)
 Inter-Mountain Instruments 5512 Domingo N E Albuquerque N M
 *Int'l Business Machines Corp Monterey & Cattle Rds San Jose 14 Calif—2400 Employees—CY 7-2950—Data Processing Equipment
 ΔInt'l Electronic Research Corp 145 W Magnolia Blvd Burbank Calif—VI 9-2481—Heat Dissipating Tube Shields, Tube Cooling Shock & Vibration Dampening for Subminiature, Miniature Octalt Power Electron Tubes
 Int'l Enterprises 5219 E 14 Oakland Calif
 Int'l Pacific Recording Corp 6909 Santa Monica Blvd Hollywood Calif HO 4-0195
 ΔInt'l Rectifier Corp 233 Kansas St El Segundo Calif—Gar Goodson—670 Employees—OR 8-6261—Silicon & Selenium Rectifiers & Diodes, Germanium Rectifiers
 Int'l Telecommunications Inc 14 Vista Ave San Mateo Calif—FI 5-3586
 Int'l Television Corp 2772 W Olympic Blvd Los Angeles
 Interstate Electronics Corp 707 E Vermont Ave Anaheim Calif—Charles T Cossar—407 Employees—PR 2-2222—Missile Range Instrumentation, Closed Circuit Television, Custom Cable
 ΔInvar Electronics Corp 323 W Washington Blvd Pasadena Calif—R Lavine—MU 1-4851—Aviation Auxiliary Electronics Equipment, Batteries, Chargers & Accessories, Measurement & Test Equipment (Generators)
 ΔIron Fireman Mfg Co Electronics Div 2838 S E 9th Ave Portland Ore BE 4-6651—Relays, Gyros, Miniature Slip Ring & Brush
 Irwin Labs Inc 1238 S Gerhart Ave Los Angeles 22 Calif—William W Irwin—5 Employees—RA 3-1819—Analyzers, Industrial Electronic Equipment, Meters (Special Purpose)
 Isotopes Specialties Co Box 688 Burbank Calif—Alfred A Michaud—VI 9-2213—Nuclear Products, Measurement & Test Equipment (Counters), Tubes
 *ITT 815 San Antonio Rd Palo Alto Calif—DA 6-9900—Capacitors & Terminals
 *ITT Components Div 815 San Antonio Rd Palo Alto Calif—Robert Olander—50 Employees—DA 6-9900—Capacitors, Seals, Plug
 *ITT Farnsworth Electronics Co Div 815 S San Antonio Palo Alto Calif—DA 6-9900
 *ITT Federal Telecommunications Labs Div 937 Commercial Palo Alto Calif—DA 1-0211
 Δ*ITT Industrial Products Div ITT Corp 15191 Bledsoe St San Fernando Calif—EM 7-6161—Power Supplies
 *ITT Labs/Div ITT 937 Commercial St Palo Alto Calif—H Busignies—41 Employees—DA 1-0211—Amplifiers, Chokes, Communication Systems
 J
 Jack Scientific Instrument Co 143 S Cedros St Solana Beach Calif—Richard T Johnson—150 Employees—SK 5-1551—Servo Amplifiers, Assemblies, Control Equipment
 Jaeneck Electrical Mfg Co 2104 N Rosemead El Monte Calif
 Jamac Products Co 8845 N E Sandy Blvd Portland 20 Ore—J W Jackson—AL 2-2929—Antennas (Commercial)
 Jamco Western 8152 Orion Ave Van Nuys Calif
 James-Friedman 10450 Langdon San Fernando Calif
 James Pond & Clark Inc 2181 E Foothill Blvd Pasadena Calif—W A Walbert—150 Employees—RY 1-7136—Check, Relief, Shutoff, Shuttle & Special Valves
 Janco Corp 3111 Winona Ave Burbank Calif—J T Peterson Jr—65 Employees—TH 8-5792—Rotary Switches, Ammeter Shunts, Bonding Jumpers
 Jan Engineering 2128 Pico Blvd Santa Monica Calif—David M Griver—EX 6-8798—Chassis, Accessories, Fuses & Shielding, Connectors & Terminals
 Javex Electronics P O Box 646 Redlands Calif—C J Reimuller—46 Employees PY 3-5752—TV HiFi & Audio Accessories, Electrical Products
 Jefferies Transformer Co 610 Turner St Los Angeles Calif—MA 5-2185
 Jefferson Electronic Products Corp 322 State St Santa Barbara Calif—Donald F Barr—190 Employees—WO 5-8505—Multi-Conductor Neoprene Jacketed Cable, Harness Assemblies, Molded Cable Configurations
 ΔJennings Radio Mfg Corp 970 McLaughlin Ave San Jose 8 Calif—Robert F Johnston—325 Employees—Capacitors, Variable, Switches (Power), Transfer Relays (All Vacuum)
 Jobbins Electronics 771 Hamilton Ave Menlo Park Calif—Charles W Jobbins—30 Employees—DA 6-7110—Traveling Wave Tube Focus Solenoids, Current Regulated Power Supplies, RF & IF Coils & Chokes
 Jerrold Electronics Corp 1042 Terminal Way San Carlos Calif—LY 3-8273
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MELBOURNE, FLORIDA
Medco, Inc., PArkway 3-7016
MINNEAPOLIS, MINNESOTA
Murphy Associates, FEderal 9-4851

OTTAWA, ONTARIO, CANADA
Instronics, Ltd., TAibot 8-1253
PALO ALTO, CALIFORNIA
Kittleson Company, DAVenport 6-7410
ST. LOUIS, MISSOURI
Engineering Services Co., VOLunteer 3-3660
SEATTLE, WASHINGTON
Packard Bell, MAin 4-5320
TORONTO, ONTARIO, CANADA
Instronics, Ltd., AXminster 3-7806
WASHINGTON, D. C.
S. S. Lee Associates, LOKwood 5-3066
WINSTON-SALEM, NORTH CAROLINA
S. S. Lee Associates, STate 8-0431

1960 Directory of Western Electronic Manufacturers

Johnson Co Lou 1506 N W Irving St
Portland Ore
Johnson-Williams Inc 2625 Park Blvd
Palo Alto 15 Calif—P L Williams—
DA 3-4131—Analyzers, Detectors
Johnston Co Ray 1011 E 69th St Seattle
Wash—LA 4-5170
Jo-Line Tools Inc 8442 Otis St South
Gate Calif—William S Woods—25
Employees—LO 7-1489—Tools
(Hand), Control Equipment (Indus-
trial), Indicators
Jonathan Mfg Co Inc 720 E Walnut
Ave Fullerton Calif—M Fritz Hagen
Jones Electronics Hiram 2313 W Olive
Ave Burbank Calif—E W Reed—4
Employees—VI 9-5311—Connectors
& Terminals, Hardware, Chassis, Ac-
cessories, Fuses & Shielding
Jones & Wettlar Eng'g Corp 11780 W
Pico Blvd W Los Angeles Calif—GR
7-3247—Analog to Digital Con-
verters
Joslyn-Hudson Inc 2040 Colorado Ave
Santa Monica Calif
J P Mfg Co 1820 Peralta Way Calif—
BA 706843

K

Kaar Eng'g 2095 Middlefield Rd Palo
Alto Calif—DA 6-5050
Kahl Scientific Instrument Corp P O Box
1166 El Cajon Calif—M Kahl—HI
4-5944—Nuclear Products, Indus-
trial Electronic Equipment, Meters
(Special Purpose)
Kaiser Aluminum & Chemical Corp 1440
Broadway Oakland Calif—Robert
Brown
Kaiser Aircraft & Electronics Kaiser
Electronics Div 850 San Antonio Rd
Palo Alto Calif—Floyd Buell
Kaiser Aircraft & Electronics 880 Doo-
little Dr San Leandro Calif
Kaiser Aircraft & Electronics/Div Kaiser
Industries Corp P O Box 1828 Oak-
land 4 Calif—R M Watt Jr—750
Employees—LA 6-4688—Missile
Preflight Testers, Contact Analog
Display Systems, Thin Cathode-Ray
Tubes
Kalbfell Electronix 3434 Midway Dr San
Diego 10 Calif—D C Kalbfell—5 Em-
ployees—AC 3-7156—Magnetic Am-
plifiers
Kauke & Co Inc 1632 Euclid St Santa
Monica Calif—Fran M David—6 Em-
ployees—EX 5-5246—Aviation Aux-
iliary Electronic Equipment, Military
Systems (Eng'g), Measurement &
Test Equipment (Special Purpose)
Kavamil Co Inc/Spacecrafts Div 1501 W
El Segundo Blvd Compton Calif—
E V Miller—75 Employees—NE 6-
9600—Amplifiers, Assemblies,
Bridges
Kaynar Mfg Co Inc P O Box 2001 Ter-
minal Annex Los Angeles 54 Calif—
Robert D Eklund—SP 3-3070—
Hardware
*Kearfott Co Inc 500 University Ave
Palo Alto Calif—DA 6-3010
*Kearfott Co Inc Microwave Div 14844
Oxnard St Van Nuys Calif—Walter
K Dau Jr—250 Employees—ST 6-
1760—Microwave Test Equipment,
Engineering Development, Ferrite De-
vices
Keim Precision Mirrors Corp 1346 E
Colorado Glendale Calif—CH 5-2725
—Optical Coatings
Keltner Electronics 3012 W Tanforan
Littleton Colo—PY 4-1730
Kelvin Electric Co 5907 Noble Ave Van
Nuys Calif—Boyd Barton—128 Em-
ployees—ST 3-2666—Precision Wire
Wound Resistors, Subminiature Tor-
oidal Coils, Unceased, Plastic Encap-
sulated Hermetic Sealed Magnetic
Amplifiers
Kennedy Co 2487 E Washington Pasa-
dena Calif—Sy 8-4727
Kerns James L 6055 N E Glisan St
Portland Ore
△Key Resistor Corp 321 W Redondo
Beach Blvd Gardena Calif—Wilfred
Pedde—65 Employees—FA 1-4980
—Resistors & Volume Controls,
Power Supplies & Converters, Filters
K-F Development Co 2606 Spring St
Redwood City Calif—EM 8-5670—
Precision Wire Wound Resistors,
Trimmer & Wire Wound Potentiom-
eters Produced to AIA Standards or
Special Requirements
KFR Corp 6006 W Washington Blvd Cul-
ver City Calif—UP 0-6955
Kibbey Instrument Co 7701 17th Ave
Sacramento Calif
Kibbey Instrument Co P O Box 50 Per-
kins Calif—M B Kibbey—GL 1-
6571—Wire & Cable, Cabinets,
Racks, Panels & Accessories, Kits

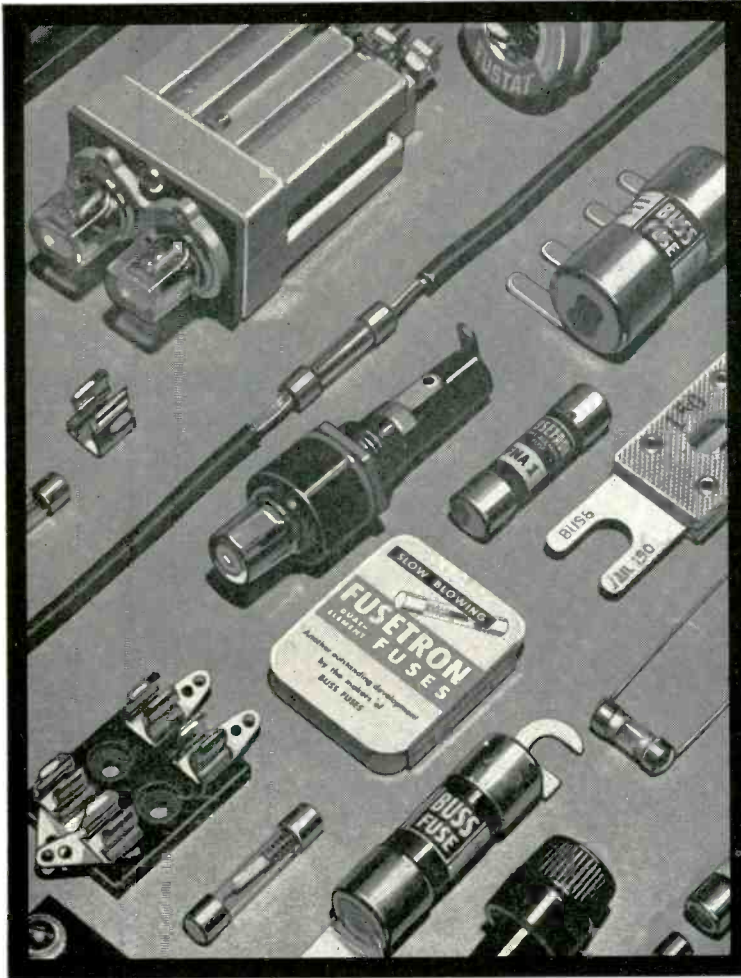
Kidwell Inc 7762 Burnet Ave Van Nuys
Calif
Kiilburn Corp James 2515 Palm Pl San
Mateo Calif—FI 1-3421
Kilo Eng'g Co 2011 3rd St LaVerne
Calif—J B Gach—17 Employees—
Dials & Front Panel Accessories,
Services (Industrial)
Kinco Mfg Co 5211 Telegraph Rd Los
Angeles Calif—AN 8-1201
Kinetics Corp 410 S Cedros Solana Beach
Calif—F E Matthews—90 Employees
SK 5-1181—Power Changeover
Switches, Static Commutators & In-
verters, Voltage Testers
King Laboratory Inc 2645 S 2nd St
Salt Lake City Utah
Kingman Enterprises 4210 San Fernando
Rd Glendale Calif
△Kingley Machine Co Electronic Div 850
Cahuenga Blvd Hollywood Calif—
HO 9-7243
Kinsley Machine Co Electronics Div 850
Cahuenga Blvd Hollywood 38 Calif—
John M Butler
△KinTel Div Cohu Electronics 5725
Kearney Villa Rd San Diego 11
Calif—Henry J Pannell
Kitcraft Products Co 4507 Brunswick
Ave Los Angeles Calif—CL 3-8710
Kittel-Lacy Inc 10816 E Fawcett Ave
El Monte Calif—GL 4-9567
Kit-Tronics 2315 Hendola Dr N E Al-
buquerque N M—Walter C Hunter—
1 Employee—AX 9-1089—Testers
Kitway Electronic Products Corp Box
37205 Los Angeles Calif—PL 3-
2387
Kleer-Marine-Tronics 1933 Ocean Ave
San Francisco Calif
Klein Electronics Co Leg 2404 S LaBrea
Ave Los Angeles 16 Calif—Harold
Navis—WE 5-3119—Production Ma-
chinery & Equipment, Meters (Elec-
trical Measurement)
Klisey Eng'g Co 4407 Union Pacific Ave
Los Angeles Calif—AN 9-2265
△Knapp Electro-Physics Inc 936-38 In-
dustrial Ave Palo Alto Calif—YO
8-4408—Semiconductors
Knopp Inc 1307 66th St Oakland Calif—
OL 3-1661
Koch & Sons H P O Box 127 Corte Ma-
dera Calif—WA 4-3510
Koenig Co Fred P 3815 Atlantic Ave
Long Beach Calif
KPF Electric Co 1624 E Alpine Stock-
ton Calif—HO 4-8381—Switches
Kruger Instruments Harold P O Box 164
313 Valley San Gabriel Calif
Kurz & Root Co Pacific Div 2033 N Lin-
coln St Burbank Calif—VI 9-5818
Kwikheat Mfg Co 3732 San Fernando
Glendale 4 Calif—Elmer E Watcher
—6 Employees—Tool (Hand)

L

Lake Mfg Co 2323 Chestnut St Oakland
7 Calif—W E Howe—26 Employees
—TE 2-2498—Audio Amplifiers &
Equipment, Communications Systems
*Lambda-Pacific Engineering Inc 14725
Arimita St Van Nuys Calif—L W
Mallach—52 Employees—ST 2-1980
—Microwave Relay Systems, Micro-
wave Test Equipment, UHF Trans-
lators
Lamcor Inc 765 E Pico Blvd Los An-
geles Calif—RI 9-7891
Laminair Inc 18530 S Broadway Gar-
dena Calif—I W Love—App 20 Em-
ployees—FA 1-0545—Radomes, Ant-
enna Structure, Structural Airborne
Components of Fiberglass Reinforced
Plastic
La Moree C D 2433 Birkdale Los An-
geles Calif—Ben Ley—12 Employees
—CA 5-5666—Dielectrics, Engraving,
Insulating Compounds
Lance Antenna Mfg Co 1730-1802 1st St
San Fernando Calif—Milton Mann—
35 Employees—EM 1-8645—Outdoor
Antennas, FM Antenna, Fringe Area
Antennas
Land-Air Inc 1732 W Slauson Los An-
geles Calif—AX 5-5421
△Land-Air Inc Stepper Motors Div 16226
S Broadway Gardena Calif—Clarence
Adams
Land-Air Instrument & Electronics Div
2133 Adams Ave San Leandro Calif
—B Pat Moore—80 Employees—
LO 9-5841—Sub-Miniature Receiv-
ers, Radioactive Gas Monitors, Alpha
Particle Converters
*Land-Air Inc P O Box 2327 Airport
Sta Cheyenne Wyo—J T Shelton—
232 Employees—2-6481—Missile
Ground Support Equipment, Engi-
neering & Fabrication of Aircraft Re-
trofit Kits for Modification of Air-
craft

Landsverk Electrometer Co 641 Sonora
Ave Glendale 4 Calif—D L Collins—
CH 5-6687—Nuclear Products, Tubes,
Meters (Special Purpose)
Lane Electronics Mfg Corp 7254 Atoll
Ave N Hollywood Calif—John T
Chase—22 Employees—PO 5-2413—
Engineering & Production Pro-
totypes of Electronic Units, Custom
Radio Control Panels, Modification &
Overhaul of Airborne Electronic
Equipment
Lanes Industries Corp Cornell Deep Draw-
ing Co Div 612 Colorado Ave Santa
Monica Calif—UP 0-7970
Langert Bros Co 14 N Central Ave Phoenix
Ariz
Lansing Sound Inc James B 3249 Casitas
Ave Los Angeles 39 Calif—200 Em-
ployees—NO 5-4101—Loudspeakers
(High Fidelity), Loudspeaker Systems
& Enclosures
Larson Electronic Glass P O Box 371
2426 El Camino Real Redwood City
Calif—J Palmer Larson—4 Employees
—EM 8-7228—Metal to Glass Seals,
Electronic Components Sealing
Lawrence Lab 1668 Euclid St Santa Mon-
ica Calif—EX 5-8249
L & B Welding Equipment Inc 2424 6th
St Berkeley 10 Calif—C F Leader—
40 Employees—TH 3-5734—Con-
trols, Testing & Welding Equipment
Leach Corp—Communications Div 18435
Susana Rd Compton Calif—(Miss)
Beverly Johnson—2 Employees—NE
6-1061—Mobile Communications
Equipment, Military Equipment, Com-
munications Systems
△Leach Corp Inet Div 18435 Susana Rd
Compton Calif—(Miss Beverly John-
son—102 Employees—NE 6-1061—
Power Supplies & Converters, Con-
trol Equipment (Industrial), Motors
& Generators & Blowers
Leach Corp Leach Relay Div 5915 Avalon
Blvd Los Angeles 3 Calif—G F Rose-
well—App 484 Employees—AD 2-
8221—Relays (Over-Voltage & Un-
der-Voltage Relays & Contactors)
Leach Corp Special Products Div 516 E
Compton Blvd Compton Calif—(Miss)
Beverly Johnson—11 Employees—NE
6-0683—Amplifiers (Special Pur-
pose, Recorders (Audio), Computers
Leaming Eng'g Inc 3743 Cahuenga Blvd N
Hollywood Calif—TR 7-3233
LeBec Chemical Corp 14066 S Garfield
Ave Paramount Calif—D Stapleton—
10 Employees—Chemicals, Coatings &
Related Products, Insulation Mate-
rials & Compounds
Leed Insulator Corp 781-793 E Pico
Blvd Los Angeles Calif—Plastic Fab-
rication Serving U S & Foreign
Lefco Products Inc 15521 Lanark St Van
Nuys Calif—TR 3-1991
Le Feill Mfg Co 3359 Packers Ave Los
Angeles Calif
Leland Inc G H 4331 1/4 Leimert Blvd Los
Angeles Calif—AX 2-9183—Rotary
Solenoids, Switches, Relays & Syn-
chronal Stepping Motors
△Lenkurt Electric Co Inc 1105 County
Rd San Carlos Calif—Communica-
tions & Telemetering Systems
△Lerco Electronics Inc 501 S Varney
Burbank Calif—VI 9-5556
Leupold & Stevens Instruments Inc 4445
N E Glisan St Portland 13 Ore—R J
Stevens—50 Employees—BE 4-7432
—Recorders (Special Purpose), In-
dicators
Levin & Son Louis 3610 S Broadway Los
Angeles 7 Calif—Samuel Levin—AD
3-7169—Production Machinery &
Equipment
△Leventhal Electronic Products Inc 3180
Hanover St Stanford Industrial Park
Palo Alto Calif—Albert J Morris—
80 Employees—DA 6-1640—Trans-
mitters, Modulators, Power Supplies
Lewis Electronics Inc 103 W Indian
School Rd Phoenix Ariz—F F Lewis
Jr—CR 9-4661—Services (Indus-
trial), Transformers, Indicators
Lewis & Kaufman Ltd P O Box 337 Los
Gatos Calif—Alfred Thompson—60
Employees—EL 4-3540—Transmit-
ting Electron Tubes
△Librascope Div General Precision Inc
Glendale Branch 808 Western Ave
Glendale 1 Calif—K J Slee—1276
Employees—Computers, Amplifiers
(Special Purpose), Military Systems
(Eng'g)
Librascope Div General Precision Inc Bur-
bank Branch 100 E Tujunga Ave Bur-
bank Calif—K J Slee—175 Em-
ployees—VI 9-6061—Computers,
Measurement & Test Equipment (Spe-
cial Purpose), Recorders (Special
Purpose)

Librascope Inc Precision Technology Dept
66 S "P" St Livermore Calif—Ken-
neth A Johnson—90 Employees—HI
7-3343—Exploding Bridgewire Ord-
nance Components, Proximity Scoring
Devices, Image Converter Cameras
Likens Coil Mfg Co 3255 W Rosecrans
Ave Hawthorne Calif—OS 6-3736
Lincoln Electronics Corp 1773 Lincoln
Ave Anaheim Calif—PR 4-1107
△Ling-Altec Electronics Inc Ling Elec-
tronics Div 1515 S Manchester Ave
Anaheim Calif—L E Gillingham—PR
4-2900
Ling Electronics 1515 S Manchester Ave
Anaheim Calif—W S Northbridge—
300 Employees—TE 0-7711—Vibra-
tion Test Systems, High Fidelity &
High Intensity Sound Systems, High
Power Transmitting & Industrial
Tubes
Ling Systems Inc 11949 Vose St N
Hollywood Calif—R H Goodwin—
160 Employees—PO 5-9041—Special
Antennas, Cable Assemblies, Cables
Link Aviation Inc P O Box 1318 Palo
Alto Calif—Ray Rutman
Linlar Inc 4101 San Fernando Rd Glen-
dale 4 Calif—S H Ise—CL 2-8811
—Power Supplies & Converters, Am-
plifiers (Audio), Coils
Lipps Co Edwin A 1511 Colorado Ave
Santa Monica Calif—Bernard D Lipps
—EX 3-0449—Sound Reproducing
Equipment (Magnetic), Recording
Accessories, Computers
Litton Eng'g Labs P O Box 949 Grass
Valley Calif—F L Towne—70 Em-
ployees—GR 1730—Glassworking
Lathes & Accessories, Vacuum Pumps,
Hydrogen Furnaces
△Litton Industries Inc Electronic Com-
ponents Div 336 N Foothill Rd Be-
verly Hills Calif—Crosby M Kelly—
1100 Employees—CR 4-7411—Elec-
tronic Components, Equipment & Sys-
tems
△Litton Industries/Components Div Rodeo
Rd Culver City Calif—Richard Wil-
liamson—12000 Employees—CR 4-
4711—Printed Circuits, Computers,
Radar Systems
Litton Industries 1476 66th St Emery-
ville Calif—Robert H Dolbear—30
Employees—OL 8-3831—High Defi-
nition & Special Cathode Ray Tubes,
Computer & Image Storage Type
Cathode Ray Tubes, Color Tubes
△Litton Industries/Electron Tube Div 960
Industrial Rd San Carlos Calif—
Norman H Moore—1350 Employees
—LY 108411—Carcinotrons, Filters,
Tubes
Litton Industries U S Eng'g Div 13536
Saticoy St Van Nuys Calif—Paul J
Robichaud—App 100 Employees—
TR 3-3520—Electronic Hardware,
Printed Circuits, Terminals & Ter-
minal Boards
Livermont Inc Myrtle & Maple Ave Mon-
rovia Calif—EL 9-2555
LMB Co 1101 Venice Blvd Los Angeles
Calif—DU 7-6995
Lockheed Aircraft Missile Systems Div
3251 Hanover Palo Alto Calif—DA
4-3311
Lockheed Aircraft Missile Systems Div
1122 Jaegals Rd Sunnyvale Calif—
RE 9-9611
Lockheed Aircraft Missile Systems Div
7701 Woodley Ave Van Nuys Calif—
ST 6-4210
Lockheed Electronics & Avionics Div
Lockheed Aircraft Corp 6201 E Ran-
dolph St Los Angeles 22 Calif—S J
Jatras—495 Employees—RA 3-8896
—Telemetry Systems, Magnetic
Tape Recorders (Airborne), Mini-
aturized Television Systems
△Lockheed Electronics Co 2555 N Holly-
wood Way Burbank Calif—J F Waters
△Lockheed Missile & Space Div 1122
Jaegals Rd Sunnyvale Calif—L E
Root—15000 Employees—RE 9-9611
—Military Systems Engineering, Mis-
siles
Loge J M 2171 W Washington Blvd Los
Angeles 18 Calif—J M Loge—29
Employees—RE 4-9178—Inter-office
Communication Systems, Audio Am-
plifiers, Portable Public Address
Systems
Long-Lok Corp 2681 Colorado Ave Santa
Monica Calif
Los Angeles Plating Co 6921 Avalon Los
Angeles Calif
Loyola Laboratories Box 90074 Airport
Sta Los Angeles Calif—OR 8-1686
Lubeco Inc 15725 Illinois Ave Paramount
Calif
Luther Electronic Mfg Co 5728 W Wash-
ington Los Angeles Calif—WE 9-
5826



In the complete BUSS line...

you can quickly find the right fuse and fuseholder to meet every demand!

Dual-element "slow-blowing", single-element "quick-acting" and signal or visual indicating type fuses . . . plus a companion line of fuse clips, blocks and holders . . . are available from one source — BUSS. You'll save time and trouble by turning first to BUSS when you need fuses and fuseholders.

To safeguard against 'kicks' or complaints, every BUSS fuse is tested in a sensitive electronic de-

vice. Any fuse not correctly calibrated, properly constructed and right in all physical dimensions is automatically rejected to assure dependable protection under all service conditions.

Save engineering time on special problems in electrical protection. At your request, the BUSS fuse engineers are at your service to help you determine the fuse or fuse mounting best suited to your needs.

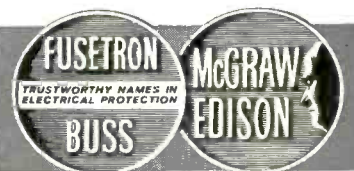
In many cases it is possible to find, in the complete BUSS line, a fuse and fuse mounting already available in local wholesalers' stocks, so that your device can be easily serviced.

For more information on BUSS and FUSETRON small dimension fuses and fuseholders . . . Write for bulletin SFB.

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BUSS fuses are made to protect - not to blow, needlessly.

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Now, with one instrument, you can

1 mv at

411A Voltmeter

Specifications

Voltage Range: 10 mv rms full scale to 10 volts rms full scale in seven ranges. Full scale readings of 0.01, 0.03, 0.1, 0.3, 1, 3 and 10 volts rms.

Frequency Range: 500 KC to 1,000 MC with accessory probe tips.

Accuracy: 1 MC to 50 MC, $\pm 3\%$ of full scale; 50 MC to 150 MC, $\pm 6\%$ of full scale; 500 KC to 1,000 MC, ± 1 db.

Meter Scales: Two linear voltage scales, 0 to 1 and 0 to 3, calibrated in the rms value of a sine wave. Db scale, calibrated from +3 to -12 db; 0 db = 1 mw in 50 ohms.

Galvanometer Recorder Output: Proportional to meter deflection, 1 ma into 1000 ohms at full scale deflection.

Probe Tip Furnished: Pen type Probe Tip, 500 KC to 50 MC. Shunt capacity less than 3 picofarads at 1 volt, less than 4 picofarads at 10 mv. Shunt resistance depends on voltage and frequency.

Other Probe Tips Available at Additional Cost: VHF Probe Tip, 500 KC to 250 MC. Shunt capacity less than 1.5 picofarads at 1 volt, less than 2 picofarads at 10 mv. Shunt resistance depends on voltage and frequency.

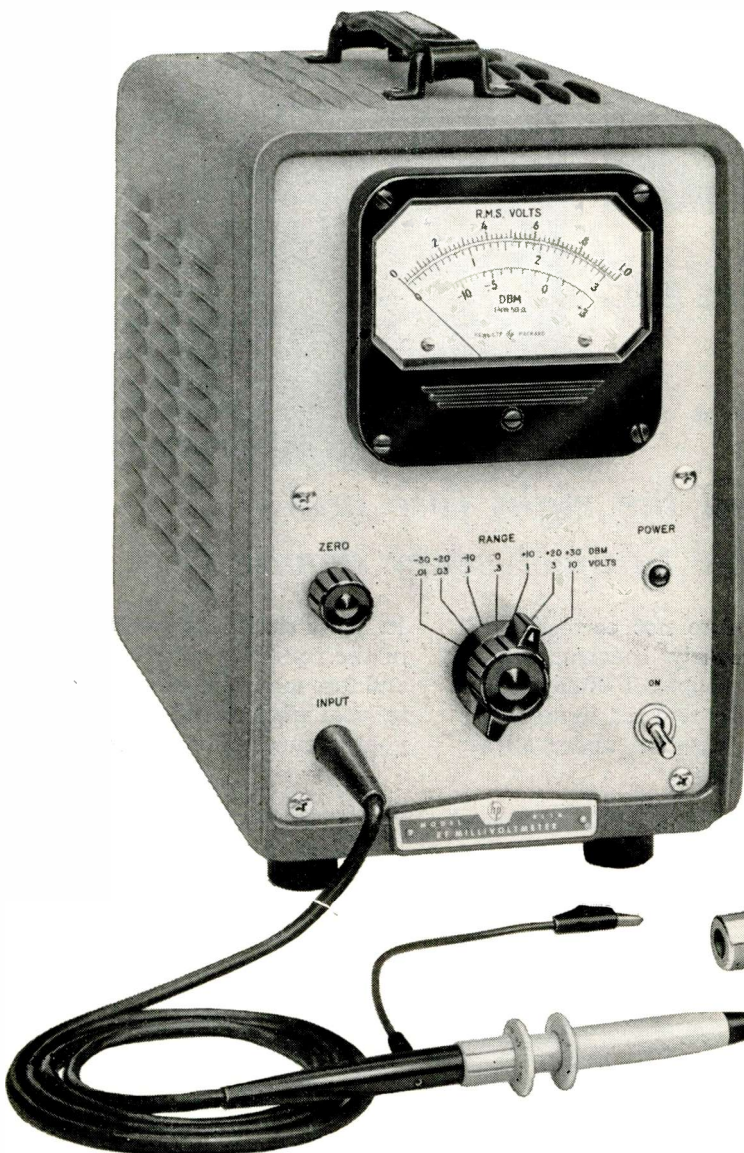
Type N "Tee" Probe Tip, 500 KC to 1,000 MC. SWR less than 1.15 when terminated in 50 ohms.

BNC Open Circuit Probe Tip, 500 KC to 500 MC.

100:1 Divider Probe Tip, 500 KC to 250 MC. Division accuracy $\pm 1\%$. Shunt capacity 2 picofarads. Shunt resistance depends on voltage and frequency.

Power: 115/230 volts $\pm 10\%$, 60 cps, 35 watts.

Price:  Model 411A \$450.00.



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

instantly measure

1,000 mc!

or any rf voltage 1 mv to 10 v, over the very broad bandwidth of 500 KC to 1,000 MC. Accuracy is higher than any similar voltmeter known. Measuring is as simple as "touch and read" on the big, high resolution linear scale. Annoying thermal drift errors are eliminated.

Think of the times you would have liked to measure—with utmost accuracy—millivolts at rf frequencies.

Now you can do it, easily and dependably, with one compact instrument—the new Φ 411A VTVM.

This remarkable instrument has true linear operation—no correcting networks are required.

It has high temperature stability—negligible accuracy change from 10° to 40°C.

Such performance stems from a unique, Φ -developed circuit involving feedback applied to a diode-detector-dc amplifier arrangement; and further involving instantly replaceable, encapsulated, *matched* diodes!

Truly, this circuit has to be seen and operated to be believed. Write for a detailed description (ask for Φ 411A Data Sheet) or better yet, call your Φ rep for a bench demonstration.

And how about these extra features: (a) the matched diodes are protected against burnout (b) probe is temperature compensated for low drift (c) Φ -developed amplifier photochopper eliminates contact noise, guarantees high sensitivity, zero-drift freedom (d) extra probe tips include units for high frequency measurement, for measuring *on* as well as *at termination* of coax transmission lines, and a capacity divider increasing 411A voltage capability to 1,000 volts.

Why put up with complex, cumbersome instruments? Get a new 411A into action on your bench now!



HEWLETT-PACKARD COMPANY

1051B Page Mill Road, Palo Alto, California, U.S.A.

Cable "HEWPACK" Davenport 6-7000

Sales representatives in all principal areas

HEWLETT-PACKARD, S.A. Rue du Vieux Billard No. 1, Geneva, Switzerland

Cable "HEWPACKSA" Tel. No. (022) 26. 43. 36

1960 Directory of Western Electronic Manufacturers

- Luther Engineering & Mfg Co 6 Esther St Pasadena Calif—MU 1-8197
- Luther Mfg Co 7312 Varma Ave N Hollywood Calif—PO 5-4625—Precision Motors & Synchros, Sub-Miniature Relays
- Lynch Carrier Systems Inc 695 Bryant St San Francisco 7 Calif—E B Stone—200 Employees—EX 7-1471—Carrier Telephone & Telegraph Equipment Components, Remote Control & Telemetering Systems
- Lynch Mfg Co R H 7831 E Arroyo Dr San Gabriel Calif—AT 0-3810
- Lynde Electronics 1526 E 4th St Long Beach Calif
- Lyn-Tron Inc 5350 Riverton Ave N Hollywood Calif—Jack R Snyder—8 Employees—ST 7-9023—Printed Circuit Hardware, Molded Products, Connectors
- Lyon Aircraft Service 2701 N Ontario St Burbank Calif—R C Butler—200 Employees—Military Equipment
- Lytel Corp 1404 San Mateo Blvd S E Albuquerque N M—Robert T Dillin—AM 8-3311—Services (Broadcast), Printed Circuits, Dials & Front Panel Accessories
- ## M
- McAlister Inc J G 1117 N McCadden Pl Hollywood 38 Calif—W A Klinger—HO 9-5317—Lighting Equip & Accessories, Studio Equipment
- McCormick Selpo Assoc Hollister Airport Hollister Calif—Frank B Polard—100 Employees—Me 7-3731—Connectors & Terminals, Hardware, Aviation Auxiliary Electronic Equip
- McCulloch Motors Corp 6101 W Century Los Angeles Calif—Missile Contractor
- *McGraw-Edison Co Penn Transformer Div 936 Commercial Palo Alto Calif
- McKnight Co Box 543 Menlo Park Calif—OA 6-3762
- McKenna Labs 2503 Main St Santa Monica Calif—A G McKenna—10 Employees—EX 9-8846—Ultrasonic Equipment
- McPherson Corp 1361 S Broadway Denver 10 Colo—Dewe N Stevens 35 Employees—PE 3-2481—Hardware
- △ MacDonald & Co 1324 Etheri St Glendale 7 Calif—D G MacDonald—4 Employees—SY 0-1651—Sleeving Cutter, Jiffy Connector & Plug Holders, Circuit Board Holders
- MacKay Research Labs P O Box 738 Benson Ariz—S H MacKay—11 Employees—Lead Sulphide Tubes, Magnetrons, Miscellaneous Type Photoconductive Tubes
- MacKenzie Electronics Inc 145 W Hazel St Inglewood 3 Calif—Louis G MacKenzie—15 Employees—OR 8-9335—Audio Equipment, P A Systems, Audio Recorders
- Maghead Labs Inc 702 S Arroyo Prky Pasadena Calif—MU 1-0888—Digital Computer, Magnetic Heads, Multi-Channel Modulator
- △ Magnasync Mfg Co Ltd 5546 Satsuma Ave N Hollywood Calif—Howard V Auchstetter—45 Employees—ST 715493—Amplifiers, Consoles, Control Equipment
- *Magnavox Co Sentinel Radio Corp Div-Research Labs 2255 S Carmelina Ave Los Angeles Calif—GR 9-7796
- *Magnavox Research Labs 2255 Carmelina Ave Los Angeles 64 Calif—J J Slattery—220 Employees—GR 9-7796—Digital Data Processors, Telemetry Commutators—Switches, Digital Communication Equipment
- *Magnecraft Electric Co 1157 N Western Ave Los Angeles 27 Calif—Richard A Strasser
- Magne-Head Div General Transistor Western Corp 2660 S LaCienega Blvd Los Angeles 34 Calif—Martin Braude—55 Employees—UP 0-8601—Computers, Sound Reproducing Equip (Magnetic), Recording Accessories
- *MagneTec Corp 7232 Eton St Canoga Park Calif—Vern Johnson—15 Employees—DI 7-4642—Magnetic Brakes, Controls, Magnetic Clutches
- *Magnetic Amplifiers Inc 136 Washington St El Segundo Calif—Morris Beard—OR 8-2665—Magnetic Amplifiers, Variable Speed Drives, Motor Generator* Controls & Systems
- Magnetic Circuit Elements Inc 3722 Park Pl Montrose Calif—John S Conklin—15 Employees—CH 5-2012—Magnetic Amplifier, Transformers, Instrument Sensors
- Magnetic Recorders Co 7120 Melrose Ave Los Angeles Calif—E G VanLeeuwen—Recorders (Audio), Head-phones, Power Supplies & Converters
- Magnetic Research Corp 3160 W El Segundo Blvd Hawthorne Calif—John L Boethling—157 Employees—OS 5-1171—Magnetic Components & Sub-Assemblies, Signal Conditioning Systems, Universal Temperature Measuring Systems
- Magnetic Systems Inc 225 W Duarte Rd Monrovia Calif—EL 9-6631—Toroids, Toroidal Filters, Crystal Filters
- *Magnetics Inc 3941 E Colorado Blvd Pasadena Calif MU 1-7487
- *Magnetics Inc 1743 Maryland Ave Redwood City Calif—EM 6-1210
- Magnuson Engineers Inc 509 Emory St San Jose 10 Calif—Traver J Smith—CY 2-3657—Measurement & Test Equipment (Counters), Relays, Meters (Special Purpose)
- *Mallory Co Inc P R 9121 E Garvey Rosemead Calif—CU 3-5921
- Mandrel Industries Inc Burbank Div 2950 N Ontario St Burbank Calif—Edward J Stephens—280 Employees—VI 9-2341—Custom Cable, Sheet Metal Fabrication & Electronic Assemblies
- Mandrel Industries Inc 800 Welch Rd Palo Alto Calif—W E Wilson—DA 1-2366—Seismic Exploration Equipment, Photoelectric Sorting Machines, Integrating Gyroscopes
- Manor TV & Electronics 109 W 25th Ave San Mateo—FI 5-3360
- Manufacturers Lab 10610 Keswick St Sun Valley Calif—H P Stark—Sound Reproducing Equipment (Disc)
- Mark-Line 7227 Whitset Ave N Hollywood Calif
- *Marman Div Aeroquip Corp 11214 Exposition Blvd Los Angeles 64 Calif—Myra Sparkman—GR 3-0932—Pneumatic & Hydraulic Systems
- Marquart Aircraft Co Pomona Div 2709 N Garvey Ave Pomona Calif—U W Richardson—368 Employees—LY 3-1311—Trainers & Stimulators, Ground Support Equipment, Data Processing & Display Equipment
- Marquardt Aircraft Co 16555 Satcoy St Van Nuys Calif—ST 5-8361—Missile Test Equip & Beacons
- Marquardt Aircraft Co 1000 W 33rd St Ogden Utah—Missile Test Equip Z Beacons
- Marquardt Aircraft Co/Copper Development Div 2626 S Peck Rd Monrovia Calif—MU 1-5664
- △ Marshall Industries 2065 Huntington Dr San Marino Calif—Gerald C Wolcott
- Martin Co P O Box 179 Denver Colo
- Martin Co 12250 S Hwy 75 Littleton Colo
- Mason Electric Corp 3839 Verdugo Rd Los Angeles 65 Calif—L H Littlefield—50 Employees—CL 5-1431—Switches, Relays & Contactors
- Master Crystal Lab Div 1342 S LaBrea Ave Los Angeles Calif—WE 3-7256
- △ Master Specialties Co 956 E 108th St Los Angeles—LO 4-4481—Time Delay & Phase Sequence Relays
- Master Mobile Mounts Inc 1306 Bond St Los Angeles 15 Calif—Walter Watt—27 Employees—RI 7-0638—Antennas, Radio-Tel Equipment
- Matticks Mfg Co 4156 E Pacific Wy Los Angeles Calif—AN 3-8771
- Mattson Electronics Corp 11647 McBean Dr El Monte Calif—CU 3-3471
- Mayberry Elec Co 111 S Oak Inglewood Calif—OR 8-4847—Servo Bolt-meters & Amplifiers
- Mayer Frank Engro Co 830 Mathilda Ave Sunnyvale Calif—RE 9-4971
- Mayer Frank Engro Co 6642 Santa Monica Blvd Los Angeles Calif
- Meadows Terminal Boards 4850 El Camino Real Los Altos Calif
- Meagher Electronics Co 457 Tyler Monterey Calif—FR 2-0425
- Mechanical Products Inc 1226 W Olive Burbank Calif
- Medistor Instrument Co 1443 Northlake Way Seattle 3 Wash—W D Hamm—ME 3-5145—Amplifiers (Special Purpose), Measurement & Test Equipment (Oscilloscopes), Medical Electronic Equipment
- Meditronics Assocs 1443 Northlake Wy Seattle Wash—ME 3-5145
- Mega Corp 5330 E Olympic Blvd Los Angeles—RA-5750
- △ Melabs 3300 Hillview Ave Palo Alto Calif—Dr Jack L Melchor—50 Employees—DA 6-9500—Microwave Components, Filters, Aviation Auxiliary Electronic Equipment
- Meltron Corp 950 N Highland Ave Los Angeles 38 Calif—George A Starbird—50 Employees—HO 3-4841—Switches
- △ Menlo Park Eng'g 711 Hamilton Ave Menlo Park Calif—Harold W Harrison—35 Employees—DA 6-9080—Traveling Wave Tubes Amplifiers, Electronically Swept Oscillators, Microwave Test Consoles
- Mercury Air Parts Co Inc P O Box 135 9310 W Jefferson Blvd City Calif—Mrs J L Glover—20 Employees—UP 0-5923—Hardware
- Mercury Marine Electric Foot of Jones St Wharf San Francisco Calif
- Mercury Transformer Corp 12950 Panama St Los Angeles 66 Calif—Curt Winters—25 Employees—Transformers, Chokes
- △ Meridian Metalcraft Inc 8739 S Millergrove Dr Whittier Calif—W G Sterns—103 Employees—OX 2-3861—Custom Designed Microwave Sub-systems, Rigid Waveguide Components, Microwave Connection Links
- Mesa Plastics 12270 Nebraska Los Angeles 25 Calif—F C Karas—40 Employees—GR 8-2310—Molding Compounds, Molded Parts, Molded Prototype Stock
- Metal Bellows Corp 11478 Burbank Blvd N Hollywood Calif—PO 3-4883—Valves, Force Balanced Systems, Pressure Switches
- Metal Products Eng'g Inc 4000 Long Beach Ave Los Angeles Calif—AD 2-5263
- Metallizing Co of Los Angeles 1233 S Boyle Ave Los Angeles Calif—AN 8-7108
- Meteorology Research Inc 2420 N Lake Ave Altadena Calif—MU 1-5742—Lighting Warning Systems, Time Lapse Camera Equipment, Weather Instruments
- Metrolco Corp 169 N Halstead St Pasadena Calif—F Lee Edward—12 Employees—MU 1-5914—Power Supplies & Converters, Measurement & Test Equipment (Special Purpose), Amplifiers (Special Purpose)
- Metron Instrument Co 432 Lincoln St Denver Colo—PE 3-3764
- Mica Corp 4031 Elenda St Culver City Calif—B Kessler—30 Employees—TE 9-6861—Laminates, Epoxy Resin Glass Cloth (Unclad & Copper Clad)
- △ Microdot Inc 220 Pasadena Ave S Pasadena Calif—Guy M Martin Jr—App 160 Employees—RY 1-3351—Ultraminiature & Microminiature Coaxial Cables & Connectors, Assemblies & Harnesses
- Microflex Co 2300 S 25th St Salem Ore—J S Kreitzberg—EM 3-1128—Services (Industrial), Antennas (Commercial), Microwave Components
- △ Micro Gee Products Inc 6319 W Slauson Ave P O Box 1005—B W McFadden—20 Employees—EX 1-1716—Flight Simulation Tables, Environmental Rate Tables, Servo & Operation Amplifiers
- Microloc Corp 5743 Marilyn Ave Culver City Calif—EX 8-5735
- △ Micrometals 72 E Montecito Sierra Madre Calif—EL 5-2370
- Micrometals Corp 158 N Kinnola Ave Pasadena Calif—SY 5-5941
- Micro Reproductions Inc 2009 Broadway Santa Monica Calif—EX 5-2042
- Micro-Sound Inc 4627 Leahy St Culver City Calif
- Micro-Test Inc 1718 21st St Santa Monica Calif—UP 0-3259—Strain Gages & Transducers
- △ Microwave Electronics Corp 4061 Transport St Palo Alto Calif—Stanley F Kaisel—20 Employees—DA 1-1770—Amplifiers, Oscillators, Tubes
- Microwave Eng'g Inc 943 Industrial Ave Palo Alto Calif—James K Palmer—150 Employees—DA 6-9500—Frequency Meters, Microwave Receivers & Components, Signal Generators
- Mid-Continent Mfg Inc/Dayran Electronics Div 3613 Aviation Blvd Manhattan Beach Calif—Corwin D Denney—75 Employees—OS 5-7131—Pressure Transducers, Resistance Bridge Indicators, Servo Converters
- △ Miller Co J W 5917 S Main St Los Angeles 3 Calif—J R Hummes—AD 3-4294—Filters, Coils, Transformers
- Miller Dial & Nameplate Co 4400 N Temple City Blvd El Monte Calif—Tom Moule—163 Employees—CU 3-5111—Name Plates, Dials, Focals
- Miller-Robinson Co 7007 Avalon Blvd Los Angeles 3 Calif—James Robinson—60 Employees—PL 2-6141—Pressure Switches, Pneumatic & Hydraulic
- Milmanco 620 7th Ave Renton Wash—AL 5-8656
- △ Mincom Div Minn Mining & Mfg Co 2049 S Barrington Ave Los Angeles 25 Calif—Robert J Brown—Recorders (Special Purpose), Recorders (Audio)
- Miniature Precision Bearings Inc 6214 W Manchester Los Angeles Calif—OR 8-5329
- *Minnesota Mining & Mfg Co 11801 Mississippi Ave Los Angeles 25 Calif—Robert J Brown
- Minitec 5423 Delaware Ave Los Angeles 4 Calif—Gilbert King—85 Employees—Switches
- Minitron Inc 11052 2nd St Encinitas Calif—G S MacDonnell—85 Employees—PL 3-2600—Circuits
- Minneapolis Honeywell Heiland Div 5200 E Evans Ave Denver 22 Colo—Felix Pohlmann Jr—367 Employees—SK 6-3681—Measurement & Test Equipment (Oscilloscopes), Recorders (Special Purpose), Amplifiers (Special Purpose)
- Minn-Honeywell Regulator Co Aero Div 1915 Armacost Ave Los Angeles Calif—Samuel H Cantwell—BR 2-8667—Missiles, Military Systems (Eng'g), Military Equipment
- *Minnesota Mining & Mfg Co American Lava Corp Div 320 Shaw Rd S San Francisco Calif—PL 6-0808
- *Minnesota Mining & Mfg Co Zenith Plastics Co Div P O Box 91 Gardena Calif—FA 1-2020
- Mira Corp 2656 N Pasadena Ave Los Angeles Calif—CA 1-1129
- Missile Systems Corp 11949 Vose St N Hollywood Calif—PO 5-9041—Microwave Components, Antenna Accessories, Communication Systems
- Missimers Inc 3737 San Fernando Rd Glendale Calif—CH 5-8471
- Mission Controls 3536 Rosemont N El Monte Calif
- Mitchell Camera Corp 666 W Harvard St Glendale 1 Calif—M J Kreuschner—CH 5-1-1086—Studio Equipment, Motion Picture Equipment, Relays
- M & M Machine Shop 8235A Lankershim Blvd N Hollywood Calif—RO 7-3057
- Mole-Richardson Co 937 N Sycamore Ave Hollywood Calif—Howard R Bell—OL 4-3660—Lighting Equipment & Accessories, Microphone Accessories
- Modern Communications Co Inc 605 Sunol St San Jose Calif—Arnold W Tiscornia—18 Employees—CY 7-4314—Audio Amplifiers, Assemblies, Audio Equipment
- Modern Industries Inc 5755 Camille Ave Culver City Calif—J K Brose—20 Employees—UP 0-2020—Transistorized Power Supplies
- Moisture Register Co 1510 W Chestnut St Alhambra Calif—CU 3-3143
- Moletronics Corp 373 Euclid Ave Oakland Calif
- Monadnock Mills Sub United Carr Fastner 1977 1st Ave San Leandro Calif—G A Gianandres—175 Employees—EL 7-3700—Connectors, Electronic Hardware, Wire Harnesses
- △ Monitor Products Co 815 Fremont Ave S Pasadena Calif—John W Blasier 65 Employees—RY 1-1174—Quartz Frequency Control Crystals, Crystal Ovens, Packaged Oscillators
- Monogram Precision Industries Inc Cascade Research Div 5245 San Fernando Rd W Los Angeles 39 Calif—Jerome S Jaffee—144 Employees—CH 5-8625—Microwave Components & Antennas Systems, Microwave Ferrite Modulator & Load Isolators, Microwave Circulators & Duplexors
- Montek Associates Inc 4675 S State St Salt Lake City Utah—Wayne K Johnson—12 Employees—AM 2-2464—Power Supplies & Converters, Amplifiers (Special Purpose) Resistors & Volume Controls
- Monte Verde Industries 2921 Middlefield Rd Redwood City Calif—EM 9-2727

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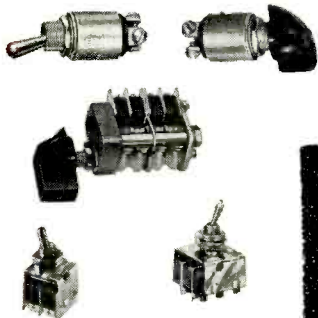
- Moore Associates Inc 2600 Spring St Redwood City Calif—James B Bullock—15 Employees—EM 9-0204—Remote Control, Telemetering & Alarm Systems, PDM Multiplexing Systems
- Morningstar-Paisley Inc 1111 Chestnut St Redwood City Calif—E C Lenz—EM 8-4647—Chemicals, Coatings & Related Products, Insulation Materials & Compounds
- Moran Co P O Box 185 721 El Segundo Blvd El Segundo Calif—Tom Moran—6 Employees—Hardware
- Moran Instrument Corp 170 E Orange Grove Ave Pasadena Calif—SY 6-7158
- Morrow Radio Mfg Co 2794 Market St Salem Ore—Fred Hart—30 Employees—EM 3-6952—Communication Systems, Receivers, Transceivers
- △Moseley Co F L 409 N Fair Oaks Pasadena Calif—MU 1-8998
- Motorolme Inc 2661 S Myrtle Ave Monrovia Calif—James Marino—HI 6-2121—Motors, Generators & Blowers
- *Motorola Inc Military Electronics Div 8201 McDowell Rd Phoenix Ariz—E E McLellan
- △Motorola Inc Semiconductors Products Div 5005 E McDowell Rd Phoenix Ariz—Charles S Granieri—760 Employees—BR 5-4411—Transistors, Rectifiers, Diodes
- *Motorola Inc 8330 Indiana Ave Riverside Calif—E D Jernigan—260 Employees—OV 9-3141—Radar Systems, Receivers
- *Motorola Inc 3171 S Bundy Dr Santa Monica Calif—EX 8-6211
- Mt Sopris Instrument Corp 500 Allatt Denver Colo
- Moviola Mfg Co 1451 N Gordon St Hollywood 28 Calif—G A Kendall—40 Employees—HO 7-3178—Sound Reproducing Equipment (Magnetic), Studio Equipment
- △Moxon Electronics Corp 489 S Robertson Blvd Beverly Hills Calif—G E Moxon
- Mueller Lab 1052 N Allen Ave Pasadena Calif—SY 7-0909
- Mugridge Geo Lewis 1901 35th Sacramento Calif—GL 5-5326
- Mullenbach Div Electric Machinery Mfg Co 2100 E 27th St Los Angeles 58 Calif—Robert F Cline—LU 2-5331—Capacitors (Fixed), Ultrasonics, Relays
- Mulvany Automatic Equipment 720 Channing Way Berkeley Calif—TH 3-8457
- △Mystik Tape Products Co 3630 Tyburn St Los Angeles Calif—CL 6-4168
- Mytron Mfg Co 4522 Brazil St Los Angeles Calif—CH 5-4931
- N**
- Nacimo Products 1090 Morean Blvd San Diego 10 Calif—William R Foster—25 Employees—BR 6-3020—Tachometer, AD-DC Converter, Temperature Transducers
- Narmco Mfg Div Narmco Industries Inc 5159 Baltimore Dr La Mesa Calif—HO 9-0171—Antennas, Commercial, Antenna Accessories
- Nat'l Aero-Tronics 1926 Placentia Ave Costa Mesa Calif—LI 8-3463—Development, Fabricating Assembly
- △National Cash Register Co/Electronics Div 1401 E El Segundo Blvd Hawthorne Calif—Wm Wright—204 Employees—PL 7-1811—Computers, Data Processing Systems, High Speed Printers
- National Coil Co P O Box 1237 Sheridan Wyo—Harold Dimple—OR 4-7644—Coils, Meters (Electrical Measurement), Transformers
- Nat'l Electronics Corp 11747 Vose St N Hollywood Calif—TR 7-3351
- Nat'l Metallurgical Corp P O Box 656 Springfield Ore—RI 6-3233
- Nat'l Rocket Corp 6711 Sepulveda Los Angeles Calif—EX 1-1821
- Nat'l Wire & Cable Corp 136 San Fernando Rd Los Angeles Calif—CA 5-5611
- Natural Lighting Corp 630 S Flower Burbank Calif—William Sennett—VI 9-5991—Lighting Equipment & Accessories, Transformers
- Neff Instrument Corp 2211 E Foothill Blvd Pasadena Calif—D B Schneider—20 Employees—Airborne & Ground DC, AC Amplifiers & Power Supplies
- Neilson Equipment Co 717 S Dale Ave Alhambra Calif
- Nelson Name Plate Co 3191 Casitas Ave Los Angeles Calif—NO 3-8117
- Nelson Vacuum Pump Co Geo F 2133 4th St Berkeley 10 Calif—B J Webb—3 Employees—TH 8-2277—Production Machinery & Equipment
- Nemeth Otto R 537 San Vicente Blvd Santa Monica Calif—EX 4-2916
- Networks Electronic Corp 14806 Oxnard St Van Nuys Calif—Richard Ousley—123 Employees—ST 3-2191—Amplifiers, Coils, Relays
- Neutronics Inc 16799 Schoenborn St Sepulveda Calif—EM 2-0761
- Nevada Air Products Co P O Box 1090 Reno Nev—J W Baldecchi—230 Employees—FA 2-9421—Antenna Tuning Units, UHF Transmitters, Blower Units & Electromagnetic Speed Changers
- Newcomb Audio Products Co 6824 Lexington Ave Hollywood 38 Calif—Robert Newcomb—85 Employees—HO 9-5381—Sound Equipment, Photographs & Radios, Tape Recorders
- Newport Electronics Inc 746 W 17th St Costa Mesa Calif—MI 6-1512—Electronic Assemblies, Relays, Switches
- Noble Electronics 444 Market St San Francisco Calif—EX 7-6296
- △Non-Linear Systems Inc Del Mar Airport Del Mar Calif—Peter J Van Benschoten—135 Employees—SK 5-1134—Indicators, Electronic Measuring Instruments, Measurement Equipment
- Norcap Mfg Co 2193 Fillmore San Francisco Calif—JO 7-0766
- Norden Div United Aircraft Corp 13210 Crenshaw Blvd—Gardena Calif—W H Saylor—60 Employees—Computers, Control Equipment (Industrial)
- Norgren-Stemac 5400 S Delaware Littleton Colo—Charles C Haney—App 100 Employees—PY 4-4271—Nameplates, Zinc Die Casting, Injection Molded Plastics—North American Aviation Inc 1700 E Imperial Hwy El Segundo Calif—OR 8-3011
- North American Aviation Inc Missile Div 12214 S Lakewood Blvd Downey Calif—TO 1-2251
- North American Aviation Inc 1700 E Imperial Hwy El Segundo Calif—OR 8-3011
- North American Aviation Inc Rocketdyne Div 6633 Canoga Ave Canoga Park Calif—OI 7-5651
- North Electric Co 105 Roundup Rd Glendora Calif ED 5-6017—Communication Systems, Multi-Point Connectors, Rotary Switches
- Northridge Instrument Co 11455 Vanowen St N Hollywood Calif—TR 7-0441
- Northrop Corp Norair Div 1001 E Broadway Hawthorne Calif—OR 8-9111
- Northrop Corp Nortronics Div 222 N Prairie Ave Hawthorne Calif—David H Utley—OR 8-9111—Military Systems (Eng'g), Computers, Aviation Auxiliary Electronic Equipment
- Northrop Corp Radioplane Div 8000 Woodley Van Nuys Calif—TR 3-1150
- Nortronics/Div Northrop Corp 222 N Prairie Ave Hawthorne Calif—R E Ringle—5108 Employees—OR 8-9111—Navigation & Guidance Equipment, Automatic Electronic Checkout Equipment, Mechanical Ground Support Equipment
- Norwest Co 330 2nd Ave W Seattle Wash Nuclear Products Co 10173 E Rush St El Monte Calif—CU 3-2603
- Nucleonic Products Co Inc 1601 Grande Vista Ave Los Angeles 23 Calif—A J Jolles—50 Employees—AN 2-1187—Germanium Diodes, Photo Diodes, Thermistors
- *Nutt-Shel Co 2701 S Harbor Blvd Santa Ana Calif—R C Poucher—150 Employees—KI 5-9311—Aircraft Self-Locking Nuts
- NYT Electronics Inc 2979 N Ontario St Burbank Calif—R L Hvidler—Apr 125 Employees—VI 9-5094—Transformers, Power Supplies, Delay Lines
- Ny-Glass Inc 16243 Vermont Paramount Calif—NE 6-8440—Bobbins, Potting Cups, Fiberglass Coil Forms
- △Nylok Corp 133 Penn St El Segundo Calif—B B Steele
- Nylon Molding Corp 7311 Van Nuys Blvd Van Nuys Calif—Caterpillar Grommets, Clamps, Special Moldings
- O'Dell Brothers 2950 Grant Rd Mountain View Calif—YO 7-2267
- Ohio Chemical Pacific Co Div Air Reduction Co Inc 1231 2nd St Berkeley Calif—P E Poole—LA 6-3365—Detectors
- Oliver Electronics 6 Hillside Blvd Daly City Calif—PL 5-7520
- Olympic Instruments Inc Vashon Wash—Carlyle A Creclius—4 Employees—HO 3-5641—Wire Length Meters, Reels
- Olympic Plastics Co Inc 3471 S La Cienega Blvd Los Angeles 16 Calif—H M Rome—240 Employees—TE 0-1121—Electrical Terminal Strips, Fiberglass Molded Parts, Plastic Packaging
- Olympic Screw & Rivet Corp 11445 S Dolan St Downey Calif—SP 3-2060
- Omega Industries Inc 2119 W 17th Long Beach Calif—HE 7-7407
- Omega Instruments Co 103 E Altadena Dr Altadena Calif—SY 4-8814
- Omegatage 858 N Vine St Hollywood Calif—HO 4-7858
- On Mark Couplings Inc 4440 York Blvd Los Angeles 41 Calif—J Alden Blake—60 Employees—Connectors & Terminals, Hardware, Missiles
- △Optical Coating Lab Inc 977 Sebastopol Rd Santa Rosa Calif—L Vance Fisher—49 Employees—LI 5-6440—High Efficiency Dichroic Mirrors, Infrared Filters, Specialized Optical Thin Films
- Opto Engineering Corp 1630 Euclid Santa Monica Calif
- △Optron Corp 335 S Calinas St Santa Barbara Calif—G A Hotham—Accelerometers, Transducers
- Orbitran Co Inc 11487 Woodside Ave Lakeside Calif—R J Price—10 Employees—HI 3-6832—Pulse Delay Generators, Delay Lines, Electronic Weighing Systems
- Oregon Electronic Mfg Co 2105 S E 6th Ave Portland 14 Ore—H K Lawson—40 Employees—BE 6-9292 Power Supplies
- Organic Development Corp 10052 Larson Ave Garden Grove Calif—JE 7-4530
- Oryx Co 13804 Ventura Blvd Sherman Oaks Calif—C H Mitchell—TR 0-4874—Tools (Hand), Transformers
- Outer Space Products Co 3623 W Jefferson Blvd Los Angeles Calif—RE 1-8591—Stainless Steel Fasteners—Military, Bristle Sockets Screws
- Owen Labs Inc 55 Beacon Pl Pasadena Calif—R P Owen—24 Employees—RY 1-6901—Power Supplies, Strain Gage Bridge Balance & Control Units, Transistor Test Sets
- P**
- Pac Aero Eng'g Corp 3021 Airport Ave Santa Monica Calif—EX 1-5281
- Pace Eng'g Co 13035 Saticoy St N Hollywood Calif—Bernard Helfand—40 Employees—P 0 5-0453—Thermocouple Reference Junction, Pressure Transducers
- Pac-Electro-Kinetics P O Box 507 Campbell Calif—FR 8-2510
- △Pacific Automation Products Inc 1000 Air Way Glendale 1 Calif—E Regan—855 Employees—Special Cables & Cable Assemblies
- Pacific Electricord Co 3217 Exposition Pl Los Angeles 18 Calif—Kurt Michael AX 3-7025—Cable Assemblies, Cables, Connectors
- Pacific Electric Motor Co 1099 66th Ave Oakland Calif—LO 9-7630
- Pacific Electro Kinetics 329 S Vermont Glendora Calif—J L Coke—ED 5-3737—Power Supplies & Converters, Industrial Electronic Equipment, Measurement & Test Equipment (Special Purpose)
- △Pacific Electronic Controls Corp 1001 S Mountain Ave Monrovia Calif—Duanee C Manning—20 Employees—Resistors & Volume Controls
- Pacific Electronic Enterprises 1412-16 W Glenoaks Blvd Glendale Calif—CH 5-3901
- Pacific Instrument Co 4926 E 12th St Oakland Calif—KE 2-2035
- Pacific Magnetic Corp Electronic Center Romeland Calif—OL 7-2637
- Pacific Mercury Electronics 8345 Hayvenhurst Ave Sepulveda Calif—Joel H Ax—1382 Employees—EC 2-3131—Television Receivers, Electronic Organs, Cable Assemblies
- Pacific Moulded Products 905 E 59th St Los Angeles Calif
- Pacific Optical Corp Div Chicago Aerial Ind 120 Glasgow Ave Inglewood 1 Calif—James W Shuck—40 Employees—OR 8-1139—Motion Picture Equipment (Accessories), Detectors
- Pacific Relays Inc 13915 Saticoy St Van Nuys Calif—N F Leo—32 Employees—ST 2-2360—Relays
- Pacific Resistor Co 2186 Colorado Santa Monica Calif—EX 3-0531
- Pacific Scientific Aeroproducts 10242 Placentia Ave Anaheim Calif—PR 4-5217
- Pacific Scientific Co 6280 Chalet Dr Los Angeles 22 Calif—Andre Reichol—300 Employees—SP 3-2020—Cable Tension Regulators, Aircraft Instruments, Furnaces for Electronics Industry
- △Pacific Semiconductor Inc 12955 Chadron Ave Hawthorne Calif—Frank E O'Brien—UP 0-4881—Semiconductors, Capacitors (Fixed), Testers
- Pacific Technical Co 2047 Sawtelle Blvd Los Angeles 25 Calif—Louis G Fields—50 Employees—GR 7-0455—Two Phase Power Supply, Delta-Wye Isolation Box, Instrumentation
- Pacific Testing Labs 14808 Oxnard Van Nuys Calif—ST 6-1618
- Pacific Transducer Corp 11836 W Pico Blvd Los Angeles Calif—R S Clarke—15 Employees—GR 8-1134—Sound Reproducing Equipment (Disc), Measurement & Test Equipment (Generators), Indicators
- Pacific Universal Products Corp 168 Vista Ave Pasadena 8 Calif—Charles Chonick—RY 1-7646—Hardware, Dial & Front Panel Accessories, Tools (Hand)
- Packard Bell Computer Corp 1905 Armatost Ave Los Angeles 25 Calif—Max Palvesky—90 Employees—GR 8-4247—Computers & Components, Converters, Power Supplies & Converters
- Packard Bell Electronics Polaris Missile Div 11961 Sherman Way N Hollywood Calif—PO 5-8322
- △Packard Bell Electronics/Technical Products Div 12333 W Olympic Blvd Los Angeles 64 Calif—Hugh Vick—1100 Employees—Digital Computers, Missile Checkout & Launch Equipment, Airborne, Aircraft & Missile Electronic Equipment
- Paoliugio Eng'g Co 113 W Harvard St Glendale Calif—CH 5-8631
- Palisades Eng'g Co P O Box 22 Pacific Palisades Calif—GL 4-8569
- Palmer Electric Mfg Co P O Box 78 Bridal Veil Ore—Martin Palmer—YU 8-5119—Recorders (Audio)
- Palmer Inc M V 4108 N W Fruit Valley Rd Vancouver Wash—OX 3-0590—Telephone Equipment Parts
- Palmer Instruments 1028 Mission S Pasadena Calif—MU 2-1337—Overn (Component & Crystal), Crystals (Low Frequency Quartz)
- △Pale Alto Eng'g Co 620 Page Mill Rd Palo Alto Calif—E H Krueger—115 Employees—DA 6-5360—Magnetic Amplifiers, Chokes, Converters
- Palomar Equipment Co 4254 Niagara Ave San Diego 7 Calif—Frank P Dane—40 Employees—AC 3-6796—Scatter Propagation Transmitters & Receivers
- Palomar Research RT I Box 660 Escondido Calif—W F Collision—S H 5-1806—Digital Computers, Absolute Velocity & Altitude Systems, Non-Inertial Electronic "Space-Gyro"
- Pan-Fax 1721 State St Santa Barbara Calif—WO 2-7919
- Pantek Co Box 17121 Foy Station Los Angeles Calif
- Panther Electronics Inc 901 S Main Burbank Calif—VI 9-6296
- Parabank Inc 13000 Yukon Hawthorne Calif—OR 8-6422
- Parametrics Box 629 Costa Mesa Calif—MI 6-2774
- Parker Electrical Mfg Co 221 Washington St Oakland Calif—TW 3-5325—Safety Switches, Panel Boards, Welding
- *Parker Seal Co 19567 Jefferson Blvd Culver City Calif—W P Lester—Wave Guide Flange Seals, Flange Seals, Fastener Seals
- Parks Lab Henry Francis 7544 23rd Ave N E Seattle 15 Wash—Henry F Parks—9 Employees—LA 3-4832—Moisture Gates, Regulated, Transistorized Power Supply Modules, Electrodes Professional Electronic Projects
- PAR Products Corp 602 Colorado Ave Santa Monica Calif—C R Hollowell—7 Employees—EX 4-4219—Optical Read Heads for Electronic Punched Paper Tape Readers, Vector Cartograph Recording Camera, Head Mount Visual Recording Camera
- Parsons Co Ralph M/Electronics Div 151 S De Lacey Ave Pasadena Calif—Edison C Lee—161 Employees—RY 1-0461—Ground & Airborne Telemetry Equipments, Electronic Miss-Distance Indicator Systems, Ground Support Equipment
- Parts Mfg Co 3265 Belmont Fresno Calif—AD 3-6728

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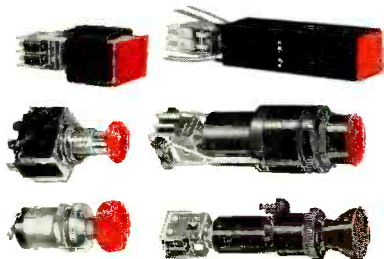
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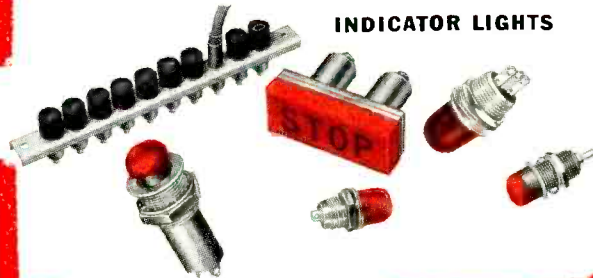
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- Paul Industries P O Box 3474 Glendale Calif—CI 2-8961—Engineering Products
- △PCA Electronics Inc 16799 Schoenborn St Sepulveda Calif—Paul Kliebert—App 125 Employees—EM 2-0721—Pulse Transformers, Delay Lines, Generators
- Pearson Electronics Inc 707 Urban Lane Palo Alto Calif—Dr Paul A Pearson—9 Employees—DA 5-3147—High Voltage, High Power Pulse Transformer, Pulse Current Transformers, Voltage Dividers
- "Pedco" 6914 Farmdale N Hollywood Calif—PO 4-7977
- Pedersen Electronics Corp 3667A Mt Diablo Blvd Lafayette Calif—William T Wilkinson—40 Employees—AT 3-3434—Amplifiers, Analyzers, Electronic Counters
- Pee Cee Tape & Label Co 521 W La Brea Ave Los Angeles 36 Calif—Paula Miller—40 Employees—WE 8-2134—Pressure Sensitive Name Plates—Die Cut Masks, Pressure Sensitive Labels & Tapes
- Peerless Electrical Products 6920 McKinley Ave Los Angeles Calif—Ercell B Harrison—124 Employees—PL 8-4175—Power, Input & Impedance Matching Transformers
- PEK Labs Inc 4024 Transport Ave Palo Alto Calif—DA 1-2787
- Penberthy Instrument Co 4301 6 Ave S Seattle Wash—R E Travis—Nuclear Products
- Pendar Inc 14744 Armita St Van Nuys Calif—R C Carter—65 Employees—TR 3-3136—Switches & Indicator Assemblies, Electronic Assemblies, Power Resistors
- △Penta Labs 312 N Nopal St Santa Barbara Calif—R L Norton—104 Employees—WO 5-4581—Electron Tubes
- △Perkin Eng'g Corp 345 Kansas St El Segundo Calif—George W Mousel—170 Employees—OR 8-7215—Static DC Power Supplies, AC Line Voltage Regulators, Inverters—Converters (Static)
- Permaluster Inc 2012 Burbank Blvd Burbank Calif—VI 9-4543
- Permanent Filter Corp 1800 W Washington Blvd Los Angeles Calif—RE 1-7381
- Permoflux Products Co 4101 San Fernando Rd Glendale 4 Calif—L M Heineman—150 Employees—CH 5-5135—Headsets, Speakers, Transformers
- Pesco Products Div Western Branch Borg Warner Corp 3310 Vanowen St Burbank Calif—R H Montgomery—24 Employees—TH 5-7411—Motors, Generators & Blowers, Power Supplies & Converters, Military Equipment
- △Phaotron Instrument & Electronic Corp 151 Pasadena Ave S Pasadena Calif—CL 2-1471—Electric Panel Meters, Frequency Sensitive Relays, Special Products for Electronic, Electric & Aircraft Equipment
- Phoenix Transformer Co 1818 E Madison Phoenix Ariz—AL 4-9747—Custom Transformers
- △Photo Chemical Products 1715 Berkeley St Santa Monica Calif—Henry G Renaud—175 Employees—EX 5-0919—Electronic Chemicals, Dials, Engraving
- Photocon Research Products 421 N Alta-dena Dr Pasadena Calif—Mrs P C Ganzell
- Photo Research Corp 837 N Cahuenna Blvd Hollywood Calif—HO 2-6647
- Photocon Research Products 421 N Alta-dena Dr Pasadena Calif—(Mrs) P C Ganzell—SY 2-4131—Amplifiers, Gages, Indicators
- Photographic Analysis Inc 13273 Ventura Blvd N Hollywood Calif—T C Robinson—12 Employees—ST 3-3580—Electro Mechanical Programmer, Data Recording, Camera, Contour
- Photo-Sonics Inc 820 S Mariposa St Burbank Calif—Darrell Lassiter—95 Employees—VI 9-6251—Motion Picture Equipment, Motion Picture Equipment Accessories
- Photoswitch Div E C A 1485 Bayshore Blvd San Francisco Calif—JU 4-7078
- Pickett & Eckel Inc 1109 S Fremont Ave Alhambra Calif—AT 2-5151
- Pick Labs Sanborn Rd Saratoga Calif—Vernon J Pick—6 Employees—UN 7-3481—Data Display Systems, Control & Computing Systems
- Pickup Precision Gear Co 1926 Placentia Costa Mesa—LI 8-2225—Gears & Gearheads
- Pioneer Broach Co 6434 Telegraph Rd Los Angeles 22 Calif—A E Ezor—RA 3-4536—Production Machinery & Equipment
- Pioneer Electronics Corp 2235 S Carmelina Ave Los Angeles 64 Calif—Zarmond Goodman—75 Employees—BR 2-8053—Relays, Switches, Tubes
- Plastic Associates 185 Mountain Rd Laguna Beach Calif—R A St Onge—HY 4-7857—Chemicals, Coatings & Related Products, Insulation Materials & Compounds, Connectors & Terminals
- Plastic Factors Inc 926 Broadway Redwood City Calif—Norman F Frost—9 Employees—EM 9-1764—Wave Guide Flanges, Protective Covers, In-Plant Panel Protective Covers
- Plasti-Parts Mfg Co 2774 E Walnut Pasadena Calif—MU 1-5221
- P & M Electromechanical Mfg Co 13917 Satcoy Van Nuys Calif—PO 5-5199
- Polytron Industries 1010 Howard Ave San Mateo Calif—DI 2-7261
- △Pomona Electronics Co Inc 1126 W 5th Ave Pomona Calif—Art Wm Nussarra—22 Employees—NA 9-9549—Patch Cords, Socket Savers, Surface Mounted Breadboard Sockets
- Precise Instruments Parts Co 4520 San Fernando Rd Glendale Calif—CH 5-4261
- Precision Capacitors Inc 150 W Cypress Ave Burbank Calif—VI 9-3193
- Precision Castparts Corp 4600 S E Harney Dr Portland 6 Ore—H H Price—150 Employees—Magnetics, Hardware
- Precision Coil Mfg Co 2215 Main St Santa Monica Calif—EX 9-2704
- Precision Crystal Lab 2223 Warwick Ave Santa Monica Calif—EX 4-7004
- Precision Dynamics Corp 2701 W Burbank Blvd Burbank Calif—VI 9-2804
- Precision Electro-Mechanical Devices 6914 Farmdale Ave N Hollywood Calif—PO 4-7977
- Precision Radiation Instruments Inc Radio Craftsmen Div 5810 S Normandie Los Angeles Calif—PL 3-3501
- Precision Resistance Products Co P O Box 51 West Covina Calif
- Preparco 1846 S California Ave Monrovia Calif—EL 9-6515
- Prescott Television Co 7706 Melrose Ave Los Angeles 46 Calif—M Prescott—12 Employees—WE 3-7193—Video Recording Equipment, Custom Home Television Receivers
- Presin Co 2014 Broadway Santa Monica Calif—M D Teichner
- Presstel Co 9705 E Garvey Blvd El Monte Calif—CU 3-1225—Benches & Storage Cabinets for Electronic Shops
- Printed Electronic Research Inc 4212-14-16 Lankershim Blvd N Hollywood Calif—Jay H Praer—6 Employees—ST 7-3063—Power Amplifiers, Stereo Equipment, Electronic Simulators
- Printronics Corp 3127 El Camino Real Palo Alto Calif—J Coffron—60 Employees—Printed Circuit Boards
- Propulsion Development Labs 236 California St El Segundo Calif—DR 8-8687
- Protair Corp 4086 Del Rey Ave Venice Calif—UP 0-4807
- Proto Tool Co Los Angeles Div Pendleton Tool Ind Inc Box 3519 Terminal Annex Los Angeles Calif—J N Womack—300 Employees—Tools (Hand)
- △PSP Eng'g Co Div Induction Motors Corp 6058 Walker Ave Maywood Calif—C B Pearson—LU 3-4377—Coils, Control Equipment (Industrial), Industrial Electronic Equipment
- △Pulse Eng'g Inc 560 Robert Ave Santa Clara Calif—Hugh B Fleming—75 Employees—CH 8-6040—Magnetic Amplifiers, Delay Lines, Filters
- Pyromet Co 429 S Canal St S San Francisco Calif—Robert L Ray
- R
- Radar Engineers 4719 Brooklyn Seattle Wash—Electronic Test Equipment
- Radar Relay Inc 2322 Michigan Ave Santa Monica Calif—W C Arrasmith 25 Employees—EX 4-2230—Word Warning Systems, Electrical Relays, Mercury Pushbutton Switches
- Radiation Detection Co 4047-49 Trans-port St Palo Alto Calif
- Radiatronics Inc 5956 Kester Ave Van Nuys Calif—George Hewitt—36 Employees—ST 2-1461—Missile, Aircraft & Communications Antennas, Antenna Components
- Radio Corp of America Tube Div 6355 E Washington Blvd Los Angeles Calif
- △*Radio Corp of America West Coast Missile & Surface Radar Dept 11819 W Olympic Blvd Los Angeles 64 Calif—M E Collins—1000 Employees—GR 8-0251—Adapters, Amplifiers, Radar Antennas
- Radio Mfg Co Inc 65 Eucalyptus Lane Santa Barbara Calif—WO 9-0419
- Radiophone Co Inc 600 E Evergreen Ave Monrovia Calif—Frank E Hamilton—App 200 Employees—EL 8-2585—Telemetering Systems, Telemetering Components, Ground Support Equipment
- Radioplane/Div Northrup Corp 8000 Woodley Ave Van Nuys Calif—W D McBride—ST 6-7020—Target & Surveillance Drone Systems
- Ram Chemicals Inc 210 E Olive St Gardena Calif—Gene Gordon—FA 1-0710—Chemicals, Coatings & Related Products, Insulation Materials & Compounds
- Ranson Research 323 W 7th St P O Box 269 San Pedro Calif—David H Ransome Jr—12 Employees—TE 2-6848—Computer Elements, Data Processing Systems, Analog to Digital or Digital to Analog Converters
- △Rantec Corp 23999 Ventura Blvd Calabasas Calif—Jack W'lls—85 Employees—DI 7-5446—Antennas, Multiplexers, Microwave Ferrite Devices
- Rapididex Inc P O Box 429 Burbank Calif
- Ratel Inc 1 El Camino Ratel Goleta Calif—G E Archenbronn—100 Employees—WO 7-1214—Transformers, TV & Radio, Toroidal Transistor Coils & Transformers
- Ratigan Electronics Inc 425 W Cypress St Glendale Calif—CH 5-5777—Coils & Delay Lines
- △Raychem Corp Oakside & Northside Redwood Calif—Daniel Defenbacher Rayco Electronic Mfg Inc 7229 Atoll Ave N Hollywood Calif—W R Seymour—50 Employees—TR 7-8191—Transformers, Coils, Filters
- Raytherm Corp-Ravclad Tubes Inc Oakside at Northside Redwood City Calif—Robert M Halperin—App 175 Employees—EM 9-3376—Hook-up Wire, Termination Miniature Coaxial Cable, Thermofit Tubing
- Rea Co J B Electronics Div 2202 Broadway Santa Monica Calif—Roy Ther-sen—EX 3-3768—Computers, Control Equipment (Industrial), Coils
- Redcor Development Corp 17750 Arminta Reseda Calif—ST 2-2850
- Redel Inc 220 N Atchison St Anaheim Calif—PR 4-3624
- Red Point Corp 1907 Riverside Dr Glendale 1 Calif—Ralph P Craig—12 Employees—TH 2-4895—Processing Machinery, Automatic Encapsulating Machines, Dual & Single Impregnators
- Reed Instrument Bearing Co Div SKF Industries Inc 4241 Redwood Ave Los Angeles 66 Calif—L P Dickey—100 Employees—Hardware
- Reed & Reese Inc 717 N Lake Ave Pasadena Calif—SY 4-1188
- Reeves Electronics Inc 7512 Santa Monica Blvd Los Angeles Calif—HO 9-3566
- *Reeves Soundcraft Corp 342 N LaBrea Los Angeles 36 Calif—Bruce MacPherson
- Regan Industries 1720 Marco Polo Burlingame Calif—G P Regan Jr
- Reinhold-Geiger Plastics Inc Unit Industries Div 8763 Crocker St Los Angeles Calif—PL 2-7195
- Reiter Co F 3340 Bonnie Hill Dr Hollywood 28 Calif—F Reiter—3 Employees—HO 2-2913—Professional Splier
- Reliable Pattern Works & Foundry 106 Stockton Ave San Jose Calif—CY 7-3240
- Reliant Industries 4947 Firestone Blvd South Gate Calif—LO 4-1741
- Remler Co 2101 Bryant St San Francisco 10 Calif—Andrew B Hart—App 100 Employees—VA 4-3435—Intercommunication Equipment, Marine & Air Microphones, Speakers & Amplifiers
- Repatch Pacific Div/Arnold Eng'g Co 641 E 61st St Los Angeles 1 Calif—P R Repath—75 Employees—AD 3-7262—Laminations, Cans & Shields, End Bell
- Republic Electric 33 Drum San Francisco Calif
- Resdel Eng'g Corp 330 S Fair Oaks Ave Pasadena Calif—A J Siegmeth—80 Employees—SY 5-5197—Ground Support Equipment, Wideband Amplifiers, Receiver Multicouplers
- Research Chemicals 170 W Providence Burbank Calif—Richard Spiller—40 Employees—VI 9-6276—Materials (Raw), Chemicals, Coatings & Related Products, Magnetics
- Research Instruments 7962 S E Powell Blvd Portland Ore—BE 5-6745—Resistors, Sockets & Bridges
- Research Manufacturing Corp P O Box 6056 San Diego Calif—AC 3-1989
- Research Specialties Co 200 S Garrard Blvd Richmond Calif—James M Felts—60 Employees—BE 5-9110—Chromatography & Electrophoresis Systems, Zone Melting Apparatus, Temperature Controlled Water Bath Shakers & Tube Heaters
- Research Welding & Eng'g Co Inc 18201 S Santa Fe Compton Calif—NE 6-9761—Missile Contractor
- Resin Formulators Inc 8956 National Blvd Los Angeles 34 Calif—P A Van Amburgh
- Resin Industries Inc 315 Olive St Santa Barbara Calif
- Resistor Labs Inc 2908 Nebraska Ave Santa Monica Calif—Richard E Sager—EX 3-5217—Tubes, Coils, Relays
- Reynolds Industries Inc 2105 Colorado Ave Santa Monica Calif—Earl Burris—EX 3-6783—Connectors & Terminals, Wire & Cable, Indicators
- Rheem Califorme Corp 1020 N LaBrea Hollywood 38 Calif—Recorders (Audio), Sound Reproducing Equipment (Disc), Sound Systems, Inter-communicators & Hearing Aids
- Rheem Mfg Co Defense & Technical Products Div 1711 Wonduff Ave Downey Calif—John H Tiley—2500 Employees—TO 1-9711—Accelerometers, Amplifiers, Communication Systems
- △Rheem Semiconductor Corp 327 Moffett Blvd Mountain View Calif—J D Hurley—App 102 Employees—YO 8-8391—Silicon Transistors, Fast Switching & High Current Silicon Diodes, Rectifiers
- Richmont Inc 922 S Myrtle Ave Monrovia Calif—H Banta Jr—50 Employees—EL 9-2555—Tools (Hand), Indicators, Control Equipment (Industrial)
- Riggs Neuleonics Corp 717 N Victory Blvd Burbank Calif—John E Markley Jr—12 Employees—VI 9-2481—Nuclear Radiation Area Monitoring Detector, Single & Multi-Channel
- Rinco Inc 7926 S E Powell Portland 6 Ore—F M Brown—24 Employees—PR 4-3259—Impedance Bridges, Decade Precision Potentiometers, Single Turn Precision Potentiometers
- Robbins Aviation Inc 2350 E 38th St Los Angeles 58 Calif—H N Mabery—20 Employees—LU 9-5221—Metering Valves, Dehydration Equipment
- Roberts Electronics Inc 1028 N LaBrea Ave Hollywood 38 Calif—Donald Monroe—HO 2-6331—Amplifiers (Audio), Recorders (Audio)
- △Roberts-Fulton Controls Co/Aeronautical & Instrument Div Santa Ana Freeway at Euclid Ave Anaheim Calif—R H Heller—618 Employees—KE 5-8151—Transistor Amplifiers, Cable Assemblies
- Robinson Aviation Inc 604 Colorado Ave Santa Monica Calif—UP 0-8270—Vibration Controls
- Rohlik-Perrin P O Box 227 Culver City Calif
- Rollins Electronic Mfg Co 11013 S Ruthelen Ave Los Angeles Calif—PL 5-1665
- Rolo Instrument Products Co 5277 W Jefferson Blvd Los Angeles Calif—WE 8-2061
- Ronson Hydraulic Units Corp 1313 Lincoln Ave Pasadena Calif—MU 1-0221
- Rosan Inc 2901 W Coast Hwy Newport Beach Calif—LI 8-5533
- Rose Mfg Co 2700 Barbary Pl Denver Colo—AC 2-7847—Missile Ground Support & Handling Equipment
- Rotex Punch Co 2350 Alvarado San Leandro Calif—Earl Pearson
- △Rototest Labs Inc 2803 Los Flores Blvd Lynwood Calif—J R Duncan—60 Employees—NE 6-9238—Environmental & Performance Testing of Electronic, Electro-Mechanical Assemblies & Sub-Assemblies
- Royal Industries Inc 2961 E Colorado Pasadena Calif—SY 6-9281

NEW

TEKTRONIX OSCILLOSCOPE

Uses Signal-Amplifier and Time-Base Plug-In Units



The new Type 561 Oscilloscope is basically an indicator. It contains a 5-inch monoaccelerator cathode-ray tube with 3.5-kv accelerating potential, a husky power supply, and a calibrator for amplitude and sweep time. The Plug-In Units drive the crt deflection plates directly, receiving their operating power from the main unit.

This system offers versatility in conventional operation. You can use a time-base plug-in unit with (1) a simple signal-amplifier plug-in unit, (2) a dual-trace, (3) a wide-band, or (4) a differential-input plug-in unit. In addition, you can operate the Type 561 as an X-Y oscilloscope by using identical signal-amplifier plug-in units in both the vertical and horizontal channels.

The Type 561 is designed to accept contemplated plug-in amplifier and time-base units for specialized applications in the electronic, electrical, mechanical, medical, chemical, and other fields. Unlike earlier similar instruments, it is not subject to the limitations imposed by active or passive circuitry between the plug-in units and the crt deflection plates.

Tentative Specifications

Type 561 Indicator Unit

- 5-inch monoaccelerator cathode-ray tube.
- 3.5-kv accelerating potential.
- New deflection blanking.
- 8-cm by 10-cm viewing area.
- Regulated power supply, capable of both present and future plug-in current requirements.
- 12-v dc regulated heater supply for gain stability and low drift.
- Z-axis input.
- Calibrator—line-frequency square wave with 2- μ sec rise-time, 0.2 mv to 100 v, accuracy within 3%.

Type 60 Plug-In Unit

- Passband—dc to 800 kc.
- Sensitivity—50 mv/cm to 50 v/cm in 4 calibrated steps, with variable control.

Type 62 Dual-Trace Unit

- Five operating modes: Alternate sweeps, chopped, channel A only, channel B only, Channels A and B added algebraically.
- Passband—dc to 500 kc.
- Sensitivity—10 mv/cm to 20 v/cm in 11 calibrated steps, with variable control.

Type 63 Differential Unit

- Differential input, 100-to-1 rejection ratio at full gain.
- Passband—dc to 300 kc.
- Sensitivity—1 mv/cm to 20 v/cm in 14 calibrated steps, with variable control.

Type 65 Wide-Band Unit

- Passband—dc to 4 mc.
- Sensitivity—50 mv/cm to 20 v/cm in 9 calibrated steps, with variable control.

Type 77 Time-Base Unit

- 18 calibrated sweep rates—1 μ sec/cm to 0.5 sec/cm, accurate within 3%.
- Versatile triggering—automatic or amplitude-level selection from rising or falling slope of triggering waveform, ac-coupled or dc-coupled, internal or external.

- External input to sweep amplifier—3 v/cm sensitivity.

Skeleton Plug-In

- Contains 24-pin connector, latch, front-panel overlay—for constructing your own special circuits.

PRICES TO BE ANNOUNCED AT WESCON

CAREER OPPORTUNITIES now exist at Tektronix in the following fields: Instrument design, Circuit design and engineering, Cathode ray tubes, Electron physics, Solid state and semi-conductor devices. For information write to Irving Smith, Personnel Director.

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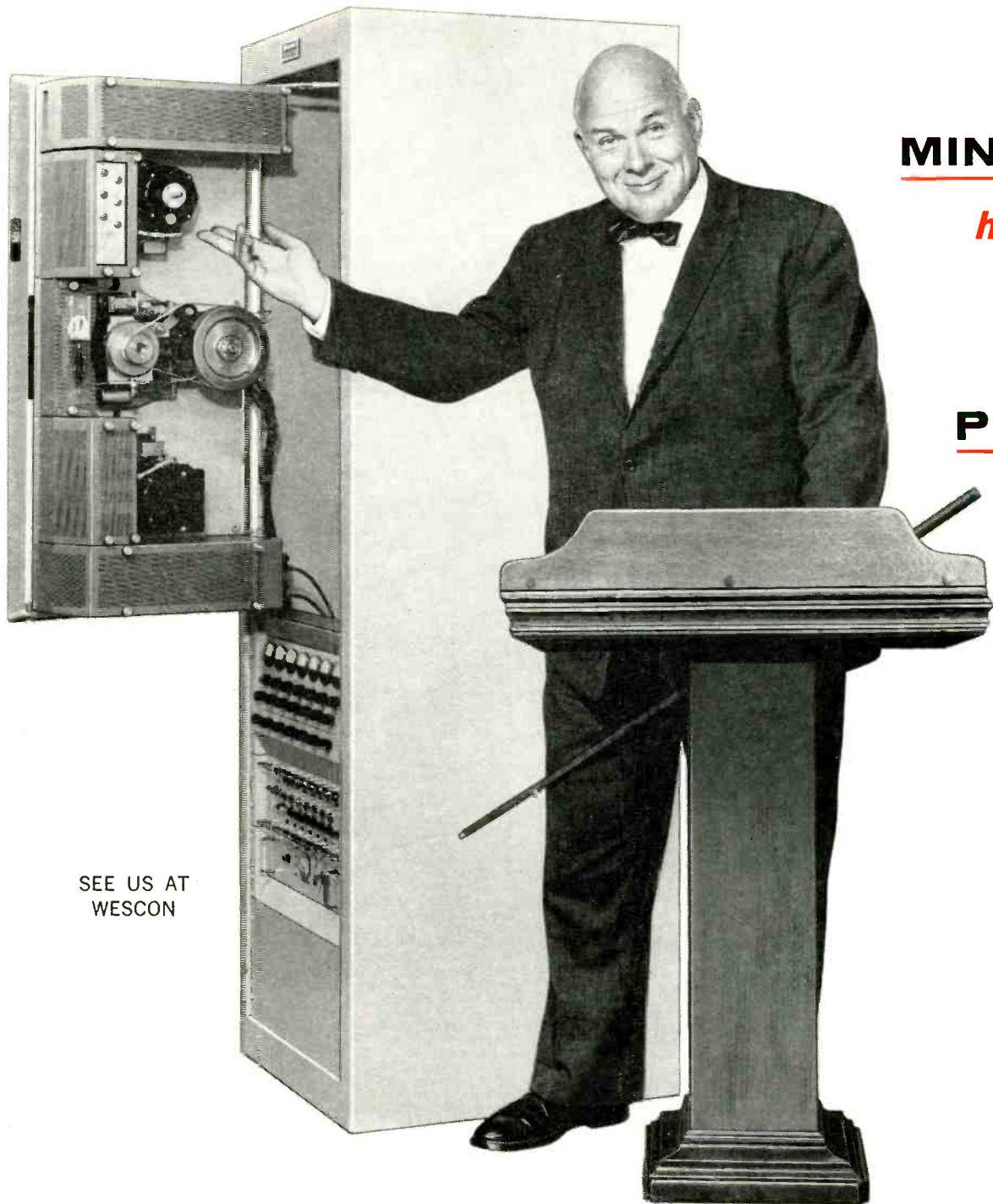
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1960 Directory of Western Electronic Manufacturers

- Royco Instruments Inc 365 San Antonio Rd Mountain View Calif—Frank Haylock—10 Employees—DA 5-2277—Indicators, Measurement & Test Equipment (Bridges), Meters (Special Purpose)
- R & R Tool & Die Corp 12955 Sherman Way N Hollywood Calif—TR 7-3331
- RS Electronics Corp 435 Portage Ave Palo Alto Calif—Albert B Worch—36 Employees—DA 1-1130—Amplifiers, Converters, Filters
- R T & E Corp 2200 Booksin Ave San Jose Calif—AN 4-5641
- Rubbercraft Corp of California 1800 W 220th St Torrance Calif—Hardware, Seals, Insulators
- Rucker Co 4700 San Pablo Oakland Calif—OL 3-5221—Centrifuges
- Rue Products 4323 Corinth Ave Culver City Calif—Herman Rue—EX 7-8666—Resistors & Volume Controls, Transmitters, Filters
- Russo John F 575 W San Carlos San Jose Calif—CY 4-2720
- △Rutherford Electronics Co 8944 Lindblade St Culver City Calif—N T Holzer—TE 0-7393—Measurement & Test Equipment (Generators) Measurement & Test Equipment (Special Purpose), Measurement & Test Equipment (Oscillators)
- Ruxton Electronic Corp 11168 Santa Monica Blvd Los Angeles Calif—GR 7-0146
- Ryan Aeronautical Co/Ryan Electronics Div 5650 Kearny Mesa Rd San Diego 12 Calif—T Claude Ryan—1300 Employees—BR 7-6450—Missile Guidance Systems & Controls, Navigation Equipment, Radar Systems
- Rytel Electronics Corp 17536 Ventura Blvd Encino Calif—ST 9-0781
- Rytron Co Inc 7303 Lankershim Blvd N Hollywood Calif—Donald S Shaw—90 Employees—PO 5-0756—Transformers, Coils, Filters
- S**
- Safety Switchboard Co Inc 910 89th Ave Oakland Calif—LO 9-7001
- Saine Equipment Lab Harry T Rt 2 Box 407 E Main Ave Morgan Hill Calif—Harry T Saine—2 Employees—MO 9-0066—Oscillator, Oscilloscope, Depolarizer
- Sandia Corp Sandia Base Albuquerque N M—AL 6-4411—Missile Contactor
- △San Diego Scientific Corp 3434 Midway Dr San Diego 10 Calif—John W Bodnar—AC 3-7156—Amplifiers (Special Purpose), Switches, Computers
- △San Fernando Electric Mfg Co 1509 First St San Fernando Calif—Lyle R Smith—175 Employees—EM 1-8681—Capacitors, Potentiometers, Filters
- San Jose Scientific 605 Sunal San Jose Calif—Bill Woodward
- △Santa Anita Eng'g Co of Calif—Kent Felker—28 Employees—MU 1-7441—Cabinets, Racks, Panels & Accessories
- *Santa Barbara Div/Curtiss-Wright Corp P O Box 689 Santa Barbara Calif—D E Trumbull—350 Employees—WO 7-3411—Automatic Checkout Equipment, Missiles & Radomes
- Santa Barbara Instrumentation Corp 411 State St Santa Barbara Calif—WO 5-3161
- Santa Clara Metalcraft 3012 Spring Redwood City Calif
- Sargent-Raymont Co 4926 E 12th St Oakland 1 Calif—Will Raymont—35 Employees—KE 6-5277—Tuners, Pre-Amp Amplifiers, Amplifiers
- *Satellite-Kennedy Inc of California P O Box 1711 (Rancho Laguna Seca) Monterey Calif—Dr J T de Betten-court—8 Employees—FR 3-2461—Research & Development, Antennas & Antenna Systems
- Scala Radio Co 2814 19th St San Francisco 10 Calif—Bruno Zucconi—Va 6-2898—Antennas (UHF & VHF)
- Scantlin Electronics Inc 2215 Colby Ave Los Angeles 64 Calif—Edmund J Canning—41 Employees—GR 8-8251—Digital Computers (Special Purpose)
- Schafer Custom Eng'g 235 S 3 St Burbank Calif—TH 5-3561—Control Equipment (Communications), Control Equipment (Industrial)
- S & C Electric Co 1640 Rollins Rd Burlingame Calif—OX 7-1130
- Schmidt Engineering Co 4062 Fabian Way Palo Alto Calif—DA 1-3376—Automatic Component Dispenser
- Schrader Co F W 11623 S Broadway Los Angeles 61 Calif—Virgie Herblom—12 Employees—PL 6-9166—Magnets Electro & Permanent, Laboratory Magnets, Rectifiers
- Scientific Components Inc 30 S Salpuedes St Santa Barbara Calif—Stanley G Oppenheim—50 Employees—WO 6-1585—Computers, Printed Circuits
- Scientific Eng'g Labs 1510 6th St Berkeley 10 Calif—George C McFarland—24 Employees—LA 6-2772—Vacuum Pumping Systems, Altitude Simulators & Controlled Atmosphere Chambers, Vacuum Furnaces
- Scientific Instrument Co 143 S Cedros St Solano Beach Calif
- Scientific Radio Products Inc 2303 W 8th St Loveland Colo—G Crawford Follmer—NO 7-2261—Crystals, Crystal Products & Accessories, Filters, Missiles
- Scott Instrument Co 3734 W Slauson Ave Los Angeles Calif—AX 5-4221
- Secode Corp 555 Minnesota St San Francisco 7 Calif—Robert Blodgett—100 Employees—MA 1-2643—Signaling & Remote Control Equipment
- Seeley Electronics 1060 S Labrea Ave Los Angeles 19 Calif—Warren M Seeley—2 Employees—WE 3-1183—Fixed Frequency Mobile Receivers
- Selectronics Inc 1329 Allyn Ave St Helena Calif—WO 3-2347
- Semco Eng'g & Mfg Co 8407-09 S Hoover Los Angeles Calif—PL 2-7657
- Semicon Inc 70 Mariposa Ave Watsonville Calif—PA 2-3488
- △Sequoia Wire & Cable Co Sub Anacosta Wire & Cable 2201 Bay Rd Redwood City Calif—Jordan E Beyer—177 Employees—EM 9-0331—Wire & Cable, Communication Cables
- Servomechanisms Inc 12500 Aviation Blvd Hawthorne Calif—R J Gray—750 Employees—OR 8-7841—Central Air Data & True Airspeed Computers, Missile Fuel Management Systems
- Servonic Instrument Inc 640 Terminal Way Costa Mesa Calif—MI 6-2427
- Servonics Engineering Services Co 4645 Van Nuys Blvd Sherman Oaks Calif—ST 9-8610
- Servo-Recording Instruments Inc 1815 W Van Buren Phoenix Ariz
- Servo-Tek of Calif 14736 Arminta St Van Nuys Calif—W A Robertson Jr—ST 6-0690—Motors, Generators, & Blowers, Indicators
- Shamban & Co W S 11617 W Jefferson Blvd Culver City Calif—Carl Wolff—Up 0-6877—Insulators, Seals, Insulations Materials & Compounds
- Shand & Jurs Co 2600 8th St Berkeley 10 Calif—R W Blake—69 Employees—TH 8-2345—Indicators, Control Equipment (Industrial), Recorders (Special Purpose)
- Shannon Luminous Materials Co 7356 Santa Monica Blvd Hollywood 46 Calif—Iris M Guider—HO 7-5509—Chemicals, Coatings & Related Products, Lighting Equipment & Accessories, Industrial Electronic Equipment
- Shapiro & Edwards 1130 Mission St S Pasadena Calif—MU 2-3054—Electronic Instrumentation
- Sheltered Workshops Inc 2521 5th St Santa Monica Calif—Joseph E Anthony—37 Employees—EX 9-7741—Assembly Services
- Sheridan-Gray Inc 24701 Crenshaw Blvd Torrance Calif—110 Employees—Cabinets, Racks, Panels & Accessories, Hardware, Control Equipment (Industrial)
- △Shockley Transistor Corp 1117 California Ave Palo Alto Calif—Frank Newman—75 Employees—DA 6-1907—Silicon Diodes, Transistor Diodes
- Short Wave Plastics 335 N Newport Blvd Newport Beach Calif—Electron Oscillators
- Shrader Co F W 11623 S Broadway Los Angeles 61 Calif—15 Employees—PL 6-9166—Production Machinery & Equipment, Power Supplies & Converters, Magnetics
- Shur-Lok Corp 879 S East St P O Box 563—Anaheim Calif—F W Rohe—30 Employees—Hardware
- Sidco Inc/Sid Ungar Co Inc 1729 W Washington Blvd Box 312 Venice Calif—EX 9-0228—Soldering Irons
- Siegler Corp 610 S Harvard Blvd Los Angeles Calif
- Sieler Design Products 10460 San Pablo Ave El Cerrito Calif—LA 5-0164
- △Sierra Electronic Corp 3885 Bohannon Dr Menlo Park Calif—C M Volkland—130 Employees—DA 6-2060—Wave Analyzers, RF Test Equipment, Oscilloscopes
- Sierra Engineering Co 123 E Montecito Sierra Madre Calif—EL 5-3318
- Signal Equipment Co 2706 3rd Ave Seattle Wash—James F Johnson
- Skyline Electronics 1828 South Bannock St Denver Colo—James F Hurlbut—5 Employees—RA 2-3234—Lighting Equipment & Accessories, Services (Industrial), Hardware
- Slideways Mfg Co 8075 Woodley Ave Van Nuys Calif—William H Johnson—35 Employees—ST 2-3393—Chassis
- Slip Ring Co of America 3612 W Jefferson Blvd Los Angeles Calif—RE 5-0253—Slip Rings, Brush Assemblies, Commutators
- Sloan Co 4029 Burbank Blvd Burbank Calif—VI 9-4667
- Smeed Sound Service 790 W 8th Eugene Ore
- Smith-Corona Marchant Inc Marchant Calculator Div 6701 San Pablo Oakland Calif—OL 2-6500
- △Smith-Florence Inc 4228 23rd Ave W Seattle 99 Wash—R E Florence—12 Employees—Power Supplies & Converters, Measurement & Test Equipment (Special Purpose), Printed Circuits
- Snow Co Wm H 1413 E Franklin Ave El Segundo Calif—OR 8-8484—AN, NAS, Mil, MS Fasteners, Metal Stampings, Precision Machining
- Soderberg Mfg Co Inc 628 S Palm Ave Alhambra Calif—H M Gibbons—50 Employees—CU 3-3382—Aircraft & Marine Lights, Landing Gear Control Panels
- Solar Aircraft Co 2200 Pacific Hwy San Diego Calif
- Solar Mfg Corp 4553 Seville Ave Los Angeles 58 Calif—C A Swanson—500 Employees—LU 3-1411—Capacitors, Condensers, Crystals
- Solid State Electronics Co 8158 Orion Ave Van Nuys Calif
- Soltronics Inc 14712 Raymer St Van Nuys Calif—Hugh Mitchell—5 Employees—ST 6-4528—Ultrasonic Bond Inspection Systems, Ultrasonic Flow Recorders
- △Southern Electronics Corp 150 W Cypress Ave Burbank Calif—Geo E Gansell—65 Employees—VI 9-3193—Capacitors, Film
- Space Products Inc 2235 Artesis St Long Beach Calif—ME 0-6622—Ezi Connectors, Chassis Slides, Moisture Proofed Nylon Applications
- △Space Technology Laboratories Inc Bldg A Room 1046 P O Box 95001 Los Angeles Calif—J R Rector
- Special Instrumentation Services Inc P O Box 847 Pacific Palisades Calif—OR 8-6279
- Specific Co 555 E Walnut Pasa Calif—MU 2-8830
- Specific Plating Co Inc 3002 Downey Rd Los Angeles 23 Calif—D Golbert
- Specific Products 21051 Costanso St Woodland Hills Calif—DI 0-3131
- Spectralab Instruments 608 Fin Ave Monrovia Calif—Franklin R Goodman—23 Employees—RY 1-7044—UHF Power Amplifiers, Oscillators, Frequency Multipliers
- Spectra-Strip Wire & Cable Corp 10052 Larson Ave P O Box 415 Garden Grove Calif—Donald D Lang—20 Employees—JE 7-4530—Wire & Cable Assemblies, Vinyl Adhesives & Marking Inks, Flat & Spiral Bonded Cables
- △Spectral Electronics Corp 1704 S Del Mar Ave San Gabriel Calif—Donald Vaughn—350 Employees—AT 7-9761—Precision Potentiometers, Precision Mechanisms, Transistorized Power Supplies
- Sperry Gyroscope Co Sunnysvale Dev Center 294 Commercial St Sunnysvale Calif—A L Mayer—RE 9-2344—Communication Systems, Military, Systems (Eng'g), Radar Devices
- Sperry Phoenix Co Div Sperry Rand 19th & Deer Valley Rd Phoenix Ariz—H C Bostwick
- Spicer Co Walter 2088 E Villa Pasadena Calif—SY 6-9746
- Sprague Electric Co 12870 Panama St Los Angeles 66 Calif—40 Em-ploees—TE 0-7531—Capacitors, Magnetic Components, High Speed Switching Transistors
- Sprague Engineering Corp 19300 S Vermont Gardena Calif
- Stancil-Hoffman Corp 921 N Highland Ave Hollywood 38 Calif—William V Stancil—HO 4-7461—Recorders (Audio), Amplifiers (Audio), Motors, Generators & Blowers
- Standard Controls Inc 1130 Poular Pl Seattle Wash
- Standard Record Mfg Co 70 N San Gabriel Blvd Pasadena Calif—Tom R Wyper—MU 1-0537 Recording Accessories
- △Standard Rectifier Corp 620 E Dyer Rd Santa Ana Calif—Grant Graham
- △Standard Wire & Cable Co 3440 Overland Ave Los Angeles 34 Calif—I M Harris—App 40 Employees—TE 0-4647—Insulated Wire, Cable & Cord
- Stanford Research Institute Engineering Div Menlo Park Calif—E Finley Carter—425 Employees—DA 6-6200—Contract Research & Development, Electronic Components & Systems, Mechanics
- Stanley Aviation Corp 2501 Dallas St Denver 8 Colo—R H Frost—425 Employees—EM 6-3581—Electronic Breadboard, Radiation Detector, Emergency Escape Devices
- Star Engraving Co Ltd 223 E 4th St Los Angeles 13 Calif—Harry Simmons—Dials & Front Panel Accessories, Lighting Equipment & Accessories, Cabinets, Racks, Panels & Accessories
- △Statham Development Corp 1834 Pontius Ave Los Angeles 25 Calif—C L Vaughn
- Statham Instruments Inc 12401 W Olympic Blvd Los Angeles 64 Calif—AJ Hunter—520 Employees—BR 2-0371—Pressure Transducers, Accelerometers, Strain Gage Signal Amplifiers
- Stearns-Roger Mfg Co P O Box 5370 Denver Colo
- Stevens Trusonic Inc 8538 Warner Dr Culver City Calif—E J Petre—75 Employees—TE 0-6671—HiFidelity Speakers & Enclosures, Condenser Microphones, Wireless Microphones
- Stepper Motors Co Div Land-Air Inc 1732 W Slauson Ave Los Angeles 47 Calif—Clarence Adams
- Starling Electric Motors Inc 5401 Telegraph Rd Los Angeles 22 Calif—Charles R McGuire—RA 3-6211—Motors, Generators & Blowers
- Stevens Enterprises Inc 1635 Centinela Ave Inglewood Calif—OR 8-8938—Turnstiles & Computers for Human Traffic Handling Systems
- Stevenson Electronics 1531 Locust St Walnut Creek Calif
- Stewart Co A T 711 Broadway Tacoma Wash
- Stewart Eng'g Co 4900 Cherryvale Ave Soquel Calif—GR 5-4790—Thermocouples & Tubes
- Stoddard Aircraft Radio Co Inc 6644 Santa Monica Blvd Hollywood 38 Calif—J H Hanrahan—135 Employees—HO 4-9292—Radio Interference-Field Intensity Meters, Attenuators, Current Probes
- Stone & Smith Inc 5965 Alcoa Los Angeles Calif—LU 7-7144—Modular & Custom Cabinets, Cases & Enclosures
- Stromberg-Carlson Co/Div General Dynamics Corp 1895 Hancock St P O Box 2449 San Diego Calif—H M Taylor—500 Employees—CY 8-8331—Analog Computers, Digital Computers, Cathode Ray Tubes
- Studio Electronics Corp 440 South Victory Blvd Burbank Calif—Oliver Berliner—10 Employees—VI 9-2375—Amplifiers (Audio), Resistors & Volume Controls, Sound Systems, Intercommunicators & Hearing Aids
- Summit Industries Inc 2104 W Rosecrans Ave Gardena Calif—FA 1-3212—Microwave Components—Radar Devices, Navigation Systems
- Sun Electric Corp Aeronautical & Automotive Div 6701 S Sepulveda Blvd Los Angeles Calif—OR 8-3841
- Sunnysvale Development Center of Sperry Gyroscope Co 294 Commercial St Sunnysvale Calif—E B Jammond—200 Employees—RE 9-2344—Accelerometers, Analog Computers, Gyroscopes
- Superior Plastics Co-Continental Circuit Div 143 Arena St El Segundo Calif—OR 8-7267—Plastic Fabr-Printed Circuits



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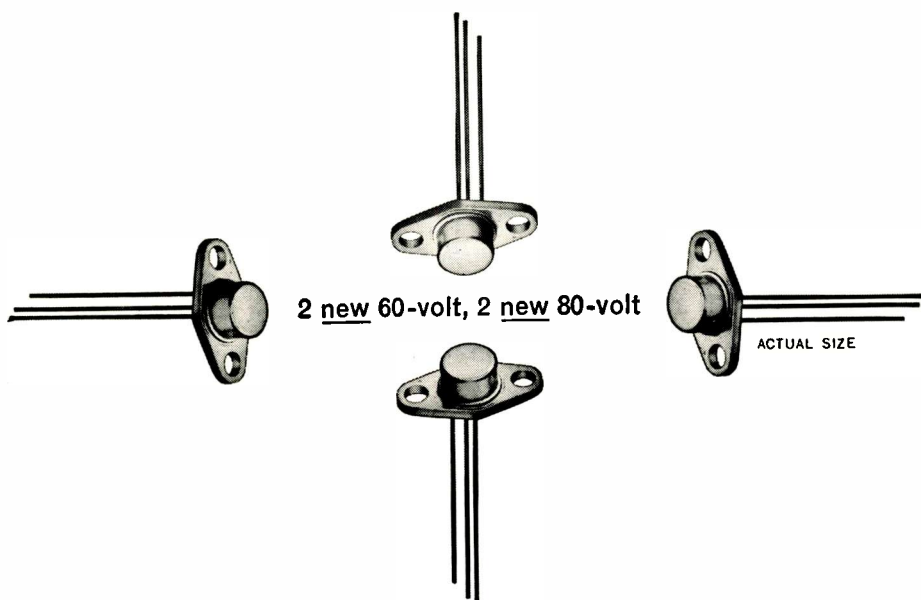
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1960 Directory of Western Electronic Manufacturers

- Superior Tool & Die 1747 Flower St
Glendale Calif—CH 5-5571
- Superscope Inc 8520 Tunjuna Ave Sun
Valley Calif—Fred C Luchinsky—35
Employees—TR 7-1313—Stereocorder,
Condenser & Wireless Microphones
- Swanson Co A C 11374 Ludington St
Sun Valley Calif—TR 7-0699—Trans-
istor & Semiconductor Components
Carbon Handling Equipment, Muffle
Type High Temperature Alloying
Furnaces
- Swissomatic Products 1818 Stanford St
Santa Monica Calif—UP 0-4422
- *Sylvania Electric Products Inc/Special
Tube Operations 500 Evelyn Ave
Mountain View Calif—David H
Simon—742 Employees—YO 8-6211—
Microwave Tubes & Components,
Counter & Trigger Tubes
- Sylvania Electric Products Inc Computer
Products Operations P O Box 941
333 Encinal St Santa Cruz Calif—
Bruce Bryant—150 Employees—GA
6-3000—Printed Circuits, Comput-
ers, Wire & Cable
- Sylvania Electronic Systems/Computer
Products Operations P O Box 941
Santa Cruz Calif—Bruce C Bryant
—GA 6-3000—Power Supplies &
Converters, Computers, Insulation
Materials & Compounds
- *Systems Development Corp 2428 Colo-
rado Ave Santa Monica Calif—David
Green—Electronic Systems
- △Syston Corp 950 Galindo St Concord
Calif—James R Cunningham—70
Employees—MU 2-3650—Computers,
Measurement & Test Equipment
(Counters), Measurement & Test
Equipment (Special Purpose)
- ## T
- Talkmaster Inc 534 Laurel St San Carlos
Calif—E D Melligan Jr—2 Employees
—LY 3-9515—Intercommunication
Equipment
- Tally Corp Newbury Park Calif—Norman
Nicholson—4 Employees—Motors,
Generators & Blowers, Power Supplies
& Converters, Missiles
- △Tally Register Corp 5300 14th Ave
N Seattle 7 Wash—M R Dilling
—40 Employees—SU 4-5500—Dig-
ital X-Y Plotter, Paper Tube Reader
& Punch, Pulse Delay Logic Switches
- TA Mfg Corp 4607 Alger St Los Angeles
39 Calif—Jay N Thraves—130 Em-
ployees—CH 5-3748—Wire Harness
Clamps, Instrument Cases, Line Sup-
ports
- Tamar Electronics Inc 2045 W Rosecrans
Ave Gardena Calif—Henry J Hamm—
100 Employees—DA 3-9110—Micro-
wave Components, Antennas (Com-
mercial), Connectors & Terminals
- Tape-Athon 523 Hindry Ave Inglewood
Calif—George M Anthony—13 Em-
ployees—OR 8-5359—Tape
- *Tapco Group of Thompson Ramo Wool-
dridge Inc P O Box 90215 5500 W
El Segundo Blvd Los Angeles 45
Calif—David Traitel
- Ta-Mar Electronics Inc 2339 Cotner Ave
Los Angeles 64 Calif
- Task Corp 1009 E Vermont Ave Anaheim
Calif—Joe A Fryer Jr—51 Em-
ployees—Motors, Generators & Blowers
- Tavis Instruments Inc 1901 E Walnut
Ave Pasadena Calif—MU 2-4722
- Taylor Fibre Co 1400 Palomares Ave
LaVerne Calif—Milton F Chapel—85
Employees—LY 3-1341—Laminated
Plastics, Vulcanized Fibre, Copper
Clad Laminates for Printed Circuits
- TDK Electronics Co Ltd 606 South Hill
St Los Angeles 14 Calif—K Suzuki
- Tech-Graphic Inc Box 47 Burbank Calif
—TH 5-3505
- Technibilt Corp 905 Air Way Glendale
1 Calif—Ray Cairnes—CH 5-7251
- Technical Associates 140 W Providencia
Ave Burbank Calif—Howard Marx—
VI 9-5838—Nuclear Products
- Technical Ceramic Corp 4326 E 3rd St
Los Angeles Calif—AN 1-5191
- △Technical Devices Co 11242 Playa
Court Culver City—M K Allen—
UP 0-3752—Production Machinery &
Equipment, Tools (Hand), Printed
Circuits
- Technical Electronics Corp 4060 Ince Blvd
Culver City Calif—W A Beswick—50
Employees—UP 0-5461—Measure-
ment & Test Equipment (Special
Purpose)
- Technical Metal Finishing 4435 San Fer-
nando Rd Glendale Calif
- Technical Oil Tool Corp 1057 N LaBrea
Ave Los Angeles 38 Calif—John P
Davis—100 Employees—OL 4-1763
- Accelerometers, Assemblies, At-
tenuators
- Technical Products Instrument Div 6670
Lexington Ave Los Angeles 38 Calif
—J H Krebs
- △Technology Instrument Corp of Calif
7229 Atoll Ave N Hollywood Calif—
J M Looney Jr—85 Employees—PO
5-8620—Accelerometers, Potentiom-
eters, Transducers
- Tech-Tronics Industry Inc 1030 W Foot-
hill Blvd Azusa Calif—ED 4-8296
- Tectron Hi-Fi 7721 Melrose Los Angeles
Calif
- Tekni-Labels Co 8160 Orion Van Nuys
Calif
- Teksun Inc 11368 Olympic Blvd W Los
Angeles Calif—BR 2-4504
- Tektronix Inc 9450 S W Barnes Rd Port-
land Ore—Howard Vollum—2400
Employees—CY 2-2611—D-C Ampli-
fiers, Differential Amplifiers, Gen-
erators
- △Tektronix Inc 701 Welch Rd Palo Alto
Calif—G E Bauder
- Tektronix Inc 9'50 S W Barnes Rd Port-
land Ore—CY 2-2611—Oscilloscopes,
Signal Generators, Measurement &
Test Equipment, Oscillators
- Tektron Instruments 26225 N W Cornell
Rd Hillsboro Ore—James Costigan
- Telautograph Corp 8700 Bellanca Los An-
geles Calif—OR 4-2690
- Teledem Industries Atlas Paak Rd Papa
Calif—BA 4-0792
- △Telecomputing Corp 915 N Citrus Ave
Los Angeles Calif—Peter L Bealer—
HO 4-3171—Amplifiers, Aviation
Auxiliary Electronic Equipment, Bat-
teries, Charges & Accessories
- Telecontrol Corp 11712 Inglewood Ave
Hawthorne Calif—John W Doering—
OS 9-2993—Amplifiers (TV), Studio
Equipment, Amplifiers (Audio)
- Telemetering Associates 4270 E Whittier
Tucson Ariz
- Telemetering Corp of America 8345 Hay-
venhurst Ave Sepulveda Calif—Joel
H Axe—14 Employees—Telemetry
Systems (FM/FM & PCM), Minia-
turized Voltage Controlled Oscillators
- △Telemeter Magnetics Inc 9937 Jefferson
Blvd Culver City Calif—Fred H.
Weisal Jr—275 Employees—UP 0-
8571—Magnetics, Military Systems
(Eng'g)
- Telepix Corp & Film Recorders 1515 N
Western Ave Hollywood 27 Calif—
Robert P Newman—14 Employees—
HO 4-7391—Industrial Motion Pic-
tures, Slide Films, Sound Record-
ing Services
- Tele-Systems Inc 6442 Santa Monica
Blvd Los Angeles Calif—HO 3-7121
- Teletronic Labs Inc 1835 W Rosecrans
Ave Gardena Calif—Daniel Rose—
FA 1-0627—Control Equipment (In-
dustrial), Wire & Cable, Services
(Industrial)
- Teletrex Eng'g Co 4688 Eagle Rock
Blvd Los Angeles Calif—CL 5-5393
—Communication & Broadcast Equip-
ment
- Telonic Engineering Corp 773 Broadway
Laguna Beach Calif—Ed Van Deusen
—5 Employees—Measurement & Test
Equipment (Generators), Filters, Re-
sistors & Volume Controls
- Tepeco Inc 936 E Arques Sunnyvale
Calif
- Testco Boeing Field RM 105 Seattle
Wash
- Tevco Insulated Wire 108 E Prospect
Ave Burbank Calif—Peter S Wald—
40 Employees—VI 9-5574—Insulated
Wire, Special Cables, TV Parts &
Accessories
- △Thermador Electrical Corp Electronics
Dept 715 S Raymond Ave Alhambra
Calif—J R Singleton—LU 8-7111
- Thermec Eng'g Corp 1773 Lincoln Ave
Anaheim Calif—KE 3-3183—Missile
Frame & Propulsion Systems Eng'g
- △Thermo-Cal Inc 1631 Colorado Santa
Monica Calif—EX 3-9841
- Thermo Materials Inc 4040 Campbell Ave
Menlo Park Calif—DA 6-2780
- Thias Engineering Associates 10617 Bur-
bank Blvd N Hollywood Calif—TR
7-9202
- △Thomas & Betts Co Inc 645 Philips St
San Francisco 24 Calif—Donal J
Frear
- Thomas Organ Co 8345 Hayvenhurst Ave
Sepulveda Calif—Howard Rieder—
EM 2-3131—Receivers (Home),
Sound Reproducing Equipment (Disc),
Sound Systems, Intercommunicators
& Hearing Aids
- Thompson Fiber Glass Co H I 1733 Cor-
onado St Los Angeles Calif—RE 3-
9161—Warhead & Nose Cone
- △Thompson Ramo Wooldridge Inc 8433
Fall Brook Ave Canoga Park Calif—
- D E Wooldridge—DI 6-6000—Mis-
sile & Aircraft Auxiliary Power Sys-
tems, Ground Support & Fuel Sys-
tems, Pumps
- Thompson Ramo Wooldridge Inc P O
Box 8405 Denver Colo—David T
Traitel—Digital Control Computers
- Thor Industries 155 Arena St El Segundo
Calif—OR 8-3715
- △Thorson Co 7361 Melrose Ave Los An-
geles 46 Calif—T Macklin
- Thor Transformer & Electronics 750 San
Antonio Rd Palo Alto Calif—DA
1-0491
- Tiegel Mfg Co Bragato Rd Belmont Calif
—LY 3-9267
- Tierney Electrical Mfg Co 2713 1st Ave
S Seattle Wash
- Timech Corp 13866 Saticoy Van Nuys
Calif—ST 2-1914
- Timev Instruments & Controls 3160 W
El Segundo Blvd Hawthorne Calif
- Tinsley Labs Inc 2526 Grove St Berkeley
Calif—TH 3-6836—Missile Tracking
& Telemetering
- Tipco Mfg Co 14734 Calvert Van Nuys
Calif—J W Gage—5 Employees—ST
6-7881—Self Adjusting Wrench,
Safety Wire Tools
- Ti-Tal Inc 1810 6th St Berkeley Calif—
TH 5-2321
- Titan Engineering Corp 921 Orangethorpe
Pk Anaheim Calif—TR 1-1543
- Tomorrow Inc 22729 Alice St Hayward
Calif—JE 8-0733—Precision Elec-
tronic Fabrication
- △Topatron Inc 942 E Ojai Ave Ojai
Calif—Lee Appleman—20 Employees
—MI 6-1600—Shielded Rooms, Ane-
choic Microwave Test Chambers &
Electronic Test Consoles
- Toroidal Components Co 1374 E Walnut
Pasadena Calif—SY 5-7123
- Toro Industries Inc P O Box 758 San
Carlos Calif
- Torque Controls Inc 825 E Broadway San
Gabriel Calif—CU 3-4182—Missile
Ground Support Equipment
- Touch-Plate Mfg Corp 16530 Garfield
Ave Paramount 1 Calif—K P Cronk
—30 Employees—ME 3-0207—Low
Voltage Switch Systems, Relays, Mo-
mentary Contact Switches
- Townsend Co Cherry Rivet Div 1224
Delhi Rd Santa Ana Calif—John R
Roy—KI 5-5511—Hardware
- Tracerlab Inc 2030 Wright Ave Richmond
Calif—J Eills—Nuclear Products
- Traffic Master Sales 465 California San
Francisco Calif
- Traid Corp 17136 Ventura Blvd Encino
Calif—TR 3-3373
- Tranco Products Inc 12210 Nebraska
Ave Los Angeles 25 Calif—Wayne
W Hoover—102 Employees—Micro-
wave Components, Antennas (Com-
mercial), Antenna Accessories
- Transdata 1844 Bridgen Rd Pasadena
Calif—SY 8-3086
- Transducers Inc 2957 Honolulu Ave La
Crescenta Calif—CH 5-3123
- Trans Electronics Inc 7349 Canoga Ave
Canoga Park Calif—William J Miller
—30 Employees—DI 0-3334—Power
Supplies, Transistor & Diode Testers
- Transformer Electronics Boulder Indus-
trial Park Boulder Colo—Kenneth E
Forsberg
- △Transformer Engineers 285 N Halstead
Ave Pasadena Calif—MU 1-6906
- Transistor Circuit Eng'g Co 80—E Fill-
more Colorado Springs Colo—1 Em-
ployee—ME 2-3923—Amplifiers
(Audio), Communication Systems,
Receivers (Communication)
- Transmit Inc 319 S Spring St Room 205
Los Angeles 13 Calif—James H
Flint—MA 6-5501—Services (Broad-
cast)
- Trans Rex Eng'g Co 305 Gate 5 Rd Sau-
salito Calif—ED 2-3794
- Trans-Tel Corp 910 N Orange Dr Los
Angeles 38 Calif—Ben Williams—
23 Employees—HO 2-7304—Audio
& Transistor Amplifiers, Baffles
Speaker, Cable Assemblies
- Transonic Inc 808 16th St Bakersfield
Calif—Charles P Cushway—FA 7-
5701—Transformers, Power Supplies
& Converters, Coils
- Transval Electronics Corp Mechanical Div
3445 Union Pacific Ave Los Angeles
Calif—AN 9-7291
- Transval Engineering Corp 10401 W Jef-
ferson Blvd Culver City Calif—VE
9-2301
- Trans-Western Electronics 430 Front St
Ventura Calif—MI 2-4219—Missile
Test Equipment
- Transwestern Instruments Box 1473 Ven-
tura Calif
- △Triad Transformer Corp Div Litton Ind
4055 Redwood Ave Venice Calif—
L W Howard—475 Employees—TE
- 0-5381—Electronic Transformers,
Filters & Toroidal Coils, Reactors
- Triangle Metal Products 911 Olympic
Blvd Montebello Calif—RA 3-6366
- Tri-Dex Co P O Box 1207 Lindsay Calif
—K B Howard—3 Employees—LI 2-
4501—Terminal Boards (Turret Lug
Type), Coils (Special Types), As-
semblies (All Contract Mfg)
- Tri-Ex Tower Corp 127 E Inyo St Tulare
Calif—Louis V Tistao—18 Employees
—MU 6-3411—Microwave & Com-
munications & Accessories, Telescop-
ing Crank Up Towers
- Tri-Fab Products 3552 E 2nd Livermore
Calif—HI 7-4017
- Triplett & Barton Inc 831 N Lake St
Burbank Calif—VI 9-1291
- Triplett Electrical Instrument Corp 202
Via Del Monte Oceanside Calif—V
A Nepper—40 Employees—SA 2-9779
—Electrical Indicating Meters
- Tri-State Supply Corp 554 Bryant St
San Francisco 7 Calif—G M Eick-
meyer
- Tru-Beam Products Inc 4141 Broadway
Oakland Calif—OL 3-9016
- Trutone Electronics Inc 6912 Santa Mon-
ica Blvd Los Angeles 38 Calif—P H
Tatak—22 Employees—HO 4-8118—
AM FM & FM Tuners, Pre-Amplif-
iers, Amplifiers & Monaural Loud
Speaker Systems & Cabinets
- T T Electronics Inc P O Box 180 Culver
City Calif—J F Sodaro—10 Em-
ployees—TE 0-3213—Twin-T Rejec-
tion & Highpass, Lowpass & Band-
pass Filters, Active Bandpass Filters
- Tub Lok Mfg Co Box 915 Palo Alto
Calif—DA 105919
- Tubo Products Inc 12177 Montague St
Pasadena Calif—EM 9-5252—Missile
Ground Support & Handling Equip
- Tucson Instrument Corp 1050 E Valencia
Rd Tucson Ariz
- *Tung-Sol Electric Co 8575 Washington
Blvd Culver City Calif—Charles Silver
- △Tur-Bo Jet Products Co Inc 424 S San
Gabriel Calif—Charles A Sprowl—
85 Employees—CU 3-5191—Coils
for Relays, Solenoids & Chokes
- Turco Products Inc 6135 S Central Ave
Los Angeles Calif—AD 2-6111
- 20th Century Electronics P O Box 11215
Tucson Ariz
- 21st Century Electronics Inc P O Box
2326 Riverside Calif—OV 8-0780—
Missile Guidance Equipment
- △Twin Lock Inc 1024 W Hillcrest Blvd
Inglewood Calif—C Parke—Masterson
—20 Employees—OR 3-0911—Adapt-
ers, Assemblies, Circuit Breakers
- ## U
- △Ultek Corp 920 Commercial St Palo
Alto Calif—Charles Piercy—DA 1-
4117
- Ultradyn Inc P O Box 3308 Albuquerque
N M—E L Amonette—AM 8-2431
—Measurement & Test Equipment
(Special Purpose), Military Equip-
ment, Aviation Auxiliary Electronic
Equipment
- Ultra-Fidelity Labs Inc 643 W 17th St
Costa Mesa Calif—A Badmaieff—16
Employees—LI 8-1381—Amplifiers,
Audio Equipment, Complete Sound
Systems
- Ultra-Violet Products Inc 5115 Walnut
Grove Ave San Gabriel Calif—Thomas
S Warren—32 Employees—CU 3-
3193—Ultra-Violet Lamps, Black
Light Lamps, Fluorescent Materials
- Ultronic Inc 111 E 20th Ave San Mateo
Calif—David Persen—100 Employees
—FI 5-7921—Wire Wound Resis-
tors, Networks, Trimming Potenti-
ometers
- △Ultronic Inc 111 E 20th Ave San Ma-
teo Calif—FI 5-7921—Precision
Wire-Wound Resistors, Trimmer Po-
tentiometers, Networks
- Ungar Co Sid 1729 W Washington Blvd
Venice Calif—EX 9-0228
- △Ungar Electric Tools Inc 4101 Red-
wood Ave Los Angeles 66 Calif—
William L Nehrenz—100 Employees
—EX 8-5718—Electrical Soldering
Tools
- United Aircraft Corp Data Systems Dept
13210 Crenshaw Blvd Gardena Calif
—FA 1-1775
- United Control Corp 4540 Union Bay Pl
Seattle 5 Wash—Robert L Hertzler
—486 Employees—LA 5-9200—Am-
plifiers (Special Purpose), Control
Equipment (Industrial), Aviation
Auxiliary Electronic Equipment
- United Electrodynamics Inc 200 Allen-
dale Rd Pasadena Calif—Frank A
Fleck—300 Employees—MU 2-1134
—Telemetering Systems & Com-
ponents, Stepping Switches
- *United Electronics Inc 9937 Jefferson

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I_{CO}	200 μ a	100 μ a	100 μ a	100 μ a	100 μ a
H_{FE}	30/90	30/75	50/125	30/75	50/125
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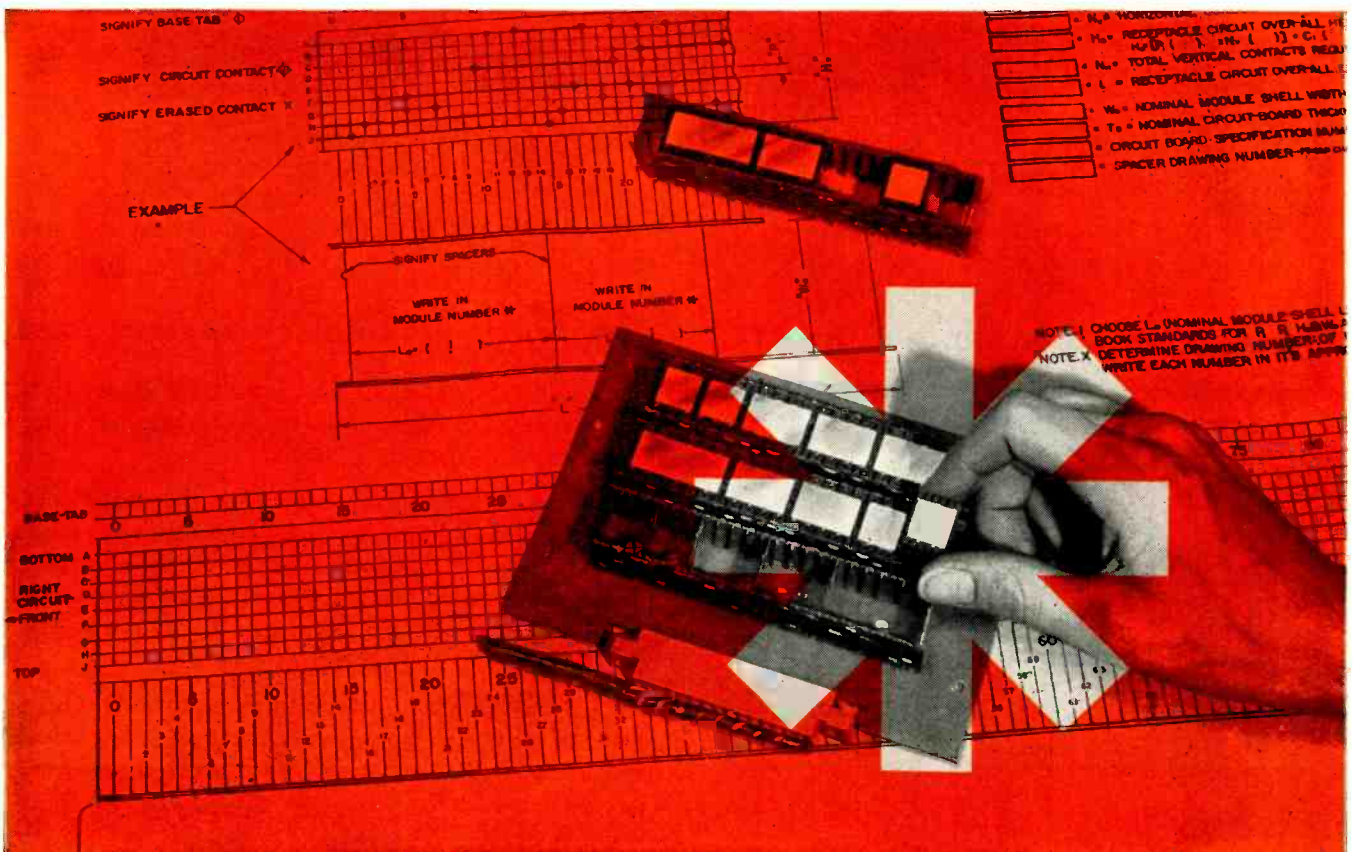
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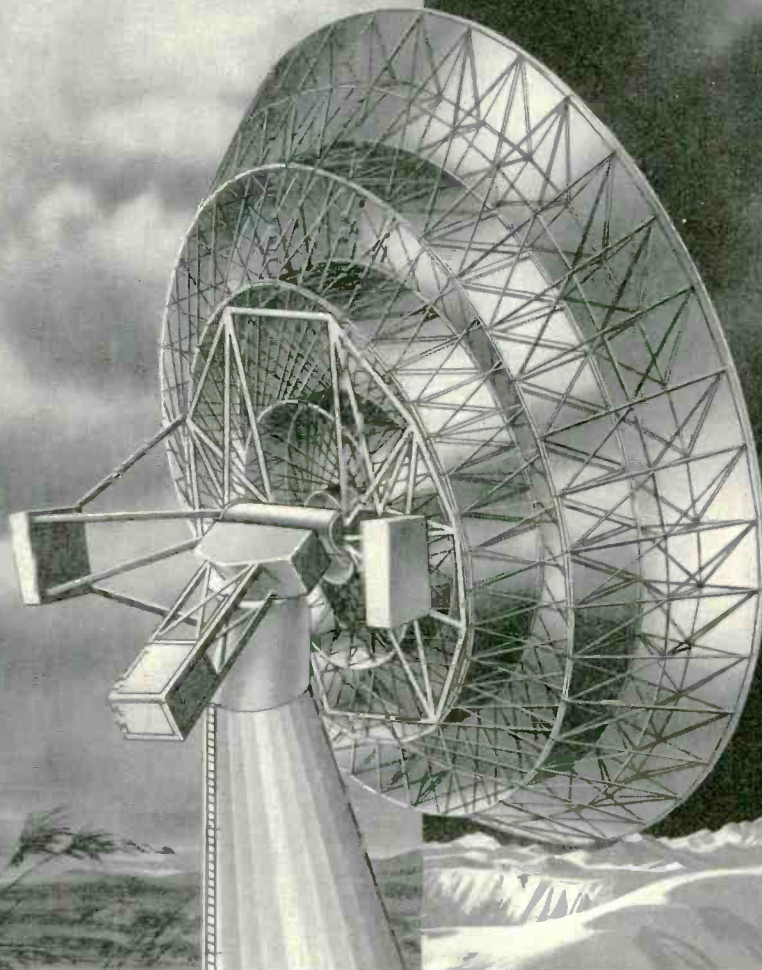
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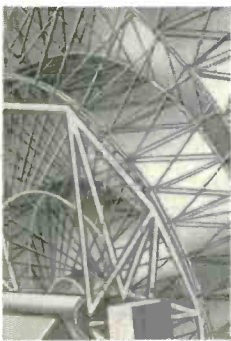
1960 Directory of Western Electronic Manufacturers

- Bld Culver City Calif—Ralph B Austrian
- United Geophysical Corp 2650 E Foot-hill Blvd Pasadena Calif—SY 5-0421
- United Testing Labs Div United Electro-dynamics Inc 573 Monterey Pass Rd Monterey Park Calif—R H Levine—1 Employee—Services (Industrial)
- United Transformer Corp 4008 W Jeffers-son Blvd Los Angeles 16 Calif—John Borg—125 Employees—RE 1-6313 —Transformers, Reactors, Filters
- Unit Industries 8763 Crocker Los An-geles Calif—PL 2-7195
- Unitek Corp 950 Royal Oaks Dr Mon-rovia Calif—Don A Drake
- Universal Electronics Co 1720 22nd St Santa Monica Calif—Edward Lacey
- Universal Match Corp Armament Div 6850 Van Nuys Calif—I A Water-street Jr
- Univox Corp 4301 W Jefferson Blvd Los Angeles Calif—Richard Wiggins—RE 4-4163—Aviation Auxiliary Elec-tronic Equipment, Antenna Accesso-ries, Wire & Cable
- UP N Atom Enterprises 1635 Centinella Ave Inglewood Calif—OR 8-8938
- U S Bearing Corp 10711 Chandler Blvd N Hollywood Calif—PO 6-3821
- U S Chemical Milling Corp 1700 Rose-crans Ave Manhattan Beach Calif—R S Stevens—350 Employees—Ser-vices Industrial, Cabinets, Racks, Panels & Accessories, Industrial Elec-tronic Equipment
- U S Electrical Motors Inc 200 E Stauson Ave Los Angeles 54 Calif—R E Goodman—AD 3-3131—Electric Mo-tors, Power Transmissions, Fractional HP Aircraft Motors
- U S Engineering Co Div Litton Industries 13536 Saticoy St Van Nuys Calif—Don Fowler—125 Employees—ST-6 9381—Printed Circuits, Hardware, Connectors & Terminals
- U S Flexible Metallic Tubing Co 454 E 3rd St Los Angeles Calif—MA 4-2121—Missile Propulsion Systems & Ground Support
- U S Plastic Rope Inc 2581 Spring St Redwood City Calif—EM 8-1461—Wire & Cable
- U S Relay Co The Electronics Div A S R Products Corp 717 N Coney Ave Azusa Calif—Lyle D Bunce—197 Employees—ED 4-8206—Relays, Solenoids, Packaged Controls
- U S Science Corp 5221 W 102nd St Los Angeles 45 Calif—M A Pah-lavan—SP 6-0450—Measurement & Test Equipment (Special Purpose), Aviation Auxiliary Electronic Equip-ment, Industrial Electronic Equip-ment
- U S Semiconductor Products Inc 3540 W Osborn Rd Phoenix Ariz—J C Worth—150 Employees—AP 8-5591 —Voltage Regulation Diodes, Low Medium & High Power Zener Diodes & Rectifiers, Dry Solid Tantalum Capacitors
- Vacudent Mfg Co 975 E 5th St Salt Lake City Utah—Louis N Bagley—11 Employees—Amplifiers (Special Pur-pose) Control Equipment (Communi-cations)
- Vacuum Apparatus Co 809 San Antonio Palo Alto Calif—YO 8-5835
- Vacuum Tube Products/Div Hughes Aircraft Co 2020 Short St Oceanside Calif—J J Sutherland—80 Em-ployees—SA 2-7648—Special Cathode Ray Tubes, High Vacuum Rectifiers & Xenon Thyratrons, Spot & Seam Welders
- Valley Engineering Co 601 Cedar St Los Alamos N Mex
- Valor Electronics Co 13214 Crenshaw Blvd Gardena Calif—Eugene Kur-chak—55 Employees—DA 3-6160—Coils, Transformers, Power Supplies & Converters
- Valor Instruments Inc 13216 Crenshaw Blvd Gardena Calif
- Van Eps Labs 426 Sonora Ave Glendale Calif
- Vanguard Electronics Co 3384 Motor Ave Los Angeles 34 Calif—Simon A Gol-berth—20 Employees—TE 0-7344—Coils, Chokes, Variable Inductors
- Vapor Recovery Systems Co 2820 North Alameda St Compton Calif—Wayne Doty—180 Employees—NE 6-1211 —Control Equipment (Communications), Switches, Transmitters
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- Victrolite Industries 4117 W Jefferson Blvd Los Angeles Calif—RE 2-4033
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- Voltron Products 1010 Mission St Pa-sadena Calif—MU 1-3377—Meters, Industrial & Military
- W**
- Waldale Research Co Inc 362 W Colorado St Pasadena Calif—MU 1-4946—Strain Gages, Strain Gage Trans-ducers, Variable Resistance Measure-ment Devices
- Walkirt Co 141 Hazel St Inglewood Calif—Wes L Kirchoff—25 Employees—OR 8-4814—Plug-in & Modular Circuits
- Wallin Optical Systems Inc 18670 Ven-tura Blvd Tarzana Calif—Walter Wallin—DE 5-4217—Motion Picture Equipment (Accessories), Studio Equipment
- Walsco Electronics Mfg Co 3225 Exposi-tion Pl Los Angeles 18 Calif—Arnold Kloman
- Walter Industries 1109 S Railroad Ave San Mateo Calif
- Walton Tool & Die Co Inc 2707 Empire Ave Burbank Calif—Walton Emmick 35 Employees—TH 6-5252—Sheet Metal Fabrication & Machining of Components Parts for Radar, Elec-tronics & Guided Missiles
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- Watkins-Johnson Co 3333 Millview Ave Palo Alto Calif—H Richard Johnson—38 Employees—DA 6-8830—Trav-eling-Wave Tubes, Backward-Wave Os-cillators, Helitrons
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- Western Transformer Co 618 E 11th Oak-land Calif
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- MA 7-2641—Wire Markers, Tubing & Sleeving, Special Labels & Mark-ers
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- Williamette Iron & Steel Co 2800 N W Front Ave Portland Ore
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- Wittek Products Co 14750 Keswick St Van Nuys Calif—ST 0-8265
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- Wyco Metal Products Stanton Div 6918 Beck Av N Hollywood Calif—Forrest N Weiss—50 Employees—TR 7-5579 —Relay Racks, Chassis, Cases
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- Wyle Mfg Corp 133 Center St El Se-gundo Calif—J A Sneller—35 Em-ployees—EA 2-0659—Environmental Test Chambers, Liquid Storage Ves-sels, High-Force Vibration Test Sys-tems
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- Yuba Consolidated Industries 351 Califor-nia St San Francisco Calif
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- Zenith Radio Research Corp 841 Warring-ton Ave Redwood City Calif—EM 9-0355
- Zep Aero 113 Sheldon St El Segundo Calif—OR 8-1161
- Zephyr Mfg Co Inc 201 Hindry Ave Ingle-wood Calif—OR 8-4331—Missile Ground Support & Ground Equip-ment
- *Zero Mfg Co 1121 Chestnut St Bur-bank Calif—Raymond A Harper—200 Employees—TH 6-4191—Con-tainer, Cases & Aluminum Fabrication
- Zeus Eng'g Co Inc 635 S Kenmore Ave Los Angeles 5 Calif—H Patrusky—App 10 Employees—DU 7-7175—Transistor Index
- Zinn Instruments 213 S Hawthorne Hawthorne Calif—OS 6-6055
- Zip Industrial Products Inc 7282 Bellaire N Hollywood Calif—TR 7-3828
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| 35 Antenna Systems, Inc.—High precision 30-foot antenna | 151 Buchanan Electrical Products Corporation—Connecting terminal blocks | 119 Corning Glass Works, Corning Electronic Components—Glass-base MIL resistors |
| 38 ARCO Electronics, Inc.—Distributor of ELMENCO capacitors | 31 Bulova Electronics Division — Portable frequency standard | 68 Dade County Development Dept.—Economic survey of metropolitan Miami |
| 136 Armco Steel Electrical Corporation — Electrical steels | 322 Burgess Battery Company—Batteries | 19 Dale Products, Inc.—Wire wound, precision, power resistors |
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| 37 Avnet Electronics Corp.—Distributor of Speery tunnel diodes | 70 Cambridge Thermionic Corporation — Panel handles | 142 Delco Radio Division, General Motors Corp.—Miniature modules with standard components |
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- 110 Ideal Precision Meter Co., Inc.—Panel meters
- 150 Illumitronic Engineering — Plastic rod, tubing and sheet
- 81 IMC Magnetics Corp.—Hysteresis & Torque motors
- 156 Interelectronics Corp.—Solid-state power inverters
- 129 Indiana Steel Products Co., Division of Indiana General Corp. — Permanent magnets
- 66 Industrial Electronic Engineers, Inc.—In-line digital displays
- 89 International Rectifier Corporation — Silicon rectifiers
- 24 ITT Industrial Products Division International Telephone and Telegraph Corp.—Power supplies

- 20 Jennings Radio Manufacturing Corporation—Vacuum relays and capacitors
- 69 Jerrold Electronics Corp.—RF test set
- 112 Johnson Co., E. F.—Variable capacitors
- 160 Jones, Howard B., Division of Cinch Manufacturing Co.—Terminal panels

- 114 Keuffel & Esser Co.—Printed circuit masters
- 63 Keystone Carbon Company, Thermistor Div.—Thermistors
- 57 Kulka Electric Corp.—Miniature terminal blocks for printed wiring

- 16 Lenz Electric Manufacturing Co.—High voltage lead wire
- 118 Light Electric Corp.—High voltage AC power supply

- 120 Magnetic Shield Division Perfection Mica Co.—Magnetic shielding foils and containers
- 61 Magnetics, Inc. — Molybdenum alloy powder
- 82 Manson Laboratories, Inc.—Frequency standard
- 56 Marconi Instruments—Deviation meter
- 157 McKinstry Metal Works, Inc.—Electrical enclosures
- 23 Microwave Associates, Inc.—Microwave components
- 138 Midwest Foam Products Company — Polyurethane foam caps.
- 60 Miller Company, J. W.—Molded choke coils
- 125 Minnesota Mining and Manufacturing Company, Products Div.—Magnetic tape
- 103 Minnesota Mining and Manufacturing Company, Mincom Div.—Instrumentation recorder reproducer
- 154 Motorola Communications & Electronics, Inc., Subsidiary of Motorola, Inc.—Electronic DC multimeter and transistorized AC voltmeter

Employment—Use the handy card below to get more information on the engineering positions described in the "Professional Opportunities" Section which begins on page 231 of this issue.

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																			361 362

YOUR NAME TITLE

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- 111 Motorola Semiconductor Products, Inc., A Subsidiary of Motorola, Inc.—Transistors, zeners, diodes and rectifiers
- 47 New Departure Division, General Motors Corporation—Miniature & instrument ball bearings
- 362 Ohmite Manufacturing Company—Tantalum wire capacitors
- 51 Pacific Semiconductors, Inc.—Semiconductor devices

- 52 Pacific Semiconductors, Inc.—Semiconductor devices
- 95 Packard Bell Computer, a subsidiary of Packard Bell Electronics — Analog digital solid-state converter
- 144 Pennwood Numechron Co. — Digital clocks
- 8 Philco, Lansdale Division — Switching transistor
- 40 Powertron Ultrasonics Corp.—Self tuning ultrasonic cleaners

- 107 PRD Electronics, Inc., a subsidiary of Harris-Intertype Corp.—Direct reading frequency meters

- 1 Radio Materials Company, Division of P. R. Mallory & Co., Inc.—Ceramic disc capacitors
- 122 Raytheon Company, Industrial Components Div.—Subminiature triode for telemetering equipment
- 86 Raytheon Company, Microwave and Power Tube Div.—Backward wave oscillators
- 45 Reeves Instrument Corporation, a subsidiary of Dynamics Corp. of America —Miniature floated gyros
- 123 Rohn Manufacturing Co.—Communication tower
- 59 Rondo of America, Inc.—Paper packagers

- 77 Sarkes Tarzian, Inc., Semiconductor Div.—Silicon rectifiers
- 54 Scientific-Atlanta, Inc.—Integral computer for antenna design applications
- 329 Sealectro Corporation—Logic programming board
- 113 Segal, Edward, Co.—Automatic eyeletting machine
- 326 Sifco Metachemical, Inc.—Selective plating process
- 330 Spectrol Electronics Corporation — Potentiometers
- 2 Sprague Electric Co.—Germanium diffused-base transistors
- 72 Sylvania Electric Products, Inc., Subsidiary of General Telephone & Electronics, Electronic Tubes Div.—Subminiature tubes
- 30 Sylvania Electric Products, Inc., Subsidiary of General Telephone & Electronics, Semiconductor Div.—Germanium alloy switching transistors
- 94 Sylvania Electric Products, Inc., Subsidiary of General Tel. & Elec., Special Tube Operations — Microwave switch
- 73 Synthane Corporation—Laminated plastics
- 327 Syntrol Rectifier Division, Subsidiary of Link-Belt Co.—Silicon rectifiers
- 146 Syntronic Instruments, Inc.—Deflection yoke coils

- 7 Taylor Fibre Co.—Laminated plastics
- 102 Tektronix, Inc.—Indicating oscilloscope
- 145 Telecomputing Corporation Div., Electronic Components—Filters, relays and capacitors
- 106 Telecomputing Corporation, Division of Narmco Industries, Inc., Narmco Mfg.—Large parabola antenna
- 6 Texas Instruments, Incorporated, Semiconductor-Components Div.—Silicon mesa transistors
- 137 Thomas & Betts Co., Inc., The—Cable ties and straps
- 36 Thompson Ramo Wooldridge, Inc.—Electrical power components
- 328 Times Wire & Cable Division The International Silver Co.—High and medium temperature ribbon coax cable
- 29 Tinnerman Products, Inc.—Vibration-proof fastener
- 109 Trak Electronics Co., Microwave Components Dept.—Miniature oscillator cavities
- 79 Transistor Specialties, Incorporated — Rack-mounting counter-timer
- 75 Transatron Electronic Corporation — Switching transistors
- 21 Tung-Sol Electric, Inc.—Thyratron tubes

- 133 United Transformer Corporation, Pacific Mfg. Div.—Filters, transformers and coils
- 62 United Van Lines Co.—Nation-wide delivery service
- 26 Unitek Corp., Weldmatic Div.—Seam weld control

- 321 Varflex Corporation—Sleeving and tubing
- 93 Varian Associates—Klystrons
- 14 Victoreen Instrument Co.—Voltage regulator tubes
- 15 Victoreen Instrument Co.—Voltage regulator or amplifier tubes
- 337 Vitramon, Incorporated—Porcelain capacitors

- 64 Waveline, Inc.—Microwave test equipment
- 76 Westinghouse Electric Corp. — Silicon power transistors
- 80 Westinghouse Electric Corp., Tube Div.—High power amplifier tubes
- 74 Wilmad Glass Co., Inc.—Precision bore glass tubing

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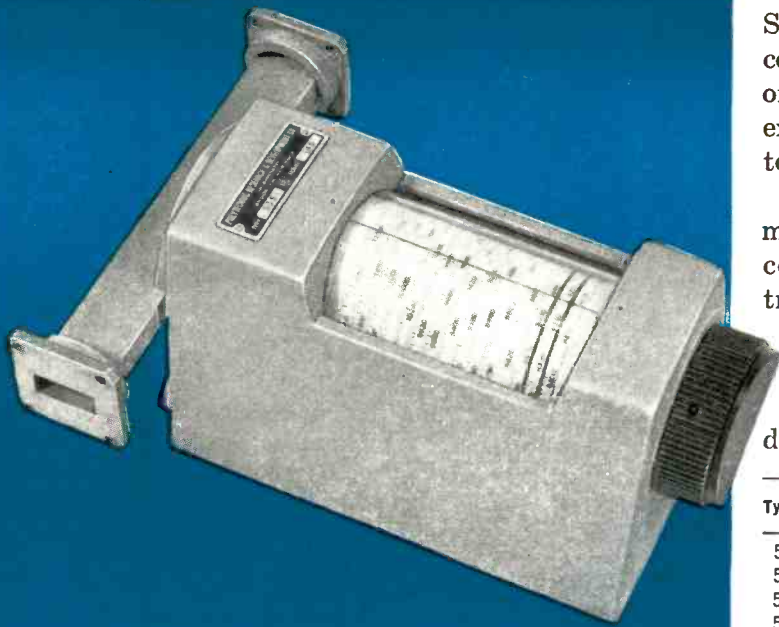
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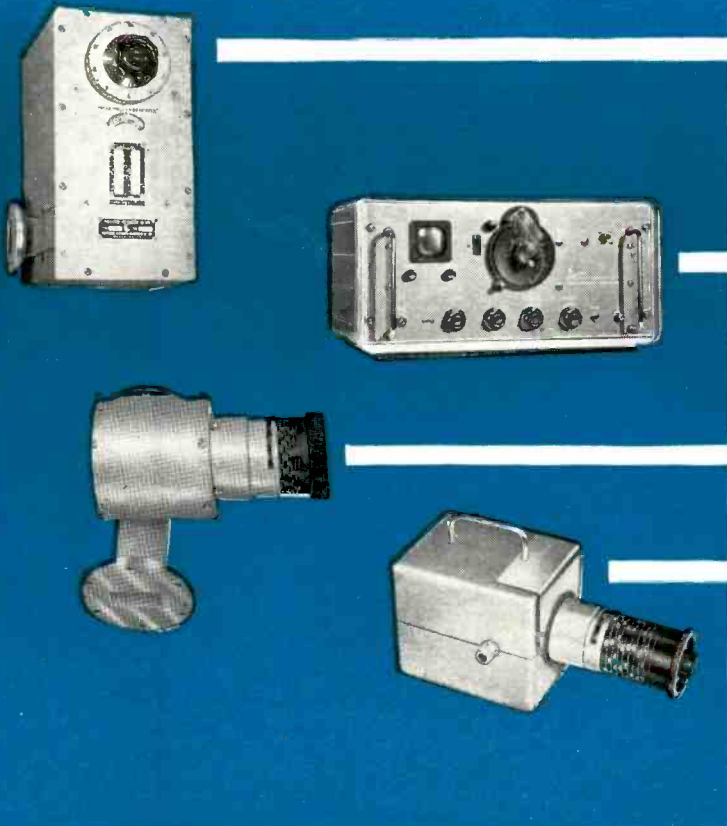
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535	8.2 to 12.4	1 x ½	UG-39/U	± 0.08	\$175
536	12.4 to 18.0	.702 x .391	UG-419/U	± 1	\$285
537	18.0 to 26.5	.500 x .250	UG-425/U	± 1	\$290
537-F1	18.0 to 26.5	.500 x .250	UG-595/U	± 1	\$290
538	26.5 to 40.0	.360 x .220	UG-381/U	± 2	\$300
538-F1	26.5 to 40.0	.360 x .220	UG-599/U	± 2	\$300

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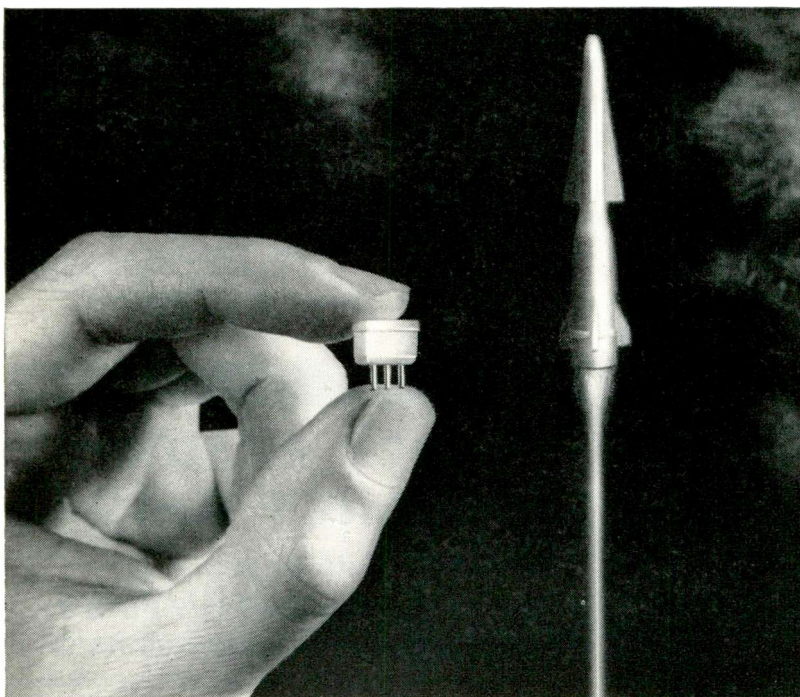
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AUDIO

The Usual and Necessary Behavior of Objective Sound Level Meters, H. Niese. "Hochfreq." Feb. 1960. 12 pp. Tests of the dynamic behavior of sound level meters are discussed. Eight different meters were thoroughly tested using audio pulses of different length, short duration single pulses of different amplitude, and pulse bursts of different repetition rates. Although seven meters met the "German Industry Standards" (DIN) for dynamic indication selectivity, the measured values were not in agreement. This appeared to be due to the different degrees of inertia and of overloading. Comparisons with subjective measurements showed that in no case were the objective readings the same as the subjective ones. It was found that a reserve of 20 db above the full scale deflection was needed to correctly measure certain sharply peaked noises. If the inertia of the meters is made to approach the subjective loudness response, the overload reserve could be reduced to 10 db. (Germany.)

A New, Large, Anechoic Room for Soundwaves, W. Kraak, G. Jahn, and W. Fasold. "Hochfreq." Feb. 1960. 4 pp. The large, newly built nonreflecting room at the Dresden Institute of Technology is described. The details of the frame and wall construction are given. An explanation is given of the methods of construction and of the considerations applied in selecting and installing the sound-absorbing materials. The special provisions provided for positioning and using apparatus and test gear are discussed. Measurements of the acoustical properties of the finished room indicate that the quality of the anechoic room is comparable to their similar sized anechoic rooms. (Germany.)

Nomogram for Determination of Audio Power in Indoor Public Address System, N. K. D. Choudhury. "J. ITE." Dec. 1959. 5 pp. The acoustical power required to establish the desired sound pressure level in a room depends on the volume of the room and also on its acoustical properties. The efficiency of the loudspeaker in the sound reinforcing system also is determined, to some extent, by the room characteristics and its location in the room. Taking all these factors in consideration, a nomogram has been evolved that can be readily used in assessing the electrical audio power output demanded from the public address amplifier in the hall. (India, in English.)



CIRCUITS

The Performance and the Design of Ring Modulators, H. Bley. "Nach. Z." Apr., 1960. 6 pp. A new quasilinear method for a lucid explanation of the performance and the design of ring modulators has been derived from an experimental basis. (Germany.)

Qualitative Analysis of a New Oscillator Circuit, St. Vojtasek and K. Janac. "Hochfreq." Feb. 1960. 6 pp. This new oscillator circuit is important because of its good frequency stability without crystal controls. The major portion

of the work is devoted to the qualitative analysis of the oscillator. This analysis is done by mathematical methods and also by an analog differential analyser. Waveforms of transient conditions are presented for various values of parameters developed in the analysis. (Germany.)

A Device for the Automatic Determination of the Imaginary Part from the Real Part and Vice Versa for Minimum Phase Type Network Functions, V. Pollack. "Hochfreq." Feb. 1960. 4 pp. Mathematical hypotheses are postulated and used to develop functions that determine the imaginary part from the real part. The justification for the hypotheses are derived. The possibilities of practical applications are discussed, and a simple analog computer proposed for automatic solution of the problem. One of the many possible systems are discussed with the aid of a block diagram. (Germany.)

Notes and Additions to Kuepfmueller's Rise Time Formula, G. Wunsch. "Hochfreq." Feb. 1960. 4 pp. Kuepfmueller's theory for low pass filters is expanded and generalized. First the phase characteristics for ideal low pass filters is developed, then the generalized Kuepfmueller formula is derived. It is shown that the generalized formula is also valid for the calculation of rise time of an optimized delay line. (Germany.)

The Imaginary Part of the Characteristic Impedance in the Passband of Filter Circuits, W. Herzog. "Nach. Z." Apr. 1960. 4 pp. A simple explanation for the imaginary part of the characteristic impedance occurring in filter chains is given with the aid of a bridge conversion. (Germany.)

Transistorized Control Circuit for In-phase Synchronization of Two Shafts, K. Hamerak. "El. Rund." May 1960. 4 pp. To control phase sync, an arrangement may be used that permits contact-free measuring of the angular difference of magnitude and sign between two rotating shafts. (Germany.)



COMMUNICATIONS

Radio Spectrum Conservation, S. Silleni. "Alta Freq." Feb. 1960. 32 pp. Problems affecting coexistence of several radio systems are considered. The paper begins with a brief review of the international organization and regulations dealing with coordination of radio spectrum use. Then an ideal spectrum occupation condition is presented, together with some of its practical limitations. (Italy.)

Current Microwave Techniques in the United Kingdom, David Simpson & G. T. J. Summer. "El. & Comm." May 1960. 5 pp. The role of basic research has always been recognized in Britain and the spirit of free enquiry flourishes in the universities and government establishments. (Canada.)

A High-Speed Signalling System for Use Over Telephone Circuits, A. P. Clark. "ATE J." Apr. 1959. 16 pp. This 600-band signalling system is capable of transmitting information in binary form over any normal telephone circuit in Great Britain, and gives reliable and trouble-free operation. It uses an ampli-

REGULARLY REVIEWED

AUSTRALIA

AWA Tech. Rev. AWA Technical Review
Proc. AIRE. Proceedings of the Institution of Radio Engineers

CANADA

Can. Elec. Eng. Canadian Electronics Engineering
El. & Comm. Electronics and Communications

ENGLAND

ATE J. ATE Journal
BBC Mono. BBC Engineering Monographs
Brit. C.&E. British Communications & Electronics
E. & R. Eng. Electronic & Radio Engineer
El. Energy. Electrical Energy
GEC J. General Electrical Co. Journal
J. BIRE. Journal of the British Institution of Radio Engineers
Proc. BIEE. Proceedings of Institution of Electrical Engineers
Tech. Comm. Technical Communications

FRANCE

Ann. de Radio. Annales de Radioelectricite
Bull. Fr. El. Bulletin de la Societe Francaise des Electriciens
Cab. & Trans. Cables & Transmission
Comp. Rend. Comptes Rendus Hebdomadaires des Seances
Onde. L'Onde Electrique
Rev. Tech. Revue Technique
Telonde. Telonde
Toute R. Toute la Radio
Vide. Le Vide

GERMANY

AEG Prog. AEG Progress
Arc. El. Uber. Archiv der Elektrischen Uebertragung
El. Rund. Elektronische Rundschau
Freq. Frequenz
Hochfreq. Hochfrequenz-technik und Elektroakustik
NTF. Nachrichtentechnische Fachberichte
Nach. Z. Nachrichtentechnische Zeitschrift
Rundfunk. Rundfunktechnische Mitteilungen
Vak. Tech. Vakuum-Technik

POLAND

Arch. Auto. i Tel. Archiwum Automatyki i Telemekhaniki
Prace ITR. Prace Instytutu Tele-I Radiotechnicznego
Roz. Elek. Rozprawy Electrotechniczne

USSR

Avto. i Tel. Avtomatika i Telemekhanika
Radio. Radio
Radiotek. Radiotekhnika
Rad. i Elek. Radiotekhnika i Elektronika
Iz. Acad. Bulletin of Academy of Sciences, USSR.

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Sources

tude-modulated signal in which both sidebands are transmitted. (England.)

Interference in Railway Line-Side Telephone Cable Circuits from 25 KV 50 C/S Traction Systems. A. Rosen. "ATE J." Oct. 1959. 21 pp. Experience already gained, particularly on the Continent of Europe, in the solution of the problem of interference in railway line-side telephone cable circuits from electrical traction systems is briefly reviewed. The relevant C.C.I.F. recommendations on the general problem of this type of interference are then stated. A calculation is made of the induced e.m.f. due to magnetic induction and analysis are given of the effectiveness of electromagnetic screening by cable sheath and by an external conductor. (England.)

Subscriber Line Concentration. H. V. Paris. "ATE J." Oct. 1959. 16 pp. The author first gives a resume of the economic argument for line concentration and then deals with basic principles and design considerations. The article describes briefly the original Gfeller concentrator and then deals specifically with the two types of battery-less crossbar line concentrator manufactured by A.T.E. giving an outline description and listing the facilities provided. (England.)



COMPONENTS

An Electrochemical Diode. Solion. "El. Rund." Apr. 1960. 3 pp. (Germany.)

Polystyrene Dielectric Capacitors. F. McCabe. "ATE J." July 1959. 8 pp. The requirements for a filter tuning capacitor and the application of polystyrene as a dielectric for this purpose are discussed. (England.)

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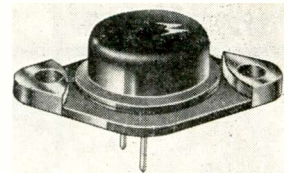
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**400 mW
ZENERS**

Diffused-junction
units from
6.8 to 200 volts
IN957
thru IN992
and IN962B
thru IN992B*

*To meet the requirements
of MIL-S-19500/117



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ZENERS**

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units from
6.8 to 200 volts
1/4M6.8Z
thru 1/4M200Z

**complete
specs...**



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ZENERS**

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thru 1M200Z
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thru 1N3051
and 1N3016B
thru 1N3051B*

*To meet the requirements
of MIL-S-19500/115



**1.5 WATT
ZENERS**

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units from
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1.5M6.8Z
thru 1.5M200Z



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Diffused-junction units
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1N2970
thru 1N3015
and 1N2970B
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reliability**



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and 1N2804B thru 1N2846B*

*To meet the requirements
of MIL-S-19500/114



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REFERENCE
DIODES**

9.3 volt
diffused-junction
reference devices
Temperature
coefficients to
.0005% / °C
1N2620
thru 1N2624



**1/2 WATT
REFERENCE
DIODES**

9.0 and 11.7 volt
diffused-junction
reference devices
Temperature
coefficients to
.0005% / °C
1N935
thru 1N939
1N941
thru 1N945

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International ELECTRONIC SOURCES

Electrolytic Capacitors, D. S. Margolis & J. H. Cozens. "ATE J." July 1959. 8 pp. After discussion of the characteristics of electrolytic capacitors in a comprehensive manner, the improvements secured through the use of super-pure aluminium are given. (England.)

Special Quality Miniature Relays, N. E. Hyde. "Brit. C&E." May 1960. 8 pp. Considerable progress has been made in recent years in the design of high reliability miniature electromagnet relays. This article reviews some of the latest advances in the field. The conclusion drawn is that electro-mechanical relays of the newer designs will for a considerable time be able to hold their own against those of the semiconductor type. (England.)



CONTROLS

Analysis of a Two-position Compensation Control System with Constant Prolonged Disturbances, A. I. Cherepanov. "Avto. i Tel." Mar. 1960. 7 pp. The simplified analytical method of calculating two-position control process (1) is shown. It can be used to analyze processes in a two-position compensation control system with constant prolonged disturbances. (U.S.S.R.)

Estimating the Interval Quantization Effect on Processes in Digital Automatic Control Systems, Z. Tsypkin. "Avto. i Tel." Mar. 1960. 5 pp. The effect of interval quantization in digital automatic control systems continuous parts which contain both constant parameters and variable ones is determined. (U.S.S.R.)

Determination of the Optimum Pulse Transient Function with Inner Noises, P. S. Matweev. "Avto. i Tel." Mar. 1960. 7 pp. The problems of (1, 2) are generalized for a case when input signals are applied to different elements of a servo system and for a case of variable parameter systems. (U.S.S.R.)

Operation of Frequency Phase Adjustment with Noises, V. I. Tikhonov. "Avto. i Tel." Mar. 1960. 9 pp. With the help of Fokker-Plank equation due to external and inner fluctuations the mean frequency of the main generator differs from that of the synchronized one is ascertained. An approximate method of calculating generator frequency overage difference and its variance is proposed. (U.S.S.R.)

Generalized Conditions of Electro-Magnetic System Proportion (Geometry of Electro-Magnetic Systems), A. S. Tulin. "Avto. i Tel." Mar. 1960. 10 pp. The problems of proportions in electro-magnetic systems are considered. Geometrical regularities connected with conditions of rational utilization of electro-magnetic energy are used. A number of optimum constructions are found. Out of which constructions, according to technical and economic requirements, one is selected for each particular case. (U.S.S.R.)

Extending the Power Range of Tirrill Regulators, W. Leonhard. "rt." Feb. 1960. 6 pp. The author surveys various possibilities of relieving the load contacts of Tirrill regulators. (Germany.)

Magnetic Devices in Control Systems, H. Bley. "rt." Feb. 1960. 5 pp. This article gives a survey of amplifying elements used in control systems which elements operate on the principle of magnetic saturation. The investigation comprises discontinuous, quasi-continuous and continuous controllers. (Germany.)

The Treatment of Non-linear Problems in Control Engineering, P. J. Nowacki. "rt." Feb. 1960. 4 pp. This contribution gives a brief comparison of the existing methods for the treatment of non-linear control problems. The author shows how, by way of iteration, the Laplace transform can be applied also for the solution of non-linear problems. (Germany.)



GENERAL

Transient Process and Steady State in Automatic Range Scope, F. M. Kilin. "Avto. i Tel." Feb. 1960. 11 pp. Dynamic properties of an automatic range finder with an operational amplifier including integrating block and a lag are considered. Analysis of the processes in the automatic range finder with an operational amplifier requires complicated algebraic manipulations. (U.S.S.R.)

Analysis of Accuracy of Essentially Non-linear Control Systems with the Help of Equivalent Transfer Function, K. A. Pupkov. "Avto. i Tel." Feb. 1960. 14 pp. The way of approximating essentially non-linear functions with the help of the equivalent frequency response based on comparing spectra of the random process of the non-linear unit input and output is considered. (U.S.S.R.)

Transistor Techniques for Reactor Control Instruments, G. G. Ballard. "El. & Comm." Mar. 1960. 6 pp. Enhanced reliability is obtained from reactor instruments incorporating transistor circuits. (Canada.)

The Problem of Minimum Description, E. L. Blokh. "Radiotek." 15, No. 2 (1960). 5 pp.

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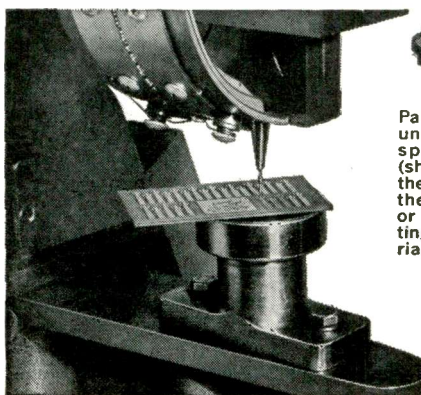
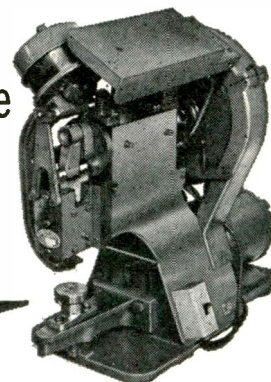
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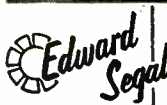
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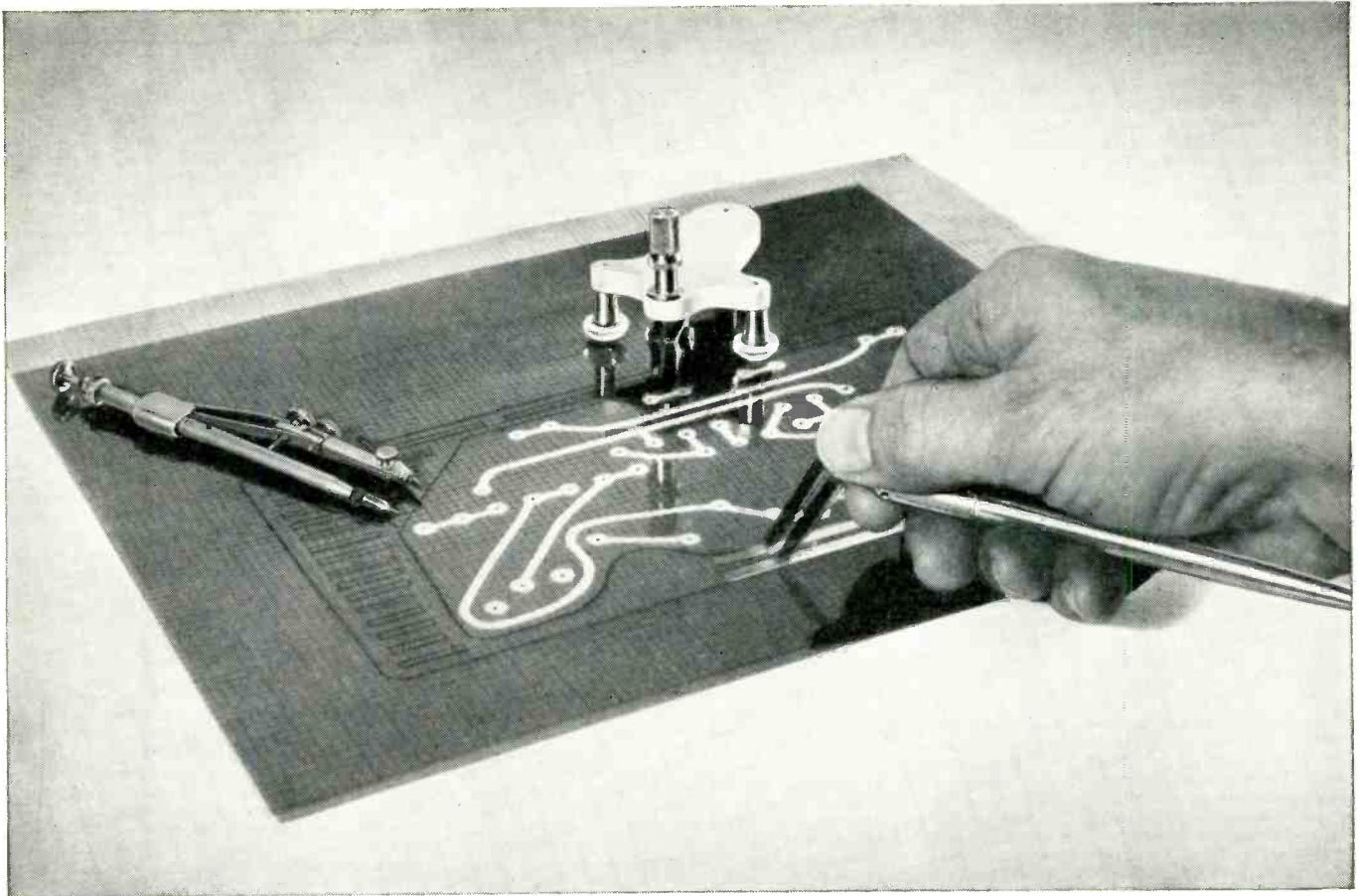
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draw on, cleanly erasable. Erase and redraw until layout is correct; then . . .

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International ELECTRONIC SOURCES

The author examines the problem of a minimum description of flat images consisting of fixed elements of different coloring, providing that the sequence of elements subject to recognition is random and is characterized by a unidimensional probability distribution. Two methods of description are mentioned, the absolute and the relative. The former recognizes images without any previous knowledge of them and the latter according to set standards. The problem of finding a minimum description is in principle reduced to that of obtaining an optimum code. (U.S.S.R.)

Reflection of a Flat Transverse-Polarized Wave from a Rectangular Comb, L. N. Deryugin. "Radiotek" 15, No. 2 (1960). 12 pp. At superhigh frequencies periodic ribbed reflectors can serve as spectrum analyzers, phasing devices for obtaining rotating polarization, etc. This article provides a technique for calculating the reflection coefficients of a flat transverse-Polarized wave from a periodically uneven surface in the shape of a rectangular comb, on the basis of a strict observance of the border electrodynamic problem. The results of calculated reflection coefficients are given and compared with those obtained on the basis of Huygens principle. The suppression of the image ray in quarter-wave resonance in depth in the comb grooves is examined. (U.S.S.R.)

Universal Functional Generator Based on Principle of Quadratic Approximation, A. V. Maslov and G. Purlov. "Avto i Tel." Feb. 1960. 8 pp. There are proposed methods of quadratic approximation when the function is given graphically or analytically. To derive the law of argument distribution, simple formulae and ratios are deduced. A diode element for getting the quadratic function is considered. (U.S.S.R.)



MEASURE & TESTING

Investigations with the Field Electron Microscope when Operating with Metal Oil Diffusion Pumps, R. A. Haefer. "Vak. Tech." Mar. 1960. 7 pp. As well known a field electron microscope (FEM) requires an extraordinarily good vacuum. Hitherto one used to generate this vacuum with two glass diffusion pumps arranged in series which are filled with Hg and are provided with liquid air traps. By the aid of the FEM it has been proved that it is possible to get a completely clean surface even with a vacuum system capable of being dismantled, having metal seals and provided with two metal oil diffusion pumps (types Diff 170 and Diff 60) arranged in series and with a water cooled baffle only. (Germany.)

Attenuation Measurement Methods and Values in Standard 2.6/9.5 mm Coaxial Pairs, R. Belus and M. Trouble. "Cab. & Trans." Apr. 1960. 21 pp. Standardization of equalization and correction equipment for coaxial systems, taking due account of C.C.I.T.T. recommendations for long distance circuits has led to the development of refined and very accurate attenuation measurement methods. (France.)

Errors Caused by Losses in the Measurement of Balanced Elements, M. Soldi. "Alta Freq." Feb. 1960. 29 pp. A detailed examination is carried on the errors which affect the measurements of balanced circuit elements by means of a composed-line balun, in the metric wave range, caused by its losses; these errors may sometimes become considerable, particularly in the case considered here of the attenuation measurement on a short sample of twin line, effected indirectly through an admittance measurement. (Italy.)

Instrumentation for a Subcritical Homogeneous Suspension Reactor, I. Reasons behind the choice of a homogeneous suspension reactor, J. J. Went. "Phil. Tech." No. 4/5, 1960. 13 pp. In the KEMA laboratories at Anaheim a one-zone homogeneous suspension-type reactor is in development. Safety and nuclear-fuel economy being major considerations in a country like The Netherlands, the choice fell on a one-zone homogeneous reactor with circulating fuel in the form of a suspension of $\text{ThO}_2\text{-UO}_2$ particles in heavy water. The fissile material, ^{235}U , is bred in the reactor itself from ^{232}Th . (Netherlands, in English.)

Instrumentation for a Subcritical Homogeneous Suspension Reactor, II. Measurement and Control of Operating Parameters, B. L. A. van der Schee and M. van Tol. "Phil. Tech." No. 4/5, 1960. 13 pp. In experiments on the subcritical suspension reactor at Arnheim the temperature can be kept constant within 0.1°C at any desired value between room temperature and 100°C . Since the circulation pump supplies about 5 KW to the fluid, the operating temperature is determined by the rate of cooling. (Netherlands, in English.)



TELEVISION

Preamplifiers for Vidicon Cameras with Drift Transistors, Hans Anders. "Rundfunk." Apr. 1960. 8 pp. The paper begins with a discussion of the circuit of a preamplifier for a vidicon camera, equipped with drift transistors. The choice of the input circuit and the effect of the working point on the signal-to-noise ratio is discussed. This is followed by results of noise measurements made on a fairly large number of transistors of different makes. (Germany.)

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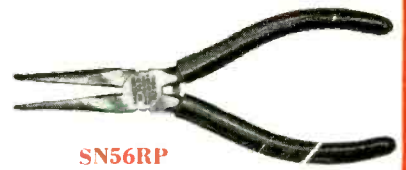
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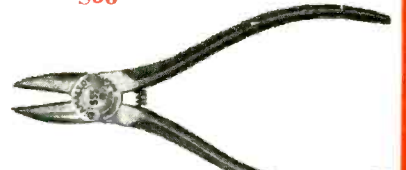
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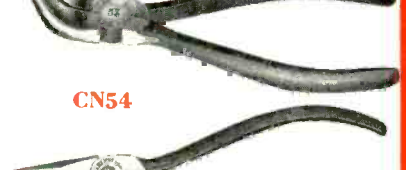
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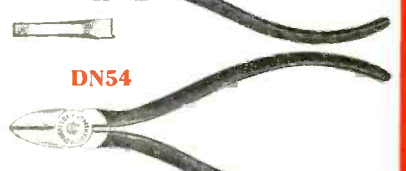
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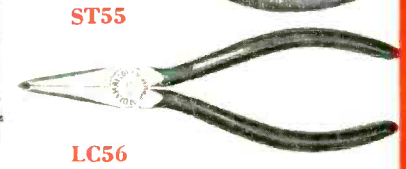
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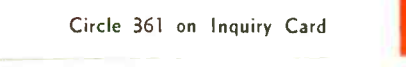
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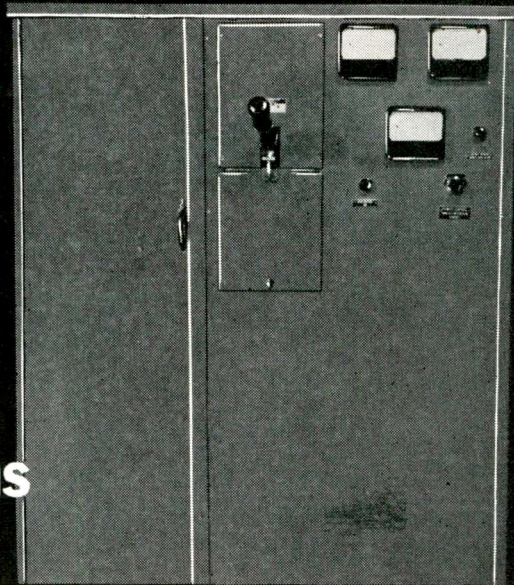


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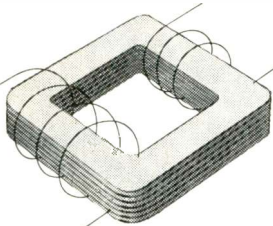
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rectifier output
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tapped furnace or
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Sources

Fundamentals of Electronic Measurements in Color TV, P. Neidhardt. "EL Rund." May 1960. 6 pp. The paper contains a description of special electronic color-TV measuring equipments required in development work apart from those known from black-and-white TV. (Germany.)

Some Aspects of Television Transmission over Long Distance Cable Links, H. Mumford. "ATE J." Oct. 1959. 13 pp. An outline of the basic properties of 0.375 in. diameter coaxial cable and the combined or alternative multi-channel telephony/television systems based on it is given. Most of the required transmission limits for such systems have now been agreed internationally and a hypothetical reference circuit evolved for which such limits can be stated. (England.)



TRANSMISSION




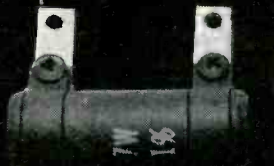
A Contribution to the Transmission Theory of AM-FM or AM and FM Carriers in Linear Networks, Part 1, E. Augustin. "Hochfreq." Jan. 1960. 8 pp. Limits are established within which the application of a simple and well known asymptotic series is valid for calculation of dynamic distortion in FM systems. It is shown that within a given margin of error this series limits the frequency deviation and the maximum rate of change of the instantaneous frequency. Assuming a reasonable margin of error and minimum phase shift, the influence of the dynamic transfer factor is within the allowable margin of error and can be neglected. If distortion is calculated for a number of stages using the asymptotic series, the situation gets more unfavorable, since the permissible frequency deviation is more limited. Part 2 of this paper will present a new mathematical method not subject to these limitations. (Germany.)

Waveguide Techniques, O. Henke and G. Stricker. "Freq." Mar. 1960. 11 pp. Correlation of electrical and mechanical demands on waveguides is described, taking into account their proposed use. Shape, dimensions, materials, precision, mechanical stability and corrosion resistance are considered. Manufacturing processes are indicated for economical production of waveguides. (Germany.)

The Microwave Circulator, E. Pivov and W. Stosser. "Freq." Mar. 1960. 7 pp. Known types of circulators are briefly reviewed, followed by a more detailed treatment of the phaseshift circulator. The necessary phase conditions are determined and using Matrices, the tolerances of the parts are calculated. Using the above results, phaseshift circulators for different frequency bands are developed. The experimental results are presented and the dimension for individual parts are given. (Germany.)

Experimental Investigations on Ferrite Resonance Isolators, R. Steinhart. "Nach. Z." Apr. 1960. 9 pp. The directional absorption and the directional phase shift of ferrites in the characteristic E and H dispositions in waveguides are investigated. (Germany.)

Feed Lines for High Power Antennas in the 10 CM Region, H. Laub and W. Stoer. "Freq." Apr. 1960. 14 pp. For establishing relatively long leads to wideband UHF antennas of high power rating, waveguides, cables, and rigid coaxial lines are particularly suitable. With some qualifications, wire guide can be used just as well. The attenuation and matching conditions are investigated on long runs of rectangular waveguide made up from many identical elements. It is shown that with full utilization of the permissible tolerances, the reflection coefficient of a waveguide built from 100 elements will remain below 5 per cent. If conversely the reflection coefficient is given, the possible line length

TYPE	SIZE	RESISTANCE (ohms)	WATTAGE	TC												
<p>NF Fusion sealed. Glass encapsulation is fusion sealed to leads and has zero moisture absorption. Exceeds requirements of MIL-R-10509C, Char. B.</p> 	NF60 NF65	100 to 100 K 100 to 360 K	$\frac{1}{8}$ @ 70° C. $\frac{1}{4}$ @ 70° C.	$\pm .03\%/^{\circ}\text{C.}$ from -55° C. to +150° C., ref. to 25° C.												
<p>N Fixed film. Extremely low noise level. 0.1 microvolt/volt. Derating to 140° C. Average resistance change after 5000 hrs. is less than 1%. Exceeds MIL-R-10509B, Char. X specs.</p> 	N20 N25 N30	10 to 500 K 10 to 1.5 meg. 30 to 4.2 meg.	$\frac{1}{2}$ @ 40° C. 1 @ 40° C. 2 @ 40° C.	$\pm .03\%/^{\circ}\text{C.}$ from -55° C. to +105° C., ref. to 25° C.												
<p>S Fixed film: high temperature. Less than 0.35% resistance change after 1000 hrs. of load-life tests at max. dissipation. Exceeds MIL-R-11804C, Char. P.</p> 	S20 S25 S30	10 to 500 K 10 to 1.5 meg. 30 to 4.2 meg.	<table border="0"> <tr> <td></td> <td>120° C.</td> <td>40° C.</td> </tr> <tr> <td>$\frac{1}{2}$</td> <td>1</td> <td></td> </tr> <tr> <td>1</td> <td>2</td> <td></td> </tr> <tr> <td>2</td> <td>4</td> <td></td> </tr> </table>		120° C.	40° C.	$\frac{1}{2}$	1		1	2		2	4		$\pm .03\%/^{\circ}\text{C.}$ from -55° C. to +235° C., ref. to 25° C.
	120° C.	40° C.														
$\frac{1}{2}$	1															
1	2															
2	4															
<p>R Power. Essentially non-inductive in high-frequency operations. Inherent noise level less than 0.1 microvolt per volt. Exceptional moisture resistance and overload capacity. Exceeds MIL-R-11804C.</p> 	R31 R33 R35 R37 R39	10 to 70 K 30 to 150 K 20 to 300 K 20 to 500 K 40 to 1 meg.	7 @ 40° C. 13 @ 40° C. 25 @ 40° C. 55 @ 40° C. 115 @ 40° C.	$\pm .05\%/^{\circ}\text{C.}$ from -55° C. to +235° C., ref. to 25° C.												

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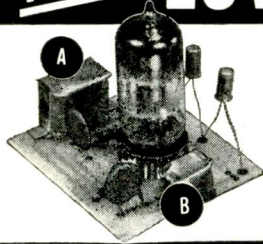
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Permit positioning foil-wrapped components A & B closely, minimizing interaction due to magnetic fields... making possible compact and less costly systems.

How thin Co-Netic and Netic foils lower your magnetic shielding costs:

- 1) Weight reduction. Less shielding material is used because foils (a) are only .004" thick and (b) cut and contour easily.
- 2) Odd shaped and hard-to-get-at components are readily shielded, saving valuable time, minimizing tooling costs.

These foils are non-shock sensitive, non-retentive, require no periodic annealing. When grounded, they effectively shield electrostatic and magnetic fields over a wide range of intensities. Both foils available from stock in any desired length in various widths.

Co-Netic and Netic foils are successfully solving many types of electronic circuitry magnetic shielding problems for commercial, military and laboratory applications. These foils can be your short cut in solving magnetic problems.

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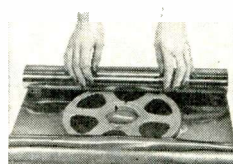


For complete, distortion-free protection of valuable magnetic tapes during transportation or storage. Single or multiple reel Rigid Netic Enclosures available in many convenient sizes and shapes.

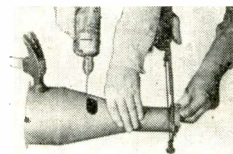


Rigid Netic (.014" and up in thickness) Shielded Rooms and Enclosures for safe, distortion-free storage of large quantities of recorded magnetic tapes.

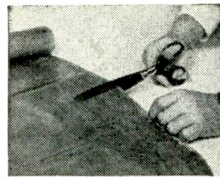
Composite photo demonstrating that magnetic shielding qualities of Rigid Netic Alloy Material are not significantly affected by vibration, shock (including dropping or bumping) etc. Netic is non-retentive, requires no periodic annealing.



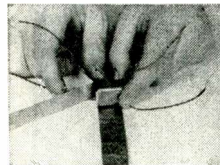
Thin pliable foil wraps easily around magnetic tape, maintaining original recorded fidelity.



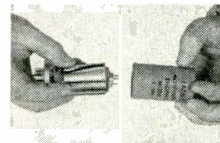
Thin pliable foil wraps easily around magnetic tape, maintaining original recorded fidelity.



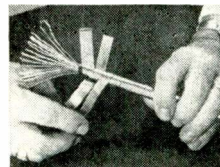
Cuts readily to any shape with ordinary scissors.



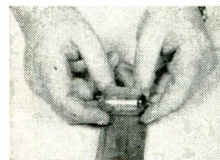
Wraps easily.



Inserts readily to convert existing non-shielding enclosures.



Shielding cables reduces magnetic radiation or pickup.



Wrapping tubes prevents outside magnetic interference.

Sources

is proportional to the length of the individual element. The paper describes some new waveguide components for antenna circuits and moreover reports the results of various measurements on surface-wave transmission lines. (Germany.)

A Polarization Filter with Symmetrical Excitation of the H_{11} Modes, E. Schuegraf. "Freq." Apr. 1960. 2 pp. A polarization filter converts the waves on two lines into two cross-polarized modes. An arrangement is described where the two H_{11} modes are symmetrically excited in a circular waveguide. This method offers the advantage that no rotation symmetrical modes are produced, such as the E_{01} mode. The balanced coupling can be effected by two probes facing each other in the circular waveguide. The probes are fed out of phase from the two arms of a waveguide E-plane bifurcation. (Germany.)



TUBES

High-Ratio Frequency Multiplication by Means of a Reflex Klystron. E. N. Bazarov, M. E. Zhabotinskii and E. I. Sverchkov. "Radiotek" 15, No. 2 (1960) 5 pp. In this work it is shown theoretically and demonstrated experimentally that reflex klystrons can be successfully used for multiplying frequencies by ratios exceeding 30, if the input signal is injected into the bunching space. The advantage of the proposed method of frequency multiplying is its great simplicity, reliability and an output power sufficiently high for use as a heterodyne oscillator in the three centimeter range. Simple formulas are derived for determining with satisfactory accuracy the output power and the range of the multiplier. (U.S.S.R.)

Use of Decadic Counter Tubes in Non-Decadic Counting Systems, K. Apel. "El. Rund." Mar. 1960. In decadic counter stages, a minimum of circuit components are sufficient when special counter tubes are employed. If, however, non-decadic events are to be counted, the ring or gate circuits employed are rather elaborate. The author outlines a method of substituting such circuits by the decadic counter tube EZ 10 of the cold-cathode type. (Germany.)

A Simple Apparatus for Making Photo-Electric Cathodes, K. Thiele. "Vak. Tech." Apr. 1960. 5 pp. This article describes an apparatus which has been built for making photo-electric cathodes as used in image converters. The vacuum system is very versatile and can also be used for other types of vacuum work, e.g. for making counting tubes, etc. After baking the high vacuum portion of the equipment, the ultimate vacuum obtainable is better than 10^{-4} microns (10^{-7} mm Hg). (Germany.)

Special Amplifier Tube Type Properties and Circuit Designs, W. Geist. "El. Rund." Apr. 1960. 6 pp. Special amplifier tubes are used in communication equipments and feature properties different from radio tubes. These properties are discussed, and means to achieve them are indicated. Special amplifier tubes supplied by Valvo GmbH are listed by their features in a Table. To illustrate their application, a number of circuit designs are shown. (Germany.)

An Experimental Disc-seal Triode for 6000 Mc/s, M. T. Vlaardingerbroek. "Phil. Tech." No. 6, 1960. 5 pp. Brief description of an experimental disc-seal triode for 5 cm waves. The cathode-grid spacing is smaller than in the EC 157 and is achieved by pre-assembling these electrodes and adjusting the spacing in a precision jig. (Netherlands, in English.)

Astigmatism in Cathode Ray Tubes, N. Patla. "J. ITE." Dec. 1959. 7 pp. A new method of observation of astigmatism in cathode ray tubes precisely within ± 5 v. is described. (India, in English.)

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Now you can specify tunnel diodes with a V_v/V_p ratio as high as 7.0:1 and with peak currents ranging from $470 \mu\text{A}$ to 100 mA ... and from a single source! Only Hoffman offers this great a selection plus the uniformity and proven performance of silicon. Guaranteed tolerances of $\pm 10\%$ and $\pm 2\%$ enable you to design to new standards of precision and reliability.

Whatever your circuit requirements, there is now a Hoffman silicon tunnel diode to meet them. For details, request Hoffman Data Sheet No. 137-760 STD.

Type Number	Peak Current
1N2928	$470 \mu\text{A}$
1N2929	1 mA
1N2930	4.7 mA
1N2931	10 mA
1N2932	22 mA
1N2933	47 mA
1N2934	100 mA

"A" versions available with $\pm 2\%$ tolerance.

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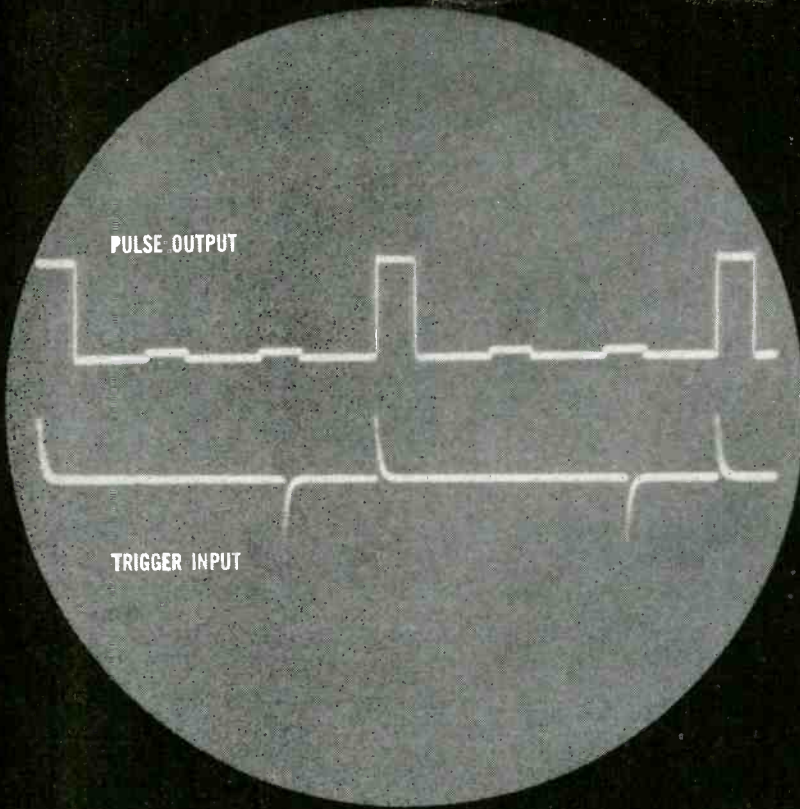
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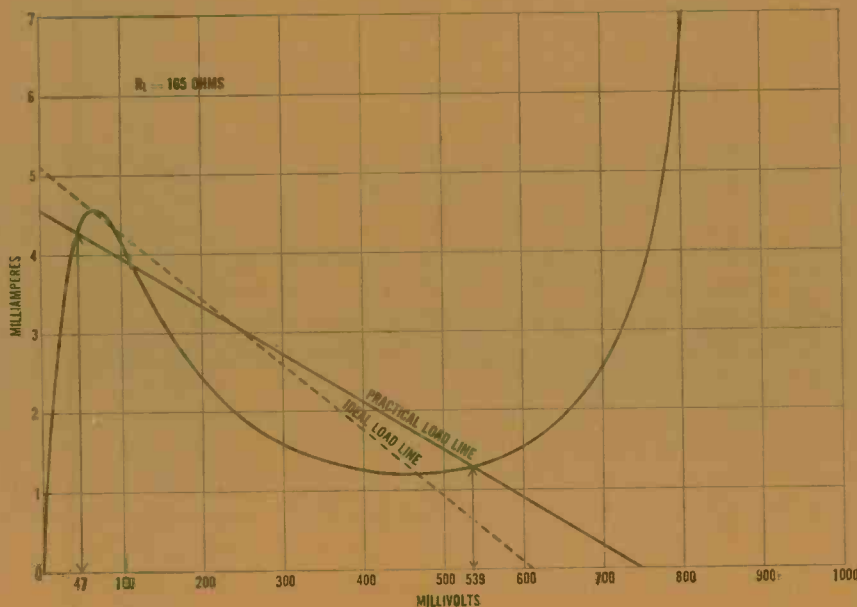
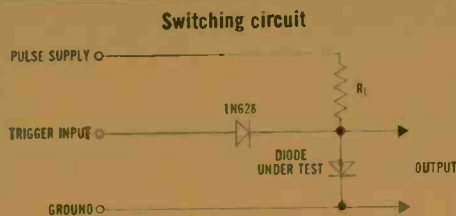
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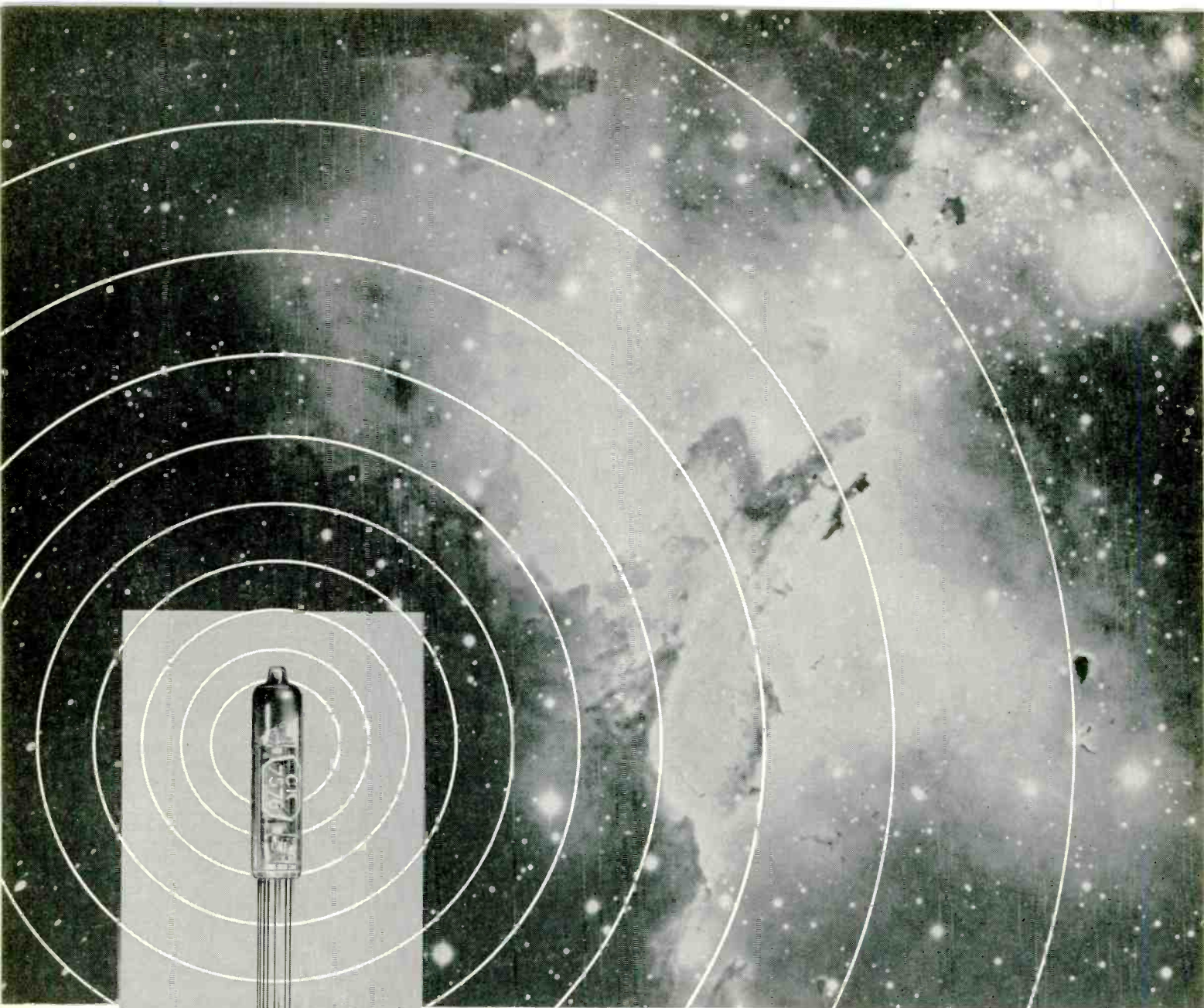
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Input and output wave forms for circuit shown below



Practical load line indicates operation with optimum stability



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235Mc GROUNDED GRID
RF AMPLIFIER**

Filament Voltage . . . $6.3 \pm 5\%$ volts
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Cathode Resistance . . . 150 ohms
Peak RF Grid
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Tele-Tech's ELECTRONIC OPERATIONS

The Systems Engineering Section of ELECTRONIC INDUSTRIES

AUGUST 1960

SYSTEMS—WISE . . .

▶ Mobile TV tape recording equipment is providing "live" training pictures for classroom viewing at the Army Transportation Training Command School, Ft. Eustis, Va. Other electronic educational aids include a closed-circuit TV system which links 22 classroom receivers, and two mobile units. The school has a main studio, equipped with three RCA cameras for live programming and slide and film presentations.

▶ Data transmission in the 12,000 MC region will be explored by the Advanced Systems Development Div. of IBM Corp. An experimental microwave communication network system, with three transmission and receiving stations and a passive repeater site, will investigate path phenomena, modulation and multiplexing, non-manned repeater station operation and system considerations.



NEW COMPUTER

Computer Design-Consultant Penny Barbe and Project Engineer John H. Fields put the new GE-225 through its paces during tests at the company's Computer Dept. The new general-purpose computer, can add 25,000 5 digit numbers/sec. Computer use ranges from scientific applications to complex business - data problems.

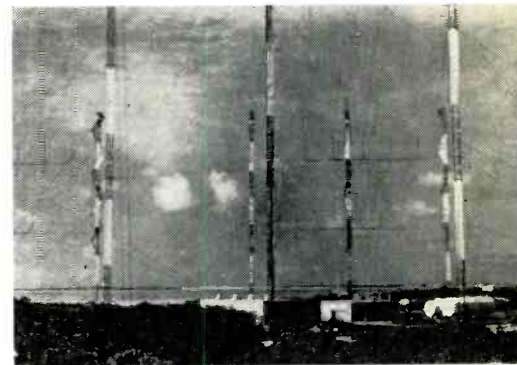
▶ Teams of Lockheed electronic specialists surveyed the Pacific area for "electronically quiet" areas to install the complex gear needed to track the Lockheed-built Agena satellites launched in the Discoverer program. They selected the wind-swept bluff of Kaena Pt., Hawaii, 35 miles from Honolulu, and Kodiak Island in Alaska.

▶ The complete electronic-industrial team chosen to produce the Airborne Long Range Input (ALRI) system for the seaward extension of North American air defense are: Electronic Communications, Inc., St. Petersburg, Fla.; A. C. Spark Plug Div. of General Motors Corp., Milwaukee; Lockheed Aircraft Service, Inc., Ontario, Calif.; GPL Div. of General Precision, Inc., Pleasantville, N. Y.; Philco Corp., Philadelphia; Technical Products Div. of Packard-Bell Electronics Corp., Los Angeles, and Military Electronic Computer Div. of Burroughs in Detroit. ALRI will extend the air defense network seaward through airborne radar and data processing equipment. This radar information will be transmitted to land-based centers in the SAGE system which will initiate countermeasures.

▶ Space scientists of the Astronautics Div. at Chance Vought, Dallas, Tex., are simulating 25,000 mph atmospheric re-entries from lunar missions and "space taxi" deliveries to space stations with an electronic Manned Space Flight Simulator. The "astronaut" gets an accurate picture of how his space vehicle would respond to his skill during an actual re-entry or a rendezvous with an orbiting space station in outer space.

DEFENSE COMMUNICATION SYSTEM

Surrounding Pacific Scatter System station on Wake Island are 400 ft. and 200 ft. antenna arrays composed of stacked or "piggyback" dual frequency corner reflectors. The 6,500 mi. Trans-Pacific scatter system, one of the world's largest multi-channel radio communications systems has eight interconnected stations. Designed and constructed for Signal Corps as part of world-wide Strategic Army Communications Network (STAR-COM) by Page Communications Engineers, Inc., Washington, D. C.



▶ The Sperry Co., Phoenix, Ariz., developed a microwave aerospace navigation (MAN) radar system which will automatically control and guide the descent of manned and unmanned spacecraft, landing them by remote control. Using a pulse code modulation technique, the automatic ground controls fire coded "questions," receive "answers," and issue commands to the spacecraft at 5,000 pulses/sec. Present flight monitoring and decision-making functions are man-performed, but for more advanced applications, computers will be used to make exacting split-second decisions.

HIGH LEVEL LOOK

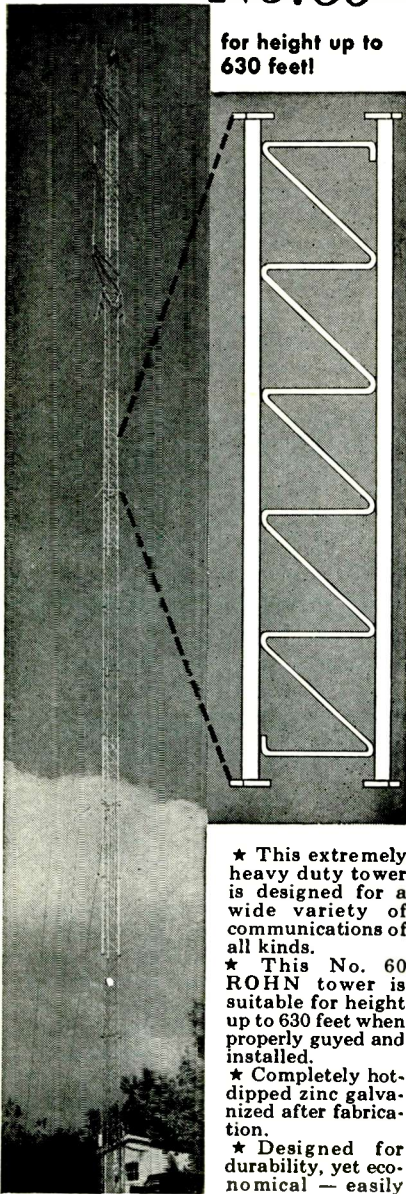
Plans of the new 65,000 sq. ft. AM FM TV building are scrutinized by M. Shapiro, TV Manager; J. Cooper, Director of Engineering; and G. Utley, Radio Manager, atop the Dallas, Tex. Morning News Building. Behind them is the new WFAA AM FM TV building which will cost \$1.5 million. Some \$2 million will also be spent equipping the studios with the latest in broadcasting and Ampex Corp. tape recording equipment.



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for height up to
630 feet!



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★ This No. 60 ROHN tower is suitable for height up to 630 feet when properly guyed and installed.

★ Completely hot-dipped zinc galvanized after fabrication.

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System Analysis

THIS system analysis technique offers a useful and economical method for analyzing electronic systems in terms of system parameter variations. It appears especially useful for systems in which nonlinear functions make a purely theoretical analysis difficult; but, where these nonlinear functions can be approximated by empirical equations. This technique for system analysis may be summarized as follows:

1. The system to be analyzed is described mathematically. In this description, empirical equations which approximate the electrical behavior of the system are used extensively. The result is a mathematical expression which describes the system output in terms of system input, both as functions of time.
2. A set of numbers is selected which has the desired magnitude and time distribution required to represent the input signal, or more often, signal plus noise.
3. A digital computer is used to compute system output *vs* time, using the selected input number set. A particular set of constants in the mathematical equations is used to repre-

sent certain specific values of system parameters. The same input conditions are used for each computer run, but the parameters of the system may be varied by changing the values of the corresponding constants in the empirical mathematical equations. The effects of parameter changes can be evaluated from a study of computer-plotted graphical presentations of system output.

Application

To illustrate the practical application of this technique, consider the simple system of Fig. 1.

Following the steps already indicated, the block components of the system of Fig. 1 are first described by empirical equations which approximate their electrical behavior. For example, a nonlinear gain function can be approximated very closely by an expression of the form

$$E'_n = A [1 - \exp(-E_n/B)],$$

where the saturation level and the degree of nonlinearity are determined by the selection of *A* and *B*. To include the effect of AGC with an inherent one-period delay, the

Now we have a technique—useful and economical—for analyzing electronic systems.

It is most applicable where non-linear functions make a purely theoretical analysis difficult, but, where these functions can be approximated by empirical equations.

By **WILLIAM F. NIELSEN**

Staff Member
Advanced Electronics Systems Div.
Sandia Corp., Sandia Base
Albuquerque, New Mexico

Using Digital Computers

gain expression may be modified slightly and expressed as

$$E'_n = A \left[1 - \exp \left(\frac{-E_n}{B(1+f_{n-1})} \right) \right]$$

An example of an expression which closely approximates the output of a typical pulse to dc stretching circuit for AGC use, with a reference level of $k_1 E'_{\text{max}}$, is:

$$f_n = k_3 f_{n-1} + \frac{\left(\frac{E'_n}{k_1 E'_{\text{max}}} - 1 \right)}{k_2}$$

where $k_2 = R_1 C / T$, the charge time constant of the stretching circuit divided by the period of the input pulse repetition rate; and

$$k_3 = \exp(-T/R_2 C)$$

where $R_2 C$ is the discharge time constant of the stretching circuit, and T is again the period of the input pulse repetition rate. Then, in the digital computer calculation of E'_n , the previous AGC output, f_{n-1} , is used.

The output, $E_o(n)$, of the system of Fig. 1, may be expressed for a typical RC integrator as:

$$E_o(n) = k_4 E_o(n-1) + E'_n$$

where

$$k_4 = \exp(-T/RC),$$

RC is the integrator discharge time constant, and T is the period of the input pulse repetition rate. With this set of equations, the system output can be expressed in terms of the system input, both as functions of time.

Gaussian Noise

The next step is to express the system input as a function of time. Consider the case of gaussian noise, for example. Assuming a normal distribution with a certain mean and sigma, a group of numbers may be selected with magnitudes and relative frequencies corresponding to this normal curve. Arranged in a random sequence,

they represent noise input to the system as a function of time. After this input has existed for a time, it may be desired to add signal to the noise. For a linearly increasing signal which appears at time $n = n_k$, the new input to the system can be written as:

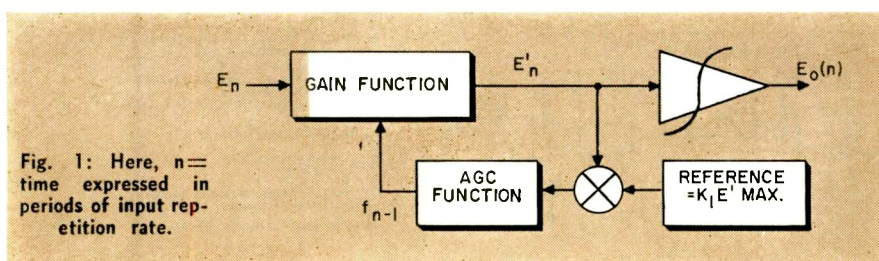
$$E_n + (n - n_k) \frac{E_s}{N},$$

where E_s = peak signal input, and N = rise time of the input signal expressed in periods of the input repetition rate.

A digital computer may now be used to compute system output vs time for the input number set selected. Using the same input conditions for each computer run, the constants of the equations controlling nonlinearity, AGC response time, integration time, and other system parameters, may be easily changed. The effects of changes in these parameters on such things as signal-to-noise ratio at the system output may then be evaluated from a study of computer-plotted system output graphs.

Acknowledgment

The development of this system analysis technique was based upon an original suggestion by G. W. Rodgers, Sandia Corp., Albuquerque, New Mexico.



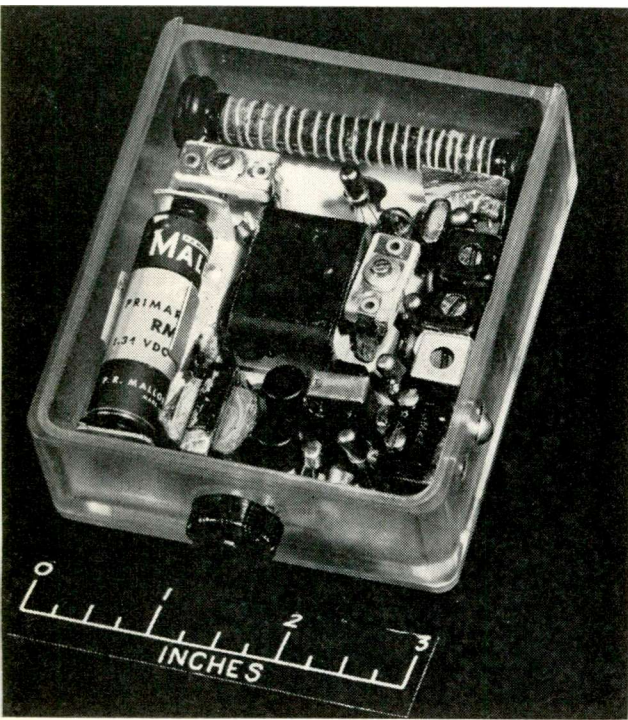


Fig. 1: Tiny WWV receiver with the cover removed shows layout

Knowledge of the exact time is often required in the field while conducting tests. Here is a compact, sensitive receiver that will meet the need quite well.

**By SACHIO SAITO
and FRANK R. BRETEMPS**

*Electronic Instrumentation Sect.
U. S. Dept. of Commerce
National Bureau of Standards
Washington 25, D. C.*

For Accurate Timing Build a

WWV Time Signal Receiver

THIS radio receiver is designed to receive the 5 MC transmission of WWV for time signals. The photographs in Figures 1 and 3 show the comparative size and parts layout of the receiver. The

receiver is housed in a plexiglass case 1 x 3¼ x 4 inches and can easily be carried in the coat pocket. Figure 2 is the circuit schematic diagram which uses nine transistors in a superheterodyne circuit.

The first six stages use the inexpensive 2N588 high frequency transistor.

The front end uses a loopstick antenna and a stage of radio frequency. (Continued on page 216)

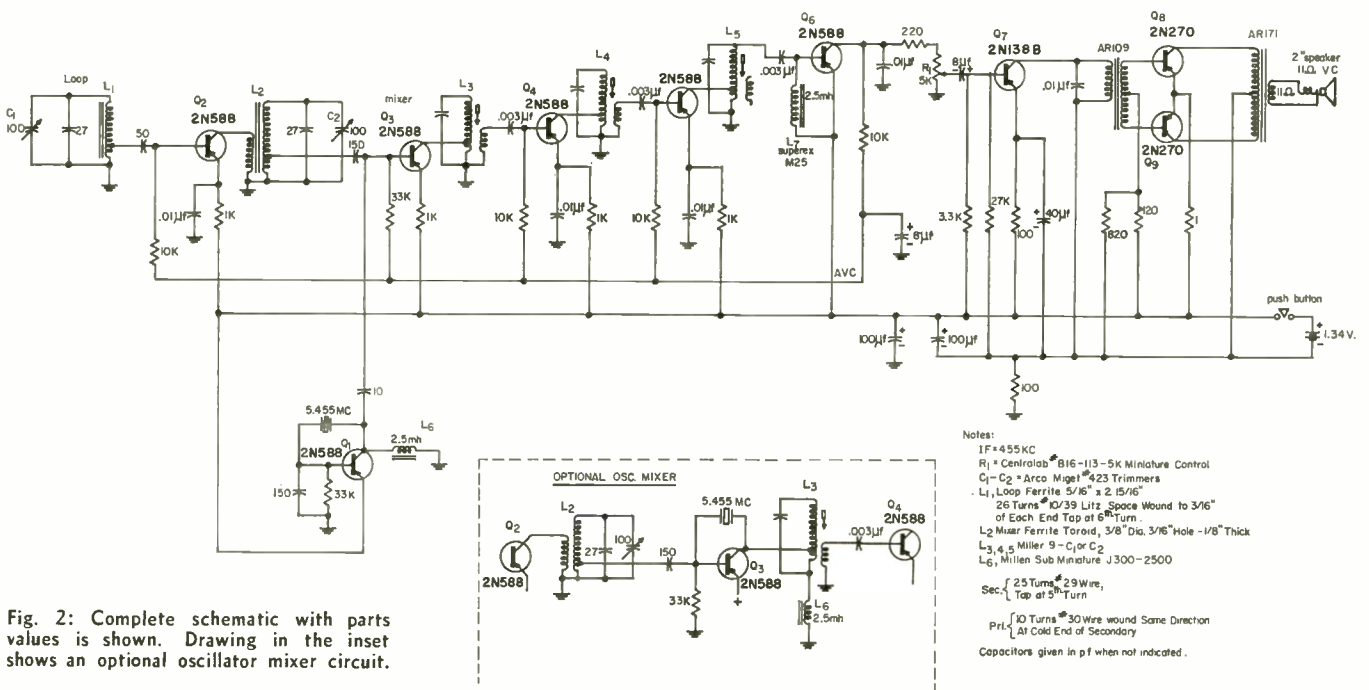
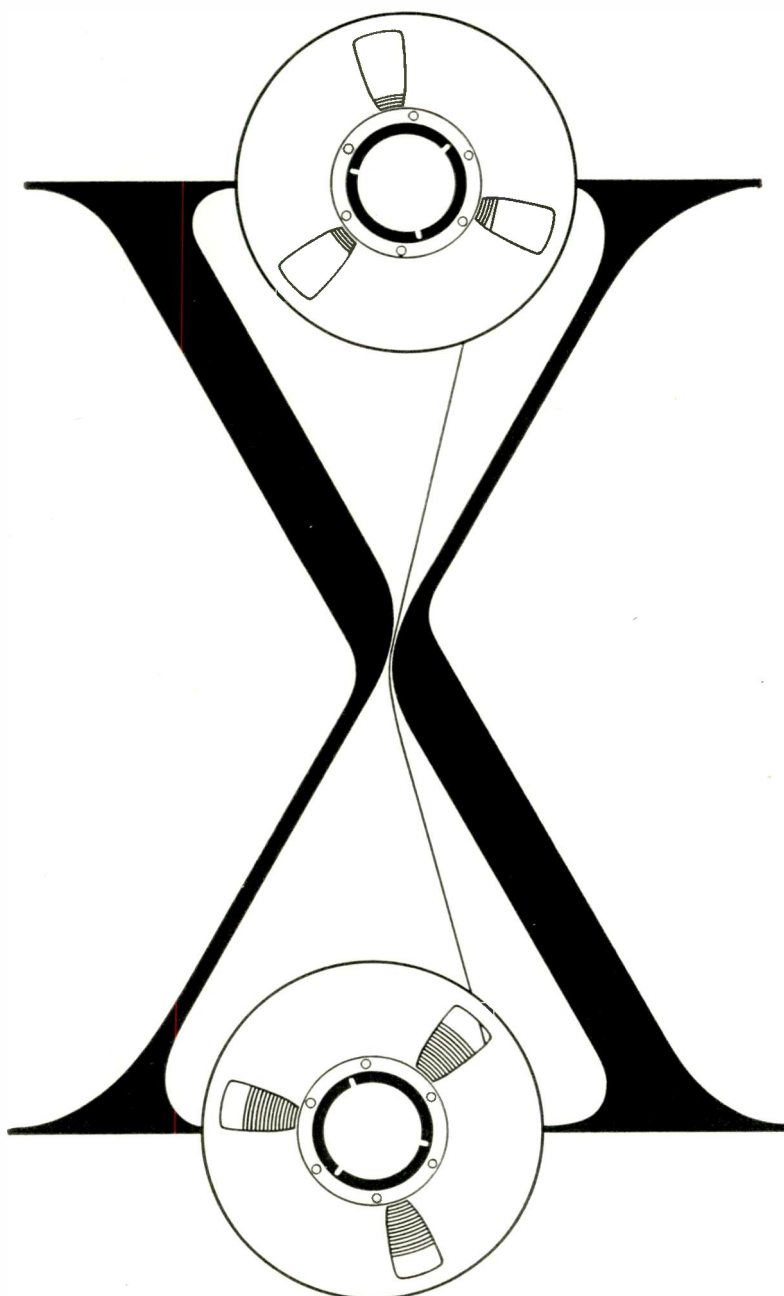


Fig. 2: Complete schematic with parts values is shown. Drawing in the inset shows an optional oscillator mixer circuit.

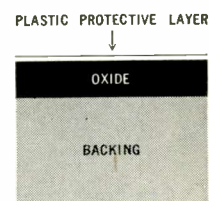
NO DOUBT ABOUT IT—
“SCOTCH” BRAND Sandwich Tapes
wear 10 times as long without errors



IN THAT NARROW LITTLE LIFELINE OF DATA known as magnetic tape, a miss is magnified into a mile. A missed bit, or one picked up by error is confusing, frustrating and time-consuming. If you're in doubt about the kind of performance you're getting, perhaps "SCOTCH" BRAND Sandwich Tapes can solve some of your tape and equipment problems.

The exclusive construction of the Sandwich Tapes combats the causes of error because it eliminates the source—oxide rub-off and head build-up. Tests prove it wears a minimum of 10 times as long as ordinary tapes before it errs. As a by-product, you can rely on it to drastically reduce maintenance and replacement costs on equipment.

The Sandwich is constructed as shown in the diagram at the right. The famous "SCOTCH" BRAND high potency oxide coating is sandwiched between a tough polyester base and a 50 micro-inch layer of plastic. Since the oxide is never in contact with the head, tape movement is smooth and low in friction—easy on both tape and equipment. Oxide can't rub off and distort valuable data.



Yet, the real meat of this remarkable Sandwich is the "SCOTCH" BRAND high potency oxide coating. Even under the protective plastic, the oxide's potency is quite sufficient to pick up 500 pulses per inch—and give desirable high-frequency response in many AM, FM and PDM applications. Sandwich Tape is but one of the developments to come out of 3M research—the same research responsible for "SCOTCH" BRAND Video Tape—the first video tape in commercial use.

Whatever your application—you'll find the right tape for reliable, error-free performance in the "SCOTCH" BRAND line-up. Check them all. *High Resolution Tapes 158 and 159* pack more bits per inch, offer either standard or extra-play time. *New Heavy Duty Tapes 198 and 199* offer good resolution and exceptional life even in poor environments. *High Output Tape 128* gives top output in low frequencies, even in temperature extremes. And *Standard Tapes 108 and 109* remain the standard of instrumentation.

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SCOTCH BRAND MAGNETIC TAPE
 FOR INSTRUMENTATION

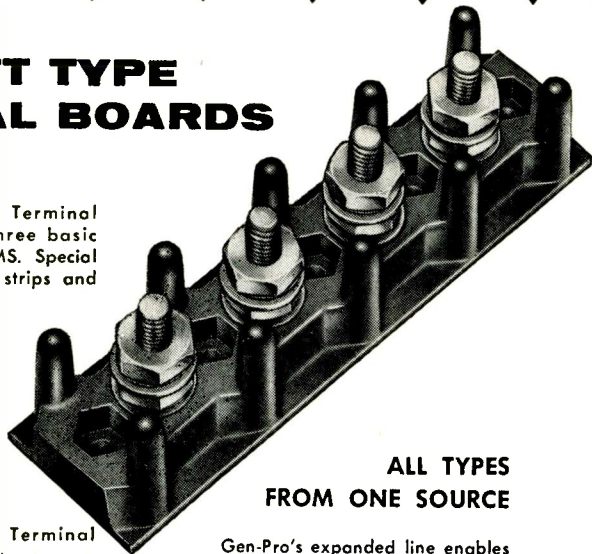
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NON-OPERATING: MIL-E-4970, Proc. III
SALT SPRAY: MIL-E-5272A
DRIP PROOF: MIL-STD-108
FUNGUS:	..... MIL-E-5272
HUMIDITY:	..... MIL-STD-202A
HIGH TEMP.	
OPERATING:	..... + 52° C
NON-OPERATING:	..... + 71° C
LOW TEMP.	
OPERATING: - 18° C
NON-OPERATING: - 54° C
DIELECTRIC	
STRENGTH:900 V RMS, 60 cps

Gertsch

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GERTSCH PRODUCTS, INC. 3211 S. La Cienega Blvd., Los Angeles 16, Calif. • Upton 0-2761 • Vermont 9-2201

WWV Receiver

(Concluded)

gency amplification Q_2 , the mixer oscillator uses separate transistors Q_3 , Q_1 , or can be combined in a single transistor as shown in the circuit inset; however, its alignment is somewhat more difficult. The crystal is tuned to the high side of the 5MC signal to obtain the 455 KC i-f signal. Two stages of i-f are used, Q_4 and Q_5 . The use of a 2N588 detector, Q_6 , gives more

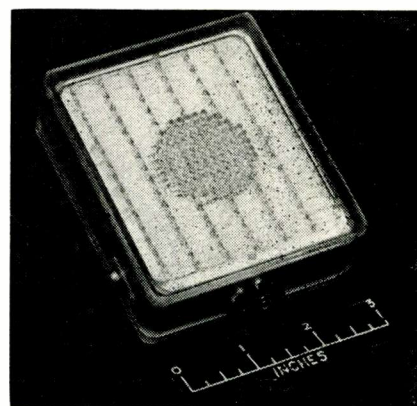


Fig. 3: WWV receiver is compact and can be carried in the pocket.

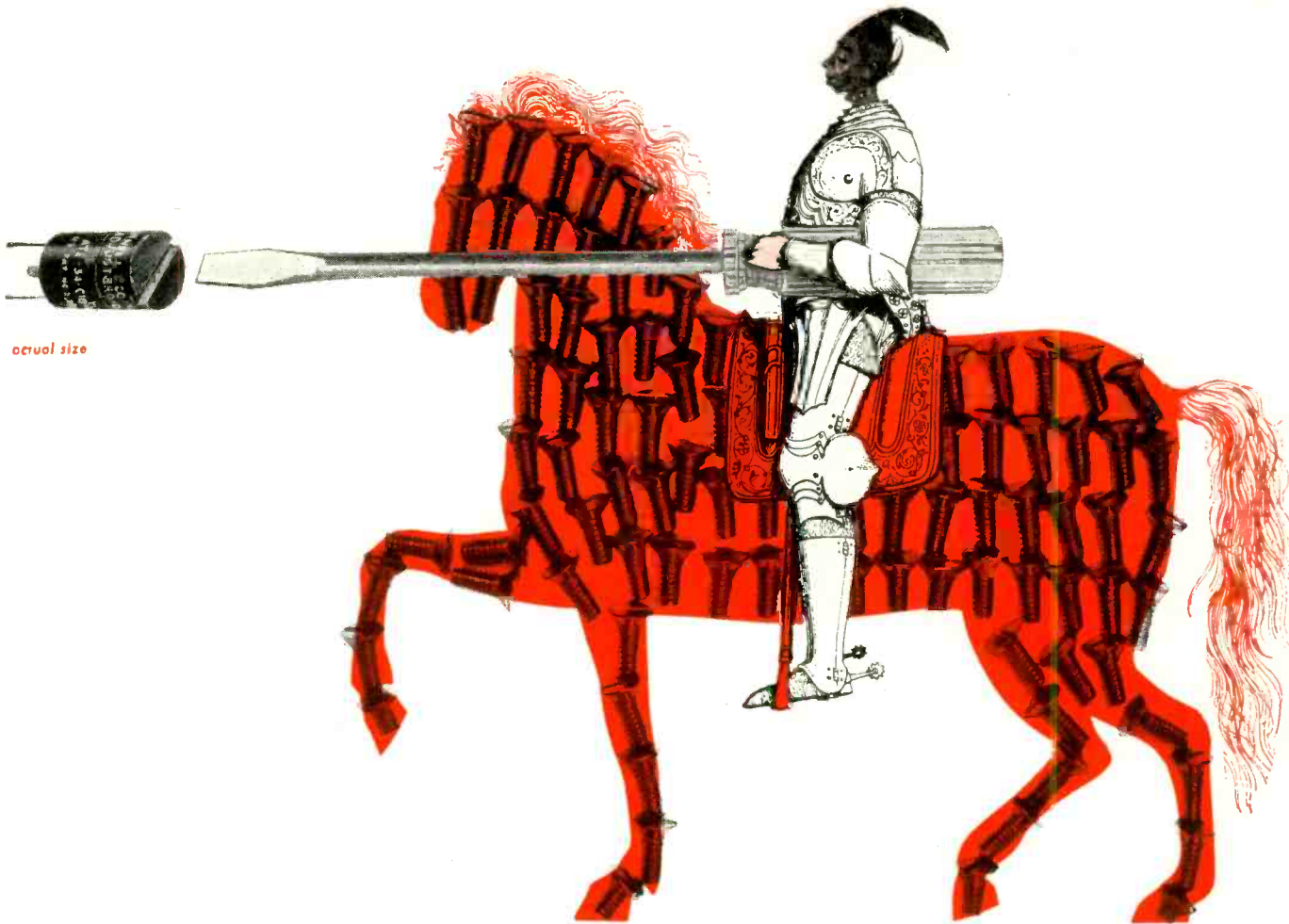
amplification than if a diode is used. The AGC voltage for all preceding steps is obtained here.

A driver and push pull class B amplifier is used to operate a 2 inch speaker at room volume. The power is supplied by a single 1.34 v mercury cell which simplifies the battery replacement problem. The current drain is about 18 ma at full signal and 6 ma with no signal. A push button switch is provided to conserve the life of the cell.

Test Machine For Teaching Electronics

The Air Force has awarded a contract to Western Design, a division of U. S. Industries, Inc., 250 Park Ave., N. Y., N. Y., for 18 automatic teaching machines. They will be tested for use in training in basic electronics.

Here is how the machine works. Similar to a microfilm machine in appearance, it presents course material to the student in a series of small, logical steps. After each step, the student is required to answer a multiple choice question based on the material he has read before he can move to the next step. Errors are explained and the student retested.



TAMING OF THE SCREW

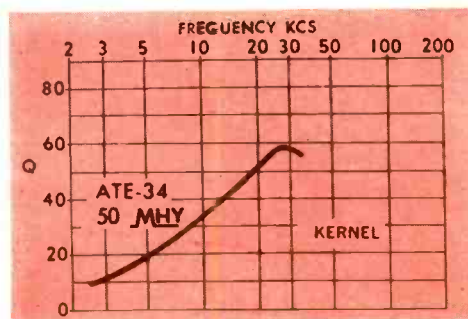
Newest additions to the Burnell Adjustoroid® line, the microminiaturized Kernel ATE 34 and the miniatures ATE 11, ATE 0, ATE 4, represent an important contribution to printed circuit design.

These new Adjustoroids possess the exclusive advantage of flush-slotted heads which serve to eliminate adjusting screws — provide maximum economy of height — insure ease of adjustment. Besides high Q, they also offer high stability of inductance versus dc.

The new microminiature Kernel ATE 34 and the miniature ATE 11, ATE 0 and ATE 4 Adjustoroids are variable over a 10% range of their inductance. Fully encapsulated, they will withstand high acceleration and vibration environments. These Adjustoroids meet specifications MIL-T 27 Grade 4, Class R and MIL-E 15305 A as well as MIL-E 5272 for humidity and thermal shock. Write for Adjustoroid Bulletin ATE-7.

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Lists more than 100 types of toroidal inductors and adjustoroids. Gives performance characteristics, mechanical specifications, including case sizes, types of sealing, etc. Attach coupon to company letterhead. And if you haven't already done so — send for your free membership in the Space Shrinkers Club.



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WHY

PERMANENT MAGNETS ARE PERMANENT!

Study of Remanence by Indiana Steel indicates 100% stability can be achieved

Truly permanent permanent magnets are now possible, according to scientists of Indiana Steel Products Division, Indiana General Corporation. Proof of 100% stability of remanence was gained during a special research project conducted by Indiana and supported by funds of the United States Air Force.*

Natural Stability

Materials having a high coercive force displayed the greatest natural stability. For example, a sample of non-oriented barium ferrite (INDOX I) with an H_{ci} of 4,000 oersteds was measured for natural stability over a period of more than 5,000 hours. Relative remanence was $100\% \pm 0.1\%$. An oriented sample of the same material (INDOX V) with an H_{ci} of 2,030 oersteds measured $99.5\% \pm 0.1\%$. The material having the lowest coercive force—ALNICO III—also exhibited the least natural stability, $97.04\% \pm 0.05\%$.

A second important factor affecting natural stability was length-to-diameter ratio (L/D). It was found that rods of ALNICO V, having a greater L/D ratio, proved more stable. For example,

rods with a ratio of 8.7:1 showed no detectable loss in remanence during a year. Rods with an L/D of 2.1:1 logged only 97.6% for the same period.

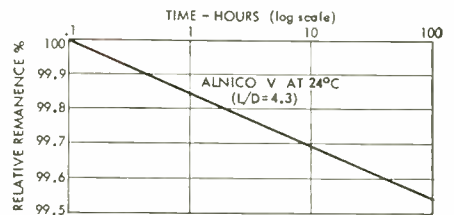
Where change in remanence was perceptible, it was found that it decreases linearly with the logarithm of time (see figure 2). This relation is expected to hold for all permanent magnets when they are undisturbed at room temperature and made of a material which does not change with time.

Test Conditions

During the study, sample magnets were kept in a special room where they were relatively free from such external demagnetizing influence as temperature variations, stray magnetic fields, short circuiting by iron contact and excessive movement or handling. Temperature was held virtually constant at $24^\circ \pm 2.5^\circ\text{C}$.

The sensitive measuring apparatus was also located in the test room. Developed in 1948 by Dr. Rudolph Tenzer of Indiana Steel, this equipment permits measurements to an over-all tolerance of better than 1 in 10,000.

FIGURE 2. Remanence decreases with time



Artificial Stabilization

Critical space-age applications often require that a magnet be completely stabilized. Many methods for achieving this were surveyed. For critical applications, methods based on repetitive processes were found superior to those based on any sudden, one-time action. Two of these proved successful, both involving artificial reduction of remanence.

- 1. Temperature Knockdown.** ALNICO V magnets were repeatedly exposed to temperatures above and below the temperature of magnetization. Several cycles improved magnetic stability, while remanence was reduced somewhat as a result. Low temperature exposures, to -65°C , produced the greatest improvement in stability, as well as the greatest reduction in remanence.
- 2. Knockdown by Applied AC Field.** ALNICO V magnets were subjected to a cycling diminishing field, which also caused a reduction in remanence. Depending upon the material and its use, magnets were knocked down a predetermined amount between 5 and 15% to achieve complete stability. Variations in remanence were less than $\pm 0.03\%$, which is the limit of measuring accuracy for this size sample.

Conclusions

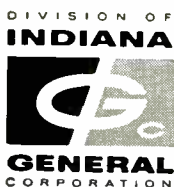
This study indicates that permanent magnets can be completely stabilized. A magnet, however, that is perfectly stable under these conditions can still be affected by larger temperature variations, stray magnetic fields, vibrations or many other factors. In the case of selected magnets, stability can be guaranteed for a flux change no greater than 0.01% per year.

For complete information on the practical aspects of "Stability," ask for a copy of *Applied Magnetism*, First Quarter, 1959. Write Dept. N-8.

FIGURE 1. Summary of Experimental Results

Material	L/D	Remanence Bd kilogauss	Stability Relative Remanence at 24°C 5 log cycles (10,000 hr) after magnetization	Measuring Accuracy
INDOX I	0.9	1.4	100.0%	$\pm .1\%$
INDOX V	0.8	2.5	99.6	$\pm .1$
ALNICO III	3.5	4.5	98.10	$\pm .04$
	2.2	3.2	97.04	$\pm .05$
ALNICO VII	3.5	4.9	99.32	$\pm .04$
	2.2	3.9	98.96	$\pm .06$
ALNICO V (long)	8.0+	12.3	99.95	$\pm .01$
(medium)	5.8	11.9	99.81	$\pm .02$
(short)	4.3	10.4	99.23	$\pm .02$
	3.5	8.2	98.84	$\pm .04$
	2.9	6.7	98.50	$\pm .05$
	2.1	4.1	97.6*	$\pm .07$

*Extrapolated 1 to 2 log cycles beyond last measurement.



INDIANA STEEL PRODUCTS

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In Canada: The Indiana Steel Products Co. of Canada Limited, Kitchener, Ontario

INDIANA PERMANENT MAGNETS

CUES

for Broadcasters

Eliminating Vibrations

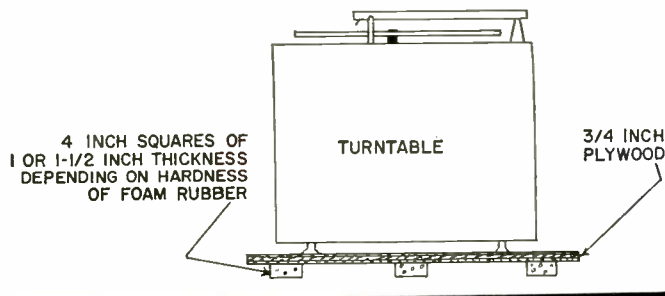
JACK VINSON, Eng.

WACO, Waco, Tex.

Some radio stations may have a problem of eliminating vibration from air conditioning equipment. This vibration can be transmitted along walls and floors for quite a distance, and cause flutter or groove-jumping on their turntables, particularly on microgroove equipment. We spent several hundred dollars to little avail trying to eliminate the trouble at its source. We finally solved it by making a platform for our turntables from $\frac{3}{4}$ inch plywood and glueing 4 inch by 4 inch squares of foam rubber of proper thickness on the bottom, as feet, to support the platform.

The entire table can be then set on the platform or two turntables or more in a row may be placed on one platform. The turntable can be jarred rather violently or may be swung in a wide arc without throwing the needle out of the groove. This solution is so inexpensive and simple that it could be overlooked by someone badly in need of it.

Vibration can be eliminated by using the platform illustrated below. Use of the platform will prevent record skip due to heavy vibrations.



Tone Remote Control Drifting

L. EDWIN RYBAK, Ch. Eng.

WGPA & WGPA-FM,
Bethlehem, Pa.

After several years of operation with tone remote control equipment, here are some suggestions to other users of Gates RCM-12 and RCM-14 remote control equipment. Doubtless, the same suggestions will apply to other tone systems.

Our first experience with the tone control was excessive drift of the tones. After writing Gates Radio Company they very courteously agreed to exchange our oscillators and selective amplifiers on a one for one basis for the newer temperature compensated units.

Previously, oscillator retuning was necessary at least once a week; like

(Continued on page 220)

Sub-Min.

Widest selection of Pilot Lights - from DIALCO



T-2

NEON

HIGH BRIGHTNESS and REGULAR TYPES

DIALCO's Sub-Miniatures use tiny T-2 Neon Glow Lamps: *NE-2J* (High Brightness) at 105-125 V., A.C.; or *NE-2D* (regular) at 105-125 V., A.C. or D.C.

NEW Series mounts from *FRONT* of panel in $15/32$ " clearance hole (supplements $17/32$ " Series).

Also—units for mounting from *BACK* of panel in $15/32$ " clearance hole. Unique lenses in 5 colors; give all-angle visibility. Units are fully insulated; meet applicable Mil. Specs.

Ask for Brochures L-159B and L-162.

(Illustr. approx. actual size)

(Front mtg., $15/32$ "



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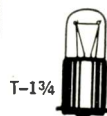
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T-1 3/4

INCANDESCENT

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Designed for use with T-1 3/4 midget flanged incandescent lamps—1.3 V. to 28 V. . .

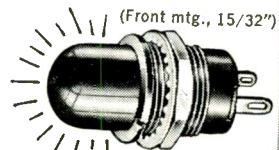
NEW Series mounts from *FRONT* of panel in $15/32$ " clearance hole—(supplements $17/32$ " Series).

Also—units for mounting from *BACK* of panel in $15/32$ " clearance hole.

Unique lenses in 7 colors. Units are fully insulated; meet applicable Mil. Specs.

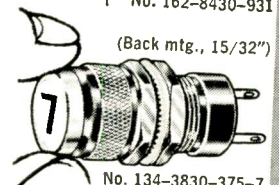
Ask for Brochures L-156C thru 159B, and L-162.

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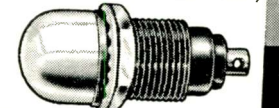
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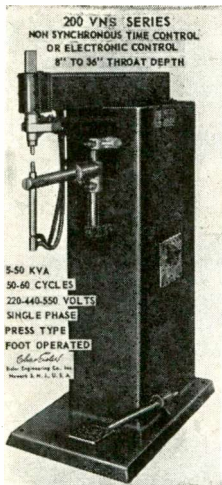
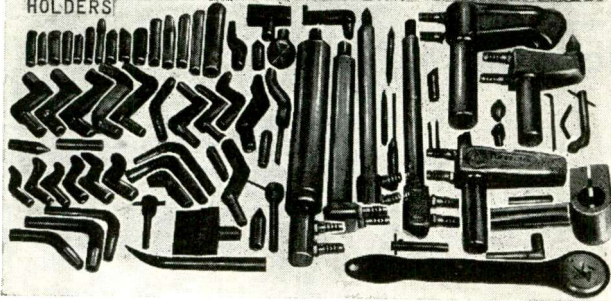
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MADE TO YOUR
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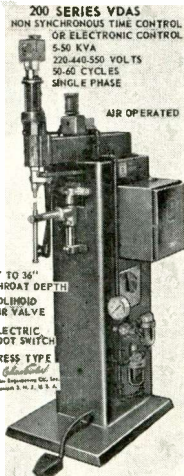
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8" TO 36" THROAT DEPTH

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50-60 CYCLES
220-440-550 VOLTS
SINGLE PHASE
PRESS TYPE
FOOT OPERATED

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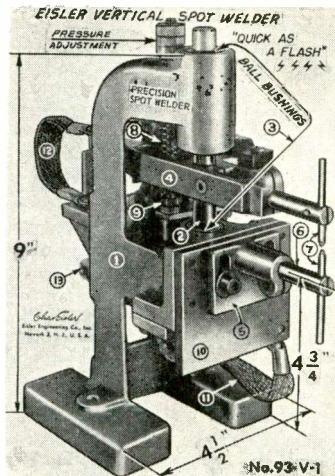


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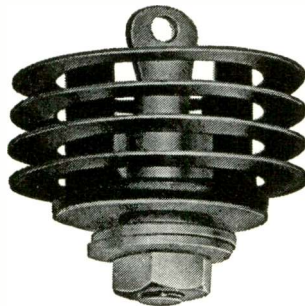
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test data write:



Cues for Broadcasters

the instruction book says. The new units made it possible to operate up to two weeks before retuning became necessary. This was still too frequently to go off the air as seasonal temperatures varied unpredictably.

Several tests were made indicating that excessive line voltage variations at the studio control room would cause a, though brief, excursion of oscillator frequency; just long enough to take the transmitter off the air. As soon as the time delay relays recycled the transmitter would return to normal operation.

Installation of a constant voltage transformer at the studio end made it possible to operate for several weeks before retuning of the oscillators became necessary. But as the seasons changed, again excessive temperature variations caused system instability.

Careful checks indicated that the oscillators were perfectly stable and therefore the drift must be due to selective amplifier instability. Installation of a constant voltage transformer at the transmitter eliminated the drift problem with the selective amplifiers. The constant voltage overcomes the difficulty as it would appear that the combination of excessive voltage changes and temperature variations had been causing the selective amplifiers to drift off frequency.

Here is how we now operate our tone remote control system. Once a year replace weak tubes. We replace the tubes that check less than 80% on transconductance. We keep on hand several tubes that have been "run-in" for two weeks in a spare oscillator. When a new tube is inserted allow an hour or two for thorough warm up (except in emergencies). Retune the channel for the center of the selective amplifier pass band-maximum cathode current. One week later check and retune; if necessary. Repeat this check at the end of the month. Now stop worrying for another year.

We have been operating our tone system on a once-a-year check basis for six years and have not lost any air time due to oscillator or selective amplifier drift or failure.

Electronics Museum

Robert S. Bell, President of Packard Bell Electronics Corp., accepted one of Dr. Lee DeForest's original 3-element amplifier tubes from Mrs. DeForest at the dedication of a permanent Museum of Electronics History in the company's 100-acre Electronics Park, Newbury Park, Conejo Valley, Calif. Ransom Matthews, Associate Curator, Mechanical Sciences, Los Angeles County Museum, also presented a score of early scientific and electronic exhibits.



FOR YOUR SPECIAL APPLICATIONS

The bulk of UTC production is on special units designed to specific customers' needs. Illustrated below are some typical units and some unusual units as manufactured for special applications. We would be pleased to advise and quote to your special requirements.

FILTERS

All types for frequencies from .1 cycle to 400 MC.



400 \sim telemetering, 3 db at $\pm 7.5\%$, 40 db at 230 and 700 \sim $\frac{3}{8}$ x $1\frac{1}{4}$ x 2"



15 \sim BP filter, 20 db at 30 \sim , 45 db at 100 \sim , phase angle at CF less than 3° from -40 to +100°C.



LP filter within 1 db to 49 KC, stable to .1 db from 0 to 85°C., 45 db at 55 KC.



LP filter less than .1 db 0 to 2.5 KC, 50 db beyond 3 KC.

PULSE TRANSFORMERS

From miniature blocking oscillator to 10 megawatt.



Wound core unit .01 micro-second rise time.



Pulse current transformer 100 Amp.



Pulse output to magnatron, bifilar filament.



Precise wave shape pulse output, 2500 V. 3 Amps.

HIGH Q COILS

Toroid, laminated, and cup structures from .1 cycle to 400 MC.



Tuned DO-T servo amplifier transformer, 400 \sim .5% distortion.



Toroid for printed circuit, Q of 90 at 15 KC.



Dual toroid, Q of 75 at 10 KC, and Q of 120 at 5 KC.



HVC tapped variable inductor for 3 KC oscillator.

SPECIALTIES

Saturable reactors, reference transformers, magnetic amplifiers, combined unit.



RF saturable inductor for sweep from 17 MC to 21 MC.



Voltage reference transformer .05% accuracy.



Multi-control magnetic amplifier for airborne servo.



Input, output, two tuned interstages, peaking network, and BP filter, all in one case.

POWER COMPONENTS

Standard and high temperature... hermetic, molded, and encapsulated.



Multi-winding 140 VA, 6 KC power transformer $1\frac{1}{4}$ x $1\frac{1}{4}$ x 1"



200° C. power transformer, 400 \sim , 150 VA.

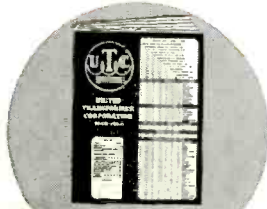


400 \sim scope transformer, 20 KV output.



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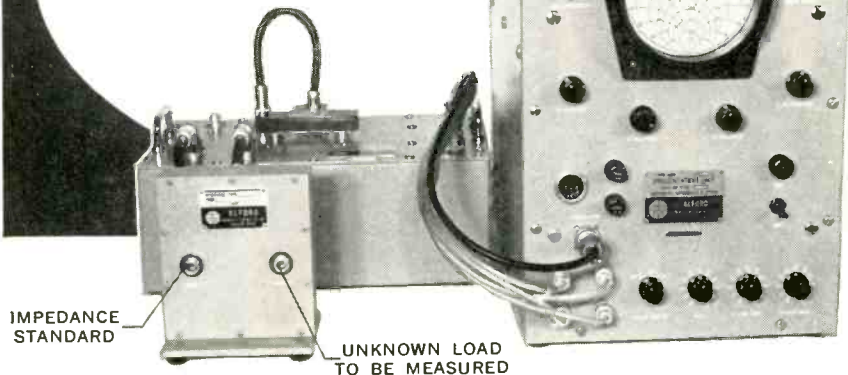
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TYPE 14

AUTOMATIC IMPEDANCE PLOTTERS



- Presents effectively continuous impedance information over a frequency band.
- Entirely self-contained except for the use of an external oscillator.
- Models available to cover 2.5-250 mc, 30-400 mc and 180-1100 mc.

Write for complete
information on AMCI
Automatic Impedance
Plotter



LASER

(Continued from page 89)

eration of the laser are these:

1. A light source, in the form of a powerful flash tube lamp, irradiates a synthetic ruby crystal which absorbs energy over a broad band of frequencies.

2. This optical energy excites the atoms to a higher energy state from which the energy is reradiated in a very narrow band of frequencies.

3. The excited atoms are coupled to an optical resonator and stimulated to emit the radiation together. This is in contrast to ordinary light sources where the atoms radiate individually at random and is responsible for the incoherence of these latter sources.

As a direct consequence of its coherence, the laser is a source of a very high "effective" or equivalent temperature. By this term we mean the temperature to which an ordinary light source would need to be heated to generate a signal as bright as the laser's at the laser's color. But, the laser is not hot, it is a "cool" source in the ordinary sense of the word and therefore does not burn up.

The color of light is a manifestation of its frequency, and the purity of a color is determined by the width of the emitted spectrum. Because light waves, in principle could be produced a million times more monochromatic, or single hued, as those from a mercury or neon lamp, lasers could generate the purest colors known. This is one more way to describe the coherence of the laser.

Another important property of a laser, indirectly a consequence of its coherence, is that it radiates an almost perfectly parallel beam. It could, in principle, generate a beam less than a hundredth of a degree of arc wide which when reaching the moon, would illuminate an area less than 10 miles wide.

The laser's use in radar and communications for space work is obvious, since there is no atmosphere in space to absorb or scatter the beams. It could be used, in effect, as a light radar.

The minimum spot size that a

(Continued on page 222)



Armco 48 Orthonik Assures Reliable Efficiency for Magnetic Control, Measurement and Amplification

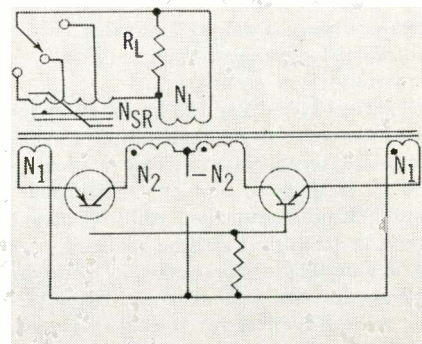
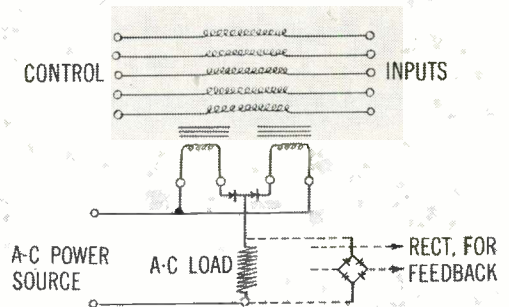
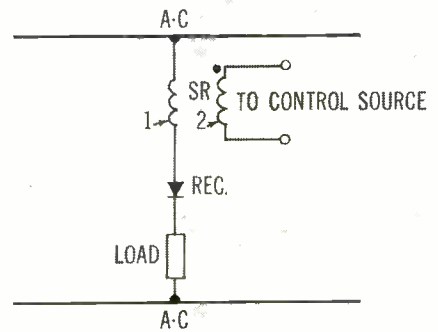
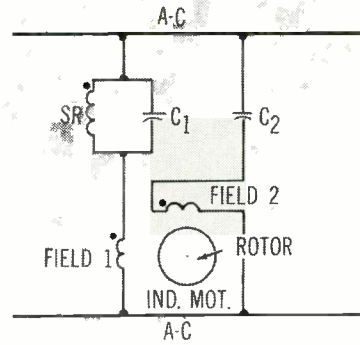


Special magnetic properties of this Armco nickel-iron magnetic alloy meet requirements for wide range of electronic components in industrial and military equipment.

For cores that require a rectangular hysteresis loop and high permeability at low and moderate inductions, Armco 48 Orthonik offers many useful advantages that assure reliable, efficient performance.

- Extremely low coercive force required permits operation with low control power.
- Very high B_r to B_m ratio at inductions near saturation results from precise mill processing.
- High saturation induction permits design of efficient power components.
- Cubic structure and controlled processing produces good magnetic properties parallel and transverse to rolling direction.
- Uniform properties assure excellent performance capabilities.
- Available in thicknesses from 6 to 1/4 mils and specially processed for use in wound or laminated cores.

Where circuits call for the basic magnetic properties of a rectangular loop, nickel-iron alloy, give your products all these additional advantages by specifying cores of Armco 48 Orthonik. Complete design data is available on request; just write Armco Steel Corporation, 2540 Curtis Street, Middletown, Ohio.



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New 100 kc PLUG-IN CRYSTAL OSCILLATOR

This 100 kc plug-in package, Model CCO-7G, combines a high precision sealed-in-glass quartz crystal with integral temperature control and transistorized circuitry.

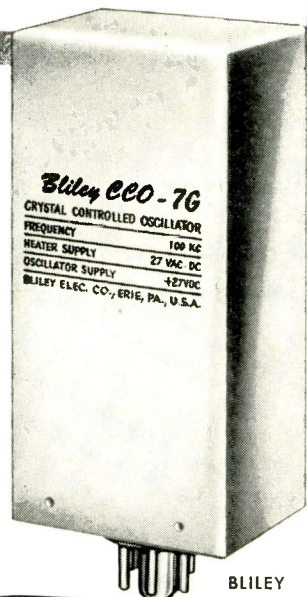
Designed to deliver 100 kc output with stability of 2 parts in 10 million over ambient temperatures from 0°C. to 50°C. With fixed ambient conditions and voltage regulation, stability of one part in 10 million can be realized. The standard unit requires 27 volts dc, 12 ma for the oscillator and 27 volts, ac or dc, 10 watts for the crystal oven. Package size, excluding octal base, is 2" x 2" x 4⁷/₁₆".

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BLILEY CCO-7G



(Continued from page 222)

coherent energy beam can be focussed into is approximately equal to the wave length of the radiant energy. The laser emits energy where the wave length is between 15 and 30 millionths of an inch.

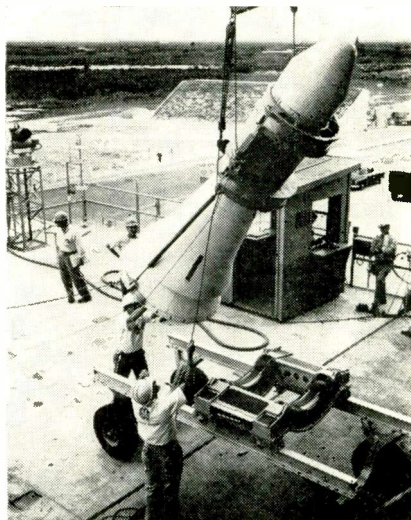
Therefore laser beams, in principle, could be concentrated to the pinpoint size of a few ten-millionths of an inch in diameter.

When energy is concentrated in such small areas, its intensity is very great and it therefore could generate intense local heat. This suggests the possibility of many uses such as sterilizing surfaces with the focussed beam. Perhaps individual parts of bacteria, small plants and particles could be vaporized. Surface areas might be modified and chemical or metallurgical change induced, and thus the laser could be useful in biology, medicine and industry.

New Hi-Fi Technique

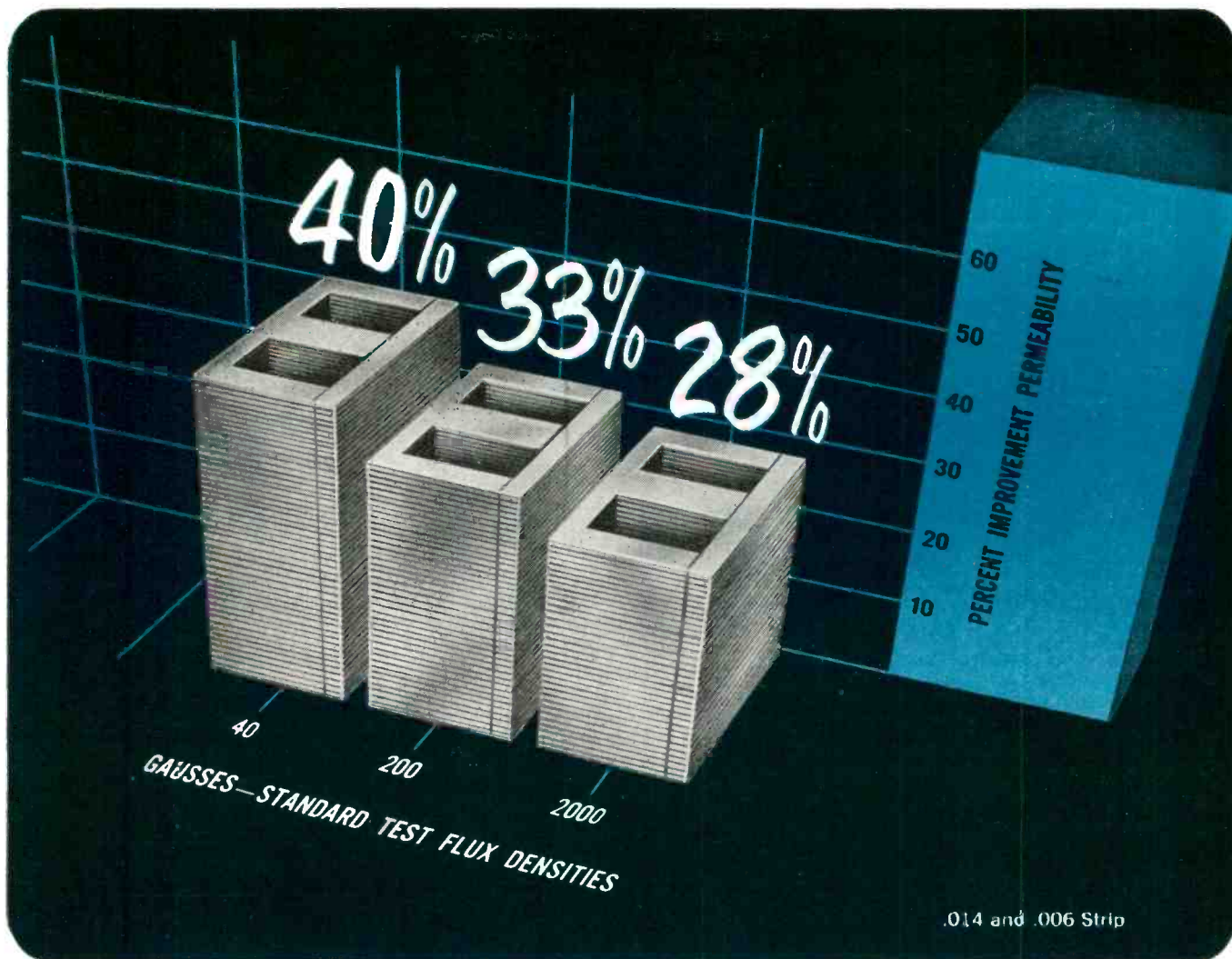
Zenith Sales Corp., 6001 W. Dickens Ave., Chicago, Ill., has described a sound reverberation development that "achieves a living, vibrant realism never heard before from high-fidelity stereo in the home." The unit, Reverba-Tone, uses "time delaying" and reverberating sound to add richness, resonance and majesty to tone. For use even in small rooms it can add to the qualities of FM and AM broadcast sound, and to monaural and Hi-fi stereo sound reproduced from records or tape.

LONG SHOT



Re-entry vehicle traveled 1/3 of the way around the earth after being launched aboard an Atlas ICBM from Cape Canaveral. The Mark 3 was developed by GE's Missile and Space Vehicle Dept., Phila., Pa. Ablation materials absorb re-entry heat.

Experience—the added alloy in A-L Electrical Steels



Higher permeability values now guaranteed for Allegheny Ludlum's Moly Permalloy

Means new, consistent and predictable magnetic core performance

Molybdenum Permalloy nickel-iron strip is now available from Allegheny Ludlum, with higher guaranteed permeability values than former typical values. For the buyer, this new high quality means greater uniformity . . . more consistent and predictable magnetic core performance.

This higher permeability is the result of Allegheny Ludlum's intensive research on nickel-bearing electrical alloys. A similar improvement has been made in AL-4750 strip steel. A-L continues its research on silicon steels,

including Silectron, well-known grain-oriented silicon steel, and other magnetic alloys.

Complete facilities for the fabrication and heat treatment of laminations are available from Allegheny Ludlum. In addition, you can be assured of close gage tolerance, uniformity of gage throughout the coil, and minimum spread of gage across the coil-width.

If you have a problem relating to electrical steels, laminations or magnetic materials, call A-L. Prompt technical assistance will be yours. And write for more information on Moly Permalloy. *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

Address Dept. EI-8

W6W 7400

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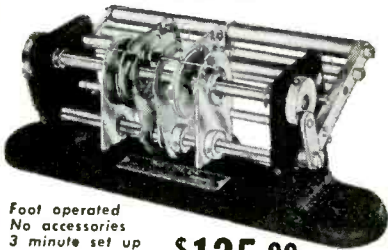
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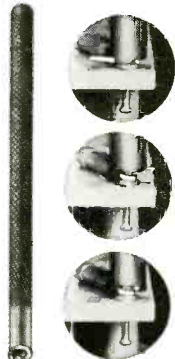
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Constant Current Source

Model 5909 features: Current output: 0.06 to 20 ma; Voltage output: 0 to 100 v. at any current from 0.06 to 20 ma; Line regulation: Current change less than 1/2% at any current



from 0.06 to 20 ma and at any load voltage from 0 to 100 v. for a line change of ±10%. Also: a DC Comparator and a Transistor Test Set. Measurements Research Co. Booth 762A.

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Model 95A Sensitive DC Meter features 17 voltage ranges and 25 current ranges. Voltage ranges are 10 μ v to 1000v. Current ranges are



1 μ ma to 1a. Input resistance (voltage ranges) is 10 megohms. Accuracy is 3% of full scale (on the most sensitive ranges it is 4%). Boonton Electronics Corp. Booth 751.

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fci Stabilized Precision Capacitors



	CAP. TYPE RANGE	V.D.C.	TEMP.	P.F.	T.C.	I.R. 25°C	MIN. TOL.	SOAK-AGE
A	.001—20MF	100—30KV	—55°C +85°C	.02% 1KC	—100 PPM/C	10 ⁶ MEG	0.1—	0.01%
B	.001—20MF	600—20KV	—55°C +70°C	.02% 1KC	+800 PPM	10 ⁶ MEG	1.0%	3.00%
C	.001—20MF	100—30KV	—55°C +200°C	.02% 1KC	—50 PPM/C	10 ⁶ MEG	0.1—	0.01%
D	.0001—20MF	100—60KV	—55°C +125°C	.5% 1KC	+500 PPM	10 ⁶ MEG	1.0%	0.10%

WRITE FOR FURTHER
INFORMATION AND OUR
COMPLETE CATALOG

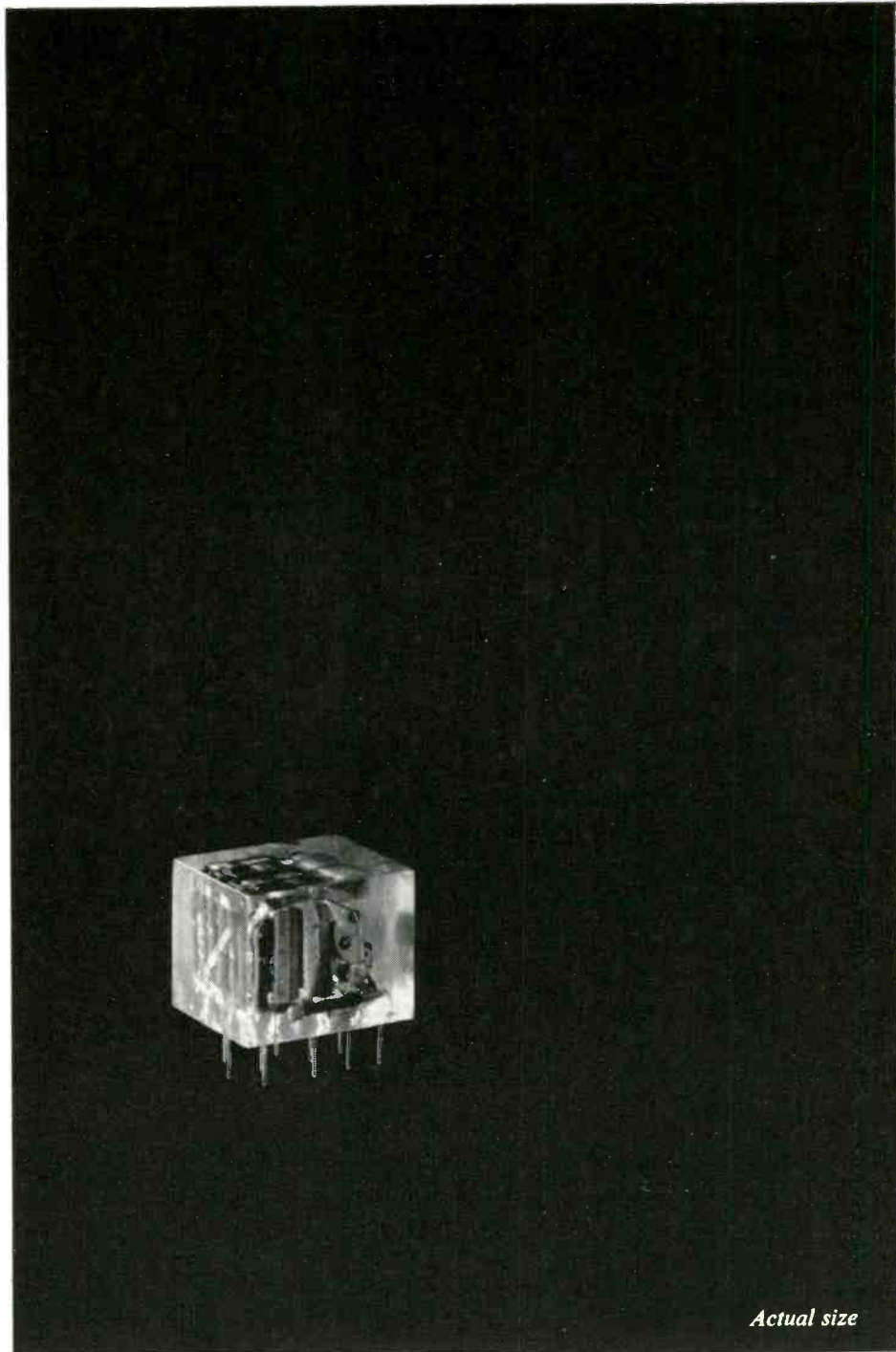
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Actual size

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MINIATURE MODULES WITH STANDARD COMPONENTS

They are *building block modules*. They are a product of Delco Radio's newly developed, three-dimensional packaging technique. They are used to build light, compact, reliable airborne and special purpose digital computers for missile control. Each module, vacuum encapsulated with epoxy resin, contains up to 35 standard components per cubic inch—averaging more than 50,000 per cubic foot. The modules perform all the standard logic functions. They meet or exceed all MIL-E-5272D (ASG) environmental requirements and will operate over a temperature range of -55°C to $+71^{\circ}\text{C}$. They can be assembled in groups on printed circuit boards. There are 10 basic types and 15 variations of Delco Building Block Modules. With them, Delco Radio can quickly and easily build a compact, reliable computer for airborne guidance or any other military application. For complete details, write to our Sales Department. *Physicists and electronic engineers: Join Delco Radio's search for new and better products through Solid State Physics.*

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DELCO
DEPENDABILITY
RADIO
RELIABILITY

Division of General Motors • Kokomo, Indiana

Search for New Markets

(Continued from page 77)

with the highest priority. The means to do this are in-house programs to achieve lowered customer cost, improved performance, quality and reliability, adaptation of design and intensive customer service.

The markets we have served in the past are the principal sources of potential new business. These markets will probably exist far into the future. The glamorous new businesses such as space technology rely on some revolutionary designs but these inevitably find their way in combination with evolutionary ideas into these sophisticated new devices. Today's customers are our major source of guidance for the engineering programs that will be best for them and pay off in new products and profits for us.

In the jungle of today's electronic markets, success is most probable for the company that can move new ideas rapidly through a streamlined engineering department, that can schedule short runs through its manufacturing facility to a good time cycle and maintain superior standards of quality with delivery at a reasonable price.

Research holds the key to long range growth. Out of research will come the new products for the markets of the 1970's. Careful selection of the areas for the expenditure of research and development funds and talent is critical. This, coupled with a vigilant and aggressive marketing program at the outset, can

assure the effective multiplication of today's corporate investment in the markets of tomorrow.

We can no longer project operations on the basis of the high volume production experience of the past. We must adapt our practices to the newer missile and space programs. We must gear our sales, engineering and productive organizations to a fast reaction capability. This capability must be based on producing limited quantities of increasingly complex equipment. It will embody more and more elements pressing the state of the art. At the same time we maintain or expand our less glamorous but most profitable "standard" markets.

The stock in trade of our Electronic Industry, the stuff of which it is made, is the pressure toward horizons beyond our view. We must increase component reliability and diminish size, weight and cost. We must combine components in ever increasing permutations and combinations into systems of ever greater capability and reliability to meet the new needs of today and the anticipated requirements of tomorrow. Expanding markets lie at home and abroad and daily are challenging an ever increasing corps of technical talent. New markets are to be found everywhere for the new and better component, the new and simpler system, the more reliable device.

The endless search for new ways to do old things better and new things first, to expand old markets and create and serve new ones, will drive the Electronic Industry to new sales highs.

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**NEW IONIZATION PUMP
OFFERS FAST PUMPING AND
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When your ultra-high-vacuum requirements demand fast pumping and long life at *low cost*, a full range of Hughes Ion Pumps is available to fill your needs.

One example is the fast, 6-liter-per-second pump. This advanced, ultra-high vacuum ionization pump offers you:

Long operating life: Up to 50,000 hours! Made clean. Designed to stay clean.

Trouble-free operation: No refrigerants, traps, oils or heating elements to repair or replace.

High efficiency: Maintains pressures from 10^{-4} to 10^{-9} mm Hg in closed vacuum systems.

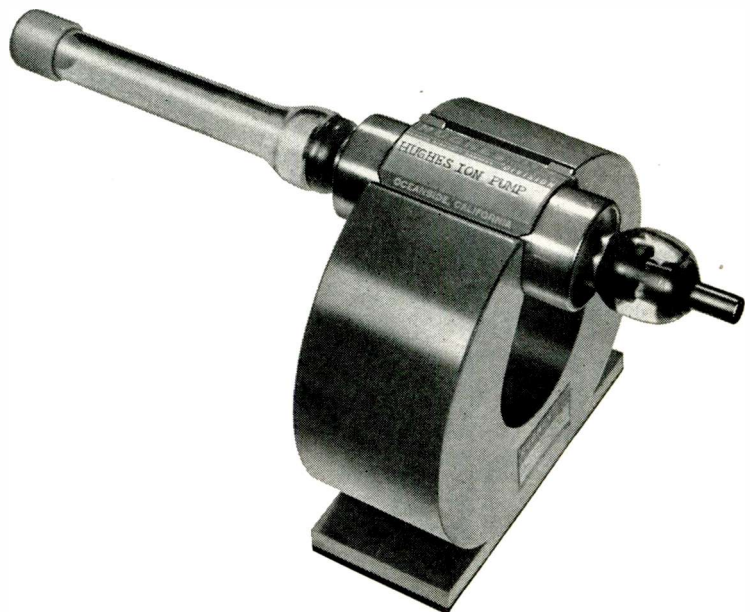
Small size: Only 5" x 3" x 5"

Versatility: Useable on either metal or glass vacuum systems.

Dual usage: Gauges as it pumps.

For complete information and detailed specifications on the new Hughes Ion Pump, write or wire today: **HUGHES, Vacuum Tube Products Division, 2020 Short Street, Oceanside, Calif.**

For export information, write: Hughes International, Culver City, California.



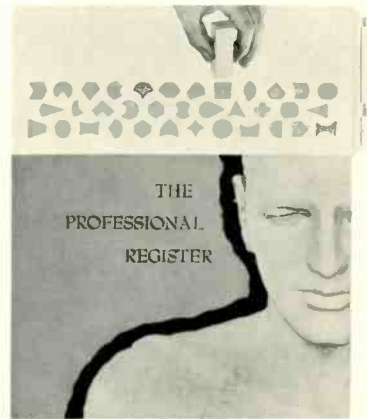
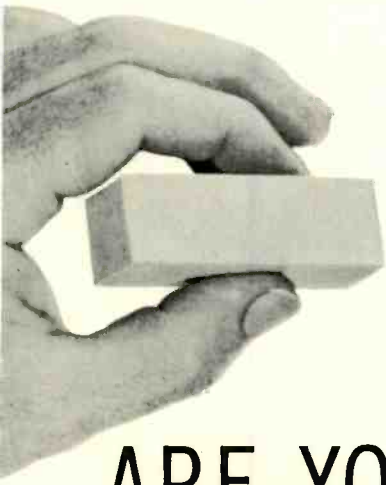
See the Hughes Ion Pump and the complete line of Hughes vacuum gauges and controls on display at **WESCON — Booths: 2826-2827.**

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HUGHES

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Please complete this card, fold, staple and mail. The information you give constitutes the first phase of the Professional Register Program and will enable our professional staff to make a preliminary evaluation of your abilities. All inquiries will be answered immediately. When you complete the Program, the inventory of your talents and capabilities will be recorded on over 20 electronic data-cards available for instant use in guiding your future progress at HUGHES-FULLERTON.

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Mathematics _____ _____

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AREAS OF PROFESSIONAL EXPERIENCE:

(please check boxes)

- Computers
- Electron Tubes
- Electronic Circuitry
- Telemetry
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- Radar
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FUNCTIONS PERFORMED:

(please check boxes)

- Research
- Development/Design
- Technical Writing
- Project Management/Supervision
- Administrative Staff Support
- Systems Analysis
- Testing/Process Control
- Product Engineering
- Field Engineering
- Operations Research
- General Engineering
- Systems Engineering
- Other: _____

Are your talents being recognized?

Most engineers have had to face an unpleasant fact. Often an employer will hire from outside to fill a supervisory post. Entirely qualified men "inside" are passed over. The problem is generally one of communication. The employer simply does not have adequate knowledge of his employees' abilities and promise.

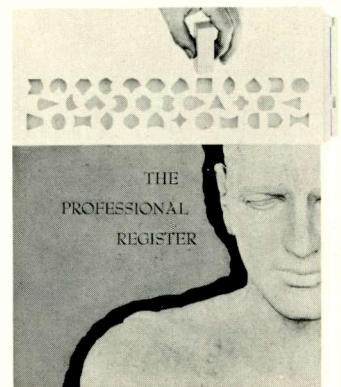
Hughes-Fullerton's new Professional Capabilities Register reflects the complete engineering-orientation of this fastest-growing Hughes activity. (From 800 to nearly 6,000 people since 1957. Planned, *scheduled* growth.)

The Register makes instantly available a complete record of every individual's abilities, interests and accomplishments. Previously hidden talents can now be put to use. Often these can mean the difference when reassignments or promotions are being made. Your potentials become a very real resource of Hughes-Fullerton Research and Development Staff.

Areas covered in the Register range from language skills through patents to books and articles published. It includes teaching experience, professional affiliations. All data is kept up-to-date and handled by automatic data processing equipment for utmost efficiency.

Hughes-Fullerton's philosophy of giving precedence to the needs of engineers has worked well. Hughes-Fullerton was first with three-dimension radar...a major breakthrough in the state of the art. Other vital areas of interest include advanced data processing and electronic display systems.


These are a few reasons why you should investigate Hughes-Fullerton. Openings exist at several experience levels for a variety of engineering specialties. For full information fill out the post card and mail it today!



Creating a new world with ELECTRONICS



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PROFESSIONAL OPPORTUNITIES

Reporting late developments affecting the employment picture in the Electronic Industries

Design Engineers • Development Engineers • Administrative Engineers • Engineering Writers
Physicists • Mathematicians • Electronic Instructors • Field Engineers • Production Engineers

What Makes Today's Engineer "Tick"?

Changes in "The Characteristics of Engineers and Scientists" are discussed in a book by Prof. Lee E. Danielson, University of Michigan (136 pp, \$4.00 from the Univ. of Mich. Bureau of Industrial Relations). It is based on interviews with 44 executives, 91 supervisors, and 277 non-supervisory professionals in 10 firms having extensive research organizations.

What did he find? For one thing, while intensely interested in their work, professional scientists and engineers do not always regard a "job well done" as its own reward. They are interested in personal advancement and recognition, but they do not respond well to many traditional management practices. Their bosses think of them as a breed apart within the business organization — and they think of themselves in pretty much the same terms.

Instead of their technical and scientific training leading to increased technical contribution, it serves as a means to an end. Many follow engineering programs only so that they will be more employable. Once employed, they actively seek to move out of the technical areas and into more lucrative ones in management and sales.

Says Prof. Danielson, "many are attracted to the sciences because of the monetary and prestige lure, rather than a devotion to fundamental knowledge. No longer does the scientist have to limit himself to employment in an academic institution. He can be well paid for full-time research work with up-to-date facilities and equipment, and see the immediate application of his results.

"The number of people attracted
(Continued on page 243)

FOR MORE INFORMATION . . .
on positions described in this section fill out the convenient inquiry card, page 195.

WAR GAMES



Maj. Gen. T. J. Daly (Australia) is briefed on IBM Computer operations used in LOGEX 60, a logistics war game under way at Fort Lee, Va. Col. R. J. Kaufman, U.S.A.F., (Left) and Col D. P. Rique, U. S. Army, look on. Mission simulated is to support Allied field army on a counter-offensive after start of nuclear war in Europe.

Patents Lag Research

The U. S. Commissioner of Patents, M. A. Crews, says that the large-scale research boom hasn't greatly increased patent applications. Research efforts are up 6 to 12 times while patent applications are up by only 1/6.

He gives several possible reasons for this puzzling situation. First the increasing complexity of modern technology, with invention piled on invention, may have developed to a point where the end product involves one solution of which there are other variants available, so that the motive for patenting is not so great. Then, the body of patent and technical literature is becoming greater and greater and it is more and more difficult to produce a patently novel invention and finally, the inhospitable attitude toward patents exhibited by some courts may discourage patenting.

An interesting point brought out by Crews (he spoke at the Univ. of Michigan's College of Engineering Industry Program) was that the individual inventor is still an important factor. Independent inventors or small organizations account for about 60% of the more important contributions and about 40% of all patent applications.

How to Stop Absenteeism? Reward "Presenteeism"

A survey by Industrial Relations News, 230 West 41st St., New York, N. Y., shows that more and more companies are taking firm steps to combat absenteeism among employees.

There are two main routes companies can take to encourage employees to come to work regularly: reward "presenteeism"; or penalize absenteeism.

Rewards for good attendance take several forms. One company hands out a week's extra pay for a year's perfect attendance. Another grants an extra week's vacation. Robbins & Myers, Inc., Springfield, Ohio, hands out bonuses based on earnings to employees who show up for work regularly. JFD Mfg. Co., New York, distributes company products as attendance awards.

Penalties are becoming more common for absenteeism. These range from a demerit system (the employee may be fired when he has accumulated a certain number of demerits) to loss of seniority.

New Scholarship Program

A \$25,000 aid to education program for outstanding students in six Eastern universities and colleges has been established by American Machine & Foundry Co., 261 Madison Ave., New York 16, N. Y.

The awards will be given to leading students in the fields of electrical engineering, mechanical engineering, business administration, and chemistry. Participating schools are Princeton, Harvard, Dartmouth, M.I.T., Cornell and Rensselaer Polytechnic Institute.

As part of the AMF program, the Company will give grants to each school in amounts to be determined after the scholarships and fellowships are awarded to the students.

AS the attention of the electronic world focuses this month on WESCON and the West Coast area a small piece of the reflected lime-light is caught by the U. S.'s proud, new off-shore state—Hawaii!

In its newly acquired mantle of statehood, Hawaii opens new doors to investment by mainland firms, particularly to light industry, such as electronics. The islands have already won the hearts of many tourists and ex-servicemen with their scenic beauty and the happy spirits of the Hawaiian people. Now, faced with its responsibility as a state Hawaii is looking very soberly at its future as an industrial area.

Situated 2,400 mi. from San Francisco, the island state offers an unusual combination of attractions to industry. While it is too early to project its future in the electronic industry it is possible to conjecture, on the basis of the natural characteristics of the country, what type of activity can be expected.

First, a few words on the physical characteristics of the Hawaiian Islands: The Island group consists of eight islands strung out over a distance of some 1,600 miles. The five largest islands are Hawaii, Maui, Molokai, Oahu and Kauai. Roughly 80% of Hawaii's 660,000 people live on the Island of Oahu. Oahu also has 90% of the manufacturing and 95% of the tourist trade. The other Islands are occupied primarily by sugar cane plantations, pineapple growing, and cattle raising.

Component manufacturing must concentrate on small, light weight items that can be shipped easily. Research & development should play a big part because the attractions that Hawaii offers—climate, recreation, low real estate values—should make it relatively easy to hire and keep top-level engineers.

The 50th State—

By **CREIGHTON M. MARCOTT**

*Managing Editor,
"ELECTRONIC INDUSTRIES"*

The present income of the Islands breaks down into—

Military	.....	\$300 million
Sugar	.....	\$150 million
Pineapple	.....	\$125 million
Tourism	.....	\$115 million

Military income is derived from the giant U. S. Naval Base at Pearl Harbor and various Army and Air Force installations, notably Schofield Barracks and Hickam Field, all in Oahu.

In the future plans of Hawaii only tourism can be expected to show any sizeable increase. Both the sugar output and pineapples are finding increased competition on the world market. Working against the industries are rising land costs throughout the state, coupled with severe land scarcity.

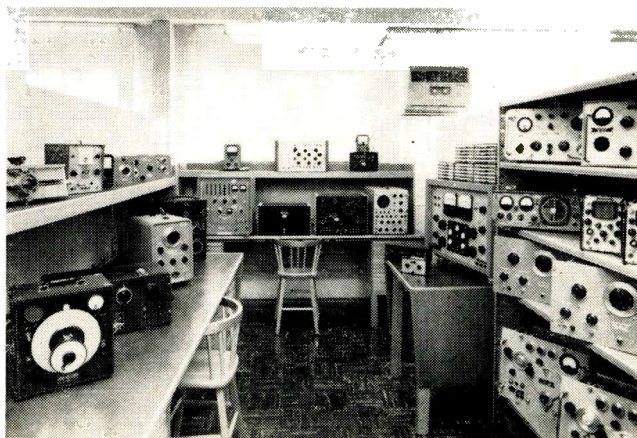
Equally uncertain is the military spending that can be expected during the immediate future. With the change of military emphasis to missiles, military spending at best becomes highly unpredictable.

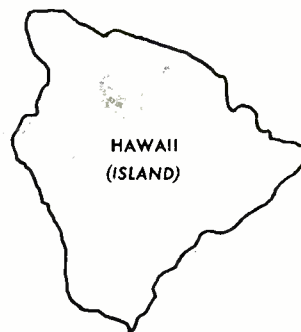
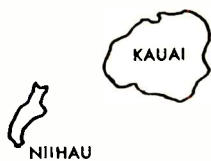
With this picture of a steady decrease in their principal industries, Hawaiian business leaders are looking to new industries to pick up the slack. As the fifth largest industry in the country and fastest growing, electronics is highly regarded in the future of the Islands. The principal electronic activity in the Islands at the moment is one firm, Kentron Hawaii Ltd. in Honolulu. Kentron is essentially a servicing and calibration center. Until recently the firm also maintained a cathode-ray

NOW IN BUSINESS IN HAWAII—

Principal electronic activity in Hawaii, other than military, is Kentron-Hawaii Ltd. at 1140 Waimanu St., Honolulu. Primarily a calibration and servicing center it employs approximately 50 engineers and technicians.

At one time it also produced 60% of the cathode ray tubes for Hawaii's consumer TV receivers. Among design and development projects they have handled are electronic sorting devices, and solar measuring instruments.





What Is Its Electronic Future?

tube manufacturing operation but the demand within the Islands was inadequate.

The rather limited population, 660,000 people, creates certain conditions which will greatly influence the growth of electronics in the Islands. First and foremost, it automatically precludes the manufacture of consumer items—radios, televisions, phonographs, home recorders, etc. As far into the future as can be seen, the Islands will have to depend upon the mainland for mass produced electronic gear.

The second important limitation on Hawaii's potential as an electronic center is its location, 2,400 miles from mainland of the U. S.

The added burden of shipping charges—shipping raw materials to the Islands, and the finished products to the mainland—would make it extremely difficult for Hawaii to meet the fierce competition in the U. S.

These two rather serious handicaps considerably narrow the possible approaches in bringing electronics to the Islands. In a sense, however, they also simplify the problem, making it possible to concentrate on very small segments of the electronic industry.

If we divide the electronic industry very roughly into its three basic groupings—components, equipment and R&D—it is somewhat easier to project Hawaii's future in electronics. The production of components, for instance, must of necessity be limited to items in which the "value added by manufacturing" is many times the value of the raw material itself. Secondly, the components must be individually quite small, lightweight and preferably be suitable for packing in bulk.

Since the work force in the Islands is rather small, it would be difficult for Hawaii to compete in the cheap labor market, nor would the Hawaiians want to. They already pride themselves on the comparatively high level of skill that the population possesses, and their reputation for dexterity. The influx of skilled industry would mean a generally higher

PROFILE OF THE HAWAIIAN ISLANDS

Area—6,435 sq. mi.

Population—660,000

34% Japanese
32% Caucasian
15% Hawaiian
11% Filipino
6% Chinese
2% All others

Principal Industries

Sugar Cane
Pineapples
Coffee
Cattle
Tourists
Defense

Labor Force

In Agriculture—40,800
Construction—12,900
Retail Trades—28,000
Defense—50,000 uniformed personnel
23,000 civilians

(One out of 4 workers in the labor force is employed in defense)

Chief Ports

Honolulu & Pearl Harbor

Location

2,400 mi. from San Francisco
3,800 mi. from Yokohama
5,100 mi. from Sydney, Australia
6,000 mi. from Lima, Peru

Mineral deposits—negligible

Principal Cities—population

Honolulu—321,583
Hilo (Hawaii)—25,078
Kailua-Lanikai—15,079

Radio & TV Stations

Broadcast Stations—17
Television Stations—7
(4 are satellite stations)

35 ENGINEERS ARE NEEDED NOW

The Department of Economic Development has just completed a survey of electronic personnel requirements in Hawaii.

The results: 35 electronic engineers are needed right now.

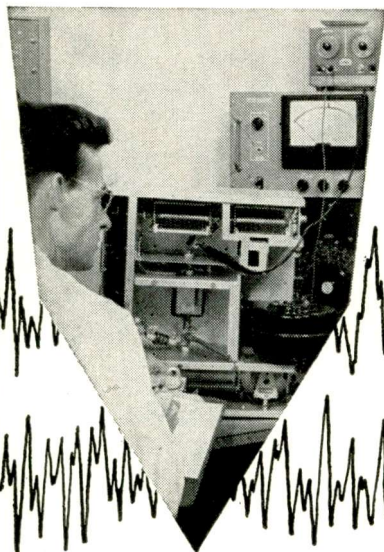
63 additional engineers will be needed in 1961.

42 additional engineers in 1962, and 28 more in 1963; for a total of 168 by 1963.

(These figures were obtained by questioning electronic installations in Hawaii at the present time, and do not include requirements of new firms moving to the Islands.)

Electro Technical School, 989 Dillingham Blvd., Honolulu, which trains electronic technicians, estimates the demand for technicians at approximately 1,000 over the next few years.

LEADERSHIP OPPORTUNITIES



WITH GATES

Gates Radio is currently seeking engineers in various skill areas, including transistor circuitry, electro-mechanical, RF networks, audio systems, transmitters for AM, FM and TV broadcasting and communications transmitters—LF, MF, VHF and UHF.

Organized in 1922, Gates is one of the nation's pioneer manufacturers of electronic equipment, with operations in military and industrial electronics, broadcasting and communications. A few diversified projects would include the design and development of UDOP and DOVAP systems for measuring the velocity and position of guided missiles, homing beacon transmitters for the Navy, missile range intercommunication systems, and multiple geophysical amplifiers used in oil field explorations. Gates is also the nation's leading designer and manufacturer of AM and FM broadcast equipment.

Gates, in Quincy, Illinois, gives you the unharried and unhurried living of a small town with big city nearness . . . an ideal place to rear a family and live the good life. It may be just what you've been searching for. If so, write to Rog Veach, our personnel director for an interview. That's Box 290, Gates Radio Company, Quincy, Illinois.

...

GATES

Circle 506 on "Opportunities" Inquiry Card

The 50th State (Continued)

standard of living throughout the Islands.

There has developed within the electronic industry, coincidentally with the coming of statehood, a rapidly developing segment which meets most of the requirements described above. The semiconductor field, and the allied field of molecular electronics, deals with extremely small units in which the level of skill and technology is above the average. The units are so small that shipping charges would represent a very small part of the total costs, and the shipment of raw material would not be a real handicap.

For the moment, however, working against the possibility of establishing a semiconductor business in Hawaii is the very fiercely competitive situation existing on the mainland. It may be necessary to await a stabilizing of the industry; a shaking out that will inevitably lead to higher margins of profits in the future. The entire industry is being threatened at the moment by foreign imports and until this threat is neutralized, it is unlikely that any manufacturers will be investing any sizeable amounts of capital in new manufacturing facilities.

The field of molecular electronics is not yet clearly defined, but on the surface it meets most of the requirements that Hawaii imposes. Units are small, technology is at a particularly high level, and unit costs are high. It remains to be seen just what direction molecular electronics will take.

Among the other components that might be considered would be precision resistors, precision potentiometers, various small capacitors, and transducers.

In the equipment field we must first eliminate the category of mass produced units. The equipment produced in the Islands will of necessity be electronic specialty items, custom units having high unit costs and requiring low volume production.

Basic to the whole problem of bringing electronics to the Islands is the establishment of facilities for providing a continuing flow of

skilled manpower. While the original staffs of electronic undertakings might be lured from the mainland—in fact Hawaiian business circles are certain that this can be done—there must be established in Hawaii a source of continuing manpower. The University of Hawaii is being looked to as the answer to this problem. The University has already established an electrical engineering department, and a rather limited number of graduates are trickling through. For the moment these graduates must look to the mainland for employment, and this is a source of great concern to Hawaiian business people.

It may well be that the key to the future of the electronic industry in Hawaii will be commensurate with the ability of the University of Hawaii and whatever other educational institutions may be set up in the Islands to supply high level technical people. It has been pretty well demonstrated in the United States that progress in electronics is tied inextricably with educational institutions. The prime examples are Boston and the activity around Massachusetts Institute of Technology; the Palo Alto, Calif. area surrounding Stanford University and Stanford Research Institute; and Chicago with the Armour Research Foundation and Illinois Institute of Technology.

Electronics has now reached the stage of development where keeping at the forefront of technology requires a very intimate relationship with educational institutions, and research organizations. The most alert engineers, interested in keeping current in their various technologies, are gravitating towards areas where post-graduate courses and similar advanced studies are readily available. In some cases engineers will be lured to areas by other considerations as well, such as climate or job opportunities. It is not long, however, before advanced educational programs follow, sometimes on the initiative of the engineers themselves.

While engineers have shown



National has had many years' experience making significant contributions to the defense effort, including airborne components.

COMPARE THIS OPPORTUNITY WITH WHAT YOU ARE NOW DOING!

HERE'S WHAT *National's* NEW MILITARY RESEARCH AND DEVELOPMENT PROGRAM OFFERS.

This operation will interest any engineer or scientist possessing enough self-confidence—ability and experience—to develop projects initially and carry them through to completion.

WHO WE'RE LOOKING FOR

National is looking for military-oriented scientists and engineers who hold a B.S. degree or advanced degrees. You should be working in electronic, electro-mechanical, mechanical, physics, optics, mathematics, or other related areas. Preference will be given to those who have had several years' experience dealing with prime contractors and government agencies.

As a member of National's New Military Development Team—you will be working initially with our Military Proposal Group. As proposals become specific projects, your responsibility will continue through the contractual stage for technical liaison, fulfillment of contractual obligations including hardware development, meanwhile retaining sufficient flexibility to continue your proposal efforts.

WHY YOU SHOULD INVESTIGATE

National's new Military Research and Development Program offers you unusual latitude in responsibility. It offers you the chance to participate in military projects

from start to finish. Furthermore, you now have the opportunity to join an operation still in its formative stage—yet backed by one of the world's most successful . . . most reputable corporations.

COMPLETE INFORMATION is yours by sending your résumé to Mr. T. F. Wade, Technical Placement Section F9-4, The National Cash Register Company, Dayton 9, Ohio. All correspondence will be kept strictly confidential.

THE NATIONAL CASH REGISTER COMPANY, DAYTON 9, OHIO

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SPECIAL CHALLENGES
AND REWARDS OF
COMMERCIAL
ELECTRONICS**

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in Lynchburg, Virginia**

Commercially-oriented programs here span the full range of industrial applications including microwave radio relay, mobile radio, power line carrier and personal communication systems.

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IMMEDIATE OPPORTUNITIES IN THESE AREAS:

- Advanced product development of communication equipment
- Microwave circuitry, wave guides, transmission lines, antennas and microwave tube applications (PhD level)
- Electronic components analysis engineering
- Transistor circuit design of: audio amplifiers, solid state power supplies, video amplifiers, switching circuits, digital circuits
- Systems and advanced circuit design
- Communications modulation techniques studies
- Power supply design, mobile equipment
- Radio transmitter design
- Microwave telecommunications systems design
- Mobile systems engineering
- Power company telemetering and relaying
- Tone signalling design

OUR LYNCHBURG LOCATION

Here you and your family will enjoy traditional charm and hospitality combined with a truly modern, progressive community offering year-round recreational facilities in a pleasant Virginia climate.

Engineers with appropriate degree and experience in one or more of the above areas are invited to write in confidence to Mr. W. J. Kelly, Dept. 24-MH.

COMMUNICATION PRODUCTS DEPARTMENT

GENERAL  ELECTRIC

Mountain View Road • Lynchburg, Virginia

The 50th State

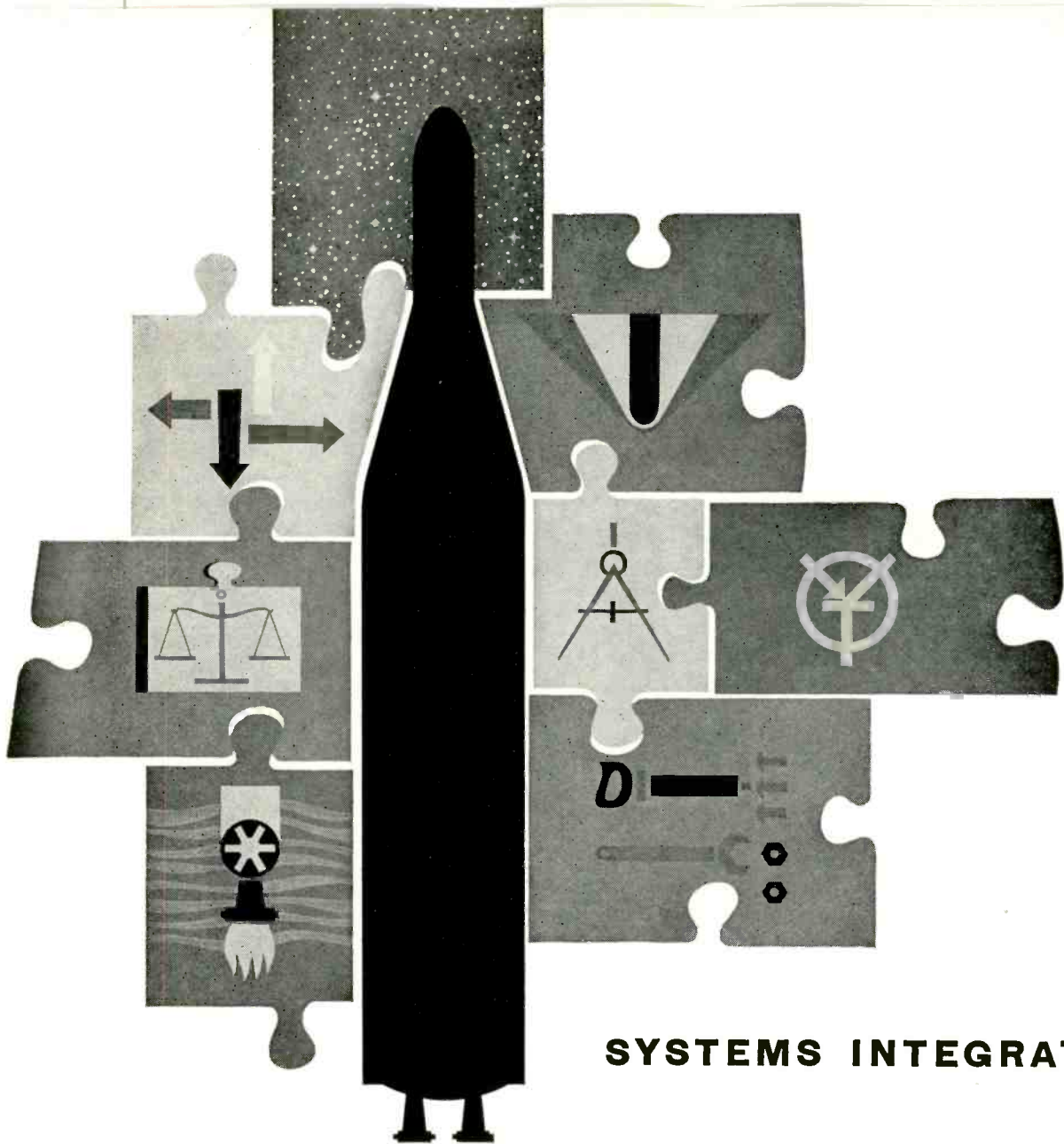
during the past few years a marked liking for the more comfortable climates—and Hawaii's is one of the finest in the world—the Islands' success in luring electronic engineers may well depend on the educational opportunities that exist there. It has been amply demonstrated that it matters very little where groups of engineers are located, so long as the basic requirements of housing, education, and recreation are available. This is perhaps a tribute to the exceptional importance that technical know-how has achieved in the industry.

One of the courses that Hawaiian business circles will most certainly follow will be in attracting research and development activities to the Islands. In perhaps no other phase of electronic activity is Hawaii so well qualified. Many of the attractions that research and development facilities are looking for are among the obvious attractions that Hawaii offers. The climate is excellent all year round, housing facilities are more than adequate, and there are many opportunities for recreation. Comparative seclusion is easily achieved and real estate values are at an attractively low level.

Transportation to and from the mainland is largely by airplane, particularly for business men. Airline schedules are extremely regular.

From the previous experiences of the Boston-MIT area and the Stanford-Palo Alto areas, it is possible to predict the pattern that electronics would take in the Islands if R&D organizations can be induced to set up there.

Inevitably, with the high-powered technical abilities that are found in research activities, there will be a good number of small R&D firms set up in the immediate neighborhood of the university or research center. We can assume for one thing that the climate will be so attractive that researchers will be reluctant to move back to the mainland, and would prefer to set up shop right there in the Islands. With R&D work this is not too much of a problem, be-



SYSTEMS INTEGRATION

Systems Integration, a major endeavor at Lockheed, involves the responsibility of establishing and maintaining composite system and subsystem characteristics within the parameters necessary for a successful development of weapon and satellite systems.

An outstanding example of this system's engineering approach is illustrated by the Navy POLARIS Fleet Ballistic Missile Weapon System. The Navy gave Lockheed Missiles and Space Division the basic overall weapon system requirements and the required operational date, and requested Lockheed to develop a missile system compatible with the other systems of the weapon system. This demanded an entirely new procedure in missile development: 1) The design had to be based on anticipated advances in the state-of-the-art to meet performance requirements. 2) Simultaneous development of missile subsystems in an independent fashion was required to meet time scale requirements. Not only is Lockheed meeting these requirements—it is *delivering an operational missile system three years ahead of the original schedule.*

Detailed functions of successful systems integration activities include: Establishment of basic system character-

istics through use of preliminary design and parametric study techniques; sectionalizing the missile and defining interfaces and performance requirements for each subsystem; monitoring and counseling the design activities of subsystems and establishing interfaces and subsystem design parameters and tolerances; assuring and maintaining design compatibility of subsystems throughout the entire development of the missile into the weapon system.

From the development of advanced system proposals into the preliminary design and system requirements, on through to final missile production, demands highly trained engineers and scientists in missile and space technology concerned with the overall systems problems.

Engineers and Scientists: Work in the broad spectrum of systems integration functions provides a constant challenge at Lockheed Missiles and Space Division. If you are experienced in this area, you are invited to write: Research and Development Staff, Department H-48, 962 W. El Camino Real, Sunnyvale, California.

U.S. Citizenship or existing Department of Defense industrial security clearance required.

Lockheed / MISSILES AND SPACE DIVISION

Systems Manager for the Navy POLARIS FBM; the Air Force AGENA Satellite in the DISCOVERER, MIDAS and SAMOS Programs; Air Force X-7; and Army KINGFISHER

SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA
CAPE CANAVERAL, FLORIDA • ALAMOGORDO, NEW MEXICO • HAWAII

Circle 503 on "Opportunities" Inquiry Card

The 50th State

cause there will be comparatively few items to be shipped. They will be selling first of all knowledge and technical know-how.

Concurrently with the establishment of R&D facilities must come a rather elaborately staffed and maintained electronic parts distributorship. This distributorship will have to be a rather large cut above the replacement parts distributor—more in the line of the large industrial distributorships, of which a few dozen exist in the United States. It will be rather important that this distributorship be well stocked because delays in procuring components could not long be tolerated. Demands in terms of quantity would be rather small. There will be a rather considerable demand in terms of variety.

The small manufacturer of electronic specialties will be a natural outgrowth of the research and development activities. And by cultivating this type of high level activity, the Islands can establish themselves as a center of technical know-how.

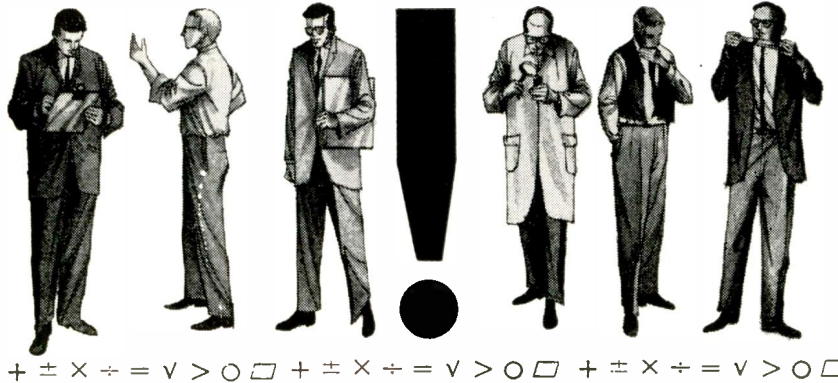
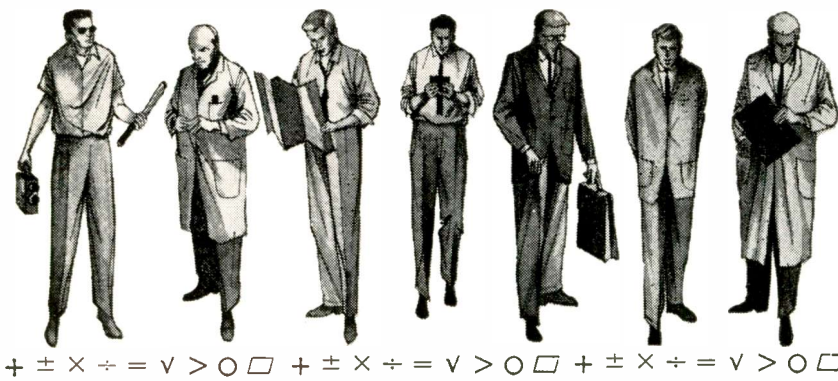
However, all this conjecture is almost completely dependent on the ability of Hawaii to establish an atmosphere of technical creativity. This in turn will depend on the educational facilities that are established or enlarged.

New Component Firm

Zoron, Inc., 612 West Monroe St., Chicago 6, Ill., has been organized as a manufacturer of electronic components. Line will include: miniature jacks, phono-jacks, pin-jacks and plugs, banana-jacks and plugs, microphone connectors, adapters, hi-fi cords, test leads, binding posts, hardware, etc.

Receives Award

Dr. Arnold O. Beckman, President, Beckman Instruments, Inc., has been given an award by the University of Illinois for "Leadership in the Field of Precision Instruments." The Illini Achievement Awards, instituted in 1957, recognize outstanding accomplishments by University alumni in their chosen fields.



We're not looking for a group of nineteen or a batch of nineteen or a bunch of nineteen. We don't need an outlet for nineteen surplus power-driven erasers. We want nineteen separate and individual, thinking human beings. Each will be considered according to his own value, assigned to his own work, judged by his own contribution. ■ That's the way things are at Bendix. Our long-term prime contract with the AEC authorizes assignments on a special project basis. It then becomes our responsibility to invent a device to meet the need, develop production techniques, manufacture the device and deliver it on schedule, in quantities from one to several hundred. ■ We manufacture thousands of electronic items, each one

of which is different from all the others. This kind of operation requires processes which are radically different from routine mass production techniques. ■ Obviously, this tailor-made operation demands Electronic Engineers who can grasp a total problem and develop a practical solution. They operate in compact teams, and they're working the way engineers were intended to work. ■ If you think you might be one of the nineteen individuals we need, you'd be wise to write Tim Tillman, Technical Placement Supervisor, Box 303-QM, Kansas City 41, Missouri. He can tell you more about Bendix than we have room for here, and he'll give you some startling information on our beautiful metropolis and its low cost of living. ■ ■



KANSAS CITY DIVISION

Industry News

Appointees named by Hughes Aircraft Co., Fullerton, Calif., Ground Systems Group are: Gerhard L. Hollander, Manager of the newly formed General-Purpose Computer Dept.; Marvin H. Gonsior, newly created position of Assistant to the Director of Product Line Operations; and Jose M. Tellez, Manager of the Army Computer Systems Dept. In the Semiconductor Div., El Segundo, Calif., are: Harley F. Pattison, Western Region Manager for Field Sales; S. Vaughan Andrews, Personnel Manager of the Manufacturing Div., John H. Richardson, Vice President, Marketing, and Elmer F. Sproule, Head of Management, Development and Training. Industrial Relations Staff are at Culver City, Calif., Company Headquarters.

Dr. Harper Q. North has been re-elected President of Pacific Semiconductors, Inc., by the Board of Directors of the Thompson Ramo Wooldridge, Inc., subsidiary. Lawrence T. Lindgren, Dr. John W. Peterson and Sidney L. Spiegel were newly elected as Vice Presidents, respectively, of Manufacturing, Research and Development, and Marketing.



Dr. H. Q. North



J. Kravetz

Jules Kravetz, former director of the U. S. Army Signal Corps West Coast Research and Development Office, has been named Director of Government Relations for Aerolab Development Co., Pasadena, Calif., wholly owned subsidiary of Ryan Aeronautical Co., San Diego, Calif. During army service he was awarded the West Coast Electronic Manufacturers Assoc. Distinguished Service Award.

Arthur A. Powell has been promoted to Product Sales Manager for Motorola Semiconductor Products, Inc., a subsidiary of Motorola, Inc.

John H. Streibel, formerly Marketing Executive for Hughes Aircraft, has been named Assistant to the Vice President, Sales, for the Houston Fearless Corp., Los Angeles, Calif.

Circle 505 on "Opportunities" Inquiry Card →

A
3-PHASE
PLAN TO

STEP OUT OF SPECIALIZATION INTO TRUE SYSTEMS ENGINEERING

Engineers with significant experience in *any* of the following areas can qualify for this unusual approach:

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Consoles

Digital Data Transmission & Recording

Power Generation & Transmission

Digital & Analog Computing

C-W Radars

Feedback Control

Airborne Transponders

Microwave Communications

Acquisition & Tracking

Unique systems programs underway at the Defense Systems Department embody the engineering disciplines listed above. If you can contribute in *any* of these areas, you'll have an opportunity to learn as many of the *others* as your abilities permit. Here's how it works:

STEP 1

Join a system project at DSD as an expert in any of the fields listed above.

STEP 2

Learn one, two, three or more of the other disciplines applying to this system and broaden your overall systems knowledge.

STEP 3

Move up to higher levels of responsibility in true systems engineering as fast as your growing capabilities permit.

STEP 4

Based on your interests and aptitudes, you have the opportunity to build further from systems engineering into program management.

TAKE THIS STEP NOW! Get the full facts on how you can take advantage of this plan to gain abilities and responsibilities in large scale systems engineering. Drop a note outlining your education, experience and interests, in professional confidence, to:

Mr. E. A. Smith, Box 8-D



DSD

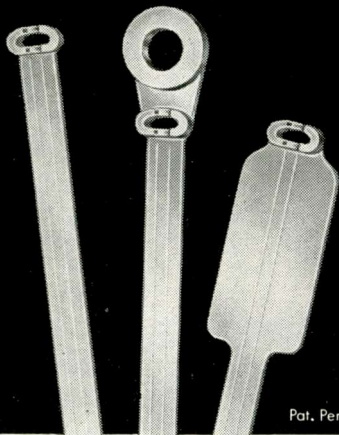
DEFENSE SYSTEMS DEPARTMENT

A Department of the Defense Electronics Division

GENERAL  ELECTRIC

Northern Lights Office Building, Syracuse, New York

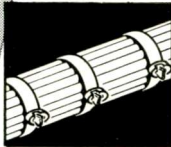
American Industry has chosen...



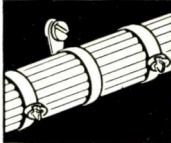
Pat. Pend.

TY-RAP™ cable ties and straps

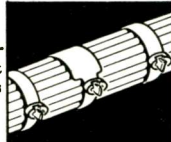
for Tying—replaces string on wire harnesses.



for Clamping—only one size needed.



for Identification—permanent, convenient and attractive, replaces tags.



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the Ty-Rap method is, simpler, faster, more economical. A Modern method designed to do a complete job.

Write for our Bulletin TR3 and learn how this T&B engineered for "Lowest Installed Cost" method can save you time and money.

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Circle 137 on Inquiry Card

Industry News

Richard C. Erbes has been appointed Customer Relations Manager for the Scientific and Process Instruments Div., Beckman Instruments, Inc., Fullerton, Calif.

Homer F. Lewis has been appointed Vice President and Treasurer of Transval Electronics Corp., El Segundo.



H. F. Lewis



H. C. Bream

Hugh C. Bream has been named President and General Manager of Western Design, Santa Barbara Airport, Goleta, Calif., a div. of U. S. Industries, Inc.

Two Key Staff Personnel have been appointed by Knapic Electro-Physics, Inc.; Frank M. Beeler as Administrative Director and Phil W. Ice as Director of Industrial Relations. Mr. Beeler was recently elected a Vice President by the Company's Board of Directors.

Bernard Elbinger was appointed Head of the Electronic Instrumentation Section of Rheem Semiconductor Corp., Mountain View, Calif.

Eric Firth has been appointed National Sales Manager of the Electronics Div., Elgin National Watch Co., Burbank, Calif.

Recent appointments at American Electronics, Inc., of Calif. are: Herbert S. Boring as Vice President, Commercial Operations; Hans Bannies as Marketing Manager, Electro-Mechanical Div.; and John P. Hastings as Manager, Field Operations, Instrument Div.

Norman J. Regnier, formerly with Hoffman Semiconductor Div., has been named Program Manager of an advanced semiconductor reliability study being conducted by Motorola Semiconductor Products Div. for Autonetics, a Div. of North American Aviation, Inc., as part of the Minuteman Intercontinental Ballistic Missile Program.

RCA offers gratifying rewards in broadcast field sales engineering

As a result of internal promotions and a program to expand business, RCA has several openings for men who can prepare extensive AM-FM-TV equipment proposals, present them to station management, and secure orders.

If you have design, installation or operational experience with TV broadcast equipment and are interested in a rewarding career with a highly respected electronics organization, this is an exceptional opportunity for you.

Salary and related benefits are above average, and there is a bonus arrangement. If you have an EE degree, or equivalent, with experience in TV broadcasting, send your resumé to:

Mr. M. H. Kessler, Dept. EI-80
RCA Professional Employment
Bldg. 10-1
Camden 2, New Jersey



RADIO CORPORATION of AMERICA

Industrial Electronic Products

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Now...One Source! FILTERS RELAYS CAPACITORS

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SAVE TIME...just one call.
SAVE MONEY
...just one responsibility.



EC FILTERS
Range: 400 cps to 70 kc
Type: Low Pass—High Pass—Telemetering
Size: Less than 0.75 Cu. In.

EC MICRO MINIATURE RELAYS
Size: .365" x .800" x .890"
Construction: 25g Vibration
Contacts: DPDT Dry Circuit or Power

EC CERAMIC CAPACITORS
Temperature: -55°C to +125°C
Stability: 10%
Rating: 200 WVDC

EC SPECIALIZES IN MINIATURIZATION OF ELECTRONIC COMPONENTS WITH PROVEN RELIABILITY. Quality and dependability are engineered and manufactured into every unit. Each component is thoroughly tested to individual and sampling specifications before the customer receives it. Only at EC can the customer order miniature Filters, Relays, and Capacitors from one source, with immediate delivery.

Write for **FREE** brochures

EC also produces Delay Lines, Capstan Motors, Magnetic Amplifiers, Transformers, Pulse Transformers, Toroidal Inductors, Epoxy Formulations, and Tele-Solv—the epoxy stripper.

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Circle 145 on Inquiry Card

ELECTRONIC INDUSTRIES • August 1960

Industry News

Norval E. Powell has been named Personnel Manager of The National Cash Register Co., Electronics Div., Hawthorne, Calif. The newly created position is part of an over-all expansion program.

Recent appointments at General Electric Co's Computer Dept., Phoenix, Ariz., include: Lacy W. Goostree, Jr., Department Manager of Marketing; George A. Haggerty, newly-established position of Manager, Process Computers; and A. T. Clawson, Sales Manager, Government and Service Sales.

Carl C. McCallus, formerly Sales Manager of the Electro-mechanical Div. of Hoffman Electronics Corp., has been appointed Director of Marketing for the U. S. Relay-Electronics, Azusa, Calif., a Div. of American Safety Razor Co.



C. C. McCallus



Dr. A. E. Lewis

Dr. Arthur E. Lewis has been appointed a scientist, Hoffman Electronics Corp., Science Center, Santa Barbara, Calif.

Ray Knox has been named Manager of International Rectifier Corp's New England Sales Office. He replaces former Manager Angus Scott, who has been promoted to Silicon Products Sales Manager, El Segundo, Calif.

Dave Fournay has been appointed to the Apparatus Div., Texas Instruments Incorporated, Los Angeles, Calif., to provide customer service to government, military and industrial agencies in that area.

George Marshall has been appointed Sales Manager of Airtron's plant in Linden, N. J.; Joel Zneimer has been appointed as Manager of the Ferrite Materials Section of Airtron. Airtron is a division of Litton Industries.

Donald R. E. Barnaby recently joined Eitel-McCullough, Inc., San Carlos, Calif., as Manager of the newly formed Parts Div.; and George R. Chambers III, has been named Manager, Research and Development Marketing at the same facility.

Raster PPI
GCA Display Elevation Scope
Character Display
Composite Display: Horizon-Altitude-Airport
Off Centered Sector Scan Precision Linear Sweeps
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COMPLETE LINE of deflection yokes for every military and special purpose—in production quantities or custom designed to your exact requirement.

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Indianapolis: Joe Murphy
Phone: VICTor 6-0359

Los Angeles: Ash M. Wood Co.
Phone: CUmberland 3-1201

syntronic
INSTRUMENTS, INC.

100 Industrial Road, Addison, Illinois
Phone: KINGSwood 3-6444

Circle 146 on Inquiry Card

News of Mfrs' Representatives

REPS WANTED

Manufacturer of microwave test equipment and special microwave devices desires Reps for the Chicago, Texas-Oklahoma, St. Louis-Wichita Areas. (Box 7-1, Editor, ELECTRONIC INDUSTRIES.

Richard Hollingworth has been appointed engineering representative in the Dayton, Ohio area for Sargent Engineering Corp., Huntington Park, Calif.

The Components Div. of Epsco, Inc., Cambridge, Mass. has appointed the following four new area sales representatives: Jaeger-Corday, Orlando, Fla., in Florida; Ascii Engineering Co., Dallas, Tex., in Texas; Douglas Randall, Canada Ltd., Scarborough, Ont., in Canada; and Loren F. Green and Associates, Chicago, Ill., in Chicago.

Egloff & Graper, Inc., Los Angeles, Calif., has been named sales representative, throughout California, for Webber Mfg. Co., Inc. of Indianapolis,



W. D. Trammell



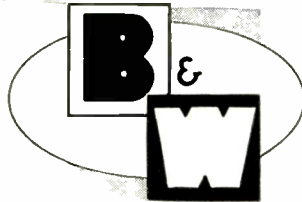
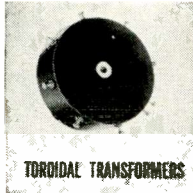
E. Egloff

William D. Trammell has been appointed sales representative for the Western District of the Silicone Products Dept., General Electric Co. His office location is 6500 Cedar Springs, Dallas, Tex.

CBS Laboratories, a div. of Columbia Broadcasting System, Inc., has appointed the following representative organizations in the Middle-Atlantic, South-Atlantic and Western Territories: The Gawler-Knoop Co., for New York City, Long Island, New Jersey, Eastern Pennsylvania, Maryland, Delaware, Virginia and District of Columbia; Scientific Sales Engineering Co., in North and South Carolina, Tennessee, Georgia, Alabama, Mississippi and Florida; and Charles W. Fowler Co., in California, Nevada, Arizona, and New Mexico.

Good-All Electric Mfg. Co., Ogallala, Nebr., has appointed J. R. Bengel and D. G. Brown of Glenside, Pa., operating as "technical Representation" as representatives in Eastern Pennsylvania, Southern New Jersey and Delaware.

FOR ADVANCED TECHNIQUES IN:



- Filters
- Toroidal Transformers

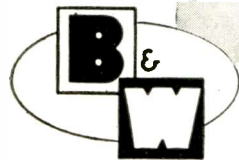
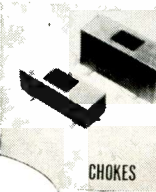
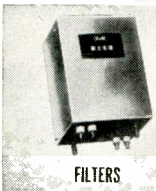
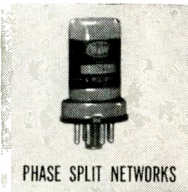
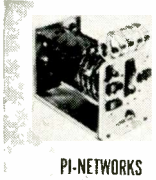
- Phase Split Networks

- Coils

- Baluns

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Today's Engineer

(Continued from page 231)

or guided, particularly by parents, into these professions has increased. Their motivations, attitudes, and expectations are quite different from those of the men and women who entered these professions in the past."

He places responsibility for the current emphasis on salaries partly with management, citing company advertising and recruiter's sales pitches emphasizing financial advantages like good starting salaries and payment of moving expenses.

He believes management must make a greater effort to explain the reasoning behind salary schedules, improve its procedures for appraising professional performance, and consider the possibility of opening new routes for professional advancement. He suggests that some firms might profit from promotions based solely on technical ability.

How do these scientists and engineers see themselves? Most consider themselves more responsible, objective, and involved in their work. They want greater freedom, more individualized and less routine supervision. They want more tangible and intangible rewards for their work, and feel they are more ambitious, creative, analytical, introverted, and emotional than other employees. They are interested in: seeing the results of their work; completing assigned tasks; receiving new, non-routine and challenging assignments, and obtaining personal satisfaction from their work as well as recognition from others.

New President of AIEE

Clarence H. Linder is the new President of the American Institute of Electrical Engineers. He is a Vice President and Group Leader, Electric Utility Group, General Electric Co., Eight District Vice Presidents and a Treasurer have also been elected. They are:

Treasurer, William R. Clark—Leeds & Nortrup Co.; Vice Presidents: Clair E. Gaylord—New York Telephone Co.; Robert T. Weil—Manhattan College; Fred W. Bush—Allis Chalmers Manufacturing Co.; Sim C. Wright—Southwestern Bell Telephone Co.; Henry A. Carlberg—GE; Adolph W. Rauth—Consumers Power Co.; Walter Criley—Vanderbilt Univ.; and Paul G. Wallace—Texas Power & Light Co.



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TRANSISTORIZED AC VOLTMETER

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FREQUENCY & RANGE	Ohmmeter—10 to 100,000 ohms (center scale) Ammeter—1 microamp to 300 milliamps (full scale)	20 CPS to 1 Megacycle
FEATURES	High sensitivity—makes virtually all measurements required in transistorized circuitry.	More accurate microvolt and millivolt measurements—eliminates power line, noise, interference, and ground loops.
VOLTAGE RANGE	2 mv. to 1000 volts (0.1 to 1000 volts full scale.) 9 ranges in 1, 3, 10 sequence.	100 uv. to 300 volts RMS (.001 to 300 volts full scale.) 12 ranges in 1, 3, 10 sequence.
ACCURACY	±3% of full scale (volts)	±3% of full scale
INPUT IMPEDANCE	11 megohms	10 megohms shunted by 15 mmf, volt ranges . . . 1 megohm, by 30 mmf, millivolt ranges
BATTERY LIFE	400 hours	Over 400 hours
MODEL NO. & PRICE	S 1052A \$195.00	S 1051B \$185.00
COMPLETE WITH REMOVABLE FRONT COVER (not shown)		

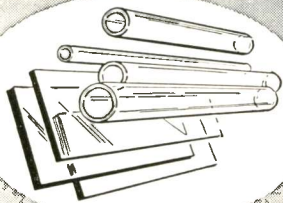
See us at the WESCON SHOW—BOOTH 605



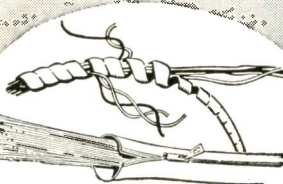
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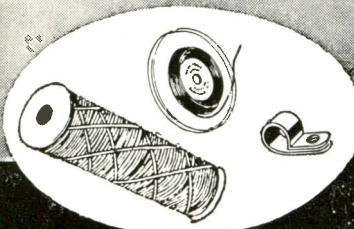
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News of Mfrs'

Representatives

Cicoil Corp., Van Nuys, Calif., will be represented nationally, with the exception of Greater Los Angeles area, Arizona, New Mexico and Utah, by Aerol Associates, Inc., Beverly Hills, Calif.

PCA Electronics, Inc., Sepulveda, Calif. has appointed the following sales representatives: J. K. Dooley Co., Seattle, Wash., to cover Washington and Oregon; Robert E. Penney, Jr., and Gene Nay, Missile Accessories Corp., Salt Lake City, Utah, for Colorado and Utah; and Marvin H. Kirkeby, Minneapolis, Minn., for Minnesota, North and South Dakota.

The Advanced Instrument Corp. (ADVINCO), Richmond, Calif., has appointed G. S. Marshall Co., San Marino, Calif., as sales representatives for California, Nevada, Arizona.

Conrad, Inc., Holland Mich., has appointed Refrigeration Engineering Co., Seattle, Wash., representative in the state of Washington.

The Synctron Div. of Electro Powerpac, Inc., a subsidiary of Hydra-Power Corp., Cambridge, Mass., has appointed Andrew J. Mott, Jr., Los Angeles as sales and technical representative for the West Coast area.

MRC Mfg. Corp., Yonkers, N. Y. has appointed the following sales representatives: Aertronic Associates, Dayton, Ohio, in Ohio, Kentucky, Indiana and Michigan; Fieldtec (Field Engineering Service), Tustin and Berkeley, Calif., in California, Arizona, New Mexico and Nevada.

Bodnar Industries, Inc., New Rochelle, N. Y., has appointed Frank A. Emmet Co., So. Pasadena, Calif., as representative in Arizona, South Nevada and Southern California.

Parker Seal Co., Culver City, Calif., has appointed Donald L. Wilson as representative in the Western Ohio and Eastern Pennsylvania area.

Vickers Inc., Electric Products Div., St. Louis, Mo., has appointed Fred Gross & Co., Dallas, Tex., as sales representative in Dallas, San Antonio and Tulsa.

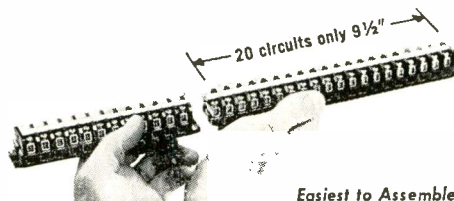
Continental Screw Co. has appointed Arthur G. Arispe, Mundelein, Ill., as sales representative covering Northern Illinois (including Chicago) Iowa and Wisconsin.

Halex, Inc., El Segundo, Calif., has appointed the Earl S. Condon Co., Los Angeles, Calif., as sales representative in California and Arizona.

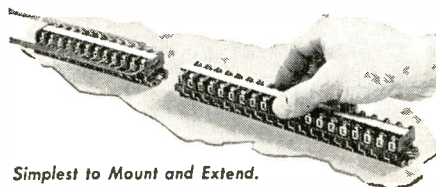
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Quickest to Handle.



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ANY NUMBER OF CIRCUITS—pre-assembled lengths of 20 snap fit circuits (1-1/8" w. x 63/64" h.). No single pieces to handle, pull off or add circuit groups as needed. Single snap-on end section completes block.

HAND ASSEMBLED without hardware; only 2 parts to handle; use mounting screws only every 12 circuits. Channel mounting also available; integral or separable marking strips.

LARGER CAPACITY IN LESS SPACE—#22 thru #8; conservative 750 volt A.I.E.E. rating... Choice of contacts (7/16" o.c.) for stripped or terminal-ended wires (can be combined in single block).

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USE FEWER CIRCUITS by grouping common wires—decrease jumpering; no unused contacts.



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Booth 2319

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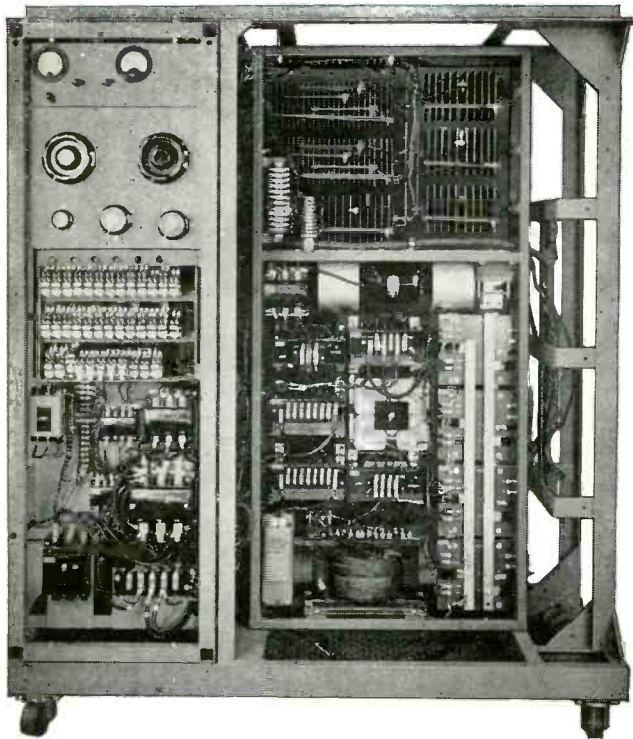
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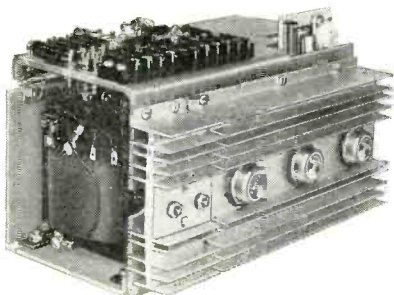
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Regulated, multiple voltage output +250 volts, +150 volts, +70 volts, +70 volts, +250 volts, -35 volts, -50 volts, -60 volts, -70 volts, -250 volts D.C. 6.3 volts, 115 volts, A.C. Total power capacity approx. 15 KW

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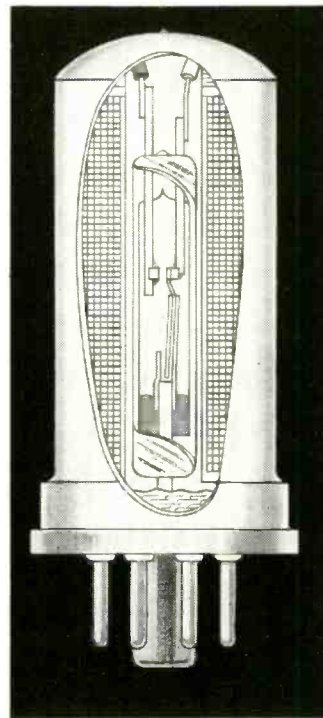
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CONTACT RATING: 250 volt — amperes, 500 volts maximum. 5 amperes maximum (with suitable contact protection).

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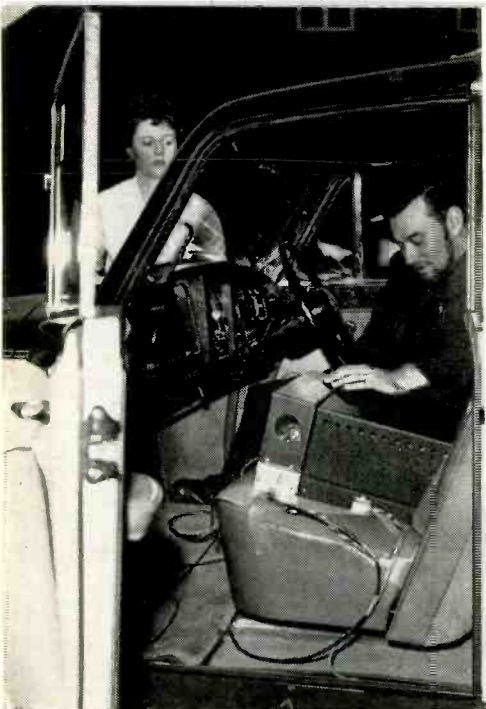
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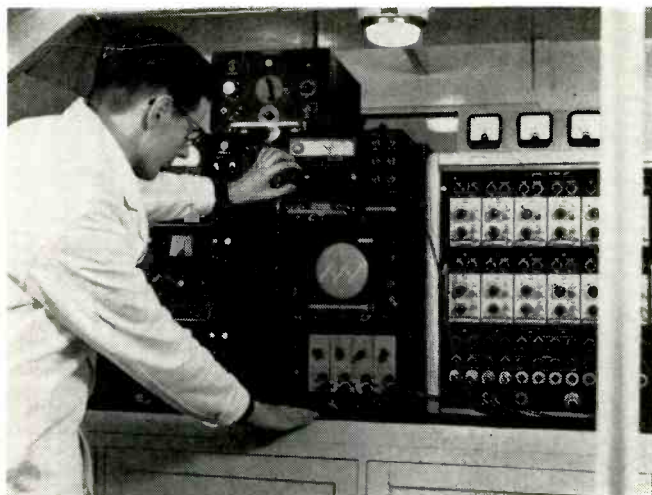
This telemetry transmitter easily fits into car which is undergoing testing. Up to 23 readings can be made simultaneously.

SAFER cars, quieter cars, more reliable cars and, above all, cheaper cars—these could be the outcome of a revolutionary new car testing method developed by British electronic engineers and now proved under actual test conditions.

A new application of the space-age science of telemetry will cut weeks, months, even years off the

Car Testing in the Space Age

Receiving end of the vehicle telemetry system. Radioed results may be permanently recorded. Scope permits "on the spot" check.



time spent on testing and proving new cars.

The new method has been developed in the electronic research department of Sir W. G. Armstrong Whitworth Aircraft Ltd., Coventry, England.

Briefly the telemetry system enables measurements of various physical factors (strain, pressure, position, vibration, temperature, etc.) to be taken from up to 23 different sources on the car while it is in motion. The measurements are transmitted back to a static

receiving station where they are processed and can be presented as graphs or figures to give a continuous picture of performance.

Strain gauges, force transducers, thermocouples and other measuring devices can be fitted to almost any part of the car and nearly a quarter of a million readings a minute can be taken from them.

The readings are transmitted on an ultra-high frequency, interference-free wavelength and can be received in the laboratory or design office several miles away. The prototype system on the car is operating on a very low power output and the signals are received clearly two miles away.

When received the signals are de-multiplexed and the weaker ones amplified. They can then be processed to show results (in the case of the test car) as a variable on a chart or converted and passed through a computer to give tables of figures.

This new method of testing is a great step forward from existing methods which involve carrying either bulky recording equipment in the test car, giving an unwanted weight penalty, or carrying a technician to record readings from meters, with the consequent limitation on the number of readings a human can accurately record, particularly in a bumping, swaying vehicle.

The driver is in radio contact with the receiving station so that the designers can not only tell him how and where to drive but can also warn him if the meters show that any particular part is nearing breaking point and thus avert disaster.

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- Front Panel Mount
- Desk or Bench Use
- Digits Resettable Individually

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Large $\frac{5}{8}$ " easy to read digits • Time is registered on 3 drums . . . minutes, 10 minutes and hours • Rotating visual 1 RPM calibrated seconds wheel • Digits resettable individually • Full vision in line read out digital display

• Independent front panel time reset controls • Illumination provided by miniature lamp with independent control switch . . . jewel light panel indicator • Synchro-Synchronization seconds wheel control switch • Movement shock resistant to withstand shock of 2000 pounds per inch • Completely enclosed anodized metal dust-proof case . . . Height $4\frac{1}{2}$ ", Width 6", Depth $3\frac{1}{4}$ " . . . front panel mount . . . desk or bench use • Available in 50 or 60 cycle . . . in all voltages AC • Precision instrument accuracy • UL approved motor and cord. Wt. $3\frac{1}{2}$ lbs.

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Smallest Ever Made



NEW SIZE TK

(On head of pin, magnified 15 times)
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Tan-O-Mite® Tantalum Wire Capacitors

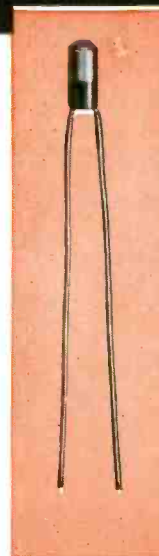
Now you can scale down your circuits still further. These new Ohmite tantalum wire capacitors are the smallest of their type ever produced. And, like all Ohmite tantalum capacitors, they must pass severe performance tests in Ohmite's laboratory under conditions similar to official ASEA qualifications.

Ohmite Series TW tantalum wire capacitors provide amazingly high capacitance for their size. Compared to aluminum electrolytics, they offer smaller size, longer shelf life, better electrical stability, and superior performance under temperature extremes. The anode is specially processed tantalum wire; the cathode is a silver case which also contains the electrolyte. Operating range is -55°C to $+85^{\circ}\text{C}$. Power factor less than 50%. DC leakage current is less than .09 $\mu\text{a}/\text{mfd}/\text{v}$ for units of 0.5 mfd and up; less than 0.4 for units under 0.5 mfd. Capacitances from .01 to 80 mfd; voltage ratings to 150. Many stock sizes are available as well as made-to-order units. Write for Bulletin 148. Tantalum foil and slug capacitors also available.

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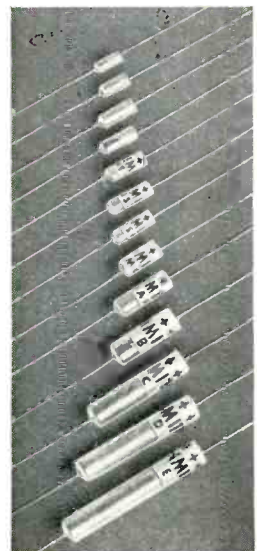
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WESCON Technical Program

MICROWAVE TUBES

- Chairman: W. H. Christoffers, Microwave Tube Div., Hughes Aircraft Corp., Los Angeles, Calif.
- "An Octave-Bandwidth Ultra Low Noise Traveling Wave Amplifier," E. W. Kinaman and G. E. St. John, Watkins-Johnson Co.
 - "Very High Convergence Electron Guns," D. V. Geppert, Sylvania Electronic Systems.
 - "Cooling of the Slow Space-Charge Wave of an Electron Beam with Application to the Traveling-Wave Tube," D. C. Forster, Hughes Research Laboratories.
 - "Arc Discharge, Microwave Switch Tube," S. J. Tetenbaum, R. R. Moats and D. Campbell, Sylvania Electronic Systems.
 - "A Periodically Focused Backward-Wave Oscillator," C. C. Johnson, Hughes Research Laboratories.
 - "A Four-Cavity, Electrostatically Focused, Ku-Band Klystron Amplifier," R. G. Rockwell, Varian Associates.

Wed., Aug. 25—P.M. Sessions

COMPUTER CIRCUITS AND DEVICES

- Chairman: George Eisler, Eisler Associates, Los Angeles, Calif.
- "Diodeless Magnetic Core Logic," S. B. Hochelson, Goodyear Aircraft Corp.
 - "A Fractional Microsecond Cycle Time Memory Using Low Coercive Ferrite Cores," Alvin Lemack and John E. Thomas, Sylvania Electronic Systems.
 - "Adaptive Switching Circuits," B. Widrow and M. E. Hoff, Stanford University.
 - "25 MC Clock-Rate Computer Circuits for Operation from -20°C to $+100^{\circ}\text{C}$," Charles R. Cook, Jr., Texas Instruments Incorporated.
 - "A Dynamic Logic Technique for Sixteen Megacycle Clock Rate," T. P. Bothwell, J. DeClue, H. H. Hill and J. R. Longland, Computer Control Co.

MAGNETIC DATA RECORDING

- Chairman: Warren R. Isom, Radio Corp. of America, Camden, N. J.

- "Extending the Bandwidth of a Conventional Instrumentation Recording System," A. M. Wilson, Precision Instrument Co.
- "A Wideband Magnetic Recording System," M. E. Anderson and J. A. Granath, Armour Research Foundation.
- "The Sensitivity of Reproducing Heads in High-Frequency Magnetic Recording Systems," W. T. Frost, Ampex Data Products Co.
- "Mechanical Design of the CM-100 Instrumentation Tape Recorder," J. T. Mullin, Mincom Div., Minnesota Mining and Mfg. Co.
- "Electrical Design and Performance of the CM-100 Instrumentation Tape Recorder," G. Nels Johnson, Mincom Div., Minnesota Mining and Mfg. Co.
- "Comparison of Wideband FM and Carrier Erase Techniques for Recording Data from DC to 10 KC," George Work and David Lewis, Leach Corp.

MICROWAVE THEORY AND TECHNIQUES—II: ACTIVE ELEMENTS

- Chairman: Richard Jamison, Hughes Aircraft Co., Culver City, Calif.
- "Masers for System Applications," H. R. Senf, Hughes Research Laboratories.
 - "Design and Operation of an S-Band Traveling-Wave Diode Parametric Amplifier," C. G. Shafer, Raytheon Co.
 - "The Noise Figure of Iterative Traveling-Wave Parametric Amplifiers," C. V. Bell, Walla Walla College.
 - "Theory of TEM Diode Switching," R. V. Garver, Diamond Ordnance Fuze Laboratories.
 - "Tunnel Diode Microwave Oscillators with Milliwatt Power Outputs," D. E. Nelson and F. Sterzer, Radio Corp. of America.

WORKING WITH ENGINEERS

- "Marketing," Glen P. Beiging, Packard-Bell Electronic Corp.
- "Patent Law," W. R. Lane, North American Aviation.
- "Accounting and Finance," R. T. Silberman, Electronics Capital Corp.

VEHICULAR COMMUNICATIONS—I: RADIATING SYSTEMS

- Chairman: D. L. MacDonald, Pacific Telephone & Telegraph, Los Angeles, Calif.
- "Theory and Performance of Vehicular Center-Fed Whip Antenna," Helmut Brueckmann, U. S. Army Signal Research & Development Laboratory.
 - "A Broad-Band 160 Megacycle Colinear Array," R. F. H. Yang and H. H. Hansen, Andrew Corp.
 - "Effects of Tower and Guys on Performance of Side-Mounted Vertical Antennas," R. F. H. Yang and F. R. Willis, Andrew Corp.
 - "Foamflex Coaxial Cable for Communications," J. Arbutnot, A. L. McKean and S. Trill, Phelps Dodge Copper Products Corp.

Thurs., Aug. 26—A.M. Sessions

PANEL DISCUSSION COMPONENT AND SYSTEMS RELIABILITY

- Chairman: Walter R. Kuzmin, Packard-Bell Electronics Corp., Los Angeles, Calif.
- S. Gollin, Walter Darwin Teague Assoc.; S. Kukawka, Bourne Laboratory, Inc.; A. Wood, Relay Div., Leach Corp.; Carlyl C. Elrod, The Ralph M. Parsons Co.
 - "Using Failure Rate Data for Component Part Derating," Irving Doshay, Aerojet General Corp.

AIR TRAFFIC CONTROL (ATC)—SESSION I

- Chairman: Vernon Weihe, General Precision, Inc., Washington, D. C.
- "Operational Considerations in ATC Design," Ralph F. Link, Bureau of Research & Development, Federal Aviation Agency.
 - "An Airline Pilot Looks at ATC," Capt. J. D. Smith, Air Line Pilots Assoc.
 - "ATC from the Aircraft Owners' Viewpoint," Victor H. Kayne, Aircraft Owners & Pilots Assoc.
 - "The Airlines and Air Traffic Control," J. R. Dettman, Air Transport Assoc. of America.

ANTENNAS—SESSION I

- Chairman: Louis L. Bailin, Hughes Aircraft Co., Culver City, Calif.
- "A New Approach to Antenna Beam-Shaping—The 'Coke-Bottle' Antenna," C. C. Phillips, Melpar, Inc.
 - "Application of Frequency Scan to Circular Arrays," Paul Shelton, Aero Geo. Astro Corp.
 - "Low Sidelobe Interferometer Antenna Patterns," Henry Pfizenmayer and J. A. Kuecken, Avco Corp.
 - "Design Techniques for a Light Weight High Power, Spiral Antenna," L. P. Jones, P. E. Taylor and C. W. Morrow, Melpar, Inc.
 - "Phase Distribution of Spiral Antennas," Norman Barbano, Sylvania Electronic Systems.

SYNTHESIS AND DESIGN OF MANNED MACHINE SYSTEMS

- Chairman: Col. Lynn Baker, U. S. Army, Chief Psychologist, Aberdeen, Md.
- "Human Factors in the Establishment of System Design Requirements," R. H. Scheider, Dunlap and Assoc.
 - "The Human Factors Laboratory as System Design Tool," Frank Marzocco, Thompson Ramo Wooldridge, Inc.
 - "On the Effect of CRT Transfer Function on Detection Threshold," C. W. Miller and W. R. Minty, Cornell Aeronautical Laboratory, Inc.
 - "Introduction to Teaching Machines," Stanley Levine, Litton Industries.

MICROMINIATURIZATION

- Chairman: Ti Liimatainen, Diamond Ordnance Fuze Lab., Washington, D. C.
- "Design and Fabrication of a Microelectronic IF Amplifier," J. R. Black, Motorola Corp.
 - "A Packaged Micromodule Laboratory for Industry," D. T. Levey, Radio Corp. of America.
 - "Semiconductor Packaging for High Component Density Application," G. P. Walker, Rheem Semiconductors, Inc.
 - "Surface Passivation As Applied to Micro-Components," T. C. Hall, Pacific Semiconductors Inc.
 - "Laminar Junction Structures: A New Concept in Micro-Circuitry," J. Alegretti, Merck, Sharpe & Dohme.
 - "Solid State Micrologic Elements," L. Kattner, J. Last and J. Nall, Fairchild Semiconductor Corp.

Thurs., Aug. 26—P.M. Sessions

GOVERNMENT AND INDUSTRY: ENGINEERING PROPOSALS

- Moderator: Comdr. W. Ten Hagen, USN, Bureau of Weapons, Western District, El Segundo, Calif.
- James Tassen, Contracts Div., Bureau of Naval Weapons; C. E. Petrillo, U. S. Army Signal R&D Laboratory; N. Klumph, Western Development Laboratories, Philco Corp.; Ray Nordlund, Wright Air Development Div.

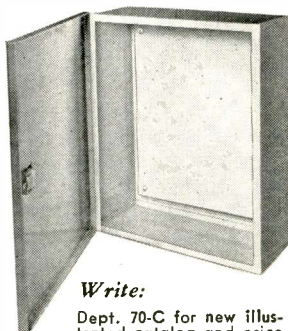
(Continued on page 252)

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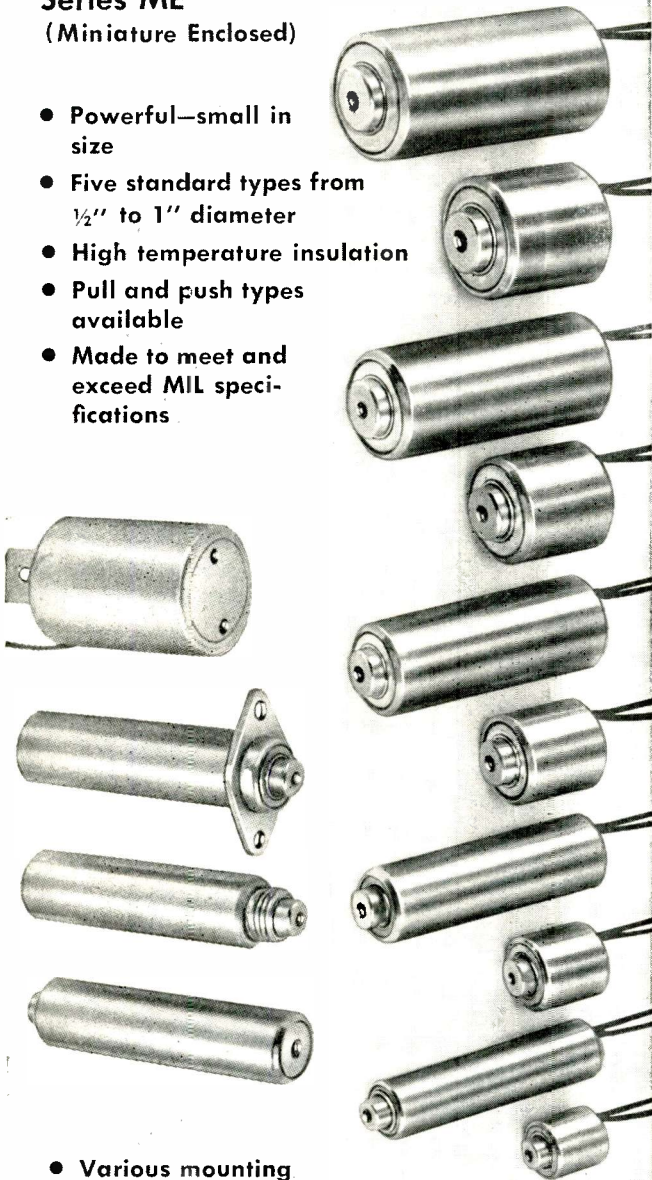


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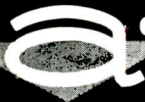


- Various mounting arrangements

Designed for DC application only, these units are available with ratings up to 125 volts, unique construction meets exacting specifications, provides long life.

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ELECTRONIC INDUSTRIES • August 1960

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WHEN YOU THINK OF IRON OXIDES FOR FERRITES!...

First of all, Mapico provides a wide range of pure synthetic iron oxides... unmatched for uniformity... produced through the most precise automatic production controls... in a plant with tremendous capacity. And Mapico iron oxides are made in three typically different particle shapes, each shape available in many accurately graded particle sizes. The selection of the proper Mapico oxide assists you in controlling electronic characteristics and shrinkage.

MAPICO IRON OXIDES UNIT

COLUMBIAN CARBON COMPANY
380 Madison Ave., New York 17, N. Y.

WRITE FOR

this useful, free, informative chart on MAPICO pure synthetic iron oxides for ferrites.

Pure Iron Oxides for the MAGNETIC CERAMICS INDUSTRY

MAPICO
PURE SYNTHETIC
IRON OXIDE REAGENTS

Columbian has had 50 years experience in the business of manufacturing pure synthetic iron oxides. They can be produced by several practical procedures to give a variety of characteristic particle shapes and particle size ranges. The methods by which MAPICO® Pure Iron Oxides are manufactured were chosen because they enable careful control of preselected characteristics.

MAPICO PURE IRON OXIDES
 (a) are strictly uniform from shipment to shipment
 (b) are free of all high temperature contaminants used in the ceramic industry
 (c) are available in three different particle shapes any of which may be had in several ranges of particle size
 (d) are of high purity and free from harmful impurities
 (e) give controlled shrinkage
 (f) give controlled electronic characteristics
 (g) are produced in ample supply by a large, modern, technically staffed plant

MAPICO PRODUCTS	TYPICAL CHARACTERISTICS	APPEARANCE				PHYSICAL PROPERTIES				TYPICAL CHEMICAL ANALYSIS				
		Color	Form	Particle Size (microns)	Specific Gravity	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
10-1*	White, spherical	0.4-0.8	32.4	1.6	35	19.8	20	13.0	0.8	1.00	20	40	0.01	0.05
10-2**	White, spherical	0.4-1.2	4.7	18	40	19.2	20	10	35	0.5	1.0	30	0.01	0.05
10-3**	White, spherical	0.4-1.2	3.5	37	39	19.2	20	10	35	0.5	1.0	30	0.01	0.05
10-4*	White, spherical	0.3-1.2	8.2	39	71	19.2	20	10	35	0.5	1.0	30	0.01	0.05
10-40	White, spherical	0.3-1.2	5.4	33	87	19.2	20	10	35	0.5	1.0	30	0.01	0.05
10-80	White, spherical	2.8-3.6	2.8	43	0.6	18.4	19	10	31	0.6	0.8	15	0.02	0.08

Circle 159 on inquiry Card



Send your specifications for prompt quotation



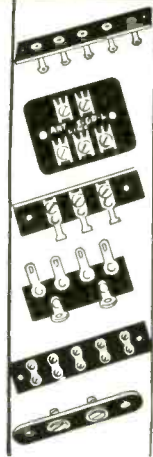
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Several pages of Jones Catalog No. 22 illustrate standard and special panels we are constantly producing. Latest special equipment enables us promptly to produce practically any panel required. Send print or description for prices, without obligation. Hundreds of standard terminal strips also listed. Send for Catalog with engineering drawings and data.

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CINCH MANUFACTURING COMPANY
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DIVISION OF UNITED-CARR FASTENER CORP.

Circle 160 on Inquiry Card

Multi-Channel Recording

(Continued from page 114)

lines to establish proper compensation for transit time of highs and lows so that they will be combined in exact time relationships. A total delay of less than 10 microseconds is encountered by such signals when compared to directly reproduced analog circuits.

Thus, the entire bandwidth of $\frac{1}{2}$ cycle to 1.0 MC is recorded and reproduced within ± 3 db, making possible the measurement of time intervals in the megacycle range and the recording of transient waveforms with a high degree of fidelity.

Applications

Because of advanced capabilities, this system can be utilized to serve a variety of functions. In pre-detection recordings, for example, intermediate frequencies of a superheterodyne receiver can be recorded for optimum data acquisition with the playback detection scheme varied at will. It can be utilized in static testing of rocket engines, and, in the FM mode of operation, for supersonic noise and vibration tests. In electronic countermeasures, unidentified signals can be recorded for later playback for identification and detailed analysis. By using a continuously variable speed playback, wide-band pulse Doppler signals can be analyzed using a single filter instead of a series covering the original bandwidth. Broader applications include radar and infra-red recording within the 1.0 MC range.



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Sleeving and Tubing...

and get these **5**
BIG Advantages

- HIGHER DIELECTRIC RETENTION
- GREATER FLEXIBILITY
- MORE HEAT RESISTANCE
- AVAILABLE IN COILS
- CAN BE AFTER-TREATED

Even under the most severe operating conditions, Varfil Sleeving and Tubing retains its average dielectric strength. Twist it, tie it, bend it, wrap it, knot it. Remains just as pliable as when you started. Won't crack, peel or suffer dielectric loss. Heat Varfil 2000 hours at 110° C.—1,000 hours at 125° C.—and even for extensive periods at 150° C. It won't break down. Can be after-treated in baking and varnishing operations. Reacts better than other oleoresinous materials and synthetic coated tubings. Available in handy coils so you can cut the exact lengths you need... no waste. Standard colors. Wide range of sizes. Exceeds or meets all A.S.T.M. specifications.

AVAILABLE IN FOLLOWING
NEMA CLASSES

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7000 VOLTS AVERAGE
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4000 VOLTS AVERAGE
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CORPORATION
Makers of Electrical Insulating Tubing and Sleeving

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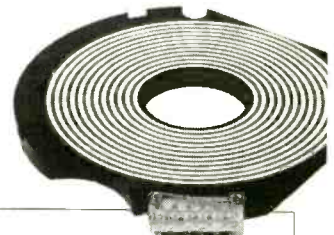
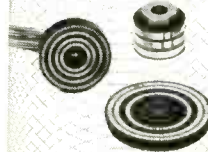
VARFLEX Corporation, 506 W. Court St., Rome, N. Y.

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Gyros
Radar Antennas
Inertial-guidance Systems
Instruments
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Programming
Sampling
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Sequence Selecting

SLIP-RING ASSEMBLIES

ROTARY SWITCHES



Your needs for slip-ring, brush-holder, and rotary-switch assemblies designed, manufactured, and tested to your performance specifications can now be met by the enlarged facilities available through the Electro Contacts Division of Electro Switch Corp.

Bulletin 60-01 shows typical products and contains a check list to help you specify. This bulletin is available through all Electro Switch sales representatives or on request to

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DIVISION ELECTRO SWITCH CORP.
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What's YOUR Portable Power Problem?

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each with the highest measure of uniform dependability! This is why 2 of 3 electronic engineers specify

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... offers compactness, long shelf life, exceptional service life. A 30% increase in battery life at no increase in size.

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Burgess Activator Batteries for transistor circuits are smaller and more compact in size! Yet they deliver 30% more power because of the patented "Wafer-Cell" construction! Burgess Activators give you compact power, uniform performance, longer shelf life... all combined with modern packaging.



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Burgess constructional features provide uniform quality and dependable service! Burgess exclusive patents offer sealed-in-steel protection, wide temperature range efficiency, controlled venting, patented inner cell connector, and flat discharge curve.



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**Miniature RF
Connectors
Match Electrical Specs...**



of Standards!

**NEW
GREMAR
Red Line
CONNECTORS
BRING RELIABLE
MINIATURIZATION
TO COAXIAL CABLE
ASSEMBLIES!**

actual size

REPLACE STANDARDS WITH MINIATURES! Now, because of GREMAR CONNECTRONICS (T), it is possible to miniaturize your RF cable assemblies and still maintain rigid electrical specs.

Red Line Miniatures, identified by their red Teflon insulation, are half the size and weight of the reliability-proved GREMAR TNC Connectors.

DESIGNED FOR USE WITH MIL-TYPE SUBMINIATURE COAXIAL CABLES, *Red Line* Miniature Connectors and adapters feature:

- A new patented metal-to-metal cable clamping method which saves up to 80% of your cable assembly time while assuring a lower, more constant VSWR.
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- Operating temperature range: -65F to +350F.
- Meets or exceeds all applicable requirements of MIL-STD-202A and MIL-E-5272B.
- Configurations for all typical applications including adapters to BNC and TNC connectors.
- Metal parts are heavily silver plated for maximum corrosion-resistance... protected with Iridite to retard tarnishing. All contacts are gold-plated.
- Standard *Red Line* adapters and connectors are stocked for immediate delivery.



WRITE FOR BULLETIN 9 containing complete data on Greomar *Red Line* Miniatures. Literature on all other RF connectors is available for the asking.

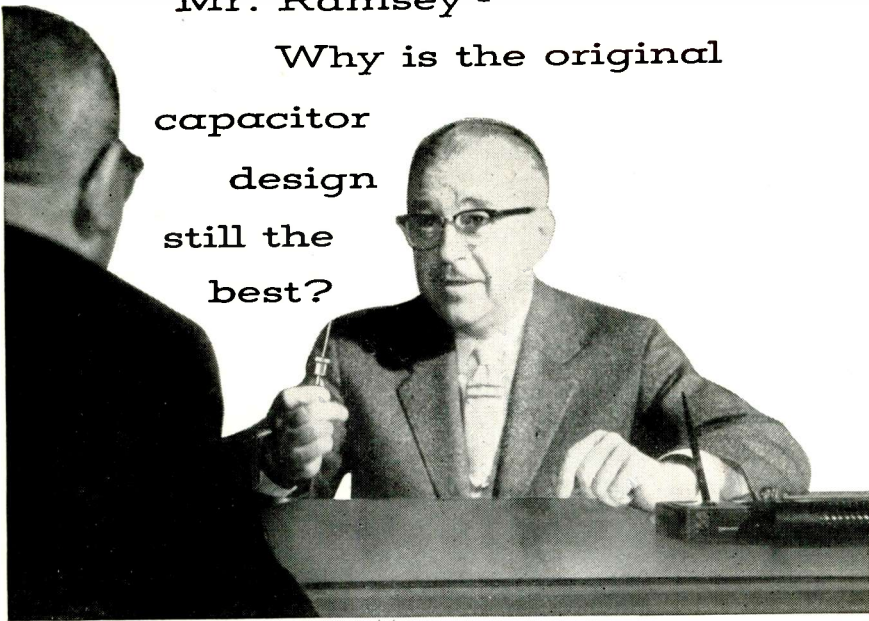


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MANUFACTURING COMPANY, INC.
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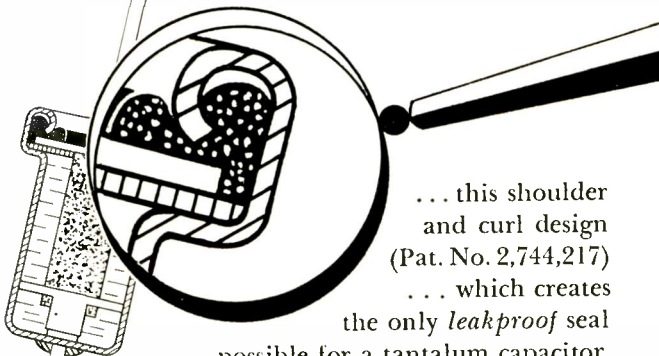
Mr. Ramsey*

Why is the original

capacitor
design
still the
best?



...because of this seal



... this shoulder
and curl design
(Pat. No. 2,744,217)
... which creates
the only leakproof seal
possible for a tantalum capacitor.

Here's why it does: it forms a steady downward pressure all the way through the capacitor's operating temperature range. It leaves a "dead air" space to guard against capillary action. As you can see, it also integrates perfectly the top gasket and the case curl. These are just 3 of the reasons why the Fansteel original capacitor has been used in millions of applications . . . with utmost reliability

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WHERE RELIABILITY DICTATES STANDARDS

Technical Program

(Continued from page 248)

AIR TRAFFIC CONTROL (ATC)—SESSION II

- Chairman: Glen Biegling, Packard-Bell Electronics Corp., Los Angeles, Calif.
"Central Data Processing of ATC Systems," Lane L. Wahlman, Librascope Div.
"Data Processing Requirements of the ATC System," Norman Pomerantz, General Precision Laboratories Div.
"Automation in ATC," T. L. Bartlett, Radio Corp. of America.
"The Need for Automatic ATC," Howard K. Morgan, Bendix Aviation Corp.
"Future Trends in ATC," Guy Van Alstyne, Gillfillan Bros., Inc.

ANTENNAS—SESSION II

- Chairman: Charles E. Dunn, Convair Div. of General Dynamics Inc., Pomona, Calif.
"A Continuous Bistatic Echo Area Range," J. W. Eberle, Ohio State Univ.
"Fresnel Region Boresight," Alfred Bagush, Radio Corp. of America.
"The Zone Plate as a Focussing Element," C. E. Hendrix and L. F. Van Buskirk, U. S. Naval Ordnance Test Station.
"Beacon Antennas for Project Mercury," D. F. Shea, D. Alstadter and W. O. Puto, Melpar, Inc.
"Miniaturized Cavity Fed Slot Antennas," F. P. Brownell and D. F. Kendall, The Martin Co.

THE PIONEER V EXPERIMENTS

- Chairman: C. P. Sonett, Space Technology Laboratories, Inc., Los Angeles, Calif.
"Preliminary Results from the Space Probe Pioneer," C. Y. Fan, P. Meyer and J. A. Simpson, Univ. of Chicago.
"Radiation Measurements made by Space Probe Pioneer V," R. L. Arnoldy, R. A. Hoffman and J. R. Winckler, Univ. of Minnesota.
"Measurements of the Geomagnetic and Interplanetary Magnetic Fields," P. J. Coleman, D. L. Judge, E. J. Smith, and C. P. Sonett, Space Technology Laboratories, Inc.
"Determination of the Astronomical Unit from a Least Square Fit to the Orbit of Pioneer V," J. P. McGuire, D. D. Morrison and L. Wang, Space Technology Laboratories, Inc.

PANEL DISCUSSION: MICROMINIATURIZATION

- Moderator: W. V. Wright, Electro Optical Systems, Inc., Pasadena, Calif.
W. B. Warren, Hughes Semiconductor Laboratories; M. Kah, Sprague Electronics; J. S. Kilby, Texas Instruments Incorporated; D. Mackey, Radio Corp. of America; H. C. Lin, Westinghouse Electric Corp.; G. J. Selvin, Sylvania Electric Products, Inc.; E. E. Maiden, Pacific Semiconductors, Inc.; R. Norman, Fairchild Semiconductor Corp.

PANEL DISCUSSION: SEEKING A LOGICAL BIO-INSTRUMENTATION SYSTEM

- Chairman: Vincent W. Blockley, Consultant: Environment Physiology, Santa Monica, Calif.
Moderator: Meyer Fishbein, System Development Corp., Santa Monica, Calif.
David Douglas, Spacelabs, Inc.; Louis Fields, Starling Corp.; Truman McNeeley, North American Aviation; Miles McLennon, Chief of Medical Electronics—Bio-Medical Laboratory.
"The Anesthetized Individual in a Normal Environment," J. P. Dillon, M.D., Univ. of Calif.
"The Unhealthy, Conscious Individual in a Normal Environment," Travis Winsor, M.D., Los Angeles, Calif.
"The Healthy, Conscious Individual in an Abnormal Environment," Patrick Meehan, M.D., Univ. of Southern Calif.
"Computers and Programming in a Bio-instrumentation System," Paul Tiffany, System Development Corp.

MILITARY ELECTRONICS

- Chairman: Lt. Col. Raymond Isenson, Office Deputy Comdr. Army, Pacific Missile Range, Pt. Mugu, Calif.
"System Implications of Electronic Ancestor Workshop," B. H. Baldrige, General Electric Co.
"Implementation of a Modern Communication System on National and Global Scales," C. K. Chappuis, System Development Corp.
"Automatic Programming of Ground Support Checkout Equipment Using Computer Techniques," Mayer Cook and C. Keeler, Convair Astronautics.
"The BMEWS Automatic Monitoring-System," E. L. Danheiser and M. Korsen, Radio Corp. of America.

INFORMATION THEORY AND MODULATION METHODS

- Moderator: Bernard Oliver, Hewlett-Packard Co., Palo Alto, Calif.
"PTM/AM," Conrad Hoepfner, Radiation Inc.
"PCM/FM," R. L. Sink, Consolidated Electro Dynamics.

"PDM," Kenneth Uglow, Electromechanical Research, Inc.
 "PACM/FM," M. B. Rudin, Aeronutronic Systems, Inc.
 "DSSB/AM," J. W. Halina, International Telephone & Telegraph Co.
 "Digilock," Ray Sanders, Space Electronics Corp.
 "Sebit 25," James L. Hollis, Rixon Electronics.
 "Telebit," John Taber, Space Technology Laboratories, Inc.

OPERATION AND TRAINING OF MANNED MACHINE SYSTEMS

Chairman: H. M. Parsons, System Development Corp., Santa Monica, Calif.
 "Model for Automating Maintenance Function," Douglas Ellis, Hughes Aircraft Co.
 "A Model for Relating Human Factors to ADP Systems Performance," John B. Teeple, Thompson Ramo Wooldridge.
 "Human Maintenance Functions in Man-Machines," Milton Grodsky and Gerrard W. Levy, The Martin Co.
 "Human Factors in System Operations and Training," James W. Singleton, System Development Corp.

VEHICULAR COMMUNICATIONS II: MOBILE RADIO AND PAGING SYSTEM

Chairman and Moderator: Kenneth T. Corner, Comm. Dept., City of Los Angeles, Calif.
 "System Performance Compatibility and Standards," R. T. Buesing and N. H. Shepard, General Electric Co.
 "Personal Two Way Radio Communication System Featuring Modular Construction," T. H. Yaffe, Bendix Radio Div.
 "Personal Radio Paging in the VHF Band," J. F. Mitchell, Motorola, Inc.
 "Police and Fire Dept. Communication Centers: A System Approach to the Control Console and the Related Facilities," G. A. Brookes, Westrex Corp.

CODING METHODS AND TELEMETRY

Chairman: A. V. Balakrishnan, Space Technology Laboratories, Inc., Los Angeles, Calif.
 "An Improved FM Discriminator Detector for Airborne Telemetry Receivers," G. E. Reis and C. E. Land, Sandia Corp.
 "Improved Dovap Transponder," Floyd M. Gardner, Gardner Research Co.
 "Optimized Data Systems," John C. O'Brien, Technical Specialist, Pomona, Calif.
 "Reliable Fail-Safe Binary Communication," J. J. Metzner and K. C. Morgan, Research Div., New York Univ.
 "Data Compression," Helmut Schwab, Applied Development Corp.

VEHICULAR COMMUNICATIONS III: NEW IDEAS AND CONCEPTS FOR MOBILE TELEPHONE OPERATION

Chairman and Moderator: A. Culbertson, Lenkurt Corp., San Carlos, Calif.
 Panelists: R. T. Crabb, Mobilfone Corp.; A. R. Ogilvie, Secode Corp.; Charles W. Schweiger, Pacific Telephone & Telegraph Co.
 "Application of Trunking Principles to Multi-channel Mobile Telephone Service," E. S. Randel, American Telephone & Telegraph Co.
 "System Concepts for Address Communication Systems," D. H. Hamsher, U. S. Army Signal R&D Laboratories.
 "Pushbutton Mobile Dial Radiotelephone: An Advanced Concept in Common Carrier Mobile Service," J. R. Stewart, Motorola, Inc.
 "A Three-Channel Single Sideband Multiplexed FM Mobile Radio System Using Transistorized Vehicle Terminal Equipment," Willard S. Felch, American Telephone & Telegraph Co.
 "Guarded Tone Signalling," William B. Smith, Bendix Radio Div.

New West Coast R & D Lab

Westinghouse Electric Corp. is establishing a new "Astro-electronics" Laboratory on a 50-acre site in the Comejo Valley 40 miles northwest of Los Angeles. The Laboratory will work on advanced electronic techniques in the missile and space area, including work on molecular electronics, semiconductors, thermoelectrics, and sensing tubes. The semiconductor laboratory will emphasize development of elements which perform multi-circuit functions. The tube division will stress advanced work on microwave and sensing tube devices.

WATER

ALMOST TOO PURE
TO DRINK...

and what
it means to the
RELIABILITY
of a
silicon rectifier

Water, after passing through a specially-designed water purifying system in the new Fansteel rectifier plant, is almost too pure for human consumption. Minerals and other "impurities" that the human body needs—and can most conveniently get from water—have been removed. Electrical resistivity of this water—true measure of its purity—is a fantastic 18,000,000 ohm-centimeters.

Here is water that is softened, de-ionized, de-mineralized... and still isn't good enough for Fansteel rectifiers. So it is passed through sub-micron filters to remove all matter coarser than 0.5 micron, organic or inorganic. (Never once, throughout its purification process, is the water permitted to contact air.) Finally, at the last second, the water is "filter-polished" to remove any impurity which might still remain.

Now the water is ready for use—in the critical chemical cleansing process of Fansteel silicon rectifier junctions. Thorough washing of the silicon rectifier junctions in this ultra-pure water results in contaminant-free junctions... and another assurance of complete Fansteel silicon rectifier reliability.

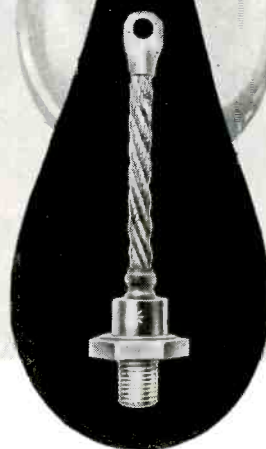
Look at any other phase of our manufacturing operations—large or small—and you'll see like examples of uncompromising thoroughness and care. We can't afford to take any short-cuts—*not when reliability is at stake.*

Fansteel Metallurgical Corporation
North Chicago, Illinois, U.S.A.

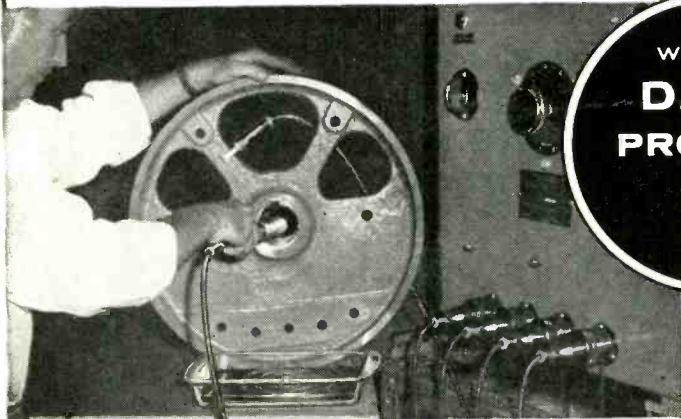


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Production and Repair Plating without using immersion tanks

Enables You to (1) Precision-plate selected areas economically — without disassembling components; (2) Deposit metals rapidly where conventional electro-plating is impossible or difficult. Mobile equipment takes the process to the job.

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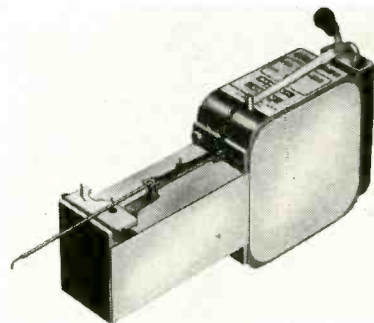
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WESCON

New Products

Writing Pen Motor

A 40 mm pen motor, Model OS-600, for ink writing on true rectangular coordinates, can record signals from dc to 100 CPS and over. Coil resistance: 16 ohms dc; current sensitivity: 28 ma/mm; linearity: 2% of full

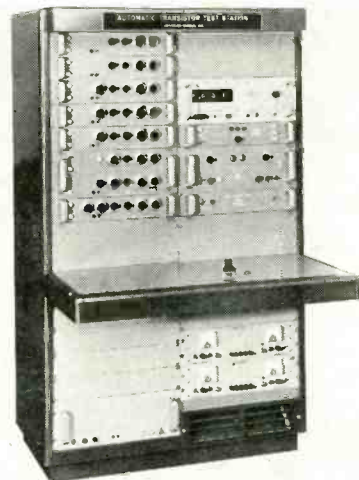


scale (40 mm peak to peak); natural frequency: 45 CPS; frequency response: dc-120 CPS (3 db down); hysteresis: less than 1/4 mm; damping: acoustic damping, approx. 30% of critical. Dc resistance 40 ohms; Maximum Undistorted Amplitude: Full scale (40 mm)—dc to 40 CPS; half scale—dc to 80 CPS; quarter scale—dc to 120 CPS. Massa Div., Cohu Electronic, Inc. Booth 557.

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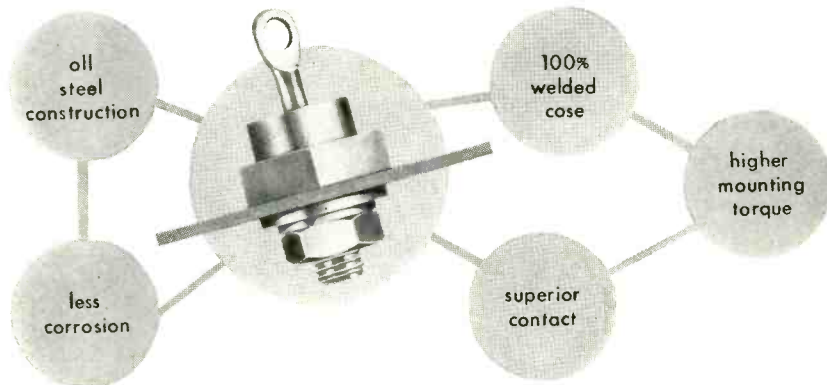


gramming is with 10 turn dials and selector switches. Readout also by digital display, automatic typewriter printout or punch card. Test accuracy is 1%. Optimized Devices, Inc. Booth 828.

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SILICON RECTIFIERS



SYNTRON'S exclusive all steel construction provides higher mounting torque, superior contact and reduces corrosion. Maximum mounting torques 50-100 inch #.

Their 100% welded case, with no blind solder connections, assures positive contact, greater efficiency and long reliable life.

Write for complete technical data or contact your nearest SYNTRON Sales Engineer.

SYNTRON RECTIFIER DIVISION

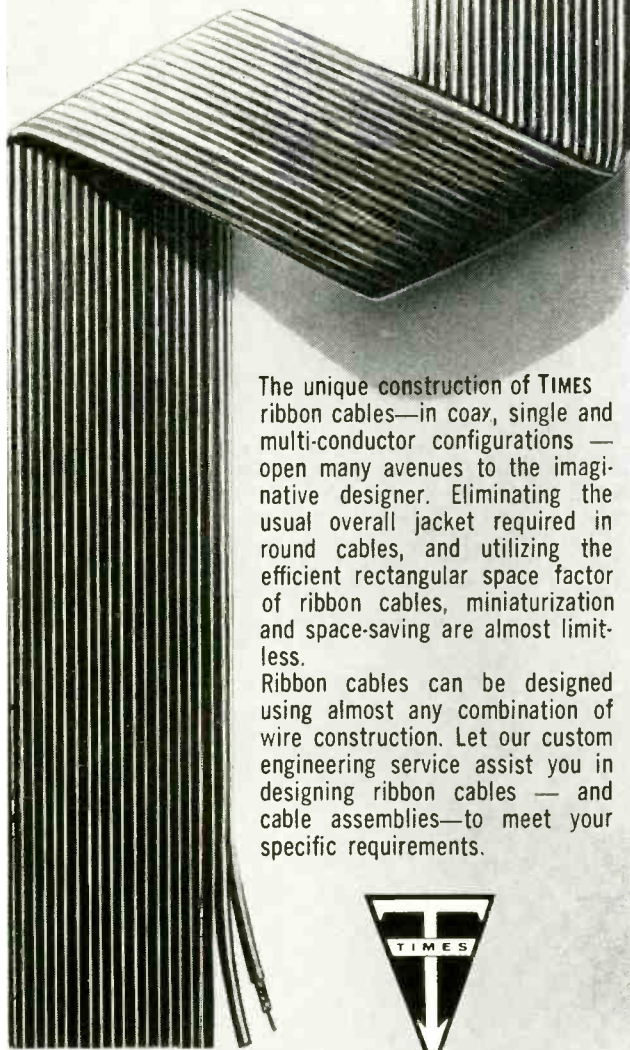
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high and medium
temperature
ribbon coax cable
for modular and
printed circuitry



The unique construction of TIMES ribbon cables—in coax, single and multi-conductor configurations — open many avenues to the imaginative designer. Eliminating the usual overall jacket required in round cables, and utilizing the efficient rectangular space factor of ribbon cables, miniaturization and space-saving are almost limitless.

Ribbon cables can be designed using almost any combination of wire construction. Let our custom engineering service assist you in designing ribbon cables — and cable assemblies—to meet your specific requirements.



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THE INTERNATIONAL SILVER COMPANY
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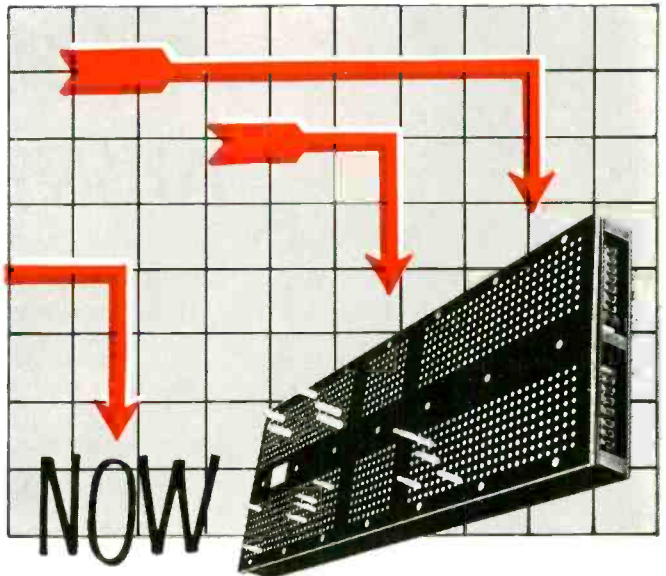
Please rush FREE literature on:

- Coaxial Cables
- Data Transmission Cables
- Multi-Conductors & Hook-up Wire
- For Info. Only Have Rep. Call



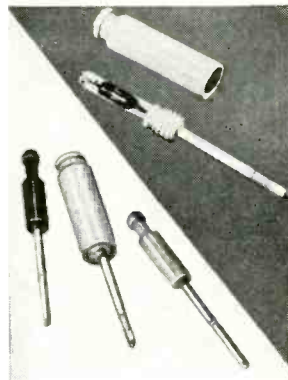
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ELECTRONIC INDUSTRIES • August 1960



PROGRAM AT THE
PUSH OF A PIN!—WITH OR
WITHOUT COMPONENT
INTERPOSITION...

NEW
SELECTOBOARD



So logical, you'll wonder why it wasn't designed before—the Selecto board allows complete logic programming at the simple push of a pin-plug. It offers every advantage in circuitry switching and component interposition and simultaneously eliminates all disadvantages.

Selecto board pin-plugs include shorting type, diode-holder, wire lead type. Available in all EIA colors. All interchangeable.

ELIMINATE: Patch cords; soldering/unsoldering components; circuit-by-circuit troubleshooting; polarization roulette;

PROVIDE: Simple, fast circuitry programming without patch cords; color-coding of logic for photo-recording; push-in, automatic polarization of component interposition; miniaturization; precise, self-cleaning, low-resistance switching; low initial cost... **ALL WITH THE SELECTOBOARD. WRITE FOR COMPLETE LITERATURE TODAY...** PAT. PENDING

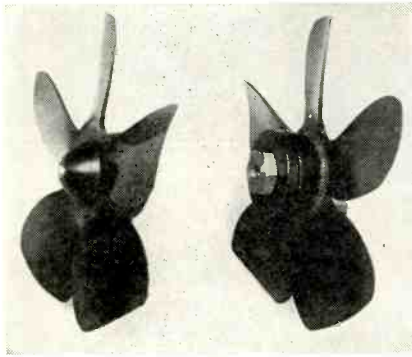
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Marsham Factory Estate, Lyon Road,
Wotton-on-Thames,
Surrey, England.

See us at WESCON Booth 954
Circle 329 on Inquiry Card

See These Products At WESCON

Constant Mass Fan

Fan and motor coupled with constant torque magnetic device provides essentially constant mass rate of air

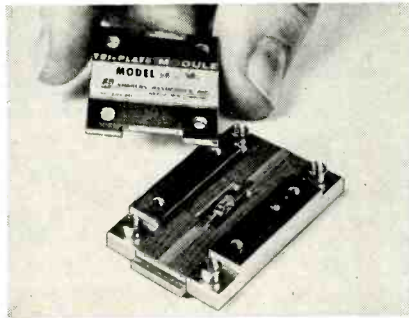


flow over the operational altitude range of cooling equipment on which assembly is applied. Coupling permits fan speed to vary directly with altitude or inversely with the square root with relative density. Eastern Industries, Inc. Booth 2054.

Circle 331 on Inquiry Card

Semiconductor Mounts

Tri-Plate semiconductor mounts extend breadboarding versatility in strip transmission line circuits. Modules are available for cartridge, double ended, pill, or pigtailed glass

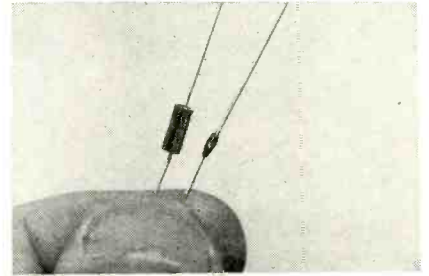


packages. Also: other Tri-Plate Modules including phase shifters, delay lines, and variable couplers and standard 50 ohm and low impedance 10 ohm Tri-Plate slotted lines with module connectors. Sanders Associates, Inc. Booth 929.

Circle 58 on Inquiry Card

Capacitors

A line of high-precision, ultraminiature ceramic capacitors for miniature circuitry. They are (less leads) 0.250 in. long and 0.098 in. in dia. for capacitances from 47 to 560 mmf and 0.125 in. dia. from 680 to 1200 mmf



when fully encapsulated in glass. These barium-titanate capacitors are precision-tuned to $\pm 5\%$ tolerance to 125°C or $\pm 10\%$ tolerance to 150°C and meet the applicable requirements of MIL-C-11015A and EIA-SMC-1 specs. Electramics Corp., Cliff at Cedros, Solana Beach, Cal.

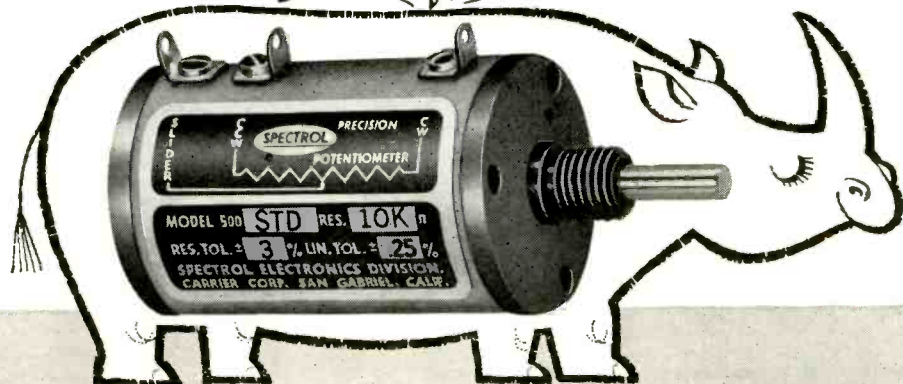
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Another **SPECTROL** First



(Diallyl Iso-Phthalate)



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Differential Voltmeter

Differential dc VTVM has 1% accuracy. Model 410 features a zero center scale with full scale ranges of $\pm 0.3, 1.0, 3.0, 10, 30,$ and 100 vdc, and

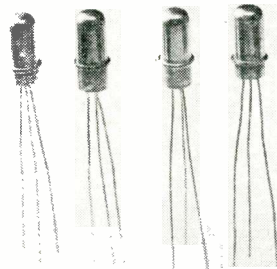


a single input impedance of 20 and 40 megohms differential. The Decker Corp. Booth 2421.

Circle 355 on Inquiry Card

MADT Transistors

Micro-alloy diffused transistors are extremely high-speed transistors suited to computer applications requiring efficiency and reliability.

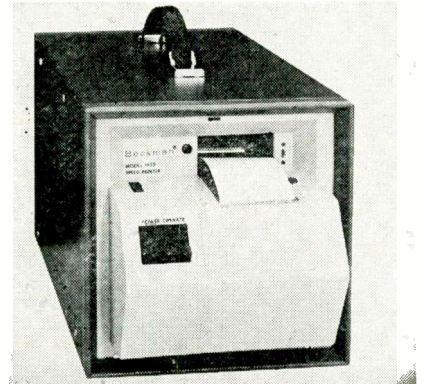


CBS Electronics, div. of Columbia Broadcasting System, Inc. Booth 2524.

Circle 356 on Inquiry Card

Speed Printer

Model 1453 can record readings of up to 12-digit numbers on a standard adding machine tape. It records samples separated by less than 200



msec. May be actuated by standard 1-2-4-8 binary code and 1-2-2-4 code. Beckman/Berkeley Div. Booth 2514.

Circle 357 on Inquiry Card

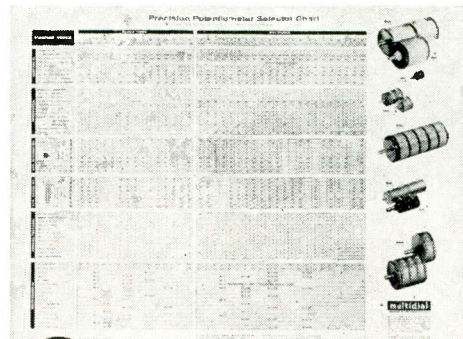
. for SPECTROL POTS

We haven't thought of a short, catchy name yet for Diallyl Iso-Phthalate, but maybe that's not too important. We'll be happy if you remember that this rugged new body for Spectrol pots is tougher than any other known plastic pot casing.

Essentially, Diallyl Iso-Phthalate consists of glass fibers suspended in plastic and molded under pressure. It has the following special characteristics:

- Absorbs virtually no moisture.**
- Maintains dimensional stability under typical military environments.**
- Has high insulation resistance.**
- Withstands temperatures to 450° F.**

This is a big improvement over previous plastic bodies. Accordingly, we have made Diallyl Iso-Phthalate casings available in many models in the broad Spectrol line. Your Spectrol rep has details, or just drop us a line at the factory.



NEW ENGINEERING AID

Have you received your pot selector chart? Suitable for wall mounting, this 24" x 30" chart contains complete and easily read specifications on 37 standard models of single and multi-turn precision potentiometers and three models of turns indicating dials (Multi-dials). For your free copy, contact your Spectrol engineering representative or write us direct. Please address Dept. 44.

Booth 1004

SPECTROL

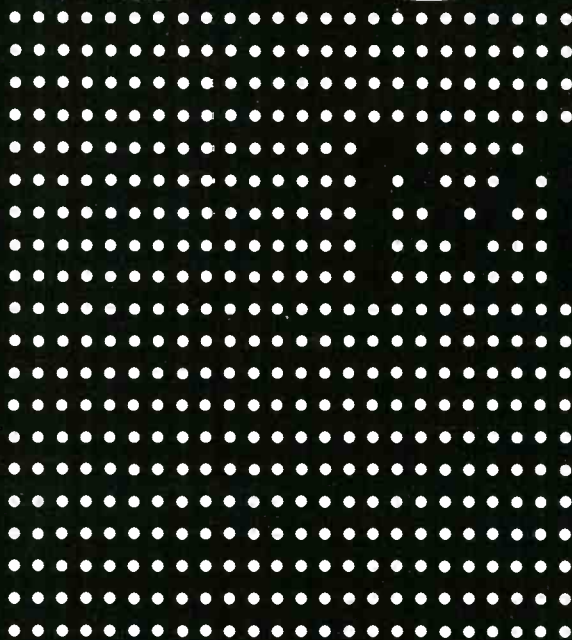
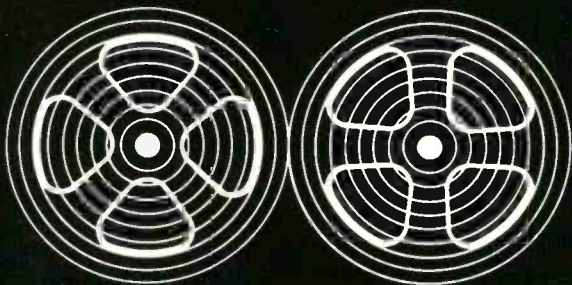
ELECTRONICS CORPORATION

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PRECISE, RELIABLE, UNATTENDED PERFORMANCE

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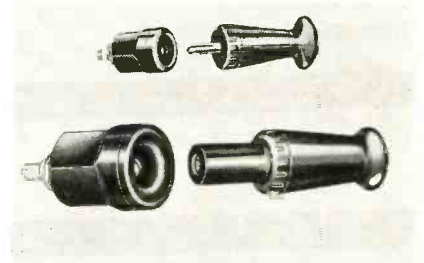
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WESCON

New Products

Electrical Connectors

Single-conductor plugs and receptacles in 25 and 250 ratings feature a functional "fishtail" plug design;



simplified, quick assembly; a range of 6 colors: red, white, blue, yellow, black and green. The Superior Electric Co. Booth 1067.

Circle 358 on Inquiry Card

Time Delay Timers

Electronic Repeat Cycle and Time Delay Timers, WC-605 operate from 24-30 vdc, cuts off power 60 sec. after



triggering cycle. Power is gated on again at the end of a second 60 sec. "off" period. Accuracy is $\pm 5\%$. Webeor, Inc. Booth 2421.

Circle 359 on Inquiry Card

Tape Recorder

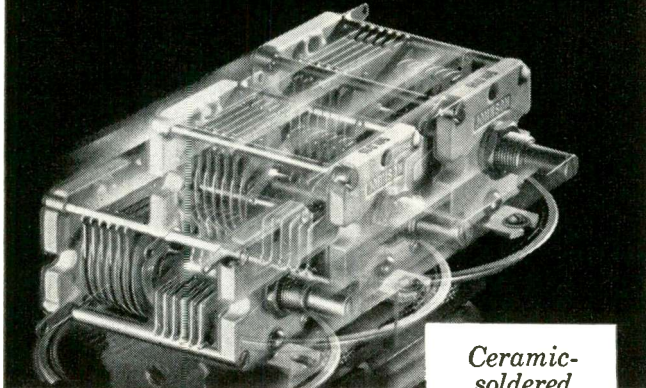
A portable magnetic tape recorder, the CP-100 reel-to-reel machine is a complete 7 or 14-channel recording



and reproducing system. It accommodates either 1/2 or 1 in. wide tape on 10 1/2-in. reels. Ampex Corp. Booth 2004.

Circle 360 on Inquiry Card

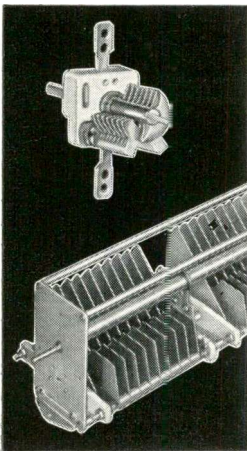
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Write today for our newest electronic components catalog—complete specifications, engineering prints and current prices on:

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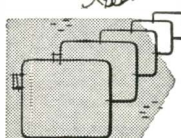
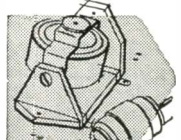
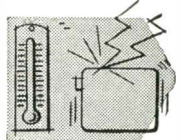
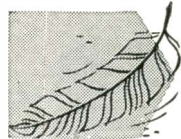
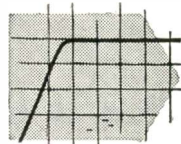
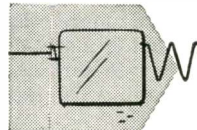
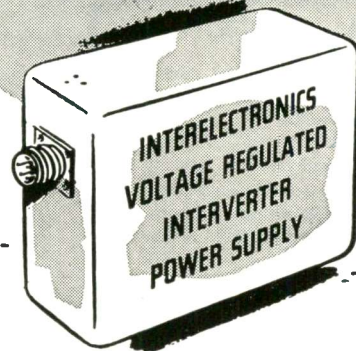
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FREQUENCY RANGE: 500CP TO 15KC

Type	Max Q	Inductance Range
TI-11	290	1MH to 50Hy
TI-12	255	1MH to 30Hy
TI-1A	250	1MH to 30Hy
TI-1	210	5MH to 20Hy
TI-4	195	5MH to 5Hy
TI-5	130	5MH to 2Hy
TI-16	72	1MH to 2Hy

FREQUENCY RANGE: 10KC TO 50KC

TI-13	303	1MH to 500MH
TI-2	285	1MH to 500MH
TI-6	279	1MH to 400MH
TI-7	200	.500MH to 200MH
TI-17	110	.100MH to 100MH

FREQUENCY RANGE: 30KC TO 200KC

TI-18	115	.1MH to 100MH
TI-8	140	.1MH to 100MH
TI-10	185	1MH to 200MH
TI-9	175	1MH to 500MH
TI-19	100	1MH to 5MH
TI-3	260	.1MH to 10MH
TI-3A	310	10MH to 100MH

HIGH FREQUENCY TOROIDAL INDUCTORS

FREQUENCY RANGE: 20KC TO 10MC

TI-21	205	.010MH to .150MH
TI-22	250	.010MH to .700MH
TI-23	210	.010MH to .500MH
TI-20	305	.050MH to 5MH



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MGA 2	Pri. 600 Split Sec. 4, 8, 16	Matching	90001	TF4RX16AJ002
MGA 3	Pri. 600 Split Sec. 135,000 C.T.	Input	90002	TF4RX10AJ001
MGA 4	Pri. 600 Split Sec. 600 Split	Matching	90003	TF4RX16AJ001
MGA 5	Pri. 7,600 Tap & 4,800 Sec. 600 Split	Output	90004	TF4RX13AJ001
MGA 6	Pri. 7,600 Tap & 4,800 Sec. 4, 8, 16	Output	90005	TF4RX13AJ002
MGA 7	Pri. 15,000 C.T. Sec. 600 Split	Output	90006	TF4RX13AJ003
MGA 8	Pri. 24,000 C.T. Sec. 600 Split	Output	90007	TF4RX13AJ004
MGA 9	Pri. 60,000 C.T. Sec. 600 Split	Output	90008	TF4RX13AJ005

FREED TRANSFORMER CO., INC.
 1726 Weirfield St., Brooklyn (Ridgewood) 27, N. Y.

WESCON

New Products

Tape Recorder

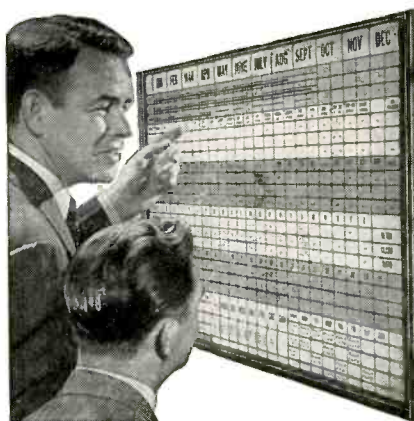
Miniature missile-borne magnetic tape recorder designed to record through a 500-mg impact deceleration and survive a 1500-g shock with-



out loss of recorded data. It will record more than 30 sec. of critical analog data during flight of a surface-to-surface missile. Westred Recording Equipment Dept. Booth 2065.

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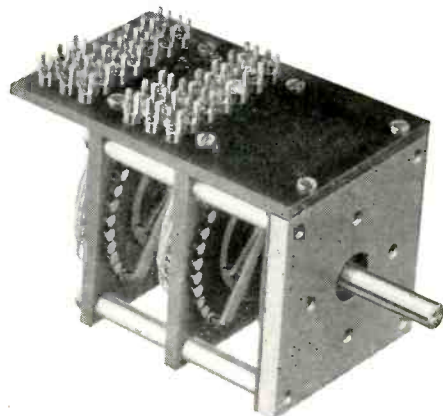
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Choice of Contact Arrangement—shorting (make-before-break) or non-shorting (break-before-make); Contact Material—solid nickel silver or Coin Silver for lower switch circuit resistance; Deck Material—fine linen base phenolic or glass epoxy for extremely high insulation resistance.

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 1100 Chestnut, Burbank, California

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How to Talk "Computerese"

Do you know what the computer people are talking about when they use terms such as: Binary Coded Decimal, Mnemonic Code (how do you pronounce it), Binary Digit, Binary Scale, and Radix. Do computer people use normal English words like: Address, Drum, Gate, Bit, and Patch in a confusing manner? What you need is the dictionary of Computerese compiled by Minneapolis-Honeywell Regulator Co., Industrial Div., Philadelphia, Penn.

The booklet, called "Do You Talk 'Computerese'?" 32-pages, pocket-sized, is a glossary of computer language. It defines over 82 commonly used computer terms.

For example: *Mnemonic* code is a list of computer instructions written in a form which can be remembered easily by the persons who program them; a *Binary Coded Decimal* is a system of representing decimal numbers, a *Binary Scale* is a numbering system and *Radix* is the numbering system's base. A *Bit* is short for *Binary Digit* (0 to 1) used in converting a decimal number into a binary number.

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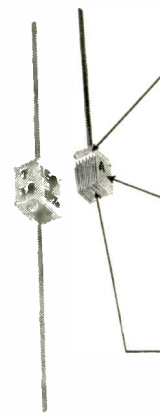
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alternate layers of high grade porcelain dielectric and fine silver electrodes

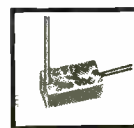
"Vitramon" capacitors feature smaller mounting area, lower inductance, and more versatility of application. Solid state construction — fine silver electrodes fused to pure porcelain dielectric — provides outstanding stability, low loss, low noise, and high frequency operation to 200°C.

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V-BAND MAGNETRONS

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(More power than you can get from any other device at this frequency)
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- Fixed tuned



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V	BL-236	54,000-57,000	10	UG385/U
V	BL-237	57,000-60,000	10	UG385/U
V	BL-221	69,000-70,500	10	UG385/U

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